Students....
Students are welcome to do their Internship research under supervision of one of the staff members of the chair group Horticulture & Product Physiology (HPP) of Wageningen University. The research topics of HPP are spread over themes encompassing pre-harvest environmental plant physiology to post-harvest product physiology, and are connected to horticultural production worldwide. The emphasis is on, but not restricted to, modern glasshouse production.

Topics are example topics....
In this document you will find a list of possible Internship topics. The list gives you an impression of the subjects which are available. The actual definition of a subject is always affected by specific interests of students.

About arranging a supervisor and signing a HPP-contract ....
Often students find their own places for internship. In that case they should look for a HPP staff member to act as supervisor for this Internship.
Before the actual start of an Internship a supervisor must have agreed and a HPP-version of the Internship contract must have been signed! You can find the HPP Internship contract on our website: http://www.wur.eu/hpp >> Education >> Contracts and evaluation forms
If you need suggestions for internship places you can contact dr. Ep Heuvelink (see info below).

Interested but don’t know where to start? Contact the HPP coordinator.....
If you want to start an Internship under supervision of a HPP supervisor but have not decided about a subject then contact the coordinator of student-research-projects (Dr. Ep Heuvelink).

ep.heuvelink@wur.nl  
tel. 4 83679

Make sure you make your arrangements in time:
Early planning from both student and supervisor involved is necessary in order to prevent study delays.

Although this document contains a recent list of topics, it is not complete and may continuously be subject to changes. You can also suggest subjects yourself. For the latest version of the list and the HPP-version of an Internship contract check our website: http://www.wur.eu/hpp >> Education
Internship topics

Maximize tomato production in high tech greenhouse in Querétaro, Mexico

Supervisor(s):
External supervisor: Marieke Vanthoor (United Farms Mexico)
Contact HPP: Ep Heuvelink

Description:
In Querétaro an Agropark is located with 112 Ha of greenhouses. In total there are 12 companies in the Agropark. Finka is one of the companies present and it offers students to do their internship or thesis within the company. Finka has high technology greenhouses where tomato and cucumbers are produced.

Aim of the project is to maximize tomato production within the greenhouse. Therefore we are looking for students that will evaluate all data obtained with the HortiMax climate control computer and relate real data with theoretical data. The climate control computer gathers many data that are at this moment not optimally used. The overview of amount of kilos produced related to all variable parameters such as CO2 input, nutrient concentration, light availability etc. needs to be reviewed in depth. Moreover in one of the greenhouse diffuse glass is placed and a good comparison of yield increase or decrease due to the diffuse glass is not done at the moment.
We are looking for motivated, independent and positive students with a study background in Agrotechnology or Plant sciences.

For further information please contact Marieke Vanthoor at mvanthoor@unitedfarms.mx or the contact for internships at HPP Ep Heuvelink.

Internship and ECTS:
Internship credits: 24 ECTS

Location:
Querétaro is located in central Mexico, 2 hours north of Mexico city. It is one of the most beautiful and safe cities in Mexico.

Planning:
To be arranged in consultation with the supervisors.
Internships at Ter Laak Orchids (location Wateringen)

**Supervisor(s):**
*External supervisor: Ewald de Koning (Ter Laak Orchids) Contact HPP: Ep Heuvelink*

**Description:**
Ter Laak Orchids is one of the leading nurseries of Phalaenopsis potplant in Europe. We are located in Wateringen, in the west of Holland in the Westland area. With our 140 employees, we grow yearly more than 6 million Phalaenopsis plants. We have 125,000 m2 production area spread over two modern, sustainable sites. We sell our plants to wholesalers, garden centres and retailers, who in turn ensure that consumers around the world can enjoy our Phalaenopsis orchids.

The potplant nursery is the epitome of sustainability. We also employ the latest cultivation techniques and use a high degree of automation. It matches perfectly the organisation's deep-seated ambition to improve continuously. We believe our new nursery is the key to a more efficient cultivation of orchids. In everything we do, we are guided by our core values: demonstrating ambition, respect for people and the environment and doing business in straightforward way.

Last but not least, we have our Daylight Greenhouse. Covering 4,000 m2, it collects solar energy in an innovative way and releases the heat at a later stage to warm the greenhouse, enabling us to cultivate in a very energy-efficient way. We have 3 research greenhouses state of the art equipped for modern Phalaenopsis cultivation including artificial light, mist, cooling.

In 2016 we started a new nursery in Guatemala, Ter Laak Americas, to serve the American market. We make preparations to build a new greenhouse on our site in Wateringen, most likely of the innovative Daylight Greenhouse type.

On our site [www.orchidee.nl](http://www.orchidee.nl) you will find more information including links to you-tube movies.

Ter Laak gives excellent students the opportunity to do an internship at our site in Wateringen. This can be on one of these fields:

- Climate control: efficient temperature cooling, humidity regulation, monitoring
- Other ways of irrigation then on top of the plants
- Efficient way of artificial lighting
- Improve hygiene
- Biological pest control e.g. against Enchytraeid
- Resistance to diseases
- Influencing number of branches, flowers and length.
- Investigate the risks and propose solutions to reduce risks
- Better grading techniques of the plants
- Initiatives of the student

For further information please contact the internships coordinator at HPP: Ep Heuvelink ([ep.heuvelink@wur.nl](mailto:ep.heuvelink@wur.nl)).

**Internship and ECTS:**
Internship credits up to 24 ECTS

**Location:**
Wateringen (Westland area)

**Planning:**
To be arranged in consultation with the supervisors.
Internship topics Post-harvest quality of fruits, flowers and vegetables

- **Influence of preharvest conditions**
  Chilling injury, LED lighting, vase-life, tree factor

- **Postharvest Physiology & Biotechnology techniques**
  Colour, firmness, HPLC, qPCR, GC-MS, CRISPR-Cas9, modelling

**Supervisor(s):**

*Dr Rob Schouten, Dr Julian Verdonk, and Prof Dr Ernst Woltering*

**Potted plants (internships)**

- Transport conditions reduce quality. Possible topics to study is the effect of darkness, ethylene, cold and mechanic damage. Effect of growing conditions (preharvest) on quality. Petunia, Chrysanthemum topics available. In collaboration with Syngenta, Dümen Orange, etc.
- Postharvest problems with transport of cuttings. Transport in plastic bags, cold and wet, some cultivars have problems rooting and show other quality problems afterwards. Poinsettia, Geranium topics available.

**Alternative topics**

- We are always interested to talk about other possibilities you might want to explore. Other species, or topics should be possible, lets discuss!

**Internship and ECTS:**

Internship credits up to 24 ECTS

**Planning:** Flexible starting time.

Reminder: make sure that a HPP staff member has agreed to act as supervisor for this Internship (see also instructions on the front-page in section ‘About arranging a supervisor and signing a HPP-contract ....’).
Internships on High Production Environments Data at SIGROW (location Wageningen Campus)

Supervisor(s):
External supervisor: Javier Lomas (SIGROW)

Description:
SIGROW BV has now space, material and time to train a couple of plant science students (MSc/BSc) who is planning his career in the direction of plant physiology / vertical farming / intensive horticulture. Look at the SIGROW website for more information: http://sigrow.com/

The student will enjoy:
- Learning python focused on big data analysis
- Analysing using Excel/R/Python real growers data from all over the World to spot environment bottlenecks
- Design of experiments to ensure data reliability under extreme growing conditions.
  Climate control: efficient temperature cooling, humidity regulation, monitoring

The student will get:
- Design of experiments to ensure data reliability under extreme growing conditions
- Climate control: efficient temperature
- Access to all Sigrow sensors under development.

For further information please contact Javier Lomas of Sigrow at javi@sigrow.com or the internships coordinator at HPP: Ep Heuvelink (ep.heuvelink@wur.nl)

Internship and ECTS:
Internship credits up to 24 ECTS

Location:
Vijfde Polder 1 - Wageningen Campus

Planning:
To be arranged in consultation with the supervisors.

Reminder:
Make sure that a HPP staff member has agreed to act as supervisor for this Internship (see also instructions on the front-page in section ‘About arranging a supervisor and signing a HPP-contract ....’)
Internship Molecular Strawberry Breeding

Who we are
Fresh Forward is a strawberry Breeding company located in Eck en Wiel, Betuwe, The Netherlands. Our breeding program started in 1943 at one of the institutes of Wageningen University. Famous varieties derived from this program include Gorella, Korona, Elsanta, Sonata and Rumba. We currently have three breeding programmes in strawberry: Northern Europe, Southern Europe and Day-Neutral varieties.

The project
In this project we want to evaluate a number of important plant and fruit characteristics in a very interesting mapping population. After the phenotypic evaluations, a QTL analysis will be performed using SNP array derived marker data.

Your Tasks:
- Set up a set of characteristics to be measured and perform the phenotyping
- Analyze the phenotypic results
- Perform QTL mapping
- General support of the breeding program when available.

Who You Are
- Following a Master studies in Plant Sciences (preferably Plant Breeding)
- A practical and analytical mind
- Available for at least 5 months, preferably 6. Starting at end of April-Early May 2017 (due to trials already being planted).
- Capable of working in a team (on-season), as well as independently (off-season).
- Fluent in Dutch (preferred) or English.

What’s in it for you?
- You will gain insight into a practical breeding program, as well as QTL mapping.
- A good work environment in a small scale company, with experienced personnel.
- Compensation for travelling as well as a monthly Fee.
- Free strawberries.

Please send your motivation and C.V. to Dr. Thijs van Dijk (thijs.vandijk@fresh-forward.nl). Who is also available for more information and a regular visitor of Radix East.

Reminder: make sure that a HPP staff member has agreed to act as supervisor for this Internship (see also instructions on the front-page in section ‘About arranging a supervisor and signing a HPP-contract ....’).
Interactions of Fe concentrations, root development, growing medium and irrigation strategy

Supervisor(s):
Wim Voogt (WUR Plant Sciences, Bleiswijk), Ep Heuvelink

Description:
This experiment is part of a project which aims to develop a prototype of a dynamic model for monitoring and surveillance of nutrient concentrations in substrate systems. This model will be based on relevant parameters related to crop and cropping system, and dynamic changes during cultivation. Experiments are carried out to fill the knowledge gaps in order to develop the model.
The experiment will focus on the question: what is the effect of root condition and root morphology on the uptake and distribution of Fe by the plant, and what are the consequences for target values in the nutrient solution supplied and the drainage.

Internship and ECTS:
Internship credits up to 24 ECTS
(also available as Master‐thesis subject)

Type of work:
Experimental: conducting the trials, routine measurements of the parameters of the water- and nutrient balance ( EC, pH nutrients, drainage, water use), as well as determination of yields/biomass, sampling plant tissue. A search for methods to determine Fe-stress ( by enzymatic reactions) will be part of the task.
Plant(s): tomato, grafted on various rootstocks

Methods:
Plant material grafted on rootstocks varying in growth power will be exposed to various Fe-concentrations and chelate types. The effect on growth and development and Fe-chlorosis will be observed, as well as the Fe-content of tissue.

Two approaches: 1) short trial in the propagation phase, with a broad range of rootstocks and Fe-concentrations and 2) a 6 months production trial with a selection of the variables of the initial trial.

Planning:
There is room for candidates in the period from February 2017 – February 2018.
In consultation with supervisor(s), experiment should start in March 2017 , the total experimental period can be extended to December 2017 or even some months into 2018.
Note: the experiments will be executed in Bleiswijk, candidates are expected to work at least 4 days/week in Bleiswijk during the experimental period.

Reminder: make sure that a HPP staff member has agreed to act as supervisor for this Internship
(see also instructions on the front-page in section ‘About arranging a supervisor and signing a HPP-contract .....’)
Introduction of research on bean sprouts physiology for Internship at Evers Specials

Supervisor(s):
External supervisor: Ruxin Hé (Evers Specials)
Contact HPP: Leo Marcelis

Description:
Evers Specials is the biggest mung bean sprouts producer in Europe. We specialize in growing mung bean sprouts and our market is mainly in Europe. Therefore, as main product, bean sprouts quality is utmost important for us. However, bean sprouts are relatively “small” vegetable from an economical point of view compared with other “big” vegetable. Therefore, there are little research performed on how to improve the quality of bean sprouts by universities and institutes.

Based on years of experiments and experience, we manage to produce stable and good quality bean sprouts. Nevertheless, the knowledge of bean sprouts physiology is still not enough, so more fundamental research on bean sprouts physiology and post-harvest quality have to be performed by ourselves.

Currently, we are working on several interesting projects to try to understand how sprouts will react on different growing situations (affected by water, air temperature, sprouts temperature and gas composition etc.). And most importantly of course, is to see how sprouts quality will be affected by these different growing patterns.

We are looking for enthusiastic and details-oriented people who are interested in discovering the secrets of bean sprouts and performing scientific research. He or she should also be able to work independently and think proactively about the results and improvements. If there are some interesting topics that come up in your mind, you are also welcomed to discuss with us. The period and content of internship will be determined after discussion based on the master program planning of the candidates.

Internship and ECTS:
Internship credits: 24 ECTS

Location:
Nijmegen

Planning:
To be arranged in consultation with the supervisors.

www.eversspecials.nl