Food Technology

Faculty of Agricultural and Environmental Sciences, Wageningen University

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Report on the bachelor programme in Levensmiddelen-technologie, the master programme in Food Technology, the master programme in Food Safety and the master programme in Food Quality Management of Wageningen University

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

Administrative data regarding the programmes

Bachelor programme in Levensmiddelentechnologie

Name of the programme:	**Levensmiddelentechnologie**
CROHO number:	56973
Level of the programme:	bachelor
Orientation of the programme:	academic
Number of credits:	180 EC
Location(s):	Wageningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master programme in Food Technology

Name of the programme:	**Food Technology**
CROHO number:	66973
Level of the programme:	master
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	A. Food Biotechnology and Biorefining B. Food Innovation and Management C. Product Design D. Ingredient Functionality E. Dairy Science and Technology F. European Master in Food Studies G. Sensory Science H. Sustainable Food Processing I. Gastronomy
Location(s):	Wageningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master programme in Food Safety

Name of the programme:	**Food Safety**
CROHO number:	60112
Level of the programme:	master
Orientation of the programme:	academic
Number of credits:	120 EC
Location(s):	Wageningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master programme in Food Quality Management

Name of the programme:	**Food Quality Management**
CROHO number:	60109
Level of the programme:	master
Orientation of the programme:	academic
Number of credits:	120 EC
Location(s):	Wageningen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

The visit of the assessment committee Food Technology to the Faculty of Agricultural and Environmental Sciences of Wageningen University took place on 3 and 4 July 2012.

Administrative data regarding the institution

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

Quantitative data regarding the programmes

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

Composition of the assessment committee

The committee that assessed the bachelor programme in Levensmiddelentechnologie, the master programme in Food Technology, the master programme in Food Safety and the master programme in Food Quality Management consisted of:

- Prof. F. Zwarts (chair), professor at University of Groningen and professor and manager at University Campus Fryslân;
- Mrs. R.L. Prenen, MSc, independent educational adviser;
- Prof. R.P. Singh, professor at the Food, Science and Technology department of UC Davis, USA;
- Prof. K. Kristbergsson, professor at the Department of Food Science and Nutrition at the University of Iceland, Reykjavik, Iceland;
- Prof. M.W. Griffiths, director of the Canadian Research Institute for Food Safety, University of Guelph, Canada;
- Dr. G. Schleining, assistant professor at the Department of Food Science and Technology of the BOKU University of Natural Resources and Life Sciences Vienna, Austria;
- Mrs. J. Agren, master student in Biotechnology, specialization in Food Technology at Lund University, Sweden.

The committee was supported by M. Maarleveld, MSc., who acted as secretary. Appendix 1 contains the curricula vitae of the members of the committee.

General information regarding Wageningen University

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

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

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

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

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

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

Working method of the assessment committee

Preparation
After receiving the critical reflection, the project manager checked the quality and completeness of the information provided. After approval, the critical reflection was forwarded to the committee, in both printed form and digitally. In addition, the committee members selected and read a total of 15 theses for each programme that was assessed (see Appendix 7).

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

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

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

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

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

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

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

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

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

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

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

Summary judgement

This report provides the findings and considerations of the Life Sciences committee on the bachelor and master programmes in Food Technology, Food Safety and Food Quality Management at Wageningen University. The assessment is based on information in the critical reflection, interviews held during the site visit and a selection of theses.

Standard 1: Intended learning outcomes
Food Technology deals with all aspects of the technology, structure, composition, quality, safety and sensory aspects of food products (mainly processed ones). In theory, it focuses on all steps of the product development cycle: from raw materials until the product has been consumed.

The bachelor programme in Food Technology has a discipline-based design, it aims to provide graduates with a balance of general and fundamental skills that can be applied in all sectors of the food industry and prepares students for a master level. At the moment there is no employment for graduates of the bachelor programme in the food industry, but the programme is considering developing a specific track in the future to prepare students for the professional field as well. The committee encourages this initiative. The intended learning outcomes of the bachelor programme were adequate, yet they seemed a little basic. This has recently been improved by the programme; they have been changed into more detailed and specific intended learning outcomes. After a broad bachelor programme, students can specialize in the master programmes.

The master programme in Food Technology offers nine specializations; together they cover the broad field of food technology. In each of these specializations, students learn how to perform food science research and how to solve problems in a specific field of the food production process.

The master programme in Food Quality Management deals with understanding the dynamic behaviour of food products in production systems as well as understanding the dynamic decision-making behaviour of food handlers and managers within their organizational context and that of the food chain.

The master programme in Food Safety focuses on the technical aspects like microbiology, toxicology, and allergies and intolerances, and integrates them with knowledge of the social sciences aspects of Food Safety.

It is unusual to separate Food Safety and Food Quality Management into two master programmes. They are strongly related, but also have distinct profiles and objectives. Both programmes integrate knowledge from technical and social disciplines, but the programme in Food Safety has a more specific focus on the technical disciplines like microbiology, toxicology, and allergies and intolerances, while the programme in Food Quality Management has a broader approach to food quality, and it is less focused on food safety.

The committee agrees with the intended learning outcomes of all three master programmes and believes they are well formulated and cover the knowledge and skills one can expect of a graduate of the respective master programmes. The link with the professional field has been strengthened by establishing an External Advisory Committee.

Standard 2: Teaching-learning environment
The committee studied the various aspects of the teaching and learning environment of the programmes and established that the curricula, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes very well.
In all four programmes students have limited freedom in choosing courses, which strengthens the coherency of the programmes and promotes the possibility that all students can achieve the intended learning outcomes.

The curricula of the bachelor programme and the master programme in Food Technology reveal that the bachelor programme is broad and primarily prepares for a master programme, while the master programme aims for specialization. The committee believes this is worked out very well. The specializations in the master programme in Food Technology cover the entire field of Food Science, and the committee considers all of them to be relevant. Even with nine specializations, the programme manages to offer a coherent curriculum, because it combines three or four compulsory courses and restricted optional courses. Its strong point is the integrative course *Process and Product Design*. Overall, the committee believes the bachelor and the master programmes in Food Technology are well structured, and their curricula will lead to achieving the intended learning outcomes.

The master programme in Food Safety used to be a specialization of Food Technology, and the master programme in Food Quality Management used to be embedded in the Social Sciences cluster programmes. The committee is of the opinion that both programmes have successfully implemented the necessary changes, resulting in separate and well-structured master programmes in the Food Science cluster. The committee is also enthusiastic about the new specialization in *Food Law* in the Food Safety programme.

For all four programmes the committee reviewed the teaching methods and found they are well balanced within and between courses. The student-staff ratios are impressive and enable small-scale education. The committee is of the opinion that the staff performs well in both education and research. For all programmes, students numbers have increased over the last few years. If this growth continues, the possible consequences for the level of student support by study advisers and the availability of programme-specific services in the future should be anticipated.

Standard 3: Assessment and achieved learning outcomes
The committee is very positive with regard to the initiatives the Examining Boards of Wageningen University are currently implementing in their programmes. The Examining Boards are in the process of strengthening their role in ensuring the quality of assessment and are committed to formalizing the assessment system. The programmes in Food Science are on schedule to implement the new initiatives. The use of course guides makes the assessment procedures very clear and transparent, and they are very useful to the students. The committee especially values the use of the rubric for the master thesis.

For all programmes the committee is very positive about the progress in using different assessment strategies within and between courses. It was impressed by the level of the bachelor and master theses, and it agreed with all the grades awarded. It was clear to the committee that the thesis projects are very well executed. Drop-out rates are low for all the programmes. The success rates are very good, except those for the master programme in Food Quality Management, which are reasonable. The reasons for the lower success rates have been identified, and the committee is confident that the changes that have been made can increase them. It appreciates the attention paid to improving these numbers further. It is of the opinion that with the current pressure on graduating in time in the Netherlands, the

large number of possible resits at Wageningen University is outdated. If students don't feel the need to pass an exam, they might not take it seriously. This is likely to lead to study delays.

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

Bachelor programme in Levensmiddelentechnologie

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good

Master programme in Food Technology:

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good

Master programme in Food Safety

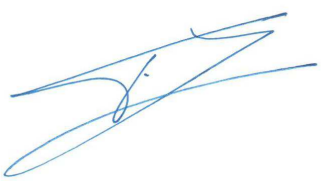
Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good

Master programme in Food Quality Management:

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good

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

Date: 23 November 2012



Prof. F. Zwarts

M. Maarleveld, MSc.

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

Standard 1: Intended learning outcomes

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

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

1.1 Findings

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

Programme objectives and profile

Food Technology deals with all aspects of the technology, structure, composition, quality, safety and sensory aspects of food products (mainly processed ones). In theory, it focuses on all steps of the product development cycle: from raw materials until the product has been consumed. Wageningen University is the only university in the Netherlands offering a bachelor programme, a master programme and a PhD programme in Food Technology. It is no coincidence that several multinational food companies have chosen the Netherlands for their headquarters (Heineken, Unilever, FrieslandCampina, DSM, Cosun) or major research centres (Mars, Danone, Heinz, Yakult).

Bachelor programme in Levensmiddelentechnologie

The bachelor programme in Food Technology has a discipline-based design, to provide graduates with a balance of general and fundamental skills that can be applied in all sectors of the food industry. This is in contrast to the product-based programmes at Dutch universities of applied science. A unique feature of the bachelor programme at Wageningen University compared to food science programmes elsewhere in Europe is the strong collaboration between the different teaching groups. This has resulted in a number of integrated courses in which staff from different Chair Groups work together in a single course.

The bachelor programme in Food Technology is designed as a broad programme to prepare students for different master programmes. It is not designed as a final degree, and according to the critical reflection there is currently no employment for these graduates in the food industry. The students are aware of that, and so far all of them have continued with an academic master programme at Wageningen University or elsewhere. In the future, students might not all wish to continue with a master degree. To address that situation, the programme is considering developing a specific track in the future aimed at preparing students for the professional field. The committee encourages the programme to keep the professional field in mind.

Master programme in Food Technology

The master programme in Food Technology has been taught at Wageningen University for more than 50 years. A typical aspect of this programme is that its specializations have been frequently adjusted over the years in order to match them optimally with the needs of the market and industry. Currently, the programme offers nine specializations which together

cover the broad field of Food Technology. In each of them, 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. To optimize food quality throughout the food chain, the programme requires an interdisciplinary approach. This means that a great deal of attention is paid to the integration of the different disciplines within Food Technology. The committee is of the opinion that the profile of Food Technology is clear.

Master programme in Food Safety
The Food Safety master programme at Wageningen University was developed as a specialization of the Food Technology programme and became a separate master programme in 2003. The programme has a highly integrated approach to the field of Food Safety. Most other programmes in this field focus on the technological aspects of food safety or the interaction of food safety and food quality.

The Wageningen programme focuses on the technological aspects as well as on the social sciences aspects of Food Safety and integrates them. The committee established that the field of knowledge of Food Safety is sufficiently broad and rich to offer as a separate master programme, instead of as a specialisation of Food Technology. Its profile and objectives are clear.

Master programme in Food Quality Management
Food Quality Management deals with understanding the dynamic behaviour of food products in production systems as well as understanding the dynamic decision-making behaviour of food handlers and managers within their organizational context and that of the food chain.

In the last few decades, increasing attention has been paid to food quality management in the agribusiness and food industry. Quality and safety problems that occur in the supply chain are commonly poorly defined, have various causes, and are typified by uncertainty (due to lack of information) and ambiguity (due to lack of insight into the underlying mechanisms). Moreover, typical characteristics of food products, like spoilage and bruising, make food businesses vulnerable to problems and put high requirements on the quality management systems.

These complex, multi-causal, quality and safety problems require people with interdisciplinary research skills. The programme has a techno-managerial (TM) approach. In problem analysis this approach combines theories from the technological sciences (to gain insights into the behaviour of the food systems) and those from the management sciences (to gain insights into the behaviour of human systems). It gives students broader insights into the possible causes of Food Quality Management issues, and results in a more comprehensive view of adequate solutions. The committee finds Food Quality Management a very relevant field of knowledge, and the techno-managerial approach is a unique feature of the programme.

Master programmes in Food Safety and Food Quality Management
Initially, the committee had some difficulty in seeing how Wageningen University managed to separate Food Safety and Food Quality Management into two different master programmes. Usually, programmes focus on either technological aspects of food sciences, or combine food safety with food quality management. Although some committee members believe the two programmes can be effectively integrated into one, from the interviews during the site visit the committee learned that the programmes are sufficiently distinct to both be independent programmes. The programme in Food Quality Management has a broader approach to food

quality, and it is less focused on food safety. The programme in Food Safety integrates knowledge from technical and social disciplines as well, but it has a more specific focus on the technical disciplines like microbiology, toxicology, and allergies and intolerances. The committee concluded that the programmes in Food Safety and Food Quality Management have clear and distinct objectives and profile.

Intended learning outcomes
For the bachelor and master programme in Food Technology, the committee based its assessment on the intended learning outcomes provided in the critical reflections. At the end of the site visit, a new set of intended learning outcomes was provided for all four programmes. They were more detailed and specifically matched the programmes. Due to time restrictions the committee based its assessment on the more general intended learning outcomes. However, based on what the committee has seen of the new set, it concludes that they are an improvement.

Bachelor programme in Levensmiddelentechnologie
The programme is designed to ensure that students can acquire the skills, knowledge and competences required of a graduate of a bachelor programme in Food Technology. Students need to have a good theoretical knowledge of all the different disciplines in Food Science and Technology (outcomes 1, 2, 3, 9). Food technologists never work in a single discipline in their professional career. In all stages of food production and research, multiple disciplines are involved. It is necessary for graduates to know about and understand other disciplines and factors that play a role in food production (outcomes 4 and 5). Because graduates will nearly always work in scientific or product development or similar teams in their future career, team-work and communication skills are an essential requirement (outcome 7). Finally, all academic graduates should be able to judge and be critical about other people's work (and their own), in order to be able to perform sound scientific research (outcome 8).

The committee is of the opinion that the intended learning outcomes are very well written. They seemed at first a bit basic, but they are at the appropriate level for a bachelor programme. At the end of the site visit, the committee was given a new set of intended learning outcomes that will be used for the bachelor programme starting in 2012/2013. These new intended learning outcomes are more specific and detailed. The committee based its positive opinion on the intended learning outcomes provided in the critical reflection, but it appreciates the development towards more specific intended learning outcomes.

Master programme in Food Technology
The intended learning outcomes of the master programme in Food Technology are based on the requirements for food technologists working in an academic or industrial environment. An important aim of the programme is to teach students how to design solutions for problems in the process of producing food (outcome 1). Therefore, all specializations contain multiple courses where students learn to optimize food products in different ways. The programme provides sufficient courses in which students learn to apply their food science knowledge to the production of animal food or non-food applications (outcome 6). A food technologist needs to be aware of the effect of food product development on the consumer, society and the market (outcome 2). Many graduates become the head of product development departments and therefore should be able to lead a product development process (outcome 7). Food technologists often have to analyse and solve complex problems within one or more stages of food production (outcome 3). As critical judgement of scientific results or publications is often needed (outcome 4), students must develop strong academic research skills. Graduates will often work in scientific or product development teams in a

multidisciplinary environment. Therefore, teamwork and communication skills are important requirements (outcomes 9 and 10). During their thesis and internship, students are being prepared for their future career and work independently in their field of specialization (outcome 5). They have to deal with social, scientific and ethical issues and cooperate with other experts in their team (outcomes 8 and 9). During their thesis defence, students have to communicate their thesis outcomes to people from different backgrounds (outcome 10). Finally, students assess their own learning progress by continuous reflection on attained knowledge, skills, attitudes and performance (outcome 11).

The committee is of the opinion that the intended learning outcomes are well formulated and reflect what can be expected of graduates of this master programme. The new intended learning outcomes the committee received during the site visit resemble those presented in the critical reflection, but they define what is expected of students more specifically, which the committee appreciates.

Master programme in Food Safety
In this programme students need domain-specific knowledge and understanding of how to apply it. They need to be able to analyse issues related to food safety problems, both in their technical and in their societal context (outcome 1). Students need to be knowledgeable about how foods are produced and how food safety is organized, practised and regulated, and prepared to take responsibility for their own contribution to the field (outcome 2). The intended learning outcomes on scientific learning are to apply and question paradigms in their field (outcome 3) and to obtain knowledge in this area built upon a solid scientific and technological training, based on the life sciences (outcome 4). Domain-specific skills refer to the ability to make a risk assessment for either an existing or a new product or product line (outcome 5), handle complex situations and make balanced judgements when confronted with incomplete available data (outcome 6), as well as design Food Safety management systems and contribute to the general knowledge of safe foods and safe food production chains (outcome 7). General academic intended learning outcomes require students to be aware of the societal and ethical consequences of developments in the area of food safety and of their own decisions and advice (outcome 8); be familiar with principles from the social sciences, in particular managerial aspects and characteristics of consumer perception and behaviour (outcome 9); work in a multidisciplinary team (outcome 10); and interpret research results in a multidisciplinary framework (outcome 11).

The committee agrees with these intended learning outcomes and thinks that they will lead to graduates at the academic master level.

Master programme in Food Quality Management
In the master programme in Food Quality Management, students learn to recognize, analyse and understand factors in the agri-food processes and the agri-food chain that influence the quality of agri-food products (outcome 1). They can describe and explain technological and managerial options and restrictions on achieving the desired quality levels, both within organizations in the food chain and for the chain as a whole (outcome 2). The intended learning outcomes on scientific learning include being able to search and critically evaluate various scientific concepts and understand that the choice for a certain concept or model determines the diagnosis and options to optimize food quality levels or standards (outcome 3) and to develop a clear perception, diagnosis and analysis of a quality issue and choose appropriate scientific approaches in a multi-methodological way, covering both managerial and technological aspects (outcome 4). There are four intended learning outcomes that refer to domain-specific skills. Students need to be able to analyse, understand and explain the

consequences of governmental quality regulations on the processes in the agri-food chain (outcome 5). They must be able to describe, analyse, and evaluate quality problems in the organization of the agri-food chain or the chain as a whole caused by these governmental policies and regulations, taking into account legislation, policy, economics, and ethics (outcome 6). Furthermore, students need to understand, communicate and work with people with different knowledge standards and backgrounds (outcome 7) and analyse and evaluate practical situations and issues from a theoretical perspective, while critically evaluating the role and the position of the researcher (outcome 8). The general academic learning outcomes require students to be able to cooperate as a specialist in a multidisciplinary, international team to solve complex situations affecting food quality in the organization of the agri-food chain (outcome 9) and to design and plan their own learning processes based on continuous reflection on personal knowledge (outcome 10).

The committee agrees with these intended learning outcomes and thinks that they reflect what can be expected of graduates at the academic master level.

Level and orientation

Bachelor programme in Levensmiddelentechnologie
The intended learning outcomes correspond with the Dublin descriptors for bachelor programmes, as shown in Appendix 3. The programme trains students for further education in a corresponding domain at the master level. Students not only learn how to do research, they also learn to reflect critically on problems, theories and research results in the field of Food Technology. Graduates of the programme have unconditional access to three master programmes at Wageningen University: Food Technology, Food Safety and Food Quality Management. With an appropriate minor in the third year, access is generally possible for related programmes, such as the master in Biotechnology or Nutrition & Health.

Graduates from the programme can also be admitted to master programmes abroad, but hardly any students actually apply for these programmes in practice. There is, at the moment, no requirement for Bachelor of Science graduates on the Dutch labour market. Three universities of applied science (HBO) provide the graduates required for positions in the food industry at the bachelor level.

Master programmes in Food Technology, Food Safety and Food Quality Management
The intended learning outcomes of all three master programmes correspond with the Dublin descriptors for master programmes (see Appendix 3). All three programmes have an academic orientation, but also stress a strong link to the food industry. In particular, the master programme in Food Quality Management primarily aims to prepare students for academic-level positions in industry and regulatory bodies, rather than an academic research career.

Requirements of the professional field and discipline
The professional field is represented by the External Advisory Committee (EAC), which consists of external professionals in the field of Food Sciences. It was established in 2010. The committee believes it is very helpful to have an EAC to strengthen the link with the professional field. The EAC and the programme committees discuss the programmes and how they relate to the professional field. The EAC supports the goals and profile of the programmes and agrees with the learning outcomes. The programme management is considering establishing a separate EAC for the master programmes in Food Safety and Food

Quality Management. The committee supports this as it could lead to more specific input for these domains.

The requirements of the professional field and discipline have been laid down in the subject-specific frameworks. The bachelor and master programmes in Food Technology share a subject-specific framework, the master programmes in Food Safety and Food Quality Management each have their own subject-specific framework (see Appendix 2).

Bachelor and master programme in Food Technology
According to the critical reflection, both programmes are in line with the domain-specific reference framework. The intended learning outcomes are more or less identical to the learning outcomes defined by the American Institute of Food Technologists. Discussions with industry representatives showed that, in addition to theoretical knowledge, practical, integration and teamwork skills are essential for graduates. This has been incorporated in the curriculum of the bachelor programme by adding a thesis (24 credits) and a large number of practicals in the courses, as well as different group work courses. These competences are further developed in the master programme. In the second year of the master programme, students do an internship to prepare them for their later career in industry. Although the subject-specific framework also covers food quality management and food safety issues, these subjects are dealt with in detail in the separate master programmes in Food Safety and Food Quality Management, and therefore receive less emphasis in the master programme in Food Technology.

Master programme in Food Safety
According to the critical reflection, the intended learning outcomes correspond to the recent developments in the field of food safety, as well as to the demands from the professional practice, as described in the domain-specific reference framework. The multi-disciplinary approach and the focus on risk assessment and food safety management systems are unique elements of this programme and are in line with the framework.

The programme is characterized by a large number of practicals and group assignments in the courses. This ensures that the graduates have enough technological knowledge while being highly skilled in research and familiar with working and acting in complex situations. These are qualities which are highly desired by industry or other employers, according to the critical reflection.

Master programme in Food Quality Management
According to the critical reflection, the discipline's requirements are still evolving and have not yet been established. The concept of the techno-managerial approach has been developed in Wageningen, and the textbook written by the programme's staff is used as a standard work in the field. The programme is aligned to the requirements of the European Organisation of Quality (www.eoq.org) for a Food Quality Systems Manager, which is taken as the subject-specific framework. These requirements describe the range of competences a professional food quality manager needs to meet.

1.2 Considerations
The committee reviewed the profiles and objectives of the four programmes and established that they are clear and well written. The broad character of the bachelor programme prepares students for different master programmes. The three master programmes have a more specialized character. The committee agrees with their intended learning outcomes and believes they are well written and cover the knowledge and skills one can expect of a graduate

of the respective master programmes. A minor comment was made on the intended learning outcomes for the bachelor programme: they are at the appropriate level, but seemed a bit basic. The new intended learning outcomes for the bachelor and the master programmes in Food Technology the committee received during the site visit showed considerable improvement in this respect. They are more specific and detailed, which the committee appreciates.

For all four programmes the intended learning outcomes correspond to the Dublin descriptors, which indicate that they are at the appropriate level. The bachelor programme is designed to prepare students for a master programme, not for the professional field. The committee understands that at the moment there is no employment for graduates of the bachelor programme in the food industry. In the future, students might not all continue with a master degree. Thus, the committee encourages the programme to think about options to prepare students better for a career, for example in a special track, as the programme management has already suggested.

The link to the professional field of Food Science is an important aspect of the three master programmes. Therefore, the committee believes that establishing an external advisory committee is wise. A separate EAC for the master programmes in Food Quality Management and Food Safety is considered to be a good idea to get more specific input for these domains. The committee concludes that the programmes meet the requirements of the professional field and discipline.

1.3 Conclusion

Bachelor programme in Levensmiddelentechnologie: the committee assesses Standard 1 as **good**.
Master programme in Food Technology: the committee assesses Standard 1 as **good**.
Master programme in Food Safety: the committee assesses Standard 1 as **good**.
Master programme in Food Quality Management: the committee assesses Standard 1 as **good**.

Standard 2: Teaching-learning environment

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

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

2.1 Findings

Curriculum and coherency of the programmes

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

Overall, the committee believes the intended learning outcomes are very well reflected in the curricula. The programmes are designed to meet all intended learning outcomes in the curricula of the four programmes. The critical reflections showed that all intended learning outcomes are addressed in one or more courses. There is one exception; in the master programme in Food Technology, specialisation G (Sensory Science), intended learning outcome 6 is not addressed in the courses. The intended learning outcomes for all specialisations in the master programme in Food Technology are the same, and in this case, intended learning outcome 6 (the use of knowledge of food science in producing food or animals and/or non-food applications) does not apply to the sensory sciences specialization. This should be dealt with by the programme management.

Wageningen programmes provide its students with a large number of free choice credits in most programmes. From the Critical Reflection and the interviews it became clear that the study adviser has a major regulatory role in the selection of courses for the free choice credits. The study adviser and student discuss the students' wishes and possible plans. The study adviser might ask feedback from one of the chair holders prior to advising the student's request of electives. If a request deviates from the standard, the study adviser will assess the programme for coherency, and the Examining Board has to approve it explicitly.

Bachelor programme in Levensmiddelentechnologie
The bachelor programme is a three-year programme consisting of the following five elements:

- General basic science courses;
- Disciplinary food science courses;
- Integrated food science courses;
- Minor;
- Thesis.

Figure 1 gives an overview of the curriculum. The first year mainly consists of general basic science courses, to reach the minimum level necessary for the food science courses. Additionally, integrated food science courses are offered in the first year. In several integrated

courses, staff from different Chair Groups work together in a single course. Each of these integrated courses focuses on a certain theme or topic. Examples are *Nutritional Aspects of Foods*, *Food Production Chains*, *Mathematical Concepts for Food Technology*, *Risk Aspects of Foods*, *Case Studies Food Quality* and *Food Properties and Function*. These integrated courses make the students aware of the complexity of foods and food science and prepare them better for their thesis work. The committee is enthusiastic about these integrated courses.

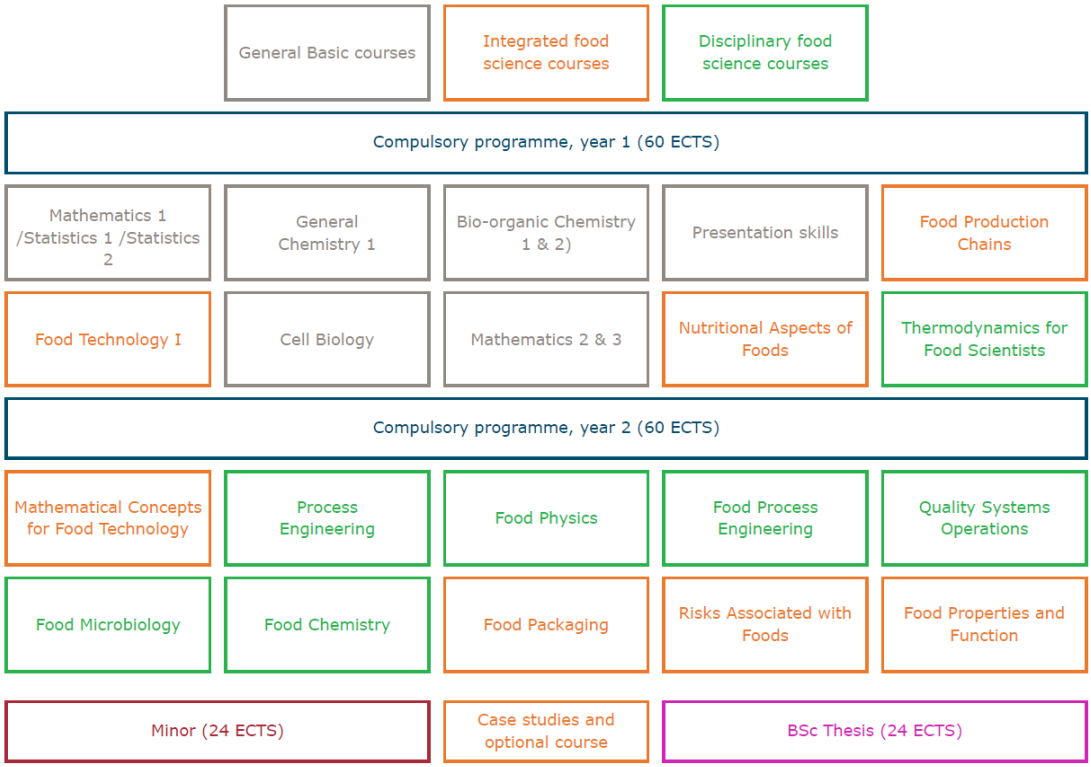


Figure 1. Overview of bachelor programme curriculum

The first year has a selective purpose to determine whether the student has made the appropriate choice. The basic courses determine the student's suitability, the integrated courses determine whether students are interested in the field of Food Science. The second year consists solely of Food Science courses, both discipline-related and integrated ones. During the second year students acquire all the basic Food Science knowledge needed for further studies. In the third year, students can choose a minor. Most students choose to take a minor at Wageningen University, but the programme also encourages students to look for minors elsewhere. While the majority of the minors are chosen within the field of Food Science and Technology (*Foods of Animal Origin, Sustainable Production of Foods*), other popular minors are in the social sciences or nutrition.

The thesis is worth 24 credits and is based on individual research work in the field of Food Science and Technology. Students can choose any topic offered by the Food Science Chair Groups. In most cases, students work under the supervision of PhD students on topics within the research project of the PhD student. The staff member supervising the PhD student acts as a second supervisor and is responsible for the undergraduate level of the thesis. This method acquaints students with the latest research in their field of interest, and they have access to equipment used by the PhD students in their research. In addition to the minor and the thesis, students take two courses in the third year: the *Case Studies Product*

Quality course and an optional course. In the former, students work in a group on a science-related case in co-operation with an industrial or other external partner.

The committee believes the programme is coherent and well structured. As it is largely compulsory, all students will graduate with the appropriate knowledge of all learning outcomes.

Master programme in Food Technology
The master programme in Food Technology offers nine specializations, for an overview see Appendix 4. The programme is designed to ensure that students specialize in their field of interest, while also obtaining an overview of the broad field of Food Technology. For most of the specializations, the curriculum consists of three or four compulsory courses (CS). In addition, students have to choose at least two courses in the field of their specialization (RO1) and at least one course either to specialize further or to broaden their knowledge (RO2). At the end of their first year, students from different specializations work together in the compulsory course *Product and Process Design*. In this course students integrate their knowledge on Food Science to work on industrial design problems from both a product and process perspective. The committee appreciates the integrated character of this course as it can help overcome the possible danger of fragmentation into nine separate specializations.

In their second year students do a thesis project of at least 36 credits at one of the Chair Groups related to their field of specialization (RO3 or RO4). The thesis project has to be performed at Wageningen University, with the exception of students in the European Master in Food Studies specialization, who conduct it at one of the industrial partners, under the supervision of Wageningen University. During their thesis project, students apply their knowledge by conducting research under supervision. In addition, students undertake an internship of at least 24 credits at a company, institute or university outside Wageningen. The programme involves lecturers from the following Chair Groups: Food Chemistry, Food Physics, Food Microbiology, Product Design and Quality Management, and Food Process Engineering. In addition, Chair Groups outside the field of Food Technology participate in the programme, for example: Rural Sociology, Human Nutrition, Management Studies and Operations, Research and Logistics.

Comparing the two programmes in Food Technology, the bachelor programme is a broad programme and largely compulsory, while the master programme goes more into depth and offers students the possibility to choose a specialization. The committee is of the opinion that the specializations cover the entire field of Food Science and are relevant. It had initially questioned the coherency on the programme level, but it learned that the integrated course *Product and Process Design* is a big asset of the programme, because students from all specializations come together to share and integrate knowledge. This results in greater coherency of the programme. The committee appreciates that for each specialization, 3 or 4 compulsory courses ensure coherency within it.

Master programme in Food Safety
The first year of the programme mainly comprises compulsory courses plus two optional courses that can be selected in the first period after consultation with the study adviser. The programme covers the technological parts of food safety (*Food Microbiology, Toxicology, Food Allergies*) as well as courses from the social sciences like *Food Law, Food Safety Economics* and *Aspects of Risk Communication*. Most disciplinary courses are taught at the beginning of the programme and the integrated courses at the end, culminating in the *Food Safety Management*

course. The second year is the research year, with a thesis and internship. Students can choose for a mono-disciplinary or a multi-disciplinary research approach.

The programme involves lecturers from the following Chair Groups: Food Microbiology, Food Chemistry, Immunology, Toxicology, Law & Governance, Business Economics, Operational Research & Logistics, as well as guest lecturers from other Chair Groups and a number of external guest lecturers.

The committee is very positive about the structure of the programme. As most courses are fixed, students are offered a coherent programme. The committee especially liked the integrative course on *Food Safety Management* at the end of the first year. In this course, students are divided into project groups, each with a different role. The groups include government, a consumer organization, an industry association and a retail organization. Each year a major assignment is handed over to the students, which is based on a joint advice to the Minister of Health of the Netherlands. During the course the groups have to look at technological, economic and consumer aspects from their own perspective, but in the end they must produce a joint recommendation. The students the committee talked to during the site visit also indicated that this course is one of the strong points of the programme. They liked how it integrates previously acquired knowledge in a realistic way. During the site visit, the committee learned that a new specialization is being developed on Food Safety Law. The committee believes that food law is a very relevant field of knowledge and that it is wise to offer it as a specialization in the programme.

Master programme in Food Quality Management
The first year of the programme is composed of 60 credits of courses; the second year contains a 36-credit thesis and a 24-credit internship. The first-year courses can be divided into three parts: compulsory courses in the area of Food Quality Management (30 credits), one statistical or methodological course (6 credits) and at least 18 credits of a disciplinary cluster of courses. The programme has recently made some changes to the curriculum. Appendix 4 gives an overview of the courses in 2010/2011. Initially, the committee had doubts about whether a programme in Food Quality Management could do without knowledge of Food Safety, but it is positive about the changes made to the programme because the strengthened disciplinary clusters enable students to choose one in Food Safety. According to the critical reflection, it is one of the most popular clusters. Starting in 2011/2012, the curriculum can be described as follows.

Students start with the *Food Quality Management* course, which is an introduction to the field and in which the concept of the techno-managerial approach is introduced. The *Food Law* and *Food Quality Analysis and Judgement* courses in the second period are also part of the core programme. *Food Quality Analysis and Judgement* focuses on measuring and evaluating food quality through finding relevant food properties that are indicators for those aspects. Measurable indicators for food quality can be categorized roughly into chemical, physical, microbiological, and sensorial ones. These topics are addressed in the theoretical part of the course. *Advanced Food Quality Management 1* and *2* are scheduled in the 4th and 5th period. Students apply their disciplinary knowledge and are taught an interdisciplinary research methodology in order to apply the techno-managerial approach to analysing and solving a complex Food Quality Management situation in a virtual food company. This research methodology consists of different phases where students proceed from an ambiguous quality problem situation, via the development of a techno-managerial research instrument, data collection, bottleneck assessment, the development of alternative technological and managerial solution strategies, to a best solution. At each research step students learn to apply

the techno-managerial approach by gathering, describing, judging, synthesising, and communicating knowledge from the Food and Social Sciences. These courses together comprise the Academic Master Cluster of the programme. The committee is of the opinion that the curriculum ensures that the intended learning outcomes are achieved. The set-up of the programmes is logical, and the committee agrees with the changes that have been made.

Multidisciplinarity

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

Bachelor and master programme in Food Technology

Food technologists never work in just one discipline in their professional career. In all stages of food production and research, multiple disciplines are involved. Therefore, in both the bachelor and master programmes in Food Technology, students learn about and understand other disciplines and factors that play a role in food production. The committee is very enthusiastic about the courses that bring together students with different backgrounds and lectures from different disciplines. For example, the *Food Properties and Function* course in the bachelor programme, and the *Product and Process Design* course in the master. The bachelor programme is mainly broad, while specializations in the master programme go into depth. The committee is of the opinion that breadth and depth are balanced in this set-up.

Master programme in Food Safety

The master programme in Food Safety specifically aims for a highly integrated approach to the field of Food Safety. It focuses on the technical aspects as well as the social sciences aspects of Food Safety. The disciplines covered in the programme are technical (microbiology, toxicology, allergies and intolerances) and social sciences oriented (law, economics management and communication). In several courses, lecturers from different chair groups work together to offer multiple perspectives. In particular, the integrated course on *Food Safety Management* combines the knowledge gained in the previous courses. The committee believes the multidisciplinary approach functions well, and the curriculum offers both depth and breadth.

Master programme in Food Quality Management

According to the critical reflection, complex, multi-causal, quality and safety problems require people with interdisciplinary research skills. In the programme, the techno-managerial approach is used. When analysing problems, this approach combines theories from the technological sciences (to gain insights into the behaviour of the food systems) and those from the management sciences (to gain insights into the behaviour of human systems). This approach is visible throughout the curriculum, and the committee appreciates that the programme has developed this approach to deal with the multidisciplinarity.

Teaching methods

Wageningen University strives to train its students to become academics with domain knowledge, a multidisciplinary attitude, interested in problem-solving, and an international orientation with a multicultural attitude. The programmes therefore work with small, diverse student groups to stimulate the interaction between students and lecturers. A variety of

didactic and learning methods are offered, including lectures, tutorials, group work, practical training, excursion and individual papers. According to the critical reflection, the teaching methods prepare graduates to work in multidisciplinary teams as well as individually, and often in a global context. Appendix 9 provides an overview and explanation of the teaching methods.

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

Bachelor programme in Levensmiddelentechnologie
Most courses apply a range of teaching methods. In ones like *Mathematics* and *Statistics*, lectures and tutorials are the most common teaching forms; in the more chemically oriented courses, lectures and practicals are used. Practical skills are important for food scientists. As a result, students spend on average 41% of the compulsory part of the programme (excluding the thesis) in a laboratory environment. As the thesis nearly always involves laboratory research, the overall percentage can be even higher. Group work as a formal teaching method only accounts for 7% of the contact hours. To prepare and motivate students for their later careers, industrial visits (excursions) form part of a number of the food science courses and account for 3% of the overall study time. Lectures comprise 21% of a student's contact hours. As students have to evaluate and prepare lectures at home, the actual time spent on lectures and assignments is much greater.

Master programme in Food Technology
A range of teaching methods is used. Practicals are an important and essential teaching method within the programme, and 33% of the contact hours are devoted to practical work. Another 18% of the contact hours is spent on group work, and the remaining 2% is used for excursions.

Master programme in Food Safety
Practicals are an important and essential teaching method within the programme, and 36% of the contact hours are spent on practical work. Several courses also include group work on cases or assignments, especially in *Risk Assessment of Foods* and *Food Safety Economics*. In total, 11% of all contact hours is spent on group work. Another 40% is spent on lectures and 9% on tutorials. In several courses a number of different teaching methods are used.

Master programme in Food Quality Management
Group work (cases, assignments) forms an important and essential teaching method within the programme, and 22% of the contact hours are devoted to this. *Advanced Food Quality Management 1* and *2* include many supervised cases (tutorials) which make up a large part of the total contact hours of the programme. In total, 32% of all contact hours are spent on tutorials or similar activities, for example interactive feedback sessions in classrooms. Laboratory practicals are only part of one compulsory course, but it is very intensive, and it makes up a large part of the contact hours. Courses like *Food Law* and *Food Quality Management*, on the other hand, require students to spend a considerable amount of time doing self-study and thus contribute less to the contact hours. The actual number of contact hours differs widely among the disciplinary clusters. The Law and Management clusters have relatively few contact hours, whereas the Food Safety and Product Design clusters have more laboratory practicals and thus more contact hours.

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

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

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

Specific topics regarding improvements to the curriculum are provided below for the four programmes. Overall, the committee was very impressed by the way management, staff, students and programme committees work and collaborate on improving the programmes. Continuous attention is paid to possible improvements. During the visit the question was raised of whether it is necessary to review the entire programme every 5-10 years, alongside continuous adaptation. It was concluded that the involvement of the Chair Groups in the programmes and the active programme committees ensure that all programmes are up to date and meet international requirements.

Bachelor programme in Levensmiddelentechnologie
The curriculum is updated and changed annually. Some changes (for example, the introduction of minors) are due to changes in university policy, others are based on the entrance level of new students (different mathematics tracks in the first year) or due to deliberate scheduling and content changes of the programme. Examples of the latter are: a new course in *Presentation Skills*, the course *Physical Chemistry for Engineers* was replaced with a new course in *Food Thermodynamics*, and a re-evaluation of the course in *Product Flows and Processes in Food Scienc*e led to a new course with more emphasis on sustainability and supply chains: *Food Production Chains*. Since 2010, the thesis is no longer a recommended but a compulsory part of the bachelor programme.

Master programme in Food Technology
The critical reflection reports several changes that have been made based on the recommendations of the previous assessment committee. They include more transparent and formal assessment criteria, which has been endorsed by university policy as well (see also assessment system under Standard 3), using the full range of grades in assessing the theses. Another remark made by the previous assessment committee concerned the involvement of alumni in making programme improvements and serving as ambassadors. In order to achieve this, an External Advisory Committee was set up with graduates and industry representatives. In addition, a LinkedIn group was created to keep track and stay in touch with graduates. The programme has also improved the visibility of the programme for prospective students. The main changes in the curriculum concern improvements to the specialization and development of three new ones: Sensory Science, Sustainable Food Process Engineering and Gastronomy.

Master programme in Food Safety
The programme has been developed from a specialization of the master programme in Food Technology into a separate programme. Several courses have been created especially for this programme: for example, *Food Safety Economics* and *Food-Related Allergies and Intolerance*. These courses replaced ones in *Epidemiology & Public Health* and *Global Food Security*. In addition to new courses, the programme is regularly updated. Courses like *Food Safety Economics, Risk Assessment of Foods* and *Food Safety Management* are revised based on recent developments and cases (such as the EHEC case in Germany in 2011). *Advanced Food Microbiology* and *Food Toxicology* both contain a number of fixed course elements, but also include lectures on current events, which are often updated. In both courses new technologies are introduced during the practicals when they become available to the Chair Groups. The committee believes the transformation into a separate programme has been executed well.

Master programme in Food Quality Management
In 2003, the Food Quality Management programme was embedded in the Social Sciences cluster of programmes, although it was primarily a joint enterprise of two Chair Groups in both the Social Sciences cluster and the Food Science cluster. The intention was a mix of students with either a social sciences or technology background, but over time primarily technology students enrolled in the programme. For that reason, in early 2011 the programme moved to the Food Science cluster. This move strengthens the interaction with the Food Safety master programme. Changes in the curriculum were necessary to make it more coherent and attractive to students. The courses *Food Ethics* and *Modular Skills Training* were omitted from the programme due to scheduling issues. The *Research Design and Research Methods* course became part of the Restricted Optional cluster with the statistics courses instead of a compulsory course. These changes had the additional effect of strengthening the disciplinary clusters by increasing the number of courses in them from a minimum of 2 to 3. The committee believes the programme has made good choices in adjusting itself to fit its new position in the Food Science cluster.

Staff
Wageningen University staff generally teach in several programmes, making it difficult to provide exact student-staff ratios, but for all programmes they are low, which impressed the committee.

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

Wageningen University introduced the University Teaching Qualification (Basis Kwalificatie Onderwijs, BKO) for new permanent staff and staff on tenured track positions. Quality of teaching is evaluated after each course, which also evaluates the course content, position of the course in the curriculum, presentation and examinations. Results of these evaluations form input for the annual performance and development interviews of staff members. Tailor-made training courses are provided by the Educational Staff Development unit for those interested, or as a result of the course evaluation.
In all programmes the teaching staff is strongly involved in their design and evaluation. This is primarily done by participation in the Programme Committee, and more informally through many meetings regarding the quality of the programmes.

The committee is very impressed by the favourable student-staff ratio in all programmes. This university-wide asset is part of what makes the diversity in the curricula possible. Staff and

students know each other and together take responsibility for the programmes. The teaching quality of the staff members is good. During the site visit, the committee received additional information regarding the research quality of the staff involved in the programme. It confirmed the committee's assumption that the staff performs well in both research and education.

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

The committee is of the opinion that the programme-specific services are good. Students can use advanced research equipment during practicals in addition to the centrally provided standard equipment. Thesis students are given a place to work (desk) as well as access to the laboratory facilities. The committee discussed the use of lab facilities during the site visit and concludes that a balance has been found for sharing the lab facilities for both teaching and research. The discussion also showed the committee that investing in pilot plant equipment is not necessary and is considered to be excessive. However, a certain level of investment is necessary to maintain well-equipped lab facilities, for both research and education.

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

There are 4 study advisers for the four programmes, with a total of 1.7 fte. The study adviser the committee talked to during the site visit stated that increasing student numbers make his tasks more difficult but still manageable. The students the committee talked to indicated that the study advisers are accessible, respond quickly and are very helpful. The committee advises the programme management team to monitor the work pressure of study advisers when student numbers increase.

In each period, the study association 'Nicolas Appert' organizes drinks to stimulate informal contacts between staff and students. 'Nicolas Appert' also organizes internship evenings and career events to facilitate students in finding an appropriate internship and job.

Bachelor programme in Levensmiddelentechnologie
The first contact between students and study advisers occurs during the first period as part of the course *Food Technology I*. In this course the study advisers teach a small module, dealing with the university system, rules and regulations, tasks of the study adviser, job opportunities and choices.

After the second period of the first year, study progress is monitored, and students with a delay are invited for a personal appointment. During this meeting the student's progress is discussed and, if needed, s/he is advised to contact the appropriate further assistance (doctor, psychologist, dean) or take a specialized course. All other students are invited for an

appointment after or during period 3 of the first year; this meeting has a more informal character. The progress of all students is monitored throughout the programme, and they are invited for talks when necessary. The study advisers organize plenary meetings on study planning and the choice of thesis and minor. Students are individually invited to discuss their choices and the planning of their minor and thesis. Finally, the study advisers help students with any other study-related matter, such as forms, problems with lecturers or other students, delay, and inform students by e-mail about registration dates and other important matters. Students mainly receive information by e-mail and from general and programme-specific information leaflets. The committee believes the study advisers do an excellent job.

Master programmes in Food Technology, Food Safety and Food Quality Management
Before the start of the programme, all students are invited for a talk with one of the study advisers. During this individual intake meeting, the study adviser helps the student to create a study plan. Throughout the rest of the programme, the study advisers monitor the students by checking their study progress from time to time and invite them for a talk if necessary. At any time, students may contact the study adviser to arrange a meeting to discuss study choices, planning or problems influencing their study. To provide general information to all students, the study advisers organize plenary meetings like the introduction presentations in August and a thesis market in November, and they are present at internship evenings. Similar to the bachelor programme, the committee believes the student support is excellent.

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

The programmes are characterized as intensive due to the large number of practical experiments and tutorials. In particular, the thesis is perceived as intensive because it is usually time consuming. But in general, the committee established that the study load is acceptable for all programmes.

Bachelor programme in Levensmiddelentechnologie
In the middle of the 1990s, the number of students entering the programme started to decline from around 85-90 to a low of 21 students in 2004. From 2004 onwards, numbers have gradually increased to around 65-70. The reason for the decline is not clear; the critical reflection suggests a number of factors, including general disinterest in technical studies, ranking of the programme among the unpopular Agricultural Sciences, and the attractiveness of Wageningen as a student city. The same decline was observed by other food technology programmes in the Netherlands. The reason for the increase is not clear either; multiple factors probably play a role. Wageningen University has promoted itself more as a University for Life Sciences than as an Agricultural University, which has probably spurred interest among school leavers. This has resulted in an overall increase in bachelor students since 2006.

In general, more students are taking an interest in programmes with a more technical profile, which benefits the programmes in Food Technology.

Master programme in Food Technology
In 2011, 487 applicants selected the Food Technology master programme as their first choice. Of those 267 of them were admitted, 114 were rejected, and the rest did not complete the application procedure. There is a large discrepancy between original number of accepted applicants and the number of registered students, primarily caused by a lack of financial support for potential students. The number of students who actually started the programme increased between 2003 and 2007 from 36 to 74 students. After a minor decrease in 2008, the number of students increased again up to 113 students in 2010.

Every year, about half of the students have an international academic background, with 90% being in Food Science or related fields. Other backgrounds include Chemical Engineering and Biotechnology. Most of the Dutch students obtained their BSc in Food Technology at Wageningen University. The percentage of Dutch students with a university of applied science bachelor is decreasing. A possible explanation is that the number of university of applied science students in the field of Food Technology is decreasing at the national level, even though the industrial demand for these graduates is high.

Master programme in Food Safety
The number of students has increased since its start in 2003. In the last 5 years over 35 students have enrolled annually. The students are largely international; only 10-15% of the total student population is Dutch. The reason for the low number is most likely that the programme was relatively unknown among Dutch students. The programme aims to increase the proportion of Dutch students.

Nearly all students have a background in Food Technology or Human Nutrition (including Dietetics); only a few students have different backgrounds, such as chemistry, plant sciences, pharmacy or biotechnology. A large number of international students already have work experience in the field of Food Safety. Several students have worked for local Food Safety authorities (for example in Colombia, Tanzania, Kenya, Saudi Arabia, Philippines and Japan), and their experience is very useful during the programme's group assignments.

Master programme in Food Quality Management
The number of students starting the programme has fluctuated since 2003 at between 20-25 students/year on average, and the programme expects it will increase further in the coming years due to improved promotion of the programme. The 2004 intake was high because of an agreement with the Van Hall Larenstein University of Applied Sciences, leading to the enrolment of 17 Chinese students into the programme. Van Hall Larenstein then changed its curriculum and intake requirements, and fewer Chinese students now enrol from that source. The 2008 intake was quite low due to the positioning and promotion of Food Quality Management solely among the Social Sciences programmes of Wageningen University, which made the programme hard to find for prospective students.

Enrolment is very international. Usually, 10-15% of the total student population is Dutch. Most students have a background in Food Technology or a similar field, followed by those with a more managerial background. Only a few students have another background, such as Horticulture, Plant Sciences, Pharmacy or Biotechnology. A large proportion of international students already have work experience in the field of Food Quality Management or Food

Safety. Their experience comes in useful during the programme's group assignments and benefits the other students in the programme.

2.2 Considerations

The committee studied the various aspects of the teaching and learning environment of the programmes and established that the curricula, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes very well.

The curricula of the bachelor and master programmes in Food Technology show that the bachelor programme is broad and prepares students for a master programme, while the master programme aims for specialization. The committee believes this works very well. As the bachelor programme is largely compulsory, all students can achieve the intended learning outcomes. The specializations in the master programme are all relevant and together cover the entire field of Food Science. The committee believes that the combination of three or four compulsory courses and restricted optional courses ensures that each specialization has a coherent curriculum. It especially likes the *Product and Process Design* course, as it enables students to step 'outside' their specialization and learn to comprehend colleagues from other specializations. This is not only required by the subject-specific reference framework, but also supports the aim of Wageningen University as a whole to offer multidisciplinary education. Overall, the committee believes the bachelor and master programmes in Food Technology are well structured, and their curricula will lead to achieving the intended learning outcomes.

The master programmes in Food Safety and Food Quality Management have undergone several changes recently. Food Safety used to be a specialization of Food Technology, and Food Quality Management used to be embedded in the Social Sciences cluster. The committee is of the opinion that both programmes have successfully implemented changes, resulting in separate and well-structured master programmes in the Food Science cluster. Both programmes offer a limited number of electives as well as courses specifically aimed to integrate knowledge from different disciplines. The committee believes this results in coherent programmes. Breadth and depth are in balance for both programmes. As remarked under Standard 1, the committee believes that food safety and food quality are related areas of knowledge, and graduates in Food Quality Management need to know about Food Safety, too. Therefore the committee appreciates that the master programme in Food Quality Management now offers a disciplinary cluster in Food Safety. It is also enthusiastic about the new specialization in Food Law in the Food Safety programme.

The committee was very impressed by the way management, staff, students and programme committees work and collaborate on improving the programmes. It agrees with the changes made to the programmes. For all four programmes the committee reviewed the teaching methods and finds they are well balanced within and between courses. The student-staff ratios are impressive, and the committee is of the opinion that the staff performs well, in both education and research, which are important elements of the teaching-learning environment.

The study load is acceptable, although for all programmes the thesis project is perceived by students as an intensive period. Student support is well-organized; the committee would recommend keeping a close eye on the work pressure of the study advisers when student numbers increase further. For all programmes, student numbers have increased over the last few years. If this growth continues, it has consequences for the availability of programme-specific services in the future. The committee was impressed with the management of services for teaching and research; investments could be needed to maintain the level of programme-specific services for both research and education in the future.

2.3 Conclusion

Bachelor programme in Levensmiddelentechnologie: the committee assesses Standard 2 as **good**.
Master programme in Food Technology: the committee assesses Standard 2 as **good**.
Master programme in Food Safety: the committee assesses Standard 2 as **good**.
Master programme in Food Quality Management: the committee assesses Standard 2 as **good**.

Standard 3: Assessment and achieved learning outcomes

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

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

3.1 Findings

Assessment system

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

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

During the site visit, the committee discussed the topic 'feedback' with students and lectures. Some students indicated that feedback during the courses could be improved, especially in courses where PhD students are involved, while other students praised the lecturers on the way feedback is given. The students indicated that the quality and quantity of feedback during the theses depends on the supervisor, but there were no complaints. Regarding the master programme in Food Quality Management, the lecturers stated that it might be difficult to maintain the level of feedback when student numbers increase, because the number of lecturers familiar with the interdisciplinary approach required for a thesis is limited. However, on the plus side, interest in the integrative approach is growing.

The critical reflections indicated that the organization of feedback on written group reports is a point for improvement. Only a few courses offer time for each group to discuss their report and receive tailored feedback. In each programme the committee has seen some very good examples of organized feedback. It is positive about the way Programme Committees encourage course coordinators to improve the feedback system for more courses in all four programmes. The discussions during the site visit on this topic confirmed for the committee that feedback is important to students, and the programme teams should keep paying attention to this topic.

Most courses conclude with a written examination. The majority of courses contain practicals or assignments. Therefore, the grades are often based on written reports, oral presentations and/or performance during learning activities. For all written examinations, students have the opportunity to check the exam and grade in person. The Programme Committee monitors the assessments based on the course evaluations, the number of students who pass the course, as well as remarks from individual students. The critical reflections indicated that students perceive the grading system as fair. The committee gained a very positive impression about the quality of the courses, including the assessment procedure. It appears that each course provides a balanced set of assessments. Based on the information provided to the committee before and during the site visit, the assessment system seems well balanced between the courses. The committee concludes that the programmes provide a balanced set of assessments.

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

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

Bachelor programme in Levensmiddelentechnologie
In 2010-2011 the inclusion of a thesis as the final part of the bachelor programme was initiated. The thesis for the bachelor programme is worth a total of 24 credits and is considered the final stage of the programme. It is defined as an individual research project dealing with any aspect of Food Science and Technology. Since 2010, the thesis project has to be conducted at one of the Food Science Chair Groups. In order to harmonize the thesis level, prerequisites and assessment, one single new course code was generated, for which all Food Science Chair Groups are equally responsible. Students choose the thesis by themselves, generally from one of the topics offered by the Chair Groups. The thesis involves an individual research project which also includes 2 credits on food ethics, and the final report should include a chapter on ethics. This part is taught and graded separately by the Applied Philosophy Chair Group.

If a student does not perform well during a thesis project, the supervisor generally discusses the necessary improvements and issues a warning that, should no improvement be noted, the student may not pass. This has to be done by the half-way point of the thesis period, to

provide sufficient time for improvement. For the assessment of a thesis, a standard form is used throughout Wageningen University. Criteria for the assessment of a bachelor thesis are: academic skills (20-50%), proposal and report (20-45%), self-reflection (10%), presentation (5%) and examination (5%). The weight of each criterion is determined after approval of the research/project proposal.

Prior to the site visit, the committee members received a total of 10 recent theses, selected from a list in the critical reflection of all theses completed during the last two years. The selection was done by the secretary on behalf of the chairman of the committee. When selecting the theses, the grading and the graduation date were considered. The student numbers of the selected theses are provided in Appendix 7. For all theses the committee read the thesis report. The use of an assessment form filled out by the supervisor has only recently been introduced, and therefore not all theses had one.

Although the committee could only assess the written report and not the other assessment criteria, it agreed with the grades given to the theses, although the grading seemed a little strict. Overall, the committee was impressed by the quality of the assessment of the bachelor theses. The theses showed use of up-to-date methodology and the results are presented very clear.

Master programmes
For master programmes, the thesis and the internship form important parts of the learning outcomes. For the internship an assessment form is used which is common to all programmes. An external and an internal supervisor are appointed for the internship: the external supervisor advises on the quality of the student's performance, the internal supervisor grades the internship.

The thesis is an individual research project (under supervision) and serves both as a learning activity and a competence test of the student. Completion of the thesis is seen as proof that the student has achieved the learning outcomes of the master programme. Typical for the thesis is that it needs to be performed at Wageningen University. Students can choose a thesis topic offered at one of the Chair Groups involved in their specialization. As there are many Chair Groups involved, this leads to a broad range of thesis topics. The thesis subject requires approval of the study adviser to make sure that it fits within the chosen specialization.

The evaluation of the thesis work is done on an assessment form, which differs slightly from the assessment form of a bachelor programme. Research competence (30-60%) and the thesis report (30-60%) constitute 90% of the final grade. The other 10% reflects the colloquium and examination. Thesis work is always assessed by two assessors, one of whom is not personally involved in the student's supervision.

Prior to the site visit, the committee members received a total of 11 recent theses for the master programme in Food Technology, 11 theses for the master programme in Food Safety, and 9 theses for the master programme in Food Quality Management. All theses were selected from a list in the critical reflection of all theses completed during the last two years. This selection was done by the secretary on behalf of the chairman of the committee. When selecting the theses, grading (the same number of high, middle and low scores were selected) and graduation date were considered. The student numbers of the selected theses are provided in Appendix 7. The use of an assessment form filled out by the supervisor has only recently been introduced, and therefore not all theses had one.

Each thesis is assessed in a final discussion between the student, the thesis supervisor(s) and the thesis examiner. The committee was impressed with the quality of the theses and agreed with the grades given. It found them to be impressive as they were clear in developing a scientific hypothesis with well-designed experiments; the results were presented and discussed in a comprehensive manner. It was clear to the committee that the theses were written and supervised in high-quality research surroundings. To improve even further, the committee suggests making the final outcome a paper that could be submitted to a scientific journal. That would give students a better idea of what it takes to perform research. The committee believes that putting together an actual article would add a relevant experience to the thesis writing. It believes that publications developed from these studies should be positively received by scientific journals.

Success rates

Bachelor programme in Levensmiddelentechnologie
In 2006, 70% of the students had obtained their bachelor degree after 4 years, compared with 44% of the 2003 cohort. It is expected that this percentage will further increase over the coming years, due to stricter monitoring and study advice. The number of students with a bachelor degree after 3 years is still low, at around 30%. According to the critical reflection, the majority of the remaining 70% only have to finish one or two courses after the 3rd year.

The number of drop-outs is rather low (average 10%), indicating that most students have chosen an appropriate programme. There is no clear reason why students drop out; the total number is too low for proper analysis. Reasons given for dropping out are: level (many continue with Food Technology at a professional hbo level), interest (wrong choice), and medical or personal reasons. Sometimes students switch to other programmes in Wageningen, and the programme also receives a few students each year from other Wageningen programmes (mainly Nutrition and Health and Molecular Life Sciences). It can be concluded that students generally choose the appropriate programme. As only a small number of students drop out because of level, the entrance requirements as well as the level of the courses are in alignment, and the programme fulfils the expectations of the new students.

Master programme in Food Technology
The success rates are high. Over 69% of the students graduates after two years, and over 90% graduates within three years. According to the critical reflection the success rates are higher than the average success rates for Wageningen University master programmes. For example, 97% of the students of 2007 cohort completed the programme in 3 years, while the average success rate in 3 years is 89%. In general, the drop-out rate is also lower than the average for Wageningen University master programmes. Since 2005 it has not exceeded 5%. The critical reflections ascribe the high success rate and low drop-out rate to the very motivated students (especially international ones). Students who quit the programme often could not keep up with the level or had made the wrong choice. Several of these drop-outs started another master at Wageningen University (mainly Food Safety or Food Quality Management).

Master programme in Food Safety
The success rates of the master programme in Food Safety after two years fluctuate greatly; 48 % in 2005, 88% in 2006, 79% in 2007 and 58% in 2008, which does not give a clear view. Looking at the percentage of students who graduated after 3 years, the committee established that the success rates are high, with the percentage of students graduating after three years varying between 76% in 2006 and 100% in 2003 and 2004.

According to the critical reflection, the high success rate of the programme is due to the students' motivation and the selection of candidates. The group of students is small and bonds together well; this is an additional stimulation for students to be successful in their studies.

Drop-out rates vary among the years, but generally, it is low. Most drop-outs from the programme switch to other MSc programmes, such as Food Technology or Food Quality Management. Due to the low numbers, the critical reflection does not indicate or pinpoint specific reasons for dropping out.

Master programme in Food Quality Management
The success rates are satisfactory, a low percentage of students need more than the normative 2 years to graduate, but after three years over 72% of the students have graduated. Many students follow an extended thesis project and internship which explains their delay. Another factor is that until 2010 the programme required 2 disciplinary courses, but many students chose three or more courses to increase their knowledge of the subject. With the new schedule (introduced in 2011) the disciplinary clusters have 3 courses, which may prevent study delay.

Another reason for study delay and drop-outs is that the admission criteria were not strictly enforced, especially for students coming from the Van Hall Larenstein programmes. This has been improved, and the expectation is that a larger percentage of students will finish the programme in time. The committee established that the success rates are reasonable and is confident that the changes will lead to improvement in the future.

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

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

The programmes are on schedule to implement the new initiatives. The use of course guides makes the assessment procedures very clear and transparent, and they are very useful to the students. The committee especially values the use of the rubric for the master thesis,

Overall, the committee did not find any major issues worth commenting on. It was impressed by the level of the bachelor and master theses, and it agreed with all the grades awarded. It

was clear to the committee that the thesis projects are very well executed. Regarding the master theses, it was suggested that it would be beneficial for the students to outline their thesis report in the form of an article.

Drop-out rates are low for all programmes. The success rates are very good, except for the master programme in Food Quality Management. The reason for the lower success rates have been identified, and the committee is confident that the changes that have been made can increase the success rates. The committee appreciates the attention paid to improving these numbers further. The committee is of the opinion that with the current pressure on graduating in time in the Netherlands, the large number of possible resits at Wageningen University is outdated. If students don't feel the need to pass an exam, they might not take it seriously. This is likely to lead to study delays.

3.3 Conclusion

Bachelor programme in Levensmiddelentechnologie: the committee assesses Standard 3 as **good**.
Master programme in Food Technology: the committee assesses Standard 3 as **good**.
Master programme in Food Safety: the committee assesses Standard 3 as **good**.
Master programme in Food Quality Management: the committee assesses Standard 3 as **good**.

General conclusion

The committee assesses the *bachelor programme in Levensmiddelentechnologie* as **good**.
The committee assesses the *master programme in Food Technology* as **good**.
The committee assesses the *master programme in Food Safety* as **good**.
The committee assesses the *master programme in Food Quality Management* as **good**.

APPENDICES

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

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

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

Dr Mansel W. Griffiths obtained his BSc degree from North East London Polytechnic and his PhD from Leicester University. He joined the Hannah Research Institute, Ayr, Scotland in 1974. In 1990 Dr Griffiths was appointed to the Dairy Farmers of Ontario/NSERC Industrial Research Chair in Dairy Microbiology in the Food Science Department, University of Guelph. Dr Griffiths is also the Director of the Canadian Research Institute for Food Safety. In 2006 he was appointed Visiting Professor at Jinan University, China and has been a Visiting Fellow at ESR, New Zealand, the University of Sassari, Italy and is an EU Fellow of the Erasmus Mundus MSc Food of Life program. His current research interests include rapid detection of foodborne pathogens; factors controlling growth and survival of microorganisms in foods; and beneficial uses of microorganisms. Dr Griffiths has authored more than 300 peer-reviewed publications and appears on ISI HighlyCited.com. He has edited four books, including "Improving the Safety and Quality of Milk", which was published in 2010. Dr Griffiths is an Editor of Applied and Environmental Microbiology, an Associate Scientific Editor of the Journal of Food Science, a member of the Executive Editorial Board of Journal of the Science of Food and Agriculture, and serves on the editorial boards of several leading food microbiology journals. He serves on the Expert Scientific Advisory Committee for Dairy Farmers of Canada, the Canada IDF Coordinating Committee on Food Safety, and the Food Safety Committee of the Canadian General Standards Board. He served as chair of the International Advisory Board of "Biotracer", an EU 6th Framework Project. He was the recipient of the International Association of Food Protection Maurice Weber Laboratorian of the Year for 2002. He served on the Ontario Meat Inspection Review, Expert Scientific Advisory Committee in 2004 and sat on the Expert Advisory Committee of the Listeriosis Investigative Review chaired by Sheila Weatherhill in 2009. He is a member of the Maple Leaf Foods Advisory Council and the Health Canada Food Expert Advisory Committee.

Dr. R. Paul Singh is a Distinguished Professor of Food Engineering, Department of Biological and Agricultural Engineering and Department of Food Science and Technology, University of California at Davis. He received his degrees in the area of agricultural engineering from Punjab Agricultural University (B.S. 1970), University of Wisconsin (M.S. 1972), and Michigan State University (Ph.D. 1974). His research involves transport phenomena in food processing and mathematical modeling to seek improvements in process efficiency. Dr. Singh is a Fellow of the Institute of Food Technologists, American Society of Agricultural and Biological Engineers, and the International Academy of Food Science and Technology. He is an author or co-author of 3 U.S. patents, 15 books, and over 260 refereed papers. Dr. Singh received the Samuel Cate Award for Research in 1982 and International award in 1988 from the Institute of Food Technologists, and Distinguished Food Engineer Award in 1997 from the Dairy and Food Industry Suppliers Association. He received the Kishida International award in 2007 and A.W. Farrall Young Educator Award in 1986 from the American Society of Agricultural and Biological Engineers. He is currently serving as Editor-in-Chief of the Journal of Food Engineering. In 2008, Dr. Singh was elected to the U.S. National Academy of Engineering. In 2010, the Institute of Food Technologists awarded him the Nicolas Appert Award– the highest award given in the field of food science in the United States

Dipl.Ing. Dr. Gerhard Schleining is Ass. Professor at the Department of Food Science and Technology at the BOKU - University of Natural Resources and Life Sciences, Vienna. He is teaching several courses on food quality management, food physics and he is also responsible for teaching issues of the department. He is also Secretary General of ISEKI-Food Association (https://www.iseki-food.net) and chairing the team for education and training since 2005. He graduated 1983 at BOKU, where he studied Food Science and Biotechnology. His doctorial thesis was about food texture. 1992 he was as post doc at the UCSD (University of California, San Diego). He was chairing several working groups on teaching and training in several European programmes (e.g. http://www.iseki-food.eu/, http://www.moniqa.eu/) and he was also teaching at Thammasat University, Kasetsart University, King Mongkut's Institute of Technology Ladkrabang: Bangkok, Thailand, Hanoi University of Science and Technology, Vietnam and Sichuan University Chengdu, China.

Prof. K. Kristbergsson is Professor at the Department of Food Science and Nutrition at the University of Iceland (since 2005). He obtained his BSc in Food Science at the Department of Chemistry at the University of Iceland in 1979. He subsequently did his MSc (1982), MPhil (1982) and PhD (1985) in Food Science at the Department of Food Science of Rutgers University, New Brunswick, NJ (US). He was a visiting professor at the Department of Food Science of the University of Queensland, Autralia in 2009. Kristbergsson was coordinator in a project funded by the Nordic Industry Fund called 'Water Jet Deboning', conducted by nine companies and government research institutions from Iceland, Norway, Sweden and Denmark. He has written a significant number of research papers, books (chapters and series editor) and published presentations as abstracts in Conference Proceedings and Invited Lectures.

Julia Ågren is a master student in Engineering, Biotechnology with specialization in Food technology at faculty of engineering at Lund University, Sweden. She was Member of the highest council of the student union at Lund University, faculty of engineering, 2010-2012 and President of student guild of Chemistry and Biotechnology, at Lund University, faculty of engineering during 2011.

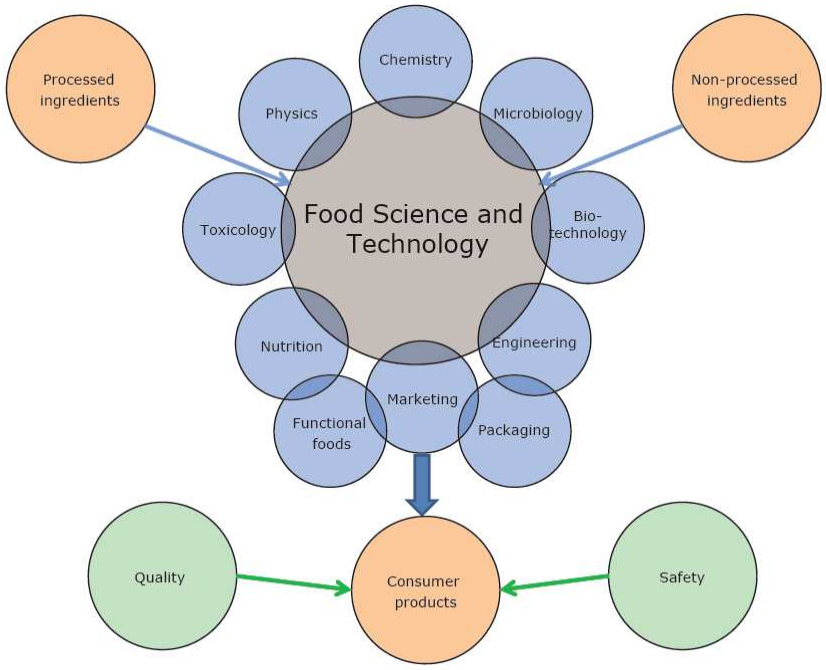
Appendix 2: Domain-specific framework of reference

2A: Domain-specific framework of reference for the bachelor and master programme in Food Technology

Food science and technology is, as the name already implies, the combination of sciences that deal with all aspects of the technology, structure, composition, quality, safety and sensory aspects of (processed) food products. In theory it focuses on all steps of the product development cycle: from raw materials until the product has been consumed.

Generally food science and technology does not deal with aspects of primary production, which are covered by plant science, horticulture, animal science etc.. It may, however, occur that food scientists require specific characteristics of a plant or animal product, which plant or animal scientists may help provide. An example is the recent developments in influencing the fatty acid profiles in milk by genetic screening of dairy cows. In that case food scientists work closely together with animal breeding experts. Nearly all foods that we consume on a daily basis have been preserved, processed or modified between primary production and the moment of consumption. The only exceptions are fresh fruits, nuts, and (arguably) water. Production of drinking water (tap water) is normally not considered part of the field, even though the purification steps could be considered as a food processing step; water being an essential nutrient or food.

From the above it can be concluded that our present diet, and thus our whole existence, is nearly fully dependent on processed foods and food science and technology can thus be considered as one of the most important sciences in our present society.



As long as we, as a species, no longer hunt or gather our foods for immediate daily consumption, food has to be preserved. Ancient, prehistoric, food processing steps thus include frying, baking, drying, brining, fermenting, salting, sugaring and similar steps. Obviously, humanity did not know why these steps kept products safe, but in ancient times, humans had already developed a number of preservation techniques. Many of these are still used on a daily basis either in the kitchen or in industry. As civilization developed, so did

food production. More complex processes, such as baking bread or making wine evolved thousands of years ago. Romans knew many complex foods, including very complicated dishes and pastries, indicating much more practical knowledge of different aspects of foods and ingredients. With a steadily growing urban population and a larger distance between primary production and consumption, preservation and processing of foods became even more important. Specialized food shops emerged, which eventually developed into the large supermarkets we see today.

From the Classical period onwards, people became intrigued by ingredients from distant regions, especially spices. The high prices for these rare ingredients increased trading and finally resulted in the age of exploration and the discovery (from a European perspective) of new continents and regions. Many new important plants and ingredients were introduced in other regions (such as tomato, potato, maize and cocoa from the Americas, coffee from Africa , tea and spices from Asia and European products to other continents). This interest in exotic products is still an important trend in the food industry, where exotic berries for example, are becoming increasingly popular in specialty fruit drinks.

Since the 18th century and the development of modern natural sciences, food science has developed from a science based on experience (baking, brewing), to a highly integrated field, combining elements from a large number of other sciences and disciplines. Some of the main disciplines are shown in Figure 1.1 above.
A modern food scientist thus has to have knowledge of all the disciplines and sciences shown in the Figure. Development of new products is no longer a matter of trial-and-error, but a highly complex design and development process, involving many ingredients and technologies as well as quality and safety aspects. A modern product normally consists of a large number of ingredients, which may be processed (powders, specialized extracts, flours, additives) or non-processed (fruits, vegetables, meats). All ingredients should comply to a number of standards, based on chemical (flavour) or physical (size) parameters, but also on quality and safety standards. The ingredients then have to be mixed and processed to a final product. This generally involves many technologies and changes in chemical, physical, microbiological and sensorial aspects. Finally the product has to be of the desired quality and packed to be marketed.

This very simplified description already indicates that a change in a single aspect, or a single process step, immediately changes many of the other parameters in a food. This makes it of utmost importance that a food scientist has knowledge of all these disciplines and is able to combine these.

Food scientists are trained and work at different levels.The traditional food scientists are not known as such, but are known as bakers, patissiers, cooks and other professions. They are normally highly skilled in a specific trade and know, from a practical point of view, all the ins and outs of their products. On a technical level, food scientists are trained in modern food science disciplines, but at a basic level, after which they further specialize in, for example, a specific product or process, to work as a process operator or similar in the food industry. Their required qualification is a food science technical degree. On a more applied level for industrial product or process development, food scientists are trained at Universities of Applied Science. The different disciplines are dealt with in more depth and integration and students at this level specialize further in product or commodity groups, such as dairy, meat sciences, or fruit and vegetable sciences. Students finish their programme with an applied research thesis.

Graduates generally work as product developers in the food industry. The degree is an applied bachelor's degree. On an academic level, the emphasis is changing from product based to nearly fully discipline based training. Students are trained in all basic disciplines of the field, which they are able to apply to different products. Integration between the different disciplines is essential and students are trained to apply these disciplines in their work. At a later stage of the academic training, students are more specialized in one or more (integrated) disciplines and are trained for fundamental (applied) research in their field of interest. In Europe, graduates generally do not enter the labour market with an academic bachelor's degree, but continue with an matster's degree. Graduates are generally employed in the food industry or research institutions in research or management positions.

Training at doctorate level obviously focuses on specialized research in a single or integrated discipline. Graduates have a PhD and are generally employed in research institutions, universities or the larger food industries.

In the food industry a food scientist (of any level) will never work alone, but will always be involved in a team. In product design and development, a team can consist of one or more food scientists specialized in different disciplines and on different levels, technical engineers and technicians, marketeers, and sometimes even psychologists, anthropologists or legal advisors. The actual composition obviously depends on the product and industry involved.
Food science is a very dynamic field, with thousands of new products launched on a yearly basis. During the last century many new trends have appeared. Some examples are:

- Discovery of vitamins and nutrients, resulting in functional foods (since the 1910s)
- Improvement and development of new fermented products (such as yogurt in the 1920s)
- Convenience foods (since the 1950s)
- Light products (1970s)
- Trendy foods (since 1930s)
- Specialty foods (clinical foods, infant nutrition…, 1910s)
- Organic foods (1980s)
- Slow-food and regional foods (1990s)
- Fears and scares (new ingredients, product reformulations, since 1930s)

In addition, the industry is always improving and using new technologies to optimize products. Even though this cannot always directly be seen in consumer products, some examples of these trends and techniques are:

- Packaging technology
- Mild preservation techniques
- Sustainable food production
- Nanotechnology
- Separation and drying technology

Finally the regulatory authorities and retailers have set laws and guidelines on food products, which have and will result in new products and product reformulations. Some of these are:

- Developments in food law (such as GMO labeling)
- Quality, hygiene and safety systems (HACCP, BRC and many others)

A food scientist thus has never finished his or her training and education, and always has to keep up with new trends, technologies and laws.

2B: Domain-specific framework of reference for the master programme in Food Safety
According to a recent WHO statement, food-borne diseases and threats to food safety constitute a growing public health problem. According to recent estimates, approximately four per million people die annually, but many millions suffer because of food-borne microbiological illness in the United States alone. The burden to public health is reduced by the improvement of food safety measures, which aim to reduce risks, with risks defined as a function of probability and severity of hazards. The trust, perception, concerns of the consumer and provision of information are adding value to the established prominent role of the consumer in the legal frame of food safety.

Food safety is a complex issue, which relates to public health and consumers, government and industry and international organizations as well as their interactions, see Figure A.1. Food safety research and education thus has to take all these stakeholders and their interests into consideration.

Public health and consumerInternational organisations WHO, FAO, Codex Goverments and IndustryEducation and research

On an industrial level, an integrated farm to fork approach of food safety became imperative as the complexity of the food chain increased so enormously that this integration was deemed crucial. Feed safety merged with food safety due to the complexity and similarity of the supply chains, which caused an increased risk of the carry-over of chemicals from feed through animals to food.Self-regulation systems developed for the whole chain which switched the focus from end-product control to prevention of risk.

Food safety management systems such as GMP (Good Manufacturing Practices) and HACCP (Hazard Analysis Critical Control Points) became compulsory. These are systematic, preventive risk management measures that strive for a safe final product that will not have a negative effect on public health. Control in the food chain between the different links appears to be very strong, especially when exerted by retailers.

Governments act as regulators setting the rules starting from which food is considered safe, to approval schemes, up to enforcement in the food industry sector. On a global scale, governments are at stake when international food safety is a matter of concern. From an export and import perspective, WTO and its agreements highlighted the relation between trade and food safety, also giving weight to risk analysis and the joint WHO/FAO Codex Alimentarius standards. Risk analysis composed of risk assessment, risk communication and risk management is a central concept in the decision making in relation with food safety.

The science
Food safety science integrates natural and social sciences. Natural sciences deal with risks of a biological, chemical and physical nature, mainly concentrating on the first two. Microbiological hazards are still the number one reason for food-borne illnesses, representing a disease burden twice larger than the burden of chemical hazards.

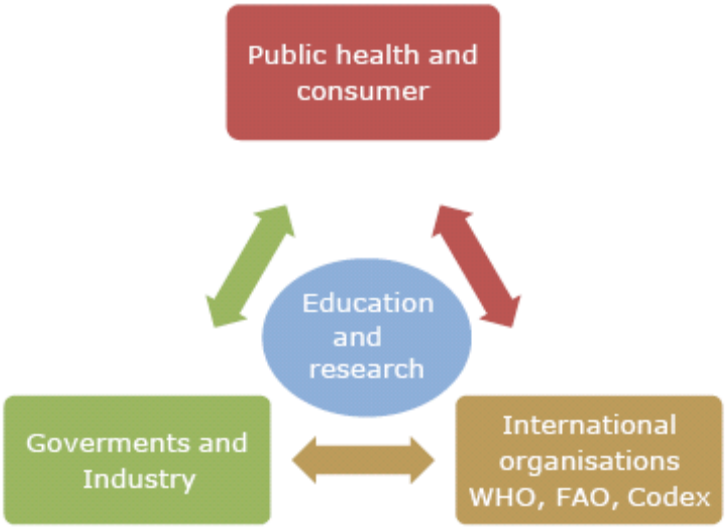
Food microbiology concerns micro-organisms, their toxins, and their behaviour in food and actions in the human body. It develops methods for detection, but also control and management of microorganisms and their toxins.

Food toxicology studies the nature, detection, properties and health effects of non-living substances that people are exposed to by consuming food. Molecular techniques and genetics are in the spotlight in both sciences, with a non-diminished significance of standard methods in microbiology and the tendency to replace animal tests with *in vitro* and *in silico* models in toxicology.

Food allergies are increasing in the Western world; 3-4% of adults and 6% of children suffer from food allergy. This necessitates a greater understanding of the allergens, their mechanism of action and means of inactivation.

Social sciences allow for understanding of the societal side of food safety that is attached to different legal, ethical, consumer, economic and managerial aspects. Food law as a branch of law that flows between different legal directions describes the legislation on food safety and tends to encompass the food chain in a holistic manner, as mentioned above, from farm to fork, from feed to food. Balanced food safety-economic attitude is desired when deciding on safety issues.

Food safety management uses all the above-mentioned sciences as tools to create successful risk management solutions: in the short term to deal with incidents, in the intermediate term with HACCP, audits, certification and regulation, and in the long term with risk management.



2C: Domain-specific framework of reference for the master programme in Food Quality Management

Qualification subjects of "EOQ Food Quality Systems Manager" by the European Organisation of Quality (www.eoq.org) and relation with the Food Quality Management programme.

No.	Food Quality Systems Manager (EOQ)	Inventory of MSc courses Wageningen	Educational level*
1	**Food Quality (introduction)**		
	Safety and Quality concepts and definitions	Food Quality Management[1]	A
	Food properties		
	Food processing	Food Quality, Analysis and Judgement	A,B
2	**Quality management (introduction)**		
	• Basic management principles (planning, organizing, human resources, decision-making, quality behaviour/communication)		
	• Organizational Concepts (introduction)		
	• QM functions	Food Quality Management	A
	• Systematic quality approach, interests of stakeholders, major food quality management functions, Quality design, quality control etc.)	Advanced Food Quality Management I[1]	B
	• Role of QA department (responsibilities, tasks, structure, objectives)		
3	**Quality design**		
	• Quality design (planning and input)		
	• Q design activities (assignment, responses, tasks, review, verification, validation)	Food Quality Management[1]	A
	• Assessment of customer needs (ext. and internal inputs, customer oriented design	Food Quality, Analysis and Judgement	A,B
	• Management of q design (project manual	Advanced Food Quality Management II	C
	• Quality design process and output (tools supporting decision-making of products and processes (sensually specific tests, shelf-life test, modelling, hygienic design, FMEA, Tagucci etc.	Thesis/Internship[2]	C,D
	• Q design review, verification and validation, changes		
4	**Quality control**		
	• Methods of prod/proc control (q analysis and measurements)	Food Quality Management	A
	• Methods of process control (accept. Sampling, capability analysis and measurement	Food Quality, Analysis and Judgement	A,B
	• Managing the control process (tasks, response, costs)	Advanced Food Quality Management II	C
	• …	Thesis/Internship	C,D
5	**Quality improvement**		
	Management of the quality improvement process		
	• Project approach, teamwork, training		
	• Organizational change situation	Food Quality Management	A
	Tools to support q improvement processes	Advanced Food Quality Management II	C
	• Preventive & team oriented Q management principles (Ishikawa, Pareto)		
	• ABC analysis, six sigma, bench marking e.o	Thesis/Internship	C,D
6	**Quality assurance**		
	Managing the q assurance process		
	• Quality assurance functions		
	• Quality auditing, certification, review	Food Quality Management[1]	A
	• Quality data info system		
	Principles of quality assurance standards & guidelines	Advanced Food Quality	C
	• HACCP, GMP, BRC etc.	Management I + II[1]	
	Tools and programmes to support quality assurance		C,D
	• Risk assessment, predictive microbiology	Thesis/Internship[1,2]	
	• Calibration programmes		
	• Maintenance programmes		
7	**Quality policy and strategy**		
	TQM/QM philosophies (Deming, Juran)	Food Quality Management	A
	Policy making		
	Quality costs		B
8	**Resource management**		
	Analysis of competences and needs		
	Training requirements	Food Quality Management	A
	Evaluation of training performance		

No.	Food Quality Systems Manager (EOQ)	Inventory of MSc courses Wageningen	Educational level*
9	**Resource management**		
	Analysis of competences and needs Training requirements Evaluation of training performance	Food Quality Management	A
10	**Data collection and analysis, statistical methods**		
	• Principles of statistical methods in QM (sampling design, SPC, basic statistic methods	Statistics	A,B
	• Techniques of reporting (written, orally)		
	• Computer aided quality (software for data collection & interpretation	Research design and methods	A, B
11	**Food logistics management**		
	Basics in logistics Principles of tracking & tracing Quality controlled logistics Agreements and partnership in contracting Selection and evaluation	Food Quality Management Food logistics Management[3]	A A,B
12	**Legal and regulatory issues**		
	International food law, WTO, Codex Alimentarius	Food law	A
	Private standards	Food law	A
	EU food law •Free movement of goods, quality requirements, mutual recognition •Principles of risk analysis, precaution, consumer protection •Authorisation of additives, GMOs, novel foods •Product quality criteria (such as MRLs) •Process requirements (hygiene, HACCP, traceability) •Labelling, nutrition and health claims •Law enforcement, incident management	Food law	A,B
13	**Emerging subjects**		
	• Sustainability • Social/Corporate responsibility		

* Educational level.
A = To understand and to be able to explain (imparting knowledge, simple applications, giving examples, cases)
B = In addition to A, to be able to indicate relevant methods and to apply them(developing practical skills in laboratory work, simulation modelling)
C = In addition to B, to elaborate and integrate relevant methods and to interpret the results (advanced cognitive skills: synthesis, communication, complex problem solving, examples)
D= Research work (thesis, internship)

Course characteristics:
1= joint input from natural science and social science
2= double coaching as well from food technology science and from managerial science
3= optional course

Appendix 3: Intended learning outcomes

3A. Intended learning outcomes for the bachelor programme in Levensmiddelen-technologie

	Intended Learning Outcomes **After successful completion of the programme graduates are expected to:**	**Dublin Descriptor**
1	have a broad basic theoretical and practical knowledge of chemistry, physics, and microbiology in relation to foods and the technological production processes;	Knowledge and understanding
2	be able to analyse problems related to food quantitatively using basic mathematical and statistical principles;	Knowledge and understanding
3	understand the basic principles of food quality and food safety and know how to manage these;	Applying knowledge and understanding
4	have insight in the effect of sustainability and logistics on food production chains;	Making judgements
5	be aware of the societal and ethical consequences of developments in the area of food technology;	Making judgements
6	have a basic understanding of consumer decision making and marketing strategies related to food products;	Applying knowledge and understanding
7	be able to work as a team and communicate with experts from related disciplines;	Communication
8	be able to evaluate food science literature;	Making judgements
9	have basic knowledge of a discipline of choice, preferably obtained through a well-motivated minor programme;	Knowledge and understanding

3B. Intended learning outcomes for the master programme in Food Technology

		Learning outcomes After successful completion of the programme students are expected to be able to:	**Dublin Descriptors** (description of Master's level)
Domain specific knowledge and understanding plus theapplication of that knowledge and understanding	1	• create solutions for optimizing food products, paying attention to changing conditions;	• Knowledge and understanding • Applying knowledge and understanding • Making judgments
	2	• understand the social consequences which are related to developments in the field of food technology;	• Knowledge and understanding • Applying knowledge and understanding
Scientific learning outcomes (research)	3	• interpret, analyse and handle problems, alone and with colleagues;	• Applying knowledge and understanding • Making judgments • Communication
	4	• follow scientific elaborations, see its opportunities and create further steps;	• Applying knowledge and understanding • Making judgments
	5	• function independently in the field of specialization in food technology and to contribute to related fields;	• Applying knowledge and understanding • Making judgments
Domain specific skills	6	• use the knowledge of food science in producing food for animals and/or non-food applications;	• Knowledge and understanding • Applying knowledge and understanding • Making judgments
	7	• lead the process of treatments/trends in food production, or organizations in food technology;	• Applying knowledge and understanding • Making judgments • Communication
General academic learning outcomes	8	• respond to social, scientific and ethical issues that are encountered in work or study in the field of food technology;	• Making judgments • Communication
	9	• cooperate as a specialist in a multidisciplinary, international team to solve complex problems;	• Making judgements • Communication • Learning skills
	10	• communicate information on food products to society and to the relevant scientific media;	• Communication
	11	• design and plan own learning processes based on continuous reflection upon personal knowledge, skills, attitudes and performance.	• Learning skills

3C. Intended learning outcomes for the master programme in Food Safety

		Learning outcomes MSc Food Technology After successful completion of the programme students are expected to be able to:	Dublin Descriptors
Domain specific knowledge and understanding and applying that knowledge and understanding	1	be able to analyse issues related to food safety problems, both in their technical and in their societal context	• Applying knowledge and understanding
	2	be knowledgeable on how foods are produced, they know how food safety is organized, practised and regulated and they are prepared to take responsibility for their own contribution to the field	• Knowledge and understanding • Applying knowledge and understanding
Scientific learning outcomes (research)	3	apply and question paradigms in their field	• Learning skills
	4	have obtained knowledge in this area built upon a solid scientific and technological training, based on the life sciences	• Knowledge and understanding
Domain specific skills	5	make a risk assessment for either an existing or a new product or product line	• Applying knowledge and understanding • Making judgments
	6	handle complex situations and are equipped to make balanced judgements when confronted with incomplete available data	• Applying knowledge and understanding • Making judgments • Communication
	7	design food safety management systems, and to contribute to the general knowledge of safe foods and safe food production chains	• Applying knowledge and understanding
General academic learning outcomes	8	be aware of the societal and ethical consequences of developments in the area of food safety and of their own decisions and advice	• Applying knowledge and understanding • Making judgments
	9	be aware of principles from social sciences, in particular (food safety) managerial aspects and characteristics of consumer perception and behaviour	• Making judgments
	10	to work in a multidisciplinary team	• Learning skills
	11	interpret research results in a multidisciplinary framework	• Applying knowledge and understanding • Making judgments • Communication

3D. Intended learning outcomes for the master programme in Food Quality Management

		After successful completion of the programme graduates are expected to be able to:	Dublin Descriptors
Domain specific knowledge and understanding and applying that knowledge and understanding	1	To recognize, analyse and understand factors in the agri-food processes and in the agri-food chain that influence the quality of agri-food products	• Knowledge and understanding • Applying knowledge and understanding • Making judgements
	2	To describe and explain technological and managerial options and restrictions for achieving desired quality levels, both within organizations in the food chain and for the chain as a whole	• Knowledge and understanding • Applying knowledge and understanding • Making judgements
Scientific learning outcomes (research)	3	To search and critically evaluate various scientific concepts and understand that the choice for a certain concept or model determines the diagnosis and options to optimize food quality levels or standards	• Applying knowledge and understanding • Making judgements
	4	To 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	• Applying knowledge and understanding • Making judgements
Domain specific skills	5	To analyse, understand and explain the consequences of governmental quality regulations on the processes in the agri-food chain	• Applying knowledge and understanding • Making judgements
	6	To describe, analyse, and evaluate quality problems in the organization of the agri-food chain or the chain as a whole, caused by these governmental policies and regulations, taking into account legislation, policy, economics, and ethics	• Applying knowledge and understanding • Making judgements
	7	To understand, communicate and work with people with different knowledge standards and knowledge backgrounds	• Making judgements • Communication
	8	To analyse and evaluate practical situations and issues from a theoretical perspective, while critically evaluating the role and position of the researcher	• Making judgements
General academic learning outcomes	9	To cooperate as a specialist in a multidisciplinary, international team to solve complex situations affecting food quality in the organization of the agri-food chain	• Communication • Making judgements
	10	To design and plan own learning processes based on continuous reflection on personal knowledge, skills, attitudes and performance	• Communication • Making judgements • Learning skills

Appendix 4: Overview of the curricula

4A. Overview of the bachelor curriculum in Levensmiddelentechnologie

Course code	Course name	Credits	Year	Period	Lectures	Tutorials	Practicals	Other
FPH-10306	Food Technology I	6	1	1	24	20	40	6
MAT-15403	Statistics 2	3	1	1		25	12	
CBI-10306	Cell Biology	3	1	2	12		48	12
PCC-12303	General Chemistry 1	3	1	2	6	12	24	
PCC-12403	General Chemistry 2	6	1	2		18	24	
MAT-14903	Mathematics 2	3	1	3		32	6	
ORC-12803	Bio-organic Chemistry I	3	1	3	4	18	24	
FCH-11306	Nutritional Aspects of Foods	6	1	4	16		36	16
FPH-10803	Thermodynamics for Food Scientists	6	1	5	13	15	12	
MAT-15003	Mathematics 3	3	1	5		32	6	
MIB-10306	Microbiology & Biochemistry	3	1	5	38	8	24	
ECS-10301	Presentation Skills	3	1	6			24	
FPE-10808	Food Production Chains	1	1	6	32	34		20
ORC-12903	Bio-organic Chemistry II	8	1	6		18	24	
MAT-14803	Mathematics 1	6	2	1		35		
MAT-15303	Statistics 1	6	2	1		25	12	
FHM-20306	Food Microbiology	6	2	1	28		60	
FPE-10306	Mathematical Concepts for Food Technology	6	2	1	8	57		12
BPE-20806	Process Engineering	6	2	2	18	36	36	
FCH-20806	Food Chemistry	6	2	2	18	21	60	5
FPH-20306	Food Physics	6	2	3	26		40	
PDQ-21306	Food Packaging	6	2	4	20		28	14
FHM-22806	Risks Associated with Foods	8	2	5	28	15		10
FPE-20306	Food Process Engineering	4	2	5	11	51	38	4
FCH-22308	Food Properties and Function	24	3	6	19	20	102	12
PDQ-10804	Quality Systems Operations	6	3	6	24		12	
PDQ-35306	Case Studies Product Quality	3	1	1				42
YFS-80824	BSc Thesis Food Science and Technology	3	1	1				
PDQ-22801	Foreign Study Trip Food Technology	6	3	1				28
PDQ-32806	Meat Science	1	3	1	12	25	30	20
FCH-21806	Food Related Allergies and Intolerances	6	3	2	33	16	21	4
MST-24306	Management and Marketing	6	3	2	18		12	18
PDQ-21806	Milk in the Dairy Chain	6	3	2	28			16

4B. Overview of the master curriculum in Food Technology

Course code	Course name	Credits	Year-period	Practicals	Lectures	Group work	Tutorials	Other
BPE-21306	Bioreactor Design	6	M1-5	85	12	-	-	-
ENP-31306	Sustainable Technology Development	6	M1-3	-	12	21	12	8
FCH-21806	Food Related Allergies and Intolerances	6	M1-2	21	33	-	16	4
FCH-30306	Food Ingredient Functionality	6	M1-1	54	24	-	12	-
FCH-30806	Advanced Food Chemistry	6	M1-4	54	24	-	9	5
FCH-31306	Enzymology for Food and Biorefinery	6	M1-5	54	24	-	12	-
FHM-21806	Food Fermentation	6	M1-1	80	24	-	-	-
FHM-22306	Advanced Food Microbiology	6	M1-3	60	30	-	-	-
FHM-30806	Advanced Fermentation Science	6	M1-5	76	15	5	-	-
FPE-30306	Food Structuring	6	M1-1	-	20	14	27	-
FPE-30806	Sustainable Food and Bioprocessing	6	M1-4	43	12	14	-	-
FPE-31306	Transfer Processes	6	M1-2	84	12	-	-	-
FPH-30306	Advanced Food Physics	6	M1-2	40	26	-	-	-
FPH-30806	Molecular Gastronomy	6	M1-1	20	24	15	-	-
FPH-31306	Advanced Molecular Gastronomy	6	M1-3	38	28	-	13	6
HNE-25306	Food Components and Health	6	M1-2	40	-	-	-	-
HNE-30506	Sensory Science I: Principles of Sensory Science	6	M1-1	44	22	-	20	-
HNE-30606	Sensory Science II: Instrumental Sensory Science	6	M1-3	56	24	-	16	-
MAT-14303	Basic Statistics	3	M1-1	12	-	-	26	-
MAT-20306	Advanced Statistics	6	M1-2	24	-	-	36	-
MCB-30806	Sensory Perception and Consumer Preference	6	M1-5	-	26	20	-	-
MST-21306	Advanced Management and Marketing	6	M1-3	-	30	5	12	-
MST-23406	New Venture Creation: from Idea to Business Plan	6	M1-5	15	16	-	15	8
MST-24806	Supply Chain Management	6	M1-4	-	30	6	-	-
MST-30306	Technology, Innovation and Strategy	6	M1-5	18	14	-	2	-
MST-32306	Strategic Change Management and Innovation	6	M1-5	-	12	27	12	-
ORC-30306	Applied Biocatalysis	6	M1-1	20	22	8	-	-
ORL-30306	Decision Science 2	6	M1-5	20	-	-	40	-

Course code	Course name	Credits	Year-period	Practicals	Lectures	Group work	Tutorials	Other
ORL-31306	Advanced Supply Chain Management	6	M1-5	28	24	-	12	-
PDQ-31306	Predicting Food Quality	6	M1-5	36	12	-	24	-
PDQ-31806	Product Properties and Consumer Wishes	6	M1-2	-	12	32	-	-
PDQ-32306	Dairy Science and Technology	6	M1-3	30	24	13	-	4
PDQ-33306	Dairy Chemistry and Physics	6	M1-1	30	24	13	-	4
PDQ-35806	Advanced Food Quality Management 1	6	M1-4	51	-	21	-	-
PDQ-60312	Product and Process Design	12	M1-6	-	16	70	-	-
RSO-21806	Origin Food: a Market for Identity	6	M1-5	-	12	2	-	17
RSO-22306	Food Culture and Customs	6	M1-4	-	30	-	13	6
SCO-20306	Modelling Dynamic Systems	6	M1-2	80	16	-	-	-
XCU-30307	Sensory Science III: Advanced Sensory Methods and Sensometrics	7.5	M1-4+5	20	40	-	36	15
XCU-30407	Sensory Science IV: Food Choice and Acceptance	7.5	M1-4+5	10	40	40	25	10
XCU-60315	Integrated Sensory and Flavour Research	15	M1-5+6	40	30	u	15	20
XEN-30304	Food and Bioprocess Control	4	M1-5	-	20	20	20	-
XEN-30803	Modelling of Food Processes	3	M1-5	-	20	-	20	-
XEN-31303	Solid Food Processing	3	M1-5	-	25	-	-	-
XEN-31802	Hygienic Design	2	M1-5	-	7	8	8	-
XLU-60312	Integrated Food Project	12	M1-6	-	-	u	-	-
XUC-30303	Sensory Analysis, Flavour and Colour	3	M1-3	9	24	-	-	-
XUC-30803	Consumer Behaviour in Food Markets	3	M1-3	-	12	-	12	-
XUC-31303	Advanced Food Business Management	3	M1-3	-	24	-	6	-
XUC-31803	Food Retail Marketing and Supply Chain Management	3	M1-3	-	24	-	6	-
YFS-30303	European Masters Special Topics	3	M1-6	-	U	u	u	-
YFS-60303	Team Project European Masters	3	M1-1+2+3+4+5+6	-	-	u	-	-
YMC-61303	Scientific Skills Training	3	M1-1	u	-	-	-	-

u = teaching method is used, but amount of hours is unknown.

4C. Overview of the master curriculum in Food Safety

Course code	Course name	Credits	Year-period	Lectures	Tutorials	Practicals	Other
FHM-20306	Food Microbiology*	6	1-1	28		60	
FCH-21806	Food Related Allergies and Intolerances	6	1-2	33	16	21	4
LAW-30806	Food Law	6	1-2	24	10		20
FHM-22306	Advanced Food Microbiology	6	1-3	30		60	
TOX-30306	Food Toxicology	6	1-4	24	20	44	
BEC-21306	Food Safety Economics	6	1-5	26		26	11
FHM-30306	Risk Assessment of Foods	6	1-5	24	4	20	15
FHM-61312	Food Safety Management	12	1-6	48			46
	Thesis	36	2				
	Internship	24	2				

Course code	Course name	Assessment method
FHM-20306	Food Microbiology*	75% exam, 25% practical course
FCH-21806	Food Related Allergies and Intolerances	80% written exam, 20% practical course and case study
LAW-30806	Food Law	Written exam, open or closed questions
FHM-22306	Advanced Food Microbiology	70% written exam, 30 % practical work, written reports on laboratory work, and an oral presentation
TOX-30306	Food Toxicology	Written examination and case study report
BEC-21306	Food Safety Economics	Written exam
FHM-30306	Risk Assessment of Foods	70% written exam, 30 % Written and oral presentations of the case study
FHM-61312	Food Safety Management	Crisis protocol(10%); Distance learning(10%); Case study (35%), Written exam (45%)

*More details per course can be found in the study handbook.

4D. Overview of the master curriculum in Food Quality Management

Course code	Course name	Credits	Year-period
PDQ-20306	Food Quality Management	6	1-1
PDQ-22306	Food Quality Analysis and Judgement	6	1-2
LAW-30806	Food Law	6	1-2
PDQ-35806	Advanced Food Quality Management 1	6	1-4
PDQ-35906	Advanced Food Quality Management 2	6	1-5
	Internship	24	2
	Thesis	36	2

Appendix 5: Quantitative data regarding the programmes

Data on intake, transfers and graduation

Bachelor programme in Levensmiddelentechnologie

Success rates

Cohort	2003	2004	2005	2006	2007	2008	2009	2010
Size at the outset	22	21	26	41	46	57	57	66
Size of re-enrolment T+1	*18*	*18*	*18*	*33*	*40*	*50*	*47*	
Diploma after 3 years (%)	33	28	33	27	33			
Diploma after 4 years (%)	44	61	50	70				
Diploma after 5 years (%)	61	83	67					
Diploma after 6 years (%)	67	89						
Diploma after 7 years (%)	78							
Diploma after 8 years (%)	17	6	11	6	13	6		

Master programme in Food Technology

Success rates

Cohort	2003	2004	2005	2006	2007	2008	2009	2010
Size at the outset	36	41	52	68	74	68	74	113
Diploma after 2 years (%)	86	73	69	84	78	78		
Diploma after 3 years (%)	94	88	92	94	97			
Diploma after 4 years (%)	97	88	96	96				
Diploma after 5 years (%)	97	93	96					
Drop-outs (%)	3	5	4	4	0	3	5	

Master programme in Food Safety

Success rates

Cohort	2003	2004	2005	2006	2007	2008	2009	2010
Size at the outset	14	14	21	24	29	38	36	39
Diploma after 2 years (%)	71	50	48	88	79	58		
Diploma after 3 years (%)	100	100	76	92	97			
Diploma after 4 years (%)	100	100	81	96				
Drop-outs (%)	0	0	14	4	3	13	0	

Master programme in Food Quality Management

Success rates

Cohort	2003	2004	2005	2006	2007	2008	2009	2010
Size at the outset	12	42	19	29	20	11	27	24
Diploma after 2 years (%)	83	83	63	59	55	82		
Diploma after 3 years (%)	83	88	79	72	75			
Diploma after 4 years (%)	83	93	84	76				
Diploma after 5 years (%)	83	93	84					
Diploma after 6 years (%)	92	95						
Drop-outs (%)	0	5	16	17	5	9	7	

Teacher-student ratio achieved

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

For the bachelor programme in Levensmiddelentechnologie the student/staff ratio is 6.05.
For the master programme in Food Technology the student/staff ratio is 6.83.
For the master programme in Food Safety the student/staff ratio is 7.05.
For the master programme in Food Quality Management the student/staff ratio is 7.5.

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

Number of programmed contact hours (on a total of 1680 hours/year)

Contact hours	Bachelor programme in Levensmiddelen-technologie	Master programme in Food Technology	Master programme in Food Safety	Master programme in Food Quality Management
Year 1	770	643	710	678
Year 2	833	50	50	65
Year 3	597	NA	NA	NA

Appendix 6: Programme of the site visit

Programme for site visit in Food Technology – 3 and 4 July 2012

3 July 2012

11.45 – 12.45	**Management BLT/MFT (responsible for content of the programme)** Dr.ir. A.E.M. (Anja) Janssen (Assistant Professor Food Process Engineering, Chair Programme Committee, Study Adviser Dr.ir. (Ralf) Hartemink (Programme Director) Prof.dr.ir. M.C.A.J. (Tiny) van Boekel (Chair Holder Product Design and Quality Management)
12.45 – 13.30	**Lunch**
13.30 – 14.30	**Students BLT/MFT** Y.I.L (Yorán) Meijers (BSc 1st year) S. (Saskia) Feijen (BSc 2nd year) B.M.J. (Bianca) Martens (BSc 3rd year) J.M. (Jente) Andriessen (BSc 3rd year) R. (Robin) Houwen (MSc 1st year) M. (Annelise) Tripp (MSc 1st year) S.H. (Sally) Millican (MSc 1st year)
14.30 – 15.30	**Lecturers BLT/MFT** Prof.dr.ir. H. (Harry) Gruppen (Chair Holder Food Chemistry) Dr.ir. C.G.P.H. (Karin) Schroën (Associate Professor Food Process Engineering) Dr.ir. A.R. (Anita) Linnemann (Assistant Professor Product Design and Quality Management) Dr.ir. M.W. (Heidy) den Besten (Assistant Professor Food Physics) Ir. H.J.F. (Hein) van Valenberg (Lecturer Dairy) Dr. E. (Elke) Scholten (Assistant Professor Food Physics)
15.30 – 15.45	**Break**
15.45 – 16.45	**Management MFQ/MFS (responsible for content of the programme)** Prof.dr.ir. J.G.A.J (Jack) van der Vorst (Chair Holder Operations Research and Logistics, Chair Programme Committee) Dr.ir. R. (Ralf) Hartemink (Programme Director) Prof.dr.ir. M.H. (Marcel)Zwietering (Chair Holder Food Microbiology) D.ir. P.A. (Pieternel) Luning (Associate Professor Product Design and Quality Management)
16.45 – 17.00	**Break**
17.00 – 17.45	**Students MFS** V. (Verena) Klaus (MSc 1st year) T. (Tomoko) Matsuta (MSc 1st year L.C. (Laura) van de Wardt (MSc 1st year) I. (Ignacio) Miro Estruch (MSc 2nd year) V. (Violetta) Foka (MSc 2nd year)
17.45 – 18.30	**Lecturers MFS** Prof.dr.ir. M.H. (Marcel) Zwietering (Chair Holder Food Microbiology Dr.ir. A. (Ans) Punt (Assistant Professor Toxicology) Dr.ir. A.G.J. (Annet) Velthuis (Assistant Professor Business Economics) Prof.dr.mr. B.M.J. (Bernd) van der Meulen (Chair Holder Law and Governance) Dr.ir. M.W. (Martine) Reij (Lecturer and Researcher Food Microbiology)

4 July 2012

9.00 – 9.45	**Students MFQ** O.M.A.A. (Olfi) Verhagen (MSc 1st year) S.P. (Shingai) Nyarugwe (MSc 1st year) N.B.N.A. (Nina Bernice) Nkrumah (MSc 1st year) J.A. (Annie) Alting (MSc 1st year) D. (Dimitrios) Tasioudis (MSc 2nd year)
9.45 – 10.30	**Lecturers MFQ** Dr.ir. P.A. (Pieternel) Luning (Associate Professor Product Design and Quality Management, Committee Member) Dr. J.L.F. (Goeffrey) Hagelaar (Assistant Professor Management Studies) Dr.ir. C.M.M. (Catriona) Lakemond (Assistant Professor Product Design and Quality) Dr.mr. H.J. (Harry) Bremmers (Associate Professor Social Sciences) H. (Hasmik) Hayrapetyan MSc (PhD Student Food Microbiology) K.K. (Klementina) Kirezieva MSc (PhD Student Product Design Development)
10.30 – 10.45	**Break**
10.45 – 11.15	**Programme Committee MFQ/MFS** Prof. dr. T. (Tjakko) Abee (Professor Food Microbilogy, Committee Member) Dr. J.L.F. (Goeffrey) Hagelaar (Assistant Professor Management Studies) D.A. (Dominique) Sinopoli (1st year MFS, Committee Member) R. (Rozita) Spirovska (2nd year MFS, Committee Member) M (Melody) Hove (2nd year MFS, Committee Member) T.I. (Thassia) Grillo Dezan Santos Soares (1st year MFS, Committee Member) J.L. (Jennifer) Banach (1st year MFS, Committee Member)
11.15 – 11.45	**Programme Committee BLT/MFT** Dr.ir. J.P.H. (Jozef) Linssen (Senior lecturer Product Design and Quality Management Group, Study adviser, Committee Member) Dr.ir. L.M.C. (Leonard) Sagis (Associate Professor Food Physics, Committee Member) M.P.J. (Martin) Schreiber (1st year BSc, Committee Member) L. (Lore) Hoogenboom (3rd year BSc, Committee Member) I.M. (Ilse-Marte) de Leeuw (1st year MSc, Committee Member) J. (Jovian) Bunawan (1st year MSc, Committee Member) D.G. (Gill) Pels (2nd year BSc, Committee Member)
12.30 – 13.00	**Lunch**
13.00 – 14.00	**Final meeting with Management (final responsibility for programme)** BLT/MFT Dr.ir. A.E.M. (Anja) Janssen (Assistant Professor Food Process Engineering, Chair Programme Committee, Study Adviser Dr.ir. (Ralf) Hartemink (Programme Director) Prof.dr.ir. M.C.A.J. (Tiny) van Boekel (Chair Holder Product Design and Quality Management) MFQ/MFS Prof.dr.ir. J.G.A.J (Jack) van der Vorst (Chair Holder Operations Research and Logistics, Chair Programme Committee) Dr.ir. R. (Ralf) Hartemink (Programme Director) Prof.dr.ir. M.H. (Marcel)Zwietering (Chair Holder Food Microbiology)

D.ir. P.A. (Pieternel) Luning (Associate Professor Product Design and Quality Management)

15.00 – 15.15 **Presentation of the preliminary finfings by committee chair**

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

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

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

Appendix 7: Theses and documents studied by the committee

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

Bachelor programme in Levensmiddelentechnologie	*Master programme in Food Technology*
840424036010	831201078110
850505077110	850327145070
900112253040	821014202060
900329369030	830527265100
880223578130	870716413060
820112664020	860904505110
900731803010	850418546120
900104831080	810513650050
880920930110	850506811050
89065826483	841008935130
	821128980100

Master programme in Food Safety	*Master programme in Food Quality Management*
810430020010	870101515010
840603157030	870816987040
830330250100	840317166130
830122329010	840527611040
750608540110	810703539100
800608599050	820901824080
851231676100	850729173060
841020759020	750808436040
830709825010	840123201060
861006936010	
851113990090	

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

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

Appendix 8: Declarations of independence

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: FRANS ZWARTS

HOME ADDRESS: PETRUS CAMPERSINGEL 253
9713 AP GRONINGEN

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

LIFE SCIENCES, SEE ATTACHMENT

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

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

1

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nederlands - vlaamse accreditatieorganisatie

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

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

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

PLACE: Nageningen DATE: March 30, 2012

SIGNATURE:

2

Bijlage bij onafhankelijkheidsverklaring

Visitatiebezoek	Opleiding (CROHO-nummer):	Variant:
A. Food Technology	B Levensmiddelentechnologie (BLT; 56973)	Voltijd
	M Food Safety (MFS; 60112)	Voltijd
	M Food Technology (MLT; 66973)	Voltijd
	M Food Quality Management (MQ; 60109)	Voltijd
B. Biotechnology en Bio-Informatics	B Biotechnologie (BBT; 56841)	Voltijd
	M Biotechnology (MBT; 66841)	Voltijd
	M Bioinformatics (MBF; 60106)	Voltijd
C. Agricultural and Bioresource Engineering	B Agrotechnologie (BAT; 56831)	Voltijd
	M Agricultural and Bioresource Engineering (MAB; 66831)	Voltijd
D. Forest and Nature conservation	B Bos- en Natuurbeheer (BBN; 56219)	Voltijd
	M Forest and Nature Conservation (MFN; 66219)	Voltijd
E. International Land and Water Management	B Internationaal Land- en Waterbeheer (BIL; 50100)	Voltijd
	M International Land and Water Management (MIL; 60104)	Voltijd
F. Landscape, Architecture and Planning	B Landschapsarchitectuur en ruim. Planning (BLP; 56848)	Voltijd
	M Landscape, Architecture and Planning (MLP; 66848)	Voltijd
G. Leisure, Tourism and Environment	M Leisure, Tourism and Environment (MLE; 60111)	Voltijd
H. Geo-Information Science	M Geo-Information Science (MGI; 60108)	Voltijd
I. Plant Sciences	B Planterwetenschappen (BPW; 56835)	Voltijd
	M Plant Sciences (MPS; 66835)	Voltijd
	M Organic Agriculture (MOA; 69300)	Voltijd
	M Plant Biotechnology (MPB; 60105)	Voltijd
J. Animal Sciences	B Dierwetenschappen (BDW; 56849)	Voltijd
	M Animal Sciences (MAS; 66849)	Voltijd
K. Climate Studies	M Climate Studies (MCL; 60107)	Voltijd
L. International Development Studies	B Internationale Ontwikkelingsstudies (BIN; 56837)	Voltijd
	M International Development Studies (MID; 66837)	Voltijd
	M Development and Rural Innovation (MDR; 60103)	Voltijd
M. Management, Economics and Consumer Studies	B Bedrijfs- en Consumentenwetenschappen (BBC; 56836)	Voltijd
	M Management, Economics and Consumer Studies (MME; 66836)	Voltijd
N. Nutrition and Health	B Voeding en Gezondheid (BVG; 56868)	Voltijd
	M Nutrition and Health (MNH; 66868)	Voltijd

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: RENATE PRENEN

HOME ADDRESS: Simon Stevinweg 21
1401 TB Bussum

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

LIFE SCIENCES - SEE ATTACHMENT

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

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

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

PLACE: Wageningen DATE: 29-03-'12

SIGNATURE:

Bijlage bij onafhankelijkheidsverklaring

Visitatiebezoek	Opleiding (CROHO-nummer):	Variant:
A. Food Technology	B Levensmiddelentechnologie (BLT; 56973)	Voltijd
	M Food Safety (MFS; 60112)	Voltijd
	M Food Technology (MLT; 66973)	Voltijd
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	M International Land and Water Management (MIL; 60104)	Voltijd
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	M Animal Sciences (MAS; 66849)	Voltijd
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	M Management, Economics and Consumer Studies (MME; 66836)	Voltijd
N. Nutrition and Health	B Voeding en Gezondheid (BVG; 56868)	Voltijd
	M Nutrition and Health (MNH; 66868)	Voltijd

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Paul Singh

HOME ADDRESS: 2317 LASSEN PL
DAVIS, CA 95616

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

Life Sciences - Food cluster
4 programmes

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Wageningen University

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

1

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

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

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

PLACE: Wageningen DATE: 3/7/2011

SIGNATURE: P Paul Singh

2

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: KRISTBERG KRISTBERGSSON

HOME ADDRESS: KLAPPARBERG 12
REYKJAVIK
IS-101, ISLAND

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

BSc Food Technology, MSc Food Technology
MSc Food Safety, MSc Food Quality Management

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

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

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

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

PLACE: Reykjavik DATE: Sept 21, 2011

SIGNATURE: Kristberg Kristbergsson

2

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Mansel W. Griffiths

HOME ADDRESS:

128 Parkedge Street, Rockwood, ON, Canada, N0B 2K0

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

BSc Food Technology; MSc Food Technology; MSc Food Safety; MSc Food Quality Management

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Wageningen University

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

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

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

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

PLACE: Guelph, ON, Canada DATE: 9th September, 2011

SIGNATURE:

2

DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: GERHARD SCHLEINING

HOME ADDRESS: FLORIANIGASSE 6/14
A-1080 WIEN

HAS BEEN ASKED TO ASSESS THE FOLLOWING PROGRAMME AS AN EXPERT / SECRETARY: BSc Food Technology, MSc Food Technology, MSc Food Safety, MSc Food Quality Management

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

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

1

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

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

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

PLACE: Vienna DATE: 15.9.2011

SIGNATURE: Schleining Gerhard

2

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: Julia Ågren

HOME ADDRESS: Stiftsvägen 8:1102
22657 Lund
Sweden

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

Food Technology at Wageningen University

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

Food Technology at Lunds University

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

1

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

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

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

PLACE: Lund, Sweden DATE: 2011-11-21

SIGNATURE:

2

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DECLARATION OF INDEPENDENCE AND CONFIDENTIALITY

TO BE SUBMITTED PRIOR TO THE ASSESSMENT OF THE PROGRAMME

THE UNDERSIGNED

NAME: MARLOES MAARLEVELD

HOME ADDRESS: BMC
Smalle pad 34
3811 MG AMERSFOORT

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

SEE ATTACHMENT

APPLICATION SUBMITTED BY THE FOLLOWING INSTITUTION:

WAGENINGEN UNIVERSITY

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

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nvao

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

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

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

PLACE: WAGENINGEN DATE: 29-03-2012

SIGNATURE:

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Bijlage bij onafhankelijkheidsverklaring

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

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

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

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

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

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

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

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

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

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

User instructions

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

Remarks

- This rubric has been validated by a number of supervisors by comparing the original grade of a number of theses to the grade resulting from this rubric.

- The main intention of using a rubric is enhance homogeneity of assessments and the ability to communicate about assessments both with students and with colleagues. Furthermore, it clarifies to students the expectations of the supervisor and helps the supervisor to structure feedback during the process of thesis research. Although the intention is to homogenize the process of assessment, it should be noted that even with the use of a rubric some arbitrariness will remain.

- The two main categories on the thesis evaluation form (research competence and thesis report) should have an assessment of 'sufficient' (i.e. ≥ 5.5) before the total thesis work can be considered as sufficient. So, no compensation between these main categories is possible to obtain the lowest final mark of 6.0.
- Please report any positive or negative experiences with and suggestions for the rubric to arnold.moene@wur.nl.

- Author of the rubric: Arnold F. Moene (Meteorology and Air Quality Group, Wageningen University), with valuable contributions from Ellis Hofland, Edwin Peeters, Tamar Nieuwenhuizen, Maarten Holtslag, George Bier, Gerard Ros, Lijbert Brussaard, Judith Gulikers and Paul Berentsen.

References

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

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

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

URL2: http://en.wikipedia.org/wiki/Rubric_(academic) (last visited November 17, 2009).