

MANNA

CONTROLLED ENVIRONMENT
AGRICULTURE



Company Info- MANNA CEA



Daniel Chon
CEO

Aaron Park
CEO

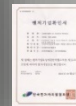


Operating 30,000 Commercial
scale greenhouses

Incorporated March 2013



Over 14 Issued Patents
20 Pending



Venture
Certified

30 million USD raised in Venture Capital

Kakao
Investment

DSC
Investment

Crowd
Funding

Kite
Foundation

DS
Asset Manage

Alpenroute

What is Aquaponics?



AQUAPONICS

The only USDA certified hydroponic system

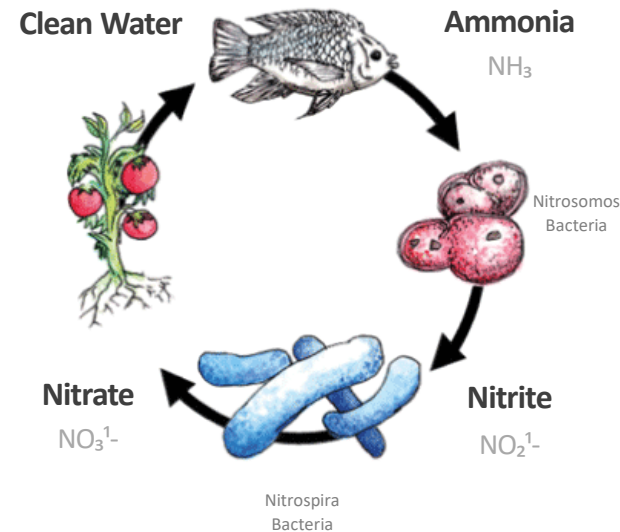
USDA : United States Department of Agriculture

01 20 % Increase in Production Compared to General Hydroponics

02 Reduce the Cost of Nutrient Solution and Maintenance Compared to Chemical Fertilizers.

03 High Phytochemical
Vitamin C 300% Calcium 151% Iron 145%

04 Reduce Disease Incidence and E.coli Risk



01 Vertical Aquaponics
Technology Patent

02 Complete Organic OMRI
Complaints Solution

03 Bacterium Control
Algorithms

04 Automated Biosensor based
Remote Control Systems

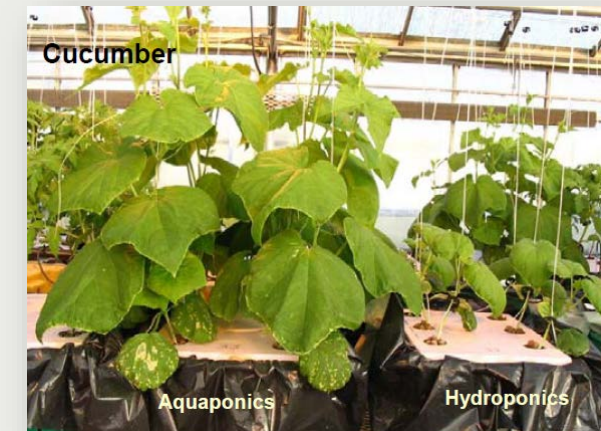
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AGRICULTURE
M A N N A

Benefits of Aquaponics-increased yield

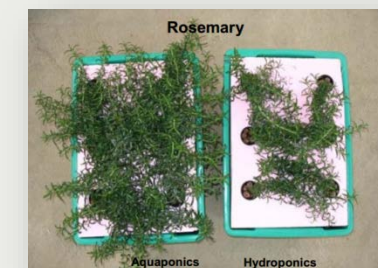
Red Romaine Lettuce, 250 PPFD, No CO₂ added, 14 hour light cycle, 2013-12-01



For non-flowering plants, average of 15% increased yield



Dr. Nick Savidov, Crop Diversification Center South Alberta Canada Study on aquaponics.

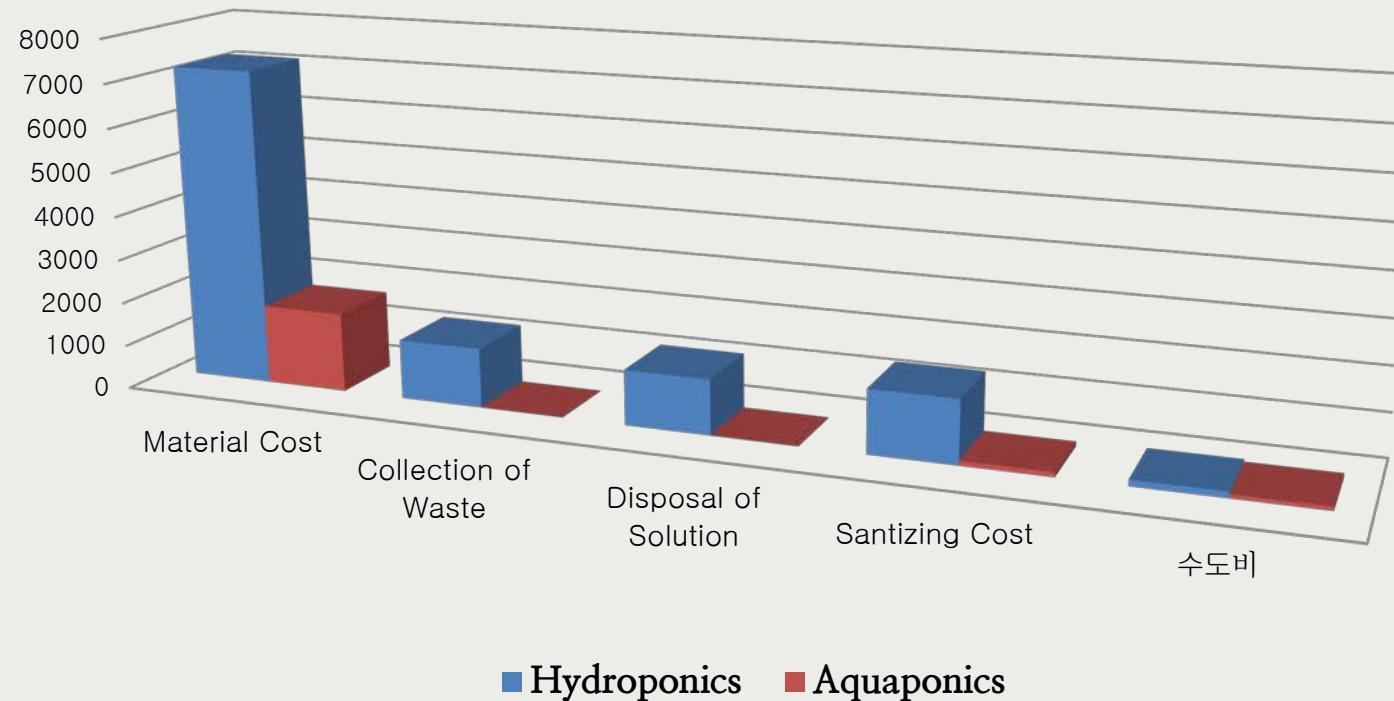


Benefits of Aquaponics-lower operating cost

Cost to maintain nutrient solution hydroponic vs aquaponics

(Based on Single Farm Unit of 2500 sq meters)

Maintenance Cost Breakdown



Monthly maintenance cost

Hydroponics KRW 11.48M

Aquaponics KRW 0.2M

82% Cost Reduction



In aquaponics, nutrient solution input cost is not an expense but rather an investment. Fish/Eel can be sold into market for a profit

Benefits of Aquaponics-Higher Actives

Aquaponics technology shows a significant increase in Phytochemicals, vitamins and actives

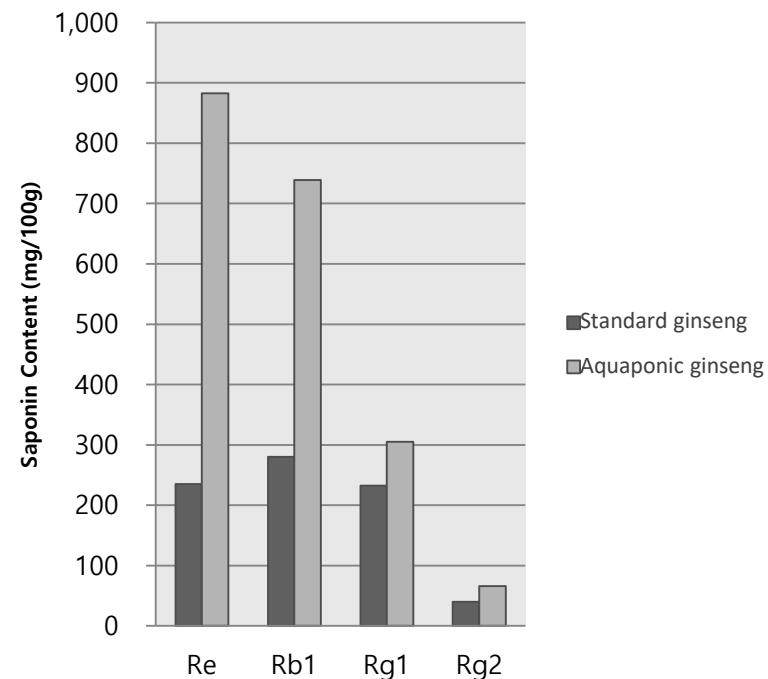


Manna CEA ginseng



Comparable Ginseng Growth

Comparison of Active Saponins



Increased Active Saponins

Re : 6 year Ginseng <375% increase
 Rb1 : 6 year Ginseng <264% increase
 Rg1 : 6 year Ginseng <131% increase
 Rg2: 6 year Ginseng <165% increase

Increased Profitability

For extraction purposes a significant
 Decrease in cultivation time is met

No Pesticides or Heavy Metals

Because this system utilized a CEA
 Approach, no harmful agents are
 introduced

시험 성적서 (Test Certificate)

접수번호 PCAM - N14 - 592

페이지 (1) / (총 1)

우 305-325 대전광역시 유성구 대덕로11로 12 (합정동 867) / 전화 (042)823-8680-1 / 전송 (042)823-8682

1. 시험 내용

기관명	농업회사법인 만나씨에이퍼	의뢰일자	2014년 9월 1일
주 소	대전광역시 유성구 문지로 193 KAIST 문지캠퍼스 행정동A 907호	의뢰자	농업회사법인 만나씨에이퍼
시 료 명	인삼	시험장소	분석실
시 행 기 간	2014년 9월 1일 ~ 2014년 9월 5일	분석장비	LC-MS/MS
용 도	제출용	시험환경온도	(22 ~ 24) °C
		시험환경습도	(35 ~ 40) %

2. 검사결과

시험결과 (측정치)

단위 : mg/kg

Compound	함량
	인삼
Rg1	3,052.58
Rb1	7,391.59
Rg2(S)	660.71
Rg2(R)	ND
Re	8,825.05

확인

작성자 (시험자)

승인자 (기술책임자)

성명 : 김진희

성명 : 이혜숙

(인)

* 본 분석결과를 인삼, 홍삼, 산삼 등 정제약재용으로 사용할 수 있습니다.

* 위의 내용은 실험인이 제출한 시료에 대한 결과이며, 시료의 명칭은 실험인에 제정한 것 입니다.

* 이 시험성적서는 용도 이외의 사용을 금합니다.

2014년 9월 5일

주식회사 피렐코리아

(인)

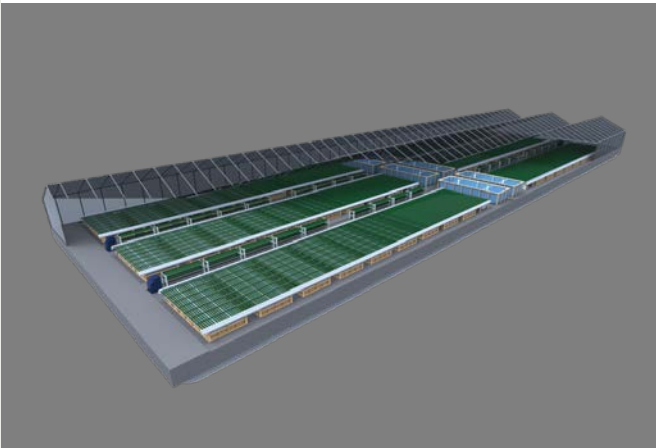
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(11-02-21 승인)

A4(210x297)

Key Technologies of MANNA

4th Industrial Technology Convergence Solution

Internet of Things, Artificial intelligence,
Information communication technology
Big Data, Programming, Machine
automation, 4th Industrial Technology
Intensive solution



USDA Certified Aquaponics

Proven safety and high productivity
with USDA certification
Aquaponics that is gaining attention as
the basis for future agricultural
production technologies



Professional researchers in various fields

Seven researchers from KAIST
24 experts in specialized research
Developing next-generation agricultural
technology in line with the rapidly changing
Fourth Industrial Revolution



Next-Generation Smart-Farm

Bluetooth Low power control system,
Voice command control, A Model
for Predicting the Control of the
Greenhouse Based on Big Data
Smart-Farm with multiple technologies



Previous works - Domestic

Jincheon Farm



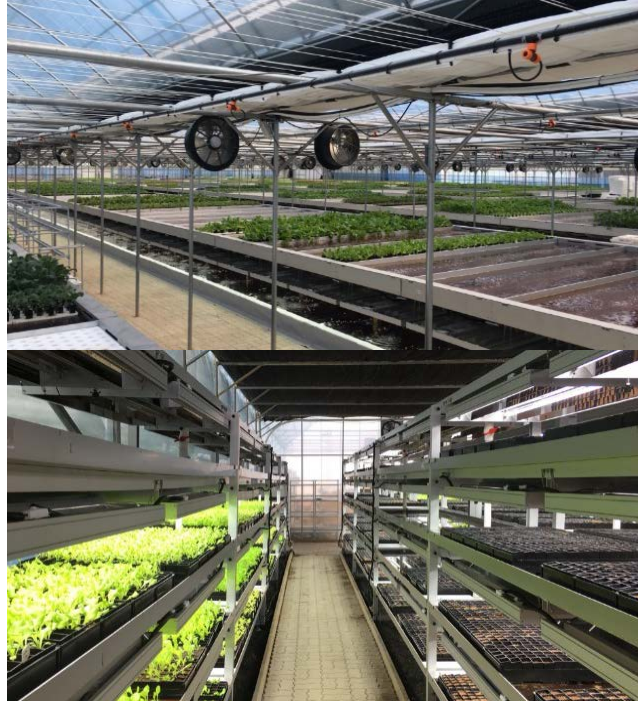
Total Area : 4,620 sqm

Lettuces, leafy greens, herbs

Annual sales : \$1,000,000

* Crowd funding based farm

Daejeon Farm



Total Area : 6,600 sqm

Lettuces, leafy greens, herbs

Annual sales : \$1,500,000

* First turn-key sales farm

Jeju Farm



Total Area : 6,600 sqm

Lettuces, leafy greens, herbs, eel

Annual sales : \$1,200,000

* Including farming experiential space

Previous works – Overseas(Kazakhstan)

- Construction of 6600 sqm aquaponics farm in the Kordai region, Zambil, Kazakhstan (18.06~)
- Designing the multi-layer vegetable growing system suitable for local environment, delivering materials and managing construction

Progress



18.04 Contract signed



18.05 Site inspection

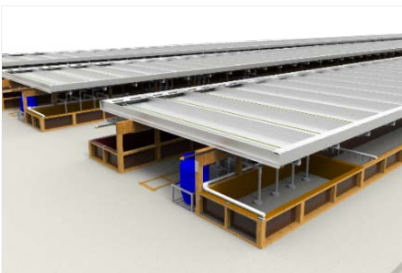
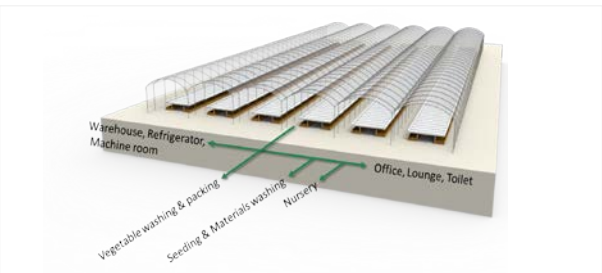


18.06 Site construction start



2018-07 Material delivery

Aquaponics Smart-farm for Kazakhstan



Total land area	6600m ²
Greenhouse area	4532m ²
Cultivation area	3148m ²
Power consumption	2MWh/day
Water consumption	20t/day
Required labor	8+



2-Level DWC growbed

- Sunlight-based DWC growbed
- Artificial light-based DWC growbed
- Aquaculture section
- Biofilter
- Autofilter

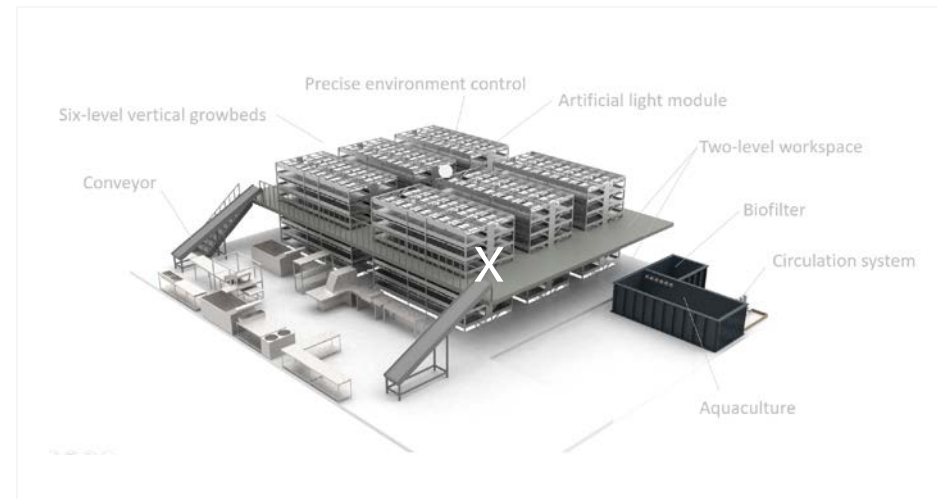
Previous works – Overseas(Saudi Arabia)

JV with local group – MOWREQ (Blossom)

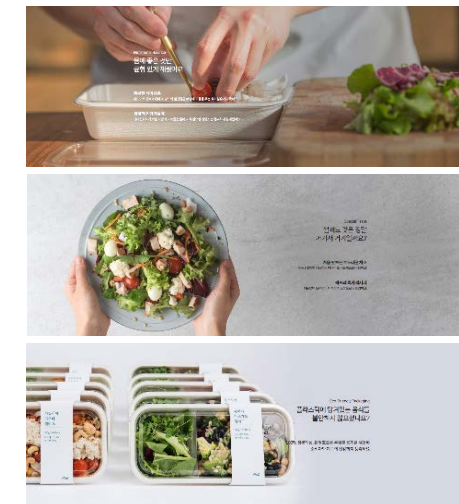
- Multi-layer baby-leaf indoor vertical farm facility in Jeddah site (Spring 2019)
- Co-work with logistics company : secure distribution network in the middle east
- Project including Saudi Arabia's local branding



Article of Saudi Arabia agreement

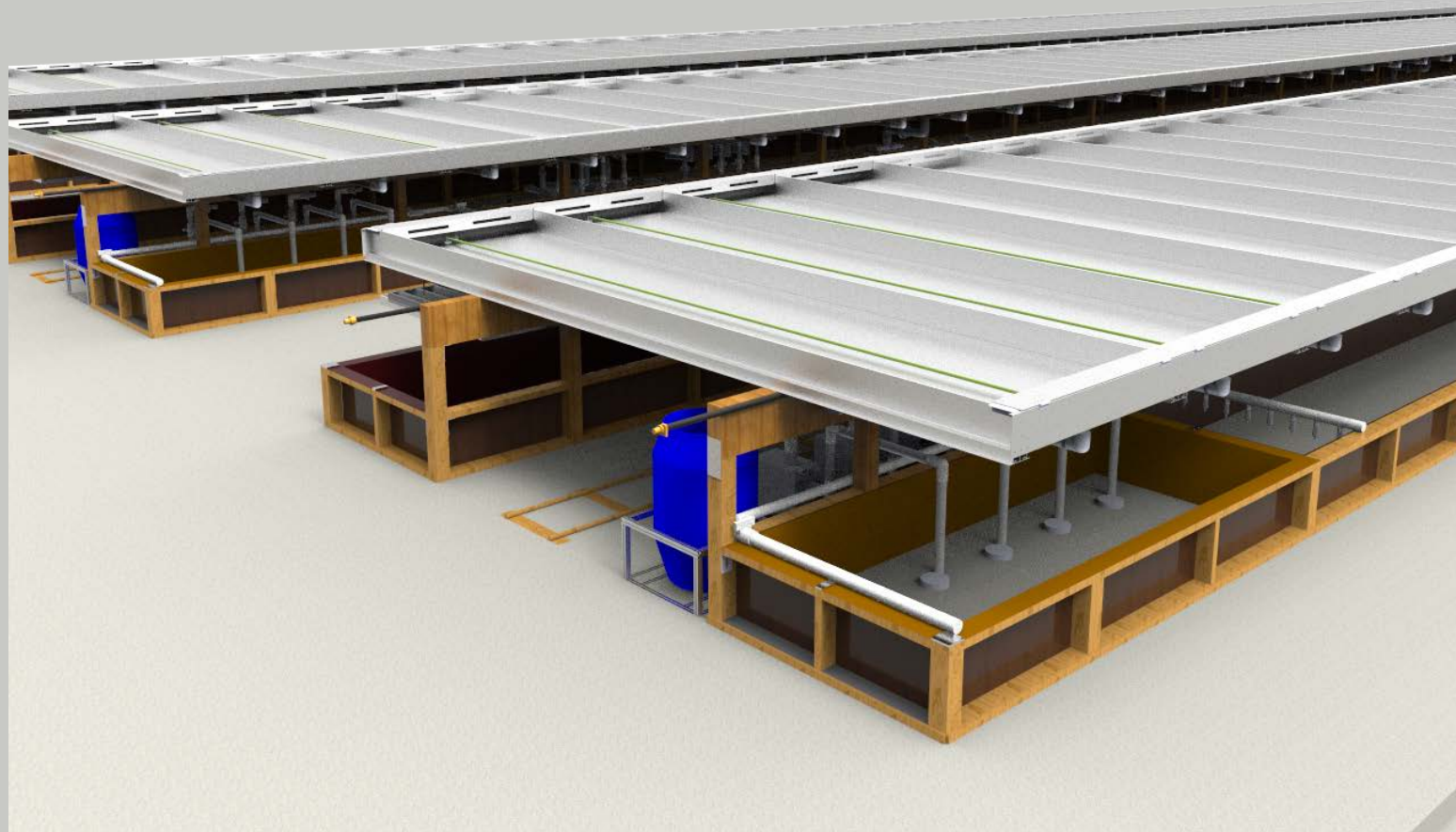


Saudi – vertical farm facility



MANNACEA salad brand : Salading

Aquaponics Smartfarm for salad greens – Greenhouse based model



2-Level DWC growbed

- Sunlight-based DWC growbed
- Artificial light-based DWC growbed
- Aquaculture section
- Biofilter
- Autofilter



Growchamber for Strwaberry

Growbed system for extreme environment condition

Using sunlight → suitable for variety of crops

Minimize maintenance cost with high energy efficiency

Enables precise environment control :

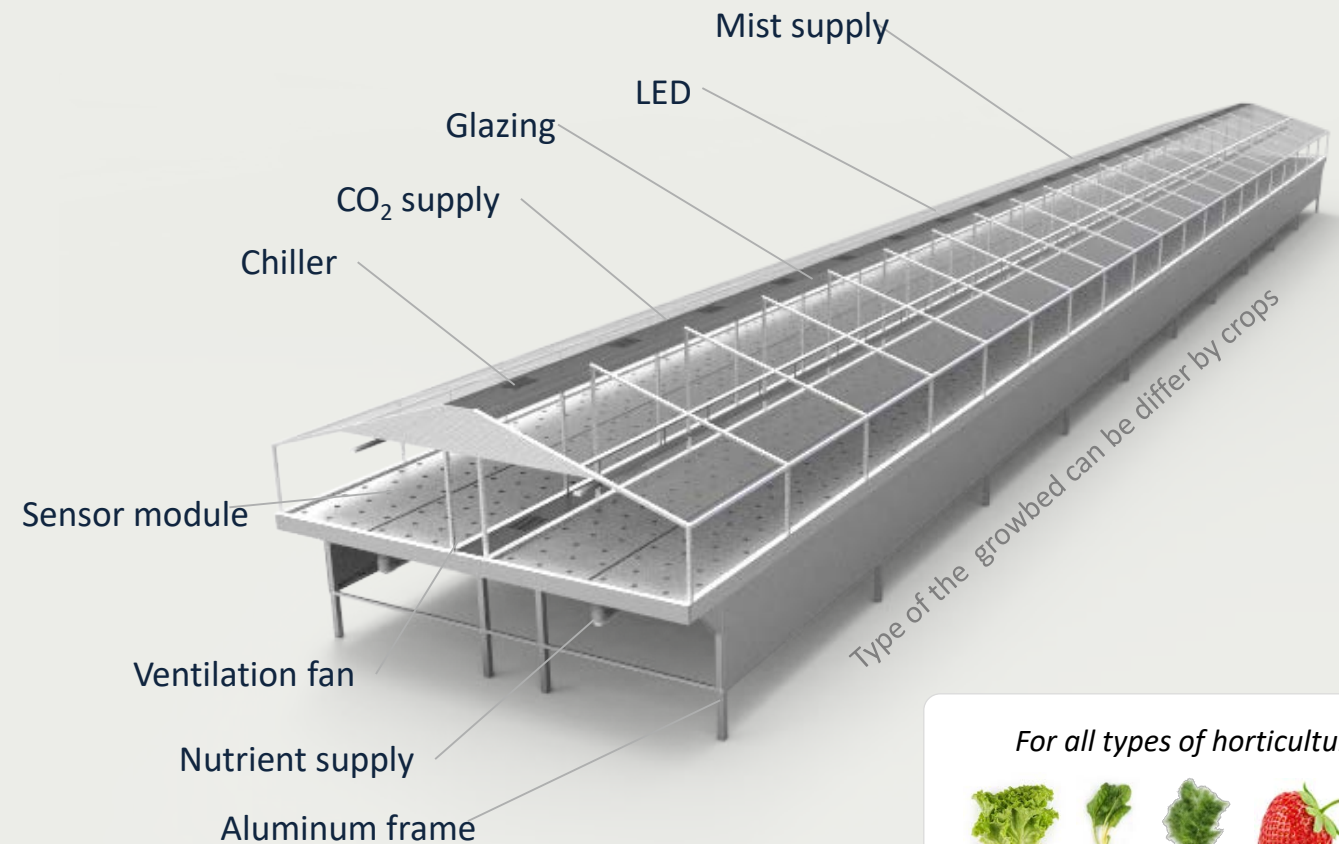
- Temperature
- Humidity
- CO₂ concentration
- Light intensity & exposure time

Lowens energy cost:

- Restricted control area
- High-performance sensor module

Facilitate pest control :




- Minimizes pest inflow
- Enhances efficiency of pest control by CO₂ mist



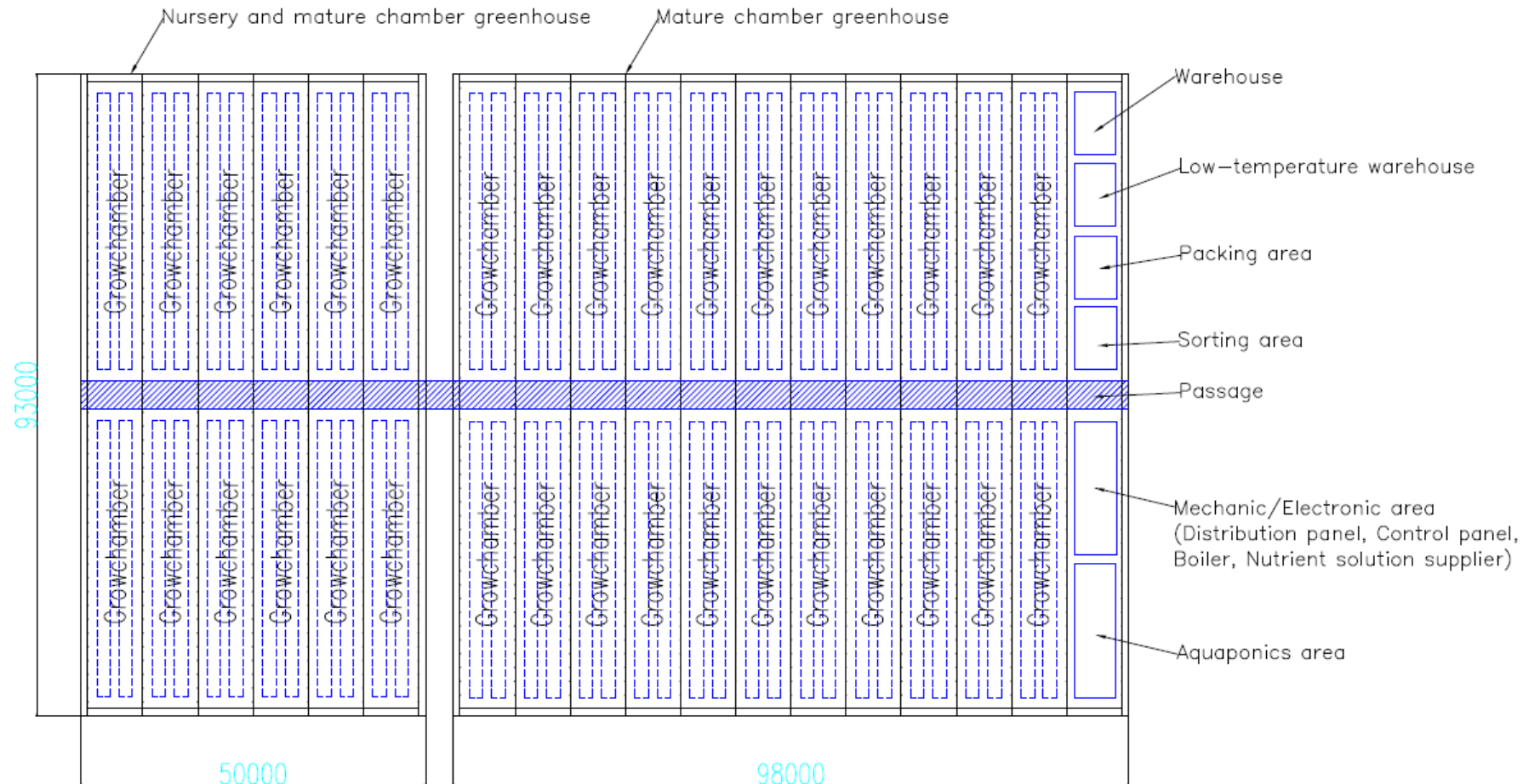
For all types of horticulture crops



Korean Strawberrys : Highly competitive in CIS, Russia and Europe

Type	Characteristics	
June-bearing (Korean strawberry)	Produced in winter season of Korea/Japan Representative products : Seolhyang, Maehyang, Geumhyang and etc Average sugar content : 9~13 Brix	
Ever-bearing	Produced in Europe, all season Produced in summer season in Korea Representative products : Gwanha, Charlotte, Flamenco, Everest, Quinalt Average sugar content : 8~9 Brix	
Day-neutral	Produced mainly in California Representative products : Albion, Seascape, Tristar, Tribute Average sugar content : 8~9 Brix	

Korean Strawberry Production Plant – Sample layout



Total area :

15,000m²

Greenhouse type:

Fully automated plastic greenhouse

Growbed type :

Growchamber

Nutrient :

Aquaponic & chemical

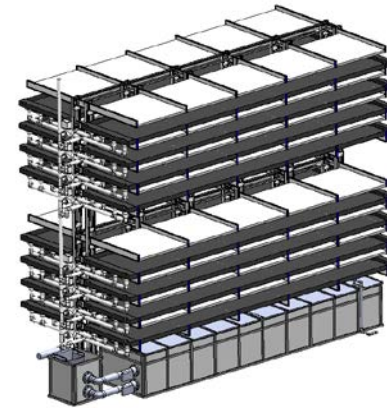
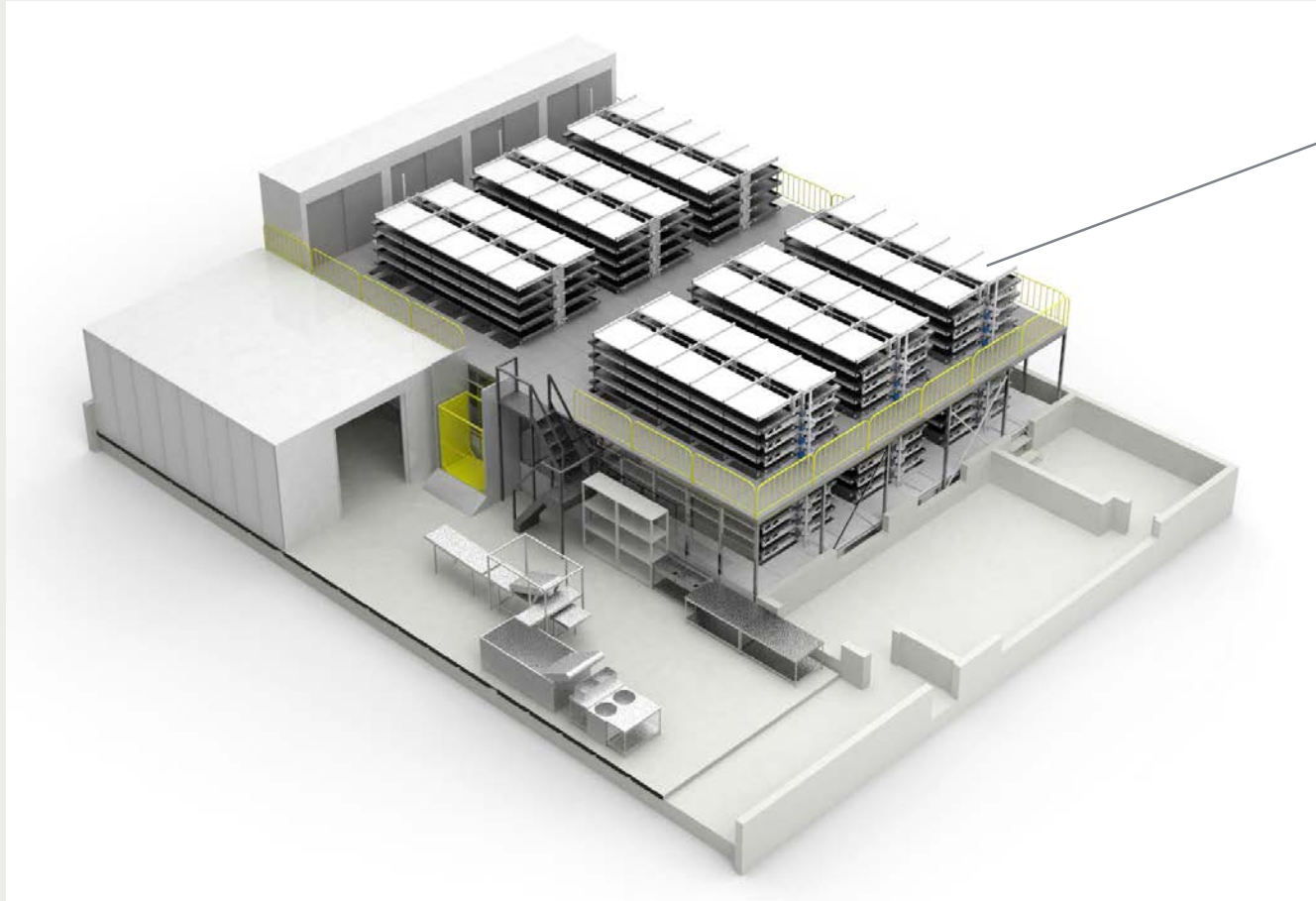
Nursery and mature chamber greenhouse :

Grows nursery plants for Mar. to Sep. and grows mature plant for Oct. to Feb.

Mature chamber greenhouse :

Grows mature plants year-round

Other Aquaponic Smartfarm System – Indoor Multi-layer



Multi-level ebb&flow grow system
(No. of levels can be adjusted)



Fish tank & filtration system located @ 1st floor
(Not shown in the image)

- Max. 8-layers of growbeds
- Can be used regardless of environment condition
- Artificial light (LED, Fluorescent lamp, etc)
- Optimized for baby leaves & herbs





Thank you