Plant Sciences

Faculty of Agricultural and Environmental Sciences, Wageningen University

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Report on the bachelor programme in Plantenwetenschappen, the master programme in Plant Sciences, the master programme in Plant Biotechnology and the master programme in Organic Agriculture of Wageningen University

This report takes the NVAO's Assessment framework for limited programme assessments as a starting point.

Administrative data regarding the programmes

Bachelor programme in Plantenwetenschappen

Name of the programme:	**Plantenwetenschappen**
CROHO number:	56835
Level of the programme:	bachelor's
Orientation of the programme:	academic
Number of credits:	180 EC
Specializations or tracks:	A: Plant Genomics and Health B: Plant Production and Ecology
Location(s):	Wageningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master programme in Plant Sciences

Name of the programme:	**Plant Sciences**
CROHO number:	66835
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	A: Crop Science B: Greenhouse Horticulture C: Natural Resource Management D: Plant Breeding and Genetic Resources E: Plant Pathology and Entomology
Location(s):	Wageningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master programme in Plant Biotechnology

Name of the programme:	**Plant Biotechnology**
CROHO number:	60105
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	A: Functional Plant Genomics B: Plants for Human and Animal Health C: Molecular Plant Breeding and Pathology
Location(s):	Wageningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master programme in Organic Agriculture

Name of the programme:	**Organic Agriculture**
CROHO number:	69300
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	A: Agro Ecology B: Consumer and Market
Location(s):	Wageningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

The visit of the assessment committee Plant Sciences to the Faculty of Agricultural and Environmental Sciences of Wageningen University took place on 18 and 19 April 2012.

Administrative data regarding the institution

Name of the institution:	Wageningen University
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	positive

Quantitative data regarding the programmes

The required quantitative data regarding the programmes are included in Appendix 5.

Composition of the assessment committee

The committee that assessed the bachelor programme in Plantenwetenschappen, the master programme in Plant Sciences, the master programme in Plant Biotechnology and the master programme in Organic Agriculture consisted of:

- Prof. F. Zwarts (chair), professor at University of Groningen and professor and manager at University Campus Fryslân;
- Mrs. R.L. Prenen, MSc, independent educational adviser;
- Dr. G. Lieblein, associate professor at the Department of Plant and Environmental Sciences, Norwegian University of Life Sciences, Norway;
- Prof. H. Stützel, professor in Vegetable Systems Modelling at the Institute of Biological Production Systems, Gottfried Wilhelm Leibniz University, Hannover, Germany;
- Prof. E. Van Damme, professor at the Department of Molecular Biotechnology, Ghent University, Belgium;
- Prof. M. De Proft, full professor at the Faculty of Bioscience Engineering, Catholic University Leuven, Belgium;
- Mr. Karl Agius, MSc, graduated in 2012 as master at the University of Malta.

The committee was supported by Dr. M.J.V. Van Bogaert, who acted as secretary. Appendix 1 contains the curricula vitae of the members of the committee.

General information regarding Wageningen University

Educational programme assessments in Life Sciences at Wageningen University
A total of 31 educational programmes of Wageningen University which could not be included in a national disciplinary assessment had to be assessed in 2012 in order to apply for reaccreditation. In consultation with QANU, Wageningen University decided to divide the work among fourteen committees in the period between March and July 2012. For each site visit different expert committee members were invited to assess the programmes. In addition to the expert committee members, two non-expert committee members were involved as core members in all site visits and programme assessments. These non-expert committee members were the chairman, Prof. F. Zwarts, and the educational expert, Mrs. R.L. Prenen, MSc. This construction was chosen to guarantee consistency between the fourteen assessments as well as to respect the diversity between the programmes. Prior to the site visits an extended kick-off meeting was held in February 2012, during which subjects applicable to all programmes were discussed (for the programme, see Appendix 6). In addition to the core members of the committee, an expert member (Prof. E. Van Damme), a student member (Mrs. T.I.E. Veldkamp, BSc) and both secretaries to the committees (Dr. M.J.V. Van Bogaert and Mrs. M. Maarleveld, MSc) were present. During the kick-off meeting, interviews were held with representatives of the educational institute, educational committees, study advisers, examining boards and alumni. The findings of the kick-off meeting were used as input for the fourteen site visits and are incorporated in the committee reports on the 31 educational programmes. Based on the information received in the first five site visits, the core committee members held another interview with the examining boards and a selection of study advisers. This meeting was held on 6 June 2012 and provided additional insight into the functioning of and relation between the examining boards and study advisers.

Wageningen University
Wageningen University is comprised of one faculty, the Faculty of Agricultural and Environmental Sciences. The Faculty consists of 80 chair groups, arranged in five departments. All educational programmes, bachelor and master, are organized by the Education Institute (OWI). The Board of the OWI is responsible for the content, quality and finances of the educational programmes. Every programme has a programme director and a programme committee, consisting of equal numbers of students and academic staff. The programme committee is responsible for the content and quality of the programme, though in a formal sense this is subject to approval by the Board of the OWI. The programme director is responsible for the realization of the programme.

The courses are provided by staff of the chair groups, the 'supply side'. The programme committees are considered the 'demand side', with the programme director being the 'matchmaker'.

Wageningen has four examining boards, usually consisting of five to eight people from different disciplines. Before the site visit period, these boards were in the process of strengthening the quality management of assessment processes and procedures.

Each programme has one or more study advisers, who are tasked with supporting students throughout their study career. Study advisers provide information and invite students for progress evaluations and meetings to plan the student's individual curriculum. Each student needs the study adviser's approval for the elective parts of the programme s/he has chosen.

Internationalization
Wageningen University has an international reputation, in terms of both research qualities and the number of international master students. The committee especially considered the latter point since there are both possible drawbacks and advantages to having many international students. Extensive discussions during the site visits made it clear to the committee that despite the fact that it will always be difficult to assess the quality of enrolling international students, the programme managements are well aware of the imperfections of its procedures and have tightened the selection in the past few years. Overall the committee thinks that the advantages of having many international students outweigh the disadvantages.

Working method of the assessment committee

Preparation
After receiving the critical reflection, the project manager checked the quality and completeness of the information provided. After approval, the critical reflection was forwarded to the committee, in both printed form and digitally. In addition, the committee members selected and read a total of 15 theses for each programme that was assessed (see Appendix 8).

Before the site visit the project manager created a draft programme for the interviews (see Appendix 6). The draft programme was discussed with the chair of the committee and the coordinator of the educational institute. As requested by QANU, the coordinators of the programmes carefully composed a select and representative panel for all interviews.

Site visit
During the initial meeting at the start of each site visit, the committee members discussed among themselves their findings regarding the critical reflection and the theses. They also discussed their task and working methods and the proposed domain-specific requirements (see Appendix 2).

During the site visit, interviews were held with representatives of the programme, students, staff members, the Educational Committee, and a student adviser. The examining boards were interviewed in the extended kick-off meeting, as can be read on page 6. The committee also received additional information, for example, study books and reports from the meetings of the Educational Committee. This information was examined during the site visit. When considered necessary, committee members could read additional theses during the site visit. A consultation hour was scheduled to give students and staff of the programmes the opportunity to talk to the committee. No requests were received for the consultation hour.

The committee used part of the final day of the site visit to discuss the assessment of the programmes and to prepare a preliminary presentation of the findings. The site visit concluded with an oral presentation by the chairman of the general assessment and several specific findings and impressions of the programme.

Report
After the site visit the project manager wrote a draft report based on the committee's findings. The draft was first commented upon by the committee members and then sent to the faculty to check for factual irregularities. All comments made by the faculty were discussed with the chair of the committee and, if necessary, with the other committee members. After revision, the report became official.

Decision rules
In accordance with the NVAO's Assessment Framework for Limited Programme Assessments (as of 22 November 2011), the committee used the following definitions for the assessment of each individual programme, both of the standards and the total programme.

Generic quality
The quality that can reasonably be expected in an international perspective from a higher education bachelor's or master's programme.

Unsatisfactory
The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

Satisfactory
The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

Good
The programme systematically surpasses the current generic quality standards across its entire spectrum.

Excellent
The programme systematically well surpasses the current generic quality standards across its entire spectrum and is regarded as an (inter)national example.

Summary judgement

This report provides the findings and considerations of the Life Sciences committee on the bachelor and master programmes in Plant Sciences, Plant Biotechnology and Organic Agriculture at Wageningen University. The committee assessment is based on information in the critical reflection, interviews during the site visit and a selection of theses.

Standard 1: Intended Learning Outcomes
Plants form the basis of life, as they convert sunlight into a source of food and renewable resources. Plants also have a stabilising effect in (agro-)ecosystems, a landscape function and ornamental value. The academic domain of Plant Sciences is linked with a professional sector that is of great importance to the world economy. Agro & Food is an essential and prominent part of the Dutch economy and highly depending on a worldwide supply of resources, including raw materials for human food and animal feed, fertilizer and agro-technological tools.

The Netherlands is leading the world market of plant breeding and horticulture. At present there is a chronic shortage of academically educated plant scientists to fill positions in the Dutch breeding industry. The goal of the Plant Sciences programmes in Wageningen is to provide the basis for the education of new generations of plant scientists.

Bachelor and master programme in Plant Sciences
The bachelor programme in Plant Sciences is the only academic programme in the Netherlands that focuses specifically on plants. It combines fundamental knowledge on plant (molecular) biology, physiology, genetics and (agro-)ecology with the application of this knowledge for improved food production, the development of plant-based bioenergy and bioresources, and a green environment. Knowledge on biodiversity, metabolic routes and breeding techniques is essential to develop new varieties that meet current demands regarding yield and quality characteristics. Rapid technological developments in the field of plant sciences, genomics and molecular genetics has enabled the application of molecular marker technology to accelerate the selection of novel varieties with a wide variety of favourable traits. In addition, genomics, proteomics and metabolomics, combined with bioinformatics, enables to study and understand fundamental processes in plants. Sound knowledge of crop physiology and agro-ecology is essential for the development of appropriate plant production systems to assure reliable supplies of safe, high quality food, while taking aspects of biodiversity and nature conservation into account.

The master programme in Plant Sciences focuses on the basic disciplines of plant physiology, genetics, ecology and molecular biology as well as on the integration of these disciplines to provide healthy plants in a safe environment for food and non-food applications. The study of food production systems at farm, regional and higher levels is also part of the programme. The master programme in Plant Sciences specifically focuses on the technological aspects of crop production, the application of scientific knowledge to develop breeding tools, plant growth models or cropping systems, with additional focus on the essential environmental, quality, health, socio-economic and logistic aspects. Students specialize in one of five specific areas to deepen their insights, skills and understanding and learn to apply knowledge in an integrated way.

The committee thinks that the aims and objectives of all four programmes are of high quality. The bachelor and master programme in Plant Sciences are in general very strong

programmes. The programme management has clear ideas on the objectives and aims, but both programmes would benefit from an improved description of these objectives.

Master programme in Plant Biotechnology
According to the critical reflection, in the upcoming biobased economy, non-food products are manufactured from renewable resources: green biomass produced through photosynthesis. Innovations in this new and competitive field are based on knowledge of the molecular and genetic background of plants and the biomass they produce. The master programme in Plant Biotechnology specifically addresses the molecular and genetic aspects of plant-based innovations. The programme focuses on the integration of plant sciences and molecular biology in order to develop healthy plants for food, non-food and health applications. The programme is oriented towards molecular and cell biology and genomics. It shares its focus on plants with the master programme in Plant Sciences, and its focus on development of novel technologies with the master in Biotechnology. The fundamental approach is combined with the development of tools and technologies that can be applied to plant breeding, plant pathology, post-harvest quality control, and the production of renewable resources. In the critical reflection it is stated that research based learning characterizes the educational profile of the curriculum.

The master programme in Plant Biotechnology could more clearly differentiate from its 'big brother' Plant Sciences. This should first be done by deciding in what respect both programmes differ from each other and subsequently by formulating a distinct programme profile and objectives.

Master programme in Organic Agriculture
As a result of increased environmental concern and consumer interest, Organic Agriculture is now globally recognized as a defined sector. This sector includes producers and producer organizations, consumers, certifying bodies, processing industry and traders, service providers, various interest groups and many other players. At the same time, agriculture remains a major user of space, is central to social cohesion in many rural areas, and not only provides food but also contributes to the health and well-being of people and eco-systems. In order to meet the challenge of producing healthy, socially responsible and ecologically sound food, the master programme in Organic Agriculture explores food production, food consumption and multi-functional land use from the viewpoint of many disciplines, multiple perspectives and different geographical scales. A system approach therefore characterizes both the research and education domains in organic agriculture. The programme prepares students for a wide range of positions related to multiple land use, organic agriculture and the food production chain. The programme was renewed in 2007, following recommendations of students, and adopted a teaching and learning environment that mimics many of the principles underlying organic agriculture: experimental, authentic, interactive and interdisciplinary.

The master programme in Organic Agriculture has clearly succeeded in positioning itself next to the other master programmes. It is an academic programme that supplies graduates all over the world. Similar to the other programmes the profile on paper could improve, especially since the programme management has clear and impressive ideas about the objective and profile of the programme.

For all four programmes the committee is positive regarding the intended learning outcomes. Although general, they clearly lead to graduates at the intended academic level and orientation.

The relation with the professional field is good, especially for the master programmes. The bachelor programme at present is not aimed to deliver students to the working field. The committee understands that prospective employers are not (yet) looking for bachelor graduates. Nevertheless, it advises the programme to describe more strongly the bachelor profile, making it distinguishable without necessarily including a master programme.

Standard 2: Teaching-Learning Environment
The committee has studied the various aspects of the teaching and learning environment of both programmes.

The bachelor and master programme in Plant Sciences are assessed as good for standard 2. The curricula are solid and provide students with high quality knowledge and skills. The individual programmes chosen by students are coherent, but due to the large amount of free choices, the programmes as a whole cannot be assessed on coherency. The fact that individual students follow programmes that are coherent has to do with the excellent support provided by the study advisers who are part of the scientific staff.

The master programme in Plant Biotechnology is assessed as satisfactory. The main criticism by the committee is that the programme provides students with such freedom in choosing their courses, that it is very difficult to think of it as one master programme. This was confirmed by the students, who don't feel part of a group, not even within their own specialization.

The committee concluded that the master programme in Organic Agriculture was clearly designed by the programme management, who did so very successfully. Despite the large number of electives, the programme clearly forms an entity. Students and staff confirmed this positive assessment of the committee. The one criticism is that the university wide used year schedule does not provide space and time for a unique course like the *Master class Organic Agriculture*. This makes the workload for students very high.

All four programmes successfully integrate multiple disciplines. The committee specifically mentions the integrative courses at the end of each bachelor year and the *Master class Organic Agriculture* as interesting courses that stimulate multidisciplinarity.

Teaching methods are well balanced within and between courses. Many courses in all programmes include a certain amount of attention to feedback and reflection. This was best visible in the master programme in Organic Agriculture. The committee was impressed by the collaboration between management, staff, students and programme committees in their focus to improve the programmes.

Research qualities of the staff are impressive, as are the student-staff ratios. Also, the staff is involved in continuously improving their didactical skills. Student support and facilities are good. Especially the before mentioned support by the study advisers is a valuable asset to the programmes. Without this support it would be impossible to run these programmes.

The committee thinks that the number of enrolling students, especially for the bachelor programme, could and should increase. Clear communication towards prospective students regarding the objectives of the programme and the job opportunities afterwards should be part of the strategy. Study load is high, but acceptable for all programmes. The Education Institute and programme management of the Organic Agriculture programme should find a

solution to deal with the additional study load the *Master class Organic Agriculture* adds to the regular programme.

Standard 3: Assessment and achieved learning outcomes
The committee is very positive with regard to the initiatives Wageningen University is currently implementing in the bachelor and master programmes. The Examining Boards are in the process of strengthening their role in ensuring the quality of assessment and seem committed to formalizing the assessment system. The secretaries of the four committees have a key role in the communication between programme management and Examining Board. Each programme at Wageningen University standardized the filling in of free choice credits. The programmes are on schedule to implement the new initiatives. The use of course guides makes the assessment procedures very clear and transparent, and they are very useful to the students.

For all programmes the committee is very positive about the use of different assessment strategies within and between courses. Although formalization of the assessment strategy is still in progress, the committee is convinced that it will be a good strategy. The committee especially values the use of the rubric for the master thesis, which is also implemented at the bachelor programme in Plant Sciences. The committee considers the quality of the theses to be good. The committee encourages the programme management to use the rubric conscientiously, as in other programmes it appears to have had a positive effect on the verification of the grades.

Overall, the committee was impressed by the level of the bachelor and master theses, and it agreed with all the grades. In none of the programmes the committee found a thesis that should not have passed. It was clear to the committee that the thesis projects are executed in excellent research surroundings. It would be beneficial to the students to equalize the outlines of the thesis projects.

Dropout rates are overall low for all programmes and success rates lie within or above Wageningen average. The committee appreciates the attention given to further improve these numbers. The committee is of the opinion that with the current pressure on graduating in time in the Netherlands, the large number of possible resits at Wageningen University is outdated. If students don't feel the need to pass an exam, they might not take it seriously. This is likely to lead to study delays.

General conclusion
The committee was overall impressed by the bachelor and master programme in Plant Sciences. Minor remarks are made throughout the programme to further increase the quality, but overall these are considered to be good programmes.

The master programme in Plant Biotechnology delivers good graduates, the quality of the theses and the assessments is good. The committee is, however, slightly worried about the identity of the programme. This reflects in its objective and aims, which according to the committee, should differentiate more from the master programme in Plant Sciences. It also reflects in the programme; courses are of high quality and the individual students follow a coherent curriculum. However, it is difficult for the committee to look at the programme as an entity. This was confirmed by students and should be dealt with before the programme can be assessed as good.

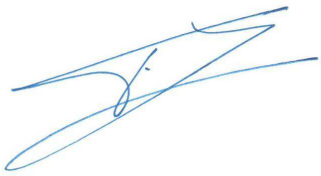
The committee was very impressed by the master programme in Organic Agriculture. It is clear that a vision lies behind the programme and are overall worked out very well. Based on the rules for the assessments by the NVAO, the programme is assessed as good. If it had been an option, the committee would have given the programme a very good.

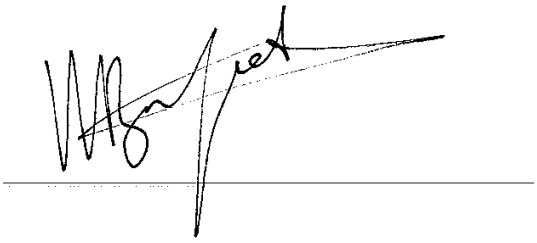
The committee assessed the standards from the Assessment Framework for Limited Programme Assessments in the following way:

Bachelor programme in Plantenwetenschappen	
Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good
Master programme in Plant Sciences:	
Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good
Master programme in Plant Biotechnology:	
Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	satisfactory
Master programme in Organic Agriculture:	
Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	excellent
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good

The chair and the secretary of the committee hereby declare that all members of the committee have studied this report and that they agree with the judgements laid down in it. They confirm that the assessment has been conducted in accordance with the criteria relating to independence.

Date: 26 October 2012





Prof. F. Zwarts

Dr. M.J.V. Van Bogaert

Description of the standards from the Assessment Framework for Limited Programme Assessments

Standard 1: Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

Explanation:
As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme.

1.1. Findings

In this standard the committee assesses the programme's objectives and profile, intended learning outcomes, and level and orientation. Furthermore, this standard describes the requirements of the professional field and discipline.

Programme objectives and profile

Plants form the basis of life, as they convert sunlight into a source of food and renewable resources. Plants also have a stabilising effect in (agro-)ecosystems, a landscape function and ornamental value. The academic domain of Plant Sciences is linked with a professional sector that is of great importance to the world economy. Agro & Food is an essential and prominent part of the Dutch economy and highly dependent on a worldwide supply of resources, including raw materials for human food and animal feed, fertilizer and agrotechnological tools.

The Netherlands is leading the world market in plant breeding and horticulture. At present, there is a chronic shortage of academically educated plant scientists to fill positions in the Dutch breeding industry. The goal of the Plant Sciences programmes in Wageningen is to provide the basis for the education of new generations of plant scientists. The domain-specific reference framework for the four educational programmes is provided in Appendix 1.

Bachelor programme

The bachelor programme in Plant Sciences is the only academic programme in the Netherlands that focuses specifically on plants. It combines fundamental knowledge on plant (molecular) biology, physiology, genetics and (agro-)ecology with the application of this knowledge to improved food production, the development of plant-based bioenergy and bioresources, and a green environment.

Knowledge on biodiversity, metabolic routes and breeding techniques is essential to develop new varieties that meet current demands regarding yield and quality characteristics. Rapid technological developments in the field of plant sciences, genomics and molecular genetics has enabled the application of molecular marker technology to accelerate the selection of novel varieties with a wide variety of favourable traits. In addition, genomics, proteomics and metabolomics, combined with bioinformatics, enable the study and understanding of fundamental processes in plants. Sound knowledge of crop physiology and agro-ecology is essential for the development of appropriate plant production systems to assure reliable supplies of safe, high-quality food, while taking aspects of biodiversity and nature conservation into account.

In the interview with the programme management, the committee asked about the differences compared with similar programmes from technical universities. The programme in Wageningen clearly has a more theoretical focus on production and breeding, while technical programmes focus more on the application. Furthermore, graduates are not expected to enter the labour market, but to continue on to a master programme.

The committee discussed the objective of the programme as a whole. The description in the critical reflection provides a clear overview of the situation in which the programme operates, but what the programme wants to achieve within the discipline is less evident. In the interviews it became clear to the committee that the programme management has a vision of what kind of graduates it would like to produce. The committee was impressed by the objectives discussed during the site visit and advises the programme to improve their profile on paper and use this for communication towards prospective students.

Master programme in Plant Sciences
The master programme in Plant Sciences focuses on the basic disciplines of plant physiology, genetics, ecology and molecular biology as well as on the integration of these disciplines to provide healthy plants in a safe environment for food and non-food applications. The study of food production systems at the farm, regional and higher levels is also part of the programme. When compared to the Plant Biotechnology master programme, the Plant Sciences master programme specifically focuses on the technological aspects of crop production, the application of scientific knowledge to develop breeding tools, plant growth models or cropping systems, with an additional focus on the essential environmental, quality, health, socio-economic and logistics aspects. Students specialize in one of five specific areas to deepen their insights, skills and understanding and learn to apply knowledge in an integrated way.

Similar to the bachelor programme but less pronounced, the committee advises the programme management to write down the objectives of the programme more clearly in order to communicate them to staff and (prospective) students. The programme provides a lot of freedom to students, which is also described under standard 2, making it very important to clearly describe and agree on the objectives of the programme.

Master programme in Plant Biotechnology
According to the critical reflection, in the future bio-based economy, non-food products will be manufactured from renewable resources: green biomass produced through photosynthesis. Innovations in this new and competitive field are based on knowledge of the molecular and genetic background of plants and the biomass they produce. The Plant Biotechnology master programme specifically addresses the molecular and genetic aspects of plant-based innovations.

The programme focuses on the integration of plant sciences and molecular biology in order to develop healthy plants for food, non-food and health applications. The programme is oriented towards molecular and cell biology and genomics. It shares its focus on plants with the master programme in Plant Sciences, and its focus on the development of novel technologies with the master programme in Biotechnology. The fundamental approach is combined with the development of tools and technologies that can be applied to plant breeding, plant pathology, post-harvest quality control, and the production of renewable resources. The critical reflection states that research-based learning characterizes the educational profile of the curriculum.

Many of the discussions the committee had about the master programme in Plant Biotechnology were related to the reason for making this an independent programme from the master programme in Plant Sciences. From the description in the critical reflection, the objectives of this programme are insufficiently clear to make its position distinctive. The committee feels it would be logical to have Plant Biotechnology as a specialization within the master programme in Plant Sciences. In the Plant Biotechnology master programme even more freedom is given to students than in the Plant Sciences programme. This means that – theoretically – students from both programmes could follow an identical curriculum. The programme management is aware of this issue and is looking for ways to profile the programme more strongly externally. The committee encourages this process, since it is important to give both programmes their own objectives and differentiate between them. It should be clear to all stakeholders what the difference is. During the site visit it was understood that the loose structure of the master programme in Plant Biotechnology has partly to do with financial issues. The committee understands that the programme management makes the best of the financial situation, but this makes it even more important to clearly define the objective, profile and intended learning outcomes.

Master programme in Organic Agriculture
As a result of increased concern about the environment and consumer interest, Organic Agriculture is now globally recognized as a defined sector. This sector includes producers and producer organizations, consumers, certifying bodies, processing industry and traders, service providers, various interest groups and many other players. At the same time, agriculture remains a major user of space, is central to social cohesion in many rural areas, and not only provides food but also contributes to the health and well-being of people and eco-systems.

In order to meet the challenge of producing healthy, socially responsible and ecologically sound food, the master programme in Organic Agriculture explores food production, food consumption and multi-functional land use from the viewpoint of many disciplines, multiple perspectives and different geographical scales. A systems approach therefore characterizes both the research and education domains in organic agriculture. The programme prepares students for a wide range of positions related to multiple land use, organic agriculture and the food production chain. The programme was renewed in 2007, following the recommendations of students, and adopted a teaching and learning environment that mimics many of the principles underlying organic agriculture: experimental, authentic, interactive and interdisciplinary.

The committee also encourages the programme management to make an effort to rewrite the programme's objectives and profile. From the interview it was apparent that the management has clear views on these issues and was able to convince the committee that the programme has found a niche and acts as a global facility for students from all nationalities. As long as the academic features are maintained, the committee considers that being an internationally unique programme should be exploited.

Intended learning outcomes

Bachelor programme
According to the critical reflection, conducting research is the core of the bachelor programme, which is reflected in the intended learning outcomes (see Appendix 3). Students acquire a full overview of the domain-specific knowledge and understanding, and hands-on experience with experimental techniques and analytical measurements. They also acquire

scientific and general academic skills to develop a scientifically relevant research plan, perform scientific experiments, and analyse experimental data.

The committee thinks that the intended learning outcomes are clear and without a doubt produce graduates in Plant Sciences at the bachelor level.

Master programme in Plant Sciences
Based on the objective and profile, a set of intended learning outcomes was formulated (see Appendix 3) that forms the backbone of the programme. The intended learning outcomes are grouped into three areas of competence:

- Domain-specific knowledge, understanding and experimental skills: Students practise a variety of experimental techniques and analytical measurements, and familiarize themselves with bioinformatics and statistical methods for the collection, processing and analysis of experimental data. The combination of fundamental and applied research approaches characterizes both education and research in the programme.
- Scientific skills: Students become academic professionals. They learn to develop a research proposal in the context of plant sciences, to execute the project with the proper research methods, to analyse and reflect on their results and data, and to report the findings.
- General academic skills: The domain is technology-oriented and has a strong international focus. This means that graduates have to be able to communicate in English with specialists and non-specialists, both orally and in writing. They have to learn how to find useful information, evaluate its quality and scientific relevance, and cite sources properly.

The second intended learning outcome is different for the five specializations, making the total of learning outcomes more specific for all specializations. The committee agrees with these intended learning outcomes and thinks that they will lead to graduates at the academic master level.

Master programme in Plant Biotechnology
Based on the objective and profile, the programme committee designed a set of intended learning outcomes that forms the backbone of the programme and serves as the basis for curriculum development. The intended learning outcomes (see Appendix 3) are grouped into three areas of competence:

- Domain-specific knowledge, understanding and experimental skills: The academic domain of molecular plant biology is explored, with a focus on developing healthy plants for food, non-food and health applications. Students acquire experience with a variety of laboratory techniques and analytical measurements, and familiarize themselves with bioinformatics and statistical methods. The combination of fundamental and applied research approaches characterizes both education and research in the programme.
- Scientific skills: Students become academic professionals. They learn to develop a research proposal in the domain of plant biotechnology, to execute the project with the proper research methods, to analyse and reflect on their results and data, and to report adequately.
- General academic skills: The domain is technology-oriented and has a strong international focus. This means that graduates have to be able to communicate in English with specialists and non-specialists, both orally and in writing. They have to learn how to find useful information, evaluate its quality and scientific relevance, and cite sources properly.

The intended learning outcomes are differentiated for the three specializations and according to the committee will lead to graduates at the academic master level.

Master programme in Organic Agriculture
The intended learning outcomes are provided in Appendix 3 and are grouped into four areas of competence:

- Domain-specific knowledge, understanding and experimental skills: Students are trained in multiple aspects of organic agriculture, the associated processing and marketing chain, and multifunctional land use. The programme examines in detail the underlying principles and processes from a natural science perspective and combines them with aspects from the social and economic sciences. It provides a balance between fundamental and applied science, and reflects the integrated systems approach that characterizes the scientific domain.
- Scientific skills: Students are trained to become academic professionals, learn to develop a research proposal, carry out the project using the proper research methods and experimental techniques, analyse and reflect on their results and data, and report adequately.
- Societal awareness: Organic Agriculture is interdisciplinary and relates to both the natural sciences and the social sciences, with many stakeholders involved. Students learn to be able to evaluate the ethical, environmental, societal and economic consequences of research in this domain.
- General academic skills: In addition to being interdisciplinary, the domain is also internationally oriented. This means that graduates have to be able to communicate in English with specialists and non-specialists, both orally and in writing. They have to learn how to find useful information, evaluate its quality and scientific relevance, and cite sources properly. Students are trained to co-operate effectively in an international, cross-cultural context.

The intended learning outcomes are differentiated for the specializations and according to the committee will lead to graduates at the academic master level.

Level and Orientation

Bachelor programme
The intended learning outcomes correspond with the Dublin descriptors for bachelor programmes, as shown in Appendix 3. Intended learning outcomes 1-4 show that students acquire knowledge of and insights into the domain and relevant experimental skills to do research. Intended learning outcomes 5-7 refer to defining research questions and conducting research by gathering and interpreting relevant data, and problem-solving abilities. These intended learning outcomes clearly show the academic orientation of the programme. Students learn to judge new developments in plant sciences in their societal and ethical context, to communicate and co-operate, and to design a personal learning path, as shown in intended learning outcomes 5-8. The programme trains students for master-level education in a corresponding domain.

Master programmes in Plant Sciences, Plant Biotechnology and Organic Agriculture
The intended learning outcomes of all three master programmes correspond with the Dublin descriptors for master's programmes (see Appendix 3). Students obtain knowledge, insight, skills and attitudes at an advanced level, and learn to apply, evaluate and integrate state-of-the-art research methods and experimental and modelling techniques. They also acquire the

ability to conduct experiments, to collect, analyse and simulate data, and to communicate at an academic level, all without supervision.

The master programmes are academic programmes that enable students to develop their scientific knowledge and skills by working on authentic tasks during courses and the thesis project. They also participate professionally in an organization during the academic internship. They acquire scientific skills to carry out academic research in their area of specialization, qualifying them for a PhD programme.

Requirements of the professional field and discipline
The professional field is represented by the External Advisory Committee (EAC), which supports the goals and profile of the programmes and agrees with the learning outcomes. The critical reflection states that the professional field values the focus on the development of scientific and academic skills throughout the programme.

Bachelor programme
The bachelor programme is unique in the Netherlands. According to the critical reflection, the professional field has a strong interest in educating students in plant breeding, horticulture and sustainable agriculture. Professionals in the domain interact frequently with the programme committee and teaching staff. Six academic experts were consulted, and all agreed that the intended learning outcomes and the curriculum meet international standards for scientific quality and requirements of the domain. An introduction to career orientation is included in the programme. For example, during two short internships, students individually experience the work of a plant scientist as a professional.

The committee noticed that although the programme is of interest to the professional field, students are not expected nor stimulated to enter the job market after graduation. This holds for the programme management, for students and for the professional field. The committee would like to point out that in the near future, students might change their expectations of the programme and will, due to financial constraints, decide to look for work after graduation. The programme management should take this into consideration in their design of the programme. It should clearly focus on the labour market and distinguish itself from technical university programmes, offering a complete education without the need to continue on in a master programme. The committee feels this does not require major changes in the programme, since it already focuses on the students' future careers.

Master programmes
Students that graduate from the master programmes are well prepared to enter the labour market in the committee's view. Knowledge, skills, multidisciplinary attitude and some practical experience are all developed during the programme. The EACs are interested in two aspects: first, graduates need to be skilful in research; second, graduates need to be competent in general academic skills, such as critical thinking, switching between integration levels, integration of knowledge, multidisciplinary co-operation and reflective learning.

Master programme in Plant Sciences
According to the critical reflection, the programme combines a strong technological focus with the development of academic skills, including the ability to write and conduct scientifically relevant research plans, to co-operate in an interdisciplinary international team and to evaluate the societal and ethical aspects of scientific work. Because of the uniqueness of the programme and the sector's strong need for graduates, especially in plant breeding,

horticulture and crop modelling, professionals in the domain interact frequently with members of the programme committee and teaching staff.

Master programme in Plant Biotechnology
The programme focuses on the lower integration levels (molecule, gene, cell) and combines a fundamental research approach with the development of molecular tools that can, for example, be applied in the selection of valuable plant varieties. Students learn to combine technological insights with the development of academic skills.

Five international academic experts were consulted about the intended learning outcomes of the master programme in Plant Biotechnology. All agreed that they meet the international standards for scientific quality and requirements for the domain.

Master programme in Organic Agriculture
The members of the EAC stress the importance of a good balance between the breadth of the programme and its degree of specialization. They expect graduates to have an overall view of the organic sector as a whole, while mastering a specialist domain within the sector. Graduates have to be able to present facts and examples within their chosen domain. The professional field emphasizes the important contribution of internships to the achievement of the intended learning outcomes.

1.2. Considerations
The committee thinks that the aims and objectives of all four programmes are of high quality and are typical Wageningen University programmes. Therefore, it focused on further improvement and provides its vision on possible changes to the benefit of the programmes.

The bachelor and master programme in Plant Sciences are in general very strong programmes. The programme management has clear ideas about the objectives and aims, but both programmes would benefit from an improved description of these objectives on paper. By formulating the aims and objectives on paper the high quality will become clear not only to the insiders, but also to outsiders from the programme. This should then be used in the communications aimed at prospective students. This is especially valid for the bachelor programme when looking at the enrolment numbers.

The objective and profile of the master programme in Plant Sciences are good, although they could be written down more clearly, as discussed with the programme management.

The master programme in Plant Biotechnology needs to more clearly differentiated from its 'big brother' Plant Sciences. This should first be done by deciding in what respect the programmes differ from each other and subsequently formulating a distinctive programme profile and objectives.

The master programme in Organic Agriculture has clearly succeeded in positioning itself alongside the other master programmes. It is an academic programme that supplies graduates all over the world. Similar to the other programmes, the profile could improve, especially since the programme management has clear and impressive ideas about the objective and profile of the programme.

For all four programmes the committtee approves the intended learning outcomes. Although expressed in general terms, they clearly lead to graduates at the intended academic level and orientation.

The relation with the professional field is good, especially for the master programmes. The bachelor programme at present does not focus on training students for the labour market. The committee understands that prospective employers are not (yet) looking for bachelor graduates. Nevertheless, it advises the programme to describe the bachelor profile more strongly, making it distinctive without necessarily including a master programme.

1.3. Conclusion

Bachelor programme in Plantenwetenschappen: the committee assesses Standard 1 as **good**.
Master programme in Plant Sciences: the committee assesses Standard 1 as **good**.
Master programme in Plant Biotechnology: the committee assesses Standard 1 as **satisfactory**.
Master programme in Organic Agriculture: the committee assesses Standard 1 as **good**.

Standard 2: Teaching-learning environment

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

Explanation:
The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

2.1. Findings

Curriculum and coherency of the programmes

The academic year of Wageningen University consists of two semesters, each with 3 periods. In periods 1, 2 and 5 (six weeks each) two courses are taught, one in the morning and one in the afternoon. Periods 3 and 4 are short periods with 4 weeks of teaching and only one course each. Period 6 lasts nine weeks. Each year students can take one exam and two resits for each course. Currently, this system is being reviewed, concerning the number of resits and the timing of the exams.

For all programmes the intended learning outcomes were linked to the courses in a matrix. The committee was impressed by these matrices and considers them to be an excellent starting point for the curricula. It does point out that these matrices need to be updated continuously to be able to understand what the consequences are of changes in the courses and/or intended learning outcomes.

Initially, the committee had some reservations regarding the coherency of the programmes. This is the result from the large number of free choice credits most programmes provide to their students. From the critical reflection and the interviews it became clear that the study adviser has a major regulatory role in the selection of courses for the free choice credits. The study adviser and student discuss the students' wishes and possible plans. The study adviser might ask feedback from one of the chair holders prior to advising the student's request of electives. If a request deviates from the standard, the study adviser will assess the programme for coherency, and the Examining Board has to approve it explicitly.

Bachelor programme in Plant Sciences

The bachelor programme in Plant Sciences comprises three main elements: the common part (108 credits), the major (42 credits) and the elective (30 credits). The structure of the curriculum and the full programme are provided in Appendix 4. The common part consists of four types of courses: supporting courses, general biology courses, domain-specific courses and courses that focus on research skills, academic skills, and societal and economic aspects.

The supporting courses – including chemistry, mathematics and statistics – provide a basis for understanding the domain-specific courses. The general biology courses include cell biology, genetics, molecular biology, plant physiology and ecology; students acquire knowledge about plants and other living organisms at all levels of integration. The domain-specific courses prepare for the major and include two tracks, both continuing on from the *Introduction in Plant Sciences* course. One track focuses on plant physiology and agro-ecology, the other track provides students with a sound background in plant breeding, plant pathology, and the origin and systematics of plant genetic resources. Both tracks combine subject matter coverage with skills training and professional orientation. Finally, two courses focus on research skills and

societal and economic aspects. This implies that each year concludes with a research project of increasing complexity, with the thesis project in the third year.

The two majors provide students with the opportunity to follow more advanced courses. Each major consists of four compulsory courses. According to the critical reflection, students indicated that they would prefer more options to choose from, for example a set of restricted optional courses within their major. This issue will be taken up by the programme committee. The thesis project of 18 credits, which corresponds to a three-month research project, completes the bachelor programme and is part of the major.
In the third year of each bachelor programme at Wageningen University, students have 30 credits of free choice, either to broaden their scope, to deepen it, or to prepare for a master with specific prerequisites. Students can choose one of almost 60 minors or can make a motivated selection among optional courses. They are also allowed to follow the minor at another university or abroad. Choices are made in close consultation with the study adviser.

Many courses are developed and taught by staff from the 15 Plant Sciences Chair Groups. Lecturers combine education and research and meet regularly to discuss research developments in their field. The programme committee organizes discussion sessions with lecturers involved in sets of related courses to adjust and align their content, and to discuss options for incorporating new developments and theories into their courses. The course content is also regularly related to the professional practice.

The critical reflection provides a matrix demonstrating that all courses contribute to one or more of the intended learning outcomes. It also shows that all intended learning outcomes are covered by the courses.

During the site visit the committee was able to look at the course material and exams, which confirmed that the quality of the courses is very good. The committee especially values the research project at the end of each year, resulting in valuable integration.

Based on the critical reflection and the interviews held during the site visit, the committee concludes that the programme is not curriculum-oriented, but course-oriented. Due to the many choices students have, there is not one coherent curriculum for all students. However, the committee is impressed by the basic structure chosen for the bachelor programme. In addition, students have a lot of freedom, which is appreciated by them as well as by the programme management. Nevertheless, it is assured that each student follows a coherent – albeit individual – programme. The committee was impressed by the role of the study adviser in this. S/he strongly influences the way each student chooses his/her courses and assures a coherent individual programme.

Master programme in Plant Sciences
Appendix 4 provides an overview of the structure of the full master programme in Plant Sciences. The first year consists mainly of courses, the second consists of the thesis and either the academic internship or another thesis. All elements contribute to achieving the intended learning outcomes at the programme level, as is shown in a matrix in the critical reflection.

To deal with the varied background of bachelor graduates, the programme offers linkage courses which students can include in their programme if equivalent courses were not part of the bachelor programme. The linkage courses include 2nd- and 3rd-year courses of the bachelor programme in Plant Sciences, and derived e-learning versions of these courses.

The programme has five specializations:

- Crop Science;
- Greenhouse Horticulture;
- Natural Resource Management;
- Plant Breeding and Genetic Resources;
- Plant Pathology and Entomology.

Each of the five specializations describe the courses that students are required to take, and the set of theses subjects to choose from. Prior to the thesis, students have to follow an advanced course that is related to their thesis. The thesis is considered the integrating element of the programme and aims at preparing students to conduct independent research and to further develop their scientific skills. The thesis comprises an individual research project, usually part of a larger research project at a Chair Group, supervised by staff members and examined by a full professor of the supervising Chair Group.

Students choose either an academic internship or a second thesis, depending on their career ambitions. The internship enables students to work in a professional academic environment, learning to integrate knowledge and skills in the context of a company or organization. Students broaden their scope and develop a professional attitude. They often go abroad for the internship, although international students prefer to do their internship in the Netherlands.

A compulsory part of all master programmes at Wageningen University is the Academic Master Cluster, and students of the master programme in Plant Sciences participate in *Academic Consultancy Training (ACT* and *Modular Skills Training)*. In the ACT a multidisciplinary team of students from different programmes works on a real-world project for a commissioner. During these projects, students are confronted with the societal and ethical aspects of life sciences research. Assisted by a coach, they regularly reflect on their own functioning, the functioning of a team and of the team members. All groups deliver a presentation to the commissioner, peers and coaches involved in the course. In addition, students complete several individual assignments including a (self)assessment document. In Modular Skills Training, students practise skills that are essential for functioning at the master level. Students discuss with their study adviser which skills need further development, and select two (or four) skills modules.

To complement their specialization, students select optional courses for the elective (24-36 credits) to deepen or broaden their knowledge and insight. The selection of courses should be coherent and must be relevant to the programme, and at a sufficiently high level. Choices are made in close consultation with the study adviser.

A matrix in the critical reflection shows the relationship between courses and their contribution to the intended learning outcomes at the programme level. The link with research can be found in the thesis project, during which students function as junior members of the research group and are supervised by academic staff members.

In the interviews students mentioned that they do not consider the five specializations of the programme to be an entity. Within each specialization the coherency of the curriculum is clearer. Students feel part of their year-specialization group, but do not interact with students from other specializations. According to the committee, this exemplifies the situation in which the programme as a whole finds itself. There are many specializations, each with a large

number of free choices and a few common courses. From the figure in Appendix 4 it becomes clear that each specialization is indeed coherent on its own and well thought out, but it is hardly possible to identify one coherent programme. To the committee this is not considered a problem, since the specializations were deliberately chosen and strongly link to the labour market. As long as each student has an individual, coherent programme the committee is positive about the setup of the programme. Based on the information the committee received during the site visit, it is convinced that each student indeed follows a coherent programme. It should also be clear to external stakeholders, e.g. employers, which specialization was chosen and what this implies. From the interviews it became clear to the committee that the specialization is mentioned on the diploma.

Master programme in Plant Biotechnology
An overview of the structure of the full master programme in Plant Biotechnology is given in Appendix 4. The first year consists of courses, the second consists of the thesis and either the academic internship or another thesis. The latter option is chosen by 20-25% of the students. All elements contribute to achieving the intended learning outcomes at the programme level, as is shown in a matrix in the critical reflection.

To compensate for the diversity of bachelor backgrounds of students entering the programme, linkage courses are offered in *Plant Biotechnology* and *Gene Technology*. The programme offers three specializations:

- Functional Plant Genomics;
- Plants for Human and Animal Health;
- Molecular Plant Breeding and Pathology.

The specialization determines the topic of the thesis and the courses that students are required to take. Prior to the thesis, each student follows a selection of specialization-related courses that match the intended thesis topic. As of the 2012-2013 academic year, specialization A will also have one specialization-related course, *Genomics*. The committee is pleased to see such a course introduced, as it provides some visibility to the specializations.

The thesis is considered to be the most important element of the programme and aims to prepare students to conduct independent research and to develop their scientific skills further. The research project is physically performed at one of the Chair Groups involved in the programme and is usually part of a larger research project. This implies that students also participate in other Chair Group activities, like seminars, colloquia and social activities.

Students select optional courses for the elective (24-42 credits), to deepen or broaden their knowledge and insight. Often, they choose courses from other specializations or from the master programme in Plant Sciences. According to the critical reflection, students appreciate the options for creating their own study path. The committee agrees that having options has its advantages, but wonders whether the programme is exaggerating the amount of free choice. During the site visit two issues became clear. The first was that the description of the programme in the critical reflection implies there are more free choices than are actually present. In practice, the study advisers actively reduce the choices in order to create coherent, individual programmes. The difference between the programme on paper and in practice was partly explained by financial issues. The committee understands that a programme in Plant Biotechnology might have higher costs than other programmes, but it does not favour the chosen solution. It makes the programme incomprehensible to both students (current and prospective) and outsiders (like the committee). The committee therefore strongly advises the

programme management and the management of the Education Institute of Wageningen University to look into this situation. The programme on paper should resemble the programme in practice. The second issue that arose during the site visit came from the students. Many, especially the international students, feel lonely within the programme. They had no idea who their fellow students were, not even within their specialization. Students stated that this made it very difficult to create a student community within the programme. Each student has an individual programme, and due to the absence of common courses, even at the start of the programme and within each specialization, students have no idea who is taking the same specialization. The committee thinks that this is an issue that should be taken seriously by the programme management. Having a lot of free choice to create one's own programme is good, but some credits should be allotted for a course at the start of the programme in which students can create a student-community or year group. It will help them to successfully continue their studies and will make them feel more part of the programme.

Master programme in Organic Agriculture
An overview of the programme structure of the full programme is given in Appendix 4. The curriculum has been designed to provide a balance between fundamental and applied science. Contributing Chair Groups work in various areas, thus achieving an interdisciplinary and integrated programme. Specific courses have been developed to ensure that the learning experience is more than the sum of the individual contributions of the Chair Groups involved. The critical reflection states that the programme highly values the blending of theory-and-practice and action-and-reflection.

The first year mainly consists of courses, and the second year consists of the thesis (36 credits) and the academic internship (24 credits). All elements of the programme contribute to achieving the intended learning outcomes at the programme level. The programme offers linkage courses to compensate for variations in the students' bachelor backgrounds. All students follow three courses that constitute the compulsory core of the programme. *Integrated Natural Resource Management* and *Analysis and Management of Sustainable Organic Production* are scheduled as a block in the second period to provide all students with a thorough common basis. The *Masterclass Organic Agriculture* links all courses and the thesis within the programme. It runs throughout the entire programme, allowing students to form a community of learners, in which first-year students learn from the second-year students.

The programme has two specializations, with the major difference being the choice of Chair Groups for the thesis research project. This choice requires the inclusion of one or more specific courses during the programme, resulting in distinguishable, individual programmes. The combination and integration of natural sciences and social sciences can only be achieved when students master both domains at an intermediate to advanced level, thus the programme has chosen for a vast common core. Students have some free choice options (6-18 credits) to compose an individual programme. The committee is very enthusiastic about the composition of the master programme in Organic Agriculture. The programme clearly aims at a coherent programme for all students and still provides a limited amount of free choice. The common core courses provide a perfect basis for subsequent specialization and differentiation by the individual student. From the interviews it was clear that the students feel part of their year group and even linked with the other year groups in the programme. The interdisciplinary and integrative objectives are worked out very well in the programme.

Multidisciplinarity
Wageningen University aims to offer programmes with a multidisciplinary and holistic approach. This is meant to stimulate students to develop a broad view and a wide range of interests. Most of the courses are attended by students from different programmes, creating a setting that favours multidisciplinary education. This could also lead to a possible friction between breadth and depth. The committee assessed whether students receive a multidisciplinary programme with sufficient depth, making them experts in a specific discipline.

All four programmes aim at integrating multiple disciplines and do this rather successfully according to the committee. Many courses are organised by multiple Chair Groups and have many lecturers. Initially, the committee was somewhat worried that the involvement of many lecturers would lead to overlap in topics and reduce coherency within a course. However, the students convinced the committee during the interview that this is not the case. They definitely see joint ownership by the lecturers in a course, and in general, each lecturer seems to know what the other lecturers are doing in the courses. The course coordinator has little input to make in this aspect.

According to the committee, the bachelor programme in Plant Sciences and the master programme in Organic Agriculture in particular are impressive for introducing multidisciplinarity into the programme. At the end of each bachelor year, there is an integrative course offered in the form of a research project. The master programme in Organic Agriculture has the *Master class Organic Agriculture*, in addition to the multidisciplinary aspects similar to the other master programmes. The committee is very impressed by this course that runs throughout the entire programme, in which students from both years collaborate and integrate. As described earlier, in addition to making the programme more of an entity, this course will provide students with integration and hands-on experience in working with multiple disciplines. The students the committee interviewed during the site visit confirmed that the course is valuable and contributes to the interdisciplinary nature of the programme. However, the academic year schedule of Wageningen University does not allow time for a course that runs alongside the courses given in a specific period. The result is that the *Master class Organic Agriculture* takes place in the evening, often after a full day of work on other courses. Students claim that this sometimes is too much, and as a consequence they do not make full use of this course. The committee agrees with the students that this course should not be 'added' to the other courses, resulting in too high a study load. However, the concept and theory behind this course are so impressive that the committee would like to see it in more master programmes. Nearly all master programmes at Wageningen University have a large amount of free choice credits, and a course like the *Master class Organic Agriculture* could add to their coherency. Therefore, the committee advises the Educational Institute to look into the scheduling problems and search for a solution.

Teaching methods
Wageningen University strives to train its students to become academics with domain knowledge, a multidisciplinary attitude, interested in problem-solving, and an international orientation with a multicultural attitude. The programmes therefore work with small, diverse student groups to stimulate the interaction between students and lecturers. A variety of didactic and learning methods are offered, including lectures, tutorials, group work, practical training, excursion and individual papers. According to the critical reflection, the teaching methods prepare graduates to work in multidisciplinary teams as well as individually, and often in a global context.

The teaching methods used for the different programmes are provided below. For all four programmes the committee finds that a balanced combination of teaching methods is used in the different courses. The course coordinator and lecturers clearly search for the best teaching methods to realise the learning outcomes of the course. There is also a variation in teaching methods between the different courses.

In all programmes a certain amount of attention is paid to feedback and reflection on the programme and the courses. This is especially incorporated in the master programme in Organic Agriculture, which the committee considers a best practice.

Bachelor programme in Plant Sciences
A typical course in the bachelor programme in Plant Sciences includes a combination of two or more teaching methods. The critical reflection provides five categories: lectures (18%), tutorials (19%), practical (50%), (field) excursions (5%) and group work (8%). In the critical reflection an example is given to demonstrate the combination of teaching methods used. The *Orientation Plant Sciences* course worth 6 credits includes a two-day excursion of 0.5 credits and two mini-internships of 1.1 credits. The Knowledge on Crops module is a practical of 1.2 credits. Finally, students work on a small research project (combination of lectures, practical and group work) of 3.2 credits.

Master programme in Plant Sciences
During the initial course phase, a large share of the contact hours is spent on tutorials and practicals (21% and 34%, respectively) to train students in experimental skills and techniques that are commonly used in plant research. Almost all courses combine different teaching methods to stimulate students to apply theoretical knowledge taught during lectures (22%) in the laboratory, the greenhouse, field experiments (12%), or group assignments (11%).

During thesis work, individual supervision is the common teaching method. This is considered to be more than an occasional contact between student and supervisor. Students work in the Chair Group and get four hours of individual supervision per week, to discuss their progress, research approach, and problems that may arise.

Master programme in Plant Biotechnology
During the course phase, the majority of contact hours is spent on practicals (58%) in order to teach students experimental skills and techniques. A typical course includes other teaching methods to stimulate students to apply the theoretical knowledge taught in lectures (23%), laboratory experiments or assignments. The supervision of the thesis work is similar to that in the master programme in Plant Sciences. Other teaching methods used are tutorials (12%), (field) excursions (1%), group work (4%) and supervision of individual assignments (2%).

Master programme in Organic Agriculture
A typical course includes a combination of two or more teaching methods. The teaching methods used are lectures (23%), tutorials (21%), practicals (38%), (field) excursions (12%), group work (5%) and supervision of individual assignments (1%).

Improvements to the curriculum
The individual Programme Committees are responsible for improving the curricula, although occasionally improvements are introduced for all programmes jointly. One example is the introduction of scheduling of electives in one semester, including minors.

Ideas for improvement usually come from online course evaluations. Detailed results are reported to the lecturers and Programme Committees. Summaries of the results are published on the intranet. In addition to the course evaluations, there are bachelor first-year evaluations, bachelor and master graduate evaluations, career surveys among alumni, and the Education Monitor.

The programme committees regularly discuss the outcomes of the evaluations and take action when considered necessary. In addition to the online evaluations, many programmes hold panel meetings with students to obtain oral feedback on the courses and the programmes. Since many of the programmes are small and the attitude between students and lecturers is informal, many issues are often dealt with informally rather than in a formal procedure.

Specific topics regarding improvements to the curriculum are provided below for the four programmes. Overall, the committee was very impressed by the way management, staff, students and programme committees work and collaborate on improving the programmes. Continuous attention is paid to possible improvements.

Bachelor programme in Plant Sciences
The previous assessment committee indicated strong points, which are still considered assets of the programme. Weak points have been addressed since the previous assessment, improving the structure and cohesion of the programme and the connection between courses. The programme was transformed from 'tradition-based' to 'future-proof'. According to the critical reflection, the active participation of many students and lecturers in the redevelopment of the programme has resulted in an integrated and well-balanced programme in which courses are updated on a regular basis. In general, the programme committee is satisfied with the current programme, but continues to actively monitor the need for improvement.

Master programme in Plant Sciences
The international perspective of the programme continues to play a prominent role, since international students outnumber Dutch students every year. Having many international students and staff members with a global network has both advantages and disadvantages. An example of the latter is the varied backgrounds students bring to the programme. To help resolve this issue, linkage courses combined with e-learning modules were included in the programme.

In the critical reflection, several improvements are described which have been implemented over the past few years. The programme's ambition is to continue to improve its attractiveness and its global perspective. The programme aims to maintain its academic level and the student focus as well as the close link between education and research.

Master programme in Plant Biotechnology
The programme has a strong research orientation founded on the educational concept of research-based learning. This approach builds on the integrated concept developed for the bachelor programme in Plant Sciences. In the last few years, many adaptations to the programme were implemented, and several examples are given in the critical reflection. In connection with the strong research focus and the desire of many students to continue in a research career, one of its newest ambitions is to add a Research Master Cluster as an alternative for the Academic Master Cluster. Furthermore, the programme committee has started discussions on updating the content of specializations and courses to incorporate recent developments in systems biology and the bio-based economy.

Master programme in Organic Agriculture
According to the critical reflection, staff and students contributed intensively to the new design of the programme in 2007 and are involved in continuous improvement of the curriculum and adjustments to align the core courses. The committee was impressed by the way the redesigning of the programme has taken place.

Staff
Wageningen University staff generally teach in several programmes, making it difficult to provide exact student-staff ratios. The estimated student-staff ratios for the programmes in this report are provided in Appendix 5.

Staff members are required to be both an expert in their discipline and a skilful lecturer. This combination allows them to make use of new scientific insights in their teaching. Most lecturers hold a PhD degree.

Wageningen University introduced the University Teaching Qualification (Basis Kwalificatie Onderwijs, BKO) for new permanent staff and staff on tenured track positions. Quality of teaching is evaluated after each course, which also evaluates the course content, position of the course in the curriculum, presentation and examinations. Results of these evaluations form input for the annual performance and development interviews of staff members. Tailor-made training courses are provided by the Educational Staff Development unit for those interested, or as a result of the course evaluation.

In all programmes the teaching staff is strongly involved in the design and evaluation of the programme. This is primarily done by participation in the Programme Committee, participation on the board of the programme management, and more informally through many meetings regarding the quality of the programmes.

In the following sections specific information is provided regarding the four programmes. The committee is very impressed by the favourable student-staff ratio in all programmes. This university-wide asset is part of what makes the diversity in the curricula possible. Staff and students know each other, and together feel responsible for the programmes. The teaching quality of the staff members is good. When problems occur regarding individual lecturers, they are quickly detected and handled. To further improve the teaching quality of the staff, the committee suggests introducing peer review by other teachers. This will further increase the quality along with the integration of the courses and will reduce any overlap.

The committee is very impressed by the research competencies of the staff involved in the programmes. The high quality is clearly reflected in the quality of the courses and thesis work.

Bachelor programme in Plant Sciences
The estimated student-staff ratio for the bachelor programme in Plant Sciences is 5.1:1, enabling frequent interactions between staff and students. The exact student-staff ratio depends on which electives the students choose. Almost all teaching staff are members of the Experimental Plant Sciences or Production Ecology and Resource Conservation Graduate School. According to the critical reflection, the teaching staff are experts in their discipline. Many full professors are involved in courses of the common part. They are also considered good teachers, several lecturers received educational bonuses, and one received the Wageningen teacher of the year award.

Master programme in Plant Sciences
The student-staff ratio for the master programme in Plant Sciences is 6.8:1, enabling frequent interaction between staff and students. Courses are developed and maintained by the academic staff, taking into account the advances in their subject area. Nearly all academic staff have a PhD degree. Most staff members involved in the programme are members of the Experimental Plant Sciences (EPS) or Production Ecology & Resource Conservation (PE&RC) Graduate Schools. The programme considers its staff members to be experts in their research areas.

Master programme in Plant Biotechnology
The student-staff ratio for the master programme in Plant Biotechnology is 6.1:1, enabling frequent interaction between staff and students. The majority of the teaching staff holds a PhD degree and is a member of the Experimental Plant Sciences Graduate School (EPS). In the critical reflection, examples are given that emphasize the high-quality research of the teaching staff.

Master programme in Organic Agriculture
The student-staff ratio for the master programme in Organic Agriculture is 5.4:1, enabling frequent interaction between staff and students. The research quality of the staff is shown by the fact that most of them hold a PhD degree and are members of one of four Graduate Schools. The critical reflection provides other examples of individual staff members that emphasize the high-quality research of the teaching staff.

Programme-specific services
Wageningen University has chosen to centralize all teaching facilities like lecture rooms, labs, rooms for group work and the university library on the new campus. The main education building is the Forum. The Orion education building is under construction and will add to the existing facilities in 2013. Most Chair Groups are – or will be – located on the campus.

The Plant Sciences Group is located in the Radix building, opposite the main education building, the Forum. The research facilities of Radix are regularly used for practical courses and for thesis experiments. The campus is very suitable for providing education. The committee very much appreciated the Forum building, which is specifically created for students. The students in the interviews stated that they are content with the facilities.

Student Support
Although differences exist between programmes, all Wageningen programmes provide a lot of freedom for the individual student, making the programmes student-centred. The chair groups and their research strongly influence the courses offered, making the programmes also course-oriented. This makes the position of the study adviser crucial and demands certain qualities of him/her. The committee thinks that the study adviser should be a member of the academic staff to be able to support students in their choice for certain courses.

With the large amount of free choice in all four programmes, study advisers play a major role in assuring the quality and coherency in the individual curriculum of each student. They thus have an important and difficult job and have to make sure that students select courses that meet the university's requirements as well. Therefore, the committee is positive about the fact that study advisers are part of the academic staff. It was very impressed by the role of the study advisers and concluded from the interviews that study advisers ensure that the students make well motivated and sensible choices.

Bachelor programme in Plant Sciences
The programme has two study advisers who supervise an equal number of students per year, and cooperate closely. Student numbers are relatively low, making contact informal and personal. Students receive general information about the programme, studying at a university, study advice and student support at the start of their studies. All students are invited for an individual meeting with the study adviser early in the first year, to discuss their motivation for taking the programme. In the second half of the first year, another appointment is organized to discuss study progress. When the study progress is average, students discuss the design of their second year with the study adviser. In the second year lunch meetings are organized to inform students about the major, electives, organising the thesis, study programme, etc. Second- and third-year students are invited to the annual Thesis Market in October, where Chair Groups present research topics and discuss thesis options with students.

Master programmes in Plant Sciences, Plant Biotechnology and Organic Agriculture
Students receive a booklet before arriving in Wageningen which contains relevant information about the general design of the programme and its specializations, and the choices they have to make for their individual programme. During the annual introduction days, students are introduced to the programme, and before classes start, each student meets individually with his/her study adviser about the courses they will take in the first two periods. Furthermore, students are invited to the annual Thesis Market in October, where all Chair Groups present research topics and discuss individual thesis options with students. At the start of the second year, students have to discuss the final design of their programme with the study adviser, paying special attention to the thesis and internship. The study adviser also discusses study progress with students, and students can contact the study adviser if they encounter problems or need to discuss programme changes.

Student intake, study load
Students for the bachelor programmes are admitted on the basis of their pre-university qualifications. Individual admission of students who do not meet the standard requirements is centralized. The general admission requirements of master students are published on the internet, including detailed information on admission procedures. These requirements include a relevant bachelor degree, a grade point average of 70%, fluency in English, good skills in mathematics and statistics, and basic computer skills. Master students are admitted following approval by the Admission Committee. In total, there are four Admission Committees, reflecting the four domains. These Admission Committees consist of the relevant Programme Directors, supported by central staff. The four Admission Committees participate in the joint Admission Policy Committee. In total, approximately 5,600 applications are handled each year.

Bachelor programme in Plant Sciences
Students with a Dutch pre-university secondary degree are admitted if they have a Nature & Engineering or Nature & Health profile. Students with an Economy & Society profile need to include two courses of Biology, Chemistry or Physics in their profile. In other cases, the general admission regulations are followed.

After a decrease in enrolment up to 2004, student intake has increased to 29 enrolling students in 2010. According to the committee, the number of students that start the programme could and should increase. The committee is of the opinion that if (prospective) students are more aware of what the programme is about, more would register. To achieve this, the approach of the programme towards prospective students should be reconsidered

The number of contact hours is 825 and 746 for the first and second year, respectively. The number of contact hours in the third year is 582 (estimation) for courses and 60 for the thesis work. According to the evaluation results, the study load is mostly adequate. Some courses have a slightly higher study load, other courses a slightly lower study load. In the interview students confirmed that the study load is acceptable.

Master programme in Plant Sciences
A bachelor degree in Plant Sciences, Biology, Agronomy, Horticulture, Life Sciences or a related academic field is required for admission. All applications are assessed by the programme director, and final decisions are taken by the Admission Committee for Life Sciences.

Approximately 25% of the students is Dutch. Another 25% is from EU countries, while 50% is from non-EU countries. Initiatives have been developed to increase the number of Dutch students specifically, by promoting the options for graduates with a bachelor degree in Biology or in laboratory technology from a university of applied science. The number of students that enrol has increased over the years, from 30 in 2003 to 95 in 2010. Part of the increase is due to the success of non-EU students in acquiring scholarships.

The average amount of time spent in face-to-face instruction is 792-840 hours, depending on whether students choose an internship or a second thesis. Variations occur based on the particular selection of optional courses by individual students. Students perceive the study load as somewhat heavier than most other master programmes in Wageningen. Some courses have a heavy study load. However, the overall rating of these courses is still good to very good.

Master programme in Plant Biotechnology
Students enrolling in the programme require a bachelor degree in Biology, Plant Sciences, (Molecular) Life Science, Biotechnology or a related academic field. All applications are assessed by the programme director, and final decisions are taken by the Admission Committee for Life Sciences.

Approximately one-third of the students is Dutch. Most applications (70-150 complete files per year) come from outside the EU. About 50-75% are admitted, but only a few of the non-EU students are able to obtain a scholarship or sufficient private funds.

Because the master programme in Plant Biotechnology is not linked to a specific bachelor programme, the minor in Plant Biotechnology was developed. This minor is meant for bachelor students in biology, life sciences or laboratory technology, and focuses on many relevant topics. Initiatives have been taken to increase the student intake, which were modestly successful. Student numbers increased from 7 in 2003 to 24 in 2010.

The average amount of face-to-face instruction is 721-769 hours, depending on whether students choose an internship or a second thesis. Variations occur based on the particular selection of optional courses by the students.

The critical reflection states that students feel some courses have a heavy study load, e.g. Genomics. However, for most courses the perceived study load matches the Wageningen University average.

Master programme in Organic Agriculture
Enrolment requires a bachelor degree in Agricultural Sciences, Social Sciences, Biology, Economics or another relevant academic field. All applications are assessed by the study adviser, and final decisions are made by the Admission Committee for Life Sciences. Each year, about 80-150 complete file applications are received, mostly from outside the EU. About 80-90% are admitted, but only a few of the non-EU students are able to obtain a scholarship or sufficient private funds. Approximately 25% of the enrolling students is Dutch. Over the years the number of students starting the programme increased from 11 in 2003 to 32 in 2010.

The average amount of face-to-face instruction is 732 hours, most of it occurring in the first year. According to the critical reflection, students perceive the study load as relatively heavy compared with other master programmes at Wageningen University. This was confirmed by students during the site visit. One explanation was that many students did a disciplinary bachelor, focussing mainly on natural sciences or social sciences. The broad and integrated approach of the master curriculum thus requires additional efforts in one of the two domains. The main cause of the perceived high study load is the *Master class Organic Agriculture*, which takes a lot of time in addition to the regular courses. The committee concludes that the study load for the regular courses is high, but feasible. However, it is clear that the additional study load for the *Master class* should be dealt with. As mentioned previously, the committee is enthusiastic about this *Master class*, but students should have time to make the most of it.

2.2. Considerations
The committee studied the various aspects of the teaching and learning environment of the programmes.

The bachelor and master programme in Plant Sciences are assessed as good for standard 2. The curricula are solid and provide students with high-quality knowledge and skills. The individual programmes chosen by students are coherent, but due to the large amount of free choice, the programmes as a whole cannot be assessed on coherency. The fact that individual programmes are coherent has to do with the excellent support provided by the study advisers who are part of the scientific staff. The teaching methods are well balanced within and between courses. The research qualities of the staff are impressive, as are the student-staff ratios (see Appendix 5). Also, the staff is involved in continuously improving their didactical skills. Student support and facilities are good. In the findings of this standard, the committee provides minor remarks to further improve the programmes.

The master programme in Plant Biotechnology is assessed as satisfactory. The main criticism made by the committee is that students have such freedom in choosing their courses that it is very difficult to think of it as one master programme. This was confirmed by the students, who don't feel part of a group, not even within their own specialization. The criticism the committee had was partly alleviated during the site visit, as the study advisers ensure that students have less freedom in practice than is shown on paper. Nevertheless, the committee advises the programme to look into this issue. On the other aspects assessed in this standard, the committee considers the master programme in Plant Biotechnology to be strong, similar to the master programme in Plant Sciences.

The committee concluded that the master programme in Organic Agriculture was neatly designed by the programme management, with a very successful result. Despite the large number of electives, the programme clearly forms one unit. Students and staff confirmed this positive assessment of the committee. The one criticism is that the annual schedule used

throughout the university does not provide space and time for a unique course like the *Masterclass Organic Agriculture*. This makes the workload for students very high. Nevertheless, the design of the programme, the quality of the courses, the multidisciplinarity, the student support and qualities of staff lead the committee to assess this standard as excellent for the master programme in Organic Agriculture.

2.3. Conclusion

Bachelor programme in Plantenwetenschappen: the committee assesses Standard 2 as **good**.
Master programme in Plant Sciences: the committee assesses Standard 2 as **good**.
Master programme in Plant Biotechnology: the committee assesses Standard 2 as **satisfactory**.
Master programme in Organic Agriculture: the committee assesses Standard 2 as **excellent**.

Standard 3: Assessment and achieved learning outcomes
The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

Explanation:
The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes. The tests and assessments are valid, reliable and transparent to the students.

3.1. Findings

Assessment system

For each course the lecturers have to formulate five to eight intended learning outcomes, which are published in the Study Handbook and course guides. The course guide is obligatory for each course and explains what a course is about, how it is organized, and how students are expected to participate. Part of the course guide covers the assessment strategy, for which requirements have recently been introduced. The assessment strategy clarifies how and when a learning outcome is assessed, who is involved in assessing students, and how the final mark will be determined. It also shows the transparency and validity of the assessment. To enhance the reliability of the assessment, examiners need to explain which elements in the student's answers lead to a certain mark. For multiple choice questions this is embodied in the answer key, and for open answer questions this is shown by model answers, assessment criteria or rubrics (for an example, see Appendix 9). The previous practice was similar to the new theory, but had a less formalized manner. Currently, all Wageningen programmes are in the transition phase from the previous practice to the new situation.

With the changes in the Higher Education and Research Act, the position of the Examining Boards has changed. They are currently in the process of strengthening their role in assuring the quality assessment, both via interim course exams and the evaluation of internships and theses. The new role of the Examining Boards has two elements. The first is that each examiner will be made explicitly responsible for ensuring that an assessment of a course is valid, reliable and transparent. This was made a regular part of the University Teaching Qualification. Wageningen University produced documents to help examiners and lecturers achieve this, and meetings between the Examining Boards and examiners were held in the spring of 2011. The second element is that the Examining Boards will visit chair groups on a regular basis to verify the quality of assessment of courses provided by the groups. Additional visits will take place when required, for example when indicated by the results of course evaluations.

The committee learned during the site visit that students can do many resits for each course if they don't pass the first time. Each year three exam possibilities are offered for each course, and students can retake the exam as often as needed to pass.

Bachelor programme
The learning outcomes of each course are assessed based on reports, written exams, oral presentations and/or the student's performance during practicals. Students have the opportunity to review their graded written exams. In the critical reflection the assessment approach is exemplified in the assessment of a specific course, *Introduction to Plant Sciences*. The assessment consists of a written exam (55%), performance in problem-oriented education (10%), written excursion reports (10%) and the practical/morphology/taxonomy test (25%). For each course an assessment approach and the relationship between intended learning outcomes and the assessment form are available. The committee gained a very positive

impression about the quality of the courses, including the assessment. It feels that each course provides a balanced set of assessments. Based on the information provided to the committee before and during the site visit, the assessment system seems good and well balanced between the courses. The programme management is currently working on an overview of assessments at the programme level. Since the programme is rather course-oriented, the committee agrees that this overview should be formalized and kept up to date.

Master programmes
The learning outcomes at the course level are connected to the intended learning outcomes at the programme level. Assessment of each course's learning outcomes is based on reports, written exams, oral presentations, or the student's performance during practicals. During their thesis work, students meet with their supervisor to discuss research progress, experimental skills and theoretical background. They also participate in research meetings to give and receive feedback on current research projects.

In the Academic Consultancy Training, student teams get feedback on their project proposal, followed by written feedback on their individual proposal. Students formulate several personal learning outcomes and write a mid-term and final reflection paper. The internship includes several moments of feedback, reflection and assessment. Students define the learning outcomes with the local supervisor and the Wageningen University supervisor. They have to write an internship report based on their work and reflect on their own learning outcomes.

During the site visit the assessment strategy was discussed. The formal strategies are still being formulated on paper, but the committee is convinced that the programme management and the individual lecturers have a clear vision on what the quality of assessment should be like. The quality of the examinations the committee inspected was good. The committee concludes that the programmes provide a balanced set of assessments.

Quality and assessment of the thesis work
The thesis work is always graded by two assessors: the supervisor and the examiner. Both are present during the presentation and final discussion of the thesis. In the study year 2011-2012 the assessment procedure for the thesis will be further improved by developing a rubric. A rubric is an assessment tool based on a set of criteria and standards linked to learning outcomes that is used to assess or communicate about product, process and performance. The rubric provides guidelines for the thesis evaluation. In Appendix 9 an example of a rubric is provided.

The committee noticed that there are differences in the thesis reports between and within programmes. For example, the length ranged between 20 and 100 pages, but also the presentation varied. This could be a deliberate choice by the particular programme management, but the committee emphasizes the importance of standardizing the outlines of thesis projects. This will make it easier for students to focus on content and finishing in time.

In all four programmes, the assessment and subsequent grading of the thesis project is only partly based on the final written report. Although the percentages of the grade dedicated to certain criteria is standardized at the university level, the committee noticed that the actual written report only constitutes a minor part of the final grade. Since this report is the only tangible proof students have of their thesis project, the committee would suggest giving it greater weight.

Bachelor programme
In 2010-2011 the inclusion of a thesis as the final part of the bachelor programme was initiated. The thesis for the bachelor programme in Plant Sciences has a total of 18 credits and is considered the final stage of the programme. The assessment is based on a university-wide standard form accompanied by a rubric. For the assessment of a thesis, a standard form is used throughout Wageningen University. Criteria for the assessment of a bachelor thesis are: academic skills (20-50%), proposal and report (20-45%), self-reflection (10%), presentation (5%) and examination (5%). The weight of each criterion is determined after approval of the research/project proposal.

Prior to the site visit, the committee members received a total of 12 recent theses, selected from a list in the critical reflection of all theses completed during the last two years. The selection was done by the secretary on behalf of the chairman of the committee. When selecting the theses, the grading and the graduation date were considered. The student numbers of the selected theses are provided in Appendix 7. For all 12 theses the committee read the thesis report. The use of an assessment form filled out by the supervisor has only recently been introduced, and therefore not all theses had one.

Although the committee could only assess the written report and not the other assessment criteria, it agreed with the grades given to the theses. Overall, the committee was impressed by the quality of the assessment of the bachelor theses. This might be the result of the introduction of a rubric. The committee did notice that only a few thesis assessment forms included written feedback and suggests this should be stimulated.

Master programmes
For master programmes, the thesis, internship and Academic Master Cluster (AMC) form important parts of the learning outcomes. There is an extensive assessment format for the AMC to evaluate each student's individual contribution to the final product and collaborative process. It aims at securing grading reliability across the large number of teams participating each year. For the internship an assessment form is used which is common to all programmes. An external and an internal supervisor are appointed for the internship: the external supervisor advises on the quality of the student's performance, the internal supervisor grades the internship.

The evaluation of the thesis work is done on an assessment form, which differs slightly from the assessment form of a bachelor programme. Research competence (30-60%) and the thesis report (30-60%) constitute 90% of the final grade. The other 10% reflects the colloquium and examination. Thesis work is always assessed by two assessors, one of whom is not personally involved in the student's supervision. Students are only given permission to finalise their thesis when the supervisor gets the impression that the work is of sufficient quality. If a student fails the final assessment, thorough revision of the work or an additional assignment can be required.

Prior to the site visit, the committee members received a total of 10 recent theses for the master programmes in Plant Biotechnology and Organic Agriculture, and a total of 12 recent theses for the master programme in Plant Sciences. Theses were selected from a list in the critical reflection of all theses completed during the last two years. This selection was done by the secretary on behalf of the chairman of the committee. When selecting the theses, grading (the same number of high, middle and low scores were selected) and graduation date were considered. The student numbers of the selected theses are provided in Appendix 7.

Each thesis is assessed in a final discussion between the student, the thesis supervisor(s) and the thesis examiner (generally, the full professor or a mandated associate professor). The assessment is based on the standard assessment form and with a standardized rubric. Students are only given permission to finalize their thesis if the supervisor deems the work to be of sufficient quality.

The committee was impressed with the quality of the theses and agreed with the grades given. It was clear to the committee that the theses were written and supervised in high-quality research surroundings. Despite the differences in assessment that remain between individual supervisors and between Chair Groups, the use of a rubric seems to lead to verifiable and just grading.

Success rates

Bachelor programme
Student numbers for the programme are quite low, with 18-29 enrolling each year since 2007. Drop-out rates are also relatively low; quantitative information on success rates is provided in Appendix 5. Similar to other Wageningen bachelor programmes, students in the bachelor programme in Plant Sciences often start with master programme courses before graduating from the bachelor programme. This leads to a study delay for the bachelor programme, which should disappear when the bachelor-before-master requirements are introduced. The critical reflection states that employers are not interested in academic bachelor graduates and that the bachelor graduates, in general, are not interested in finding a job after graduation. This leads to all students continuing with a master programme at Wageningen University, in most cases the master programme in Plant Sciences.

Master programme in Plant Sciences
The success rates show that 60-80% of the students finish within the nominal duration of two years, and up to 95% within three years. The critical reflection makes a distinction between Dutch and international students, as the latter almost all finish the programme in two years. The number of drop-outs has been relatively low in recent years.

Most graduates easily find a job at the academic level, 19% find a PhD position. In 2011 a survey was held among alumni, which showed that Dutch graduates of the programme work in a wide variety of organizations. This is also true for the international graduates.

Master programme in Plant Biotechnology
The success rates show that 80-100% of the students finish within the standard duration of three years. Due to the low student numbers, the percentages fluctuate considerably. Almost all international students complete the programme in two years. The number of drop-outs is very low.

Graduates are positive about the basis to enter the labour market or to start a PhD provided by the programme. More than 75% of the graduates start a PhD project, often at Wageningen University. Other graduates work at research institutes or in research-related functions. This leads to the conclusion that the programme educates students for a research function.

Master programme in Organic Agriculture
The success rates fluctuate strongly as a result of low student numbers. On average, 42-76% of the students finish the programme within two years, and up to 87% in three years. Almost

all international students complete the programme within two years. Since 2007 the drop-out rates have been strongly reduced, coinciding with the new design of the programme.

Graduates are positive about the basis to enter the labour market provided by the programme, specifically starting a PhD position. In addition to PhD positions, graduates start outside academia in a wide variety of functions in the domain and level of the programme.

3.2. Considerations

The committee is very positive with regard to the initiatives Wageningen University is currently implementing in the bachelor and master programmes. The Examining Boards are in the process of strengthening their role in ensuring the quality of assessment and seem committed to formalizing the assessment system. The committee agrees that having only four Examining Boards is stimulating the consistency and equality of the procedures. However, these four Examining Boards are responsible for a total of 49 programmes. The committee was worried that the limited number of Examining Boards leads to a certain distance from the programmes, making it difficult for the Examining Boards to really be in control at the programme level. During the two meetings with representatives of the Examining Boards and their secretaries it became clear to the committee that they are in control. The secretaries of the four committees have a key role in the communication between programme management and Examining Board.

For all programmes the committee is very positive about the use of different assessment strategies within and between courses. Although formalization of the assessment strategy is still in progress, the committee is convinced that it will be a good strategy.

The programmes are on schedule to implement the new initiatives. The use of course guides makes the assessment procedures very clear and transparent, and they are very useful to the students. The committee especially values the use of the rubric for the master thesis, which is also implemented by the bachelor programme in Plant Sciences. It considers the quality of the theses to be good. It encourages the programme management to use the rubric conscientiously, as in other programmes it appears to have had a positive effect on the verification of the grades.

Overall, the committee did not find any major issues worth commenting on. It was impressed by the level of the bachelor and master theses, and it agreed with all the grades awarded. In none of the programmes did the committee find a thesis that should not have passed. It was clear to the committee that the thesis projects are executed in excellent research surroundings. It would be beneficial for the students to standardize the outlines of the thesis projects.

Drop-out rates are low for all the programmes, and the success rates lie within or above the Wageningen University average. The committee appreciates the attention paid to improving these numbers further. The committee is of the opinion that with the current pressure on graduating in time in the Netherlands, the large number of possible resits at Wageningen University is outdated. If students don't feel the need to pass an exam, they might not take it seriously. This is likely to lead to study delays.

3.3. Conclusion

Bachelor programme in Plantenwetenschappen: the committee assesses Standard 3 as **good**.
Master programme in Plant Sciences: the committee assesses Standard 3 as **good**.
Master programme in Plant Biotechnology: the committee assesses Standard 3 as **good**.
Master programme in Organic Agriculture: the committee assesses Standard 3 as **good**.

General conclusion

The committee was especially impressed by the bachelor and master programme in Plant Sciences. Minor remarks were made to further increase the quality, and, in case of the bachelor programme, the publicity to potential students, but overall they are considered to be good programmes.

The master programme in Plant Biotechnology delivers good graduates; the quality of the theses and the assessments is good. The committee is slightly worried, however, about the identity of the programme. This reflects on its objective and aims, which the committee feels should differentiate it more from the master programme in Plant Sciences. It also reflects on the programme; the courses are of high quality, and the individual students follow a coherent curriculum. However, it is difficult for the committee to regard the programme as an entity. This was confirmed by students and should be dealt with before the programme can be assessed as good.

The committee was very impressed by the master programme in Organic Agriculture. It is clear that a vision lies behind the programme which is worked out very well. Based on the rules for the assessments by NVAO, the programme is assessed as good. If there had been such an option, the committee would have given the programme a very good score.

Conclusion

The committee assesses *Bachelor programme in Plantenwetenschappen* as **good**.
The committee assesses *Master programme in Plant Sciences* as **good**.
The committee assesses *Master programme in Plant Biotechnology* as **satisfactory**.
The committee assesses *Master programme in Organic Agriculture* as **good**.

APPENDICES

Appendix 1: Curricula vitae of the members of the assessment committee

Professor Frans Zwarts was Rector Magnificus of the University of Groningen between 2002 and 2011. He studied linguistics at the University of Amsterdam (1967-1973) and at the Massachusetts Institute of Technology (1974), and wrote a doctoral dissertation on Categorical Grammar and Algebraic Semantics (cum laude). He was appointed lecturer at the University of Groningen in 1975 and became Professor of Linguistics in 1987. He was the initiator of the European Summer School in Logic, Language and Information (ESSLLI) in 1989. In 1992, Zwarts was a visiting scholar at UCLA (University of California, Los Angeles). Between 1995 and 2002, he was chair of the Netherlands Steering Committee for Research on Developmental Dyslexia, initiated by the NWO as part of a multidisciplinary national research programme. In 1999, he became academic director of the Graduate School of Behavioural and Cognitive Neurosciences of the University of Groningen. In 2003, he and the Rector Magnificus of Uppsala University established a close partnership between Groningen and Uppsala. This was extended in 2006, when the Universities of Ghent, Göttingen, Groningen, and Uppsala decided to form the U4. In 2011 he was appointed professor and manager to realise the University Campus Fryslân.

Mrs. Renate Prenen, MSc is educational advisor and independent entrepreneur educational advice. She studied Applied Educational Sciences at Twente University. She worked at Randstad secretarial bureau as advisor and programme manager. Later, she worked at the Academic Medical Centre (AMC) of the University of Amsterdam, where she was educational advisor. One task was to participate in research on learning requirements, obstacles and motivation for evidence-based medicine for family doctor trainers, teachers and family doctors in training. In September 2009 she started as an independent educational advisor. She has been a committee member on other QANU assessment committees.

Dr. Geir Lieblein is associate professor at the Department of Plant and Environmental Sciences of the Norwegian University of Life Sciences. He received his PhD in 1993 in Horticulture at the same university. He was appointed visiting professor at the Department of Crop Science of the University of Ruhuna, Sri Lanka between 2006 and 2009. Since 2011 he is honorary scholar at the University of Wisconsin, Madison (US). His main educational achievement is the leadership role in the Nordic group that conceptualized a Nordic Master Programme in Agroecology in 1996 and he played a key role in the establishment of the new Master Programme in Agroecology at UMB in 2000. He furthermore is member of the European Network of Organic Agriculture University Teachers. He has written many publications and supervised several master thesis projects.

Professor Els Van Damme is professor at the department of Molecular Biotechnology of Ghent University. She received her PhD with greatest distinction in 1991 at K.U.Leuven, Belgium. She continued her academic career at the same university as postdoctoral researcher and guest professor. The research unit Biochemistry and Glycobiology studies the role of plant proteins, that play a role in signal transduction in the plant cell, but are not involved in plant defence against pathogens and insects. New strategies are developed to protect plants against diseases. Van Damme furthermore teaches at Ghent University in several bachelor and master courses. In 2009 she became member of the Royal Flemish Academy of Belgium.

Professor Maurice De Proft is full professor at the Faculty of Bioscience Engineering at K.U.Leuven. He teaches at the bachelor programme and master programme at this faculty. He is member of the Faculty Board and member for the project evaluation committee for education research. Between 2004 and 2011 he was president of the education programme of

the bachelor programmes of the Faculty of Bioscience Engineering. Since 2011 he is Department Head of the Biosystems department. His research interests are physiology and production of Bromeliads & Orchids, ethylene physiology, Belgian endive production, and Sugar beet (seed physiology).

Professor Hartmut Stützel is professor in Vegetable Systems Modeling at the Institute of Biological Production Systems Gottfried Wilhelm Leibniz Universität Hannover, Germany since 1993. His PhD was received in 1985 at the University of Hohenheim. Stützel is programme director of the master programme in International Horticulture and Chairman of the Center for Business Administration in Horticulture of Hannover. Between 2007 and 2009 he furthermore was Dean of the Faculty of Natural Sciences He is reviewer of several journals and evaluator of Funding Bodies.

Karl Agius, MSc is a 24 year old PhD student at the University of Malta. He holds a BSc (Hons) in Chemistry and Biology and a MSc in Biology (graduated in 2012). He has served in various student organisations and bodies including the Science Students' Society (as Secretary General and President) and in the University Students Council (as Education Commissioner and Secretary General). He also served in the Faculty Board of Science and on Senate of the University of Malta. He is also active in the European Students' Union (ESU) where he served in the Social Affairs Committee (SAC) and the Student Union Development Committee (SUDC), currently serving as Coordinator for Membership Issues. Karl also holds interest in QA. He is a member of the ESU QA Expert pool and has participated in the Institutional Evaluation Programme (IEP) run by the European Universities Association (EUA). Karl has a passion for education and has also worked as a Science/Biology teacher at a secondary school and as a teaching assistant at the Chemistry Department within the University of Malta.

Appendix 2: Domain-specific framework of reference

Plants are the basis of life. They provide the world with oxygen, food, feed and renewable resources. Today, the world is facing a variety of pressing issues, such as the growing world population, climate change, flooding or drought, the energy crisis, hunger, health issues, land degradation and urbanisation. Often, plant-based innovations can contribute to the development of relevant solutions. Four domains can be identified in relation to Plant Sciences, Plant Biotechnology and Organic Agriculture, that can all be viewed from different perspectives, from integrative organic to eductionist (bio-)technological:

Food production and food security
Further growth of the world population and a rising standard of living in emerging economies will lead to an increased demand for food, which implies that agricultural productivity needs to be enhanced. However, the dwindling availability of resources such as water, certain essential plant nutrients, biocides and fossil energy and the unprecedented impact of current practices on the environment calls for the development of high-tech greenhouse agriculture on the one hand, and low input agricultural practices, including organic agriculture, and sustainable agro-ecosystem management on the other hand. The current challenge is to double the yield with half the (man-made) inputs. To achieve this goal, scientific advances are urgently needed in crop management, agro-ecological pest management, availability of improved crop varieties (e.g. drought tolerant, salinity resistant, disease resistant), improved shelf life, and international food chain management. ("two times more for two times less")

Plants and health
There is an important relationship between the human diet and health. Hunger on the one hand and obesity on the other need to be addressed on a world-wide scale. Life sciences research focuses on the functionality of (human) genes. Insight into health-related factors is expected to grow in the next five to ten years. Individual dietary recommendations will increasingly be based on individual genome analysis. This requires an enormous increase of the knowledge about cultivation of healthy plants as the most important food source for humans and animals. It also requires knowledge on constituents/proteins that have a health-promoting (*e.g.* fibres, vitamins, minerals, flavonoids, anti-oxidants, immunomodulating compounds) or (hypo-) allergenic effect, or can serve as a source of pharmaceuticals. In all these cases, knowledge on biodiversity, metabolic routes and breeding techniques plays an important role. ("healthy food for healthy people")

Green environment
Nature and agriculture compete for limited space. While they depend on each other, they can also undermine each other. Crucial is the development of strategies for sustainable resource management and crop production, conservation of (agro-) biodiversity, multifunctional land use, urban agriculture and organic/low-input agriculture. These strategies are also helpful to prevent the effects of climate change caused by increased production of greenhouse gases through human activity. Plants are the world's largest CO2 binders and thus play a pivotal role in reducing the amount of greenhouse gases. In addition, plants have abundant possibilities for adaptation to the negative effects of climate change (drought, flooding, salination). Plants also have the potential to build buffering capacity, for example in bioremediation of polluted soil, capturing particulate matter by trees and to limit the effects of heavy rain showers, flooding or groundwater seepage. Finally, plants (especially ornamentals, gardening plants, urban green) contribute to human well-being by providing leisure opportunities, social gifts and healthy indoor environments. ("sustaining green (urban) environments")

Bio-energy and bioresources
Crops convert 3% of all solar energy into sugars, whereas the worldwide annual energy consumption is approximately 0.01% of all solar energy caught by the earth. This creates a huge potential for the development of strategies to harvest solar energy for human use through plants. In addition, plants provide a wide variety of renewable resources. Biorefinery of plant-based proteins, secondary metabolites, polysaccharides and fatty acids forms a sustainable basis for the production of bioplastics, biofibres, biofuel and pharmaceutical products. Plant-based resources that can support a biobased economy include common staple crops such as maize or sugar cane, industrial crops (cotton, hemp, tobacco), specialty crops including plants producing platform chemicals, and novel crops like Miscanthus (elephant grass). Current innovations focus on marine agriculture, i.e. the cultivation of seaweed and algae for the production of biobased raw materials. ("the plant as a plant") Shared characteristic in these four domains is the integrated approach, based on a combination of scientific, (bio-) technological and societal aspects, linking life sciences with environmental and social sciences.

National and international perspective
In the Netherlands, Plant Sciences is only taught at an academic level at Wageningen University. Also worldwide, there are only a few academic programmes that cover the full domain of Plant Sciences. Within Europe, Wageningen University participates in the EuroLeague for Life Sciences (ELLS), with six other European universities in the domain of Life Sciences: University of Natural Resources and Applied Life Sciences, Vienna (BOKU); University of Copenhagen, Faculty of Life Sciences (LIFE); Swedish University of Agricultural Sciences (SLU); University of Hohenheim (UHOH); Czech University of Life Sciences Prague (CULS) and Warsaw University of Life Sciences (SGGW). Of these ELLS partner universities LIFE and SLU match best with the domain coverage and academic level of Plant Sciences at Wageningen University. Through ELLS, Wageningen University participates in LLSNA (Euroleague for Life Sciences and North American Universities), which is the platform for cooperation with seven universities in the US and Canada: Michigan State University, University of California (Davis), Cornell University, University of Wisconsin, Purdue University, University of llinois, University of Guelph. Of these North American universities the University of California (Davis) and Cornell University have corresponding study programmes that cover the domain and academic level of the Plant Sciences programmes at Wageningen University.

Connection with the academic Biology programmes in the Netherlands
The lack of corresponding national study programmes at academic level hampers determining a frame of reference that is broader than this specific study programme. Therefore, a link is made with the Domain Specific Frame of Reference that was determined for all academic Biology programmes in the Netherlands ("Domeinspecifiek referentiekader Biologie NL"). The reasoning behind this choice is that within the Netherlands Plant Sciences and Organic Agriculture are considered an inclusive part of Biology, and thus can be evaluated within the framework of Biology. Obviously, there are essential differences between each of the programmes in the Plant Sciences domain. Plant Sciences and Plant Biotechnology specifically focus on plants, and in addition, Plant Biotechnology is limited to the lower integration levels (DNA, molecule, cell). In contrast, Organic Agriculture has a much broader focus, as it also addresses socio-economic aspects. These differences will be addressed in further detail in each of the critical reflections. The text below is a translation of the corresponding sections from the "Domeinspecifiek referentiekader Biologie NL". Whenever "biology" is mentioned in the original text, this is replaced in the translation by "plant sciences, plant biotechnology and organic agriculture".

The diverse societal positions in which plant scientists are needed, challenges the study programmes to prepare students for careers in fundamental research, applied research and technology, education, communication, policy and business, both in plant sciences itself, as in related scientific disciplines. The main objective of the study programmes plant sciences, plant biotechnology and organic agriculture, is to provide the student with profound insight into the coherence and complexity of biological systems in interaction with both the biotic and the abiotic environment. The student has to acquire academic and technical skills that enable him/her to develop novel insights independently. Amazement on and appreciation of the way in which nature functions and is organized will inspire students to participate in the development of new knowledge and become a scientist, or to pass the acquired knowledge on to society as a lecturer, adviser, consultant, politician or otherwise. Finally, this inspiration can lead to new entrepreneurship, in which knowledge on biological systems is used to protect these, or utilize them responsibly for the benefit of society.

The study programmes in plant sciences, plant biotechnology and organic agriculture consist of a threeyear bachelor programme and a two-year master programme. The bachelor programme provides students with the academic basis of the discipline; the master programme educates them to become junior scientists within their selected specialization.

The objectives of the bachelor programme Plant Sciences are to provide sufficient knowledge, insight and skills to facilitate the graduate to contribute to identifying, raising and solving research problems in the domain of plant sciences under supervision, at an academic level, and to realize a good starting point to successfully pursue a master programme in Plant Sciences, Plant Biotechnology, Organic Agriculture and related disciplines.

A graduate of the Bachelor of Science in Plant Sciences:

- has knowledge of and insight into the mechanisms that underlie the structure and dynamic functioning of plant systems, and is able to indicate how the various levels of organization in nature depend on this;
- has insight into the position of the various subdomains within plant sciences in the broad sense, and their relation to adjoining scientific disciplines;
- has sufficient knowledge of supporting courses in natural sciences to have insight into the importance of other natural sciences for plant sciences, and vice versa;
- has the capacity to think critically, to abstract, and to analyse a scientific research question;
- has insight into the way in which common hypotheses can be tested through experiments, and how acquired knowledge can lead to development of theories;
- has sufficient theoretical and practical skills to perform experiments under supervision;
- has insight into the importance and the limitations of the use of model organisms;
- has the skills to communicate with specialists on experimental results;
- has sufficient knowledge and understanding of the societal role of plant sciences to be able to reflect on scientific and societal problems;
- is able to make a motivated choice for a master programme after critical self reflection and orientation on specializations and societal perspectives of that master programme.

The objectives of the master programmes Plant Sciences, Plant Biotechnology and Organic Agriculture are to provide sufficient knowledge, insight and skills to facilitate the graduate to contribute independently and at an academic level to identifying, raising and solving research problems in the domain; discuss this contribution with specialists, inform non-specialists in a

clear and unambiguous way on conclusions and considerations underlying the research problem, and successfully pursue a PhD in Plant Sciences or a related discipline, whether or not in combination with preparation for a career other than research.

A graduate of the Masters of Science in Plant Sciences, Plant Biotechnology or Organic Agriculture:

- has such theoretical and practical knowledge in one or more specializations within the domain that he/she is able to perform research under broad supervision;
- has the capacity to independently analyse scientific problems and relevant scientific literature, formulate verifiable hypotheses, and reflect critically on their own research and research by others;
- has the capacity to interconnect and integrate various disciplinary areas within plant sciences;
- is able to think interdisciplinary;
- has the capacity to communicate on experimental results, both verbally and in writing, has the skills to communicate with specialists, and can present experimental results and research data on a conference or as (part of) a scientific publication;
- has sufficient insight into the societal role of plant sciences to be able to reflect on scientific and societal issues, and accordingly develop an ethically sound professional attitude.

Demands for the programmes:

- the intended learning outcomes of the programme are described in terms of content, level and orientation, and meet international standards;
- the programme, staff and programme specific facilities enable incoming students to realize the intended learning outcomes;
- the orientation of the programme guarantees the development of academic, scientific and professional skills;
- the programme commands an adequate system of examination and proves that the intended learning outcomes are met;
- the programme commands an adequate system of training communication skills, and feels jointly responsible for the training of academic teachers;
- the programme offers a mix of teaching methods (lectures, tutorials, skills training, practical training, literature study, research internship and self-study) focused on supporting active learning;
- the programme stimulates reflection on the interface of plant sciences and society;
- the programme offers sufficient opportunities to spend part of the curriculum abroad.

Prerequisites: To be able to realize the objectives the programmes need to meet at least the following prerequisites:

- a strategic vision of the programme and/or faculty;
- a strong strategic position within the institution to implement this vision;
- availability of good facilities with regard to research and the different study phases;
- availability of lecturers with a broad overview on the domain of plant sciences in addition to their own scientific specialization;

- good human resource management with result and development discussions and focus on education in career perspective and improvement of competences;
- a balanced relation between education and research efforts among staff;
- adequate information to potential students, study advice including advice on study programme related choices;
- well-considered scheduling and regulations;
- good monitoring system for study progress;
- an adequate system for quality control in which study elements, study phases and the study as a whole are regularly evaluated.

Appendix 3: Intended Learning Outcomes

3A. Intended learning outcomes for the bachelor programme in Plant Sciences

		After successful completion of the programme graduates are expected to be able to:	Dublin Descriptors				
			Knowledge and understanding	Applying knowledge and understanding	Making judgements	communication	learning skills
Domain-specific knowledge, understanding and experimental skills	1	explain the biology of plants in their environment, both at a fundamental level and in terms of the various functions of plants for people and animals, based on knowledge of plant physiology, morphology and taxonomy, biochemistry, organic and physical chemistry, molecular and cell biology, mathematics, statistics, genetics and ecology	x				
	2	apply the knowledge of fundamental processes in plants at the molecular and cellular level in order to analyse the development of novel varietiees, the interactions bewtween plants and their pests and pahtogens, and the use of plant products for food and health purposes (Major A)		x			
	3	apply the knowledge of the role of natural resources and environmental factors on plant and (agro)system development in order to analyse open and protected plant production systems, and the interactions between agriculture and its environment in a wide range of agro-ecological systems (Major B)		x			
	4	apply laboratory techniques, analytical measurements, mathematical and statistical methods for the collections, processing and analysis of experimental data in plant cience, and to judge their suitability in solving specific research questions (Major C)		x	x		
Scientific skills	5	translate a scientific problem in plant sciences into research questions and develop a scientifically relevant research plan in which problem definition, hypothesis, experimental set-up and data analysis are described in relation to the existing literature (under supervision)		x	x		
	6	perform (under supervision) simple scientific experiments and analyse and interpret experimental data, in order to develop or design a novel soution, system, model or product		x	x		
	7	establish a scientific approach by - retrieveing and critically selecting relevant literature from bibliographic databases - combining new knowledge with previously obtained knowledge - demonstrating and undersstanding of the process of etesting hypotheses, theories and models trhough experiments.	x		x		x
General Academic Skills	8	Communicate verbally and in writing about the results of learning, experiments and project work with specialists and non-specialists, both in Dutch and in English				x	
	9	co-operate in a team of students to perform project-based work				x	
	10	understand the international, socio-economic, ethical , cultural and temproal context of new developments in plant sciences			x		
	11	reflect (under supervision) on personal knowledge, skills, attitudes and functioning, both individuall and in discussions with others, and desgin and plan a personal learning path.					x

3B. Intended learning outcomes for the master programme in Plant Sciences

		After successful completion of the programme graduates are expected to be able to:	**Dublin Descriptors**				
			Knowledge and understanding	Applying knowledge and understanding	Making judgements	communication	learning skills
Scientific skills Domain-specific knowledge, understanding and experimental skills	1	explain and exemplify theories, methods and techniques that are relevant to the selected specialization, and stay informed about recent developments in their field of specialization as well as related fields	X		X		
	2a	apply the knowledge of the physical, chemical and physiological aspects of crop growth and production, and of modelling and simulation to analyse yield constraints and develop appropriate crop management practices to sustain, and, where possible, improve food production (Specialization A - Crop Science)		X			
	2b	apply the knowledge of (environmental) plant physiology, crop ecology and post-harvest physiology in order to analyse plant growth in a protected environment, and develop technological approaches to control abiotic and biotic factors and improve post-harvest quality (Specialization B - Greenhouse Horticulture)		X			
	2c	apply the knowledge of soil quality, crop growth, nutrient dynamics, ecology and biointeractions to analyse interactions between agriculture and the environment, for conservation of (agro-) biodiversity and to improve the sustainability of agricultural land use (production of food, feed and fuel) (Specialization C - Natural Resources Management)		X			
	2d	apply the knowledge of classical, molecular, population and quantitative genetics, plant physiology, statistics and genomics to design, develop and select varieties with improved yield, disease resistance, quality characteristics and suitability for sustainable plant production systems (Specialization D - Plant Breeding and Genetic Resources)		X			
	2e	apply the knowledge of plant-insect, plant-pathogen and crop-weed relationships, both at ecological and molecular level to analyse and design strategies for integrated pest management by integrating genetic plant resistance, cultural practices and biological control (Specialization E - Plant Pathology and Entomology)		X			
	3	independently select and apply suitable laboratory techniques, analytical measurements, surveys, mathematical and statistical methods for the collection, processing and analysis of experimental data in plant science		X	X		
	4	independently resolve a scientific problem in plant sciences into research questions and develop a scientifically relevant research plan in which research question, hypothesis, experimental set-up and data analysis are described in relation to relevant literature		X	X		
	5	independently perform scientific experiments and analyse and interpret experimental data, in order to develop or design a novel solution, system, model or product		X	X		
	6	translate research data and scientific knowledge in the field of specialization into relevant solutions to complex problems		X			
	7	critically select relevant scientific literature to analyse current concepts, theories, techniques and debates as a basis for defining research questions and testing hypotheses in order to draw conclusions and develop recommendations			X		
General Academic Skills	8	communicate in professional English with specialists and non-specialists about research and solutions to problems related to the field of specialization, both verbally (in presentations and debates) and in writing				X	
	9	co-operate in a multi-disciplinary international team in different team roles, including the role of team leader to plan, perform and manage project-based work				X	
	10	analyse and evaluate the socio-economic, ethical and environmental aspects related to the academic field of specialization and integrate these in scientific work in an international context			X		
	11	self-reflect on personal knowledge, skills, attitudes and functioning, both individually and by giving and receiving feedback, and develop a personal learning path					X

3C. Intended learning outcomes for the master programme in Plant Biotechnology

		After successful completion of the programme graduates are expected to be able to:	**Dublin Descriptors**				
			Knowledge and understanding	Applying knowledge and understanding	Making judgements	communication	learning skills
Scientific skills Domain-specific knowledge, understanding and experimental skills	1	explain and exemplify theories, methods and techniques that are relevant to the selected specialization, and stay informed about recent developments in their field of specialization as well as related fields	X		X		
	2a	apply knowledge of genomics, molecular biology, genetics and bio-information technology to analyse gene expression in order to improve understanding of fundamental processes in plants and interactions between genes and gene products (Specialization A - Functional Plant Genomics)		X			
	2b	apply the knowledge of plant molecular biology, genomics, metabolomics and biomedical science in order to analyse and design plant-based systems for the production of health-improving compounds (proteins and secondary metabolites) (Specialization B - Plants for Human and Animal Health)		X			
	2c	apply the knowledge of molecular markers, genomics and genetics to explore genetic variation and to develop novel plant varieties, and apply knowledge on plant-insect, plant-pathogen, cropweed interactions and molecular detection technologies to design strategies for integrated plant health-management and disease resistant crops (Specialization C - Molecular Plant Breeding and Pathology)		X			
	3	select and apply suitable laboratory techniques, analytical measurements, mathematical and statistical methods for the collection, processing and analysis of experimental data in plant biotechnology independently		X	X		
	4	independently formulate a scientific problem in plant biotechnology in terms of research questions, and develop a scientifically relevant research plan in which problem definition, hypothesis, experimental set-up and data analysis are described in relation to relevant literature		X	X		
	5	independently perform scientific experiments and analyse and interpret experimental data, in order to develop or design a novel solution, system, model or product		X	X		
	6	translate research data and scientific knowledge in the field of specialization into relevant solutions to complex problems		X			
	7	critically select relevant scientific literature to analyse current concepts, theories, techniques and debates as a basis for defining research questions and testing hypotheses in order to draw conclusions and develop recommendations			X		
General Academic Skills	8	communicate in professional English with specialists and non-specialists about research and solutions to problems related to the field of specialization, both verbally (in presentations and debates) and in writing				X	
	9	co-operate in a multi-disciplinary international team in different team roles, including the role of team leader to plan, perform and manage project-based work				X	
	10	analyse and evaluate the socio-economic, ethical and environmental aspects related to the academic field of specialization and integrate these in scientific work in an international context			X		
	11	self-reflect on personal knowledge, skills, attitudes and functioning, both individually and by giving and receiving feedback, and develop a personal learning path					X

3D. Intended learning outcomes for the master programme in Organic Agriculture

		After successful completion of the programme graduates are expected to be able to:	**Dublin Descriptors**				
			Knowledge and understanding	Applying knowledge and understanding	Making judgements	communication	learning skills
Scientific skills	1	Integrate knowledge of chain management, legislation and certification, consumer behaviour, marketing, economics, communication, education, plant and animal production, environmental sciences and social sciences to analyse the main components of complex farming systems and to explore the principles of food production, consumption, natural resource management, multifunctional land use and the social environment; Describe the available research-orientations, from empirical analytical to interpretative to socially critical, and explain the merits of each orientation depending on the purpose pursued and the research question at stake	X				
Domain-specific knowledge, understanding and experimental skills	2a	*Specialization A (Agro Ecology)* Integrate and apply the knowledge of plant and animal production and soil and environmental science in the context of organic agriculture; Explain the key differences between organic and conventional agricultural systems, as well as between other emerging agricultural systems (low input, sustainable agriculture); Analyse agro-ecological processes and management systems		X			
	2b	Specialization B (Consumer and Market) Integrate and apply basic knowledge of chain management, legislation, consumer behaviour, and economics in the development of healthy, socially responsible and ecologically sound food and other agricultural products; Analyse consumer behaviour and (chain)management systems in relation to organic agriculture		X			
	3	Apply a systems approach in analysing, evaluating and designing complex agricultural systems and (food) production chains by using suitable analytical measurements, surveys and mathematical end statistical methods; Understand and criticize certification systems for organic products		X	X		
	4	Design, independently, a research proposal in which the research orientation used and details of corresponding methodology, research design and methods used are made explicit		X	X		
	5	Execute a carefully chosen and societally relevant research design X X		X	X		
	6	Translate (action) research data and scientific knowledge in organic agriculture into relevant solutions to complex problems, to play a pivotal role in international innovation networks and transition processes		X	X		
Societal awareness	7	Contribute scientific knowledge and understanding in interactive multi-stakeholder change processes (e.g. action research) aimed at innovating and improving the organic sector, both strategically and practically; Shift between different perspectives in time (past, present & future), space (local, regional & global), culture and discipline			X		
General Academic Skills	8	Analyse and evaluate the ethical, environmental, societal and economic consequences of research and reflect on the different roles of the scientist in agricultural transition processes			X	X	
	9	Co-operate in a multi-disciplinary international team in different team roles, including the role of team leader, to design viable alternatives for conventional strategies				X	
	10	Communicate effectively and with an open mind for new ideas about creative alternatives in organic agriculture with specialists and non-specialists, both verbally (in presentations and debates) and in writing; Act as an intermediary between science experts on the one hand, and policy makers and the wider public on the other				X	
	11	Design and plan personal learning processes based on continuous reflection and feedback on individual knowledge, skills, attitudes and performance					X
	12	Reflect on the consequences of values, perspectives and actions -self-reflection, for others (empathic understanding), and for larger societal systems in which students are involved					X

Appendix 4: Overview of the curricula

4A.1. Overview of the bachelor curriculum in Plant Sciences

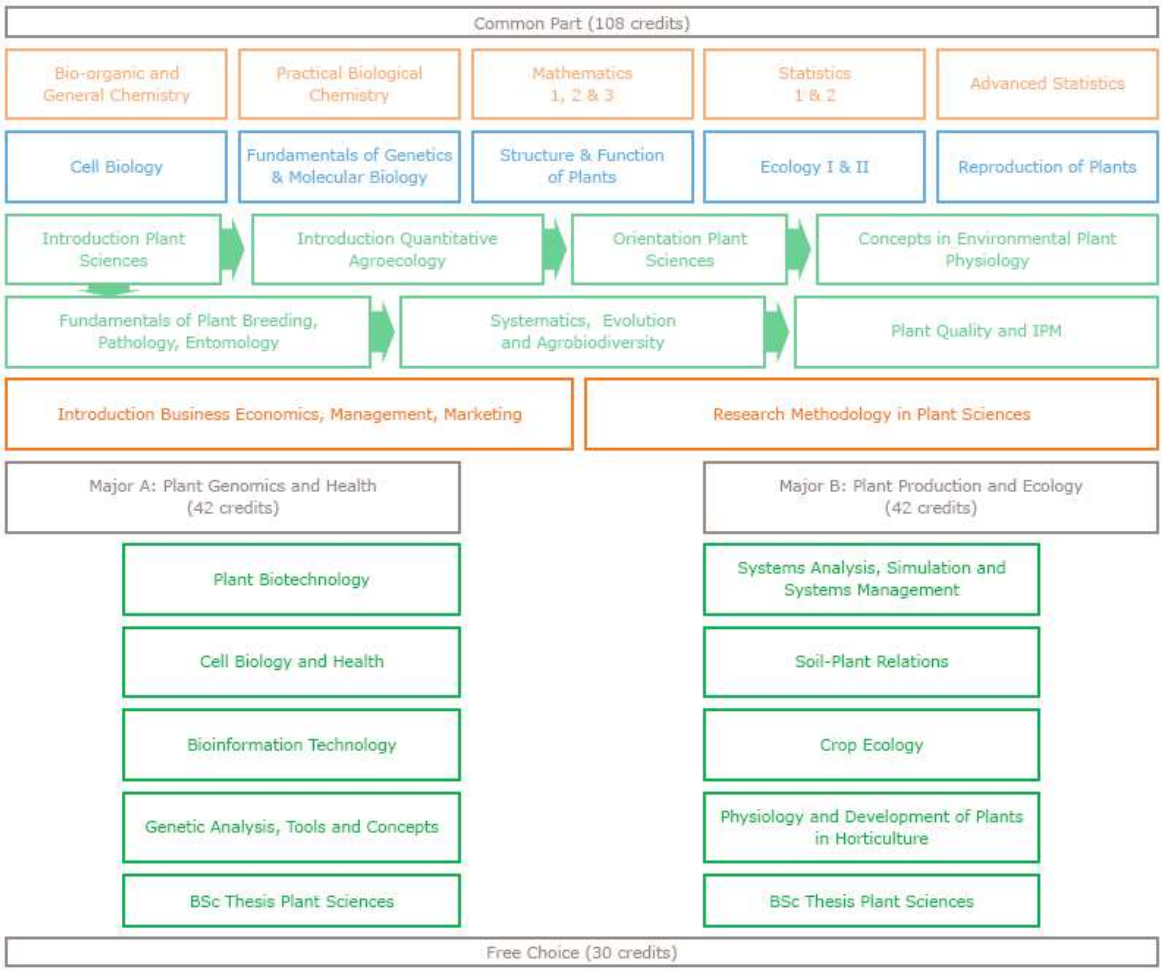


Figure 1 Curriculum structure.

supporting courses; general biology courses; domain specific courses that prepare for the majors; courses that focus on research skills, academic skills and societal and economic aspects; courses that belong to the majors.

4A.2. Overview of courses in the bachelor programme in Plant Sciences

Course code	Course name	Major	Credits	CS/RO	Year	Period
NEM-10306	Introduction Plant Sciences		6	CS	B1	1
PCC-12803	General Chemistry for the Life Sciences		3	CS	B1	1
CBI-10306	Cell Biology		6	CS	B1	2
MAT-15403	Statistics 2		3	CS	B1	2
ORC-13803	Bio-organic Chemistry for Life Sciences		3	CS	B1	2
GEN-11806	Fundamentals of Genetics and Molecular Biology		6	CS	B1	3
BIC-10306	Practical Biological Chemistry		6	CS	B1	4
CSA-10806	Introduction Quantitative Agroecology		6	CS	B1	5
PPH-10806	Structure and Function of Plants		6	CS	B1	5
NCP-10503	Ecology I		3	CS	B1	6
NCP-20503	Ecology II		3	CS	B1	6
NEM-10806	Orientation Plant Sciences		6	CS	B1	6
MAT-14803	Mathematics 1		3	RO1	B1	1
MAT-15303	Statistics 1		3	RO1	B1	1
HPC-22803	Concepts in Environmental Plant Physiology		3	CS	B2	1
PCB-10803	Reproduction of Plants		3	CS	B2	1
PHP-20806	Fundamentals of Plant Breeding, Plant Pathology and Entomology		6	CS	B2	1
MAT-14903	Mathematics 2		3	CS	B2	2
MAT-15003	Mathematics 3		3	CS	B2	2
PBR-21306	Biosystematics, Evolution and Agrobiodiversity		6	CS	B2	4
BEC-21806	Introduction to Business Economics, Management and Marketing		6	CS	B2	5
ENT-20806	Plant Quality and Integrated Pest Management		6	CS	B2	6
NEM-20306	Research Methodology in Plant Sciences		6	CS	B2	6
MAT-20306	Advanced Statistics		6	CS	B3	1
YPS-82318	BSc Thesis Plant Sciences		18	CS	B3	1
GEN-20806	Plant Biotechnology	A	6	CS	B2	2
CBI-20306	Cell Biology and Health	A	6	CS	B2	3
SSB-20306	Bioinformation Technology	A	6	CS	B2	5
GEN-30306	Genetic Analysis, Tools and Concepts (GATC)	A	6	CS	B3	1
PPS-20306	Systems Analysis, Simulation and Systems Management	B	6	CS	B2	2
CSA-20306	Soil-Plant Relations	B	6	CS	B2	3
HPC-21306	Crop Ecology	B	6	CS	B2	5
HPC-20306	Physiology and Development of Plants in Horticulture	B	6	CS	B3	1

CS: Compulsory course; RO1: Choice dependent on type of mathematics at secondary education.

4B.1. Overview of the master curriculum in Plant Sciences

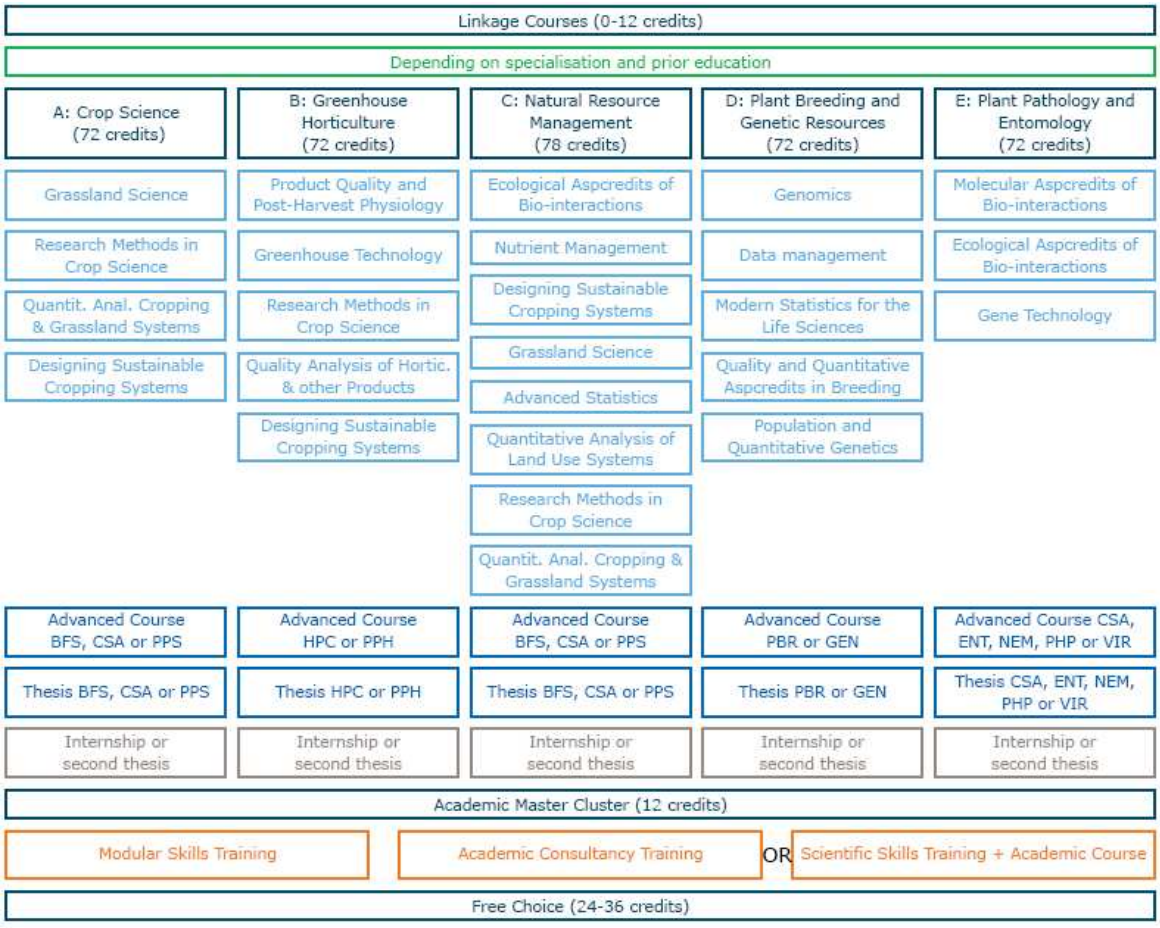


Figure 1 Curriculum structure.

linkage courses; core courses of the specialization (students in specializations A, B, D, E have to choose at least one course; students in specialization C at least two); cluster of advanced course and Thesis; internship or second thesis; courses of the Academic Master.

4B.2. Overview of courses in the master programme in Plant Sciences

Course code	Course name	Specialization	Credits	CS/RO	Year	Period
YMC-61303	Scientific Skills Training		3	RO1	M1	1
YMC-60303	Modular Skills Training (MOS)		3	CS	M1/2	1
YMC-60809	Academic Consultancy Training		9	RO1	M1/2	1
HPC-22803	Concepts in Environmental Plant Physiology	A	3	RO0	M1	1
HPC-23303	Quantitative Aspects of Crop Production	A	3	RO0	M1	1
PPS-20306	Systems Analysis, Simulation and Systems Management	A	6	RO0	M1	2
HPC-21306	Crop Ecology	A	6	RO0	M1	5
CSA-31806	Grassland Science	A	6	RO1	M1	1
CSA-30806	Research Methods in Crop Science	A	6	RO1	M1	4
PPS-30806	Quantitative Analysis of Cropping and Grassland Systems	A	6	RO1	M1	5
CSA-32306	Designing Sustainable Cropping Systems	A	6	RO1	M1	6
BFS-30806	Organic Plant Production	A	6	RO2	M1	5
CSA-30806	Research Methods in Crop Science	A	6	RO3	M1	4
CSA-30306	Advanced Crop Physiology	A	6	RO4	M1	2
PPS-30306	Quantitative Analysis of Land Use Systems (QUALUS)	A	6	RO5	M1	3
BFS-80436	MSc Thesis Biological Farming Systems	A	36	RO2	M2	1
CSA-80436	MSc Thesis Crop and Weed Ecology	A	36	RO3	M2	1
CSA-80936	MSc Thesis Crop Physiology	A	36	RO4	M2	1
PPS-80436	MSc Thesis Plant Production Systems	A	36	RO5	M2	1
BFS-70424	MSc Internship Biological Farming Systems	A	24	RO6	M2	1
BFS-80424	MSc Thesis Biological Farming Systems	A	24	RO6	M2	1
CSA-70424	MSc Internship Crop and Weed Ecology	A	24	RO6	M2	1
CSA-70924	MSc Internship Crop Physiology	A	24	RO6	M2	1
CSA-80424	MSc Thesis Crop and Weed Ecology	A	24	RO6	M2	1
CSA-80924	MSc Thesis Crop Physiology	A	24	RO6	M2	1
PPS-70424	MSc Internship Plant Production Systems	A	24	RO6	M2	1
PPS-80424	MSc Thesis Plant Production Systems	A	24	RO6	M2	1
HPC-20306	Physiology and Development of Plants in Horticulture	B	6	RO0	M1	1
HPC-22803	Concepts in Environmental Plant Physiology	B	3	RO0	M1	1
HPC-23303	Quantitative Aspects of Crop Production	B	3	RO0	M1	1
HPC-21306	Crop Ecology	B	6	RO0	M1	5
HPC-30806	Product Quality and Post-Harvest Physiology	B	6	RO1	M1	2
FTE-31306	Greenhouse Technology	B	6	RO1	M1	3
CSA-30806	Research Methods in Crop Science	B	6	RO1	M1	4
CSA-32306	Designing Sustainable Cropping Systems	B	6	RO1	M1	6
HPC-31306	Quality Analyses of Horticultural and other Plant Products	B	6	RO1	M1	6
HPC-30306	Hortonomy	B	6	RO2	M1	5
PPH-30306	Plant Cell and Tissue Culture	B	6	RO3	M1	5
HPC-80436	MSc Thesis Horticultural Production Chains	B	36	RO2	M2	1
PPH-80436	MSc Thesis Plant Physiology	B	36	RO3	M2	1
CSA-70924	MSc Internship Crop Physiology	B	24	RO4	M2	1
CSA-80924	MSc Thesis Crop Physiology	B	24	RO4	M2	1
ENT-70424	MSc Internship Entomology	B	24	RO4	M2	1
ENT-80424	MSc Thesis Entomology	B	24	RO4	M2	1
HPC-70424	MSc Internship Horticultural Production Chains	B	24	RO4	M2	1
HPC-80424	MSc Thesis Horticultural Production Chains	B	24	RO4	M2	1
PPH-70424	MSc Internship Plant Physiology	B	24	RO4	M2	1

Course code	Course name	Specialization	Credits	CS/RO	Year	Period
PPH-80424	MSc Thesis Plant Physiology	B	24	RO4	M2	1
PPS-70424	MSc Internship Plant Production Systems	B	24	RO4	M2	1
PPS-80424	MSc Thesis Plant Production Systems	B	24	RO4	M2	1
ENT-30306	Ecological Aspects of Bio-Interactions	C	6	RO1	M1	1
SOQ-31806	Nutrient Management	C	6	RO1	M1	5
CSA-32306	Designing Sustainable Cropping Systems	C	6	RO1	M1	6
CSA-31806	Grassland Science	C	6	RO2	M1	1
MAT-20306	Advanced Statistics	C	6	RO2	M1	1
PPS-30306	Quantitative Analysis of Land Use Systems (QUALUS)	C	6	RO2	M1	3
CSA-30806	Research Methods in Crop Science	C	6	RO2	M1	4
PPS-30806	Quantitative Analysis of Cropping and Grassland Systems	C	6	RO2	M1	5
BFS-30806	Organic Plant Production	C	6	RO3	M1	5
CSA-30806	Research Methods in Crop Science	C	6	RO4	M1	4
CSA-30306	Advanced Crop Physiology	C	6	RO5	M1	2
PPS-30306	Quantitative Analysis of Land Use Systems (QUALUS)	C	6	RO6	M1	3
BFS-80436	MSc Thesis Biological Farming Systems	C	36	RO3	M2	1
CSA-80436	MSc Thesis Crop and Weed Ecology	C	36	RO4	M2	1
CSA-80936	MSc Thesis Crop Physiology	C	36	RO5	M2	1
PPS-80436	MSc Thesis Plant Production Systems	C	36	RO6	M2	1
BFS-70424	MSc Internship Biological Farming Systems	C	24	RO7	M2	1
BFS-80424	MSc Thesis Biological Farming Systems	C	24	RO7	M2	1
CSA-70424	MSc Internship Crop and Weed Ecology	C	24	RO7	M2	1
CSA-70924	MSc Internship Crop Physiology	C	24	RO7	M2	1
CSA-80424	MSc Thesis Crop and Weed Ecology	C	24	RO7	M2	1
CSA-80924	MSc Thesis Crop Physiology	C	24	RO7	M2	1
PPS-70424	MSc Internship Plant Production Systems	C	24	RO7	M2	1
PPS-80424	MSc Thesis Plant Production Systems	C	24	RO7	M2	1
MAT-20306	Advanced Statistics	D	6	RO0	M1	1
PHP-20806	Fundamentals of Plant Breeding, Plant Pathology and Entomology	D	6	RO0	M1	1
PBR-21803	Plant Breeding:: Basic Concepts and their Applications	D	3	RO0	M1	4
ABG-30306	Genomics	D	6	RO1	M1	1
INF-21306	Data Management	D	6	RO1	M1	1
ABG-30806	Modern Statistics for the Life Sciences	D	6	RO1	M1	5
PBR-30306	Quality and Quantitative Aspects in Breeding	D	6	RO1	M1	5
GEN-30806	Population and Quantitative Genetics	D	6	RO1	M1	6
PBR-30806	Design of Plant Breeding Programmes	D	6	RO2	M1	6
GEN-30806	Population and Quantitative Genetics	D	6	RO3	M1	6
PBR-80436	MSc Thesis Plant Breeding	D	36	RO2	M2	1
GEN-80436	MSc Thesis Genetics	D	36	RO3	M2	1
BIF-70324	MSc Internship Bioinformatics	D	24	RO4	M2	1
BIF-80324	MSc Thesis Bioinformatics	D	24	RO4	M2	1
BIS-70424	MSc Internship Biosystematics	D	24	RO4	M2	1
BIS-80424	MSc Thesis Biosystematics	D	24	RO4	M2	1
ENT-70424	MSc Internship Entomology	D	24	RO4	M2	1
ENT-80424	MSc Thesis Entomology	D	24	RO4	M2	1
GEN-70424	MSc Internship Genetics	D	24	RO4	M2	1
GEN-80424	MSc Thesis Genetics	D	24	RO4	M2	1

Course code	Course name	Specialization	Credits	CS/RO	Year	Period
MOB-70424	MSc Internship Molecular Biology	D	24	RO4	M2	1
MOB-80424	MSc Thesis Molecular Biology	D	24	RO4	M2	1
NEM-70424	MSc Internship Nematology	D	24	RO4	M2	1
NEM-80424	MSc Thesis Nematology	D	24	RO4	M2	1
PBR-70424	MSc Internship Plant Breeding	D	24	RO4	M2	1
PBR-80424	MSc Thesis Plant Breeding	D	24	RO4	M2	1
PCB-70424	MSc Internship Plant Cell Biology	D	24	RO4	M2	1
PCB-80424	MSc Thesis Plant Cell Biology	D	24	RO4	M2	1
PHP-70424	MSc Internship Phytopathology	D	24	RO4	M2	1
PHP-80424	MSc Thesis Phytopathology	D	24	RO4	M2	1
PPH-70424	MSc Internship Plant Physiology	D	24	RO4	M2	1
PPH-80424	MSc Thesis Plant Physiology	D	24	RO4	M2	1
VIR-70424	MSc Internship Virology	D	24	RO4	M2	1
VIR-80424	MSc Thesis Virology	D	24	RO4	M2	1
HPC-23303	Quantitative Aspects of Crop Production	E	3	RO0	M1	1
PHP-20806	Fundamentals of Plant Breeding, Plant Pathology and Entomology	E	6	RO0	M1	1
NEM-21803	Plant Diseases and Immunity: Basic Concepts and their Applications	E	3	RO0	M1	4
HPC-21306	Crop Ecology	E	6	RO0	M1	5
ENT-30306	Ecological Aspects of Bio-interactions	E	6	RO1	M1	1
MOB-20306	Gene Technology	E	6	RO1	M1	1
PHP-30806	Molecular Aspects of Bio-interactions	E	6	RO1	M1	2
CSA-30806	Research Methods in Crop Science	E	6	RO2	M1	4
ENT-30806	Fundamental and Applied Aspects of the Biology of Insects	E	6	RO3	M1	1
NEM-30306	Host-Parasite Interactions	E	6	RO4	M1	1
PHP-30306	Plant-Microbe Interactions	E	6	RO5	M1	6
VIR-30806	Fundamental and Applied Virology	E	6	RO6	M1	4
CSA-80436	MSc Thesis Crop and Weed Ecology	E	36	RO2	M2	1
ENT-80436	MSc Thesis Entomology	E	36	RO3	M2	1
NEM-80436	MSc Thesis Nematology	E	36	RO4	M2	1
PHP-80436	MSc Thesis Phytopathology	E	36	RO5	M2	1
VIR-80436	MSc Thesis Virology	E	36	RO6	M2	1
CSA-70424	MSc Internship Crop and Weed Ecology	E	24	RO7	M2	1
CSA-80424	MSc Thesis Crop and Weed Ecology	E	24	RO7	M2	1
ENT-70424	MSc Internship Entomology	E	24	RO7	M2	1
ENT-80424	MSc Thesis Entomology	E	24	RO7	M2	1
NEM-70424	MSc Internship Nematology	E	24	RO7	M2	1
NEM-80424	MSc Thesis Nematology	E	24	RO7	M2	1
PBR-70424	MSc Internship Plant Breeding	E	24	RO7	M2	1
PBR-80424	MSc Thesis Plant Breeding	E	24	RO7	M2	1
PHP-70424	MSc Internship Phytopathology	E	24	RO7	M2	1
PHP-80424	MSc Thesis Phytopathology	E	24	RO7	M2	1
VIR-70424	MSc Internship Virology	E	24	RO7	M2	1
VIR-80424	MSc Thesis Virology	E	24	RO7	M2	1

4C.1. Overview of the master curriculum in Plant Biotechnology

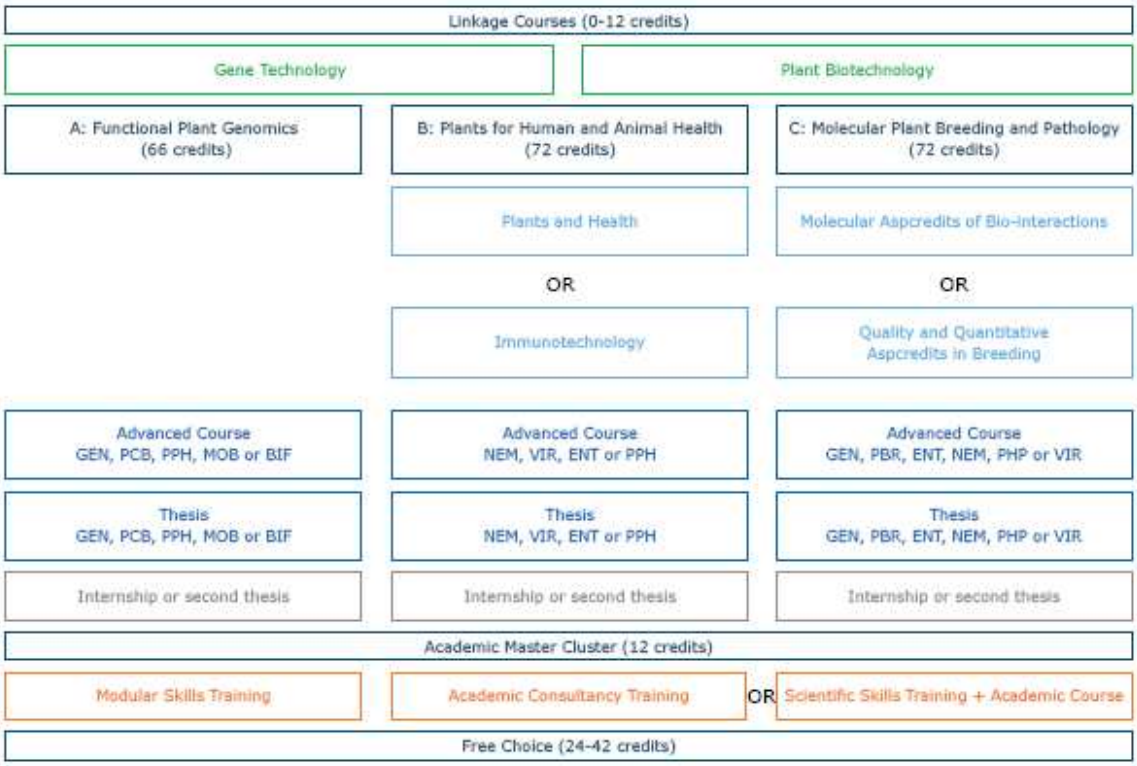


Figure 1 Curriculum structure.
linkage courses; courses of the specialization; cluster of advanced course and thesis;
internship or second thesis; courses of the Academic Master Cluster.
For abbreviations see Table 2.

4C.2. Overview of courses in the master programme in Plant Biotechnology

Course code	Course name	Specialization	Credits	CS/RO	Year	Period
MOB-20306	Gene Technology		6	RO0	M1	1
GEN-20806	Plant Biotechnology		6	RO0	M1	2
YMC-61303	Scientific Skills Training		3	RO1	M1	1
YMC-60303	Modular Skills Training (MOS)		3	CS	M1/2	1
YMC-60809	Academic Consultancy Training		9	RO1	M1/2	1
ABG-30306	Genomics	A	6	RO1	M1	1
PCB-30306	Cell Biology and Advanced Imaging Technologies	A	6	RO2	M1	2
MOB-30806	Regulation of Plant Development	A	6	RO2	M1	5
MOB-30806	Regulation of Plant Development	A	6	RO3	M1	5
PPH-30306	Plant Cell and Tissue Culture	A	6	RO3	M1	5
ABG-30306	Genomics	A	6	RO4	M1	1
MOB-30806	Regulation of Plant Development	A	6	RO4	M1	5
BIF-30806	Advanced Bioinformatics	A	6	RO5	M1	4
GEN-80436	MSc Thesis Genetics	A	36	RO1	M2	1
PCB-80436	MSc Thesis Plant Cell Biology	A	36	RO2	M2	1
PPH-80436	MSc Thesis Plant Physiology	A	36	RO3	M2	1
MOB-80436	MSc Thesis Molecular Biology	A	36	RO4	M2	1
BIF-80336	MSc Thesis Bioinformatics	A	36	RO5	M2	1
BIF-70324	MSc Internship Bioinformatics	A	24	RO6	M2	1
BIF-80324	MSc Thesis Bioinformatics	A	24	RO6	M2	1
ENT-70424	MSc Internship Entomology	A	24	RO6	M2	1
ENT-80424	MSc Thesis Entomology	A	24	RO6	M2	1
GEN-70424	MSc Internship Genetics	A	24	RO6	M2	1
GEN-80424	MSc Thesis Genetics	A	24	RO6	M2	1
MOB-70424	MSc Internship Molecular Biology	A	24	RO6	M2	1
MOB-80424	MSc Thesis Molecular Biology	A	24	RO6	M2	1
NEM-70424	MSc Internship Nematology	A	24	RO6	M2	1
NEM-80424	MSc Thesis Nematology	A	24	RO6	M2	1
PBR-70424	MSc Internship Plant Breeding	A	24	RO6	M2	1
PBR-80424	MSc Thesis Plant Breeding	A	24	RO6	M2	1
PCB-70424	MSc Internship Plant Cell Biology	A	24	RO6	M2	1
PCB-80424	MSc Thesis Plant Cell Biology	A	24	RO6	M2	1
PHP-70424	MSc Internship Phytopathology	A	24	RO6	M2	1
PHP-80424	MSc Thesis Phytopathology	A	24	RO6	M2	1
PPH-70424	MSc Internship Plant Physiology	A	24	RO6	M2	1
PPH-80424	MSc Thesis Plant Physiology	A	24	RO6	M2	1
VIR-70424	MSc Internship Virology	A	24	RO6	M2	1
VIR-80424	MSc Thesis Virology	A	24	RO6	M2	1
NEM-31806	Plants and Health	B		RO1	M1	3
CBI-30806	Immunotechnology	B		RO1	M1	5
NEM-30306	Host-Parasite Interactions	B		RO2	M1	1
VIR-30806	Fundamental and Applied Virology	B		RO3	M1	4
ENT-30806	Fundamental and Applied Aspects of the Biology of Insects	B		RO4	M1	1
PPH-30306	Plant Cell and Tissue Culture	B		RO5	M1	5

Course code	Course name	Specialization	Credits	CS/RO	Year	Period
NEM-80436	MSc Thesis Nematology	B		RO2	M2	1
VIR-80436	MSc Thesis Virology	B		RO3	M2	1
ENT-80436	MSc Thesis Entomology	B		RO4	M2	1
PPH-80436	MSc Thesis Plant Physiology	B		RO5	M2	1
ENT-70424	MSc Internship Entomology	B		RO6	M2	1
ENT-80424	MSc Thesis Entomology	B		RO6	M2	1
NEM-70424	MSc Internship Nematology	B		RO6	M2	1
NEM-80424	MSc Thesis Nematology	B		RO6	M2	1
PPH-70424	MSc Internship Plant Physiology	B		RO6	M2	1
PPH-80424	MSc Thesis Plant Physiology	B		RO6	M2	1
VIR-70424	MSc Internship Virology	B		RO6	M2	1
VIR-80424	MSc Thesis Virology	B		RO6	M2	1
PHP-30806	Molecular Aspects of Bio-interactions	C		RO1	M1	2
PBR-30306	Quality and Quantitative Aspects in Breeding	C		RO1	M1	5
ABG-30306	Genomics	C		RO2	M1	1
PBR-30306	Quality and Quantitative Aspects in Breeding	C		RO3	M1	5
ENT-30806	Fundamental and Applied Aspects of the Biology of Insects	C		RO4	M1	1
NEM-30306	Host-Parasite Interactions	C		RO5	M1	1
PHP-30306	Plant-Microbe Interactions	C		RO6	M1	6
VIR-30806	Fundamental and Applied Virology	C		RO7	M1	4
GEN-80436	MSc Thesis Genetics	C		RO2	M2	1
PBR-80436	MSc Thesis Plant Breeding	C		RO3	M2	1
ENT-80436	MSc Thesis Entomology	C		RO4	M2	1
NEM-80436	MSc Thesis Nematology	C		RO5	M2	1
PHP-80436	MSc Thesis Phytopathology	C		RO6	M2	1
VIR-80436	MSc Thesis Virology	C		RO7	M2	1
BIF-70324	MSc Internship Bioinformatics	C		RO8	M2	1
BIF-80324	MSc Thesis Bioinformatics	C		RO8	M2	1
ENT-70424	MSc Internship Entomology	C		RO8	M2	1
ENT-80424	MSc Thesis Entomology	C		RO8	M2	1
GEN-70424	MSc Internship Genetics	C		RO8	M2	1
GEN-80424	MSc Thesis Genetics	C		RO8	M2	1
MOB-70424	MSc Internship Molecular Biology	C		RO8	M2	1
MOB-80424	MSc Thesis Molecular Biology	C		RO8	M2	1
NEM-70424	MSc Internship Nematology	C		RO8	M2	1
NEM-80424	MSc Thesis Nematology	C		RO8	M2	1
PBR-70424	MSc Internship Plant Breeding	C		RO8	M2	1
PBR-80424	MSc Thesis Plant Breeding	C		RO8	M2	1
PCB-70424	MSc Internship Plant Cell Biology	C		RO8	M2	1
PCB-80424	MSc Thesis Plant Cell Biology	C		RO8	M2	1
PHP-70424	MSc Internship Phytopathology	C		RO8	M2	1
PHP-80424	MSc Thesis Phytopathology	C		RO8	M2	1
PPH-70424	MSc Internship Plant Physiology	C		RO8	M2	1
PPH-80424	MSc Thesis Plant Physiology	C		RO8	M2	1
VIR-70424	MSc Internship Virology	C		RO8	M2	1
VIR-80424	MSc Thesis Virology	C		RO8	M2	1

4D.1. Overview of the master curriculum in Organic Agriculture

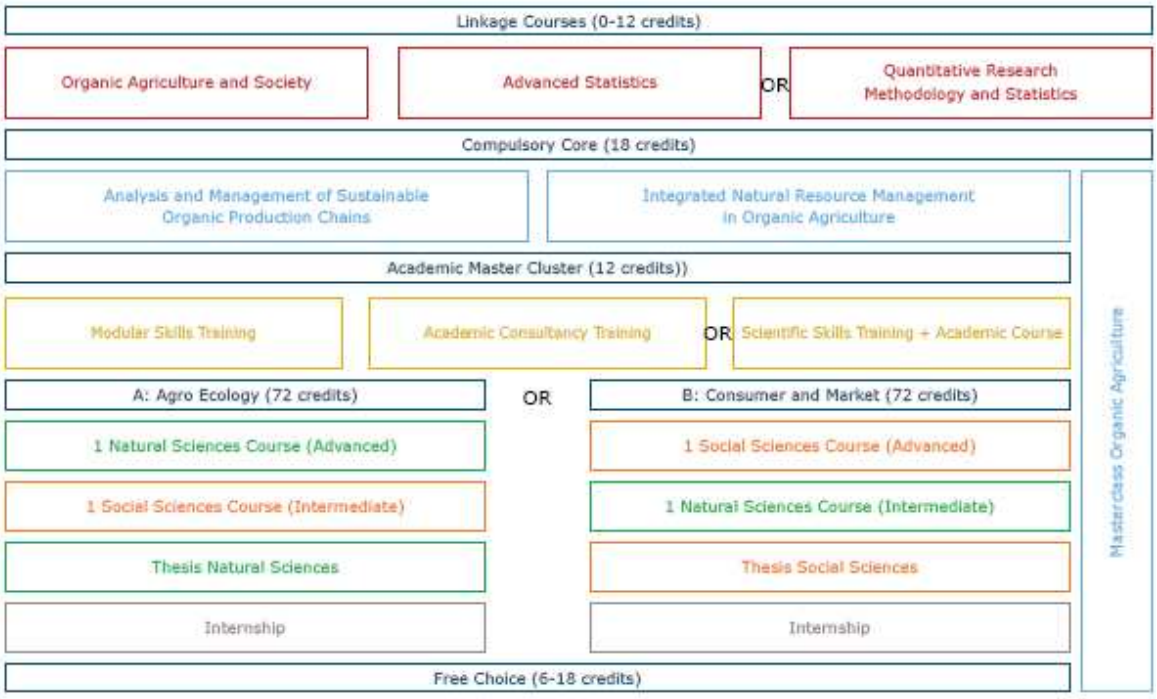


Figure 1 Curriculum structure.

linkage courses (Advanced Statistics is required for specialization A; Quantitative Research Methodology and Statistics for specialization B); courses of the compulsory core; courses of the Academic Master Cluster; natural sciences elements; social sciences elements; internship.

4D.2. Overview of courses in the master programme in Organic Agriculture

Course code	Course name	Specialization	Credits	CS/RO	Year	Period
CSA-31306	Masterclass Organic Agriculture		6	CS	M1	1
SOQ-33306	Integrated Natural Resource Management in Organic Agriculture		6	CS	M1	2
YPS-30306	Analysis and Management of Sustainable Organic Production Chains		6	CS	M1	2
BFS-21306	Organic Agriculture and Society		6	RO0	M1	1
MAT-20306	Advanced Statistics		6	RO0	M1	1
MAT-22306	Quantitative Research Methodology and Statistics		6	RO0	M1	3
YMC-61303	Scientific Skills Training		3	RO1	M1	1
YMC-60303	Modular Skills Training (MOS)		3	CS	M1/2	1
YMC-60809	Academic Consultancy Training		9	RO1	M1/2	1
CSA-31806	Grassland Science	A	6	RO1	M1	1
ENT-30306	Ecological Aspects of Bio-interactions	A	6	RO1	M1	1
PPS-30306	Quantitative Analysis of Land Use Systems (QUALUS)	A	6	RO1	M1	3
APS-20806	Systems Approach in Animal Sciences	A	6	RO1	M1	4
CSA-30806	Research Methods in Crop Science	A	6	RO1	M1	4
APS-30306	Sustainable Development of Animal Systems: Issues and Options	A	6	RO1	M1	5
BFS-30806	Organic Plant Production	A	6	RO1	M1	5
SOQ-31806	Nutrient Management	A	6	RO1	M1	5
APS-31306	Future Livestock Systems	A	6	RO1	M1	6
BFS-30306	Analysis and Design of Organic Farming Systems	A	6	RO1	M1	6
AEP-20306	Economics of Agribusiness	A	6	RO2	M1	1
AEP-31306	Rural Economic Analysis	A	6	RO2	M1	3
MST-21306	Advanced Management and Marketing	A	6	RO2	M1	3
ENP-31806	Globalization and Sustainability of Food Production and Consumption	A	6	RO2	M1	4
MCB-30306	Consumer Behaviour: Concepts and Research Methods	A	6	RO2	M1	4
RDS-30806	Governance, Livelihoods and Resources	A	6	RO2	M1	5
RSO-21306	Policy, People and Resources in Comparative Perspective	A	6	RO2	M1	5
RSO-30806	The Sociology of Farming and Rural Life	A	6	RO2	M1	5
TAD-30806	Technography, Researching Technology and Development	A	6	RO2	M1	5
BEC-30306	Advanced Agricultural Business Economics	A	6	RO2	M1	6
ECS-31806	Applied Environmental Education and Communication	A	6	RO2	M1	6
MCB-31306	Selected Themes in Marketing and Consumer Behaviour	A	6	RO2	M1	6
APS-80436	MSc Thesis Animal Production Systems	A	36	RO3	M2	1
BFS-80436	MSc Thesis Biological Farming Systems	A	36	RO3	M2	1
CSA-80436	MSc Thesis Crop and Weed Ecology	A	36	RO3	M2	1
ENT-80436	MSc Thesis Entomology	A	36	RO3	M2	1
PPS-80436	MSc Thesis Plant Production Systems	A	36	RO3	M2	1
SOQ-81836	MSc Thesis Soil Biology and Biological Soil Quality	A	36	RO3	M2	1
AEP-70424	MSc Internship Agricultural Economics and Rural Policy	A	24	RO4	M2	1
APS-70424	MSc Internship Animal Production Systems	A	24	RO4	M2	1
BEC-70424	MSc Internship Business Economics	A	24	RO4	M2	1
BFS-70424	MSc Internship Biological Farming Systems	A	24	RO4	M2	1
CSA-70424	MSc Internship Crop and Weed Ecology	A	24	RO4	M2	1
ECS-70424	MSc Internship Educational Studies	A	24	RO4	M2	1
ENP-70424	MSc Internship Environmental Policy	A	24	RO4	M2	1
ENT-70424	MSc Internship Entomology	A	24	RO4	M2	1
MCB-70424	MSc Internship Marketing and Consumer Behaviour	A	24	RO4	M2	1

Course code	Course name	Specialization	Credits	CS/RO	Year	Period
PPS-70424	MSc Internship Plant Production Systems	A	24	RO4	M2	1
RDS-70424	MSc Internship Rural Development Sociology	A	24	RO4	M2	1
RSO-70424	MSc Internship Rural Sociology	A	24	RO4	M2	1
SOQ-70424	MSc Internship Soil Quality	A	24	RO4	M2	1
TAD-70424	MSc Internship Technology and Agrarian Development	A	24	RO4	M2	1
AEP-20306	Economics of Agribusiness	B	6	RO1	M1	1
AEP-31306	Rural Economic Analysis	B	6	RO1	M1	3
MST-21306	Advanced Management and Marketing	B	6	RO1	M1	3
ENP-31806	Globalization and Sustainability of Food Production and Consumption	B	6	RO1	M1	4
MCB-30306	Consumer Behaviour: Concepts and Research Methods	B	6	RO1	M1	4
RDS-30806	Governance, Livelihoods and Resources	B	6	RO1	M1	5
RSO-21306	Policy, People and Resources in Comparative Perspective	B	6	RO1	M1	5
RSO-30806	The Sociology of Farming and Rural Life	B	6	RO1	M1	5
TAD-30806	Technography, Researching Technology and Development	B	6	RO1	M1	5
BEC-30306	Advanced Agricultural Business Economics	B	6	RO1	M1	6
ECS-31806	Applied Environmental Education and Communication	B	6	RO1	M1	6
MCB-31306	Selected Themes in Marketing and Consumer Behaviour	B	6	RO1	M1	6
CSA-31806	Grassland Science	B	6	RO2	M1	1
ENT-30306	Ecological Aspects of Bio-interactions	B	6	RO2	M1	1
PPS-30306	Quantitative Analysis of Land Use Systems (QUALUS)	B	6	RO2	M1	3
APS-20806	Systems Approach in Animal Sciences	B	6	RO2	M1	4
CSA-30806	Research Methods in Crop Science	B	6	RO2	M1	4
APS-30306	Sustainable Development of Animal Systems: Issues and Options	B	6	RO2	M1	5
BFS-30806	Organic Plant Production	B	6	RO2	M1	5
SOQ-31806	Nutrient Management	B	6	RO2	M1	5
APS-31306	Future Livestock Systems	B	6	RO2	M1	6
BFS-30306	Analysis and Design of Organic Farming Systems	B	6	RO2	M1	6
AEP-80436	MSc Thesis Agricultural Economics and Rural Policy	B	36	RO3	M2	1
BEC-80436	MSc Thesis Business Economics	B	36	RO3	M2	1
ECS-80436	MSc Thesis Educational Studies	B	36	RO3	M2	1
ENP-80436	MSc Thesis Environmental Policy	B	36	RO3	M2	1
MCB-80436	MSc Thesis Marketing and Consumer Behaviour	B	36	RO3	M2	1
RDS-80436	MSc Thesis Rural Development Sociology	B	36	RO3	M2	1
RSO-80436	MSc Thesis Rural Sociology	B	36	RO3	M2	1
TAD-80436	MSc Thesis Technology and Agrarian Development	B	36	RO3	M2	1
AEP-70424	MSc Internship Agricultural Economics and Rural Policy	B	24	RO4	M2	1
APS-70424	MSc Internship Animal Production Systems	B	24	RO4	M2	1
BEC-70424	MSc Internship Business Economics	B	24	RO4	M2	1
BFS-70424	MSc Internship Biological Farming Systems	B	24	RO4	M2	1
CSA-70424	MSc Internship Crop and Weed Ecology	B	24	RO4	M2	1
ECS-70424	MSc Internship Educational Studies	B	24	RO4	M2	1
ENP-70424	MSc Internship Environmental Policy	B	24	RO4	M2	1
ENT-70424	MSc Internship Entomology	B	24	RO4	M2	1
MCB-70424	MSc Internship Marketing and Consumer Behaviour	B	24	RO4	M2	1
PPS-70424	MSc Internship Plant Production Systems	B	24	RO4	M2	1
RDS-70424	MSc Internship Rural Development Sociology	B	24	RO4	M2	1
RSO-70424	MSc Internship Rural Sociology	B	24	RO4	M2	1
SOQ-70424	MSc Internship Soil Quality	B	24	RO4	M2	1
TAD-70424	MSc Internship Technology and Agrarian Development	B	24	RO4	M2	1

Appendix 5: Quantitative data regarding the programmes

Data on intake, transfers and graduation

Success rates for the bachelor programme in Plant Sciences

Cohort	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Size at the outset	11	6	17	14	18	20	23	29
Size of re-enrolment T+1	*10*	*4*	*14*	*12*	*16*	*18*	*20*	
Diploma after 3 years (%)	0	25	7	0	38			
Diploma after 4 years (%)	20	50	36	33				
Diploma after 5 years (%)	30	75	64					
Diploma after 6 years (%)	30	100						
Diploma after 7 years (%)	90							
Diploma after 8 years (%)	*10*	*0*	*7*	*25*	*0*	*11*		

Success rates for the master programme in Plant Sciences

Cohort	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Size at the outset	30	33	48	40	43	55	69	95
Diploma after 2 years (%)	80	73	67	68	77	69		
Diploma after 3 years (%)	93	85	88	90	95			
Diploma after 4 years (%)	93	85	88	93				
Diploma after 5 years (%)	*7*	*15*	*13*	*8*	*5*	*9*	*3*	

Success rates for the master programme in Plant Biotechnology

Cohort	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Size at the outset	7	9	13	5	10	18	18	24
Diploma after 2 years (%)	57	56	59	80	40	56		
Diploma after 3 years (%)	86	78	92	80	100			
Diploma after 4 years (%)	86	78	100	80				
Diploma after 5 years (%)	*14*	*22*	*0*	*20*	*0*	*0*	*11*	

Success rates for the master programme in Organic Agriculture

Cohort	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Size at the outset	11	12	17	25	15	13	23	32
Diploma after 2 years (%)	64	42	76	44	60	54		
Diploma after 3 years (%)	82	67	82	52	87			
Diploma after 4 years (%)	82	75	82	64				
Diploma after 5 years (%)	82	83	82					
Diploma after 6 years (%)	*18*	*17*	*18*	*24*	*7*	*0*	*4*	

Teacher-student ratio achieved

For Wageningen University the average student/staff ratio lies between 5 and 12.5 for bachelor programmes, and between 5.5 and 10 for master programmes.

For the bachelor programme in Plant Sciences the student/staff ratio is 5.1
For the master programme in Plant Sciences the student/staff ratio is 6.8.
For the master programme in Plant Biotechnology the student/staff ratio is 6.1.
For the master programme in Organic Agriculture the student/staff ratio is 5.4.

Average amount of face-to-face instruction per stage of the study programme

Number of programmed contact hours

Contact Hours	Bachelor in Plant Sciences	Master in Plant Sciences	Master in Plant Biotech.	Master in Organic Agric.
Year 1	825 (49%)	680 (40%)	609 (36%)	620 (37%)
Year 2	746 (44%)	112 (7%) or 160 (10%)*	112 (7%) or 160 (10%)*	112 (7%)
Year 3	642 (38)	NA	NA	NA

* Depending on the choice between an academic internship (112 hours) or a second thesis (160 hours)

Appendix 6: Programme of the site visit

Programme for Kick-off meeting, 21 February: Common part of critical reflections

09.00 09.15	**Welcome by the Rector and the Director of the EI**[1]
09.15-11.00	**Preparatory meeting of assessment panel**
11.00-12.15	**General management programmes**:
	P. (Paulien) Poelarends (member, Board of the EI)
	R.A. (Rosella) Koning (member, Board of the EI)
	Prof. T.W.M. (Thom) Kuyper (member, Board of the EI)
	Prof. L.E. (Leontine) Visser (member, Board of the EI)
	Prof. E.W. (Pim)Brascamp (Director of the EI)
	J.J. (Jan) Steen (Quality assurance and enhancement officer)
12.15-12.45	Lunch
12.45-13.30	**Study Advisers:**
	Dr. A.E.M. (Anja) Janssen (BSc and MSc Food Technology, Food Safety, Food Quality Management)
	C.M. (Neeltje) van Hulten (BSc and MSc Agriculture and Bioresource Engineering)
	C.Q.J.M. (Stijn) Heukels (BSc and MSc Landscape Architecture and Planning)
	W.T. (Willy) ten Haaf (MSc Geo-Information Science)
	Dr. W. (Wouter) Hazeleger (MSc Animal Sciences) [not present]
	R.N.M. (Gineke) Boven (BSc Management and Consumer Studies)
13.30-14.30	**Examining boards**:
	Dr. P.B.M. (Paul) Berentsen (secretary, EB[2] Social Sciences)
	Dr. M.C.R. (Maurice) Franssen (secretary, EB Technology and Nutrition)
	C.P.G.M. (Lisette) de Groot (chair, EB Technology and Nutrition)
	Dr. D. (Dick) van der Hoek (secretary, EB Environment and Landscape)
	Dr. K. (Klaas) Swart (secretary, EB Life Sciences)
	Prof. W (Willem) Takken (chair, EB Life Sciences)
14.30-14.45	Break
14.45-15.45	**Lecturers of Programme Committees:**
	Dr. A.J.B. (Ton) van Boxtel (Biotechnology and Bioinformatics)
	Dr. J. (Jan) den Ouden (Forest and Nature Conservation)
	Dr. K.B.M. (Karin) Peters (Leisure, Tourism and Environment)
	Dr. W.A.H. (Walter) Rossing (Organic Agriculture)
	Dr. R. (Rico) Lie (International Development Studies)
	Dr. W.T. (Wilma) Steegenga (Nutrition and Health)
15.45-17.15	**Meeting of assessment panel**: evaluation and first findings
17.15-18.00	**Graduates**:
	Francesco Cecchi, MSc (MSc International Development Studies)
	Prof. Charlotte de Fraiture (MSc International Land and Water Management)
	Dr. Dinand Ekkel (MSc Animal Sciences)
	Loes Mertens (MSc Organic Agriculture)
	M. Visser (MSc Forest and Nature Conservation)

[1] EI = Education Institute
[2] EB = Examining Board

Programme for site visit in Plant Sciences – 18 and 19 April 2012

Day 1

12.30 – 13.30	**Management BPW MPS MPB** **Dr. G.J. (Anja) Kuipers Study adviser BPW** Dr.ir. U. (Uulke) van Meeteren **Dr.ir. A. (Arjen) Schots Study adviser BPW**
13.30 – 13.45	**Break**
13.45 – 14.45	**Students BPW MPS** C.A. (Cosmas) Broek E. (Eva) Goudsmit B. (Bart) Terra J.G. (Janneke) Grit V.A. (Viktor) Valk L. (Lisanne) Schuddebeurs D. (Daowei) Yang A.P. (Adrien) Rochette X (Xiaoxue) Sun
14.45 – 15.45	**Lecturers BPW MPS** Dr.ir. C.A. (Chris) Maliepaard Dr.ir. B.P.H.J. (Bart) Thomma Dr.ir. A.(Aska) Goverse Dr.ir.L. (Lammert) Bastiaans Dr.ir. G.W.J. (Gerrie) van de Ven Dr.ir. E. (Ep) Heuvelink Prof.dr.ir. M.K. (Martin) van Ittersum Dr.ir. P.A. (Peter) Leffelaar Dr.ir. J. (Jan) Vos
16.00 – 16.45	**Students MPB** S. (Sonja) Warmerdam K.G.R. (Kelly) Heckman J.S. (Jeroen) Stellingwerf L. (Lorenzo) Locci A. (Andreas) Pallidis
16.45 – 17.45	**Lecturers MPB** **Dr. A.B. (Guusje) Bonnema Study adviser MPB and MPS** Dr. M.G.M. (Mark) Aarts Dr. J.H.S.G.M. Hans de Jong Dr. J.A.L. Jan van Kan Dr.ir. G. Geert Smant
17.30 – 17.45	**Break**
17.45 – 18.30	Programme Committee (students) BPW MPS MPB C.Z. (Marloes) van Wijk R.F. (Rachel) Begheyn M. (Menno) van der Zweep W.J. (Wietske) van der Starre

Day 2

9.00 – 9.45	**Management MOA** Dr. G.J. (Anja) Kuipers Prof.dr.ir. A.E.J. (Arjen) Wals Prof.dr.ir. E.T. (Edith) Lammerts van Bueren
9.45 – 10.00	**Break**
10.00 – 1045	**Students MOA** J.C. (Juliette) Prazak G.D. (Grace) Docuyanan E. (Egle) Draugelyte C. (Christine) Bickelhaupt J.K. (Jan Klaas) Santing N.J. (Natalie) Oram
10.45 – 11.30	**Lecturers MOA** Ir.ing. H.J. (Hansje) Eppink Ir. H.A. (Henk) Oostindie Dr.ir. W.A.H. (Walter) Rossing **Drs. C.A. (Cor) Langeveld Study adviser MOA MPS** M.J.J. (Martine) Hoogsteen MSc
11.45 – 12.15	**Programme Committee (students) MOA** N.M. (Nynke) Lobregt N. (Natasja) Poot B. (Blair) van Pelt K. (Kirt) Hainzer Dr.ir. W.A.H. (Walter) Rossing
13.45 – 14.45	**Final meeting with management** Dr. G.J. (Anja) Kuipers Dr.ir. U. (Uulke) van Meeteren Dr.ir. A. (Arjen) Schots Prof.dr.ir. A.E.J. (Arjen) Wals Prof.dr.ir. E.T. (Edith) Lammerts van Bueren

Appendix 7: Theses and documents studied by the committee

Prior to the site visit, the committee studied the theses of the students with the following student numbers:

Bachelor programme in Plant Sciences	Master Programme in Plant Sciences
891125462110	750901824010
890124748110	780620513010
880517103050	840719650030
870423575060	860101515130
881024928030	880602893040
881230169040	840622045120
851109204010	851215759030
870110889050	850115663020
850611586110	810527987100
851216834130	840824989030
841203129130	861130217090
881018528130	850327831080

Master programme in Plant Biotechnology	Master programme in Organic Agriculture
740228184020	860927987010
800507416020	810102544030
820302119130	831002357120
820612584090	821130540100
860608560110	840823535110
770406543010	810228896100
790419156020	760920181060
870413759020	830206599040
850906238130	850926614070
830625686020	831006682090

During the site visit, the committee studied the following documents (partly as hard copies, partly via the institute's electronic learning environment):

- Reports of consultations with relevant committees / organs (programme committee and examinations committee, relevant ad-hoc committees);
- Examination tasks with associated evaluation criteria and standard (answer keys) and a representative selection of completed examinations (presentations, internship and/or research reports, portfolios, etc.) and their evaluations;
- List of required literature;
- Summary and analysis of recent evaluation results and relevant management information;
- Thesis regulations and guidelines for preparing projects;
- Internship regulations/handbooks;
- Course, staff and curriculum evaluations, student satisfaction survey(s), etc.;
- Alumni/exit questionnaires;
- Material about the student associations;
- Documentation on teaching staff satisfaction.

Appendix 8: Declarations of independence

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: FRANS ZWARTS

HOME ADDRESS: PETRUS CAMPERSINGEL 253
9713 AP GRONINGEN

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / ~~SECRETARY~~:

LIFE SCIENCES, SEE ATTACHMENT

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

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nederlands - vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Wageningen DATE: March 30, 2012

SIGNATURE:

2

Bijlage bij onafhankelijkheidsverklaring

Visitatiebezoek	Opleiding (CROHO-nummer):	Variant:
A. Food Technology	B Levensmiddelentechnologie (BLT; 56973)	Voltijd
	M Food Safety (MFS; 60112)	Voltijd
	M Food Technology (MLT; 66973)	Voltijd
	M Food Quality Management (MQ; 60109)	Voltijd
B. Biotechnology en Bio-Informatics	B Biotechnologie (BBT; 56841)	Voltijd
	M Biotechnology (MBT; 66841)	Voltijd
	M Bioinformatics (MBF; 60106)	Voltijd
C. Agricultural and Bioresource Engineering	B Agrotechnologie (BAT; 56831)	Voltijd
	M Agricultural and Bioresource Engineering (MAB; 66831)	Voltijd
D. Forest and Nature conservation	B Bos- en Natuurbeheer (BBN; 56219)	Voltijd
	M Forest and Nature Conservation (MFN; 66219)	Voltijd
E. International Land and Water Management	B Internationaal Land- en Waterbeheer (BIL; 50100)	Voltijd
	M International Land and Water Management (MIL; 60104)	Voltijd
F. Landscape, Architecture and Planning	B Landschapsarchitectuur en ruim. Planning (BLP; 56848)	Voltijd
	M Landscape, Architecture and Planning (MLP; 66848)	Voltijd
G. Leisure, Tourism and Environment	M Leisure, Tourism and Environment (MLE; 60111)	Voltijd
H. Geo-Information Science	M Geo-Information Science (MGI; 60108)	Voltijd
I. Plant Sciences	B Planterwetenschappen (BPW; 56835)	Voltijd
	M Plant Sciences (MPS; 66835)	Voltijd
	M Organic Agriculture (MOA; 66300)	Voltijd
	M Plant Biotechnology (MPB; 60105)	Voltijd
J. Animal Sciences	B Dierwetenschappen (BDW; 56849)	Voltijd
	M Animal Sciences (MAS; 66849)	Voltijd
K. Climate Studies	M Climate Studies (MCL; 60107)	Voltijd
L. International Development Studies	B Internationale Ontwikkelingsstudies (BIN; 56837)	Voltijd
	M International Development Studies (MID; 66837)	Voltijd
	M Development and Rural Innovation (MDR; 60103)	Voltijd
M. Management, Economics and Consumer Studies	B Bedrijfs- en Consumentenwetenschappen (BBC; 56836)	Voltijd
	M Management, Economics and Consumer Studies (MME; 66836)	Voltijd
N. Nutrition and Health	B Voeding en Gezondheid (BVG; 56868)	Voltijd
	M Nutrition and Health (MNH; 66868)	Voltijd

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: RENATE PRENEN

HOME ADDRESS: Simon Stevinweg 21
1401 TB Bussum

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / ~~SECRETARY~~:

LIFE SCIENCES - SEE ATTACHMENT

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

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HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Wageningen DATE: 29-03-'12

SIGNATURE:

Bijlage bij onafhankelijkheidsverklaring

Visitatiebezoek	Opleiding (CROHO-nummer):	Variant:
A. Food Technology	B Levensmiddelentechnologie (BLT; 56973)	Voltijd
	M Food Safety (MFS; 60112)	Voltijd
	M Food Technology (MLT; 66973)	Voltijd
	M Food Quality Management (MQ; 60109)	Voltijd
B. Biotechnology en Bio-Informatics	B Biotechnologie (BBT; 56841)	Voltijd
	M Biotechnology (MBT; 66841)	Voltijd
	M Bioinformatics (MBF; 60106)	Voltijd
C. Agricultural and Bioresource Engineering	B Agrotechnologie (BAT; 56831)	Voltijd
	M Agricultural and Bioresource Engineering (MAB; 66831)	Voltijd
D. Forest and Nature conservation	B Bos- en Natuurbeheer (BBN; 56219)	Voltijd
	M Forest and Nature Conservation (MFN; 66219)	Voltijd
E. International Land and Water Management	B Internationaal Land- en Waterbeheer (BIL; 50100)	Voltijd
	M International Land and Water Management (MIL; 60104)	Voltijd
F. Landscape, Architecture and Planning	B Landschapsarchitectuur en ruim. Planning (BLP; 56848)	Voltijd
	M Landscape, Architecture and Planning (MLP; 66848)	Voltijd
G. Leisure, Tourism and Environment	M Leisure, Tourism and Environment (MLE; 60111)	Voltijd
H. Geo-Information Science	M Geo-Information Science (MGI; 60108)	Voltijd
I. Plant Sciences	B Plantenwetenschappen (BPW; 56835)	Voltijd
	M Plant Sciences (MPS; 66835)	Voltijd
	M Organic Agriculture (MOA; 69300)	Voltijd
	M Plant Biotechnology (MPB; 60106)	Voltijd
J. Animal Sciences	B Dierwetenschappen (BDW: 56849)	Voltijd
	M Animal Sciences (MAS; 66849)	Voltijd
K. Climate Studies	M Climate Studies (MCL; 60107)	Voltijd
L. International Development Studies	B Internationale Ontwikkelingsstudies (BIN; 56837)	Voltijd
	M International Development Studies (MID; 66837)	Voltijd
	M Development and Rural Innovation (MDR; 60103)	Voltijd
M. Management, Economics and Consumer Studies	B Bedrijfs- en Consumentenwetenschappen (BBC; 56836)	Voltijd
	M Management, Economics and Consumer Studies (MME; 66836)	Voltijd
N. Nutrition and Health	B Voeding en Gezondheid (BVG; 56868)	Voltijd
	M Nutrition and Health (MNH; 66868)	Voltijd

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: KARL AGIUS

HOME ADDRESS:

11, TOWER STREET QRENDI QRD1257, MALTA, EUROPE

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

① PLANT SCIENCES ; ② LEISURE, TOURISM & ENVIRONMENT ; ③ AGRICULTURE & BIORESOURCES ENGINEERING

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

EUROPEAN STUDENTS' UNION

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

NVAO

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: MALTA DATE: 15/11/11

SIGNATURE:

2

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: ELS VAN DAMME

HOME ADDRESS:

NIEVELVELSWEG 9

9310 MOERBEKE - AALST

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / ~~SECRETARY~~:

PLANT SCIENCES

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

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HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Gent DATE: January 9, 2012

SIGNATURE:

2

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: GEIR LIEBLEIN

HOME ADDRESS: LYNGVEIEN 10,
N-1430 ÅS, NORWAY

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

PLANT SCIENCES

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Wageningen University

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

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HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Ås, Norway DATE: 12/09/2011

SIGNATURE:

2

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: MAURICE DE PROFT

HOME ADDRESS:
BERGEVELD 52
3220 HOLSBEEK
BELGIË

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY:

PLANT SCIENCE CLUSTER

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

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HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Leuven. DATE: 24-02-2012

SIGNATURE: M. De Proft

2

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: MEG VAN BEVAERT

HOME ADDRESS: CATHARYNESINGEL 56
3511 GE UTRECHT

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN ~~EXPERT /~~ SECRETARY:

LIFE SCIENCES, SEE ATTACHMENT

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

1

nvao
nederlands - vlaamse accreditatieorganisatie

HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: UTRECHT DATE: 20/3/12

SIGNATURE:

2

nvao
nederlands - vlaamse accreditatieorganisatie

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

~~TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME~~

THE UNDERSIGNED

NAME: Hartmut Stützel Q277

HOME ADDRESS:

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / ~~SECRETARY~~:

Plant Sciences - four programmes

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Wageningen University

HEREBY CERTIFIES TO NOT MAINTAINING ANY (FAMILY) CONNECTIONS OR TIES OF A PERSONAL NATURE OR AS A RESEARCHER / TEACHER, PROFESSIONAL OR CONSULTANT WITH THE ABOVE INSTITUTION, WHICH COULD AFFECT A FULLY INDEPENDENT JUDGEMENT REGARDING THE QUALITY OF THE PROGRAMME IN EITHER A POSITIVE OR A NEGATIVE SENSE;

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HEREBY CERTIFIES TO NOT HAVING MAINTAINED SUCH CONNECTIONS OR TIES WITH THE INSTITUTION DURING THE PAST FIVE YEARS;

CERTIFIES TO OBSERVING STRICT CONFIDENTIALITY WITH REGARD TO ALL THAT HAS COME AND WILL COME TO HIS/HER NOTICE IN CONNECTION WITH THE ASSESSMENT, INSOFAR AS SUCH CONFIDENTIALITY CAN REASONABLY BE CLAIMED BY THE PROGRAMME, THE INSTITUTION OR NVAO;

HEREBY CERTIFIES TO BEING ACQUAINTED WITH THE NVAO CODE OF CONDUCT.

PLACE: Wageningen DATE: 18-4-2012

SIGNATURE:

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Appendix 9: Rubric for the assessment of a MSc-thesis

Author: Arnold F. Moene, Meteorology and Air Quality Group, Wageningen University
Version: 1.1 (December 15, 2010)

Item	Mark for item					
	2-3	**4-5**	**6**	**7**	**8**	**9-10**
1. Research competence (30-60%) *						
1.1. Commitment and perseverance	Student is not motivated. Student escapes work and gives up regularly	Student has little motivation. Tends to be distracted easily. Has given up once or twice	Student is motivated at times, but often, sees the work as a compulsory task. Is distracted from thesis work now and then.	The student is motivated. Overcomes an occasional setback with help of the supervisor.	The student is motivated and/or overcomes an occasional setback on his own and considers the work as his "own" project.	The student is very motivated, goes at length to get the most out of the project. Takes complete control of his own project. Considers setbacks as an extra motivation.
1.2. Initiative and creativity	Student shows no initiative or new ideas at all.	Student picks up some initiatives and/or new ideas suggested by others (e.g. supervisor), but the selection is not motivated.	Student shows some initiative and/or together with the supervisor develops one or two new ideas on minor parts of the research.	Student initiates discussions on new ideas with supervisor and develops one or two own ideas on minor parts of the research.	Student has his own creative ideas on hypothesis formulation, design or data processing.	Innovative research methods and/or data-analysis methods developed. Possibly the scientific problem has been formulated by the student.
1.3. Independence	The student can only perform the project properly after repeated detailed instructions and with direct help from the supervisor.	The student needs frequent instructions and well-defined tasks from the supervisor and the supervisor needs careful checks to see if all tasks have been performed.	The supervisor is the main responsible for setting out the tasks, but the student is able to perform them mostly independently	Student selects and plans the tasks together with the supervisor and performs these tasks on his own	Student plans and performs tasks mostly independently, asks for help from the supervisor when needed.	Student plans and performs tasks independently and organizes his sources of help independently.
	No critical self-reflection at all.	No critical self-reflection at all.	Student is able to reflect on his functioning with the help of the supervisor only.	The student occasionally shows critical self-reflection.	Student actively performs critical self-reflection on some aspects of his functioning	Student actively performs critical self-reflection on various aspects of his own functioning and performance.
1.4. Efficiency in working with data Note: depending on the characteristics of the thesis work, not all three aspects	**Experimental work** Student is not able to setup and/or execute an experiment.	Student is able to execute detailed instructions to some extent, but errors are made often, invalidating (part of) the experiment.	Student is able to execute an experiment that has been designed by someone else (without critical assessment of sources of error and uncertainty).	Student is able to execute an experiment that has been designed by someone else. Takes sources of error and uncertainty into account in a qualitative sense.	Student is able to judge the setup of an existing experiment and to include modifications if needed. Takes into account sources of error and uncertainty quantitatively.	Student is able to setup or modify an experiment exactly tailored to answering the research questions. Quantitative consideration of sources of error and uncertainty. Execution of the experiment is flawless.

Item	Mark for item					
	2-3	**4-5**	**6**	**7**	**8**	**9-10**
(experimental work, data analysis and model development) may be relevant and some may be omitted	**Data analysis** Student is lost when using data. Is not able to use a spreadsheet program or any other appropriate data-processing program.	Student is able to organize the data, but is not able to perform checks and/or simple analyses	Student is able to organize data and perform some simple checks; but the way the data are used does not clearly contribute to answering of the research questions and/or he is unable to analyze the data independently.	Student is able to organize the data, perform some basic checks and perform basic analyses that contribute to the research question	Student is able to organize the data, perform commonly used checks and perform some advanced analyses on the data	Student is able to organize the data, perform thorough checks and perform advanced and original analyses on the data.
	Model development Student is not able to make any modification/addition to an existing model.	Student modifies an existing model, but errors occur and persist. No validation.	Student is able to make minor modifications (say a single formula) to an existing model. Superficial validation or no validation at all.	Student is able to make major modifications to an existing model, based on literature. Validation using some basic measures of quality.	Student is able to make major modifications to an existing model, based on literature or own analyses. Validation using appropriate statistical measures.	Student is able to develop a model from scratch, or add an important new part to an existing model. Excellent theoretical basis for modelling as well as use of advanced validation methods.
1.5. Handling supervisor's comments and development of research skills	Student does not pick up suggestions and ideas of the supervisor	The supervisor needs to act as an instructor and/or supervisor needs to suggest solutions for problems	Student incorporates some of the comments of the supervisor, but ignores others without arguments	Student incorporates most or all of the supervisor's comments.	Supervisor's comments are weighed by the student and asked for when needed.	Supervisor's comments are critically weighed by the student and asked for when needed, also from other staff members or students.
	Knowledge and insight of the student (in relation to the prerequisites) is insufficient and the student is not able to take appropriate action to remedy this	There is some progress in the research skills of the student, but suggestions of the supervisor are also ignored occasionally.	The student is able to adopt some skills as they are presented during supervision	The student is able to adopt skills as they are presented during supervision and develops some skills independently as well	The student is able to adopt new skills mostly independently, and asks for assistance from the supervisor if needed.	The student has knowledge and insight on a scientific level, i.e. he explores solutions on his own, increases skills and knowledge where necessary.
1.6. Keeping to the time schedule	Final version of thesis or colloquium more than 50% of the nominal period overdue without a valid reason (force majeure)	Final version of thesis or colloquium at most 50% of the nominal period overdue (without a valid reason).	Final version of thesis or colloquium at most 25% of nominal period overdue (without valid reason)	Final version of thesis or colloquium at most 10% of nominal period overdue (without valid reasons)	Final version of thesis or colloquium at most 5% of nominal period overdue (without good reasons)	Final version of thesis and colloquium finished within planned period (or overdue but with good reason).
	No time schedule made.	No realistic time schedule.	Mostly realistic time schedule, but no timely adjustment of time schedule.	Realistic time schedule, with some adjustments (but not enough or not all in time) in times only.	Realistic time schedule, with timely adjustments. of times only.	Realistic time schedule, with timely adjustments of both time and tasks.

Item	Mark for item					
	2-3	**4-5**	**6**	**7**	**8**	**9-10**
2. Thesis report (30-60%) *						
2.1. Relevance research, clearness goals, delineation research	No link is made to existing research on the topic. No research context is described.	The context of the topic at hand is described in broad terms but there is no link between what is known and what will be researched.	The link between the thesis research and existing research does not go beyond the information provided by the supervisor.	Context of the research is defined well, with input from the student. There is a link between the context and research questions.	Context of the research is defined sharply and to-the-point. Research questions emerge directly from the described context.	Thesis research is positioned sharply in the relevant scientific field. Novelty and innovation of the research are indicated.
	There is no researchable research question and the delineation of the research is absent	Most research questions are unclear, or not researchable and the delineation of the research is weak	At least either the research questions or the delineation of the research are clear	The research questions and the delineation are mostly clear but could have been defined sharper at some points	The research questions are clear and researchable and the delineation is clear.	The research questions are clear and formulated to-the-point and limits of the research are well-defined.
2.2. Theoretical underpinning, use of literature	No discussion of underlying theory.	There is some discussion of underlying theory, but the description shows serious errors.	The relevant theory is used, but the description has not been tailored to the research at hand or shows occasional errors.	The relevant theory is used, and the description has been tailored partially successful to the research at hand. Few errors occur.	The relevant theory is used, it is nicely synthesized, and it is successfully tailored to the research at hand.	Clear, complete and coherent overview of relevant theory on the level of an up-to-date review paper. Exactly tailored to the research at hand.
	No peer-reviewed/primary scientific papers in reference list except for those already suggested by the supervisor	Only a couple of peer-reviewed papers in reference list.	Some peer-reviewed papers in reference list but also a significant body of grey literature.	Relevant peer-reviewed papers in reference list but also some grey literature or text books. Some included references less relevant.	Mostly peer-reviewed papers or specialized monographs in reference list. An occasional reference may be less relevant.	Almost exclusively peer-reviewed papers in reference list or specialized monographs (not text books). All papers included are relevant.
2.3. Use of methods and data	No description of methods and/or data.	Research is not reproducible due to insufficient information on data (collection and/or treatment) and analysis methods	Some aspects of the research regarding data-collection, data-treatment, models or the analysis methods are described insufficiently so that that particular aspect of the research is not reproducible.	Description of the data (collection, treatment) or models as well as the analysis methods used is lacking in a number of places so that at most a more or less similar research could be performed.	Description of the data (collection, treatment) or models as well as the analysis methods used is mostly complete, but exact reproduction of the research is not possible due to lack of some details.	Description of the data (collection, treatment) or models as well as the analysis methods is complete and clear so that exact reproduction of the research is possible.
2.4. Critical reflection on the research performed (discussion)	No discussion and/or reflection on the research. Discussion only touches trivial or very general points of criticism.	Only some possible weaknesses and/or weaknesses which are in reality irrelevant or non-existent have been identified.	Most weaknesses in the research are indicated, but impacts on the main results are not weighed relative to each other.	Most weaknesses in the research are indicated and impacts on the main results are weighed relative to each other.	All weaknesses in the research are indicated and weighed relative to each other. Furthermore, (better) alternatives for the methods used are indicated.	Not only all possible weaknesses in the research are indicated, but also it is indicated which weaknesses affect the conclusions most.

Item	Mark for item					
	2-3	**4-5**	**6**	**7**	**8**	**9-10**
	No confrontation with existing literature.	Confrontation with irrelevant existing literature.	Only trivial reflection vis-a-vis existing literature.	Only most obvious conflicts and correspondences with existing literature are identified. The value of the study is described, but it is not related to existing research.	Minor and major conflicts and correspondences with literature are shown. The added value of the research relative to existing literature is identified.	Results are critically confronted with existing literature. In case of conflicts, the relative weight of own results and existing literature is assessed. The contribution of his work to the development of scientific concepts is identified.
2.5. Clarity of conclusions and recommendations	No link between research questions, results and conclusions.	Conclusions are drawn, but in many cases these are only partial answers to the research question. Conclusions merely repeat results.	Conclusions are linked to the research questions, but not all questions are addressed. Some conclusions are not substantiated by results or merely repeat results.	Most conclusions well-linked to research questions and substantiated by results. Conclusions are mostly formulated clearly but with some vagueness in wording.	Clear link between research questions and conclusions. All conclusions substantiated by results. Conclusions are formulated exact.	Clear link between research questions and conclusions. Conclusions substantiated by results. Conclusions are formulated exact and concise. Conclusions are grouped/ordered in a logical way.
	No recommendations given.	Recommendations are absent or trivial.	Some recommendations are given, but the link of those to the conclusions is not always clear.	Recommendations are well-linked to the conclusions.	Recommendations are to-the-point, well-linked to the conclusions and original.	Recommendations are to-the-point, well-linked to the conclusions, original and are extensive enough to serve as project description for a new thesis project.
2.6. Writing skills	Thesis is badly structured. In many cases information appears in wrong locations. Level of detail is inappropriate throughout.	Main structure incorrect in some places, and placement of material in different chapters illogical in many places. Level of detail varies widely (information missing, or irrelevant information given).	Main structure is correct, but lower level hierarchy of sections is not logical in places. Some sections have overlapping functions leading to ambiguity in placement of information. Level of detail varies widely (information missing, or irrelevant information given).	Main structure correct, but placement of material in different chapters illogical in places. Level of detail inappropriate in a number of places (irrelevant information given).	Most sections have a clear and unique function. Hierarchy of sections is mostly correct. Ordering of sections is mostly logical. All information occurs at the correct place, with few exceptions. In most places level of detail is appropriate.	Well-structured: each section has a clear and unique function. Hierarchy of sections is correct. Ordering of sections is logical. All information occurs at the correct place. Level of detail is appropriate throughout.
	Formulations in the text are often incorrect/inexact inhibiting a correct interpretation of the text.	Vagueness and/or inexactness in wording occur regularly and it affects the interpretation of the text.	The text is ambiguous in some places but this does not always inhibit a correct interpretation of the text.	Formulations in text are predominantly clear and exact. Thesis could have been written more concisely.	Formulations in text are clear and exact, as well as concise.	*Textual* quality of thesis (or manuscript in the form of a journal paper) is such that it could be acceptable for a pear-reviewed journal.

Item	Mark for item					
	2-3	**4-5**	**6**	**7**	**8**	**9-10**
3. Colloquium (5%) *						
3.1. Graphical presentation	Presentation has no structure.	Presentation has unclear structure.	Presentation is structured, though the audience gets lost in some places.	Presentation has a clear structure with only few exceptions.	Presentation has a clear structure. Mostly a good separation between the main message and side-steps.	Presentation clearly structured, concise and to-the-point. Good separation between the main message and side-steps.
	Unclear lay-out. Unbalanced use of text, graphs, tables or graphics throughout. Too small font size, too many or too few slides.	Lay-out in many places insufficient: too much text and too few graphics (or graphs, tables) or vice verse.	Quality of the layout of the slides is mixed. Inappropriate use of text, tables, graphs and graphics in some places.	Lay-out is mostly clear, with unbalanced use of text, tables, graphs and graphics in few places only.	Lay-out is clear. Appropriate use of text, tables, graphs and graphics.	Lay-out is functional and clear. Clever use of graphs and graphics.
3.2. Verbal presentation and defense	Spoken in such a way that majority of audience could not follow the presentation.	Presentation is uninspired and/or monotonous and/or student reads from slides: attention of audience not captured	Quality of presentation is mixed: sometimes clear, sometimes hard to follow.	Mostly clearly spoken. Perhaps monotonous in some places.	Clearly spoken.	Relaxed and lively though concentrated presentation. Clearly spoken.
	Level of audience not taken into consideration at all.	Level of audience hardly taken intro consideration.	Presentation not at appropriate level of audience.	Level of presentation mostly targeted at audience.	Level of presentation well-targeted at audience. Student is able to adjust to some extent to signals from audience that certain parts are not understood.	Clear take-home message. Level well-targeted at audience. Student is able to adjust to signals from audience that certain parts are not understood.
	Bad timing (way too short or too long).	Timing not well kept (at most 30% deviation from planned time).	Timing not well kept (at most 20% deviation from planned time).	Timing is OK (at most 10% deviation from planned time).	Timing is OK.	Presentation finished well in time.
	Student is not able to answer questions.	Student is able to answer only the simplest questions	Student answers at least half of the questions appropriately.	Student is able to answer nearly all questions in an appropriate way.	Student is able to answer all questions in an appropriate way, although not to-the-point in some cases.	Student is able to give appropriate, clear and to-the-point answers to all questions.

Item	Mark for item					
	2-3	**4-5**	**6**	**7**	**8**	**9-10**
4. Examination (5%) *						
4.1. Defense of the thesis	Student is not able to defend/discuss his thesis. He does not master the contents	The student has difficulty to explain the subject matter of the thesis.	Student is able to defend his thesis. He mostly masters the contents of what he wrote, but for a limited number of items he is not able to explain what he did, or why.	Student is able to defend his thesis. He masters the contents of what he wrote, but not beyond that. Is not able to place thesis in scientific or practical context.	Student is able to defend his thesis, including indications where the work could have been done better. Student is able to place thesis in either scientific or practical context.	Student is able to freely discuss the contents of the thesis and to place the thesis in the context of current scientific literature and practical contexts.
4.2. Knowledge of study domain	Student does not master the most basic knowledge (even below the starting level for the thesis).	The student does not understand all of the subject matter discussed in the thesis.	The student understands the subject matter of the thesis on a textbook level.	The student understands the subject matter of the thesis including the literature used in the thesis.	Student is well on top of subjects discussed in thesis: not only does he understand but he is also aware of current discussions in the literature related to the thesis topic.	Student is well on top of subjects discussed in thesis: not only does he understand but he is also aware of discussions in the literature beyond the topic (but related to) of the thesis.

Manual for use of the thesis evaluation form and the MSc-thesis assessment rubric (version 1.1) of Wageningen University

User instructions

- Grading the thesis work is generally done by two persons, the daily supervisor and the second reviewer/examiner. For the sake of grading uniformity, it is highly recommended by the Exam Boards that the second reviewer within a chair group is always the same person. Preferably it is the head of the group.
- The thesis evaluation form has four categories. The research competence category can only be filled in by the daily supervisor as this person has worked with the student. The Thesis report category can most objectively be filled in by the second reviewer who was not involved in the thesis process, as grading the thesis report should not be biased by positive or negative experiences with the student. The daily supervisor who has these experiences can take these into account when grading the research competence.
- Use of the comment fields on the thesis evaluation form is highly recommended. It is an extra feedback for the student.
- The assessment rubric has the form of an analytic rubric (see e.g. Andrade (2005), Reynolds *et al.* (2009), URL1, URL2). Each line discusses one **criterion** for assessment. Each column gives a **level** for the grading. Each cell contains the **descriptor** of the level for that criterion.
- The criteria in the rubric exactly follow the items presented in the Excel worksheet "Thesis evaluation Wageningen University" constructed by the Exam Boards. In a few cases the criteria in the original thesis evaluation document were split into two or more parts because the description of the criteria clearly covered different subjects.
- Since the final mark is composed of so many criteria, the scores on individual criteria should be discriminative. Not all levels are equally broad in marks. Since the final marks of theses usually range between 6 and 9, in the rubric individual levels have been established for the marks of 6, 7 and 8. When performance is at the 9-10 level, decide whether the student is on the low edge (9) or high edge (10) of this level. Descriptions at the 9-10 level tend to describe the ultimate performance (10). Hence, if a student performs well above 8, but below the description at the 9-10 level, a 9 would be the appropriate mark.
- Keep in mind that each line in the rubric should be read independently: it could be that a student scores a 2-3 on one criterion and a 9-10 on another.
- Always start at the lowest mark in the rubric, and test if the student should be awarded the next higher mark. In some cases achievements of a next lower level are not repeated at the higher level (i.e. the lower level achievements are implicit in the higher levels). Furthermore, if a level has a range of marks, choose the most appropriate one (consider the description of the level of performance as a continuum, rather than a discrete description).
- Wherever the student is indicated as 'he', one can also read 'she'.

Remarks

- This rubric has been validated by a number of supervisors by comparing the original grade of a number of theses to the grade resulting from this rubric.
- The main intention of using a rubric is enhance homogeneity of assessments and the ability to communicate about assessments both with students and with colleagues. Furthermore, it clarifies to students the expectations of the supervisor and helps the supervisor to structure feedback during the process of thesis research.
  Although the intention is to homogenize the process of assessment, it should be noted that even with the use of a rubric some arbitrariness will remain.
- The two main categories on the thesis evaluation form (research competence and thesis report) should have an assessment of 'sufficient' (i.e. ≥ 5.5) before the total thesis work can be considered as sufficient. So, no compensation between these main categories is possible to obtain the lowest final mark of 6.0.
- Please report any positive or negative experiences with and suggestions for the rubric to arnold.moene@wur.nl.
- Author of the rubric: Arnold F. Moene (Meteorology and Air Quality Group, Wageningen University), with valuable contributions from Ellis Hofland, Edwin Peeters, Tamar Nieuwenhuizen, Maarten Holtslag, George Bier, Gerard Ros, Lijbert Brussaard, Judith Gulikers and Paul Berentsen.

References

Andrade, H.G, 2005. Teaching With Rubrics: The Good, the Bad, and the Ugly. *College Teaching* **53**, p. 27-31.

Reynolds, J., R. Smith, C. Moskovitz and A. Sayle, 2009. BioTAP: A Systematic Approach to Teaching Scientific Writing and Evaluating Undergraduate Theses. *Bioscience* **59**, p. 896-903.

URL1: http://jonathan.mueller.faculty.noctrl.edu/toolbox/rubrics.htm (last visited November 17, 2009).

URL2: http://en.wikipedia.org/wiki/Rubric_(academic) (last visited November 17, 200\