PROTECTED AGRICULTURE RESEARCH

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Desert Agriculture and Ecosystems Program: Challenge

- Develop sustainable agriculture as it is a key element of sustainable development and is integral to the long-term viability of the environment (soils, water, and recyclability of materials) and the preservation of non-renewable resources in Kuwait.

Desert Agriculture And Ecosystem Program

Logic Tree

Activities

- Greenhouse structure, Cladding material, Environment Control, Cooling System, LED Lighting
- Growing System and growth media, organic farming, High density modular production system
- Monitoring ecosystem changes, ecological preserve, national seed bank, mass propogation of native plants
- Fodder production, cultivar evaluation, soil and nutrient management, pest control, productivity and sheep meat quality
- Establishment of Urban greenery center at Salmiya, demonstrate sustainable practices for landscaping and ornamental plants under unban setting
- Practice for ornamental horticulture, public awareness and ecotourism

Solution Areas

1. **Optimized Protected Agriculture**
2. **Document Terrestrial Biodiversity and Strategies for degraded Ecosystem**
3. **Advance Open Field Agriculture**
4. **Optimized Landscape Practices for Urban Settings**

Goals

- Optimized production of vegetables, fruits and ornamental plants under innovative protected agriculture technology
- Assessment of ecosystem resilience through long term monitoring and repair damage for restoration to fully functional ecosystem including urban ecosystem and compliance with international treaties
- Advance forage farming practices and integration of forage and sheep production in small holdings
- Establishment of state-of-the-art facility for ornamental horticulture and landscaping

Challenge

Produce food and feed by adopting international best practices of desert agriculture while restoring to fully normal functional ecosystem for provision of greater ecological services and aesthetic amenities

Fig 1. Logic Tree: Desert Agriculture and Ecosystems Program (DAEP)

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Optimize Protected Agriculture
Greenhouse Structure, Cladding Material, Environment Control, Cooling System, LED Lighting, Growing Systems and Growth Media, High Density Modular Production Systems, Cultivar Evaluation, Crop Nutrition, Water Use Efficiency.

→ Optimized production of vegetables, fruits and ornamental plants under innovative protected agriculture technology.

Document Terrestrial Biodiversity and Strategies for Degraded Ecosystems
Monitoring, Ecosystem Changes, Ecological Preserve, National Seed bank, Mass Propagation of Native Plants, Introduction of Wildlife and Restoration of Degraded Ecosystems.

→ Assessment of ecosystem resilience through long-term monitoring and repair damage for restoration to fully functional ecosystem including urban ecosystem and compliance with international treaties.

Advance Open Field Agriculture(Forages and Animal Production)
Fodder Production Scheme, Cultivar Evaluation, Soil and Nutrient Management, Precision Irrigation, Forage Quality, Nutrition, Immunization, Productivity and Meat Quality, Stress Management (**sheep**), Value Added Animal Products.

→ Advance forage farming practices and integration of forages and sheep production in small holdings.

Optimize Horticulture and Landscape Practices for Kuwait Urban Settings
Establishment of Urban Greenery Center at Salmiya, demonstrate sustainable practices for landscaping and ornamental plants under Urban Settings, Cultural Practices for Ornamental Horticulture, and Promote Public Awareness and Ecotourism.

→ Establishment of state-of-the art facilities for ornamental horticulture and landscaping and demonstration of various sustainable landscapings for different uses in urban settings.

→ Produce Food and Feed by adopting international best practices of desert agriculture while restoring to fully normal functional ecosystem for provision of greater ecological services and aesthetic amenities.

Projects

1. Optimized Protected Agriculture

1. Developing Sustainable and Environmentally Safe Technologies to Mitigate Overuse of Toxic Pesticides on an Invasive Pest
2. Influence of LED Light on the Productivity and Quality of Selected Crops in a Closed Plant Factory System
3. Utilization of Kuwait's Native Seaweeds for Greenhouse Vegetable Production
4. Evaluation of the potential use of LED technology for pest management in Kuwait
5. Evaluation of Nano-material to Improve the Weatherability and Control Biofouling of Evaporative Cooling Pads under Kuwait's Agro-climatic conditions

Achievements

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1. Capacity building:
   a) State-of-the-art research glasshouse.
   b) Center pivot irrigation system.
   c) Modular Agricultural Production System (MAPS)- prototype.
   d) Urbanized cultivation (plant factory concept)- pilot scale.
   e) Improved lab facilities: well-equipped labs, recent photobiology lab
   f) Mentoring juniors:

2. Development of 'Growbox' and CIPS techniques.

3. Established data-base on the status of pest and pesticide use
   1. Pest and Pesticide Use Survey, and the Potential of Bio-Pesticides as a Tool for Managing Soil-Borne Plant Pathogens.
   2. Developing Sustainable Safe Technologies to Mitigate Overuse of Toxic Pesticides
   3. Evaluation of the potential use of LED technology for pest management in Kuwait
   4. Established an IPM Lab.


BRUTE
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ACID

Research Glasshouse

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Evaluation of Selected Exotic Tomato Cultivars for Greenhouse Cultivation in Kuwait

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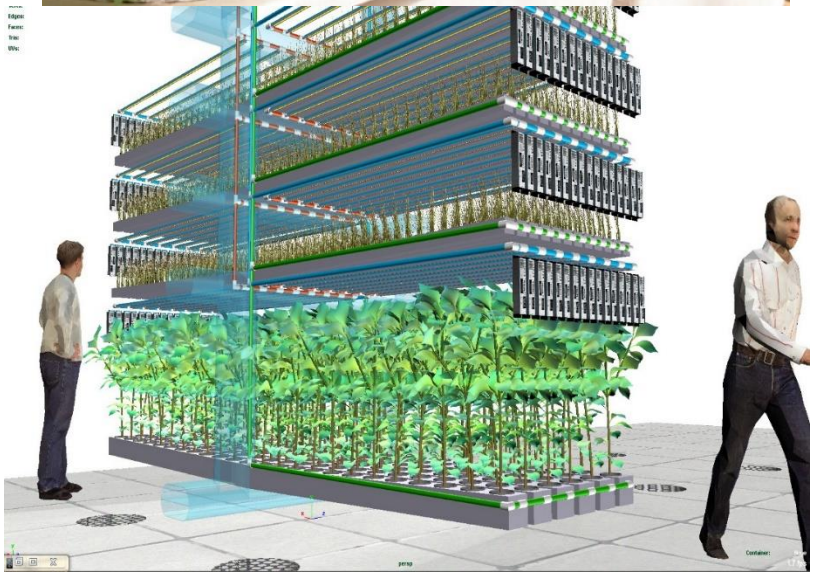
Closed Insulated Pallet System (CIPS)

Growbox Technique



Conceptual LED-based plant factory module suggested for Kuwait

Modular Agricultural Production System

Collection for seed bank

Mass production of native plants
Mass production of native plants

Vetiver to curb sand encroachment

Examples of highly efficient soilless production techniques

- Closed insulated pallet system (CIPS).
- Hydroponics - NFT.
- Hydroponics- Aeroponics.
- Growbag culture.
- Growbox culture.
- Vertigrow
- Plant factory

Cherry Tomatoes
Closed Insulated Pallet System (CIPS)

Cucumber Crop Grown on CIPS

CIPS - Ornamentals

CIPS- Coleman

Hydroponics- NFT System

A-Shaped Aeroponics System (Dianthus)

Growbag Technique

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Growbox Technique

Tomato cv. Yusra grown on Growbox

Vertigrow

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Plant Factory

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Prototype MAPS


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Greenhouses - IR Reflective Glass/Polycarbonate

MODULAR AGRICULTURAL PRODUCTION SYSTEM (MAPS)

- Collaborative innovation of **KISR** and **University of Guelph, Canada**.
- Modular plant production system using **top-notch LED lighting technology** and **hydroponics**.
- Based on **NASA space research center technology concept** for **Life on Space**.
- **Unique and first of its kind** in the global map of agricultural research.
- Completely controlled growing environment for **high quality designer plants**.
- Capable of **remotely controlling** the **system environmental parameters.**
- **Remotely accessible Argus Control system** for real time data acquisition and crop management.
- Possibility to **hygienically** produce **very high quality designer plants.**
- A completely closed **high density production system** with **excellent research potential**.
- Consumer face produce under **hygienic plant production protocols**.
- Best suited for **urban scenarios** and **plant factory systems**.
- Initial experimental crop **LETTUCE** - *Lactuca sativa* cv. "New Red Fire"


ARGUS


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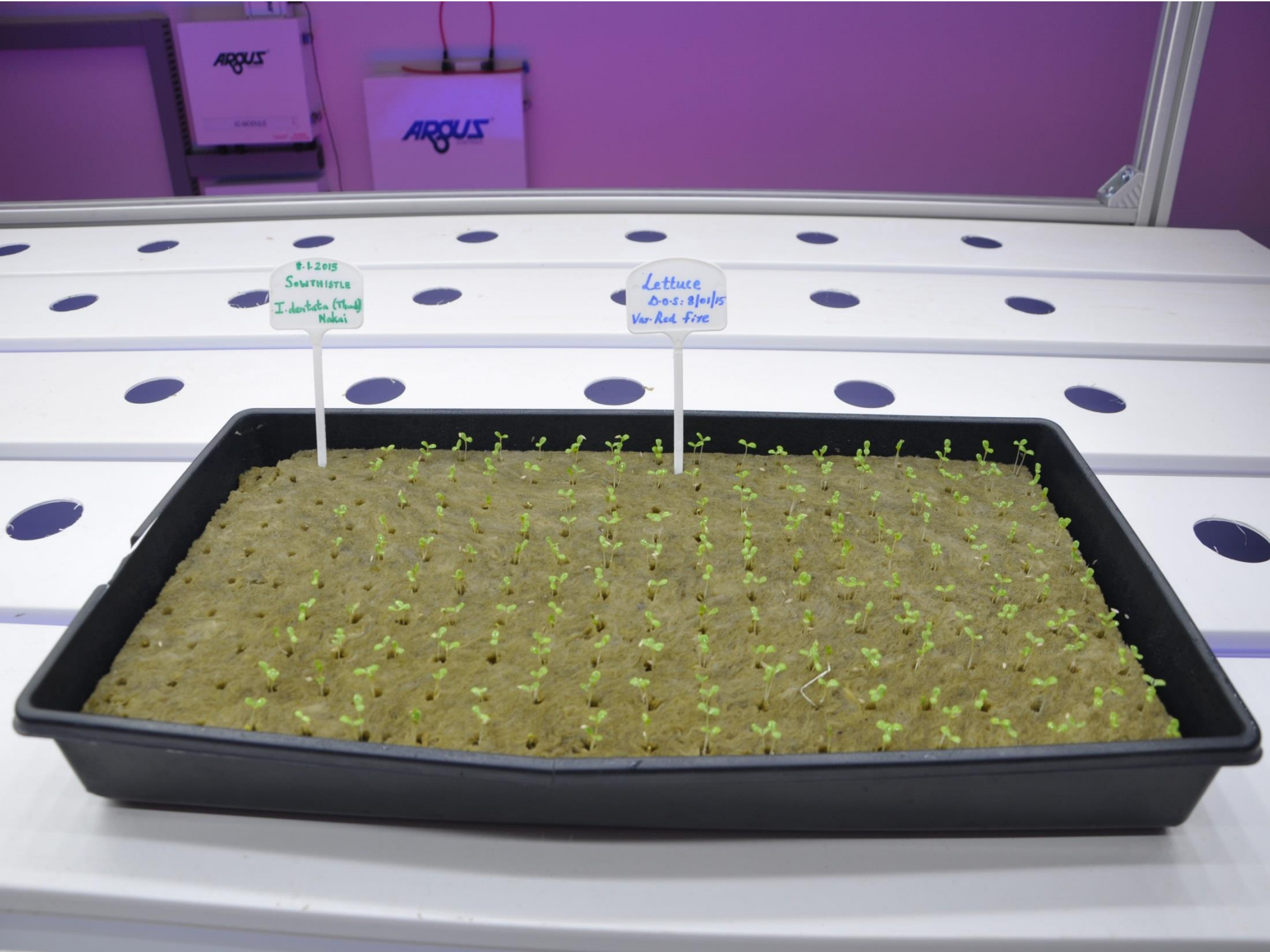
8.1.2015
SOWTHISTLE
I. dentata (Thunb)
Nakai
Lettuce
D.O.S: 8/01/15
Var. Red fire
ARGUS
ARGUS


ARGUS


ARGUS


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Lactuca Sativa cv. New Red Fire
Blue LED Light
White LED Light
Red LED Light
LIGHT QUALITY TREATMENT

Light Quality Treatment

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THANK YOU

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