

LIFE SCIENCES AND NATURAL RESOURCES

FOOD TECHNOLOGY, FOOD SAFETY AND FOOD
QUALITY MANAGEMENT

WAGENINGEN UNIVERSITY

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This report was finalized on 7 March 2019



REPORT ON THE BACHELOR'S PROGRAMME FOOD TECHNOLOGY AND THE MASTER'S PROGRAMMES FOOD SAFETY, FOOD TECHNOLOGY AND FOOD QUALITY MANAGEMENT OF WAGENINGEN UNIVERSITY

This report takes the NVAO's Assessment Framework for Limited Programme Assessments as a starting point (September 2016).

ADMINISTRATIVE DATA REGARDING THE PROGRAMMES

Bachelor's programme Food Technology

Name of the programme:	Food Technology
CROHO number:	56973
Level of the programme:	bachelor's
Orientation of the programme:	academic
Number of credits:	180 EC
Specializations or tracks:	
Location:	Wageningen
Mode(s) of study:	full time
Language of instruction:	Dutch, English
Expiration of accreditation:	31-12-2019

Master's programme Food Safety

Name of the programme:	Food Safety
CROHO number:	60112
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	3
Location:	Wageningen
Mode(s) of study:	full time
Language of instruction:	English
Expiration of accreditation:	31-12-2019

Master's programme Food Technology

Name of the programme:	Food Technology
CROHO number:	66973
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	11
Location:	Wageningen
Mode(s) of study:	full time, part time
Language of instruction:	English
Expiration of accreditation:	31-12-2019

Master's programme Food Quality Management

Name of the programme:	Food Quality Management
CROHO number:	60109
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	4
Location:	Wageningen
Mode(s) of study:	full time
Language of instruction:	English
Expiration of accreditation:	31-12-2019

The visit of the assessment panel Food Technology to Wageningen University (WU) took place on the 11th and 12th of October 2018.

ADMINISTRATIVE DATA REGARDING THE INSTITUTION

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

COMPOSITION OF THE ASSESSMENT PANEL

The NVAO has approved the composition of the panel on March 7th 2018. The panel that assessed the bachelor's and master's programmes Food Technology and the master's programmes Food Safety and Food Quality Management consisted of:

- Prof. dr. S. (Stanley) Brul (Chair), professor Molecular Biology and Microbial Food Safety at the Universiteit van Amsterdam (UvA) and chair of the Dutch institute for Biology (NIBI).
- Dr. A. A. J. (Annik) van Keer, educational advisor at the Faculty of Science at Utrecht University (UU).
- Dr. J. M. (Jesus) Frías Celayeta, professor in Food Science and Engineering and academic leader of the Environmental Sustainability and Health Institute at the Dublin Institute of Technology (DIT) (Ireland).
- Prof. dr. C. (Carol) Wallace, professor in Food Management Safety Systems and co-directeur of the International Institute of Nutrition Sciences & Applied Food Safety Studies at the University of Central Lancashire (Verenigd Koninkrijk).
- M. (Marit) de Kort (student member), graduated in 2017 in Biomedical Sciences at Utrecht University (UU). She is currently following a master's programme Cancer, Stem Cells and Developmental Biology at the UU.

The panel was supported by dr. M. (Meg) Van Bogaert, who acted as secretary.

WORKING METHOD OF THE ASSESSMENT PANEL

Preparation

In preparation of the site visit, the panel studied several documents amongst others: the NVAO assessment framework (2016), the institutional audit of WU and the previous programme assessments (of 2012). The accreditation system has entered its third phase (concurrently with a second round of institutional audits). Wageningen University has recently successfully passed its

second institutional audit. The new NVAO assessment framework is “geared to a quality assurance system that is based on trust in the existing, high quality of Dutch higher education”.

In 2012 the bachelor’s and master’s programmes that are assessed in this report were assessed with an overall good. The previous panel was specifically positive about the way the curricula, staff and programme specific services enabled students to achieve the intended learning outcomes (ILOs). The small scale and favourable student staff ratio of the programmes was considered a positive, although the increasing student number was considered a threat. Furthermore, the panel was positive with regard to initiatives by the Examining Board to strengthen its role. The quality of these was also good.

With the new philosophy of the framework and the last assessment of these specific programmes in mind, in this report the panel (of peers) does not want to elaborate too long on the different criteria of the four standards of the limited framework. The overall evaluation of the programmes by this panel is, as it was in 2012, good. Therefore, the panel wants to concentrate on how the programme developed since 2012 and where the programme can become even better than it already is.

QANU received the self-assessment report of the Food programmes on 27 September 2018 and made it available to the panel. The panel members read the self-assessment and prepared questions, comments and remarks prior to the site visit. The secretary collected these questions in a document and arranged them according to panel conversation and subject.

In addition, panel members read recent theses from each programme. In consultation with the chair, fifteen theses per programme were selected from the academic years 2015-2016 and 2016-2017, covering the full range of marks given and all specialisations. The panel members also received the grades and the assessment forms filled out by the examiners and supervisors. An overview of all documents and theses reviewed by the panel is included in Appendix 4.

The programme management drafted a programme for the site visit. This was discussed with the secretary and chair of the panel. As requested by QANU, the programme management carefully selected discussion partners. A schedule of the programme for the site visit is included in Appendix 3.

Site visit

The site visit took place on 11 and 12 October 2018 at Wageningen University (WU). In a preparatory meeting on the first day of the site visit, the panel members discussed their findings based on the self-evaluation and on the theses and formulated the questions and issues to be raised in the interviews with representatives of the programme and other stakeholders.

During the site visit, the panel studied a selection of documents provided by the programme management. They included course descriptions, course materials, written exams, assignments and other assessments. The panel interviewed the programme management, students, alumni, staff members, members of the Programme Committee and members of the Examining Board.

After the final meeting with the management, the panel members extensively discussed their assessment of the programmes and prepared a preliminary presentation of the findings. The site visit was concluded with a presentation of these preliminary findings by the chair.

Report

After the visit, the secretary produced a draft version of the report. She submitted the report to the panel members for comments. The secretary processed corrections, remarks and suggestions for improvement provided by the panel members to produce the revised draft report. This was then sent to WU to check for factual errors. The comments and suggestions provided by the programme management were discussed with the chair of the assessment panel and, where necessary, with the other panel members. After incorporating the panel’s comments, the secretary compiled the final version of the report.

Definition of judgements standards

In accordance with the NVAO's Assessment framework for limited programme assessments, the panel used the following definitions for the assessment of both the standards and the programme as a whole.

Generic quality

The quality that, in an international perspective, may reasonably be expected from a higher education Associate Degree, Bachelor's or Master's programme.

Unsatisfactory

The programme does not meet the generic quality standard and shows shortcomings with respect to multiple aspects of the standard.

Satisfactory

The programme meets the generic quality standard across its entire spectrum.

Good

The programme systematically surpasses the generic quality standard.

Excellent

The programme systematically well surpasses the generic quality standard and is regarded as an international example.

SUMMARY JUDGEMENT

Standard 1: Intended learning outcomes

The bachelor's programme Food Technology (FT) is a solid, broad programme with a discipline-based design. Students are provided with a balance of general and fundamental skills to be applied in all sectors of the food industry. Strong collaboration between Chair Groups makes the multidisciplinary programme unique in Europe and leads to integrated courses. The FT programme is successfully transforming the programme to true international programme that includes social and cultural aspects as well as the international perspective. The intended learning outcomes (ILOs) are very appropriate, well described, ambitious, meet the international standards and are clearly of academic bachelor's level. The panel is specifically pleased with the attention to ethical aspects. The labour market for graduates is limited as the large numbers of HBO-graduates lead to a very limited need for academic bachelor's. The panel agrees with this when taking the Dutch situation into consideration, but points out that internationally this might be different. It therefore is positive that students can do a 12 EC internship (optional).

The master's programme Food Technology (FT) currently offers ten specializations which together cover the broad field of food technology. The specializations are discipline-based, but with multidisciplinary areas being covered and in each specialization students learn to perform food science research and how to solve problems in the food production process. The panel thinks that the FT programme is an international reference in the area of food technology training, with truly innovative skills being taught and the presence of a clear link between research and education. The panel is pleased with the dynamic environment in which new specializations are easily developed based on demands from industry. Also the part-time, online specialization that focuses on life-long learners shows a clear connection to the requirements from the professional field. The ILOs are general to fit the many specializations, but clearly are of academic master's level and are relevant to the field of food technology. The panel appreciates the attention in the ILOs to the combination of academic skills, multidisciplinary and the connection to industry.

The master's programme Food Safety (FS) has a highly integrated approach to the field of food safety. It focuses on the combination of technical aspects, legal aspects and social science aspects, making it a unique programme and the panel concludes that the profile is clear and adequate. The

FS programme offers three specializations that will attract not only students with a food technology background, but also students with a bachelor's in e.g. law. The ILOs are mostly indicate the integrated character of the programme. The panel concludes that the ILOs suit the programme and are at fitting an international academic master's programme. The panel did notice that the ILOs best fit the initial specializations and was pleased to learn that the FS programme is planning to modify the ILOs to suit all specializations at the same level. The panel is of the opinion that the professional field requires graduates from this programme. However, future employers still have to get used to these specialists, which leads to uncertainty for some students regarding their future. The panel expects that the arrival of a new chair holder will help in this respect.

The master's programme Food Quality Management (FQM) focuses on the increasing attention on this topic in agribusinesses and food industry. Issues with respect to quality and safety in the supply chain are often not well defined, and are typified by uncertainty and ambiguity. The FQM programme trains students who are able to deal with a broad variety of complex food quality management issues which requires interdisciplinary (research) skills. The panel is positive about this integrated approach that is combining technological sciences and management sciences and is clearly appropriate for dealing with food quality management issues. Most ILOs are of an integrate nature, underpinning the interdisciplinary and integrated nature of the programme. The panel is convinced that graduates of this programme have added value in the professional field and have many options for finding appropriate positions. The internship is an important feature in the connection between the academic aspects of the programme and the professional field.

Standard 2: Teaching-learning environment

The first and second year of the bachelor's FT programme predominantly consist of compulsory courses. The third year includes optionals (minor) and the bachelor's thesis. The general basic sciences courses in the first year provide an excellent basis for the food sciences courses later on in the programme. The panel likes the addition of three interdisciplinary (integrated) food science courses to the more basic science courses in the first year. The second year consists of food science courses, throughout the year developing from disciplinary towards integrated courses. Essential skills are developed in the many (laboratory) practicals. In the third year students follow one compulsory course in addition to a minor and writing of the thesis.

The ten specializations of the master's FT programme can be divided into three groups: mono-disciplinary, interdisciplinary and inter-specializations. The panel appreciates this variety, allowing students to fit the programme to their skills and interests. Most specializations have three or four compulsory courses, a number of restricted optional courses and a number of optional courses. The final course of the first year is mandatory and integrates knowledge on food sciences with industrial design problems from both a product and process perspective. The panel is very positive about this course that teaches students to integrate their specialization with those of the other students. In the second year students do a thesis at one of the Chair Groups related to the specialization chosen and an internship outside WU. The part-time online specialization can be concluded in four years, two years of courses and two years that include the thesis and internship. All students are able to compose a tailor-made and unique programme with in-depth specialization, which is strongly appreciated by the panel.

The FS master's programme has two compulsory courses for all students. Furthermore, each of the three specializations has a number of compulsory courses, restricted optionals (RO) and optionals. All three specializations have a coherent curriculum and allow sufficient flexibility to individual students to design their own, tailor-made programme. The panel is of the opinion that the second compulsory course, *Food Safety Management*, is a good way to combine the three specializations in a collaborative and integrative manner. Students of the Food Law specialization are somewhat struggling with their future opportunities in the professional field. This is understandable as their specialization is unique and new. The panel is pleased with the increasing attention this aspect receives from the programme and stimulates to continue this.



The FQM master's programme has a common compulsory part in the area of food quality management, methodology and statistical courses, specialization courses and optionals. Similar to the other master's programmes FQM has a thesis and internship in the second year. The diversity in backgrounds of enrolling students is large and the compulsory courses are intended to align and upgrade knowledge of students. The panel is pleased with the way the programme deals with the different backgrounds and manages to have all graduates fulfil the ILOs. The study adviser is crucial in this respect. Students can choose one of four specializations which are all based on the roles the graduates will have after completing the programme. The panel was convinced of the choice for these four specializations which clearly complement each other and cover the entire field of food quality management.

The panel is very positive about the Scientific Preparation Week for master's programmes in which students who are new in Wageningen are introduced to Wageningen and studying in the Netherlands. The panel is of the opinion that also Wageningen students would benefit from (parts of) this course, specifically with respect to intercultural awareness.

The increasing student numbers led to a number of structural changes within the programmes in the past evaluation period. Overall the panel considers that many of these changes were an improvement to the programmes as they stimulate students to prepare their classes and practicals. As an example for the FT bachelor's programme can be given the way the computer programme Lab-buddy is used and the fact that the programmes still offer a rich learning environment. The increasing student numbers allow the FT master's programme to add new specializations to the programme and to introduce new courses.

Although the programmes have been rather successfully dealing with the increasing student numbers, the panel wonders if the situation is long term sustainable (specifically in case of further growth).

The amount of teaching staff is growing to deal with the increasing student numbers and student-staff ratio is appropriate. The main challenge is to find sufficient supervisors for thesis work and often PhD students are included. The panel emphasizes the importance of training and supervising the PhD students for this task. Didactic skills of teaching staff is strongly appreciated by the students. Although the percentage of UTQ is not extremely high, new staff members are all required to obtain a UTQ. For senior teaching staff a tailor made programme was developed. The panel was impressed by the high research qualifications of the staff members, all food Chair Groups are renowned worldwide. High quality graduates are the result of students being able to work in such an environment.

The eight study advisers all have thorough knowledge and understanding of the programmes and specializations. Students have to initiate the level and intensity of guidance, which makes it student centred. The panel is pleased with the quality of student guidance, which is specifically important because students have a lot of freedom to choose optional courses and the individual programme should comply to the ILOs. Students also stated that teaching staff is approachable and documentation is informative and clear.

The programmes aim at providing a variety in teaching methods and clearly succeed in this. In addition to group-work, which is considered important, digital teaching methods are available as well as tutorials and lectures. The main challenge is to continue providing (written) feedback throughout the programmes with increasing student numbers. The panel recommends to choose quality of feedback over quantity.

Standard 3: Student assessment

The Food programmes all follow the general assessment policy and assessment plan that is considered to be good by the panel. Methods of assessment are aligned with the learning outcomes and the panel is pleased with the WU policy to have courses and assessments reviewed by external peers. Assessment strategies are clearly communicated to students. The panel observed some nice assessment strategies and rubrics in courses. The Chair Groups involved in the programme frequently make use of rubrics. The high student numbers, specifically in the bachelor's programme, result in relatively many multiple choice (MC) assessments. Although the panel is convinced that MC questions can assess more than knowledge, it is important that the programmes pay sufficient attention to this aspect as well as to the motivation of students when giving (too) many MC assessments. The panel is positive about the interaction between Chair Groups with respect to weighing the criteria on the thesis assessment form.

The Examining Board (EB) responsible for the Food programmes is the largest EB in Wageningen and tries to visit each Chair Group one every four years. However, due to workload of the EB this was not always achieved. The EB and Chair Group discuss the theses and internship assessment forms. The panel recommends to the EB to look for effective ways to verify if all ILOs are covered in the individual programmes of all students. Specifically in some specializations of the master's programmes this is a point of attention.

The thesis procedure is described clearly and all programmes use a similar application procedure. This procedure allows all students – despite increasing student numbers - to find a thesis placement. The assessment strategy of thesis is clear and the student knows beforehand on which criteria he/she will be assessed. The panel noticed that written feedback on many assessment forms was absent. Although the panel is convinced that oral feedback as well as written feedback throughout the process is provided, it emphasizes the importance of the formal feedback on the assessment form. The programmes monitor the students' progress, but have no formal go/no-go decision with clear criteria. The panel recommends to set up a clear procedure for all programmes.

Internships are all carried out outside WU, but are closely supervised and assessed by WU staff members. The panel considers the internship to be a valuable and important link between academia and the professional field. The panel does recommend to include the professional skills more manifestly in the assessment form and contract to emphasize their importance.

Standard 4: Achieved learning outcomes

The quality of the bachelor's theses is good and clearly prepares students for continuing in a master's degree programme. The panel praises the supervision environment for the bachelor's thesis, including the thesis ring. Although most students continue with a master's programme, the panel is pleased to notice the increasing attention of labour market in the bachelor's programme. This is specifically relevant with respect to the increasing number of international students.

The panel also agreed with the grading of the master's theses of all programmes and conclude that the quality of the theses is good and clearly prepare students at the master's level for continuation in academia and for a position in the professional field. Each master's programme has a number of specializations, this wide variety was reflected in the topics of the theses. The panel is very positive about the consistent use of a rubric by all supervisors and examiners.

The panel concludes that the positions of graduates on the labour market underlines that students achieve the ILOs. Graduates easily find jobs and state to profit from the T-shaped skills they were taught as well as from the multidisciplinary approach of the programmes.



The panel assesses the standards from the *Assessment framework for limited programme assessments* in the following way:

Bachelor's programme Food Technology

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Student assessment	satisfactory
Standard 4: Achieved learning outcomes	good
General conclusion	good

Master's programme Food Safety

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Student assessment	satisfactory
Standard 4: Achieved learning outcomes	good
General conclusion	good

Master's programme Food Technology

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Student assessment	satisfactory
Standard 4: Achieved learning outcomes	good
General conclusion	good

Master's programme Food Quality Management

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Student assessment	satisfactory
Standard 4: Achieved learning outcomes	good
General conclusion	good

The chair prof. dr. Stanley Brul and the secretary dr. Meg Van Bogaert of the panel hereby declare that all panel members have studied this report and that they agree with the judgements laid down in the report. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 7 March 2019

DESCRIPTION OF THE STANDARDS FROM THE ASSESSMENT FRAMEWORK FOR LIMITED FRAMEWORK ASSESSMENTS

Governance structure of Wageningen University

In contrast to many other Dutch Universities, WU has only one faculty: the Faculty of Agricultural and Environmental Sciences. Therefore the governance structure of WU also differs from most other universities. The Rector Magnificus of the university is also the Dean of the Faculty. The Dean of the Faculty appoints the Programme Board, which consists of four professors and four students. The Programme Board is the legal governing body of the university's 18 BSc and 28 MSc degree programmes. The Programme Board is responsible for the design, content, quality and financing of the programmes.

Each programme has its own Programme Committee. A Programme Committee consists of an equal number of students and staff members who are appointed by the Programme Board. Programme Committees advise the Programme Board on the design and content of their degree programmes.

The Programme Board does not employ the lecturers (of the programme's courses); these are employed by one of the 94 Chair Groups. These generally include a Chair Holder (full professor), academic and support staff, postdocs and PhD students. The Programme Board, its Programme Committees, and the Chair Groups together form the WU education matrix organization.

The Executive Board of WU has appointed four Examining Boards (EB), each responsible for a group of related degree programmes (domains) and Chair Groups. Examining Boards are independent from the Programme Board and include staff members from the domain. The Examining Boards assess the individual study programmes of students and award student degrees. The Examining Boards also appoint the course examiners and monitor changes to the assessment strategy of interim examinations in the annual education modification cycle. The Examining Boards assure the quality of the interim examinations, and for that reason periodically visit Chair Groups to discuss the validity and reliability of the assessments.

Standard 1: Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings

Bachelor's programme Food Technology

Profile and objective

As stated in the self-evaluation report the bachelor's programme Food Technology at Wageningen University Research is set up as a broad Bachelor of Science degree programme with a discipline-based design, providing graduates with a balance of general and fundamental skills to be applied in all sectors of the food industry. Strong collaboration between participating Chair Groups makes this multidisciplinary programme unique in Europe. The collaboration is visible in a number of integrated courses offered by multiple Chair Groups. These courses make students aware of the complexity of foods and food science. The panel met with a strong bachelor's programme that has clearly matured over the past evaluation period and has a clear profile and objective.

The programme strives to be among the top food programmes in Europe and worldwide and will be transformed into a fully English-taught, internationally oriented programme in 2018. The panel discussed the transformation during the site visit. The first step was one of translation, making sure that all materials are available in English. The programme made use of the knowledge of the programme of native English staff and students to translate documents. The programme and panel agree that internationalisation also includes another aspect: not only teaching in English, but to also



pay attention to cultural backgrounds of enrolling students, and to even more strongly include international developments into the programme. The first – teaching in English – is succeeded and the programme is working on also making it an actual international programme. Attention is also given to social and cultural aspects of enrolment of international students, both Dutch and international students have to learn to work together.

Intended learning outcomes, level and orientation

The intended learning outcomes (ILOs) are provided in appendix 1. The ILOs are divided into four groups: 1) domain specific knowledge and understanding, 2) scientific learning, 3) domain specific skills and 4) general academic learning. The ILOs fulfil the criteria described in the Dublin descriptors. The External Advisory Board has reviewed and approved the ILOs, which are also in line with the learning outcomes as described by the American Institute for Food Technology.

Students acquire knowledge of all basic disciplines in food science and technology at a basic, academic level. This prepares them for a specialisation in the master's programme, but also enables them to discuss problems with experts of another discipline within the food science domain. Students gradually learn to work more independently; experiments are initially clearly described, while in later courses students have to design the experiments based on a general protocol, electronic means and the course manuals. Finally, in the thesis, students need to design and perform experiments based on scientific literature and previous experiments. Students follow lectures on ethical aspects and have to write an ethical chapter as part of their thesis. In addition to the individual work in the thesis, students have to do group and teamwork activities. The panel considers that the programme has clear ILOs. The ILOs clearly meet the international standards and are of academic bachelor's level. The panel thinks that the ILOs are ambitious, this is specifically reflected in the ILO6 and ILO7 that are high level ILOs.

Requirements of the professional field and discipline

The bachelor's programme Food Technology is the only Dutch academic bachelor programme in the field of food sciences. There are, however, many bachelor's programmes at University of Applied Science (HBO) level. The labour market is supplied with these HBO-graduates and there is no real need for academic bachelor's graduates. The bachelor's programme in Wageningen is therefore predominantly focussed on delivering graduates to appropriate master's programmes. The programme thus is set up as a broad programme offering students different options for further studies. With respect to the Dutch labour market the panel agrees with the fact that the options for finding a job with only a bachelor's degree are limited. However, when taking a more international perspective, the bachelor's is considered a full-fledged degree. It is important, especially for international students who aim at the British or Irish labour market, that the bachelor's programme allows for a preparation to enter the labour market.

Master's programme Food Technology (FT)

Profile and objective

The master's programme Food Technology aims to be a front-runner in food technology education. The programme currently offers ten specializations (see appendix 2) which together cover the broad field of food technology. The panel would have appreciated a benchmark of the programme in relation to other European Food Technology programmes. In each specialization, students learn how to perform food science research and how to solve problems in the food production process. To make sure that graduates will be able to work in different branches of the food industry, the specializations are discipline-based instead of product-based. The many specializations and ability of the programme to frequently adjust these in order to optimally match them with the needs of the professional field and industry, combined with strong cooperation between Chair Groups, makes the programme manoeuvrable and adaptive.

To optimize food quality throughout the food chain, the programme requires an interdisciplinary approach. Attention is paid to the integration of the different disciplines within food technology. The

programme includes lectures from a large number of chair groups and explicitly has an integrative setup.

The panel is of the opinion that the Food Technology master's programme is clearly an international reference in the area of food technology training. The fact that ten specializations are offered in which truly innovative skills are taught (as a result of the clear link between research and education) reflects the broad and excellent quality of the chair groups providing the programme. At the same time the panel observes many multidisciplinary areas that are covered in one programme.

According to the panel the programme clearly allows for in-depth teaching by offering ten specializations that together cover the entire industry of food technology. The panel is pleased to see the dynamic environment in which new specializations are easily developed based on demands from industry. There is also a potential risk: creating new specializations is much easier than closing them down. Although no issues were observed in the site visit, the panel recommends managing the life cycle of the specializations to keep the programme manageable. The panel was specifically impressed by the European Masters in Food Science and Technology. The programme management might consider giving this specialization a special status, like a "capstone programme".

Since 2017 the programme also offers an online, part-time online specialization. The panel paid specific attention to this online programme. This specialization is focussed on life-long learners who already work in the food industry. This broad programme comprises courses from three specializations. The ILOs are the same as those of the other Food Technology specializations, which will guarantee the same high level. At the same time, the panel is positive about the redesigning of the courses to fit not only distance learning, but also the enrolling students who often have a position in food industry. A positive side effect of this is that efforts are leveraged where possible with the demands of existing programmes (e.g. knowledge clips).

Intended learning outcomes, level and orientation

The intended learning outcomes (ILOs) are provided in appendix 1. Similar to the bachelor's programme the ILOs are divided into four groups: 1) domain specific knowledge and understanding, 2) scientific learning, 3) domain specific skills and 4) general academic learning. The ILOs fulfil the criteria described in the Dublin descriptors. The External Advisory Board (EAB) has reviewed and approved the ILOs, although the panel thinks that involvement of the EAB could be increased.

During the programme students specialise in the discipline of their choice, although all specializations include courses from different food science disciplines to allow for an interdisciplinary approach. Students are taught how to design solutions for problems in the process of producing food. Therefore, all specializations contain multiple courses where students learn to optimize food products in different ways. Important aspects that are covered in the ILOs are awareness of the effect of food product development on the consumer, society and market. Also, sustainability and links between nutrition and food are important trends. The ILOs allow graduates to develop strong academic skills as well as function in industry, and to be able to work in multicultural and multidisciplinary settings. Graduates have an advanced level of knowledge and understanding in the field of their specialization and a basic level of knowledge and understanding in related disciplines. Nearly all courses require students to critically judge results, problems, situations or literature. There is ample attention to communication skills. The panel considers that the programme has clear ILOs. The ambitious ILOs not only meet, but maybe even set the international standards for an academic programme in Food Technology at master's level. The panel appreciates the fact that intended learning outcomes are the same for the full-time and part-time programme, while the courses are adapted.

Requirements of the professional field and discipline

The academically oriented programme has strong links to the food industry. Nearly all graduates work in the field of food science and technology. In the interviews an estimate of 10% was given as the percentage of graduates who continue in a PhD position. There appears to be a clear demand from industry for graduates, both with master's degrees and with subsequent PhD degrees. The proximity of major food industry, like Friesland Campina and the Unilever laboratories, confirms to the panel the clear and strong link between the programme and industry.

Master's programme Food Safety (FS)

Profile and objective

In 2003 the master's programme Food Safety transferred from a specialization in Food Technology to a separate master's programme. The programme has a highly integrated approach to the field of food safety, which makes it different from some programmes worldwide, as it focuses on the combination of technical aspects, legal aspects and social science aspects. The programme now has three specializations, Applied Food Safety, Food Law and Supply Chain Safety. The first two specializations are rather fixed in order to be able to reach the required depth. In the third specialization students make a choice for one of three thesis tracks, which further determines their programme. Students from all three specializations come together in the last period in a highly integrated course.

The panel agrees that there are not many programmes similar to the Food Safety programme in Wageningen, although other programmes cover parts of this programme. The profile of the programme is clear and adequate. The panel noticed that the introduction of two new specializations since 2012 is well founded in the self-evaluation report. Having three specializations and including social sciences aspects, convinces the panel that the programme should not be a specialization of the Food Technology programme. The Food Safety programme will not only attract students with a food technology background, but also students with a bachelor's in e.g. law are candidates to enrol.

Intended learning outcomes, level and orientation

The twelve intended learning outcomes (ILOs) are provided in appendix 1. The ILOs are divided into four groups: 1) domain specific knowledge and understanding, 2) scientific learning, 3) domain specific skills and 4) general academic learning. The ILOs fulfil the criteria described in the Dublin descriptors.

Many of the ILOs are of integrated nature and thus indicate the integrated character of the programme. Some courses earlier in the programme are mono-disciplinary to lay a solid foundation of the basic principles of Food Safety (knowledge and understanding) while later in the programme courses are integrated and students have to apply knowledge from the previous courses (apply knowledge and understanding). In the final, integrated course, students collaborate on a case related to Food Safety Management (making judgements). In this course there is also explicit attention to negotiations and different ways of writing (communication). In the thesis students work independently on a research proposal, experiments and acquisition of independent skills (apply knowledge and understanding, making judgments and learning skills). Finally, students find an internship and perform individually as a professional in a non-academic environment (learning skills).

The ILOs suit the programme and are at an appropriate level for an international academic master's programme. The panel discussed during the site visit the fact that the ILOs best fit the initial specialization, Applied Food Safety. For example, ILO 5 on "having obtained knowledge in this area built upon a solid obtained scientific and technological training based on the life sciences" does not appear in the mandatory part of specialization C and is obtained by making specific optional module choices. Although the panel concludes that the ILOs do fit all specializations, it was also reassured that the study adviser verifies the coverage of all ILOs for the individual students, the panel stimulates the programme to continue with the planned modification of the ILOs to suit all three specializations to the same level.

Requirements of the professional field and discipline

The design of ILOs is approved by the External Advisory Board and are in line with expectations from the professional field. The professional field, in particular industry, show clear interest in hiring graduates from this programme. The panel also sees a clear position for graduates of the Food Law specializations, but noticed that students themselves are uncertain and some future employers still have to get used to these specialists. New job descriptions are required and positions have to be created as Food Law is a recently developed discipline and the attributes of a Food Law specialist at MSc level might till not yet be well defined at the professional level. The panel expects that the recruitment of a new chair holder will help in this respect and emphasizes the importance of supporting students in finding not only internships, but also in developing a sense of their future possibilities.

Master's programme Food Quality Management (FQM)

Profile and objective

Food quality management has received increasing attention in agribusiness and food industry in the last decades. Consequently, food quality management has become an integral part of business' management systems in food enterprises along the entire agri-food chain. Issues with respect to quality and safety in the supply chain are usually not well defined, have various causes and are typified by uncertainty and ambiguity. These issues require competent people who are able to deal with a broad variety of complex food quality management issues. This subsequently requires interdisciplinary (research) skills. Therefore the approach of the FQM programme is techno-managerial. In problem analysis this approach combines theories from technological sciences and management sciences. This approach provides a broader insight into possible causes of food quality management problems and a comprehensive view on adequate solutions.

The panel is positive about the integrated approach, which includes both management and scientific aspects and is appropriate for food quality management issues. The combination of technological sciences and management sciences makes it clear to the panel that FQM should be an independent master's programme, rather than a specialisation of the Food Technology master. It should not only attract students with a food technology background, but also students with a management background fit well in this programme.

Intended learning outcomes, level and orientation

The twelve intended learning outcomes (ILOs) are provided in appendix 1. The ILOs are divided into four groups: 1) domain specific knowledge and understanding, 2) scientific learning, 3) domain specific skills and 4) general academic learning. The ILOs fulfil the criteria described in the Dublin descriptors.

Most of the eleven ILOs are of an integrated nature, underpinning the integrated, interdisciplinary nature of the programme. This will lead to graduates who are trained in an integrated and interdisciplinary way. Students get ample opportunity to apply knowledge and skills in various courses. In most courses students need to analyse complex problems, critically judge results, work with real life situations or literature from both technological and social sciences. Communication skills are developed throughout the programme. Intercultural skills and understanding are developed in the multinational student population. The integrated techno-managerial approach stimulates students to use and develop learning skills in order to improve their performance.

The specialization courses, thesis and internship allow students to follow a tailor-made learning process. During the thesis students follow a course on ethics, which is considered to be very important in food quality. The panel concludes that the ILOs suit the programme and are at an appropriate level for an international academic master's programme.



Requirements of the professional field and discipline

The design of ILOs is approved by the External Advisory Board and are in line with expectations from the professional field. Although SME organisations not yet always see the purpose for hiring a food quality management expert, the panel is convinced that graduates clearly have many options for finding an appropriate position. Similar to the other master's programmes the internship is an important link between the academic master's programme and the professional field. It clearly supports students in developing their view on the professional field and their future job perspectives.

Considerations

The panel has reviewed the profiles and ILOs of all four programmes and considers them to be very appropriate. The chair groups underlying these programmes are internationally leading and this is reflected in the broadness of the programmes offered, while at the same time there is a lot of expertise on many aspects present. These four programmes fit perfectly in the Wageningen University profile which has a strong focus on Food. The ILOs are compliant with the Dublin Descriptors and all four programmes clearly showed a relation between the ILOs and the level and orientation of the programme.

The bachelor's programme Food Technology offers a solid, broad basis in the interdisciplinary field of food sciences. The master's programme Food Technology offers many specializations, covering nearly the entire field. The flexibility of adding new specializations based on the demand from the professional field is impressive. The panel does emphasize the importance of continually managing the life cycle of the specializations. Both Food Safety and Food Quality Management are clearly independent programmes with their own profiles. Both programmes not only include technological sciences in the programme, but also focus on social sciences.

The panel paid specific attention to the part-time online specialization in the master's programme Food Technology. The ILOs are the same as those of the other Food Technology specializations although the courses were redesigned for online students. The panel is pleased about this development of introducing an online specialization. This programme serves the need from industry to continue training their employees.

All programmes, even the bachelor's programme, focus on the connection to and requirements from the industry and professional field. This ensures that students are wanted after graduation and easily find a position that fits their interests and level of education. The fact that major companies in food industry have a research plant in Wageningen confirms this good connection. The panel asks attention for the possibilities of bachelor's graduates in finding a job. This is specifically relevant for the international student population that will increase in the English taught bachelor's. A positive development in this is the opportunity students now have to do an internship in the bachelor's programme. With respect to the Food Safety programme the panel considers that students might need some additional support in finding their way towards industry and the professional field.

Conclusion

Bachelor's programme Food Technology: the panel assesses Standard 1 as 'good'.

Master's programme Food Safety: the panel assesses Standard 1 as 'good'.

Master's programme Food Technology: the panel assesses Standard 1 as 'good'.

Master's programme Food Quality Management: the panel assesses Standard 1 as 'good'.

Standard 2: Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings

In all four programmes student numbers have increased between 2010 and 2017. The highest increase is observed in the bachelor's programme Food Technology (from 60 to over 180), and the master's programme Food Technology (from 115 to 220). The other master's programmes had a smaller increase, but significant nonetheless, Food Safety went from 40 to 80 and Food Quality Management from 25 to 45. To deal with this increase in student numbers, changes were made to the programmes. The panel has paid attention to how each programme deals with this increase. The previous panel also commented on the supervision of students, making this an important aspect during the site visit.

Bachelor's programme Food Technology

Structure of the curriculum

The first and second year of the three-year bachelor's programme mainly consist of compulsory courses, the third year includes a minor and the bachelor thesis. An overview of the curriculum is provided in appendix 2. Most of the first year courses are general basic science courses, in order to reach the minimum level for the food science courses. In addition there are three interdisciplinary (integrated) food science courses in the first year, to motivate students. This way the first year is selective; basic courses determine suitability of the student, while the integrated courses determine the motivation for food science.

Students with different VWO profiles are accepted, these profiles differ in level of Mathematics/Statistics and may lack biology or physics. The mathematics/statistics deficiencies are covered in the first year. Students follow either statistics, or mathematics depending on their VWO level. Students who lack physics or biology at VWO level are informed about the challenges, but no compensation courses are offered within the programme. In practice the success rates are similar to students who did have biology and physics.

The second year consists of food science courses, in the first part of the year predominantly discipline related (5 courses) and towards the end of the year more integrated courses (5 courses). Integrated courses combine at least two disciplines. Many courses also include (laboratory) practicals to develop essential skills. During the third year students choose a minor or take 30 EC as optional courses. The programme encourages students to look for minors outside Wageningen University and even abroad. Students also follow the compulsory course *Case Studies Product Quality*, which includes groupwork on a science related case in cooperation with an industry or other external partner. The programme is finalized with the 24 EC thesis that is based on individual research work in the field of food science and technology.

An overview of the relation between the ILOs and the curriculum is provided in the self-evaluation report. This overview shows that all ILOs are covered in the compulsory part of the programme. The courses in the first year are more general and form the foundation of the second year courses, therefore, most ILOs are covered in the second and third year.

The panel has in depth looked at the curriculum and considers it to be well balanced. The choice to start in the first year with disciplinary and basic courses seems well founded, the panel applauds the fact that some integrative courses are also present in this first year. The programme is coherent and trains high quality graduates. In addition to this coherent compulsory programme, there is ample room for optionals and the thesis. This allows students to adapt the programme to their interests. The course *Cell Biology* (year 1) was didactically and content wise impressive. According to the panel the wide variety level of the optionals in the third year, this wide scope of the bachelor's programme is clearly a major asset.



Teaching learning environment: student numbers and teaching methods

In the bachelor's programme a number of structural changes were made to the programme to deal with the increasing student numbers. Specifically with respect to the many practicals and group work there was pressure on the facilities and staff for supervision. Some experiments were reduced, or replaced by dry-lab (computer) practicals and tutorials. The programme also introduced many knowledge clips to help students study beforehand, allowing the students to do more experiments in the same time during practicals. The panel was impressed by a number of measures that were taken. For example the student centred Lab-buddy approach is introduced, which the panel considers a best practice. This programme helps students not only prepare for the practical, but also deals with the student support on basic aspects during the practical. This allows the teaching staff to deal with cognitively more complex topics and discussions during the course, resulting in more depth. The fact that the changes stimulate students to prepare classes and practicals beforehand is another positive development. The increase in diversity of teaching methods focuses on the diversity of learners. Finally, similar to team 1 in the biotechnology programmes, a *food force* is just established. Different chair groups jointly hire a number of lecturers to help with practicals in several courses and programmes.

Despite these positive and successful measures to deal with the increasing student numbers, the panel emphasises that sustainability of the measures is key in long term success. Specifically with the change to an English, international programme, student numbers might increase. Students informed the panel that they do not think the large cohorts have a negative effect on the quality of the courses. The issue mentioned by the students was limited equipment, like insufficient scales and long waiting lines. For this the new building will be helpful, but this aspect should be kept under review. Another issue is the supervision of thesis work. Students mentioned that not all students can do a thesis project on the topic of their first choice. However, all students the panel talked to did get their first choice and stated that usually a solution is found. The panel recommends continuous attention to thesis supervision, also regarding the workload for staff members.

Irrespective of increasing student numbers, the programme focuses on offering a rich learning environment with many different teaching methods in almost every course. Many courses offer lab practicals as well as case studies and group work. This leads to around 20-25 contact hours per week. A nice example of mixed teaching methods is the final course in the second year (*Food Property of Function*), where students have to apply the knowledge of all previous courses. This course combines lectures on chemical, physical, sensorical and ethical aspects. There is a digital assignment on chocolate, comprising interactive cases. The course furthermore combines three practical parts in which students also have to do a group assignment. The panel is of the opinion that this is an exemplary course that encourages activated learning in students. The programme clearly has introduced a focus on diversity of learners, suiting the individual student's needs and requirements.

Master's programme Food Technology

Structure of the curriculum

The master's programme in Food Technology comprises ten full-time campus based specializations and one part-time, online specialization. The specializations can be divided into three groups:

- A. Specialization that focus on a specific field within food technology (mono-disciplinary):
 - Ingredient Functionality
 - Product Design
 - Dairy Science and Technology
 - Sustainable Food Processing
 - European Masters in Food Studies
- B. Interdisciplinary specializations
 - Food Innovation and Management
 - Gastronomy
- C. Inter specializations
 - Sensory Sciences (with Nutrition and Health)

- Digestion & Health (with Nutrition and Health)
- Food Biotechnology & Biorefining (with Biotechnology)

The panel is pleased to see the variety in specializations, allowing students to fit the programme to their skills and interests. The panel is specifically impressed by the inter-specializations that truly offer students an interdisciplinary programme. This model is replicated in the managerial approach of the FQM programme and the Law approach in the FS programme. Food technology is highly interdisciplinary, hence training in this area provides state of the art graduates who are ready for a start in industry. The programme manages to bridge the different areas whilst keeping sufficient depth in the curriculum. Students stated that even though they have chosen a specialization, this does not deter them from entering other fields. This implies that the compulsory modules have a very high level of achievement.

For most of the specializations the curriculum consists of three or four compulsory courses (CS). Student furthermore have to choose at least two courses in the field of their specializations (RO1) and at least one course either to further specialize or to broaden their knowledge (RO1). In the final course of the first year all students jointly follow the integrated course *Product and Process design*. In this course the knowledge on food sciences is integrated to work on product design problems from both a product and a process perspective. The common part of the programme is completed by two small courses.

The second year is spent on a thesis of at least 36 EC at one of the Chair Groups related to the specialization chosen. In addition students do an internship of at least 24 EC at a company, institute or university outside WU. Only students following the European Masters in Food Studies are allowed to do their thesis at one of the industrial partners. According to the panel this European Masters in Food Studies specialization is set up almost like an honours track. A small and selected group of motivated students spend their first year following courses in four European countries. The second year consists of a ten-month research project (combining thesis and internship) in industry, but supervised by WU. The intensity of the programme and international perspective, combined with selected students makes this a very impressive specialization.

The part-time, distance-learning specialization started in 2017-2018. The programme comprises courses from the different full-time specializations, which have been redesigned for an online programme. The overall programme has been designed as a broad specialization, to make it suitable for students from different roles and fields in the food industry. Courses have been reduced to 3 EC each. Plenary lectures have been replaced by knowledge clips and regular group work by online group work. Laboratory practicals have either been replaced by simulation experiments or included in the Wageningen weeks (two two-week intense laboratory practicals on campus). The programme can be followed in four years, with two years of courses and two years of thesis and internship. The panel is very positive about this online specialization. The tailoring towards students who also work is well considered and allows these students to – in smaller chunks – get the same depth in knowledge and skills compared to the full-time, on campus students.

The design of the programme allows students from all specializations to compose a tailor-made, unique programme. An appendix in the self-evaluation report provides an overview of the relation between the ILOs and the courses. All ILOs are obtained in each specialization and most of the ILOs are addressed in the final compulsory course, *Product and Process Design*, but also in the thesis and internship. Different specializations have a stronger focus on one or more of the ILOs.

With ten specializations there are many options for students within the programme. In contrast to the broad scope of the bachelor's programme there is depth and specialization in the master's. The panel is of the opinion that this allows master's students to obtain the required level within the discipline(s) of their specialization. In addition, the compulsory course *Product and Process Design* unites students from the specializations, where they integrate their knowledge and skills and learn to use the specializations in a collaborative way. The panel is very positive about this integrated,



multidisciplinary course. This course is attended by all students in all specializations and students are organized in mixed groups and learn by the exchange and integration of the knowledge of each other in a common project. According to the panel this is an excellent approach that brings the student to experience how industry and research teams work in a multidisciplinary way. All courses the panel looked at were state of the art in terms of teaching material and context in which the programme is embedded. At master's level integration of various disciplinary fields was commonly seen. Teaching materials were rich, interactive and students were able to easily access it through the electronic learning environment. As stated in standard 1, the panel is positive about the flexibility in the programme to adapt to new trends and requirements in the food industry. In addition to the internship and group work, this allows for students to be well-prepared for the professional field after graduation.

For all three master's programmes in food the Wageningen Scientific Preparation Week is developed for students who are new to Wageningen. This course is for external students and is held prior to the start of the academic year. About 70% of the external students follow this course. The panel is very positive about this introductory week. The international students the panel talked to stated that it helped them to get acquainted with the Dutch way of studying. Although a number of the topics are not relevant for the Wageningen bachelor's graduates, the panel would have liked a common part of this course for all students. Not only external, but also Dutch students should be trained in intercultural awareness.

Teaching learning environment: student numbers, student support and teaching methods

Over the past years the number of students enrolling the master's programme Food Technology has increased. This is partly the result of the increase in student numbers of the bachelor's programme, but also the number of international students increases. Further increase is expected over the next five years. According to the programme, the upside of increasing student numbers is the opportunity to develop new courses and specializations. Examples are given, like the specialization Digestion & Health and the course *Food Flavour* that will be offered first in the European master's specialization and starting in 2020 also for other specializations. The panel considers it a strength of the programme that it is flexible and able to add courses. This reduces the pressure on teaching staff having to deal with increasing student numbers. The panel does warn that only adding might – in the long run – also lead to obsolete courses and specializations. The panel concludes that the programme is dealing well with the increasing student numbers. The main challenge, similar to the bachelor's programme, is providing all students with a thesis topic that fits their wishes and provides adequate supervision. So far, the programme is dealing with this rather well, but also in this programme the panel questions the sustainability of the solutions that were introduced. Will the programme be able to deal with thesis supervision on the long term?

Admission criteria are clearly set for Wageningen students. For external students they have become more strict based on experience over the past years. Not only the level of English is considered to be important, but also knowledge of the core disciplines. The panel considers this a good development, specifically with the increasing number of international students.

All specializations offer multiple teaching methods in most courses, like lab practicals, tutorials, case studies and group work. On average students have 17-23 contact hours per week, depending on the specializations and optionals. The programme considers laboratory practicals to be an important part of the curriculum. The increase in student numbers has put a strain on staff and space/equipment. The chosen solution was to invest in developing innovative teaching methods, for example reducing the number of lab classes and replacing them with a pre-lab simulation case study (LabSim). The problem is similar to the laboratory practical and students have to design an experimental set-up to answer the research questions. This prepares students well for the actual lab classes, making the time spent in the laboratory more efficient and effective. The panel agrees with the programme that by using LabSim the number of laboratory practical hours can be reduced without loss of quality in the courses. By applying more than one teaching method, students actually can get used to different approaches.

Master's programme Food Safety

Structure of the curriculum

In the master's programme Food Safety the courses *Food Law* and *Food Safety Management* are compulsory. The first course is to train students with a large range of backgrounds in the principles of food law which is deemed necessary in the programme. The second course is integrating all students to apply their knowledge and skills in a complicated case study. The programme has three specializations.

1. Applied Food Safety, a more technical specialization with emphasis on food microbiology, food toxicology and making risk assessments based on the knowledge obtained. In the first period of this specialization the curriculum comprises of optional courses. As students come from a large range of backgrounds, not all students are skilled at the same level in (basic) food microbiology, some students are required to take the course *Food Microbiology*. Similarly, courses like *Food Quality Management* and *Advanced Statistics* are offered to allow student to get at the required level.
2. Food Law and Regulatory Affairs, also attracting students with a legal background. To prepare these students two lines of restricted optionals are included; students with a legal background have to follow the courses *Basics in Food Technology* and *Food Hazards*, while students with a technical background follow courses on *European governance* and *Food Safety Economics*. The core of the curriculum consists of courses in food law and the Food Quality Management course.
3. Supply Chain Safety, specifically developed upon request of food industry in order to train specialists who have knowledge about the complexity of the supply chain in relation to safety. The specialization has two compulsory courses, *Risk Management in Food Supply Chains* and *Global Food Security*. In 2019-20 an integrative course will be developed that will integrate both courses with Food Law. Students can focus on a specific aspect of the supply chain and base their courses on this.

The panel reviewed the courses underlying the three specializations and concludes that all three are coherent and have a good combination of courses. The programme offers a good combination of scientific and technical courses with regulatory, managerial and policy courses. This is a good combination to provide the essential skills required for a Food safety specialist. The courses were innovative in their presentation of the teaching material. The content was overall state of the art and at master's level integration of various disciplinary fields was observed. Accessibility of teaching materials were a challenge for students with respect to some topics, students had to travel to other universities to find the right books. The *Food Safety Management* course brings students from all three specializations together to collaborate and integrate their knowledge. To further improve this course and the programme, the panel recommends to include a systems approach and wider structure of the system (e.g. auditing, communicating and assessing) in the course.

According to the panel the Food Law specialization leads to graduates that are necessary in the professional field. Students, however, struggle to find an internship and are uncertain about their future job opportunities. The panel thinks this is due to the professional field still being insufficiently aware of the need for these graduates. Also, this relatively new specialization requires making new contacts in the field of food law. The coordination and acquisition of internships is still in development. In this specialization there is also attention required to facilities and documents, which are not always available at WU. The programme did arrange that students can make use of facilities at other universities, but this costs time and (travelling) expenses for the students. The panel is confident that these issues will be solved in time and recommends in the meantime to carefully guide the students in this specialization.

The design of the programme allows all students to compose a tailor-made, unique programme. In the self-evaluation report an overview is provided that shows the relation between courses and ILOs. The panel noticed that one ILO (regarding awareness of social sciences) is only covered in (restricted) optional courses. Although the study adviser is involved in the choice for optionals, the panel thinks



that this is a vulnerable situation. During the site visit the programme management informed the panel that they had also noticed this and will repair this omission. The panel furthermore noticed that another ILO, 'to be able to design food safety management systems', is only covered in one course. As this topic is important in a Food Safety programme, the panel recommends to cover this ILO in at least one other course.

Teaching learning environment: student numbers, student guidance and teaching methods

Student numbers have increased steadily over the past years. Although numbers are not at the level of the Food Technology programmes, the numbers doubled between 2010 and 2018. A further increase is expected, partly due to increasing student numbers in the bachelor's programmes that deliver most students. Part of the growth is due to the introduction of two specializations, which subsequently allowed spreading of students. The major challenge in dealing with increased student numbers is finding thesis topics (including lab spaces) and supervisors for the thesis project. Until now the programme managed to deal with the student numbers and is now discussing how to deal with future growth. The panel is pleased to see that the programme is thinking of sustainability in dealing with the increasing student numbers. However, although money is available to hire new teaching staff, good staff members cannot always be found.

The programme aims at offering a rich learning environment with many different teaching methods. Specifically the common, compulsory course *Food Safety Management* is integrating a number of teaching methods and focuses on multidisciplinary, multinational teams. Students work in groups and based on their own specialization, have to work on a large assignment. In addition to lectures the teaching methods include presentations, collaboration, giving and writing down an advice, negotiations and team meetings. In addition to this large case, students also have to design an Incident Management Protocol, which requires a different way of working. The panel agrees with the programme that this course is a good way to combine and integrate the knowledge and skills of students from all three specializations.

Master's programme Food Quality Management

Structure of the curriculum

The first year courses of the master's programme Food Quality Management can be divided into three parts; compulsory courses in the area of food quality management (30 EC), a statistical or methodological course (6 EC) and at least 12 EC of specializations courses. In the first period students start with the introductory course *Food Quality Management* that introduces the concept of the Techno-Managerial Approach. The diversity in backgrounds of enrolling students is large and this course aligns and upgrades the knowledge of students. In the second period the course *Food Law* is compulsory for all students as it covers a number of essential topics like international trade, QTO, etc. The main focus in this course lies on EU food law. In the second period students choose one of two courses, depending on their previous training (technology background or social sciences background). Furthermore, all students have to follow at least one methodological course, again based on their previous training and after consultation with the study adviser. In addition to the common part of the programme, there are four specializations that cover the entire field of food quality management and are based on the roles the graduates will have after completing the programme.

1. Quality and Safety Control and Assurance: a more technology-oriented specialization linking to the Food Safety programme.
2. Food Logistics Management: on the functioning of complex food supply chains, with emphasis on product quality, sustainability and technology.
3. User Oriented Food Quality: studies food quality from the consumer's perspective and the different systems that exist to check and control food quality in the production chain.
4. Quality Management and Entrepreneurship: insights into developing business in a complex and dynamic environment, taking into account multiple and conflicting demands.

The panel discussed the differences between the four specializations with the students. Students could make clear to the panel what the differences are and could explain in what way they complement each other. The panel concludes that the four chosen specializations indeed cover the field of food quality management.

In the second year students perform a thesis in which they follow the four phases of the interdisciplinary research approach (Appreciation, Analysis, Assessment and Action/Evaluation) to analyse and solve a food quality management problem from a technological and managerial perspective. Finally, students do an internship that is aimed at gaining experiences in an academic working environment outside WU.

The panel has carefully looked at the way that the programme deals with the different backgrounds of enrolling students. Depending on their previous education, students have to make certain choices in their programme, to make sure that all graduates have adequate knowledge, skills and understanding of both the technological and social sciences aspects. The study adviser is crucial in this respect. In addition, students choose a specialization that fits their profile and interests. This structure clearly allows for T-shaped skills to be developed: breadth and depth. The courses were clear in their presentation of teaching material. The content was overall state of the art and reached depth whilst at the same time also aiming at integration of various disciplinary fields relevant to food quality management. Teaching material was rich, interactive and students were able to easily access it through the electronic learning environment.

In the self-evaluation report an overview is provided in which the ILOs are matched with the courses. All ILOs are covered in the compulsory part of the programme (including thesis and internship). Although covered in the compulsory course *Food Law* the ILO on analysing, understanding and explaining the consequences of governmental quality rules on the processes in the agri-food chain is not covered in any other course. The panel recommends to cover this ILO also in other (optional) courses).

Teaching learning environment: student numbers, student guidance and teaching methods

Although this programme is the smallest of the four food programmes, it also has grown over the past period, from 25 to nearly 45 students per year. In this programme the growth was desired and the panel considers that the student population is healthy in numbers. Further growth is expected up to 60-70 students per year.

The master's programme Food Quality Management, like the other programmes, aims at a rich learning environment with many different teaching methods. With less time spent on practicals and more on groupwork, this programme has a somewhat different teaching philosophy. The number of contact hours is comparable to the other programmes with an average of 24 contact hours per week. There is a lot of focus on group work, although lab-work, lectures and tutorials also are part of the teaching methods. The panel understands this approach, but does ask attention for assessment of group work (see standard 3).

Teaching staff in the food programmes

The number of teaching staff per course varies and is depending on the teaching methods. The policy of the programme has always been to employ specialists in each course. This leads to relatively large numbers of teachers being involved in each course. Lecturers from five Chair Groups from the field of food technology are included in the programmes. In addition, some Chair Groups outside the field also participate in the programme.

The student-staff ratio is 14 for bachelor's programme and 25 (FT), 26 (FS) and 29 (FQM) for the three master's programmes. For the bachelor's the ratio is considered appropriate for a programme with many contact hours and intensive teaching methods. The student-staff ratio for the master's programmes seems high in a programme with many contact hours and intensive teaching methods. However, in some courses large student numbers from other programmes (up to 150 or 200



students) lead to these high ratios. The increase in student numbers is likely to have an effect on this number in the next years. However, the increase in student numbers is accompanied by an increase in teaching fte. Although it is a challenge to also find qualified teaching staff, the panel considers that the quantity of staff members is indeed adequate at the moment of the site visit. The programmes have managed to deal with the increase in students numbers rather well over the past years (see also teaching learning environment).

With the increasing student numbers the programmes have to rely more on PhD students in the daily supervision of thesis work. This is not a problem by itself, as the programmes all arranged a senior staff member as supervisor for each student. It does require some attention in training PhD students to assure that they are capable of supervising bachelor's and master's students and to take care of the number of students that are daily supervised by a PhD candidate.

Didactic skills of staff are considered to be important, as well as good research reputation. Most staff have the university teaching qualification (UTQ) and most Chair Group Leaders have a prominent research profile. The percentage of 49-63% UTQ is not very high, but is within the objectives set by WU. The fact that some of the teaching staff are not employed in Chair Groups, but in research institutes where a UTQ is not mandatory, lowers this percentage. The programme clearly states that all new staff members are expected to get a UTQ and that nearly all course coordinators and principal teaching staff do have a UTQ. For senior teaching staff with a lot of experience only recently a tailor made UTQ programme was made available. The panel is confident that this tailor made programme will increase the percentages to the level that reflects the quality of the teaching staff. Students are in general very positive about the teaching qualities of teaching staff, this was confirmed by students in the interview with the panel.

Nearly all teaching staff have a PhD and overall the panel is very impressed by the high research qualifications of the staff members. The Wageningen food Chair Groups are renowned worldwide for their research qualities. Students are able to work and learn in such an environment, which leads to very high quality graduates (see standard 4). WU has a clear policy and structure with respect to the balance between research and teaching and the combination of both. The panel understands that the growth of the programmes led to teaching staff with hardly any research task. It does emphasise the importance of all teaching staff being involved in research at some level (and the other way around). It was pleased to learn that all teaching staff will get a small amount of time to do research on educational topics.

The growth of the programmes resulted in an increase of teaching staff with a teaching appointment. The WU policy is that these staff members are also engaged in research for a small amount of their appointment. Often this is educational research, sometimes scientific research. The panel appreciates that these opportunities are provided and emphasizes the importance of this in keeping research and teaching connected.

Student guidance

All programmes in food technology provide students with the opportunity to select courses and create their individual programme. In the master's programmes students with different backgrounds enrol, both from different cultures and with different pre-education. This makes it important that students are well-guided in making choices throughout the programme in order to achieve the ILOs and to design a coherent, tailor-made curriculum. Like all WU programmes, the role of study adviser is crucial for students to define their tailor made programme.

During the site visit the panel has discussed the student guidance, specifically in relation to the many specializations and optionals. All four food programmes jointly have a total of seven study advisers, all with thorough knowledge and understanding of the programmes and specializations. The master's students are invited for an interview on arrival, subsequent meetings are on request of the student. The study advisers provide tailor made guidance; students who want regular meetings to discuss their options can get these, while students who are well aware of their choices can do with the one

meeting. Students, teaching staff and study advisers all stated to be pleased with the guidance. The panel is of the opinion that the programme is dealing well with guiding students in the many choices they have to make and at the same time give each student the guidance he/she wants.

In addition to the study advisers, teaching staff are considered to be very approachable by the students. In addition to clear course guides that describe the learning goals of the course very well, students informed the panel that teaching staff are available for questions. Also, students mentioned that feedback is dealt with appropriately. During courses (small) changes are made, and student evaluations also lead to changes in courses over time.

Teaching methods and student numbers

All four programmes provide a variety in teaching methods, examples are given in the *teaching-learning environment* part for each programme. The panel is enthusiastic about this variety and the way this makes the programmes student-oriented. Group-work is important in all programmes and teaches students how to collaborate with others, both within their own specialization and with students from other specializations. This prepares them well for the prospective jobs where collaboration with colleagues having different (educational) backgrounds is daily business. Furthermore, students can do a lot of work digitally (from home), or can choose to go to tutorials and lectures more often. Each student can choose the teaching methods that best fit his/her wishes and needs. Students stated that they appreciate this choice.

Some of the teaching methods were developed in order to deal with the high and increasing student numbers. The panel considers that the programmes have managed to take this potential problem and use it to improve the quality of teaching in many respects. By digitalising the basics, more time can be spent on more complex topics during contact hours. Students mentioned that despite the large cohorts, they do not feel like a number.

The most important challenge the panel observes with respect to teaching methods and student numbers, is providing adequate and sufficient feedback throughout the programme. Providing good feedback takes time, but is essential in a student centred approach. Students require feedback on their work, both when the result is good or bad. The programmes have to carefully consider when to provide feedback. When feedback is given, it has to make sure that students can use it to develop their skills or knowledge.

Although students are overall pleased with the measures taken to deal with the increasing student population, they did state that specifically lab-practicals are under pressure. This does not immediately relate to teaching staff, but rather to equipment. The prospective building is crucial in the sustainability of dealing with high student numbers.

Considerations

The bachelor's programme has a clear and logical build-up, with compulsory, disciplinary courses in the first year that develop into multidisciplinary and optional courses in the progress of the programme. The panel observed a clear relation between ILOs and the curriculum. The increase of student numbers in the past evaluation period is being dealt with very well. In fact, the programme has introduced a number of innovative teaching methods. The panel does point out the sustainability of the measures on the long term, specifically if student numbers should further increase. Overall the learning environment is rich and despite the large numbers of students, it is clearly a well identifiable cohort of Food Technology bachelor's students that is distinguishable as one cohesive group.

The master's programme in Food Technology provides a large number of specializations, allowing student to gain in depth knowledge. The panel is impressed specifically by the integrative course *Product and Process Design* in which the students' knowledge on food sciences is integrated across specializations and with a focus on industrial design problems from both a product and process perspective. Students have a lot of freedom to choose their own path and specialization, while at the



same time the integrative course and two smaller common courses allow for breadth in the individual programmes.

The master's programme in Food Safety has two compulsory courses, allowing for a common, multidisciplinary basis of the students. Subsequently students can opt for one of three specializations. According to the panel some attention is required in the Food Law specialization with the relation to the professional field. Student numbers also increase in this programme and lead to new optionals.

The master's programme in Food Quality Management is divided into three parts: compulsory courses, a methodological/statistical course and specialization courses. This build-up of the programme allows for both a multidisciplinary, broad approach and specialization.

In all three master's programmes student numbers also strongly increased, which was also mentioned as a threat in the student chapter of the self-evaluation report. The master's programme in Food Technology had the highest increase in absolute numbers. All programmes dealt well with the increasing student numbers, introducing innovative teaching methods. The new building with laboratory spaces is essential in dealing with longer term growth. Furthermore, the main challenge that remains is providing sufficient thesis topics and supervision of thesis work. So far, the programmes manage to make it work.

The three master's programmes jointly organize the Wageningen Scientific Preparation Week, which is an excellent example of introducing new students to the university. The three master's programmes also all deal well with the variety in backgrounds of enrolling students. In the first part of the programme students have to choose a restricted optional course depending on their previous education. This way all students have a minimal amount of knowledge and skills in multiple disciplines.

Teaching staff numbers are adequate and the panel is impressed by the research qualities of the Chair Groups involved in the programmes. Students are able to work and learn in a research intensive, high quality environment. Students are positive about the didactic skills of teaching staff. Involvement of PhD students in daily supervision of thesis work is increasing. Most PhD students are being trained on supervising and all PhD students work under close supervision of their supervisor.

Student guidance is good. The study advisers have an important role in setting up individual, tailor made programmes. With a total of seven study advisers, the programmes can deal with all students. The panel is impressed by the student-focussed approach, both in teaching methods and guidance.

Conclusion

Bachelor's programme Food Technology: the panel assesses Standard 2 as 'good'.

Master's programme Food Safety: the panel assesses Standard 2 as 'good'.

Master's programme Food Technology: the panel assesses Standard 2 as 'good'.

Master's programme Food Quality Management: the panel assesses Standard 2 as 'good'.

Standard 3: Student assessment

The programme has an adequate system of student assessment in place.

Findings*General assessment policy*

In 2017, WU renewed its vision on education alongside its education assessment policy. This assessment policy defines why and how WU assesses and how the roles and responsibilities are distributed. Its goal is to generalise assessment rules and policies and to make them transparent to both lecturers and students. In this policy, the ILOs of the degree programmes are the starting point. These are described for every programme and are in line with the Dublin descriptors. Furthermore, in every programme WU tries to create a clear relation between the ILOs and the learning outcomes of the courses, the teaching and learning activities and the assessment. As mentioned in standard 2, the panel noticed that in the Food Safety programme one of the ILOs is minimally covered in the programme and is pleased to learn that the programme will be dealing with this.

The panel finds that WU has a good general assessment policy and clear assessment plan. The four food related programmes follow this general assessment policy and apply different assessment methods (assignments, project reports, oral presentations and performance evaluations) that are aligned to the different learning outcomes. The panel verified that all learning outcomes are assessed. The panel is pleased to notice that the programmes use the WU policy to have their courses peer reviewed by external peers. This clearly is a quality increasing measure.

The assessment strategies for the courses are published in the study handbook and in more detail in the course guide. The assessment strategies make clear how and when a learning outcome is addressed, who is involved and how the final grade is determined. This contributes to the validity, reliability and transparency of the assessment. In the self-evaluation report an example of the text in a course guide is given. The panel concludes that this information indeed provides the conditions, and time-line of the assessment and which percentage each of the assessments within a course contribute to the final grade. In addition to formal assessments, many courses use systems of (online) peer feedback and individual reflections as part of the assessment. Many courses have been peer-reviewed by external experts, feedback is incorporated in the assessment of the course. The panel considers this WU policy to be an excellent way to contribute to the quality of assessment.

The panel concludes that the courses are adequately assessed and it observed some nice examples of assessment strategies and rubrics. The panel was pleased to learn that Chair Groups that are heavily involved in the food programmes are making frequent use of rubrics in many courses and the thesis. The programmes overall have a balance in the assessment methods. The assessment of courses the panel looked at in depth during the site visit showed appropriate assessment methods and questions that were in line with the learning goals of the course. It found examinations with a right mixture of multiple choice questions and open questions, which is positive for programmes with many (and increasing number of) students. The panel furthermore observed a significant number of numerical calculations in examinations of several modules as well as a nice balance between group work and individual work. The panel noticed a variety in assessments and many rubrics and assessment strategies that support an objective, verifiable and transparent assessment.

The Food Safety programme provided an example in which group work (group assessment) and individual assessments are combined, leading to a balanced, individual final grade. The other programmes have similar procedures. Even if grades are given to a group, there is always the opportunity to adjust the group mark for individual group members. This is important according to the panel, to prevent free riding. Students informed the panel that they have to assess each other (peer feedback), including their involvement in the group process (e.g. free-riding). They also stated that it is not clear to them what the consequences are of their feedback on the marking of an individual student. The panel thinks that this requires some communication towards students.



The one exception in alignment between teaching method, ILO and assessment that students informed the panel about, is that multiple choice (MC) questions were given on calculation assignments and no marks were given for any working. If the MC questions are designed in such a way that they also verify the path towards the answer this could be an option, but the panel also observed less appropriate MC questions. It recommends to carefully look into the learning goals of a course and find appropriate assessments.

The Chair Groups in Food agreed on a fixed weighing of the criteria on the thesis assessment form, which is considered wise by the panel. The fact that theses in the social sciences have less or no laboratory work clearly corroborates the different choices that are made by some other Chair Groups. The panel thinks that Chair Groups give adequate attention to the differences in weighing and marking between Chair Groups, this is necessary in order to avoid strategic studying by students. The programmes do consider this in the thesis work, but also in other courses this is a point of attention.

There is a clear connection between the assessment methods that are being used and the complexity of the learning objectives. There is a course dependent assessment strategy that is written down in a clear and transparent (digital) course guide. During the site visit, the panel learned from the Examining Board (EB) that it is satisfied with the quality of the assessment. The students told the panel that they thought the assessments were transparent and objective.

Examining Board

At WU there are four Examining Boards (EB), each responsible for the assurance of the quality of examination of a group of related degree programmes. The members are appointed by the Executive Board and at least one member is independent (not related to the degree programmes). For each course a member of the lecturing staff is appointed as examiner by the responsible EB. The examiner is responsible for the assessment strategy of the course(s).

The EB that is responsible for the food programmes, accompanied by an assessment expert, tries to visit each Chair Group once every four years. However, in the past the practice was rather once every five-six years due to the high workload of the EB. It checks a sample of theses and internship assessments and during the visit it discusses the validity, reliability and transparency of the assessments (of the courses). When necessary, it proposes enhancements. From the interview during the site visit, the panel concludes that the EB is well aware of its legal duties and responsibilities. The EB that is responsible for the Food programmes is the largest of the four WU EB's. Although the panel understands that visiting all Chair Groups is time consuming, it recommends to the EB to more frequently meet with each Chair Group. The minimum should be once every four years, preferable even more frequent. This will shorten the PDCA cycle. The panel was very pleased to learn that the EB's will be given more resources by the WU to do their important work.

In addition to visiting the Chair Groups, the panel recommends the EB to look for effective ways to check if all ILOs are covered in the programme of all students. Specifically in some, often the most recent specializations this is a point of attention as the panel noticed that a number of ILOs are only covered in one course. It is important that the EB establishes that the programme guarantees that indeed this ILO is met in that specific course.

Bachelor's and master's thesis

In the individual bachelor's thesis (24 EC) students have to demonstrate that they are able to design, plan, execute and reflect on research in the field of their choice (one of five Chair Groups), in accordance with academic standards. The thesis covers the entire process of proposal writing, theoretical framework and hypothesis, methodological design, use of acquired knowledge, discussion of results and drawing sound conclusions. The thesis is completed with a written paper (including an ethical chapter) a public colloquium and a final discussion between student, supervisor and examiner.

The master's students also have an individual thesis of 36 EC and the thesis covers the same process compared to the bachelor's programme. The difference is that students in the master's programmes are expected to show an academic attitude at a higher level, including logical reasoning and more complex research. For the programmes in Food Technology, approximately 90% of the theses is laboratory based. For the master's programme Food Safety this is approximately 50% with variation between specializations. The panel noticed that in the bachelor's programme the recommendation by the previous panel to include an ethical chapter was taken up. Ethical issues are important in food technology and the addition of an ethical chapter seems wise.

All programmes use the thesis application procedure (Food Quality Management as of this academic year), which has been developed to make sure that all students will have a thesis placement. Due to large student numbers the thesis placement is centrally organised. Similar to master's programmes, the bachelor's programme introduced the thesis ring, the five food Chair Groups are participating in this. This reduces some of the workload for supervisors and at the same time creates an active learning strategy. The panel is very positive about the thesis rings in which students peer review each other's work, which specifically had a positive effect at the start (writing of a thesis proposal) and end (finalizing the thesis) of the theses.

The assessment strategy of the thesis is clear, and the assessment form is provided to the student as part of the thesis contract that is signed by the student and supervisor. The assessment of the thesis is always done by the supervisor and a second, independent assessor. The panel did notice that written feedback varied between theses and although students and teaching staff stated that a lot of informal written as well as oral feedback is given in the process, this is a point of attention. Although the programmes evaluate the students' progress, the panel considers that there should be a formal go/no-go decision or a more formally organised midterm evaluation with clear criteria for a pass or a fail. For students who fail, a procedure must be at stake to avoid that students continue with a "light" version of the original project. This will be beneficial for students who are underperforming, they might be better off in a different thesis project. Also students who perform well can receive feedback on how to further improve or what aspects to pay attention to. With only one failed bachelor's student and no failed master's students in the period between 2015 and 2017 there are hardly any major issues. The panel is of opinion however, that a clear progress evaluation procedure will help all students.

Internship of the master's programmes

All internships are carried out outside WU. Students have to find their own internship position, after which the internship coordinator has to approve the topic, level and suitability for the programme and background of the student. The internship coordinator furthermore appoints a university supervisor who meets at least once with the student prior to the start of the internship. This meeting is to explain the rules of the Chair Group on internships. Most internship supervision is done at the host institutions, with regular updates from the students to the university supervisor. The internship course guide describes the learning aims and duties of students and supervisors. The host supervisor evaluates the student on performance at the host institution, the university supervisor grades the report, the final presentation and the academic level. For both evaluations a rubric is used. The final assessment is done during an evaluation talk with the university supervisor and – when possible – the host supervisor. The panel considers that the internship provides an important and valuable link between academia and the professional field. Even though all internships have a research question, not all internships are similarly research driven. This depends both on the organisation and the preferences of the student. The panel recommends to include the professional skills more manifestly in the assessment form and contract to emphasize their importance.

For the part-time variant of the Food Technology master's programme the assessment of internship and thesis is identical to that of the full-time specializations. Supervision and assessment will be carried out by online means. During the site visit no thesis or internship had started, the appropriate procedures are still being developed. The panel is confident this will be successful, as WU has experience in other part-time, distant learning programmes.



Considerations

All four programmes have a solid system of assessment in place, which is based on the WU-wide assessment policy. Within this system sufficient attention is paid to validity, reliability and transparency of examinations. The panel concludes that the overall level of sample tests studied by the panel is adequate.

The procedure for assessing the final product of the programmes, the thesis, are clear and the assessment itself is sound. The panel was pleased to find that the use of standardized rubrics and assessment forms is not only commonplace in all Chair Groups, but also that the food Chair Groups explicitly made agreements on the weighing of different aspects in the assessment form. Some attention is required to providing written feedback on the assessment forms in addition to oral feedback.

Finally, the panel established that the overall level of assessment is sufficiently safeguarded by the Examining Board. Increasing the capacity of this Board, as is the intention of the Executive Board, will help to ensure a good relationship with the Chair Groups.

Conclusion

Bachelor's programme Food Technology: the panel assesses Standard 3 as 'satisfactory'.

Master's programme Food Safety: the panel assesses Standard 3 as 'satisfactory'.

Master's programme Food Technology: the panel assesses Standard 3 as 'satisfactory'.

Master's programme Food Quality Management: the panel assesses Standard 3 as 'satisfactory'.

Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings

To review the achieved ILOs the panel studied documents like course manuals, fifteen theses for each programme and spoke to alumni of the programmes. General findings of the panel on the theses are that all theses that were read by the panel fulfilled the level that was expected and many theses were of good to very good quality.

Bachelor's programme Food Technology

The panel generally agreed with the grading by the thesis supervisors and on no occasion deviated in its grading with more than 1 grade. Overall the panel considers the quality of the theses to be good, in some cases very good. The panel notes that with the increasing student numbers taken into consideration, of a remarkable breadth in terms of topics is discussed. All bachelor's theses closed the loop and consistently used the 'hourglass' model as basis for their structure. The panel thinks that a 24 EC bachelor's thesis clearly prepares students as junior food technologists and for a master's programme. The subjects students deal with in their thesis are an appropriate reflection of the broad profile of the programme. The weaker theses were suffering from issues that have to do with not phrasing the research question optimally and sometimes a limited framework. Stronger theses were also observed in the sample, with relevant research questions, thorough literature studies and a good presentation of the current knowledge in the field. The panel is convinced that all of the theses in the sample meet the basic quality requirements. The supervising environment is ideal for bachelor's students, with strong research groups in the field of Food Technology. The fact that the bachelor's programme introduced thesis rings – which are usually more common in master's programmes – is a positive development.

In addition to the studied theses and other materials the panel spoke to staff, students and alumni about the perspective of bachelor's graduates. Most graduates (approximately 90%) continue with a

master's programme and this has been the focus of the programme for a long time. The panel is pleased to notice that this focus is somewhat shifting. Although connection to the professional field was not the reason for introducing a bachelor's internship, it does help students in their understanding of the possibilities they have. Specifically international students more often enter the labour market after graduating from a bachelor's programme. With the programme becoming English-taught and internationally oriented, the panel is positive about the developments.

Master's programmes

Some of the findings of the panel on the theses of the master's programmes are valid for all three programmes. In general the panel agreed with the grading by the supervisors. The panel is of the opinion that the quality of the theses is good and the theses clearly prepare students at the master's level for continuation in academia as well as a position in the professional field. The large number of specialisations are reflected in the topics chosen for the theses, with specialized topics in a broad field. The length and format of the theses vary strongly, between article format and 90 pages. Although this does not necessarily affect the quality, the panel thinks that a more uniform length and format will help the students. The panel is positive about the consistent use of a rubric by all supervisors and examiners. The panel did notice that the marking of theses seems to be tightly parked between 6.5 and 7.5. Although the panel never deviated from this grading with more than one grade, this seems a narrow range to differentiate. In a number of theses the level of research awareness demonstrates the achievement of high quality research related skills.

In the stronger theses, research objectives are outlined clearly and relevant methods are used to collect and analyse data. Some of the theses had a high quality conclusion, discussion and recommendations. The panel concluded that this reflected the high quality of the student. Weaker theses were less in-depth and showed limited work in comparison with other theses and would have benefitted from a stronger theoretical underpinning. Examples of the theses showed a good standard of literature review, lab work and description of results. In some cases the discussion of implications was more limited and hence led to a somewhat lower grading. The panel is convinced that all students achieve the intended end level of the programme and many surpass the basic requirements.

The position of graduates on the labour market underlines that students achieve the ILOs. Graduates easily find jobs after graduation, which is supported by the T-shaped skills they were taught. The master's programme graduates are specifically valued with respect to their multidisciplinary approach and ability to communicate and collaborate with people from other disciplines. Although graduates of all three specializations of the Food Safety programme seem to find fit positions after graduation, the future positions for food law graduates are sometimes unclear to them. Supporting them towards the labour market will help. Overall the panel thinks that there are very good opportunities on the labour market for graduates of all three master's programmes. The number of graduates that continue with a PhD is limited compared to many other WU programmes, although most graduates would be able to do a PhD if they preferred. Alumni stated to the panel that they felt well prepared for the position they got after graduation and still make use of the knowledge and skills they obtained during their training.

Food safety is a very dynamic field (worldwide) with increasing regulation and safety/quality demands of both governments and consumers. Therefore a regular check of alignment between ILOs and demands from society and professional field is required. The panel considers it wise that this regular check and update is executed. The same accounts for the Food Quality Management programme.

Considerations

All the sample theses of all four programmes that were studied by the panel and the position of graduates indicate that students indeed achieve the intended learning outcomes of the programmes. The general level of the final (thesis) projects is good: the scientific quality of the work lies between satisfactory and very good and reflects the T-shaped skills (breadth and depth). Specifically the multidisciplinary skills of graduates make them wanted by (future) employers. Most graduates of the bachelor's programme continue their studies in one of the three master's programmes, but also in other master's programmes. The panel is positive about the increased attention for entering the labour market after the bachelor's programme. Master's graduates find appropriate positions in food related industry, businesses and academia. Alumni generally feel that the programme's provided them with a solid foundation from which they can benefit in their careers.

Conclusion

Bachelor's programme Food Technology: the panel assesses Standard 4 as 'good'.

Master's programme Food Safety: the panel assesses Standard 4 as 'good'.

Master's programme Food Technology: the panel assesses Standard 4 as 'good'.

Master's programme Food Quality Management: the panel assesses Standard 4 as 'good'.

APPENDICES

APPENDIX 1: INTENDED LEARNING OUTCOMES

Appendix 1A: ILOs of the bachelor's programme Food Technology and the relation to the Dublin descriptors.

	Dublin descriptors				
	Have knowledge and understanding	Apply knowledge and understanding	Making judgements	Communication	Learning skills
After successful completion of this BSc programme graduates are expected to be able to:					
Domain specific knowledge and understanding and applying that knowledge and understanding					
1 analyse problems related to food in a quantitative way, using basic mathematical and statistical principles					
2 acquire, understand and apply theoretical knowledge of chemistry, physics, microbiology in relation to foods and the technological production processes					
3 understand laboratory techniques and analytical measurements to be applied to food technology oriented cases					
4 apply the basic principles of food quality and food safety and know how to manage these					
5 acquire and understand basic concepts of consumer behaviour, marketing strategies and logistics in respect to the food production chain					
Scientific learning outcomes (research)					
6 resolve (under supervision) a pre-defined food technology related research question or design problem into verifiable research or design questions					
7 develop and execute individually (under supervision) a research plan in which a research question, hypothesis, experimental set-up and data analysis are described in relation to relevant literature, in order to develop new knowledge or a new product or process					
Domain specific skills					
8 understand the importance and effect of sustainability in food production chains					
9 identify and discuss on societal and ethical consequences of developments in the area of food technology					
General academic learning					
10 demonstrate an academic attitude by generating and recognizing creative ideas and recognizing the limits of scientific knowledge					
11 work in a team and communicate with experts from related disciplines					
12 search, find and analyse scientific literature in the field of food sciences					
13 apply basic knowledge of a discipline of choice, preferably obtained through a well-motivated minor programme					

Appendix 1B: ILOs of the master's programme Food Technology and the relation to the Dublin descriptors.

	Dublin descriptors				
	Have knowledge and understanding	Apply knowledge and understanding	Making judgements	Communication	Learning skills
After successful completion of this MSc programme graduates are expected to be able to:					
Domain specific knowledge and understanding and applying that knowledge and understanding					
1 create solutions for optimizing food products, processes and chains, paying attention to dynamically changing global conditions					
2 acquire, apply and evaluate theoretical and practical knowledge of own specialisation in relation to foods and the technological production processes					
3 design a new food concept or process by applying knowledge of own specialisation in an integrated approach					
4 design a new food concept or process that meets the objectives and demands of an interested party					
Scientific learning outcomes (research)					
5 develop and execute individually a research plan in which a research question, hypothesis, experimental set-up and data analysis are described in relation to relevant literature, in order to develop new knowledge or a new product or process					
6 design and plan own learning process based on continuous reflection upon personal knowledge, skills, attitudes and performance					
Domain specific skills					
7 evaluate the importance and effect of sustainability in food production and processing					
8 make judgements on societal and ethical consequences of developments in the area of food technology					
General academic learning					
9 evaluate food science literature					
10 demonstrate an academic attitude by generating creative ideas; recognizing the limits of scientific knowledge; reason logically and abstractly in discussion with both experts and laymen					
11 cooperate as a specialist in a multidisciplinary, multicultural (international) team to solve complex problems					
12 communicate verbally and in writing about the results of experiments, cases or project work with colleagues and non-colleagues					
13 are critical, self-reflective and able to operate in an international context according to explicit academic codes of conduct and professional ethical standards					

Appendix 1C: ILOs of the master's programme Food Safety and the relation to the Dublin descriptors.

	Dublin descriptors				
	Have knowledge and understanding	Apply knowledge and understanding	Making judgements	Communication	Learning skills
After successful completion of this MSc programme graduates are expected to:					
Domain specific knowledge and understanding and applying that knowledge and understanding					
1 be able to analyse issues related to (global) food safety problems, both in their technical as in their societal context					
2 be knowledgeable on how foods are produced, they know how food safety is organised, realized and regulated on a local and international level, and are prepared to take responsibility for their own contribution to the field					
3 be able to make a risk assessment for either an existing or a new product or product line					
4 be aware of the societal, cultural and ethical consequences of developments in the area of food safety and of their own decisions and advices					
Scientific learning outcomes (research)					
5 have obtained knowledge in this area built upon a solid scientific and technological training, based on the life sciences					
6 be able to handle complex situations and are equipped to make balanced judgements when confronted with incomplete available data					
Domain specific skills					
7 be aware of principles from social sciences, in particular (food safety) managerial					
8 be able to design food safety management systems, and can contribute to the general knowledge of safe foods and safe food production chains					
General academic learning					
9 be able to work in a multidisciplinary, multicultural (international) team					
10 be able to interpret research results in a multidisciplinary framework					
11 be able to apply and question paradigms in their field					
12 are critical, self-reflective and able to operate in an international context according to explicit academic codes of conduct and professional ethical standards					

Appendix 1D: ILOs of the master's programme Food Quality Management and the relation to the Dublin descriptors.

	Dublin descriptors				
	Have knowledge and understanding	Apply knowledge and understanding	Making Judgements	Communication	Learning skills
After successful completion of this MSc programme graduates are expected to be able to:					
Domain specific knowledge and understanding and applying that knowledge and understanding					
1 recognize, analyse and understand factors in the agri-food processes and in the agri-food chain that influence the quality of agri-food products. Graduates are expected to be able to analyse these factors with the integrated use of technological (such as product and process aspects) and management knowledge (such as policy, consumer demands, and organization structure)					
2 describe and explain technological and managerial options and restrictions for realizing desired quality levels, both within organizations in the food chain and for the chain as a whole					
3 analyse, understand and explain the consequences of governmental quality rules on the processes in the agri-food chain					
4 describe, analyse, and evaluate quality problems in the organization of the global agri-food chain or the chain as a whole, caused by these governmental policies and regulations, taking into account legislation, policy, economics, and ethics					
5 describe, develop, and evaluate processes of quality design, quality control and improvement, and to understand and integrate management aspects (such as sales, marketing) and technological aspects (such as product development, process design, control measures) in these fields of quality					
Scientific learning outcomes (research)					
6 search and critically evaluate various scientific concepts and realize that the choice for a certain concept or model determines the diagnosis and options to optimize food quality levels or standards					
Domain specific skills					
7 determine external influences on quality and able to describe, develop, and evaluate quality systems and quality policies					
8 develop a clear perception, diagnosis and analysis of a quality issue and be able to choose appropriate scientific approaches in a multi-methodological way covering both managerial and technological aspects. This should result in certain applications and implementations of certain food quality management tools based on the selected theories					
General academic learning					
9 understand, communicate and work with people from different nationalities and with a different knowledge background					
10 design, conduct and evaluate policy relevant research on quality subjects. This means that graduates are able to analyse and evaluate practical situations and issues from a theoretical perspective, while critically evaluating the role and position of the researcher					
11 are critical, self-reflective and able to operate in an international context according to explicit academic codes of conduct and professional ethical standards					

APPENDIX 2: OVERVIEW OF THE CURRICULUM

Appendix 2A: Overview of the bachelor's curriculum Food Technology

Common Part

RO1: Choose MAT-14803 or MAT-15303 depending on the Math on VWO level.

RO2: Choose 0 - 3 course.

Course		Ects	CS/RO	Phase	Period
FPH-10306	Food Technology I	6.00	CS	B1	1AF
PCC-12303	General Chemistry 1	3.00	CS	B1	1MO
CBI-10306	Cell Biology	6.00	CS	B1	2AF
ORC-12803	Organic Chemistry 1	3.00	CS	B1	2MO
PCC-12403	General Chemistry 2	3.00	CS	B1	2MO
ORC-12903	Organic Chemistry 2	3.00	CS	B1	3AF
MAT-15403	Statistics 2	3.00	CS	B1	3MO
FCH-11306	Nutritional Aspects of Foods	6.00	CS	B1	4WD
MIB-10306	Microbiology & Biochemistry	6.00	CS	B1	5AF
MAT-14903	Mathematics 2	3.00	CS	B1	5MO
MAT-15003	Mathematics 3	3.00	CS	B1	5MO
ECS-10301	Presentation Skills	1.00	CS	B1	6AF
FPH-10803	Physical Chemistry for Food Scientists	3.00	CS	B1	6AF
FPE-10808	Food Production Chains	8.00	CS	B1	6WD
FHM-20306	Food Microbiology	6.00	CS	B2	1AF
FPE-20806	Mathematical Concepts for Food Technology	6.00	CS	B2	1MO
FPE-21306	Food Production and Preservation	6.00	CS	B2	2AF
FCH-20806	Food Chemistry	6.00	CS	B2	2MO
FPH-20306	Food Physics	6.00	CS	B2	3WD
FQD-21306	Food Packaging and Design	6.00	CS	B2	4WD
FHM-22806	Food Hazards	6.00	CS	B2	5AF
FPE-20306	Food Engineering	6.00	CS	B2	5MO
FCH-22308	Food Properties and Function	8.00	CS	B2	6WD
FQD-20804	Quality Systems Operations	4.00	CS	B2	6WD
YFS-80824	BSc Thesis Food Science and Technology	24.00	CS	B3	1,2,3,4,5,6
FQD-24306	Case Studies Product Quality	6.00	CS	B3	1MO, 4WD
MAT-14803	Mathematics 1	3.00	RO1	B1	1MO
MAT-15303	Statistics 1	3.00	RO1	B1	1MO
YFS-10301	Excursions and lectures Food Technology	1.00	RO2	B3	1,2,3,4,5,6
FQD-23806	Meat Science	6.00	RO2	B3	1AF
HNE-30506	Principles of Sensory Science	6.00	RO2	B3	1AF
ORL-20306	Decision Science 1	6.00	RO2	B3	1AF
FQD-22801	Foreign Study Trip Food Technology	1.00	RO2	B3	1WD
MST-24306	Management and Marketing	6.00	RO2	B3	2AF
FPH-21306	History of Food Production	6.00	RO2	B3	2MO
FQD-21806	Milk in the Dairy Chain	6.00	RO2	B3	2MO
ENT-21306	Insects as Food and Feed	6.00	RO2	B3	3WD

Appendix 2B: Overview of the master's curriculum Food Technology

Common Part

RO0: Choose this course after consultation with the study advisor.

RO1: Choose 1 internship after consultation with your study advisor.

Course	Ects	CS/RO	Phase	Period	
YFS-10801	Wageningen Scientific Preparation Week	1.00	RO0	M1	1WD
BCT-70424	MSc Internship Biobased Chemistry and Technology	24.00	RO1	M2	1,2,3,4,5,6
FCH-70424	MSc Internship Food Chemistry	24.00	RO1	M2	1,2,3,4,5,6
FHM-70424	MSc Internship Food Microbiology	24.00	RO1	M2	1,2,3,4,5,6
FPE-70324	MSc Internship Food Process Engineering	24.00	RO1	M2	1,2,3,4,5,6
FPH-70424	MSc Internship Physics and Physical Chemistry of Foods	24.00	RO1	M2	1,2,3,4,5,6
FQD-70424	MSc Internship Food Quality and Design	24.00	RO1	M2	1,2,3,4,5,6
HNE-73824	MSc Internship Sensory Science and Eating Behaviour	24.00	RO1	M2	1,2,3,4,5,6
MIB-70424	MSc Internship Microbiology	24.00	RO1	M2	1,2,3,4,5,6
ORL-70424	MSc Internship Operations Research and Logistics	24.00	RO1	M2	1,2,3,4,5,6
RSO-70424	MSc Internship Rural Sociology	24.00	RO1	M2	1,2,3,4,5,6

A - Food Biotechnology and Biorefining

RO1: Choose at least 2 courses

RO2: Choose at least 1 course

RO3: Choose 1 biotechnology or enzymology related thesis

Course	Ects	CS/RO	Phase	Period	
FHM-21806	Food Fermentation	6.00	CS	M1	1MO
FCH-31306	Enzymology for Food and Biorefinery	6.00	CS	M1	5MO
FQD-60312	Product and Process Design	12.00	CS	M1	6WD
ORC-30306	Applied Biocatalysis	6.00	RO1	M1	1AF
FPE-30806	Sustainable Food and Bioprocessing	6.00	RO1	M1	4WD
BPE-21306	Bioreactor Design	6.00	RO1	M1	5AF
FHM-30806	Advanced Fermentation Science	6.00	RO1	M1	5AF
FHM-22306	Advanced Food Microbiology	6.00	RO2	M1	3WD
FCH-30806	Advanced Food Chemistry	6.00	RO2	M1	4WD
FCH-80436	MSc Thesis Food Chemistry	36.00	RO3	M2	1,2,3,4,5,6
FHM-80436	MSc Thesis Food Microbiology	36.00	RO3	M2	1,2,3,4,5,6
FPE-80336	MSc Thesis Food Process Engineering	36.00	RO3	M2	1,2,3,4,5,6
MIB-80436	MSc Thesis Microbiology	36.00	RO3	M2	1,2,3,4,5,6

B - Quality and Food Logistics

Limited choice:

RO1: Choose at least 1 course

RO2: Choose at least 4 courses

Course		Ects	CS/RO	Phase	Period
MST-21306	Advanced Management and Marketing	6.00	CS	M1	3WD
MST-31306	Advanced Business Research (ABR)	6.00	CS	M1	5AF
FQD-60312	Product and Process Design	12.00	CS	M1	6WD
MST-80436	MSc Thesis Management Studies	36.00	CS	M2	1,2,3,4,5,6
MST-24806	Supply Chain Management	6.00	RO1	M1	2MO, 4WD
MST-23406	New Venture Creation: from Idea to Business Plan	6.00	RO1	M1	5MO
YSS-32306	Technology and Business Model Innovation	6.00	RO1	M1	5MO
FPE-30306	Food Structuring	6.00	RO2	M1	1AF
FCH-30306	Food Ingredient Functionality	6.00	RO2	M1	1MO
FHM-21806	Food Fermentation	6.00	RO2	M1	1MO
FPH-30306	Advanced Food Physics	6.00	RO2	M1	2AF
FQD-31806	Product Properties and Consumer Wishes	6.00	RO2	M1	2AF
FCH-30806	Advanced Food Chemistry	6.00	RO2	M1	4WD
FPE-30806	Sustainable Food and Bioprocessing	6.00	RO2	M1	4WD
FQD-31306	Predicting Food Quality	6.00	RO2	M1	5MO

C - Product Design

Limited choice:

RO1: Choose at least 2 courses

RO2: Choose at least 1 course

RO3: Choose 1 thesis

Course		Ects	CS/RO	Phase	Period
FPE-30306	Food Structuring	6.00	CS	M1	1AF
FQD-31306	Predicting Food Quality	6.00	CS	M1	5MO
FQD-60312	Product and Process Design	12.00	CS	M1	6WD
FCH-30306	Food Ingredient Functionality	6.00	RO1	M1	1MO
FPE-31306	Transfer Processes	6.00	RO1	M1	2AF
FQD-31806	Product Properties and Consumer Wishes	6.00	RO1	M1	2AF
FPE-30806	Sustainable Food and Bioprocessing	6.00	RO1	M1	4WD
LAW-30806	Food Law	6.00	RO2	M1	2MO
FCH-30806	Advanced Food Chemistry	6.00	RO2	M1	4WD
FQD-35806	Food Quality Management Research Principles I	6.00	RO2	M1	4WD
MCB-30806	Sensory Perception and Consumer Preference	6.00	RO2	M1	5AF
FPE-80336	MSc Thesis Food Process Engineering	36.00	RO3	M2	1,2,3,4,5,6
FQD-80436	MSc Thesis Food Quality and Design	36.00	RO3	M2	1,2,3,4,5,6

D - Ingredient Functionality

Limited choice:

RO1: Choose at least 2 courses

RO2: Choose at least 1 course

RO3: Choose 1 thesis

Course		Ects	CS/RO	Phase	Period
FPH-30306	Advanced Food Physics	6.00	CS	M1	2AF
FCH-30806	Advanced Food Chemistry	6.00	CS	M1	4WD
FQD-60312	Product and Process Design	12.00	CS	M1	6WD
HNE-30506	Principles of Sensory Science	6.00	RO1	M1	1AF
FCH-30306	Food Ingredient Functionality	6.00	RO1	M1	1MO
FCH-31806	Advanced Biochemical Analysis of Foods	6.00	RO1	M1	5AF
FCH-31306	Enzymology for Food and Biorefinery	6.00	RO1	M1	5MO
FPE-30306	Food Structuring	6.00	RO2	M1	1AF
FPH-20806	Molecular Gastronomy	6.00	RO2	M1	1AF
FPH-31306	Advanced Molecular Gastronomy	6.00	RO2	M1	3WD
FQD-31306	Predicting Food Quality	6.00	RO2	M1	5MO
FCH-80436	MSc Thesis Food Chemistry	36.00	RO3	M2	1,2,3,4,5,6
FPH-80436	MSc Thesis Physics and Physical Chemistry of Foods	36.00	RO3	M2	1,2,3,4,5,6

E - Dairy Science and Technology

Limited choice:

RO1 - RO3: Choose 1 RO-cluster; within the chosen cluster choose all courses

RO4: Choose 1 dairy related thesis

Course		Ects	CS/RO	Phase	Period
FQD-33306	Dairy Chemistry and Physics	6.00	CS	M1	1AF
HNE-25306	Food Components and Health	6.00	CS	M1	2MO
FQD-32306	Dairy Science and Technology	6.00	CS	M1	3WD
FQD-60312	Product and Process Design	12.00	CS	M1	6WD
FCH-30306	Food Ingredient Functionality	6.00	RO1	M1	1MO
FPH-30306	Advanced Food Physics	6.00	RO1	M1	2AF
FCH-30806	Advanced Food Chemistry	6.00	RO1	M1	4WD
FHM-21806	Food Fermentation	6.00	RO2	M1	1MO
FHM-30806	Advanced Fermentation Science	6.00	RO2	M1	5AF
FCH-31306	Enzymology for Food and Biorefinery	6.00	RO2	M1	5MO
FHM-21806	Food Fermentation	6.00	RO3	M1	1MO
FPE-30806	Sustainable Food and Bioprocessing	6.00	RO3	M1	4WD
FQD-31306	Predicting Food Quality	6.00	RO3	M1	5MO
FCH-80436	MSc Thesis Food Chemistry	36.00	RO4	M2	1,2,3,4,5,6
FHM-80436	MSc Thesis Food Microbiology	36.00	RO4	M2	1,2,3,4,5,6
FPE-80336	MSc Thesis Food Process Engineering	36.00	RO4	M2	1,2,3,4,5,6
FPH-80436	MSc Thesis Physics and Physical Chemistry of Foods	36.00	RO4	M2	1,2,3,4,5,6
FQD-80436	MSc Thesis Food Quality and Design	36.00	RO4	M2	1,2,3,4,5,6

F - European Master in Food Studies

Limited choice:

Education will take place at University College Cork, Cork, Ireland: XUC-codes

Education will take place at AgroParisTech, Paris, France: XEN-codes

Education will take place at Lund University, Lund, Sweden: XLU-code

RO1: Choose at least 1 course; for the additional European Masters Certificate, choose 2 courses.

Course	Ects	CS/RO	Phase	Period	
FPE-30306	Food Structuring	6.00	CS	M1	1AF
FCH-30306	Food Ingredient Functionality	6.00	CS	M1	1MO
XUC-31803	Food Retail Marketing and Supply Chain Management	3.00	CS	M1	3
XUC-30303	Sensory Analysis, Flavour and Colour	3.00	CS	M1	3WD
XUC-30803	Consumer Behaviour in Food Markets	3.00	CS	M1	3WD
XUC-31303	Advanced Food Business Management	3.00	CS	M1	3WD
XEN-30304	Food and Bioprocess Control	4.00	CS	M1	5WD
XEN-30803	Food Process Design And Modelling	3.00	CS	M1	5WD
XEN-31303	Food Processing and Packaging	3.00	CS	M1	5WD
XEN-31802	Food Safety & Hygienic Design	2.00	CS	M1	5WD
XLU-60312	Integrated Food Project	12.00	CS	M1	6WD
YFS-60303	Team Project European Masters	3.00	CS	M1/2	1WD+2WD+3WD+4WD+5WD+6WD
YFS-80836	Industrial Thesis European Masters Food Studies	36.00	CS	M2	1,2,3,4,5,6
YFS-30303	European Masters Special Topics	3.00	CS	M2	6WD
FPH-30306	Advanced Food Physics	6.00	RO1	M1	2AF
HNE-25306	Food Components and Health	6.00	RO1	M1	2MO
LAW-30806	Food Law	6.00	RO1	M1	2MO

G - Sensory Science

Limited choice:

RO1: Choose at least 1 course. Note that both HNE-30506 and MAT-20306 (or equivalent) are required if these courses were not part of previous education

RO2: Choose at least 1 course

RO3: Choose 1 sensory related thesis

Course	Ects	CS/RO	Phase	Period	
MCB-32806	Advanced Sensory Methods and Sensometrics	6.00	CS	M1	2MO
HNE-30606	Instrumental Sensory Science	6.00	CS	M1	3WD
MCB-33306	Integrated Sensory Science	6.00	CS	M1	4WD
FQD-60312	Product and Process Design	12.00	CS	M1	6WD
FPE-30306	Food Structuring	6.00	RO1	M1	1AF
FPH-20806	Molecular Gastronomy	6.00	RO1	M1	1AF
HNE-30506	Principles of Sensory Science	6.00	RO1	M1	1AF
FCH-30306	Food Ingredient Functionality	6.00	RO1	M1	1MO
FHM-21806	Food Fermentation	6.00	RO1	M1	1MO
MAT-20306	Advanced Statistics	6.00	RO1	M1	1MO
FQD-31806	Product Properties and Consumer Wishes	6.00	RO2	M1	2AF
FCH-31806	Advanced Biochemical Analysis of Foods	6.00	RO2	M1	5AF
MCB-30806	Sensory Perception and Consumer Preference	6.00	RO2	M1	5AF
HNE-30306	Psychobiology of Food Choice and Eating Behaviour	6.00	RO2	M1	5MO
FCH-80436	MSc Thesis Food Chemistry	36.00	RO3	M2	1,2,3,4,5,6
FQD-80436	MSc Thesis Food Quality and Design	36.00	RO3	M2	1,2,3,4,5,6
HNE-83836	MSc Thesis Sensory Science and Eating Behaviour	36.00	RO3	M2	1,2,3,4,5,6

H - Sustainable Food Process Engineering

Limited choice:

RO1: Choose at least 2 courses

RO2: Choose at least 1 course

RO3: Choose 1 thesis

Course		Ects	CS/RO	Phase	Period
FPE-31806	Sustainability in Food Chains	6.00	CS	M1	3WD
FPE-30806	Sustainable Food and Bioprocessing	6.00	CS	M1	4WD
FQD-60312	Product and Process Design	12.00	CS	M1	6WD
FPE-31306	Transfer Processes	6.00	RO1	M1	2AF
BPE-21306	Bioreactor Design	6.00	RO1	M1	5AF
ORL-31806	Food Logistics Management	6.00	RO1	M1	5AF
FQD-31306	Predicting Food Quality	6.00	RO1	M1	5MO
FHM-21806	Food Fermentation	6.00	RO2	M1	1MO
BCT-20306	Modelling Dynamic Systems	6.00	RO2	M1	2MO
ORL-30306	Decision Science 2	6.00	RO2	M1	5MO
BCT-80436	MSc Thesis Biobased Chemistry and Technology	36.00	RO3	M2	1,2,3,4,5,6
FPE-80336	MSc Thesis Food Process Engineering	36.00	RO3	M2	1,2,3,4,5,6
FQD-80436	MSc Thesis Food Quality and Design	36.00	RO3	M2	1,2,3,4,5,6
ORL-80436	MSc Thesis Operations Research and Logistics	36.00	RO3	M2	1,2,3,4,5,6

I - Gastronomy

Limited choice:

RO1: Choose at least 2 courses

RO2: Choose at least 1 course

RO3: Choose 1 thesis

Course		Ects	CS/RO	Phase	Period
FPH-20806	Molecular Gastronomy	6.00	CS	M1	1AF
FPH-31306	Advanced Molecular Gastronomy	6.00	CS	M1	3WD
RSO-21806	Origin Food: a Market for Identity	6.00	CS	M1	5MO
FQD-60312	Product and Process Design	12.00	CS	M1	6WD
FCH-30306	Food Ingredient Functionality	6.00	RO1	M1	1MO
FCH-21806	Food Related Allergies and Intolerances	6.00	RO1	M1	2AF
FPH-30306	Advanced Food Physics	6.00	RO1	M1	2AF
FCH-30806	Advanced Food Chemistry	6.00	RO1	M1	4WD
FQD-31806	Product Properties and Consumer Wishes	6.00	RO2	M1	2AF
RSO-22306	Food Culture and Customs	6.00	RO2	M1	2MO
MCB-30806	Sensory Perception and Consumer Preference	6.00	RO2	M1	5AF
FCH-80436	MSc Thesis Food Chemistry	36.00	RO3	M2	1,2,3,4,5,6
FPH-80436	MSc Thesis Physics and Physical Chemistry of Foods	36.00	RO3	M2	1,2,3,4,5,6
RSO-80436	MSc Thesis Rural Sociology	36.00	RO3	M2	1,2,3,4,5,6

J - Food Digestion and Health

Limited choice:

RO1 : Choose at least 1 course

RO2 : Choose at least 2 courses

RO3 : Choose a thesis on a topic relevant for Food Digestion and Health

Course	Ects	CS/RO	Phase	Period
FPE-30306 Food Structuring	6.00	CS	M1	1AF
FCH-30306 Food Ingredient Functionality	6.00	CS	M1	1MO
HAP-30306 Nutritional Physiology	6.00	CS	M1	2MO
FQD-60312 Product and Process Design	12.00	CS	M1	6WD
HNE-24306 Methodology Nutrition Research	6.00	RO1	M1	2AF
HNE-30306 Psychobiology of Food Choice and Eating Behaviour	6.00	RO1	M1	5MO
HNE-36806 Nutrition and Sports	6.00	RO1	M1	5MO
FCH-32306 Food Digestion: Fermentation and Gut Health	6.00	RO2	M1	3WD
HNE-30706 Food Digestion: Nutrient Breakdown and Absorption	6.00	RO2	M1	4WD
FPE-32306 Food Digestion: Ingestion and Structure Breakdown	6.00	RO2	M1	5AF
FCH-80436 MSc Thesis Food Chemistry	36.00	RO3	M2	1,2,3,4,5,6
FPE-80336 MSc Thesis Food Process Engineering	36.00	RO3	M2	1,2,3,4,5,6
FQD-80436 MSc Thesis Food Quality and Design	36.00	RO3	M2	1,2,3,4,5,6
HNE-83836 MSc Thesis Sensory Science and Eating Behaviour	36.00	RO3	M2	1,2,3,4,5,6

Appendix 2C: Overview of the master's curriculum Food Safety

Common Part

RO0: Choose these courses after consultation with your study advisor.

Course	Ects	CS/RO*	Phase	Period
LAW-30806 Food Law	6.00	CS	M1	2MO
FHM-61312 Food Safety Management	12.00	CS	M1	6WD
YFS-10801 Wageningen Scientific Preparation Week	1.00	RO0	M1	1WD
CPT-39303 Science Communication 2.0	3.00	RO0	M1	6AF

A - Applied Food Safety

Limited choice:

RO1: Is compulsory for students with no Food Microbiology in their prior education.

RO2: Choose 1 course.

RO3: Choose 1 thesis.

RO4: Choose 1 internship.

Course	Ects	CS/RO	Phase	Period
FCH-21806 Food Related Allergies and Intolerances	6.00	CS	M1	2AF
FHM-22306 Advanced Food Microbiology	6.00	CS	M1	3WD
TOX-30306 Food Toxicology	6.00	CS	M1	4WD
FHM-30306 Food Safety Risk Assessment	6.00	CS	M1	5MO
FHM-20306 Food Microbiology	6.00	RO1	M1	1AF
BEC-21306 Food Safety Economics	6.00	RO2	M1	5AF
FQD-36306 Food Fraud and Mitigation	6.00	RO2	M1	5AF
BEC-80436 MSc Thesis Business Economics	36.00	RO3	M2	1,2,3,4,5,6
FHM-80436 MSc Thesis Food Microbiology	36.00	RO3	M2	1,2,3,4,5,6
TOX-80436 MSc Thesis Toxicology	36.00	RO3	M2	1,2,3,4,5,6
FHM-70424 MSc Internship Food Microbiology	24.00	RO4	M2	1,2,3,4,5,6
TOX-70424 MSc Internship Toxicology	24.00	RO4	M2	1,2,3,4,5,6

B - Food Law and Regulatory Affairs

Limited choice:

RO1: Students with a non-food background choose FCH-11806 and FHM-22806, students with a food background choose BEC-21306 and PAP-21806.

RO2: Choose at least 2 courses.

Course	Ects	CS/RO	Phase	Period
FQD-20306 Food Related Allergies and Intolerances	6.00	CS	M1	1MO
LAW-70424 MSc Internship Law and Governance	24.00	CS	M2	1,2,3,4,5,6
LAW-80436 MSc Thesis Law and Governance	36.00	CS	M2	1,2,3,4,5,6
FCH-11806 Basics in Food Technology	6.00	RO1	M1	1AF
PAP-21806 European Union Institutions and Policies	6.00	RO1	M1	1AF
BEC-21306 Food Safety Economics	6.00	RO1	M1	5AF
FHM-22806 Food Hazards	6.00	RO1	M1	5AF
LAW-32806 Food Law, Management and Economics	6.00	RO2	M1	2AF
LAW-32306 Intellectual Property Rights	6.00	RO2	M1	3WD
LAW-39806 Comparative Food Law : PR China and the USA	6.00	RO2	M1	4WD
LAW-31806 Global Economic (Trade) Law and Risk Regulation	6.00	RO2	M1	5MO



C - Supply Chain Safety

Limited choice:

RO1: Choose 1 course in consultation with your study adviser.

RO2: Choose 1 thesis after consultation with your study advisor on the prerequisite courses of the different thesis options.

RO3: Choose 1 internship.

Course		Ects	CS/RO*	Phase	Period
PPS-31306	Global Food Security	6.00	CS	M1	2AF
BEC-31806	Risk Management in Food Supply Chains	6.00	CS	M1	4WD
BEC-21306	Food Safety Economics	6.00	RO1	M1	5AF
ORL-31806	Food Logistics Management	6.00	RO1	M1	5AF
BEC-80436	MSc Thesis Business Economics	36.00	RO2	M2	1,2,3,4,5,6
FHM-80436	MSc Thesis Food Microbiology	36.00	RO2	M2	1,2,3,4,5,6
LAW-80436	MSc Thesis Law and Governance	36.00	RO2	M2	1,2,3,4,5,6
ORL-80436	MSc Thesis Operations Research and Logistics	36.00	RO2	M2	1,2,3,4,5,6
BEC-70424	MSc Internship Business Economics	24.00	RO3	M2	1,2,3,4,5,6
FHM-70424	MSc Internship Food Microbiology	24.00	RO3	M2	1,2,3,4,5,6
LAW-70424	MSc Internship Law and Governance	24.00	RO3	M2	1,2,3,4,5,6
ORL-70424	MSc Internship Operations Research and Logistics	24.00	RO3	M2	1,2,3,4,5,6

Appendix 2D: Overview of the master's curriculum Food Quality Management

Common Part

RO0: choose this course after consultation with your study advisor.

RO1: Choose 1 course.

RO2: Choose 1 course after consultation with your study advisor; students with a background in food science or technology choose FQD-31806, students without a background in food science choose FQD-22306.

Course		Ects	CS/RO*	Phase	Period
FQD-20306	Food Quality Management	6.00	CS	M1	1MO
LAW-30806	Food Law	6.00	CS	M1	2MO
FQD-35806	Food Quality Management Research Principles I	6.00	CS	M1	4WD
FQD-35906	Food Quality Management Research Principles II	6.00	CS	M1	5MO
YFS-10801	Wageningen Scientific Preparation Week	1.00	RO0	M1	1WD
CPT-39303	Science Communication 2.0	3.00	RO0	M1	6AF
YRM-20806	Research Design & Research Methods	6.00	RO1	M1	1AF
MAT-20306	Advanced Statistics	6.00	RO1	M1	1AF, 6MO
MAT-22306	Quantitative Research Methodology and Statistics	6.00	RO1	M1	3WD
FQD-22306	Food Quality Analysis and Judgement	6.00	RO2	M1	2AF
FQD-31806	Product Properties and Consumer Wishes	6.00	RO2	M1	2AF

A - Quality Control and Assurance

Limited choice:

RO1: Choose 1 course.

Course		Ects	CS/RO*	Phase	Period
FHM-22306	Advanced Food Microbiology	6.00	CS	M1	3WD
FHM-61312	Food Safety Management	12.00	CS	M1	6WD
FQD-70424	MSc Internship Food Quality and Design	24.00	CS	M2	1,2,3,4,5,6
FQD-80436	MSc Thesis Food Quality and Design	36.00	CS	M2	1,2,3,4,5,6
BEC-21306	Food Safety Economics	6.00	RO1	M1	5AF
FQD-36306	Food Fraud and Mitigation	6.00	RO1	M1	5AF

B - Quality and Food Logistics

Limited choice:

RO1: Choose ORL-20306 if you did not have this course in your BSc.

RO2: Choose 1 thesis and 1 internship.

Course		Ects	CS/RO*	Phase	Period
ORL-31806	Food Logistics Management	6.00	CS	M1	5AF
ORL-30806	Operations Research and Logistics	6.00	CS	M1	6MO
ORL-20306	Decision Science 1	6.00	RO1	M1	1AF
FQD-70424	MSc Internship Food Quality and Design	24.00	RO2	M2	1,2,3,4,5,6
FQD-80436	MSc Thesis Food Quality and Design	36.00	RO2	M2	1,2,3,4,5,6
ORL-70424	MSc Internship Operations Research and Logistics	24.00	RO2	M2	1,2,3,4,5,6
ORL-80436	MSc Thesis Operations Research and Logistics	36.00	RO2	M2	1,2,3,4,5,6



C - User-Oriented Food Quality

Limited choice:

RO1: Choose at least 2 courses.

Course	Ects	CS/RO*	Phase	Period	
FQD-33806	Usage Oriented Product Design	6.00	CS	M1	1AF
FQD-70424	MSc Internship Food Quality and Design	24.00	CS	M2	1,2,3,4,5,6
FQD-80436	MSc Thesis Food Quality and Design	36.00	CS	M2	1,2,3,4,5,6
SCH-20806	Lifestyles and Consumption	6.00	RO1	M1	3WD
MCB-30806	Sensory Perception and Consumer Preference	6.00	RO1	M1	5AF
YSS-31806	Consumer, Technology and Innovation	6.00	RO1	M1/2	5MO

D - Quality Management and Entrepreneurship

Limited choice:

RO1: Choose 1 course.

Course	Ects	CS/RO*	Phase	Period	
MST-21306	Advanced Management and Marketing	6.00	CS	M1	3WD
FQD-70424	MSc Internship Food Quality and Design	24.00	CS	M2	1,2,3,4,5,6
FQD-80436	MSc Thesis Food Quality and Design	36.00	CS	M2	1,2,3,4,5,6
MST-35306	Principles of Entrepreneurship	6.00	RO1	M1	1AF
BEC-21306	Food Safety Economics	6.00	RO1	M1	5AF
FQD-36306	Food Fraud and Mitigation	6.00	RO1	M1	5AF

APPENDIX 3: PROGRAMME OF THE SITE VISIT

11 October		
8.45	11.15	Arrival of panel, Preparation BSc and MSc, internal meeting and documentation review
11.15	12.00	Interview with management (including Programme Committee)
12.00	12.45	Students BSc
12.45	13.30	lunch
13.30	14.15	Teaching staff BSc
14.15	14.20	Mini break
14.20	15.20	Students MSc
15.20	15.25	Mini break
15.25	16.25	Teaching staff MSc
16.25	16.40	Break
16.40	17.15	Alumni
17.15	17.45	Internal deliberation panel, short recap day 1

12 October		
8.45	10.00	Deliberations panel and documentation review
10.00	10.30	Examining Board and Study Adviser(s)
10.30	11.15	Final interview with management
11.15	13.30	Deliberations panel, formulating preliminary findings and conclusions + lunch
13.30	14.00	Feedback of preliminary findings and conclusions

APPENDIX 4: THESES AND DOCUMENTS STUDIED BY THE PANEL

Prior to the site visit, the panel studied 15 theses of the bachelor's programme and 15 theses of each master's programme. Information on the selected theses is available from QANU upon request.

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

- Annual reports Examining Board
- Annual reports Programme committee
- LabBuddy
- Extensive information on the following courses:

BSc Food Technology:

- FHM-22806 Food Hazards;
- FCH-20806 Food Chemistry;
- FPE-10808 Food Production Chains

MSc Food Technology:

- FPE-30306 Food Structuring;
- FCH-30306 Food Ingredient Functionality;
- FQD-32306 Dairy Science and Technology;
- FPE-30806 Sustainable Food and Bioprocessing;
- FCH-31306 Enzymology for Food and Biorefinery

Online MSc Food Technology:

- FPE-35303 Sustainable Food and Bioprocessing I;
- FCH-35803 Enzymology for Food and Biorefinery I;
- FCH-37303 Laboratory Class I

MSc Food Safety:

- FHM-61312 Food Safety Management;
- LAW-30306 Food Law;
- TOX-30306 Food Toxicology

MSc Food Quality Management:

- FQD-20306 Food Quality Management;
- FQD-64306 Food Quality Management Research Principles I;
- BEC-31806 Risk Management in Food Supply Chains.