VERTICAL INDOOR CROP PRODUCTION: A LEARNING PRODUCTION SYSTEM IN THE COLLEGE OF AGRICULTURAL SCIENCES

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Outline

"Refers to the use of controlled environment systems to grow crops in structures without the use of solar light."

INDOOR CROP PRODUCTION

CLIMATE SMART AGRICULTURE

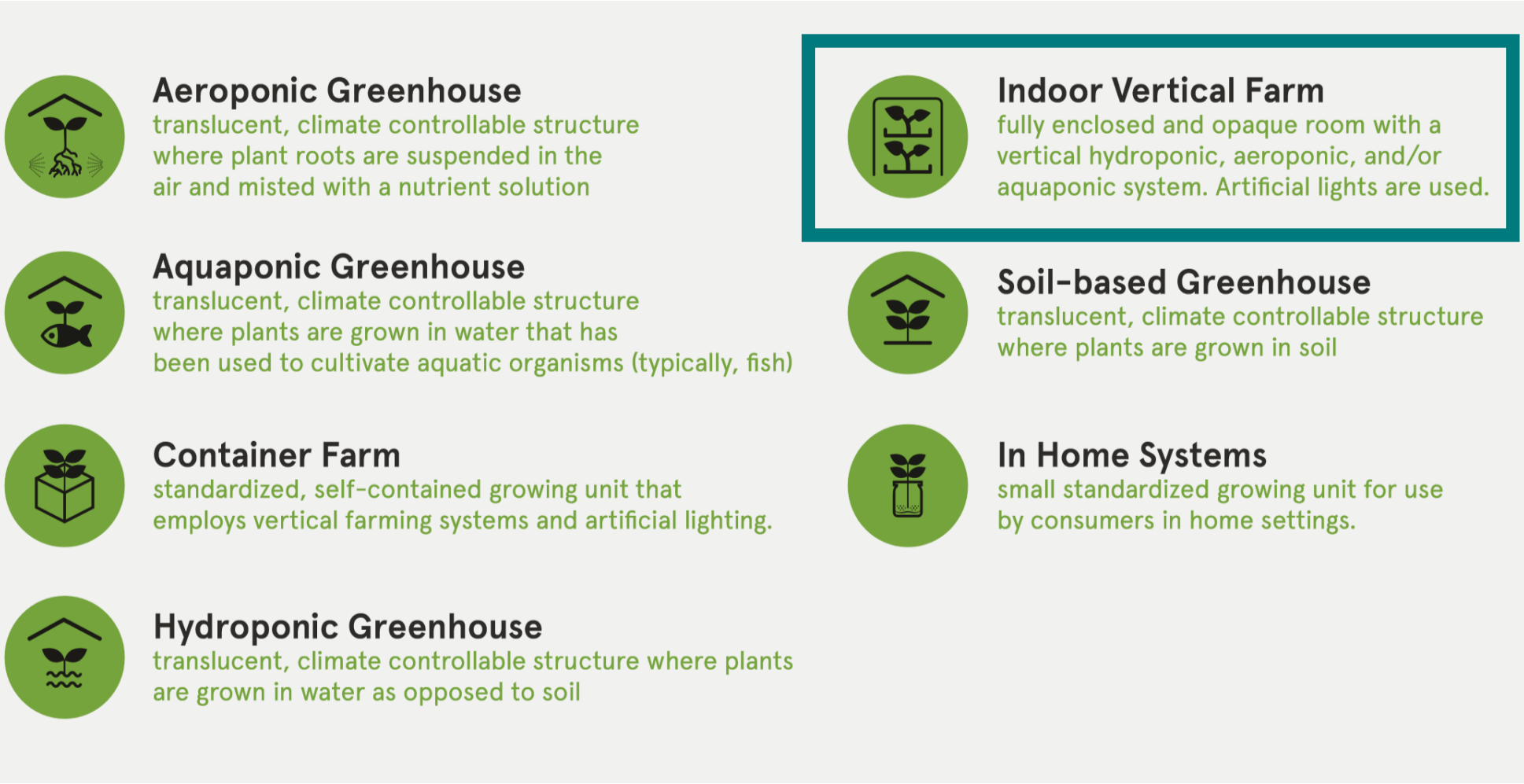
FARM EFFICIENCY

INCREASEMENT OF CROP YIELD PER FT^2 OF SPACE

REDUCTION OF WATER CONSUMPTION

SHORTEN PRODUCTION CYCLES

INNOVATION



Source: Agrilyst

Objectives

To establish an ICP facility in the UPRM Agricultural Experimental Station facilities at Lajas, PR

To develop specific recommendations for farmers, students, and investors

To educate, train, and promote agricultural production in such technology

Project Timeline

2017
RIIA/AGFEI
2018 $

01

01

Identification of empty spaces across campus

Technology Innovation and equipment search

03

04

Building renovation: food grade, OSHA regulations

April 2019

05

Location

Renovate spaced of 17.8 m^2 (192 ft^2) production area, and a showroom of 5.9 m^2 (64 ft^2)

UPRM Lajas Research Substation
Bo. Palmarejo
Carr. 101 Km 8.5
Lajas, PR

UPRM Indoor Crop Lab Facilities

Figura 1

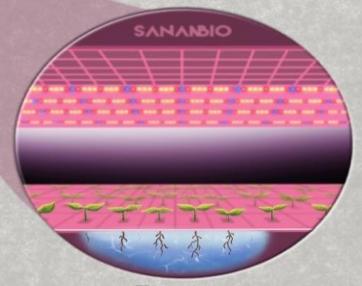


Figura 1a

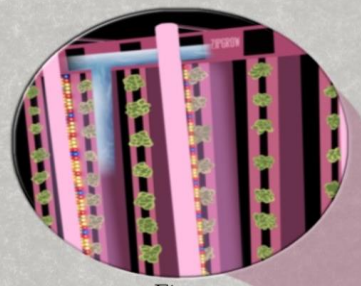
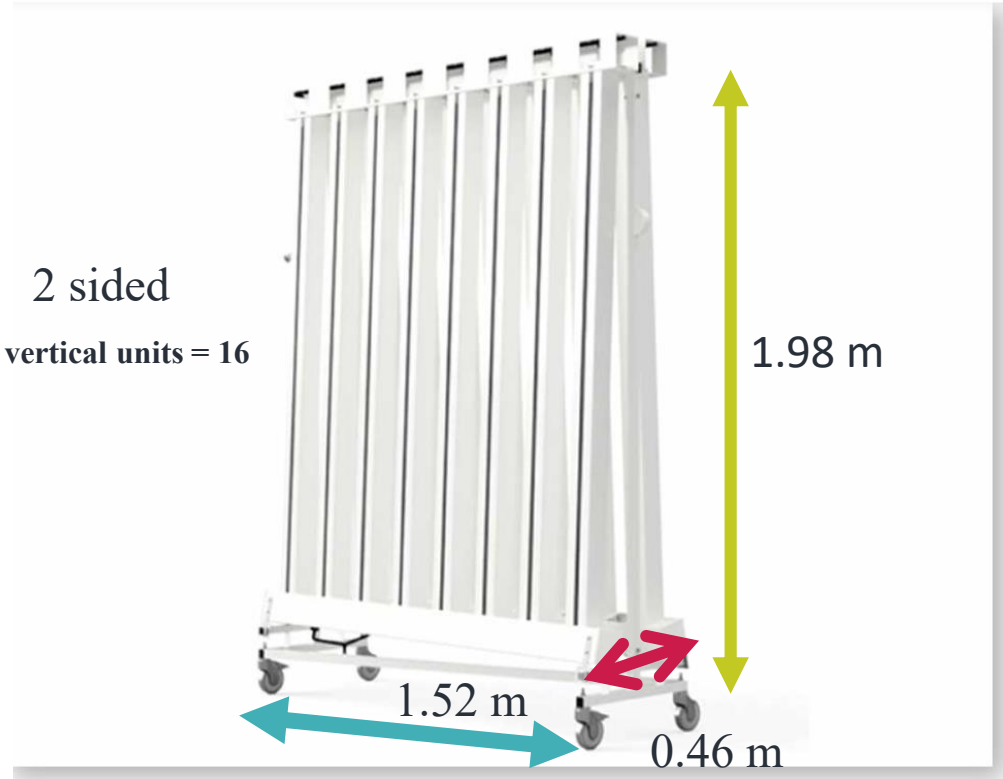
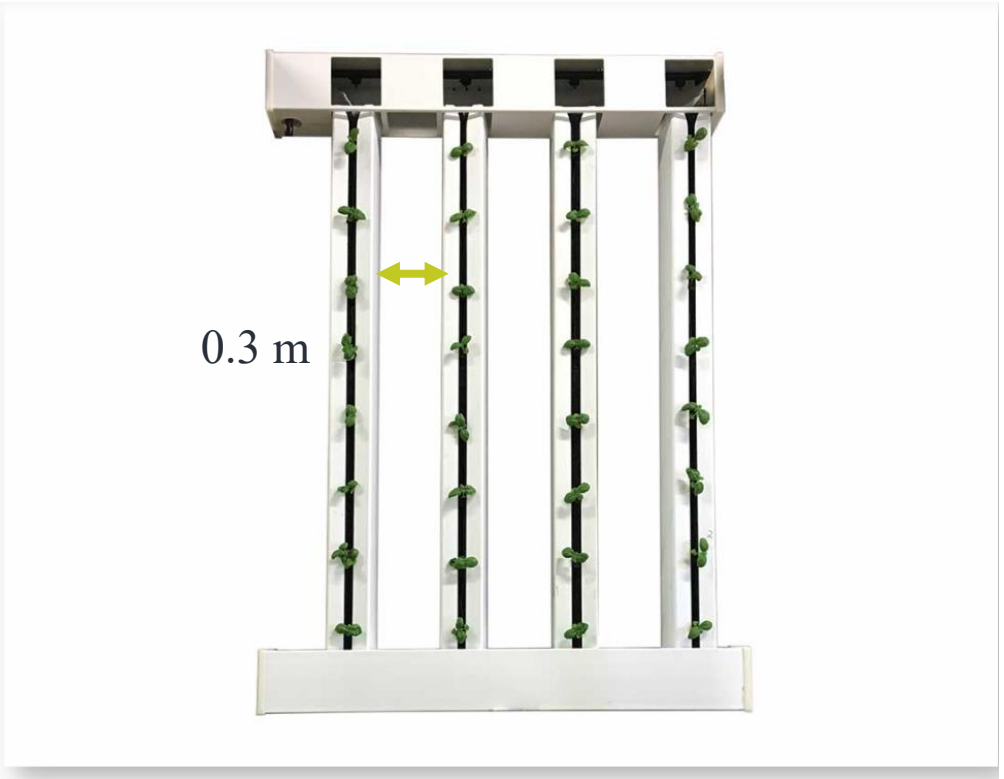


Figura 2a

Figura 2

Zipgrow ® Towers

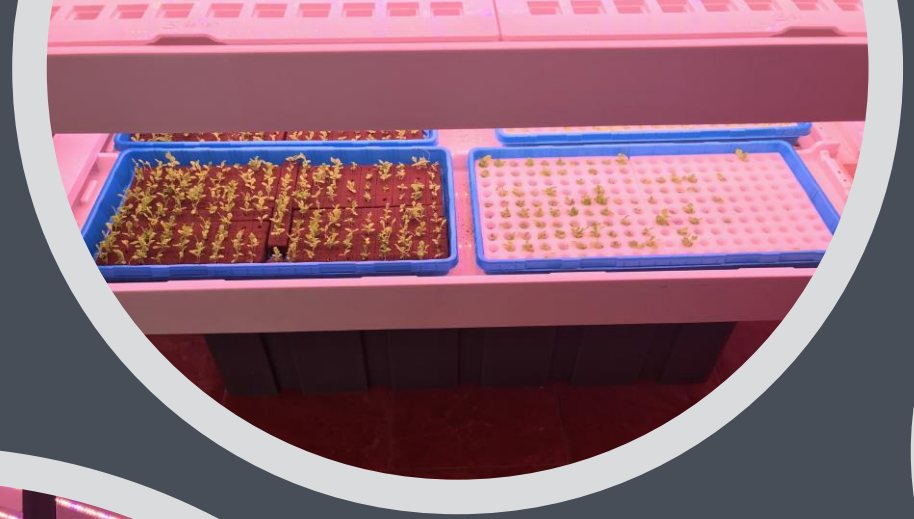




Education and market testing unit

Area total= 1.35 m^3

Capacity:
128 plants 8x8
256 plants 4x4



Sananbio ®

Radix

Radix

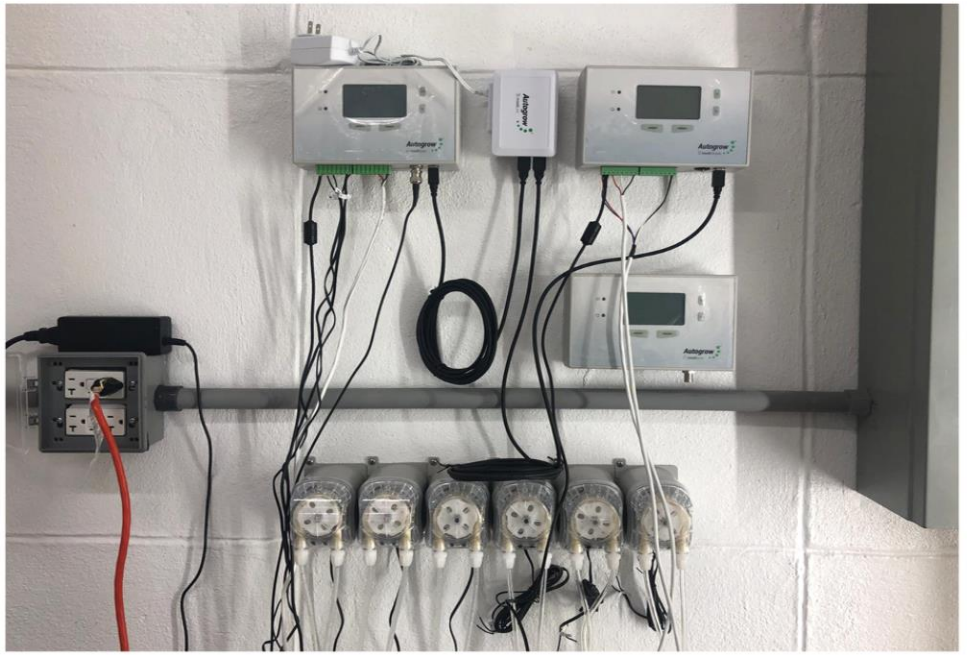
Up to 8 layers
Grow beds -0.91m x 1.22m

How many plants sites per grow bed? How about per module?
The math is simple!

If using a 54-plant-site raft, there are 54 x 2 = 108 plants per grow bed.

For a 5 grow bed module, that'll be 108 x 5 = 540 plant sites.

Intellidose



Injection system

- ph level
- EC
- Quantity of nutrients in solution
- Temperature
- Water pumping
- Air temperature
- Relative Humidity
- Light level
- CO_2 level
- Outside temperature
- Intruder detect
- Lamp over-temperature detect

Results

Germination rate if substrate is taking in consideration

- 98% oasis and cocopeat
- 52% foam

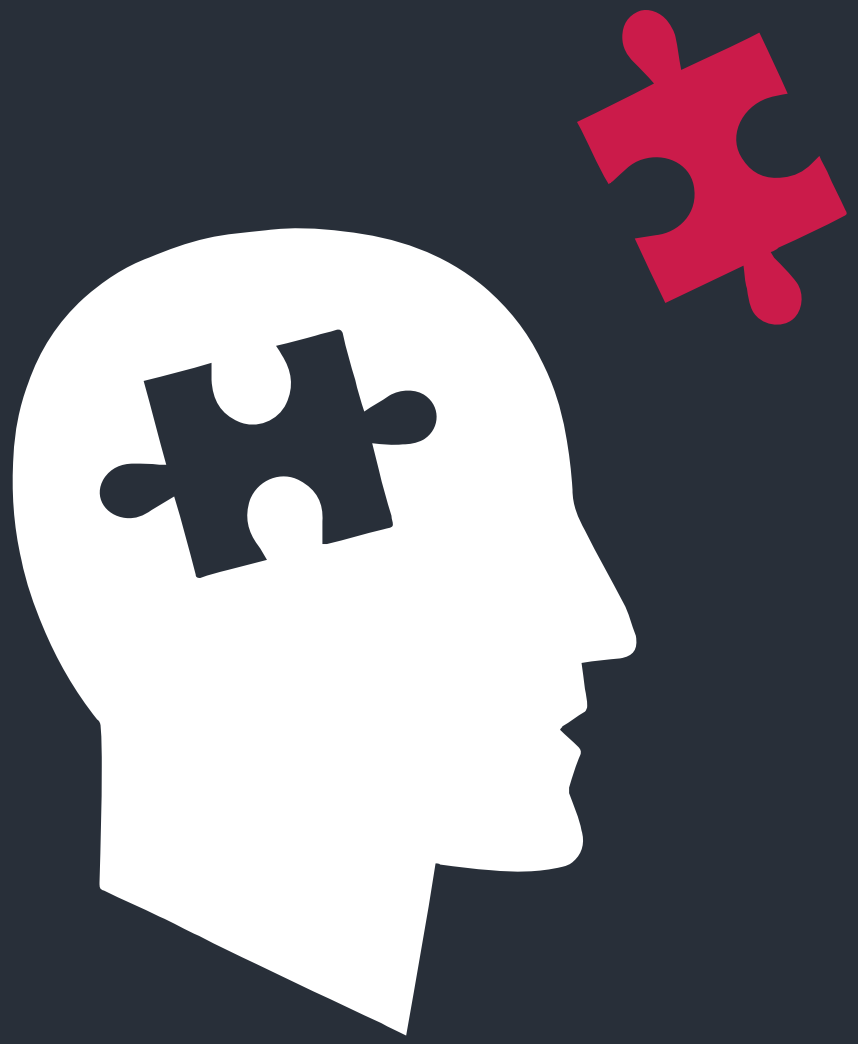
Results

	Weight (g)			Length (cm)		
	Max	**Min**	**Ave**	**Max**	**Min**	**Ave**
Sananbio	92a	0a	27.4a	21.5a	3a	12.2a
ZipGrow	30b	0a	6.6b	18b	1b	8.9b

Project Impacts

- Since April 2019:
  - Audience
    - CCA students + 350
    - Hourly Employees – 3 undergrads students (2 SAGA and 1 ECON)
    - Five farmers
    - High school students
    - EEA Lajas visitors
  - Improvement of Facilities
    - Garden near by the ICP
    - Audio System for the conference room
    - Building itself

Learning Tools



- Digital Agriculture
- Smart technology
- Climate smart technology
- Concept of indoor crop production
- Ag Innovation
- Incorporation of new practices in curricula labs
- Management

Conclusions and Future work

- **Ag technology: Simple, productive, time efficient, can be manage from a mobile device, expensive**
- **Sananbio system seems to have a better production per sq ft.**
- **Future work:**
  - **Estimation of energy cost; economical analyses**
  - **Evaluation of different crops**

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QUESTIONS