World Agricultural Forum
Conference
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Singapore

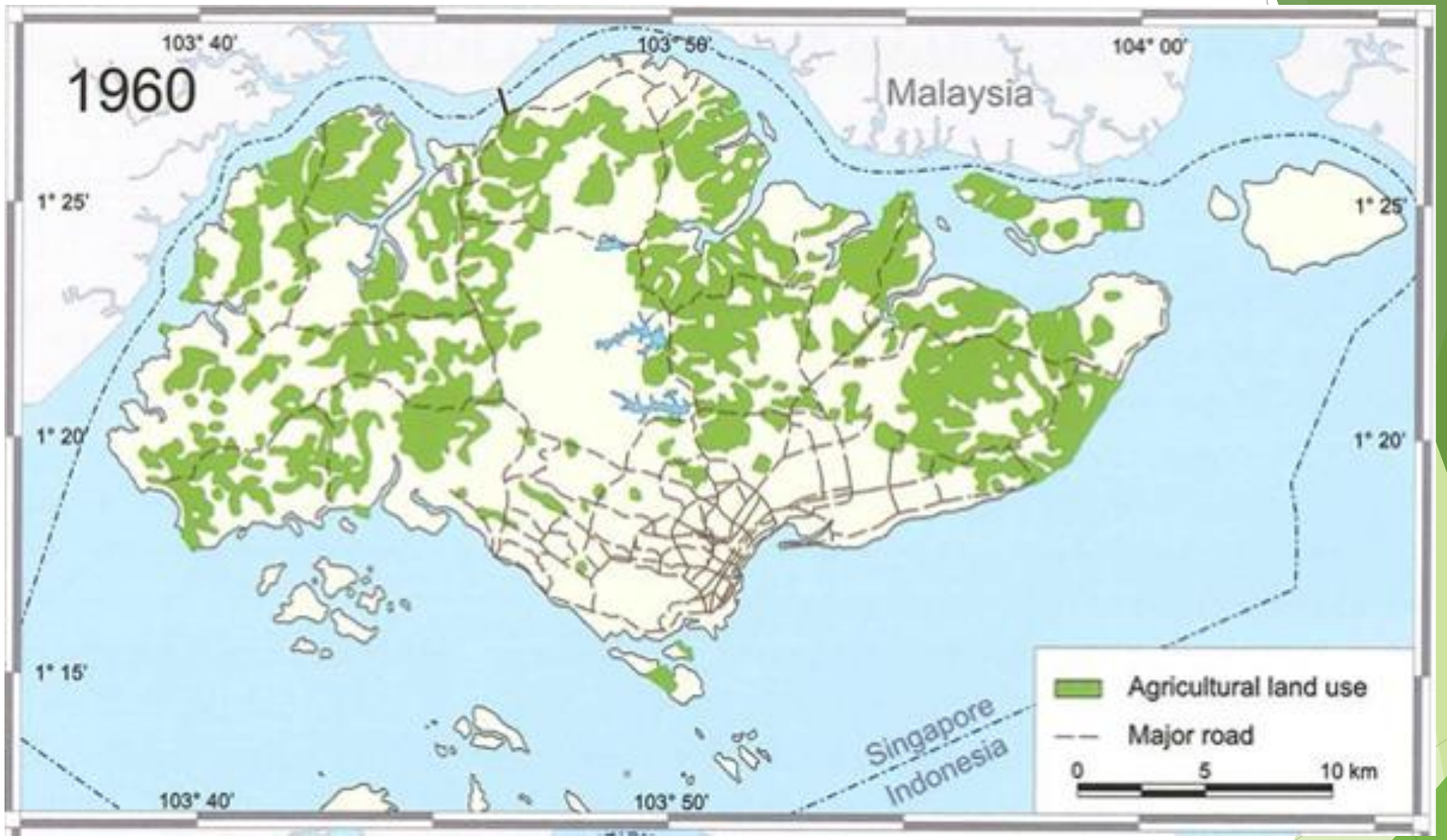
Vertical Vegetable Farming
The Singapore Experience

Dr Ngiam Tong Tau

Orchards in Orchard Rd

CHINESE FARMERS 1900

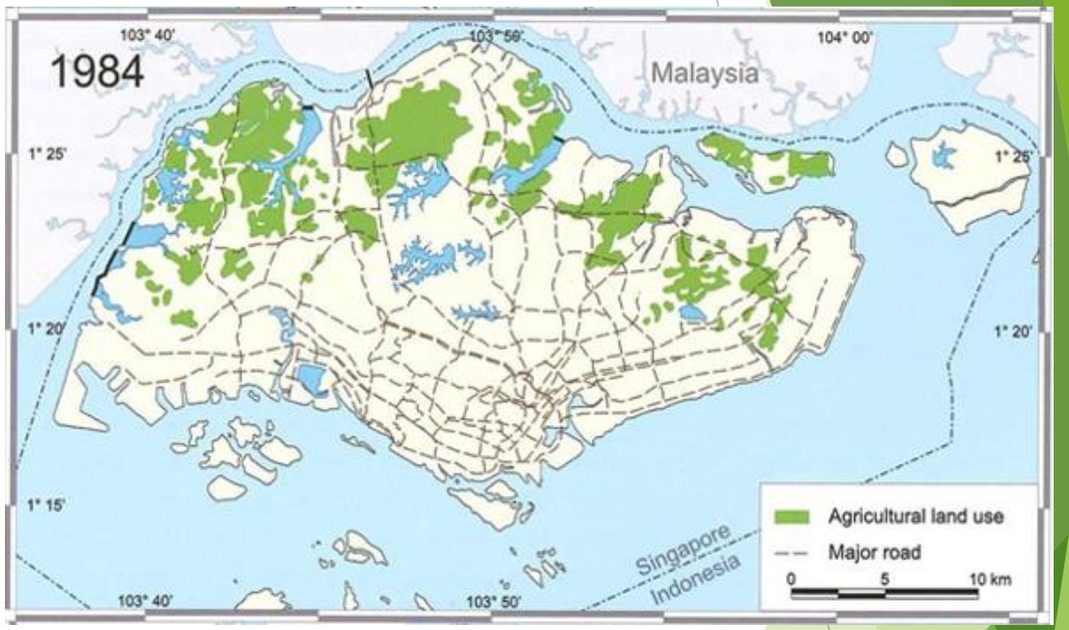
Vegetable farm 1950’s



Farmlands 1960

Resettlement of Farmers and the rural population 1960-1980

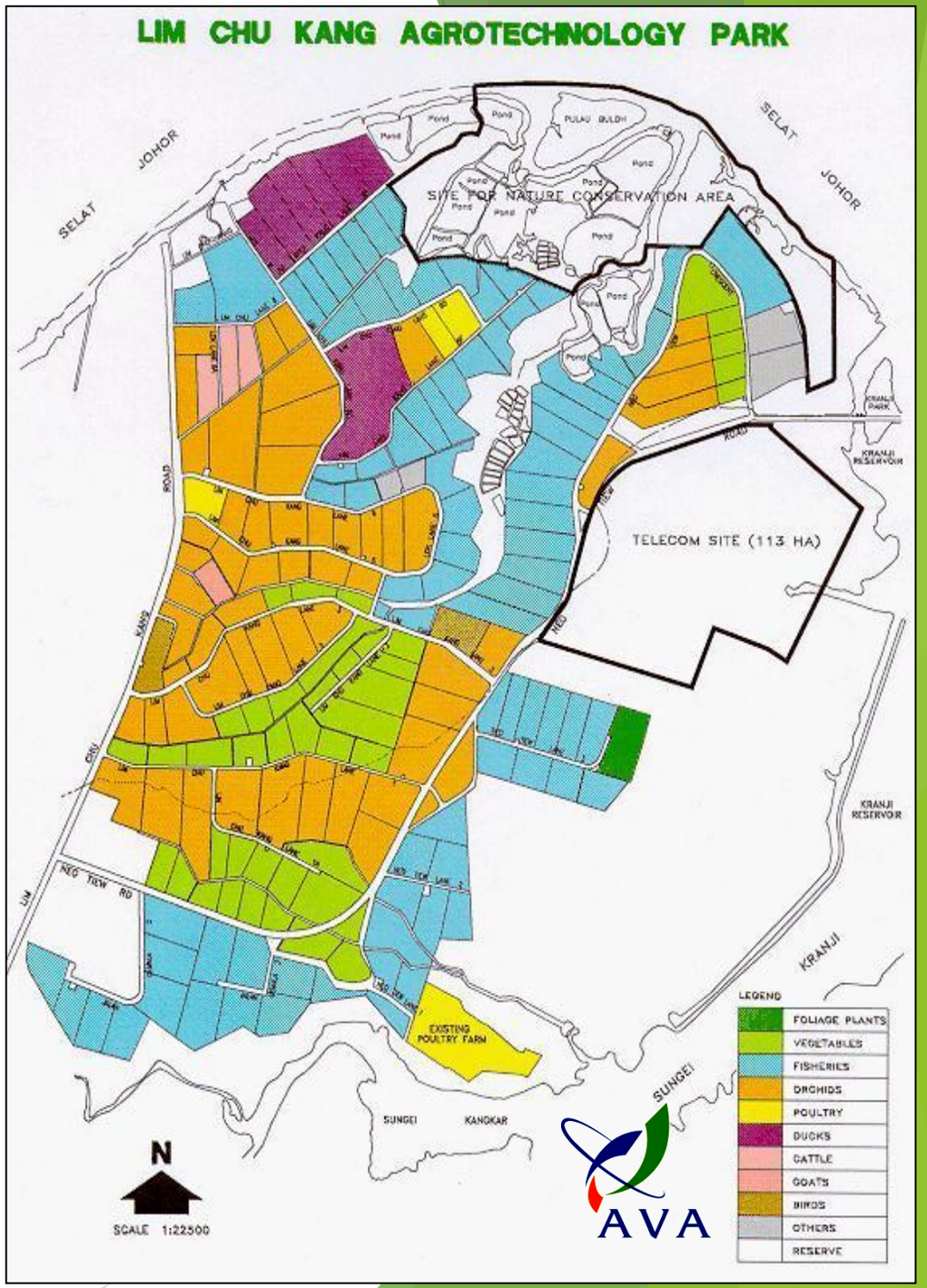
- From 1975 to 1984, the farm area fell from 10,500 ha to 5,800 ha and the number of licensed farms fell from 15,600 to 7,900 farms.
- The farms gave way to water conservation in catchment areas, public housing estates, industrial estates, roads and other public facilities.



FARMLANDS 1984

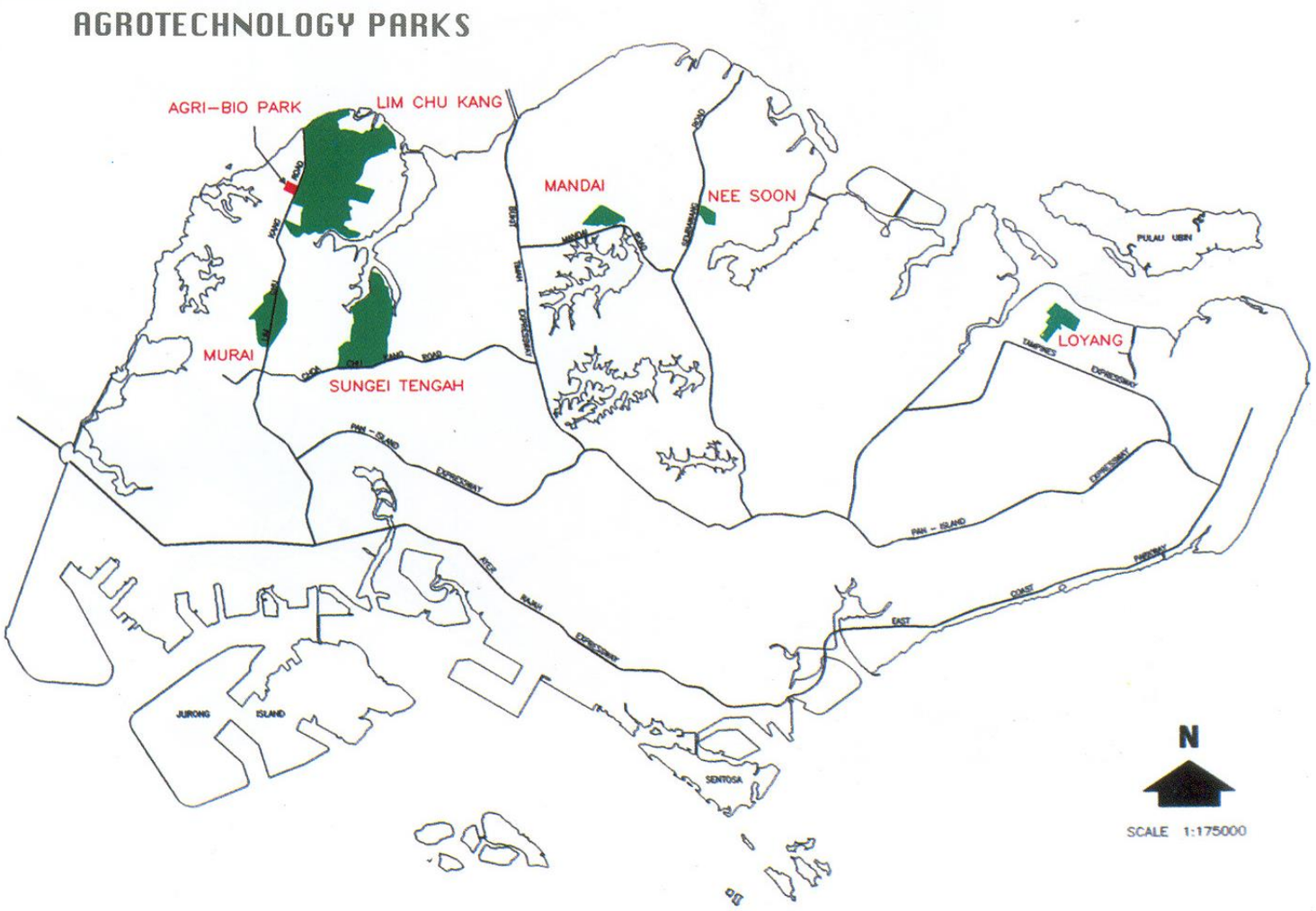
AGROTECHNOLOGY PARKS CONCEPT

- Application of appropriate technology
- Sustainable ecosystem
- Modern farming systems
- Good farm management practices
- High quality farm produce
- High productivity
- 20 year lease
- Land rental - market rate



Source: AVA

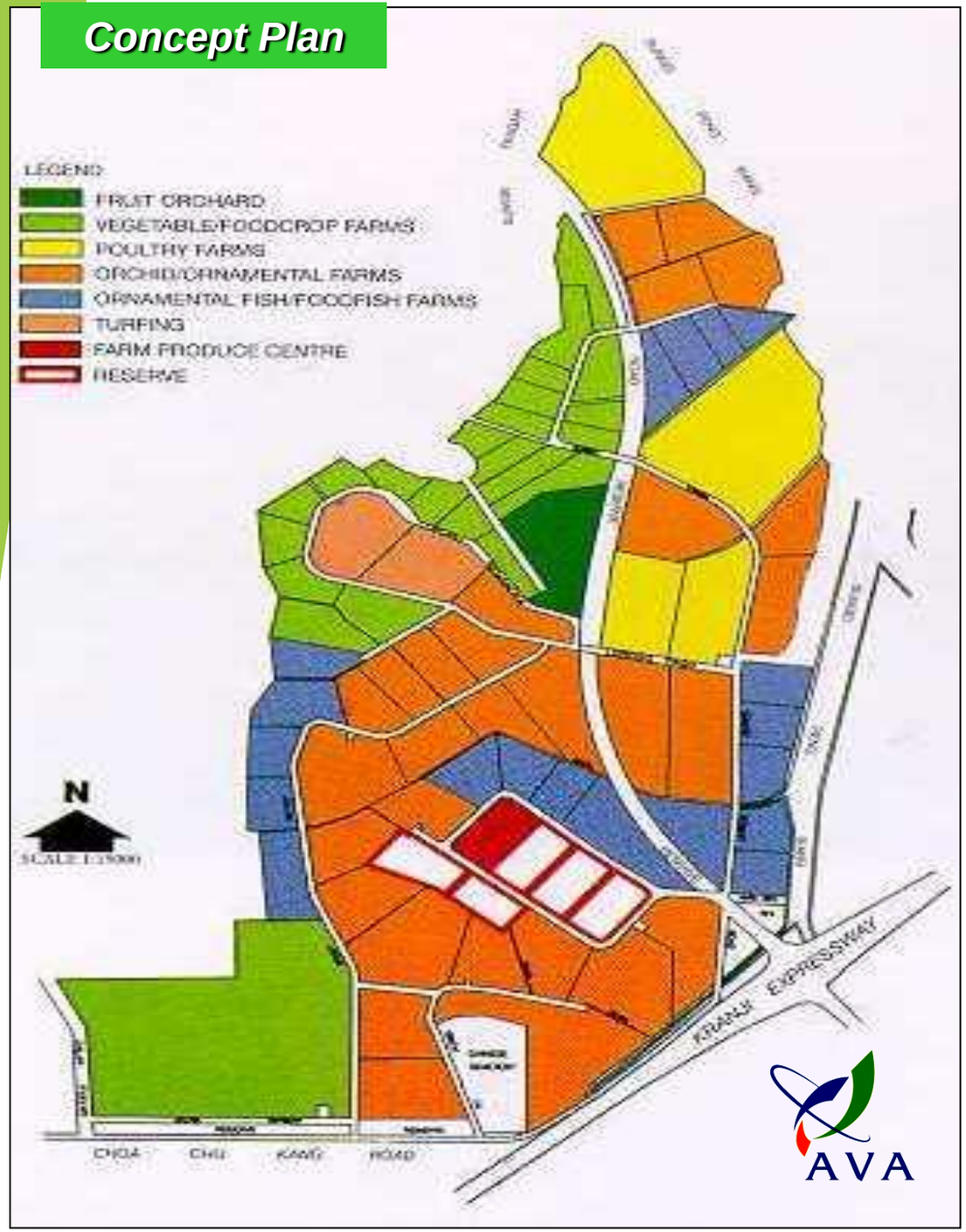
AGROTECHNOLOGY PARKS



- Local farms produce a measure of our food supply, reducing reliance on other countries
- Local farm produce serve as benchmark for safety and quality for imported farm produce

SUNGEI TENGAH AGROTECH PARK

Concept Plan



Aerial View

Source: AVA

Kok Fah Vegetable Farm

Protected Cultivation

SkyGreens Vertical Vegetable Farm, Farming in the third dimension

- A Hydraulic Wheel drives the planter boxes to revolve around a 9 meter high A Frame structure.

VFS system by numbers

- 5. 5 sqm tower footprint
- 2500 plants per 9m tower
- 454 plants per sqm
- 40 watt hour per tower
- 12L of water/kg of vegetaqbles

Sky Greens Vertical Farming System

Easy transplanting, harvesting, weighing & packing in a production line manner

Efficient delivery and cold chain management

STREAM-LINE Operations

Key Economics

10x
More Yield

Up to 10x more output compared to average farm output in Singapore of 90 tonne per ha per year

95%
Less Water

Uses only 12 litres of water to produce 1 kg of vegetables and no wastage due to run off

5¢
Elec Cost /Kg

Cost of electricity per kg of vegetables produced is $0.05 for Vertical farming solution

75%
Less Labour

Use less than half the labour of traditional farming to produce the same output

75%
Less Input

Plant requirements are calculated and there is no wastage due to water run off

SINGAPORE'S
Vertical Farm
Sky Purple Cai Xin
天鲜紫菜心
Contains Vitamin C & E
Sky
Greens
天鲜
Freshly Harvested Daily
Vitamin E is an anti oxidant that helps protect cells in the body
Product of Singapore

Winner of INDEX Award 2015, the largest design award in the world

INDEX: AWARD 2015

INDEX
DESIGN
TO IMPROVE
LIFE®

Agripolis Vision

- Satellite Farms in other countries
- 1. Linshui, Hainan, China
- 2. Cixi, Ningbo, China
- 3. Cameron Highlands, Malaysia
- 4. Tahiti

- Interest from other countries
- Middle East Countries
- Hawaii

Cixi Farm

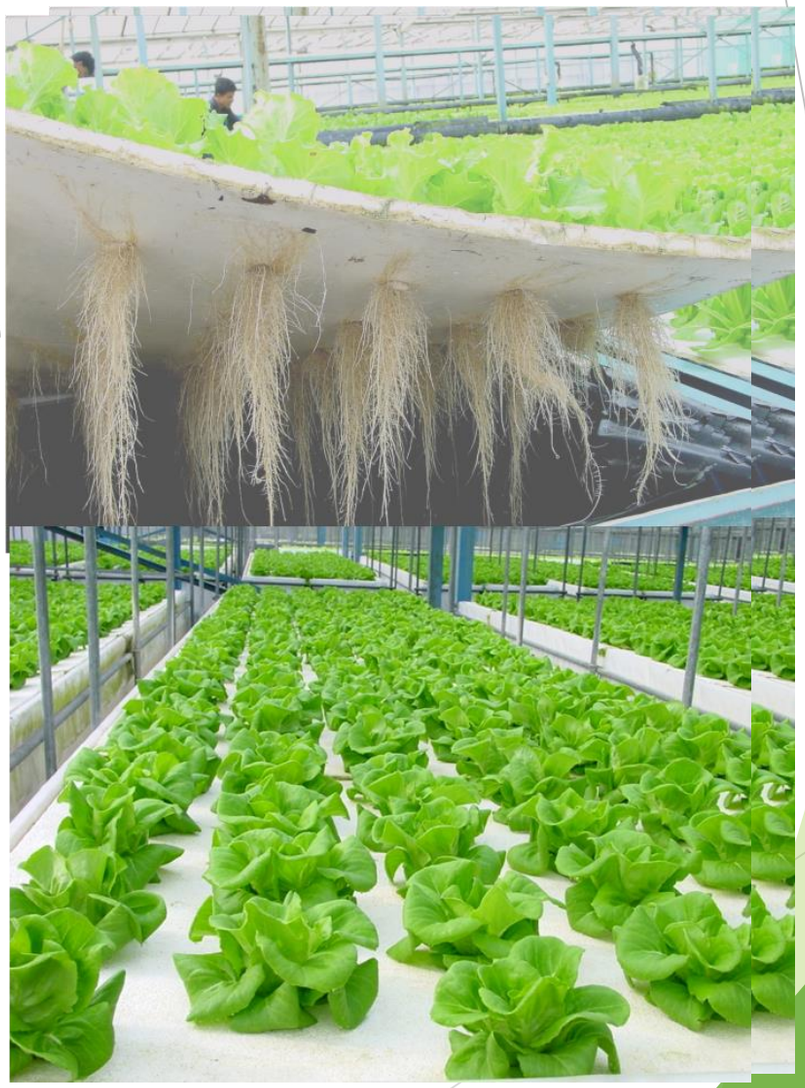
Cixi Farm

Aeroponics is

1. A modified hydroponic culture

2. Roots are suspended in the air (usually from styrofoam planks) within an enclosed chamber, in which nutrient is fed in the form of mist

3. Growing plants in the air



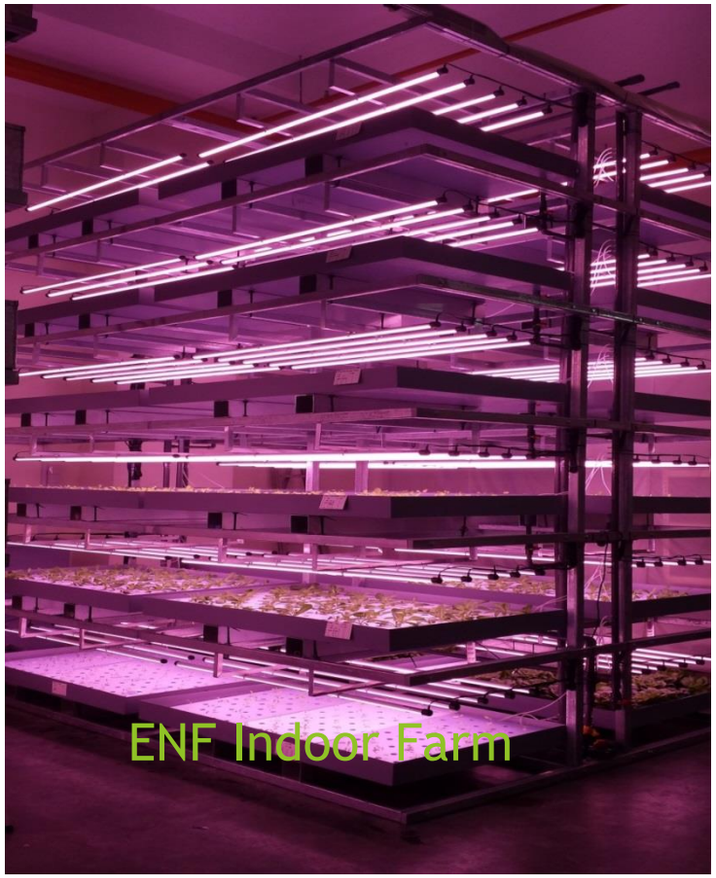
Roots suspended in air

Butterhead Lettuce

Aeroponics vertical planter boxes

LED lighting

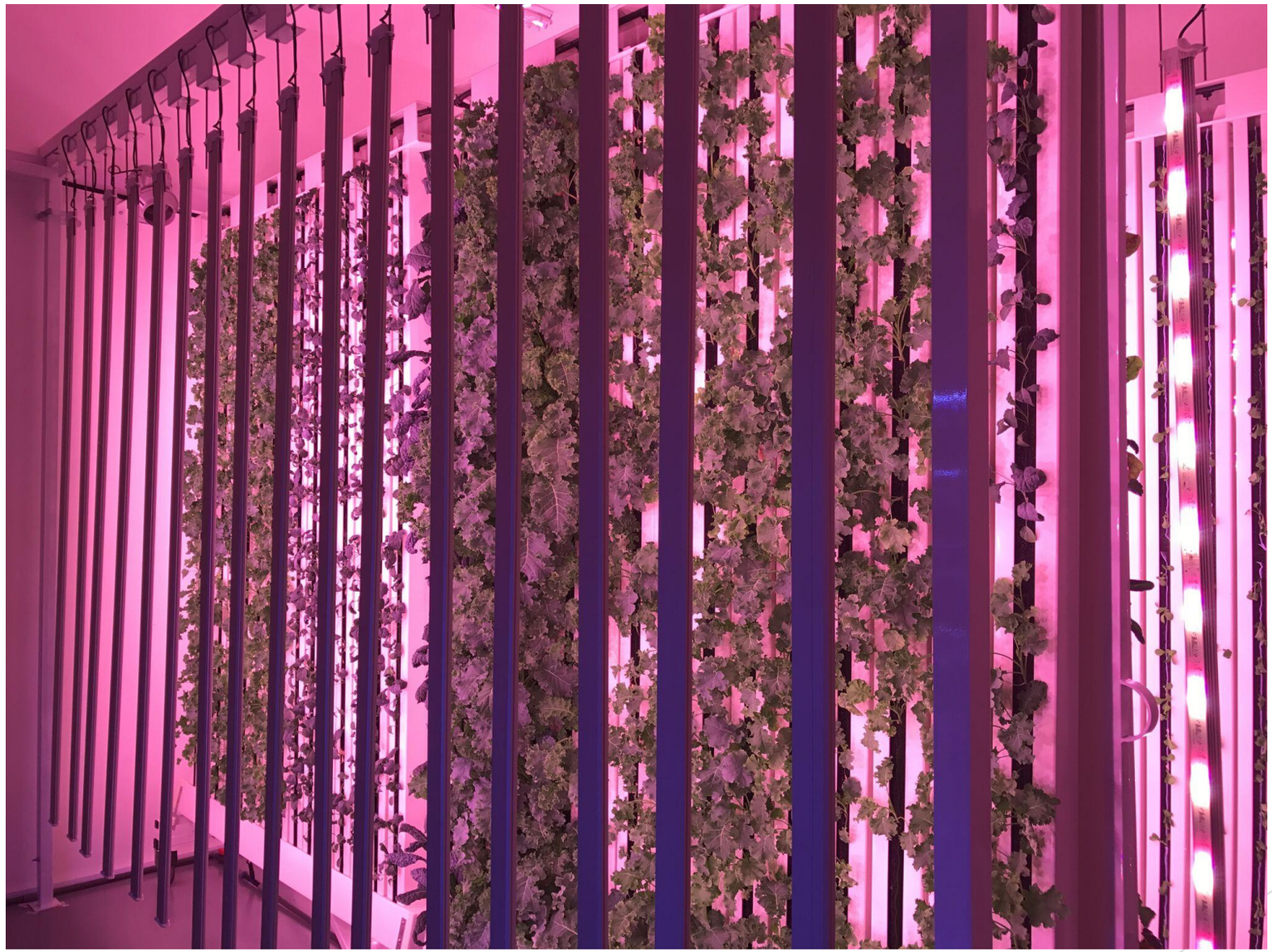
Indoor Factory Farm



LETTUCE GROWN INDOOR

PLANTER BOXES IN FACTORY FARM

Archisen Vertical Indoor Factory Farm



A wall of vegetables

Kale produced in Archisen Indoor Farm

New generation farmers and agriprueners

Concluding remarks

Vertical Vegetable Farming has the potential for a tenfold increase in production on a hectare of farmland. Inputs has been minimised with use of less water and energy. Ergonometric design with planter boxes rotating around a 9 meter high A Frame automates the production process and minimises the manual nature of farm work.

The development of precision farming technology especially in factory farms makes it possible for the production of high value crops with functional properties.

Vertical Vegetable Farming is well suited for farming in Peri-urban and Urban areas to provide a more resilient supply of food to cities which are expanding rapidly.

A new generation of farmers are attracted to Vertical Farming as it minimises the menial and manual work and is more like a factory.

THANK YOU!