

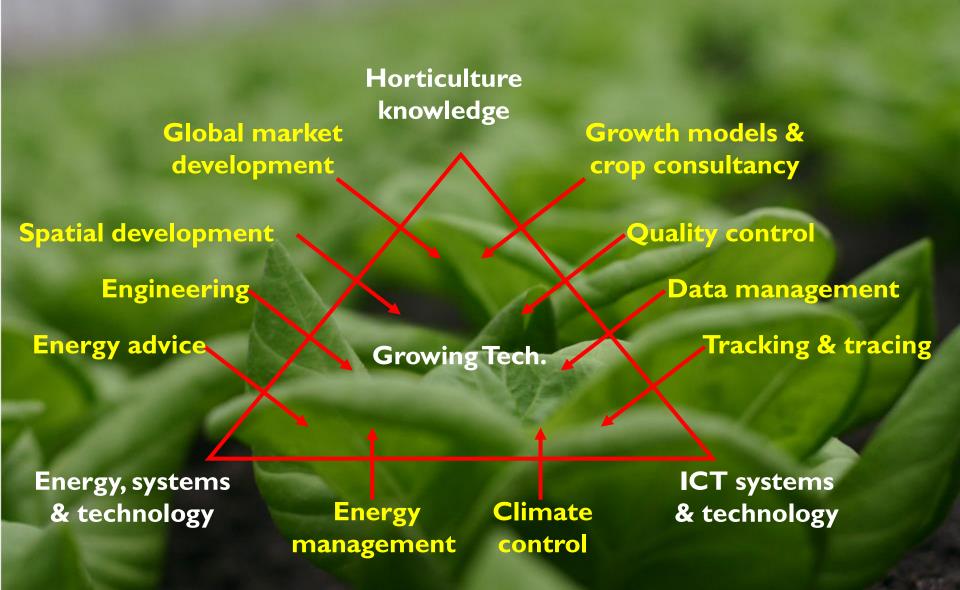
Dr. S. Krishna Kumar

Associate Research Scientist
Desert Agriculture and Ecosystems Program
Environment and Life Sciences Research Centre
Kuwait Institute for Scientific Research
Kuwait

Contents

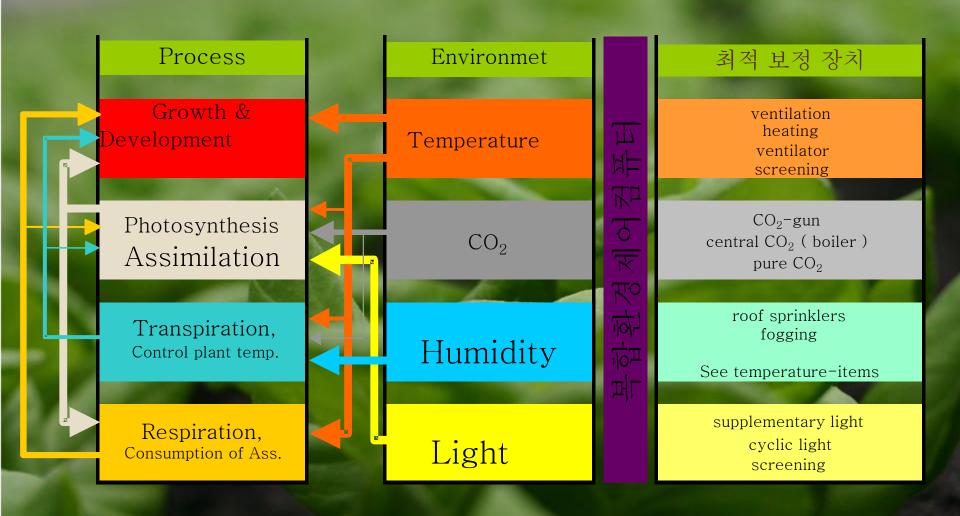
- Introduction
- Type of greenhouse and structure
- Crop Production/ management system
- Lighting systems
- Crop protection system
- Water management & Sterilization systems
- Cooling and heating system
- Horticultural tools
- Climatic control & ICT system
- Future innovation

" INTRODUCTION



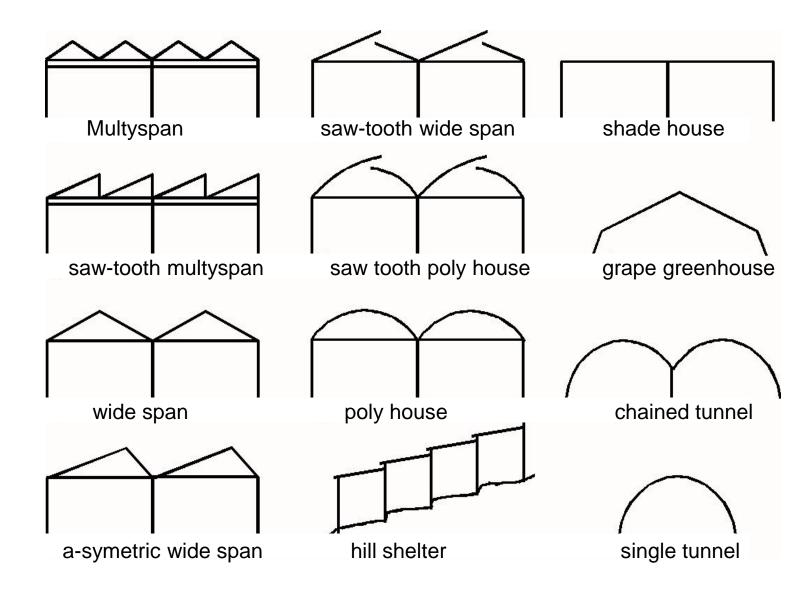
Eisma, 2006 (Hortimax)

Greenhouse Production system



TYPE OF GREENHOUSE AND STRUCTURE

Greenhouse types



CROP PRODUCTION/ MANAGEMENT SYSTEM

High bed system for strawberry







Strawberry cultivation systems









Sweet Pepper in NFT





EBB & Flow system



Cultivation system (DFT)



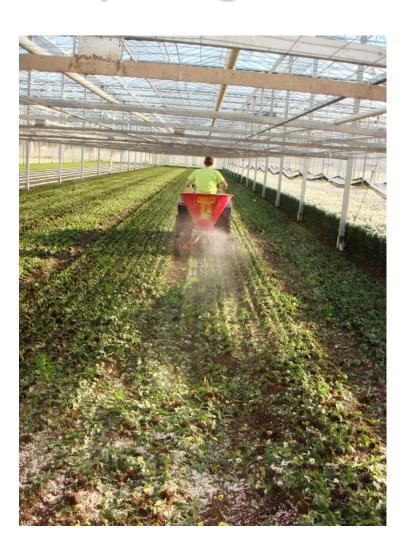


Making similar shaped plants





Preparing next crop









Direct sowing on the soil layer





Harvest and transport



Internal transport system



Pot Anthurium sorting unit



Cherry tomato sorting system





Roof clearing sytems





Crop monitoring systems



LIGHTING SYSTEMS

High pressure sodium lamps on spray chrysanthemums



Vertical lighting systmes



Application of LED

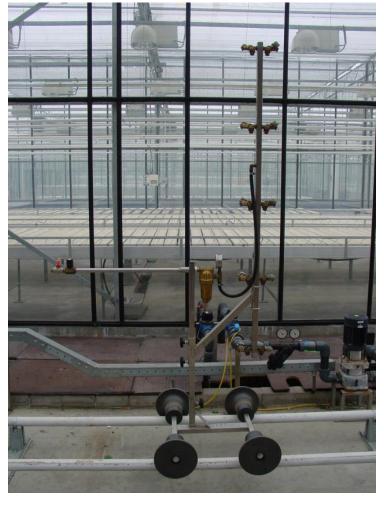


CROP PROTECTION SYSTEMS



Spraying pest & fungicide





Sprayer for strawberry crop



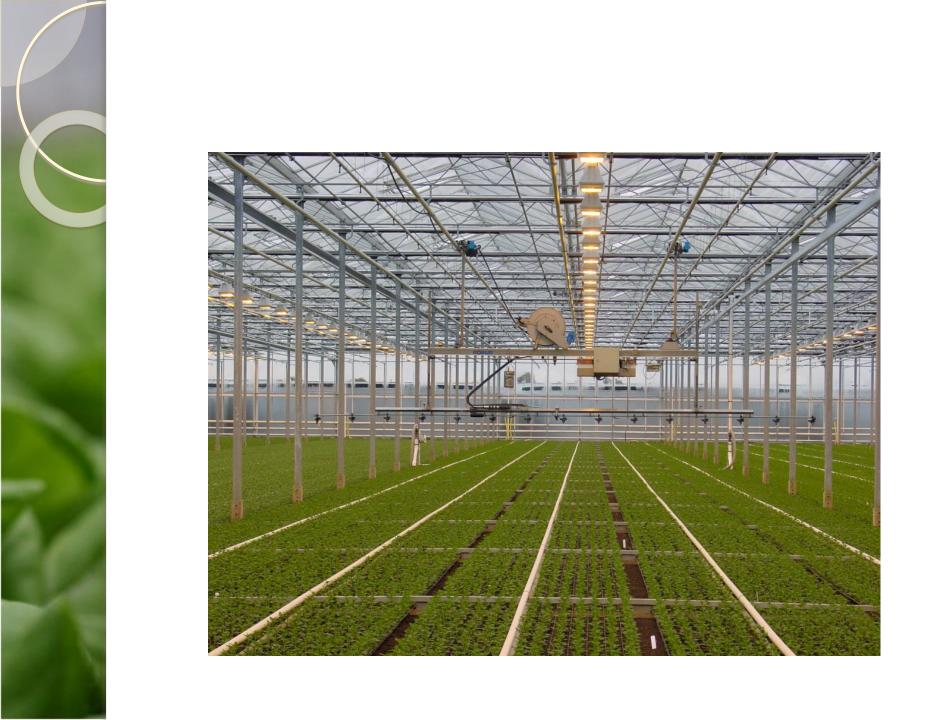
Sprayer for strawberry crop



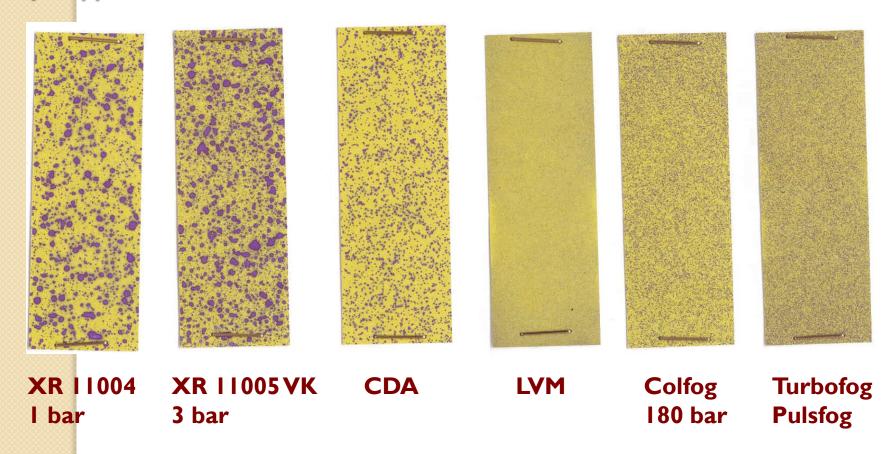


Spraying unit





Spray dripplers



WATER MANAGEMENT & STERILIZATION SYSTEMS

Re-osmosis filter system





Liquid fertilizer mixed unit







Heat Sterilization system



Low pressure UV system





High pressure UV system





° COOLING OR HEATING SYSTEMS

Boiler for hot water and steam



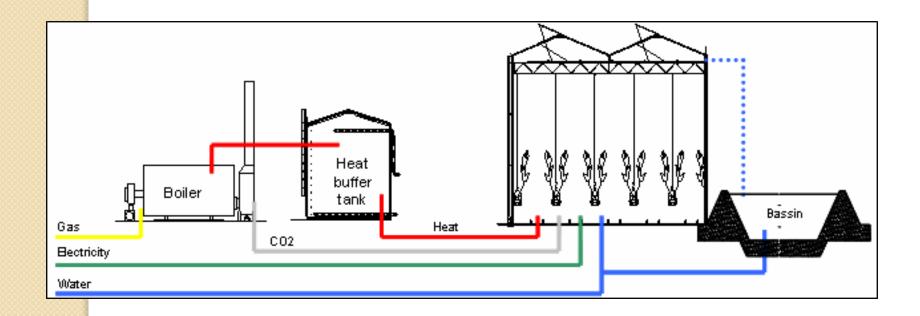


Condenser & gas blower

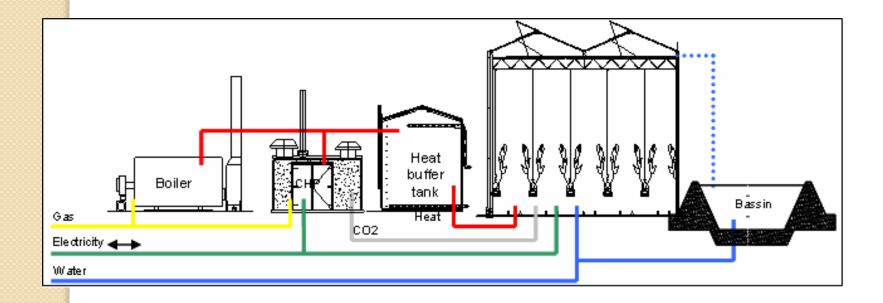


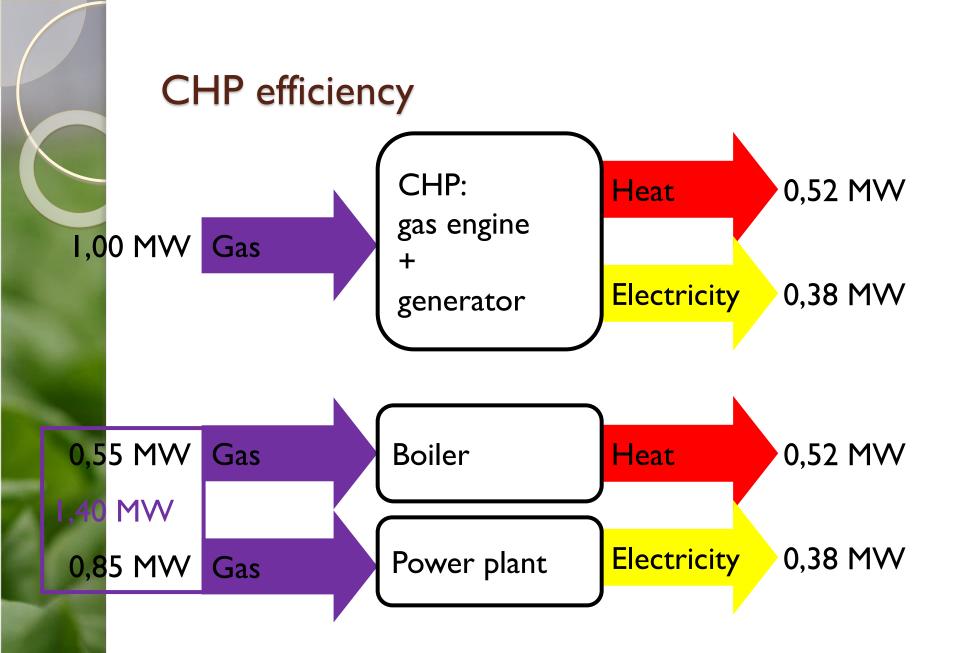


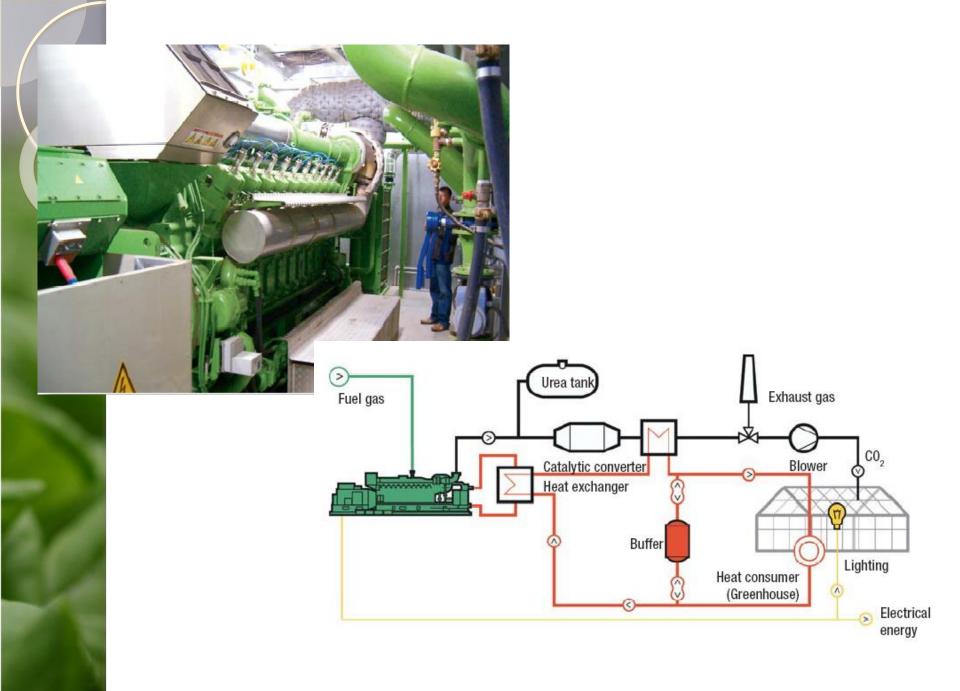
Greenhouse Concepts: Traditional Dutch



Greenhouse Concepts: Modern Dutch

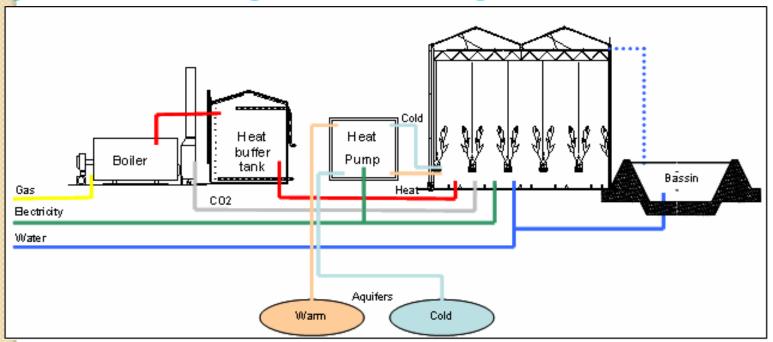






Greenhouse Concepts:

Integrated Heating and Cooling



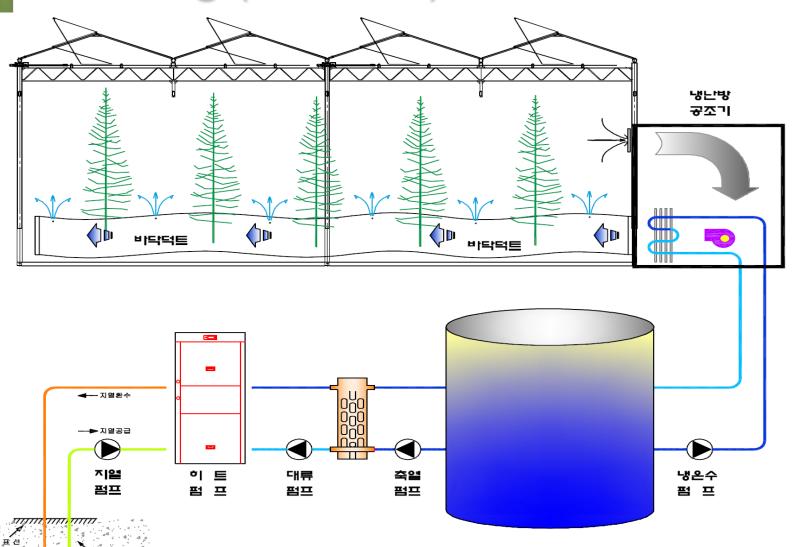




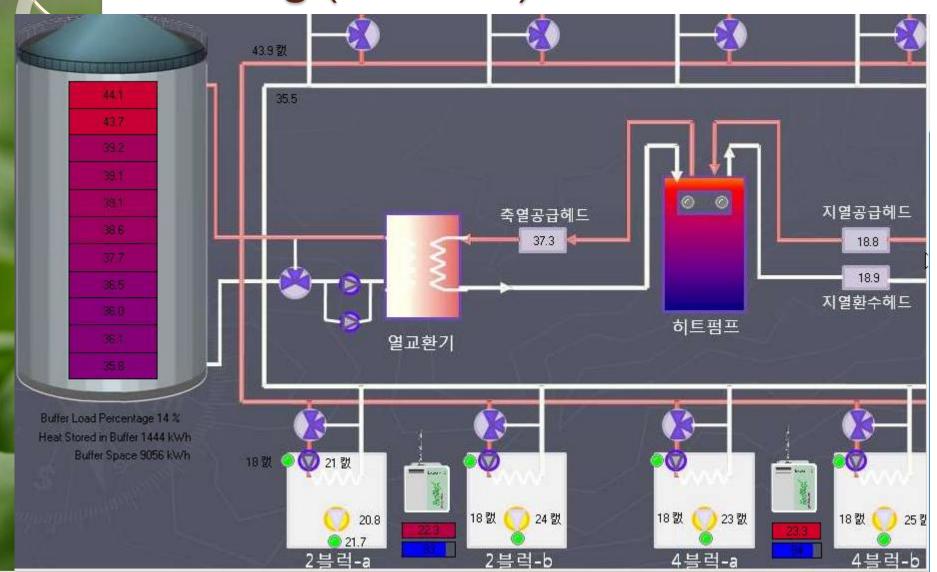




Schematic diagram of Cooling and heating (ArtFarm)



Schematic diagram of Cooling and heating (ArtFarm)



* HORTICULTURAL TOOLS

String (>250km/ha)





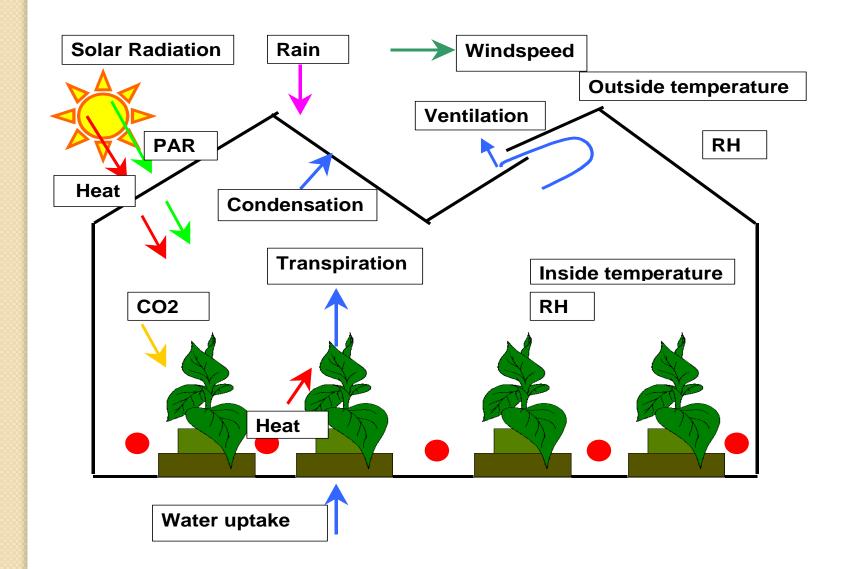


Planting chrysanthemum

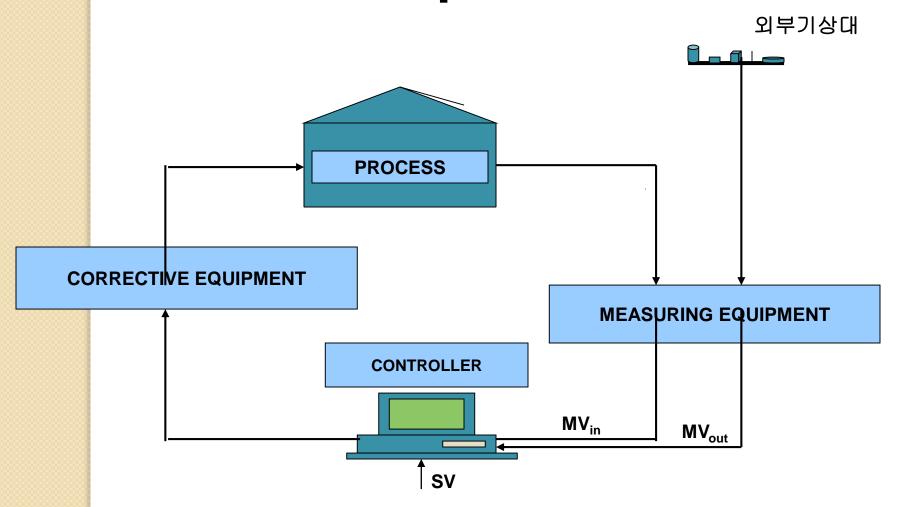




CLIMATIC CONTROL & ICT SYSTEM



Control loop





Analog climatic control system

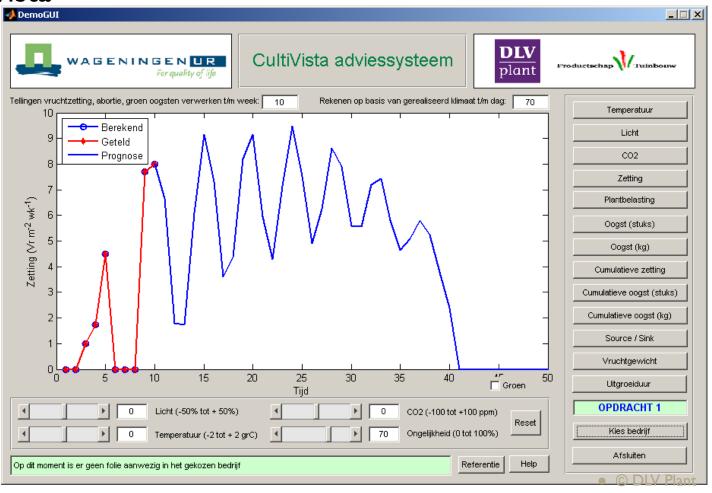


Sophisticated Computerized Controlling/Monitoring system

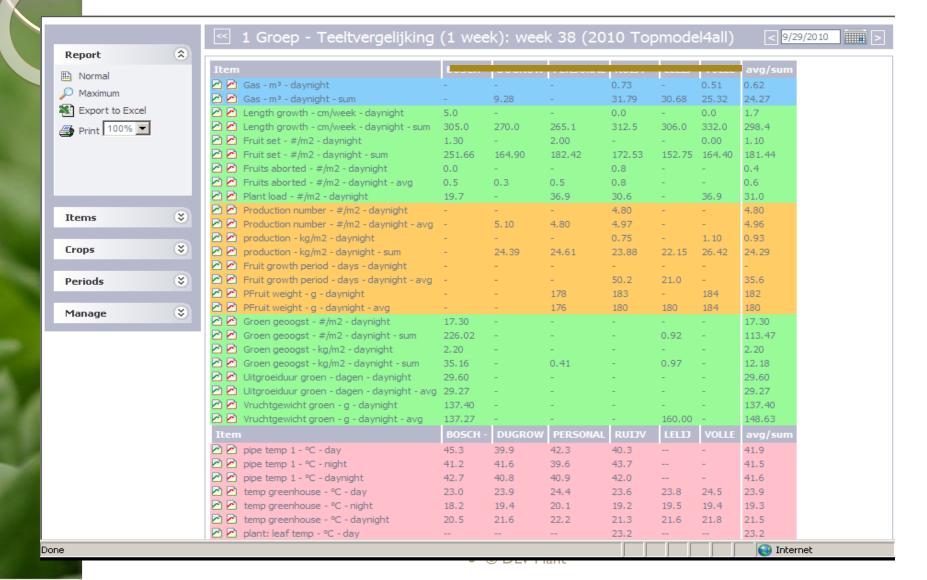


Interactive working with the model

Cultivista



Letsgrow.com



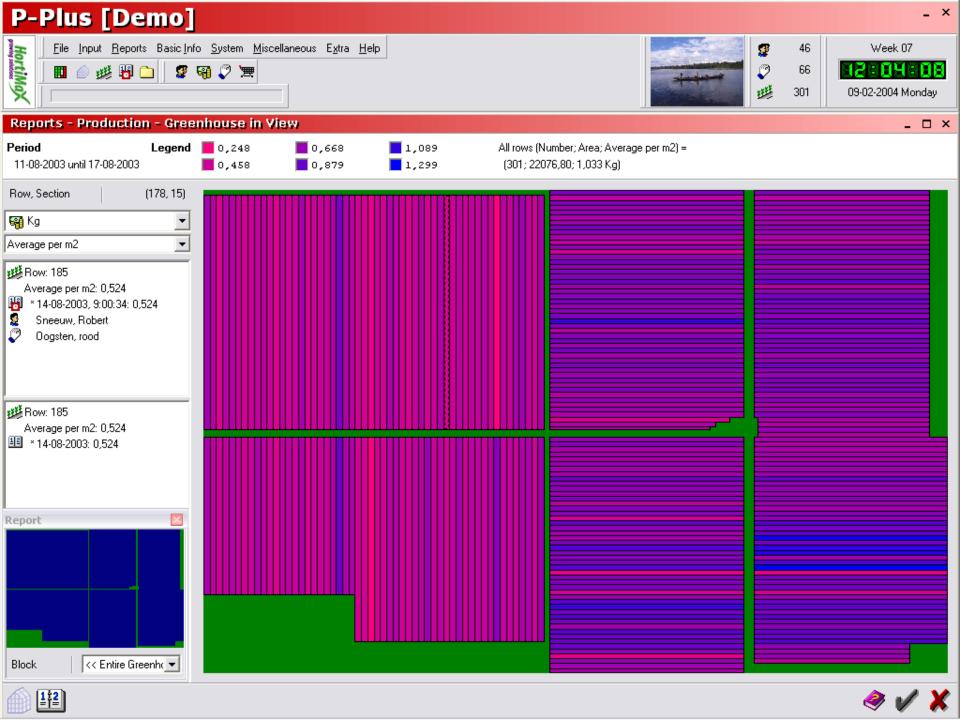
Labour & Production registration system

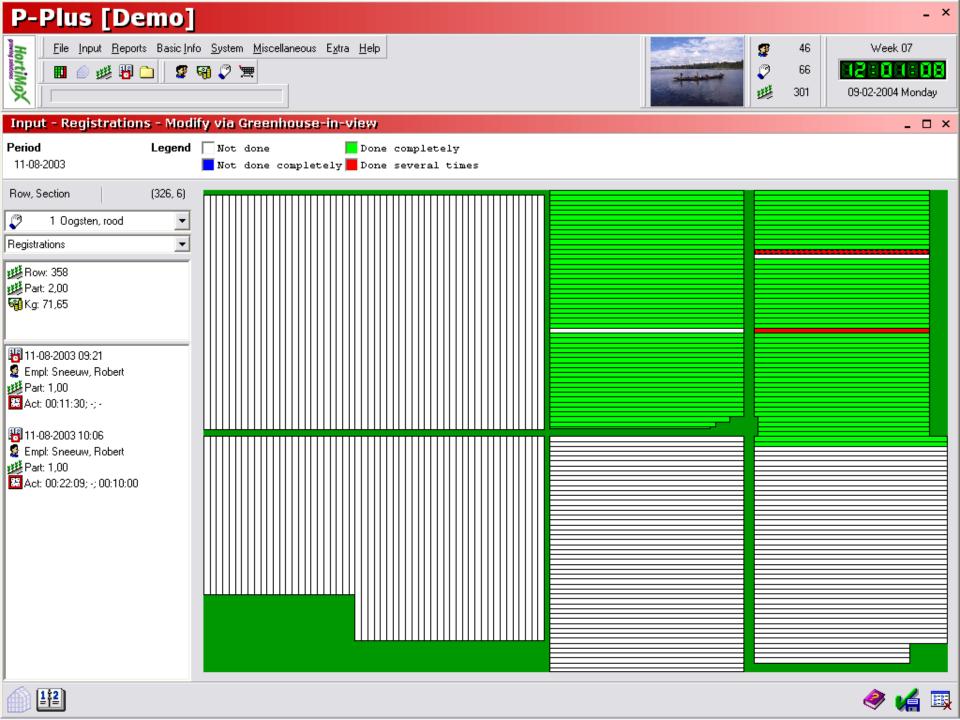


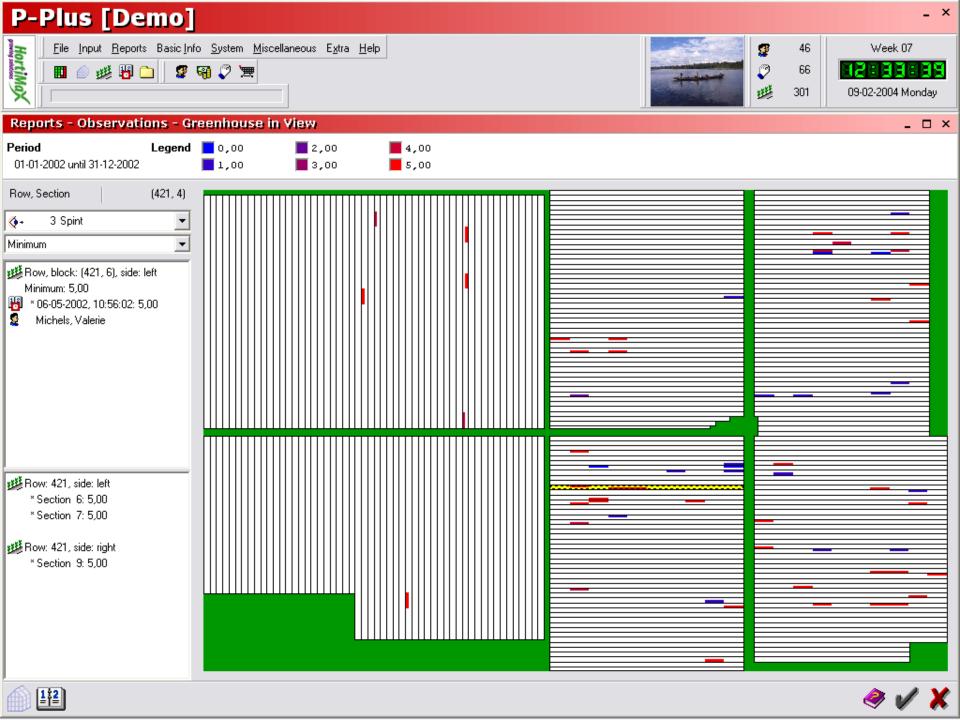
P-Plus Hardware











Report workers

Employees

50 Michels, Valerie

53 Feniks, Nicole

103 Ruys, Ton

120 Uzkug, Yitter

109 Cuyper, Jack

52 Mol, Sonja

100|

121

Postma, Wim

Leeuwin, Daniel

Gocek, Nesla

Quazizi, Abdelmajid

Buijs, Leon

10 Bruin, Tycho, de

206 Moreno, Juan

11 Philips, Rik

Report

Period

Employee:

_ & ×

Michels, Valerie Week 28, 2003

Veld, John, in 106 Holleman, Tom Janssen, Leon











610,0 519:47

30:35



37,0

42,0

69,7

82,8

32,2

56,0

39,0

54,8

49,3

3,5

16,5

rows

Report workers



33:24

32:18

26:13

25:15

18:29

47:44

43:48

39:32

49:14

Time



Time (%)

6,1

8,8

6,1

6,4

6,2

5,0

4,9

3,6

9,2

8,4

7,6

9,5

Κg

2000,55

1969,63

242,93

187,44

1183,24

4495,26

2205,06

2255,56

3728,08

4358,92

1718,99

2658,70

1688,16

1041,40

500,95

Kg/row

454,7

85,6

69,4

56,8

62,3

60,7

59,6

43,3

19,0

10,2

49,6

0,099

0,67

58,17





0,086

0,040

0,021

Kg/ plant

0,927

0,176

0,157

0,128

0,123

0,118



0,58

0,27

0,14

Kg/m²

6,28

1,19

1,06

0,87

Kg/hour

63,00

42,89

94,34

105,29

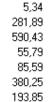
91,35

21,82

11,44







286,93

49,89

892,10

646,38

795,01

5176,54

304,50

9,96

0,17

0,11

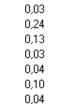
8,49

Cost

362,16

474,20

5,92



0,04

0,11

0,03

0,86

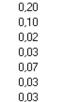
Cost/

kg

0,18

0,24

0,02



0,07

0,02

0,23

2,99

0,67

Cost/

1,14

0,29

0,03

0,02

m²

Cost/

82,31

20,62

1,69

1,62

14,84

7,98

1,51

2,04

5,46

row

Norm



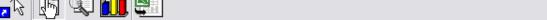












58,17

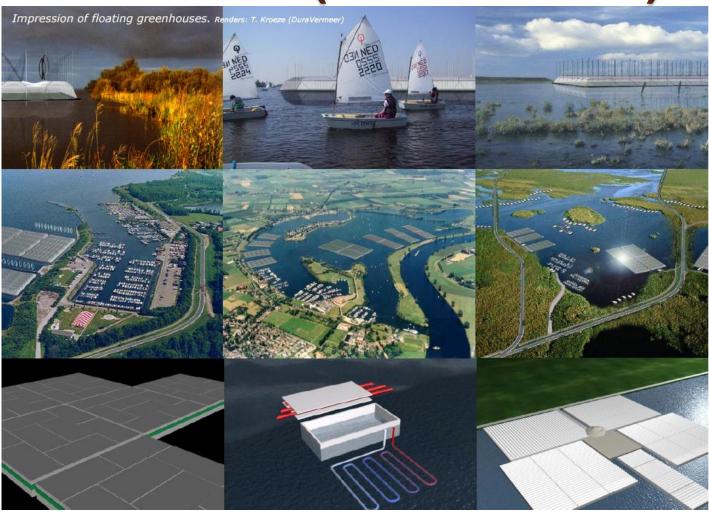
30234,86

1778,52

100,0

FUTURE INNOVATION

Impression of floating greenhouses (Dura Vemeer)





THANK YOU