



VertiFarm 2019

International workshop on vertical
farming

13-15 October 2019

Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



ISHS



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI SCIENZE E TECNOLOGIE
AGRO-ALIMENTARI



COLLEGE OF AGRICULTURE
AND LIFE SCIENCES
CONTROLLED ENVIRONMENT
AGRICULTURE CENTER

A new vision on plant production

The world population is rapidly growing from about 7 today to 9.5 billion people in 2050 and eating habits are changing. The demand for high quality fresh vegetables that are safe, healthy, tasty, and sustainably produced within or near urban areas is strongly increasing. This requires a new vision on food production and distribution. Vertical farming offers a new route that could fit future urban food systems. Vertical farming is a rapidly developing technology where plants are grown under fully controlled conditions in buildings in many stacked layers without solar light. Other terms used for this type of vertical farms are city farms, indoor farms, or plant factory with artificial light (PFAL). Vertical farming is a next level production system, which allows production of plants at any place including the most urbanised regions of the world. The use of LED light and the full control of both the aboveground and belowground conditions in combination with the right cultivar, enables growers to produce products with extra added value, which appeal to the demand of consumers for safe, reliable, and tasty, nutritious food.



VertiFarm2019: Workshop on vertical farming
13-15 October 2019
Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



ISHS



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI SCIENZE E TECNOLOGIE
AGRO-ALIMENTARI



COLLEGE OF AGRICULTURE
AND LIFE SCIENCES
CONTROLLED ENVIRONMENT
AGRICULTURE CENTER

The Workshop

It is now time for the first international workshop on Vertical Farming, organised under the auspices of the International Society for Horticultural Science.

The workshop combines a number of oral presentations of world leading horticultural researchers, panel discussions with renowned companies, short oral and poster presentations on the latest research results on vertical farming. The workshop welcomes scientific presentations on all aspects of vertical farming, ranging from plant physiology, breeding, climate control, engineering, systems design, urban planning, economics, consumer demands and business development. Although at this moment vertical farming largely deals with vegetables, there are also opportunities for production of ornamental (young) plants. Therefore, the workshop also welcomes presentations on ornamentals in vertical farms.

You are most welcome to attend the workshop from 13 to 15 October on the Campus of Wageningen University the Netherlands. If you want to be sure to have a place at the workshop, register now.



VertiFarm2019: Workshop on vertical farming
13-15 October 2019
Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



ISHS



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI SCIENZE E TECNOLOGIE
AGRO-ALIMENTARI



**COLLEGE OF AGRICULTURE
AND LIFE SCIENCES**
**CONTROLLED ENVIRONMENT
AGRICULTURE CENTER**

Keynote speakers

Eri Hayashi, Japan Plant Factory Association (Japan)

Global R&D and business trends of plant factories toward inclusive and sustainable societies

Murat Kacira, University of Arizona (USA):

Climate control

Luuk Graamans, Wageningen UR & TU Delft (the Netherlands)

Greenhouses or vertical farms? Future perspectives for cities in the light of resource use efficiency

Erik Runkle, Michigan State University (USA)

Spectral manipulations to elicit desired plant quality attributes

Qichang Yang, CAAS, Institute for urban agriculture (China)

Current status of vertical farming and its development of energy saving technologies in China

Bruce Bugbee, Utah State University (USA)

Turning photons into food: Modelling the potential of indoor agriculture

Marie-Christine Van Labeke, Ghent University (Belgium)

Multilayer production of ornamentals: light on young plants

Danny Geelen, Ghent University (Belgium)

Plant health in a controlled environment and the impact of organic nutrition

Emiel Wubben, Wageningen UR (the Netherlands)

Vertical Farming: Where is the business? A study into its business types and business models

Francesco Orsini, Bologna University (Italy)

Sustainable use of resources in indoor farms with artificial lighting

Invited speakers

Dorthe Larsen, Wageningen UR (the Netherlands)

Improving quality and secondary metabolite content in basil with LED light

Qianxixi Min, Wageningen UR (the Netherlands)

Producing lettuce with longer shelf life by short-term pre-harvest lighting

Sharath Kumar Malleshaiah, Wageningen UR (the Netherlands):

Control of flowering in vertical farms: case study on Chrysanthemum

Wenqing Jin, Wageningen UR (the Netherlands)

Effects of farred light on growth and development of lettuce

VertiFarm2019: Workshop on vertical farming

13-15 October 2019

Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



COLLEGE OF AGRICULTURE
AND LIFE SCIENCES
CONTROLLED ENVIRONMENT
AGRICULTURE CENTER

Speakers from companies during panel discussions

- Ed Harwood, Aerofarms, USA
- Katashi Kai, 808Factory, Japan
- David Proenza, Urban Farms Global, Panama
- Pavlos Kalaitzoglou, Infarm, Germany
- John Bijl, OwnGreens & VitroPlus, The Netherlands
- Celine Nicole, Philips lighting (Signify), The Netherlands
- Ali Ahmadian, Heliospectra, Sweden
- Timo Bongartz, Fluence Bioengineering/Osram, Germany
- Jan Westra, Priva, The Netherlands
- Pim Molenaars, Rockwool Grodan, The Netherlands
- Breeder (*to be announced soon*)
- *More to be announced soon*

VertiFarm2019: Workshop on vertical farming
13-15 October 2019
Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



ISHS



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI SCIENZE E TECNOLOGIE
AGRO-ALIMENTARI



COLLEGE OF AGRICULTURE
AND LIFE SCIENCES
CONTROLLED ENVIRONMENT
AGRICULTURE CENTER

Registration fee

	Early bird (before 1 Aug)	Regular (after 1 Aug)
ISHS member	265	315
Non-ISHS Member	330	380
Dinner (14 Oct)	50	50

The fee for Non-ISHS members includes the fee for a one year membership of ISHS (International Society for Horticultural Science; www.ishs.org). Hence you can benefit for one year from ISHS membership.

The registration fee includes the welcome reception, coffee/tea, lunches, bites & drinks.

Registration closes 6 October.



Poster Presentations

There is ample time for poster presentations and discussions. Poster presenters can apply for presenting also a poster pitch (3 minutes oral talk). Titles for poster pitches must be submitted before 1 July.

Sponsoring

There are several options for sponsoring, including small booths.

Practical Information

Info on accommodation and travel can be found at www.wur.eu/vertifarm2019

Registration and further information

For registration, sponsorship and further information see the website of the workshop:

www.wur.eu/vertifarm2019

Contact

Questions about registration:

Niek Botden,

Niek.Botden@hortilink.nl

All other questions (programme, sponsorship):

Leo Marcelis,

Leo.Marcelis@wur.nl

VertiFarm2019: Workshop on vertical farming
13-15 October 2019
Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



**COLLEGE OF AGRICULTURE
AND LIFE SCIENCES**
CONTROLLED ENVIRONMENT
AGRICULTURE CENTER

Programme

Sunday 13 October

Location: WICC, Lawickse Allee 9, Wageningen

5.00-8.00 PM Registration

6.00-9.00 PM Welcome reception

VertiFarm2019: Workshop on vertical farming
13-15 October 2019
Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



ISHS



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI SCIENZE E TECNOLOGIE
AGRO-ALIMENTARI



**COLLEGE OF AGRICULTURE
AND LIFE SCIENCES**
**CONTROLLED ENVIRONMENT
AGRICULTURE CENTER**

Programme

Monday 14 October

Location: Orion, Bronland 1, Wageningen

8.00 Registration

9.00 Opening (*Leo Marcelis, Murat Kacira, Francesco Orsini*)

9.10 Eri Hayashi

Global R&D and business trends of plant factories toward inclusive and sustainable societies

9.45 Murat Kacira

Climate control

10.20 Break

10.50 Luuk Graamans

Greenhouses or vertical farms? Future perspectives for cities in the light of resource use efficiency

11.25 Panel Discussion with companies (*Aerofarms, 808Factory, Urban Farms Global*)

11.55 Poster pitches (parallel sessions)

12.30 Lunch

13.30 Poster presentations

14.30 Dorthe Larsen

Improving quality and secondary metabolite content in basil with LED light

14.50 Wenqing Jin

Effects of farred light on growth and development of lettuce

15.10 Danny Geelen

Plant health in a controlled environment and the impact of organic nutrition

15.45 Break

16.15 Francesco Orsini

Sustainable use of resources in indoor farms with artificial lighting

16.50 Panel Discussion with companies (*Priva, Grodan,...*)

17.20 Closure

19.00 Workshop dinner (*Location: WICC, Lawickse Allee 9, Wageningen*)

VertiFarm2019: Workshop on vertical farming

13-15 October 2019

Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



COLLEGE OF AGRICULTURE
AND LIFE SCIENCES
CONTROLLED ENVIRONMENT
AGRICULTURE CENTER

Programme

Tuesday 15 October

Location: Orion, Bronland 1, Wageningen

9.00 Qichang Yang

Current status of vertical farming and its development of energy saving technologies in China

9.35 Erik Runkle

Spectral manipulations to elicit desired plant quality attributes

10.40 Bruce Bugbee

Turning photons into food: Modelling the potential of indoor agriculture

11.15 Panel Discussion with companies (Own Greens, Infarm,....)

11.45 Poster pitches (parallel sessions)

12.20 Lunch

13.20 Poster presentations

14.20 Qianxixi Min

Producing lettuce with longer shelf life by short-term pre-harvest lighting

14.40 Sharath Kumar Malleshaiah

Control of flowering in vertical farms: case study on Chrysanthemum

15.00 Marie-Christine Van Labeke

Multilayer production of ornamentals: light on young plants

15.35 Break

16.15 Emiel Wubben

Vertical Farming: Where is the business? A study into its business types and business models

16.40 Panel Discussion with lighting companies (Philips, Fluence, Heliospectra)

17.10 Drinks & Bites

VertiFarm2019: Workshop on vertical farming

13-15 October 2019

Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



**COLLEGE OF AGRICULTURE
AND LIFE SCIENCES**
CONTROLLED ENVIRONMENT
AGRICULTURE CENTER

Convenors



Prof Dr Leo Marcelis

www.hpp.wur.nl



Prof Dr Murat Kacira

<http://ceac.arizona.edu/>



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI SCIENZE E TECNOLOGIE
AGRO-ALIMENTARI

Dr Francesco Orsini

<https://site.unibo.it/rescue-ab/en>

VertiFarm2019: Workshop on vertical farming
13-15 October 2019
Wageningen, The Netherlands



Venue of the workshop

Orion
Bronland 1 (Building 103)
Wageningen Campus
Wageningen
The Netherlands
[https://www.wur.nl/nl/locatie/
Orion-building-number-
103.htm](https://www.wur.nl/nl/locatie/Orion-building-number-103.htm)



Location for Welcome reception (Sunday) and Dinner (Monday)

WICC
Lawickse Allee 9
Wageningen
The Netherlands
www.wicc.nl



VertiFarm2019: Workshop on vertical farming
13-15 October 2019
Wageningen, The Netherlands



WAGENINGEN
UNIVERSITY & RESEARCH



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI SCIENZE E TECNOLOGIE
AGRO-ALIMENTARI



**COLLEGE OF AGRICULTURE
AND LIFE SCIENCES**
CONTROLLED ENVIRONMENT
AGRICULTURE CENTER