Welcome to the combined presentation for the MSc Plant Sciences, including Plant Breeding (online), the MSc Plant Biotechnology, and the MSc Organic Agriculture.
We decided to combine the information for these three Masters, because they share a lot, and all relate to the broad and challenging domain of plant sciences, focusing on sustainable plant production to provide safe and healthy food, in a safe environment.

My name is Anja Kuipers, I'm programme director for these three Master's programmes, and I will explain the most important aspects of these master's in this presentation. I hope you will learn a lot on these interesting programmes, and look forward to provide you with further details if needed!
Plant Sciences/ Plant Biotechnology/ Organic Agriculture

Outline:
- The Plant domain
- Content Master’s programmes
- Structure of the programmes

This presentation explains the broad domain behind and around these Master’s, the content and curriculum of the programmes and the way they are structured.
Wageningen University: High quality education

The Keuzegids ranking compares Dutch universities. In 2019 the university is ranked as the best University in the Netherlands for the fifteenth time in a row. Wageningen University offers high quality education at bachelor and master level.
Specific about Wageningen is the combination between Wageningen University and Wageningen Research, which enables intensive interactions between fundamental research, mainly at the University, and the application of new discoveries through Wageningen Research. The Master’s Plant Sciences, Plant Biotechnology and Organic Agriculture are embedded in the Plant Sciences group, and students benefit during courses and thesis work from the close cooperation between the university department of Plant Sciences and Wageningen Plant Research.
What’s in it for you?

- Unique and inspiring environment
- Top-level innovation and education

The numerous interactions between Wageningen University and Wageningen Research in the Plant Sciences Group make Wageningen a unique and inspiring academic environment for students, in which students have many opportunities to learn from and participate in top-level innovation and education.
The broad domain of Plant Sciences is best summarized by the term Plants, people and innovation. The following slides will give an overview of various aspects of the domain in relation to the Master’s of Plant Sciences, Plant Biotechnology and Organic Agriculture:

- **Flowers**: The Dutch flower sector has an international perspective. This includes breeding new varieties of cut flowers and ornamentals, optimization of (greenhouse) cultivation technology, post-harvest physiology to improve vase life, and global logistics.

- **Food**: Most of our daily food is of plant-based origin: the bread we bake, fruit, vegetables, and staple crops such as potato, rice and maize. All three masters contribute to developing knowledge on sustainable production of healthy and tasty foods. And when it comes to details, even the cheese and meat on this sandwich in the end are linked to plants, as explained on the next slide.
- Feed: The meat and cheese we eat are produced by animals that generally have a plant-based diet. So also here the saying “no Plants no Food” is thoroughly supported!
- Fiber: In the transition towards a bio-based economy, plants are increasingly being used as a source of renewable raw materials to replace petrochemicals (chemical products obtained from petroleum and other fossil fuels by refining in the petrochemical industry). Industrial hemp, grown for its fibers, can be refined into a variety of products, such as biodegradable plastics, insulation, paint and textiles. Hemp (Cannabis sativa) is also a strong example of a multi-purpose crop, as other strains and varieties are specifically grown for the medical purposes of cannabidiol (CBD), or for recreational use of the psychoactive component tetrahydrocannabinol (THC).
- Fair trade: Many of the fruits that we eat, as well as coffee and cocoa, are of tropical origin, and produced by smallholder farmers in Asia, Africa and South America. To sustain and improve the livelihoods of these smallholder farmers the development of sustainable food systems is essential. In this perspective the term sustainable also includes social responsibility to ensure that smallholder farmers can earn an income that helps to improve their lives. This example strongly relates to the Master Organic Agriculture.

- Pharma: Many medicines are made from plant-based components. This example shows *Artemisia annua*, a small plant that produces artemisinin, the basis for an anti-malaria drug, but only in relatively small amounts. This can be improved in different ways. One option is to improve the artemisinin yield in *Artemisia annua* itself, for example through plant breeding. Another option is to elucidate the biochemical pathway of artemisinin production, and isolate genes that encode essential enzymes in this pathway. These genes can then be introduced in other plant species that already have part of this pathway, in order to make them produce artemisinin in larger quantities. This example strongly relates to the Master Plant Biotechnology.
A new upcoming theme in relation to sustainable plant-based production is the fashion sector. Sustainable fashion combines the production of sustainable, and/or organic fibres and textiles, and combine this with promoting change of the fashion system towards more ecological integrity and less waste. Developing hemp fibres to replace cotton fibres in clothes is a strong example to reduce the extensive use of water and pesticides.

Taken together these seven examples together give a good representation of the broad reach of the plant sciences domain into our daily lives on an international scale.
Developing new, innovative and sustainable solutions for various issues is another important aspect of studying Plant Sciences, Plant Biotechnology or Organic Agriculture in Wageningen. This slide shows four examples of current research in which Wageningen students participated for their final year thesis.

Top left: LED lights are gaining popularity in modern greenhouses for their energy use efficiency and their lack of heat production. To apply LEDs in an optimal way, knowledge on the effect of LED-light quality (specifically the balance between blue, red and far-red light) on plant and crop physiology is essential. This balance can influence whether plants grow tall or stay compact, and when flower buds are being formed.

Top right: Due to climate change and flooding, crops will benefit from salt tolerance to produce good yields on salty soils. This is an example of a barley breeding project aimed at developing salt-tolerant barley varieties. Seedlings are grown on nutrient solutions with increasing salt concentrations to select the best adapted young plants, and develop them into a new variety.

Bottom left: The research project N2Africa focuses on improving food security by applying nitrogen fixation to, for example, peanut production. The specific feature in this project is intensive cooperation with local smallholder farmers, which proved very successful.

Bottom right: For the production of medicinal compounds in plants tobacco has been developed as a robust plant-based platform. One of our students contributed to further optimisation of this production platform.
Three Master’s

- MSc Organic Agriculture
- MSc Plant Biotechnology
- MSc Plant Sciences

The following slides describe the specialisations and characteristics of the three Master’s.
MSc Organic Agriculture: Specialisations

- **Agroecology**
- **Sustainable Food Systems**
- **Double Degree Agroecology (with ISARA Lyon, France)**

**Focus:**
- multiple land use, organic agriculture, sustainable food systems
- interdisciplinary systems approach: social sciences & life sciences
- integration of theory and practice: participatory research

The Master Organic Agriculture starts with common courses to provide all students in the programme with a shared perspective and common background knowledge on the full domain behind the term “Organic Agriculture”. By the way: This master not only focuses on organic agriculture as such, but also on agroecology, permaculture, and sustainable agriculture in general.

The common core is followed by three specialisations:
- **Agroecology** focuses on the sustainable production of crops and livestock in an integrated way, also taking soil-plant relations and nutrient balances into account.
- **Sustainable Food Systems** focuses on the social sciences perspective of sustainable systems of food provisioning. In addition, globalisation and sustainability of food production and consumption are addressed. Production, processing and marketing of organic products is increasingly affected by (inter-)national policy and legislation. Insight into these aspects is crucial to expand and develop organic food production networks.
- The third option is a double degree programme with ISARA Lyon, in which Agroecology is combined with a landscape perspective. In the double degree programme students follow the first year in Wageningen, then move to Lyon for the second year. In this programme the Master Thesis is co-supervised by Wageningen University as well as ISARA Lyon.

Central in the programme of the Master Organic Agriculture is the integration of theory and practice in a participatory research setting. You will learn how to integrate social sciences and life sciences in an interdisciplinary systems approach.
The main focus of the Master Plant Biotechnology is the integration of molecular biology, health biology and plant sciences, with specific attention for technology development in genomics, bioinformatics, molecular marker technology and genetic modification. This is combined with attention for the societal debate related to plant biotechnology, for example regarding the GMO-discussion, and Intellectual Property Rights.

This master has three specialisations:

- Functional Plant Genomics focuses on the application of plant genomics and bioinformatics to study gene expression for understanding the complexity of interactions between genes and gene products.
- Plants for Human Health provides a fundamental understanding of how plants can be exploited for the production of foreign proteins and metabolites. In addition biomedical aspects, including immunology and food allergy, and also nutritional genomics and plant metabolomics can be studied.
- Molecular Breeding and Pathology focuses on molecular approaches and molecular markers to analyse and adapt qualitative and quantitative traits in cultivated plants in order to improve yield and quality of food and renewable resources, disease resistance and abiotic stress tolerance.

Most students in the Master Plant Biotechnology continue in research, for example with a PhD.
## MSc Plant Sciences: Specialisations

- **Crop Science**
- **Greenhouse Horticulture**
- **Natural Resource Management**
- **Plant Breeding and Genetic Resources**
- **Plant Pathology and Entomology**
- **Online Master Plant Breeding**

Focus: applied academic research

The MSc Plant Sciences has the broadest range of specialisations, and focuses mainly on applied academic research, but also on fundamental aspects. In this Master, all students have to choose a specialisation right from the start.

The five specialisations are:

- **Crop Science**
  - Focus: applied academic research
  - Focuses on a systems approach that integrates disciplinary knowledge is crucial to studying plant production at various integration levels (plant, crop, farm, region). This requires sound understanding of the basic physical, chemical and physiological aspects of crop growth and production. Modelling and simulation are used to analyse yield constraints and improve production efficiency.

- **Greenhouse Horticulture**
  - Focus: production method that can significantly control abiotic and biotic factors, supported by a steady flow of innovative technological approaches. In this way, for example, detailed investigations of the regulation of organ formation can be directly related to improved control techniques in production situations.

- **Natural Resource Management**
  - Focus: provides knowledge and tools to understand the interactions between the biotic and abiotic factors in agro-ecosystems in order to facilitate the current multitude of agricultural demands: bulk vs. specialty (pharmaceutical) products, food products vs. bio-diesel, conservation of biodiversity, dealing with climate change, eco-tourism.

- **Plant Breeding and Genetic Resources**
  - Focus: plays an important role in the development of varieties that meet current demands regarding yield, disease resistance, quality characteristics, salt or drought tolerance and suitability for sustainable plant production systems. The use of various molecular techniques contributes enormously to the rapid identification of genes for natural resistance and is essential for accelerating the selection process by marker-assisted breeding.

- **Plant Pathology and Entomology**
  - Focus: investigates the population ecology of insects, nematodes and weeds and epidemiology of fungi and viruses, including mechanisms of transmission. Knowledge of plant-insect, plant-pathogen and crop-weed relationships establishes the basis for applied research programmes on integrated pest management, disease agents and weeds.
Online Master in Plant Breeding

- Specialisation in MSc Plant Sciences
- Part time study (approx. 20 hrs/week!)
- Effective learning at online platform:
  - Knowledge clips
  - Books, e-books, online modules
  - Individual and group assignments
  - Discussions
  - Tests
- Close collaboration with lecturers and fellow students
- Two two-week stays in Wageningen for lab-work related to theory

The online master Plant Breeding is designed as a part-time study programme. The approximate workload is 20 hours per week, which gives the student the flexibility to combine work and study. The programme is suitable for employees in the plant breeding industry who want to continue their education in the perspective of life-long learning. However, it is our experience that keeping up with the study load next to a part-time job can be quite a challenge!

The general structure is a two year part-time course-programme that is offered through our online platform, followed by a tailor-made internship and master’s thesis (together 1 to 2 years, depending on personal circumstances).

The dedicated online platform enables close cooperation with lecturers and fellow students while studying the knowledge clips (short, online lectures), books, e-modules, and collaborating in assignments and discussions. Tests and exams are also organised online. The course programme includes two 2-week stays in Wageningen for lab-work related to theory.
All Master's programmes at Wageningen University have a total duration of two years, equaling 120 credits. The Master programme is made up of four major elements:
- Courses
- Academic Master Cluster
- The Master Thesis
- The academic Internship

In general the courses and Academic Master Cluster are done in year 1 and the Thesis and Internship in year 2. In the following slides each of these elements is explained in further detail.
The Master programme includes different types of courses. Depending on the specialization that you have chosen in your Master, you will have to select several courses that together form the core of the specialization. Furthermore, you always have to include an advanced course that is related to the topic of the Thesis that you will do in year 2. In addition, there is always space in your programme for optional courses. Here, you can either decide to further specialize in the domain of your specialization, or include courses of a related domain, for example by including several courses from one of the other specializations, or from another master. This enables you to personalize your Master's programme.

You can already have a look at the Study Handbook for more information on the courses that are part of the specializations:
- [https://ssc.wur.nl/Handbook/Programme/MAQ](https://ssc.wur.nl/Handbook/Programme/MAQ)
- [https://ssc.wur.nl/Handbook/Programme/MPB](https://ssc.wur.nl/Handbook/Programme/MPB)
- [https://ssc.wur.nl/Handbook/Programme/MPS](https://ssc.wur.nl/Handbook/Programme/MPS)

Once you have actually started your master in Wageningen, you will get access to MyPortal for more details on the courses.
Courses at Wageningen University always combine a variety of teaching methods. This stimulates the learning process, because you will not only learn theory, but you will also learn to apply the theoretical academic knowledge in for example practicals in the lab, the greenhouse, or behind the PC for data analysis. Other teaching methods frequently used are group work, tutorials, excursions and independent study.

On this slide you can see that there are some differences in the share of the various teaching methods per master programme, but also many similarities between de Master Organic Agriculture (MOA), Plant Biotechnology (MPB) and Plant Sciences (MPS). Because of the different setup of the online master Plant Breeding, the mix of teaching methods used is quite different for this programme.
The Master Thesis is the major element of every Master’s programme at Wageningen University, not only is size (36 credits), but also due to its academic content. That’s why the Master’s at Wageningen University are called thesis-oriented. The Master Thesis is the centre of the programme, which is done in the second year. However, you will have to start thinking of an interesting thesis topic right from the start of the Master, because the courses in year 1 will prepare you for the Thesis in year 2. We have several tools and activities available that can help you in finding an interesting Thesis topic. For the Master thesis you will generally participate in ongoing research at one of the chair groups/research groups of Wageningen University. This ensures good quality of supervision, because during your thesis work you will be embedded in a research group of people working on comparable topics with whom you can discuss your research setup and research data.
The chair groups in the domain of Plant Sciences cover a very broad range of research topics, ranging from Molecular Biology and Bioinformatics to Plant Production Systems and Farming Systems Ecology. For students in the Master Organic Agriculture, the offer is even broader, also including for example Rural Sociology or Education and Learning Sciences.
This slide explains the difference between the Master Thesis and the academic Internship. The Master Thesis focuses mainly on a research project in a scientific discipline, such as Phytopathology, Marker-assisted breeding, Post-harvest physiology, or Agroecology, for example. In a Master Thesis, you work on a research project at one of the chair groups within Wageningen University.

The academic Internship, on the other hand, focuses on your professional perspective after graduation. You may envisage a career in consultancy, as an engineer in plant breeding, as a consultant or a policy maker. The internship offers the possibility to gain experience in such a professional domain, for example at a company, research institute, (non-) governmental organisation. In contrast with the Master Thesis, the internship is always done outside Wageningen University. It is strongly recommended to include the professional experiences of the internship into your Master programme, although in some specific cases it may be an option to replace the internship with a second thesis. Which of the two fits best in your study plant is something to discuss with the study adviser as well.
The fourth element in your master programme is the Academic Master Cluster, a project designed to develop various professional skills. In the Masters Organic Agriculture, Plant Biotechnology and Plant Sciences, two options are available:

- **Academic Consultancy Training (9 ECTS)**
  - Real-life case study, multidisciplinary team
- **Modular Skills Training (3 ECTS)**
  - Training in: project management and planning, intercultural communication, negotiation skills, etc.

**Research Master Cluster (12 ECTS)**
- **Academic Research Cluster: Proposal Writing**

In Academic Consultancy Training you work with a multidisciplinary team of students from different Master programmes on a real-life case study from a company or organization. You learn how to organize, plan and perform a consultancy project, and how to communicate with the commissioner. This is supported by Modular Skills Training, a series of short skills modules of which you have to choose two. The slide mentions several of the skills modules out of the approximately 30 available skills modules.

The Research Master Cluster is specifically designed for Master students that are planning for a career in research, for example by starting a PhD after the Master. In Research Master Cluster you learn to write a research proposal and where to find research funding. This is integrated with skills modules on academic writing and project planning and management.
The academic year at Wageningen University is divided into six periods:
- Periods 1, 2 and 5 are eight weeks each, and in these periods you can follow two courses, one in the mornings and one in the afternoons. These periods are composed of 6 weeks of education (lectures, practicals, assignments, etc.) followed by a week mainly focused on self study, with only limited contact hours, to prepare for the exam in week 8.
- Periods 3 and 4 are four weeks each, in which you typically follow one course whole day, with the exam at the end of week 4.
- In period 6 it depends on the type of courses you choose whether you will have a course in the morning combined with a course in the afternoon, or two 4-week blocks consecutively. This has to do with summer season, which enables field work and excursions, and dependent on the type of activities either the first or the second format is chosen by the course coordinators.

In case you fail an exam there are two options for a re-exam: halfway the academic year in February, and in August.

There are different ways to plan your master: Many students follow courses and Academic Master Cluster (AMC) in year 1 and do their Thesis and Internship in year 2. But the planning can be adjusted on an individual basis to match your personal preferences as best as possible. Another example on this slide shows courses and the start of the Thesis in year 1. The Thesis is then continued in year 2, where it is combined with AMC and the Internship. Other options can be discussed with the study adviser.
MSc Admission criteria and application

- Relevant BSc degree
- Grade point average: minimum 70%
- Fluency in English: WU level 2 required:
  - NL: HAVO 8.0, VWO 7.0; ‘pass’ for L,R,W,S on RATER-test at WU in to Languages
  - non-NL: TOEFL: 92/23 (IT); IELTS 6.5 (6.0 for speaking); Cambridge

- How to apply: see https://www.wur.nl/en/Education-Programmes/master/Apply-for-a-Master-programme.htm
Graduates of the Master's in Plant Sciences (MPS), Plant Biotechnology (MPB) and Organic Agriculture (MOA) work in a variety of professional sectors, as shown on this slide. You can also see that there are differences between the three programmes in this respect.
MOA graduate Lara – Policy adviser


To find out more on Lara’s life after she completed the Master Organic Agriculture, watch her story online!
MPS graduate Lotte – Postdoc researcher

https://www.wur.nl/en/Education-Programmes/master/MSc-programmes/MSc-Plant-Sciences/Future-career.htm

To find out more on Lotte’s life after she completed the Masters Plant Sciences and Plant Biotechnology, watch her story online!
Graduates with a master’s diploma in Plant Sciences, Plant Biotechnology or Organic Agriculture from Wageningen University have good access to a wide variety of interesting and challenging jobs that often relate very well to the content of the programmes. Relevant vacancies are widely available, both internationally as well as in the Netherlands.
More information?

- Contact us today (30 April) in the chat
- Or later by email
  (mps.msc@wur.nl; mpb.msc@wur.nl; moa.msc@wur.nl)
- Contact a Student Coach

Courses?  Student life?  JOBS?

Housing?

MOA: Judith
studentcoachmoa@wur.nl

MPB, MPS: Sonja
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We hope the information in this presentation was helpful for you in learning more on the options to study in the domain of Plant Sciences, Plant Biotechnology or Organic Agriculture at Wageningen University. To help you make an informed choice we welcome your questions, in the chat, by email to our Programme Team, or via our Student Coaches.
What else can you do at this open day?

- Chat with study advisers and students
- Check our FAQ's about application, housing, scholarships, visa, costs, introduction days, Wageningen, student for a day, corona and more
- Take a virtual tour with one or more of our students who will show you their life

- Watch videos with tips for choosing a study programme, about student life and study experiences

There is a lot more to see and do today, see the overview in this slide!
Master’s in Wageningen

- MSc Plant Sciences, including online Master Plant Breeding
- MSc Plant Biotechnology
- MSc Organic Agriculture

Thanks for your attention, and looking forward to meeting you in Wageningen!