LIFE SCIENCES AND

NATURAL RESOURCES

ANIMAL SCIENCES

WAGENINGEN UNIVERSITY

CONTENTS

This report was finalized on 20 February 2019.

REPORT ON THE BACHELOR'S PROGRAMME ANIMAL SCIENCES AND THE MASTER'S PROGRAMME ANIMAL SCIENCES OF WAGENINGEN UNIVERSITY

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

ADMINISTRATIVE DATA REGARDING THE PROGRAMMES

Bachelor's programme Animal Sciences

Name of the programme:	B Animal Sciences
CROHO number:	56849
Level of the programme:	bachelor
Orientation of the programme:	academic
Number of credits:	180 EC
Specializations or tracks:	Animal Management and Care
	Biological Functioning of Animals
Location:	Wageningen
Mode(s) of study:	fulltime
Language of instruction:	English
Expiration of accreditation:	31-12-2019

Master's programme Animal Sciences

Name of the programme:	M Animal Sciences
CROHO number:	66849
Level of the programme:	master
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	Genetics and Biodiversity
	Nutrition and Metabolism
	Global and Sustainable Production
	Adaptation, Health and Welfare
	Molecule, Cell and Organ Functioning
	Animal Ecology
Location:	Wageningen
Mode(s) of study:	fulltime
Language of instruction:	English
Expiration of accreditation:	31-12-2019

The visit of the assessment panel Animal Sciences to the Department of Animal Sciences of Wageningen University took place on 19 and 20 November 2018.

ADMINISTRATIVE DATA REGARDING THE INSTITUTION

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

COMPOSITION OF THE ASSESSMENT PANEL

The NVAO approved the composition of the panel on March 7th 2018. The panel that assessed the Bachelor's programme Dierwetenschappen and the Master's programme Animal Sciences consisted of:

- Prof. dr. S. (Stanley) Brul, Professor Molecular Biology and Microbial Food Safety at the University of Amsterdam (UvA) and chair of the Dutch institute for Biology (NIBI) (Chair);
- Dr. A.A.J. (Annik) Van Keer, educational advisor at the Faculty of Science at Utrecht University;
- Prof. dr. H.L. (Henry) Classen, Distinguished Professor Emeritus in Animal and Poultry Science at the University of Saskatchewan (Canada). Prof. Classen was previously Natural Sciences and Engineering Research Council of Canada Senior Industrial Research Chair in Poultry Nutrition;
- Dr. J.C.M. (Jack) Dekkers, Distinguished Professor in Animal Breeding and Genetics and Leader of the Animal Breeding and Genetics Section of the Department of Animal Science at Iowa State University (United States of America);
- M. (Marit) de Kort BSc, graduated in 2017 in Biomedical Sciences at Utrecht University. She is currently following the master's programme Cancer, Stem Cells en Developmental Biology at Utrecht University (student member).

The panel was supported by Dr. F. (Floor) Meijer, who acted as secretary.

WORKING METHOD OF THE ASSESSMENT PANEL

Preparation
In preparation of the site visit, the panel studied several documents, amongst others: the NVAO assessment framework (2016), the institutional audit of WU and the previous programme assessments (of 2012). The accreditation system has entered its third phase (concurrently with a second round of institutional audits). Wageningen University and Research has recently successfully passed its second institutional audit. The new NVAO assessment framework is 'geared to a quality assurance system that is based on trust in the existing, high quality of Dutch higher education'.

The most recent assessment of the programmes took place in 2012. In this assessment, the bachelor's programme was assessed as 'satisfactory', with partial scores of 'good' for standard 1 and 2 and 'satisfactory' for standard 3. The master's programme received the overall assessment 'good', with partial scores of 'excellent' for standard 1 and 'good' for standard 2 and 3. The panel was particularly impressed with the well thought out profile of the programmes, their close relation with the professional field, the highly flexible curricula and overall rich teaching-learning environment. The panel assessed the assessment strategies and examination methods as appropriate, but concluded that the role of the examining board could be strengthened. Another positive aspect was the high quality of the theses, particularly of the master's theses.

With the new philosophy of the framework and the last assessment of these specific programmes in mind, the panel does not want to elaborate too long on the different criteria of the four standards of the limited framework. The overall evaluation of the programmes by this panel is, as it was in 2012, positive. In this report, therefore, the panel will concentrate specifically on developments since 2012 and on providing suggestions that might help to make the programmes even better than they already are.

QANU received the self-evaluation report of the Animal Sciences programmes on 16 October 2018 and made it available to the panel. The panel members read the self-evaluation and prepared questions, comments and remarks prior to the site visit. The secretary collected these questions in a document and arranged them according to panel conversation and subject.

In addition, panel members read recent theses from each programme. In consultation with the chair, fifteen theses per programme were selected from the academic years 2015-2016 and 2016-2017, covering the full range of marks given and all specialisations. The panel members also received the grades and the assessment forms filled out by the examiners and supervisors. An overview of all documents and theses reviewed by the panel is included in Appendix 5.

The programme management drafted a programme for the site visit. This was discussed with the secretary and chair of the panel. As requested by QANU, the programme management carefully selected discussion partners. A schedule of the programme for the site visit is included in Appendix 4.

Site visit
The site visit took place on 19 and 20 November 2018 at Wageningen University (WU). In a preparatory meeting on the first day of the site visit, the panel members discussed their findings based on the self-evaluation and on the theses and formulated the questions and issues to be raised in the interviews with representatives of the programme and other stakeholders. During the site visit, the panel studied a selection of documents provided by the programme management. They included course descriptions, course materials, written exams, assignments and other assessments.

The panel interviewed the programme management, students, alumni, staff members, members of the Programme Committee and members of the Examining Board.

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

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

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

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

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

Good
The programme systematically surpasses the generic quality standard.

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

SUMMARY JUDGEMENT

Intended learning outcomes

The bachelor's and master's programmes in Animal Sciences deal with domesticated and captive animals that are subject to human interventions. Students are equipped with knowledge of fundamental and applied biological concepts, and enabled to explore sustainable development solutions for complex, society-driven problems related to animal husbandry systems worldwide. The focus lies mainly on livestock and aquatic organisms, with an increasing interest for companion animals, zoo-animals and wildlife in game reserves. The panel is very impressed by the broad multidisciplinary profile, which is clearly distinct from other programmes that deal with captive and domestic animals. Especially the recently internationalised bachelor's programme occupies a unique niche. The ILOs of both programmes match their profile and objectives and demonstrate a suitable level and orientation. An opportunity for further improvement is to specifically address ethical issues in the bachelor's ILOs and to include research integrity as a topic in the bachelor's and master's ILOs that deal with academic and research skills. A particular strength of the programmes is that the needs of the professional field, most notably those of the animal production industry, feed directly into the ILOs and curricula. The panel is impressed with the close involvement of the External Advisory Committee.

Teaching-learning environment

The panel concludes that the curriculum, teaching-learning environment and staff of the Animal Sciences programmes enable students to realise the intended learning outcomes. Both curricula are well-designed and sufficiently coherent, while at the same time offering students quite a lot of freedom in designing their individual study path. The content of the curricula is a good reflection of the current state of affairs in the disciplines in the domain of Animal Sciences. Innovations in the domain are quickly picked up on and the perspective of the programmes is clearly international. The level of the courses is academic. The research of the Chair Groups feeds into the curricula and academic skills are given sufficient attention. The panel further established that the curricula as a whole cover all of the ILOs, while course specific learning goals are suitable and match the teaching methods used.

Possible improvements for the bachelor's programme include adopting a more proactive role in giving students early exposure to the practical aspects of animal husbandry. The panel would also recommend that - where possible - the programme creates opportunities for bachelor's students to do experimental work as part of their thesis, which is currently not always the case. A recommendation for the master's programme is to pay more attention to labour market orientation and possibly also to a broader range of statistical methods and big data in general. A mutual point of improvement for both programmes is that ethical aspects could be more consistently and explicitly addressed, for example by developing a learning line on roles of animals in society.

A strong feature of the master's programme is that there are many international (including double degree) options available to students. While the panel was pleased to find that the student population of both programmes is increasingly international, it does stress the importance of setting a goal for the number of international students that the programmes hope to attract in order to be able to plan and prepare for further growth.

The teaching-learning environment of the programmes is characterised by an open and pleasant atmosphere. There is an adequate number of contact hours and teaching methods are relatively small-scale, but not always as interactive as students would like. The panel encourages the programmes to further explore the use of innovative digital teaching methods, which stimulate more meaningful interaction in class, and to also make use of group work, which allows students to learn with and from one another. The panel recognises that the downsides of growth are a WU-wide concern but hopes that the current level of small-scale education can be maintained. Both programmes have a varied system of student guidance, in which study advisers play an important

role. The excellent CARUS facility is a major strength, but the panel regrets that students are not (always) able to make the most of this because of strict regulations.

The teaching staff of the programmes are motivated and qualified. Lecturers are experts in their fields and many have international experience. The increasing workload of staff members requires monitoring. The panel strongly recommends that staff numbers reflect the growing student numbers in order to maintain quality of the programmes.

Assessment

Both programmes have developed a solid system of assessment, which is based on the WU-wide assessment policy. Sufficient attention is paid to the validity, reliability and transparency of examinations. A strong aspect is the use of external peer review to validate the quality of courses, including assessment. Internal peer review in the design phase of examinations is, however, also important and should be consistently applied. The design of sample tests studied by the panel is adequate: the examinations sufficiently match the course specific learning goals and teaching methods. The level and content of the examinations is appropriate.

The procedures for assessing the final product of the programmes, the thesis, are clear and the assessment itself is sound. To further increase the transparency and comparability of thesis assessment across Chair Groups, the panel recommends streamlining the use of rubrics and of Go/No Go decisions and introducing separate assessment forms for each assessor. Furthermore, the panel advocates the university-wide implementation of a digital assessment system in which the subsequent steps in the thesis process are fully automated.

Finally, the panel established that the Examining Board safeguards the overall level of assessment in the programmes to the best of its abilities. Increasing the capacity of the EB, as is the intention of the Executive Board, could help to strengthen its agency in relation to the rather autonomous Chair Groups. Nonetheless, the panel feels that the central university should also critically reconsider whether the design of the current quality assurance system optimally suits its purposes.

Achieved learning outcomes

Both the sample theses that were studied by the panel and the position of graduates indicate that students achieve the intended learning outcomes of the programmes. The general level of the final projects is good: the work is of appropriate academic quality and fully reflects the broad domain of the Animal Sciences. Graduates of the bachelor's programme are successful in associated master's programmes, while graduates of the master's programme quickly find employment in relevant positions at companies, non-profit organisations and research institutes/universities. Alumni generally feel that the programme has provided them with a solid foundation from which they can benefit in their respective careers.

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

Bachelor's programme Animal Sciences

Standard 1: Intended learning outcomes	Excellent
Standard 2: Teaching-learning environment	Good
Standard 3: Student assessment	Satisfactory
Standard 4: Achieved learning outcomes	Good
General conclusion	Good

Master's programme Animal Sciences

Standard 1: Intended learning outcomes   Excellent
Standard 2: Teaching-learning environment   Good
Standard 3: Student assessment   Satisfactory
Standard 4: Achieved learning outcomes   Good

General conclusion   Good

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

Date: 20 February 2019

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

Governance structure of Wageningen University (WU)

In contrast to many other Dutch Universities, WU has just one faculty: the Faculty of Agricultural and Environmental Sciences. Therefore the governance structure of WU differs from most other universities. The Rector Magnificus of the University is also the Dean of the Faculty. The Dean of the Faculty appoints the Programme Board, which consists of four professors and four students. The Programme Board is the legal governing body of the university's 18 bachelor's and 28 master's programmes. It is responsible for the design, content, quality and financing of the programmes. Each programme has its own Programme Committee, which consists of an equal number of students and staff members who are appointed by the Programme Board. Programme Committees advise the Programme Board on the design and content of their degree programmes. The Programme Board does not employ the lecturers; these are employed by the 94 Chair Groups, which generally include a Chair Holder (full professor), academic and support staff, postdocs and PhD students. The Programme Board, the Programme Committees and the Chair Groups together form the WU education matrix organization.

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

Standard 1: Intended learning outcomes
The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings

Profile
The bachelor's and master's programmes in Animal Sciences deal with domesticated and captive animals that are subject to human interventions in terms of nutrition, breeding, housing and disease treatment. Students are equipped with knowledge of fundamental and applied biological concepts, and enabled to explore sustainable development solutions for complex, society-driven problems related to animal husbandry systems worldwide. The focus lies mainly on livestock (dairy animals, pigs, poultry) and aquatic organisms, with an increasing interest for companion animals, zoo-animals and wildlife in game reserves.

Whereas the BSc gives students a broad overview of the whole domain of Animal Sciences, the MSc offers students the opportunity to specialise in one (or two) subdomains or disciplines. The six MSc specialisations are: (1) Genetics and Biodiversity, (2) Nutrition and Metabolism, (3) Global and Sustainable Production, (4) Adaptation, Health and Welfare, (5) Molecule, Cell and Organ Functioning and (6) Animal Ecology. Both the bachelor's and the master's programme have an international orientation. As of September 2018, the bachelor's programme is fully taught in English, making it part of a select group of five international BSc programmes currently hosted by WU. The master's programme offers students the opportunity to pursue a double degree, by following part of the courses and/or completing their thesis or internship at one of eight European partner universities.

The panel is very pleased with the multidisciplinary and international orientation of both programmes. This profile is clearly distinct from that of related programmes at universities of applied sciences in the Netherlands (e.g. Animal Husbandry and Animal Care at HAS Hogeschool), as well as from academic programmes in veterinary sciences (e.g. at Utrecht University). Especially at the bachelor's level, the broad, international focus on (healthy) domesticated and captive animals is unique, not just in the Netherlands but within Europe. From interviews with students and graduates, the panel concluded that students appreciate the broad scope of the programmes. Even so, students feel that the role of domesticated animals and wild animals living in captivity is perhaps somewhat overstated in the programmes' PR. While the programmes are indeed gradually moving into these areas, the emphasis is still firmly on livestock. The programmes may wish to better manage expectations of prospective students.

Intended learning outcomes
The profile and objectives of the bachelor's and master's programmes have been translated into two sets of ten intended learning outcomes (ILOs). Overviews of the ILOs can be found in appendix 1. The panel concludes that both sets of ILOs reflect the broad focus and multidisciplinary orientation of the programmes. The ILOs are linked to the Dublin descriptors, which ensures that their level and orientation are suitable. The strong emphasis on scientific research in the ILOs underscores the academic character of the programmes. Some particular aspects could be sharpened. The panel feels that attention for ethical and societal issues with respect to animal husbandry should be explicitly included in the bachelor's ILOs, as is already the case for the master's programme (ILO 4). Similarly, it would be advisable to stress the necessity of developing professional ethics and awareness of responsible research practices ('research integrity') in the ILOs of both programmes.

Link with the professional field
A major strength of the programmes is their strong connection to the animal production industry. This field is closely involved in the programmes, not least by way of the External Advisory Committee (EAC), which consists of nine representatives of the Dutch professional and academic field. Some of the members are themselves graduates of the programmes in Animal Sciences. The EAC provides valuable input on the ILOs of the programmes and the curricula, as is evidenced by a SWOT analysis that was completed in the 2018 annual EAC meeting. An opportunity for further improvement is to further strengthen the programmes' ties to non-livestock animal sectors, such as the pet nutrition industry, as is indeed the intention of the management.

Considerations
The panel is highly pleased with the broad multidisciplinary profile of the bachelor's and master's programmes in Animal Sciences, which is clearly distinct from other programmes that deal with captive and domestic animals. Especially the recently internationalised bachelor's programme occupies a unique niche. The ILOs of both programmes match their profile and objectives and demonstrate a suitable level and orientation. An opportunity for further improvement is to specifically address ethical issues in the bachelor's ILOs and to include research integrity as a topic in the bachelor's and master's ILOs that deal with academic and research skills. A particular strength of the programmes is that the needs of the professional field, most notably those of the animal production industry, feed directly into the ILOs and curricula. The panel is impressed with the close involvement of the External Advisory Committee.

Conclusion
Bachelor's programme Animal Sciences: the panel assesses Standard 1 as 'excellent'.
Master's programme Animal Sciences: the panel assesses Standard 1 as 'excellent'.

Standard 2: Teaching-learning environment
The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings

Curriculum bachelor's programme
Over the review period, the annual intake in the bachelor's programme Animal Sciences fluctuated between 80 and 120 students. Of the 123 students that were admitted in 2018, at the start of the programme, 12 are international. This percentage is expected to increase in coming years, as is the total number of students. Students are admitted based on their secondary school profile (equivalent of Dutch vwo-diploma with profile in Science & Health or Science & Technology). International students need to demonstrate their English proficiency (IELTS 6.0 or higher).

In 2017 the curriculum of the programme was given an update in order to prepare for the inflow of international students, but also to ensure a good fit with the evolving demands of the labour market and to better attune the curriculum to expectations of students. The panel appreciates the proactive attitude of the management in adapting to changing circumstances. The current English-taught curriculum (180 EC, cf. appendix 3) consists of common courses (111 EC), a major (24 EC), a minor (33 EC) and a bachelor's thesis (12 EC). Together these building blocks aim at an all-encompassing approach to the domain of Animal Sciences. Students are trained in problem solving at every aggregation level of the domain (the animal; the caretaker; society; the world), from molecule signaling in the gut to worldwide food security issues. Specific disciplinary themes that are addressed in the courses are (1) Animal Ecology, (2) Genetics and Biodiversity, (3) Molecule, Cell and Organ Functioning, (4) Nutrition and Metabolism, (5) Global & Sustainable Production and (6) Adaptation, Health and Welfare.

The panel established that the programme design is clear and sensible, with sufficient attention for both breadth and depth. In the first year, students follow courses that cover the biological fundamentals and the general methodologies of the natural sciences. Parallel to these basic courses in biology, chemistry, mathematics and statistics, students are introduced to the domain of Animal Sciences in programme-specific courses such as *Introduction to Animal Sciences, Biology of Domestic Animals* and *Animal Science in Society* (21 EC). The second year of the programme is all about disciplinary deepening. Students take courses in relevant disciplines and start one of two recently introduced majors in Animal Management and Care or the Biological Functioning of Animals, which continues into the third year. The main aim of the third year is integration. Students choose a minor consisting of elective courses at WU or abroad with the intention of further broadening their scope and write a thesis which combines the acquired competences of the previous years.

During the site visit the panel studied a number of sample courses from all three years and both majors, notably the first-year basic biology course *Introduction to Cell Biology*, the second-year course *Behavioural Endocrinology* (major Biological Functioning of Animals) an the third-year course *The Role of Livestock in Future Food Systems* (major Animal Management and Care). The panel concludes that the level and content of these courses is appropriate. It was especially pleased with the thorough courses on behavioural ecology and the high level of statistics. Furthermore, the panel wishes to compliment the programme for the fast adaptation to innovation that is clearly demonstrated in the courses. Learning goals for students are appropriate and match the teaching methods used. A curriculum matrix shows that the programme as a whole covers all of the ILOs. Like the panel, students are positive about the content of the curriculum, which scored a 4.0/5 in the National Student Enquiry (NSE) of 2018. They particularly appreciate the flexibility of the programme, which allows students to develop and pursue their own interests.

A point for improvement is that ethical aspects could be more consistently and explicitly addressed within the curriculum, for example by developing a learning line on roles of animals in society. This may prove a suitable way of addressing students' concerns about negative outside perceptions of

the animal production sector and the study programme itself, as well as students' own sentiment that the programme and the research of the Chair Groups contributes to increasing animal productivity, while alternative modes of production receive less attention. A further suggestion made by some of the student's involved in the student chapter is to put more emphasis on the bigger picture, including aspects such as systems of governance, chain value, and policies. This is something that the programme could look into.

The panel notes that the research of the Chair Groups clearly feeds into the curriculum, which covers fundamental biological approaches (so called 'omics') that are central to some of WU's research. Academic skills are given sufficient attention. Instruction and training in research methods, academic writing and presenting are part of the regular courses. A promising development is that the programme is currently developing a full learning trajectory on academic skills, the so-called Skills Academy. By making an inventory of all courses in the curriculum, the programme aims to pinpoint and fill gaps in skills training. Skills training is concluded by the bachelor's thesis, an individual research product which students complete in the first or second semester of the third year. The programme allows different final projects and products, depending on the topic. Students can assist PhD students on a thesis experiment, write a literature review, or work on a dataset or lab analysis. Topics can either be selected from a list or are suggested by the student her/himself. The panel remarks that this varying practice is not acknowledged in the ILOs for the thesis, which suggest that all students need to conduct experimental work (ILO 3) as part of their final project. During the site visit, the management indicated that individual lab work is not possible for all students because of the very limited time span of the thesis (two months, 12 EC). In some of the Chair Groups it is, however, common that groups of (4-5) students are jointly involved in at least one experiment. According to the panel it is indeed preferable that students who opt for a literature review do not miss out on practical work altogether. The panel also noticed that the ILO on reflection (ILO 10) is covered in the curriculum, but not in the thesis. In its opinion it would make sense to include reflection on personal knowledge, skills and attitude in the final project.

Although bachelor's graduates are not expected to directly enter the labour market, the programme is aware of the need to prepare students for practice. The panel agrees that students, especially those that come from non-farming backgrounds (90%), benefit from early exposure to the practical aspects of animal husbandry. To this effect, the programme contains a short internship in the first year, as well as optional summer courses on farming practices, which the panel applauds. Furthermore, it notes that excursions such as farm visits are organised by the highly active study association ('De Veetelers'). In the 2018 NSE, preparation for the labour market scored a 3.3/5, which suggests that further improvements could be made. Rather than just visiting farms and other relevant companies/organisations, the panel recommends to look for higher impact ways of immersing students in the practical aspects of Animal Sciences, preferably by giving them more hands-on experience in handling animals. This could be done in cooperation with the study association, but the programme should be aware that labour market preparation is first and foremost the responsibility of the programme itself. The programme management should ensure that all students, not just members of the study association, are given ample opportunities in gaining practical experience.

With the start of the international programme, internationalisation is a relevant topic for the bachelor's programme. The panel fully agrees with the rationale for abandoning the Dutch-taught programme in favour of an English-taught programme, even if this takes some getting used to from Dutch students. Carefully managing expectations is important in this respect. While the panel supports internationalisation of the programme, both in terms of students and content, it will be important to maintain some focus on the Dutch animal industries and practices. The panel is convinced that the programme has a responsible take on admitting foreign students, which ensures that the quality of the programme is not compromised. It does, however, stress the importance of setting a goal for the number of international students it hopes to attract in order to be able to plan and prepare for further growth. The panel also concludes that the internationalisation of the curriculum content is not yet complete. The adaptation of courses will require further efforts over

the coming years. Positive is that on average almost 25% of students choose to take courses abroad as part of the minor. This percentage is expected to increase further, with the promising new 'Broaden your Horizon' programme that is currently under development. This allows students to study abroad for 2-4 months (max. 24 credits) as part of their free choice in the third year.

Curriculum master's programme
The two-year master's programme Animal Sciences has an average annual intake of 150 students, although the most recent cohort numbered 171 students. On average the intake consists of 50% graduates of Dutch BSc programmes, 25% graduates of Dutch universities of applied sciences and 25% international students, who are admitted based on the match between their pre-existing knowledge and the content of the programme. Furthermore, students need a GPA of 70/100 and a sufficient level of English to qualify for admission. Students with deficiencies are required to complete a 30 EC linkage programme or take a relevant WU minor as part of their BSc programme.

The panel established that the master's curriculum (120 EC) is well designed and sufficiently coherent. It consists of advanced, in-depth courses (12-18 EC), academic and/or professional skills training (6-12 EC), a thesis (36 EC), an academic internship (24 EC) and minor/elective courses (30-42 EC). Courses are primarily scheduled in the first year, while the thesis and internship take up the second year.

The panel appreciates that students are offered a broad choice of six specialisations. Three of these focus on interventions and adaptations at the animal level (Genetics and Biodiversity; Nutrition and Metabolism; Adaptation, Health and Welfare). A fourth specialisation (Molecule, Cell and Organ Functioning) zooms in on fundamental physiological processes and mechanisms, while the fifth (Global and Sustainable Production) adopts a systems approach and the recently added sixth (Animal Ecology) focuses on the interaction between animal populations and their wider environment. Within each specialisation there is a further choice between a number of study tracks, each offered by one of the Chair Groups. These consist of two to three thesis-preparing courses as well as a thesis in the particular field of the Chair Group involved. The panel is of the opinion that the extensive freedom for students to design an individual study path is a particular strength of the programme. Nonetheless, it also presents some challenges in the form of scheduling issues and unbalances in the spread of students across specialisations.

After studying material from a number of sample courses, the panel concluded that the content of these courses is a good reflection of the current state of affairs in the disciplines in the domain of Animal Sciences. The level of the courses is clearly academic. Like in the bachelor's programme, the panel recommends to pay more attention to ethical aspects, potentially by developing a learning line on animals in society. In the student chapter, students indicated that they do not feel optimally equipped to participate in current societal debates on animal husbandry. Other possibilities for improvement mentioned during the student interview were to devote more attention to big data and advanced statistics. International students mentioned that they could do with more instruction on machine learning in general and computer modelling specifically, which is not always part of their prior education. The programme may wish to make students more aware of the options for improving general and specific computer skills that are available WU-wide. All in all, students are positive about the contents of the curriculum, which received a score of 4.1/5 in the 2018 NSE.

The final dedicated piece of work in the programme is the thesis, for which students conduct a scientific research project. The majority of theses is connected to an ongoing PhD project. The thesis consists at least of writing a literature study and research proposal, performing an animal or lab experiment and/or data analysis, writing a scientific report, and presenting the results orally. As part of their final project, students also write a self-reflection paper in which they reflect on their goals for the thesis and how the final project relates to further career planning. The panel notes that the programme provides sufficient opportunities for students to prepare for an academic career, notably by offering a selective research track, in which students follow the course *Research Master Cluster*,

take at least four advanced thesis-preparing courses and replace the internship with a second ('minor') thesis.

The programme also contains a number of elements that could help students prepare for a non-academic career, notably the internship, the *Academic Consultancy Training* course and the option to choose a so-called professional track in either Education, Communication & Policy or Business & Management, as part of the elective space. According to students, however, labour market orientation could be given more attention in the curriculum. In the student chapter, students indicated that they would like to get more experience in the professional field and currently feel that there is a gap between the research-oriented study programme and industry. This sentiment is reflected in the rather low score of 3.2/5 on labour market preparation in the 2018 NSE. The panel believes that the programme's highly engaged EAC may be able to offer advice on how to improve productive interactions between students and stakeholders within the programme. It also notes that the animal facility on campus offers an excellent opportunity to introduce students to animal handling. Although done to some extent in laboratories, planned animal handling inside or outside of classes would increase student confidence and serve as a first step towards industrial experience.

Worth mentioning are the international options that the programme offers. Students can opt to do part of the courses, thesis, or internship abroad, or even pursue a double degree from WU and one of its international partners. Notable examples of international MSc exchange programmes that WU is involved in are the EURAMA MSc European Animal Management, the Erasmus Mundus MSc Sustainable Animal Nutrition and Feeding (SANF) and the new MSc in Animal Breeding and Genetics, both of which are offered by a consortium of European universities. During the site visit, the panel was presented with the consortium agreement for SANF.

Teaching-learning environment
Both programmes offer their students a good teaching-learning environment, which is characterised by an open and pleasant atmosphere. The panel notes that this aspect scored a 4.4 (BSc) / 4.3 (MSc) in the 2018 NSE. Major strengths that were reported by students during the interviews and in the student chapters include the accessibility of staff members and the informal contact between staff and students.

Various teaching methods are in use within the programmes, with a reported preference for relatively small-scale forms of instruction that encourage learning-by-doing such as tutorials and (lab) practicals. Larger-scale lectures account for roughly a third of the contact hours. After speaking to staff and students the panel concludes that both programmes could consider introducing a larger variation of more activating teaching methods that encourage students to prepare for and actively participate in classes. Students indicated that lecturers usually provide opportunities for asking questions, but do not always sufficiently encourage discussion. Available digital facilities, both in class (e.g. interactive Smart Boards) and within the online digital learning environment, are not optimally used. The panel advises the programmes to further explore the use of innovative digital teaching methods, such as knowledge clips, which allow for a 'flipped' classroom and stimulate more meaningful interaction in class. The introduction of LabBuddy, software that helps students to prepare for laboratory classes, is a good step in this direction. Another area in which progress was already made is the development of MOOCs (Massive Open Online Courses), with the online courses *Introduction to Animal Behaviour* and *Animal Breeding and Genetics* as prominent examples. The panel notes that these courses, which are costly to produce, serve multiple purposes. Prospective international students can be referred to the MOOCs as a reference point for the level that they can expect at WU, while clips from the courses can also be used in the regular teaching.

The share of group work is rather limited in both programmes, which is regretted by bachelor's students who would appreciate to more often work on case studies and concrete assignments, particularly in cooperation with other students. The panel agrees that group work has a clear function in the increasingly international classrooms of the programme, as it helps students to develop soft skills and learn from one another. In order to make the most out of group work, the panel

recommends setting clear learning goals with respect to group processes and carefully monitoring and guiding these dynamics.

Both programmes have an adequate number of contact hours. On average bachelor's students have 18-24 contact hours per week, while master's students have 13 contact hours per week. The numbers reflect the fact that students are expected to become more self-reliant and independent over the course of the programmes. Bachelor's and master's students confirmed that the programmes are feasible. Even so, a large part of the student population does not complete the programmes within the appropriate time frame, for example because they wish to extend the (MSc) internship or thesis. Although the success rate of the bachelor's programme seems rather low to the panel, it conforms to the target set by the university. For the master's programme, the management is aware that the time to completion needs further improvement. The panel would recommend to specifically review the internship trajectory. Because of its limited duration it is important that the internship is highly structured to avoid study delays.

Students are generally pleased with the quality of guidance and supervision by staff members, which bachelor's students scored a 4.0/5 and master's students a 3.7/5 in the 2018 NSE. Study advisers play an important role in supporting students in developing their own study paths. The panel concludes that students appreciate the efforts of study advisers. There is a sufficient number of study advisers and they are available when students need help, but do not necessarily proactively approach students. In addition, in the bachelor's programme there is a mentoring system in place, in which second- and third-year students mentor a group of first-year students during their first weeks/months in Wageningen. This is run by the study association *De Veetelers*. New in the bachelor's programme is a buddy system, which links an international first-year student to a Dutch fellow-student in order to promote integration. According to first-year students, the idea behind this system is nice, but the practical execution needs further work. For master's students, study advisers organise a walk-in-morning before the start of the year. Later on in the programme, students can make individual appointments if necessary. With respect to thesis supervision, the panel established that practices vary across different Chair Groups. This is illustrated by the example of 'thesis rings', which function as intervision groups for students who are working on their thesis. Despite positive experiences with thesis rings, these have not yet been introduced in all Chair Groups. The panel would like to advise a WU-wide introduction of this best practice.

The excellent facilities that the programmes offer students are a major strength. The state-of-the-art experimental facility CARUS provides live animals and a 'living lab' that is used in bachelor's courses such as *Biology of Domestic Animals* and *Principles of Animal Nutrition.* Master's students generally execute in vivo trials for their MSc thesis at the CARUS facility. The panel is slightly worried by the trend towards in-vitro experimental set-ups that master's students identified. Because of stricter regulations with respect to biosecurity and animal welfare, it is increasingly difficult to get approval for in-vivo experiments, which means that students get less opportunities to handle live animals. As this is a vital part of their training, the panel recommends that the programme looks into alternative ways of ensuring that students gain hands-on experience in interacting with animals. Worth mentioning is the highly active study association (De Veetelers), which organizes excursions, discussion evenings, meetings with companies, and social activities.

A concern is the increasing number of students at WU and within the programmes themselves. The management indicated to the panel that the programmes have so far been successful in accommodating an increasing student population, especially since growth in the Animal Sciences programmes has not been as rapid as in other WU programmes. At the start of the international BSc programme, a deliberate choice was made to hold off advertising until the programme has become more established. Even so, the panel notes that the increasing inflow of (international) students will require careful planning and managing in order to avoid a loss of quality. Both bachelor's and master's students made clear to the panel that they perceive continuous growth as a major threat, as it will put pressure on classrooms, (master's thesis) supervision, facilities and the staff-student ratio. The panel has established that both the programme management and the Board of the

University are well aware of the potentially negative side effects of growth. It was pleased to learn that the strategic plan for the coming years recognises the necessity to preserve the small-scale education that is considered typical for WU. This involves hiring additional staff and possibly splitting up courses.

In conclusion, the panel notes that the teaching-learning environment offered by the programmes features many strong elements, as well as some aspects that could be further strengthened. From the interviews it is clear that the management is dedicated to continuously improving the quality of its teaching and facilities. Students indicated that they are actively involved in this process.

Teaching staff
A total of 83 staff members employed at 19 different Chair Groups contribute to the teaching in the bachelor's and master's programmes. Teaching staff generally teach both at the bachelor's and the master's level, which is why the documentation on the staff that was provided to the panel does not distinguish between the two programmes.

The panel is pleased with the quality of the teaching staff. Lecturers are experts in their fields, actively participate in WU research projects, and are part of relevant international networks. Although staff members are mostly Dutch, many have international experience. A large majority are members of the Graduate School of Wageningen Institute of Animal Sciences (WIAS), which underscores the close link between research and teaching. 90% of lecturers have obtained a PhD. Students described their lecturers as highly knowledgeable, passionate researchers, who are generally approachable and helpful. Furthermore, students feel that their feedback on courses is acted upon. In the 2018 NSE, both bachelor's and master's students assessed the teaching staff with a score of 4.0/5. A point of improvement that was mentioned by bachelor's students concerns the verbal English language skills of lecturers, which in some cases could be improved.

The panel notes that didactic skills are considered important and lecturers are given sufficient opportunities to obtain a University Teaching Qualification (UTQ) and/or other qualifications that benefit their teaching. Approximately 80% of lecturers have obtained a UTQ, which is high compared to other WU programmes. PhD students who supervise thesis students are given a training to do so and the same goes for MSc students who assist during lab practicals. A promising development is that, university-wide, there seems to be a growing awareness that the current model of building careers on research rather than teaching is in need of reconsideration. The panel fully supports a new initiative to fit teaching into the career development plan for staff, by creating positions for so-called Principle Educators (PE's) as a counterpart to Principle Investigators (PI's). This scheme will not just benefit individual staff members with a particular interest in teaching, but also emphasise the importance of didactics in general. The panel was pleased to learn that the central university also offers some financial support for educational innovation initiatives. Furthermore, several lecturers have received an education bonus after achieving excellent results in student evaluations of their courses, while others have won teaching awards. According to the panel, the existence of such incentives clearly demonstrates that the Chair Groups involved in the programmes are committed to teaching.

As was mentioned before, some of the students feel that not all teachers fully succeed in engaging students in their classes. This issue may be solved by creating more interest in innovative and interactive teaching methods and by providing staff with the time and means to adopt such methods in their own classes. A promising step that was mentioned during the interviews is that applications have been made to NWO's Comenius project, which awards scholarships to innovative teaching projects.

An issue for the programmes, and for WU in general, is the substantial workload of staff members and the threat that it poses to the current level of interaction between staff and students. Growing numbers of students at WU mean that staff members experience an increasing teaching burden that comes at the expense of their dedicated research time. Thesis supervision in particular takes up

more and more time, especially at the Chair Groups that receive the majority of students. Currently, the Chair Groups in Animal Nutrition and Adaptation Physiology attract almost 50% of master's thesis students, while other Chair Groups receive few or no animal science students. In the opinion of the panel, the programmes should aim for an optimal spread of students across Chair Groups to meet the programs needs whilst keeping in mind resources available. The panel established that the issue of increasing teaching-loads has the attention of the programme management and Executive Board of the university. Funds are being made available to hire additional staff, including dedicated teachers without (or with little) research time. Currently, the bachelor's programme has a student-staff ratio of 15:1, while the course phase of the master's programme has a student-staff ratio of 25:1. Both these ratios are acceptable.

Considerations
The panel concludes that the curriculum, teaching-learning environment and staff of the Animal Sciences programmes enable students to realise the intended learning outcomes. Both curricula are well-designed and sufficiently coherent, while at the same time offering students quite a lot of freedom in designing their individual study path. The content of the curricula is a good reflection of the current state of affairs in the disciplines in the domain of Animal Sciences. Innovations in the domain are quickly picked up on and the perspective of the programmes is clearly international. The level of the courses is academic. The research of the Chair Groups feeds into the curricula and academic skills are given sufficient attention. The panel further established that the curricula as a whole cover all of the ILOs, while course specific learning goals are suitable and match the teaching methods used.

Possible improvements for the bachelor's programme include adopting a more proactive role in giving students early exposure to the practical aspects of animal husbandry. The panel would also encourage the programme to seek opportunities whenever available to let bachelor's students do experimental work as part of their thesis. A recommendation for the master's programme is to pay more attention to labour market orientation and possibly also to a broader range of statistical methods and big data in general. A mutual point for improvement for both programmes is that ethical aspects could be more consistently and explicitly addressed, for example by developing a learning line on roles of animals in society.

A strong feature of the master's programme is that there are many international (including double degree) options available to students. While the panel was pleased to find that the student population of both programmes is increasingly international, it does stress the importance of setting a goal for the number of international students that the programmes hope to attract in order to be able to plan and prepare for further growth.

The teaching-learning environment of the programmes is characterised by an open and pleasant atmosphere. There is an adequate number of contact hours and teaching methods are relatively small-scale, but not always as interactive as students would like. The panel encourages the programmes to further explore the use of innovative digital teaching methods, which stimulate more meaningful interaction in class, and to also make use of group work, which allows students to learn with and from one another. The panel recognised that the downsides of growth are a WU-wide concern. It hopes that the current level of small-scale education can be maintained. Both programmes have a varied system of student guidance, in which study advisers play an important role. The excellent CARUS facility is a major strength, but the panel regrets that students are not (always) able to make the most of this because of strict regulations.

The teaching staff of the programmes is motivated and qualified. Lecturers are experts in their fields and many have international experience. The increasing workload of staff members requires monitoring. The panel strongly feels that staff numbers should reflect the growing student numbers.

Conclusion
Bachelor's programme Animal Sciences: the panel assesses Standard 2 as 'good'.
Master's programme Animal Sciences: the panel assesses Standard 2 as 'good'.

Standard 3: Student assessment
The programme has an adequate system of student assessment in place.

Findings

System of assessment
The panel established that WU has a sound assessment policy. In 2017, WU renewed its vision on education alongside its education assessment policy. This assessment policy defines why and how WU assesses and how the roles and responsibilities are distributed. Its goal is to generalise assessment rules and policies and to make them transparent to both lecturers and students.

The system of assessment that is in use within the Animal Sciences programmes takes the WU-wide policy as a starting point. To ensure that tests are valid, an assessment strategy is drawn up for each course, linking the course specific learning outcomes to assessment methods. The assessment strategies make clear how and when a learning outcome is assessed, who is involved in assessing students and how the final grade is determined. By publishing the assessment strategies in the Study Handbook, as well as in the study guide of individual courses, the programmes ensure that students are well aware of what is expected of them. Course examiners are responsible for test design and checking test results. In several (but not all) courses, a rubric is used to enhance the reliability and transparency of the assessment. The programme management is aware of the need to encourage an even wider use of rubrics. Following grading, students are enabled to inspect their exam results and receive individual feedback, which helps them learn from mistakes. Overall, the panel finds that there is sufficient attention for the validity, reliability and transparency of assessment. It is pleased with the WU wide policy of asking external experts to validate the quality of courses, including the assessment. It notes that this policy of external peer review is conscientiously followed by the Chair Groups involved in the Animal Sciences programmes. The panel would, however, prefer to also involve the Examining Board in this process. From a quality assurance perspective it is important that the Examining Board follows up on recommendations made by external peers. The panel, however, also wishes to stress the importance of internal peer review. It is not entirely clear to the panel how this mechanism is formalised at course level. The panel recommends to make sure that the four eye principle is common practice when designing tests and answer models.

For the bachelor's programme, the panel was able to establish that the combined assessment of all courses covers the full range of intended learning outcomes. The panel was not presented with an assessment plan for the master's programme. It notes that drawing up (and continuously updating) such a plan is an important step in the assessment cycle. Courses in both programmes commonly use a range of assessment methods. These include written exams, individual or group (lab) reports and presentations. During the site visit, the panel studied assessments and answer models of a number of sample courses at bachelor's and master's level. It found that these tests are generally well aligned with the learning goals and teaching methods. Often an appropriate combination of multiple choice and essay questions is used. The overall level of the exams is adequate. The assessment reflects the content that was discussed during the course and sufficiently addresses all of the relevant cognitive levels. From its interviews with stakeholders, the panel concludes that all parties involved are generally pleased with the assessment procedures and quality of examination. Both bachelor's and master's students scored assessment with a 4.0/5 in the 2018 NSE. An issue that was raised by some of the bachelor's students is that they would prefer to have more formative tests. More specifically they would like to have the opportunity to practice academic skills such as designing, executing and presenting research and receive feedback on their achievements without immediate consequences for their final grade. The panel agrees that the programme should aim for a correct balance between formative and summative testing.

Thesis assessment

The final product of the bachelor's programme is a 'mini-research project' (thesis) of 12 EC, in which students demonstrate that they have achieved the majority (8 out of 10) of the ILOs. Two assessors are involved in the assessment of the thesis: the supervisor(s) and an independent examiner (second reader). These assessors jointly fill out a standardised assessment form. At bachelor's level, the thesis assessment covers a number of different aspects: the student's research competence (up to 30% of the final mark), the thesis report (up to 60% of the final mark) and the final colloquium (up to 10% of the final mark), which includes an oral defence of the thesis. Rubrics help assessors to score these aspects appropriately. The panel established that students are generally satisfied with the assessment procedure, although some students find it somewhat problematic that the final mark for the thesis reflects the assessment of writing skills rather than research skills. Even so, students indicated that they consider the limited bachelor's thesis as good preparation for the more extensive master's thesis.

The master's programme is concluded with both an internship and a thesis. The thesis (rather than the internship) is seen as central to the successful completion of the programme and covers all of the ILOs. It is assessed by the supervisor(s) involved, in deliberation with an independent examiner (second reader), and in accordance with the thesis rubric. In the case of research projects that are conducted abroad at a partner organisation, there is always at least one WU supervisor involved in order to safeguard quality and continuity. The different components that are scored on the standardised assessment form are the research competence (30-60% of the final grade), the thesis report (30-60% of the final grade), the colloquium (5%-10% of the final grade) and the final examination (5%-10% of the final grade). As a rule, the final examination takes place in Wageningen, even for projects that were conducted abroad. Students that the panel spoke with are generally satisfied with the design of the thesis process. A positive aspect that they stressed is that they feel very much included in the research environment of the Chair Groups, which is considered stimulating and inspiring.

The panel is generally pleased with the (procedures for) thesis assessment. While the general outlines of the assessment are standardised, some of the specifics are determined at Chair Group level. Within a general range set by the Examining Board, Chair Groups are at liberty to define the weight they wish to attach to the different components of the assessment. This makes it possible for the assessment to reflect the particular nature of the research topic and methodology. While the panel understands the need for variety in some respects, in others it advocates more standardisation. A prominent example is the current practice that each Chair Group uses its own rubric for scoring the thesis. In order to achieve comparability, the panel recommends this practice to be streamlined, which is indeed described as a future challenge by the programme management. A similar challenge is the implementation of a Go/No Go decision across all Chair Groups. The panel learned that some Chair Groups already use this instrument in the master's thesis process as a way of monitoring progress, while others do not. The panel agrees with the management that it would be preferable if all Chair Groups adopt this mechanism. A general issue that needs to be addressed is the fact that the assessments of both assessors are recorded on a single assessment form. To enable external reviewers to establish that both readers have independently phrased their assessment, it is preferable to have each assessor fill out a separate form and administrate both forms. A general recommendation that the panel would like to make is to further streamline the thesis process by digitalisation of the subsequent steps, from start to finish.

After studying a sample of theses and associated assessment forms, the panel concludes that forms are generally complete and contain relevant feedback. The panel largely agreed with the assessments and grades given by the assessors.

Examining Board

At WU there are four Examining Boards (EBs), each responsible for the assurance of the quality of examination of a group of related degree programmes. The Executive Board appoints EB members and at least one member is independent (not affiliated to the programmes). For each course a

member of the lecturing staff is appointed as examiner by the responsible EB. The examiner is responsible for the assessment strategy of the course.

Part of the responsibilities of the EB is to check whether the individual study programmes of students (which can vary widely because of the many different specialisations and ample elective space) cover all of the ILOs, thereby assuring that students have achieved the intended end level upon graduation. The panel is convinced that the EB does this to its best ability. To ensure the quality of assessment, the EB periodically visits the Chair Groups that are involved in the teaching. Prior to these visits, which generally take place every six years, a delegation of EB members accompanied by an external assessment expert check a sample of theses and internship assessments, whose validity, reliability and transparency they later discuss with representatives of the Chair Groups. Where necessary, the EB proposes improvements. In the 2013-2017 period, four of the twelve key Chair Groups in the domain of Animal Sciences were visited by the EB. The panel has not heard of any specific comments or suggestions that were made during these visits. The management did indicate to the panel that it generally finds its interaction with the EB productive and helpful.

Although the panel has no particular reasons for concern with respect to the quality of assessment in the Animal Sciences programmes, it does note that the current university-wide system of quality assurance poses some challenges at programme level. To start with, there is considerable distance between the EB and the Chair Groups, which operate with a large measure of autonomy. The limited means that were available to the EBs over the reporting period meant that these may have lacked agency in properly streamlining procedures across Chair Groups and following up on prior recommendations. An additional issue for WU to consider is that the current system does not seem to allow for taking a snapshot of the assessment quality in a certain programme at a certain moment. Programmes such as those in Animal Sciences rely on a large number of Chair Groups, which are all visited at different times and (often) by different Examining Boards. The panel was very pleased to learn that the Executive Board of WU is doubling the resources for Chair Groups as of 2019. Even so, it does advise the university to carefully consider how these resources can be used to their optimal effect.

Considerations
Both programmes have developed a solid system of assessment, which is based on the WU-wide assessment policy. Sufficient attention is paid to the validity, reliability and transparency of examinations. A strong aspect is the use of external peer review to validate the quality of courses including assessment. Internal peer review in the design phase of examinations is, however, also important and should be consistently applied. The design of sample tests studied by the panel is adequate: the examinations sufficiently match the course specific learning goals and teaching methods. The level and content of the examinations is appropriate.

The procedures for assessing the final product of the programmes, the thesis, are clear and the assessment itself is sound. To further increase the transparency and comparability of thesis assessment across Chair Groups, the panel recommends streamlining the use of rubrics and Go/No Go decisions and introducing separate assessment forms for both assessors. Furthermore, the panel advocates the university-wide implementation of a digital assessment system in which the subsequent steps in the thesis process are fully automated.

Finally, the panel established that the Examining Board safeguards the overall level of assessment in the programmes to the best of its abilities. Increasing the capacity of the EB, as is the intention of the Executive Board, could help to strengthen its agency in relation to the rather autonomous Chair Groups. Nonetheless, the panel feels that the central university should also critically reconsider whether the design of the current quality assurance system optimally suits its purposes.

Conclusion
Bachelor's programme Animal Sciences: the panel assesses Standard 3 as 'satisfactory'.
Master's programme Animal Sciences: the panel assesses Standard 3 as 'satisfactory'.

Standard 4: Achieved learning outcomes
The programme demonstrates that the intended learning outcomes are achieved.

Findings

Theses
Prior to the site visit, the panel studied a sample of fifteen recently completed bachelor's theses. The panel is pleased with the level and content of these theses. It concludes that the subject choice matches the broadness of the domain of Animal Sciences. Thesis subjects vary in aggregation level, from animal systems and management to biological processes and mechanisms. Students furthermore deal with various animal species, mostly in the livestock sector. The chosen methodology also varies, as some theses involved experimental work, while others (mainly) consist of a literature review. The panel notes that the chosen form is mostly appropriate for the topic that the student deals with. The theses in the sample cover the full range of (pass) grades. With respect to the weaker theses, the panel concludes that these are less in-depth or reveal a lack of understanding of the complex issues that are in play. These weaknesses are, however, adequately reflected in the marking. The theses with higher marks are in most cases impressive pieces of work, which pose relevant questions, include good data interpretation and well-substantiated conclusions. On the whole, the panel is convinced that all of the theses in the sample surpass the basic quality requirements. As a rule, the theses demonstrate clear evidence of an ability of the students in scientific inquiry and associated methodology and research execution. In addition, theses show the ability of students to characterise the practical relevance of their research relevant to their field of study. The panel also observed that the theses are generally well written, but in some cases the English needed editing.

The conclusions on the bachelor's theses also apply to the fifteen master's theses that the panel studied. Again, the subjects that students deal with are an appropriate reflection of the broad, unique domain of the programme. The theses in the sample reflect the full range of marks given and some are therefore better than others, but the panel is convinced that all of these theses meet the ILOs and generally surpass the expected thesis quality. In the stronger theses, research objectives are clearly outlined, relevant methods are used to collect and analyse data, and valuable conclusions and recommendations are put forward. The weaker theses are less in-depth, lack critical reflection and/or would have benefitted from a stronger theoretical underpinning. All of the theses are of high biological quality and - depending on the specialisation chosen - reflect the unique life science and/or societal flavour of the master's programme.

Position of graduates
The position of graduates after completion of the programmes underlines that students achieve the ILOs. As was mentioned before, it is not customary for bachelor's graduates to enter the labour market. A large majority of alumni (90%) choose to continue their studies at WU, by enrolling in the MSc Animal Sciences (79%), the MSc Aquaculture and Marine Resource Management (6%) and other WU programmes (5%). Students generally perform well in these programmes. Bachelor's students did indicate to the panel that they would prefer to receive more information on the full range of choices available at MSc level, especially with respect to the different specializations available in the master's programme Animal Sciences. This is something for the programme to address. At the moment it is not entirely clear what career possibilities are open to graduates who wish to directly enter the labour market. The programme is currently exploring the option of offering a four-year double degree ('scientist-practitioner') programme in cooperation with a university of applied sciences, which should increase the employability of bachelor's gradates because of the larger component of practical skills education in the programme. The panel applauds this initiative.

Master's graduates either find employment in companies and non-profit (governmental) organisations, or start a PhD project at WU or other universities/research organisations. The panel was pleased to find that MSc graduates are in high demand: students quickly find jobs that match the level and profile of the programme. Feedback that the programme receives from employers

indicates that alumni have acquired the necessary competences and generally perform well. Students that the panel spoke with are mostly pleased with the level of preparation for the labour market, although they feel somewhat better prepared for PhD positions than for jobs in companies. Similar feelings were expressed by recent alumni, who mentioned that they find it difficult to envision a career trajectory outside of academia. Alumni with more substantial working experience, however, indicated that the programme has taught them important skills and knowledge from which they have clearly benefitted in their careers.

Considerations
Both the sample theses that were studied by the panel and the position of graduates indicate that students achieve the intended learning outcomes of the programmes. The general level of the final projects is good: the work is of appropriate academic quality and fully reflects the broad domain of Animal Sciences. Graduates of the bachelor's programme are successful in associated master's programmes, while graduates of the master's programme quickly find employment in relevant positions at companies, non-profit organisations and research institutes/universities. Alumni generally feel that the programme has provided them with a solid foundation from which they can benefit in their respective careers.

Conclusion
Bachelor's programme Animal Sciences: the panel assesses Standard 4 as 'good'.
Master's programme Animal Sciences: the panel assesses Standard 4 as 'good'.

GENERAL CONCLUSION

The panel notes that the programmes in Animal Sciences were strong programmes during the 2012 assessment and continue to perform very well, and have appropriately evolved, six years later. This is not least due to the positive and collaborative leadership provided by the programme management. Students and lecturers feel strongly involved in continuously improving the quality of education. Also noteworthy are the excellent ties to the livestock sector, which is very much engaged in setting objectives and translating these to the content of the curriculum. So far, the programmes do not seem negatively affected by the university-wide growth, but that could change, especially now that the bachelor's programme opened its doors to international students. One overall recommendation that the panel would like to offer is to carefully plan for (and when necessary to cap) further growth in order to maintain the high quality teaching-learning environment that the programmes currently offer students.

Conclusion
The panel assesses the *bachelor's programme Animal Sciences* as 'good'.
The panel assesses the *master's programme Animal Sciences* as 'good'.

APPENDICES

APPENDIX 1: DOMAIN-SPECIFIC FRAMEWORK OF REFERENCE

Programme objective and profile for the BSc programme

The BSc programme Animal Sciences is a 3-year multidisciplinary programme with the objective to deliver academically trained graduates who are equipped with knowledge of fundamental and applied biological concepts, and who are able to explore sustainable development solutions for complex, society-driven, problems related to animal husbandry systems worldwide. Sustainable development is constrained by technical factors such as feed supply, animal health and genetic diversity, as well as by management, ecological and socio-economic factors. Animal scientists are trained to tackle issues that are time and place defined.

For example, while emerging economies worldwide strongly demand an increased supply of animal protein, in the western world animal rights organisations advocate a reduced or even a ban of consumption of meat, driven by their focus on the intrinsic value of animals. In both situations, ethical considerations play a major role and animal scientists should take the lead in these discussions. The concept of studying 'Animal Sciences' refers to a domain where animals are subject to our care and management. Therefore, they are mostly domesticated (kept in captivity) and subject to human interventions in terms of nutrition, breeding, housing and disease treatment. An animal scientist feels responsibility for the well-being of an animal or a group of animals, with the basic attitude to align the circumstances of keeping animals in a manner that is closest to their 'natural' environment.

The focus in our programme is mainly oriented towards livestock (dairy, pigs, and poultry) and aquatic organisms, with an increasing interest for companion animals (dogs, cats, and horses), zoo animals, and wildlife in game reserves. The fact that animal scientists work in principle with domesticated animals or animals kept in captivity (except fisheries) makes the programme different from (animal) biology, where the focus is on free living animal populations. Next to that, veterinary sciences (a professional job oriented programme) primarily focuses on curing of livestock and pets, whereas animal sciences focuses in essence on healthy animals. That makes the programme unique.

Recent innovations: new majors and an international BSc. From September 2017 two innovations have been implemented in our BSc programme. Firstly, two new majors were developed (A: 'Animal Management and Care' (from animal to society level) and B: 'Biological Functioning of Animals' (from gene to animal level). In Paragraph 2.1 the argumentation for these two new majors will be described in detail.

Secondly, the International BSc was implemented in September 2018. The argumentation for this decision was that our graduates find jobs all over the world. Due to the large number of Dutch multinational companies with global divisions in Agribusiness, a student with an international attitude and approach is in demand, and we want to prepare students for these international jobs and to create awareness of the global issues in animal sciences. Therefore we need to train them in an international environment (international classroom, language skills, intercultural understanding and collaboration). An international BSc is a drive to focus even more on international concepts and worldwide issues in the domain of animal sciences.

Another argument was that an academic international BSc programme fully oriented on animal sciences is exceptional in the EU region; most related programmes in neighbouring countries (Belgium, Germany) offer BSc programmes in agronomy, where students can only major in animal sciences. We wanted to offer such a programme. Based on these innovations, we expect an extra inflow of around 20-30% freshmen in the coming years, partly from international students.

Programme objective and profile for the MSc programme

The objective of the MSc Animal Sciences is to train students to become skilled professionals, who are well equipped to address worldwide issues related to a sustainable development of management and care for all domesticated and captive animals, such as livestock and companion animals. The animal-human relationship is perceived differently all over the world, and we train students to understand and reflect on the different roles animals play in society. Themes like nutrition and health (e.g., as a model for human gastro-intestinal disorders), zoonotic diseases (e.g., bird flu or foot-and-mouth disease), welfare issues as related to the animal's behavioural repertoire, biodiversity to preserve genetic variation in (wildlife) populations, as well as socio-economic factors are all widely discussed in the different specialisations from which a student can choose.

The MSc Animal Sciences has a unique profile in terms of a disciplinary orientation (i.e., the management of and care for animals by use of biological concepts and theories) and species of interest (i.e., domesticated animals such as livestock and pets, but also marine organisms, zoo animals and to some extent wildlife). The programme teaches students state-of the-art research concepts and novel theories in animal sciences at an advanced level. Students become specialists and upon graduation from this programme they are experts in one of the subdomains of animal science. Learning paths for animal geneticists are different from the ones for animal nutritionists. It is logical that many graduates from a BSc in Animal Sciences (WU or from elsewhere), Veterinary Sciences, or Animal Biology choose this MSc to deepen their knowledge.

Whereas the objective of the BSc is to give students a broad overview of the whole domain of Animal Sciences, the MSc gives students the opportunity to specialize in one (or two) subdomains or disciplines. Students focus on deepening their knowledge in such a way that they can be perceived as experts in their field (i.e., a subdomain such as breeding, nutrition, health, sustainable issues, etc.). After graduation, our students perform in academic settings and professional organisations varying from agri-business to non-governmental and governmental organisations, as well as institutions and universities, in different roles such as adviser, researcher, policy maker or educator.

The general backbone of our programme is that students follow advanced courses to prepare for their final work, the major thesis. At the start of the 1st year, freshmen need to choose a set of these advanced courses ('a study track') within a specialisation that leads to a certain subdomain such as health, nutrition, epidemiology, genetics, etc.. Students are guided by their study advisers throughout this process. The major thesis is the final proof of the student's ability to think critically, discuss his/her work in oral and written statements, and display a scientific attitude (to ask the 'why' question).

The objective and profile of our MSc programme have been translated into 10 intended learning outcomes (ILOs), specific for a programme that aims to deliver skilled academic professionals for international business or research-oriented jobs at multinationals, R&D departments or knowledge centres (Appendix 9). Moreover, ILOs have been grouped in competences such as domain specific knowledge, skills and understanding (ILOs 1-47) and more generic skills and attitude (ILOs 8-10).

APPENDIX 2: INTENDED LEARNING OUTCOMES

Bachelor's Programme Animal Sciences

1. Explain the biological functioning of animals in relation to their environment, both at a fundamental level and in the various purposes of (captive) animals for human use and well-being;

2. Integrate the acquired disciplinary knowledge to obtain healthy animals in a safe environment for food and non-food functions; as well as identify gaps in his/her knowledge and to review and acquire new knowledge in response;

3. Apply (chemical) laboratory and dissection techniques, mathematical and statistical methods for the collection and analyses of experimental data in animal sciences, and to evaluate their suitability for addressing specific research questions;

4. Demonstrate a scientific approach by the ability to retrieve and select relevant literature from bibliographic databases and understand the process of testing hypotheses through experimental evidence;

5. Critically evaluate the concepts, approaches and methodologies of the various disciplinary domains within animal (terrestrial and aquatic) sciences including breeding, health, behaviour and nutrition;

6. Make judgements on the sustainable development of animal (terrestrial or aquatic) systems, based on the knowledge of the (bio-)technological, ecological, socio-economic and ethical context in a world-wide setting;

7. Design and conduct (under supervision) a short research project;

8. Work in a team of students with different backgrounds and nationalities to perform a small project within the context of a course and/or the entire programme;

9. Communicate the results of a research project to a (semi-) professional audience, both verbally and in writing, in English;

10. Reflect (under supervision) individually or in group sessions upon their personal knowledge, skills and attitude, and design and plan a learning path.

Master's Programme Animal Sciences

1. Apply in-depth knowledge in at least one specialization on the biological functioning of animals in relation to their environment, both at a fundamental level and in the various purposes of animals for human use and well-being;

2. Distinguish different advanced and complex concepts, approaches and methods in a certain domain within animal sciences, reflect upon the scientific literature (text books, readers and papers) and make a critical judgment towards its applicability to solve dilemmas in animal husbandry practices world-wide;

3. Criticize the sustainable development of animal systems at various integration levels and in an ecological, ethical and socio-economic context, based on their fundamental and applied knowledge of a chosen specialization;

4. Analyse the side effects of animal husbandry upon man, animal and environment; signal problems and initiate multidisciplinary solutions by use of novel research concepts and methodologies;

5. Apply advanced laboratory and modelling techniques, mathematical and statistical methods for

the collection and analyses of experimental data from a literature review or animal trial, and to evaluate their suitability for addressing the specific research questions and hypotheses;

6. Design a research plan (e.g., an animal experiment or literature review) in a domain within animal sciences and critically reflect (under supervision) on the phases of a scientific research;

7. Conduct a research plan in a domain within animal sciences under supervised responsibility using adequate materials and methods to collect and interpret data;

8. Communicate orally and in writing in a convincing way on the results of a learning activity, conducted research and/or a project work in English, considering the nature of the audience;

9. Work on a project-oriented basis as a specialist and collaborate in multidisciplinary and/or multicultural teams, having the ability to make a planning and distribution of tasks;

10. Design and plan their own learning processes based on a continuous reflection upon the acquisition of new knowledge in the field of their own specialization, and the improvement of their skills and attitudes and performance.

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APPENDIX 3: OVERVIEW OF THE CURRICULUM

Bachelor's Programme Animal Sciences

Major A Animal Management and Care

		Period 1 Sep-Oct	Period 2 Nov-Dec		Period 3 January	Period 4 February	Period 5 Mar-Apr		Period 6 May-June	
Year 1	Morning	CBI-10806 Introduction in Cell Biology	GEN-11806 Fundamentals of Genetics and Molecular Biology		YAS-10806 Biology of Domestic Animals	MAT-14903 Mathematics 2	EZO-10306 Human and Animal Biology 1		BHE-20303 Animal Behaviour	YAS-11306 Internship
	Afternoon	YAS-10306 Introduction Animal Sciences	ORC-13803 Bio-Org. Chem. Life Sci	MAT-14803 Math 1 / MAT-15303 Stat 1		PCC-12803 Gen.Chem. Life Sci.	YAS-11803 Animal Science in Society	MAT-15403 Statistics 2	MAT-15003 Mathematics 3	
Year 2	Morning	HAP-20306 Human and Animal Biology 2	QVE-20306 Veterinary Epidemiology & Economics		ANU-20306 Principles of Animal Nutrition	APS-20806 Systems Approach in Animal Sciences	AFI-20306 Aquaculture and Fisheries		REG-21306 *Introduction in Animal Ecology*	ADP-21803 Reproduction and Fertility
	Afternoon	ABG-20306 Animal Breeding and Genetics	ADP-20306 Immunology & Thermoregulation				BEC-21806 Intro. Bus Econ, Manag. & Mark / *YAS-32806 Quality of Animal Products*			ADP-22303 Infections and Disorders
Year 3	A - Morning	MAT-20306 Advanced Statistics	YAS-80312 BSc Thesis		*YAS-33406 The Role of Livestock in Future Food Systems*	Minor part				
	A - Afternoon	Free choice & YAS-20303 Dev&Skills & YAS-20801 International study visits								
	B - Morning	Minor part			YAS-32306 Comp An / AFI-33306 Sust Fish & Seafd Prod	MAT-20306 Advanced Statistics		YAS-80312 BSc Thesis		
	B - Afternoon					Free choice & YAS-20303 Dev&Skills & YAS-20801 International study visits				

Note: Courses are colour-coded. In dark blue are orientation courses in Animal Sciences, in green are the basic Biology courses, in light blue are the chemistry, mathematics and statistics courses, and in orange the courses that are specific for the major. The recently introduced courses in the curriculum are indicated in bold and italic. In year 3 option A and B are interchangeable.

Major B Biological functioning of Animals

		Period 1	Period 2		Period 3	Period 4	Period 5		Period 6	
		Sep-Oct	Nov-Dec		January	February	Mar-Apr		May-June	
Year 1	Morning	CBI-10806 Introduction in Cell Biology	GEN-11806 Fundamentals of Genetics and Molecular Biology		YAS-10806 Biology of Domestic Animals	MAT-14903 Mathematics 2	EZO-10306 Human and Animal Biology 1		BHE-20303 Animal Behaviour	YAS-11306 Internship
	Afternoon	YAS-10306 Introduction Animal Sciences	ORC-13803 Bio-Org. Chem. Life Sci	MAT-14803 Math 1 / MAT-15303 Stat 1		PCC-12803 Gen.Chem. Life Sci.	YAS-11803 Animal Science in Society	MAT-15403 Statistics 2	MAT-15003 Mathematics 3	
Year 2	Morning	HAP-20306 Human and Animal Biology 2	QVE-20306 Veterinary Epidemiology & Economics		ANU-20306 Principles of Animal Nutrition	APS-20806 Systems Approach in Animal Sciences	*HMI-20306 Microbiomes and Health*		*REG-21306 Introduction in Animal Ecology*	HAP-21806 Behavioural Endocrinology
	Afternoon	ABG-20306 Animal Breeding and Genetics	ADP-20306 Immunology & Thermoregulation				*BIC-10306 Practical Biological Chemistry*			
Year 3	A - Morning	MAT-20306 Advanced Statistics	YAS-80312 BSc Thesis		*CBI-20306 Cell Biology and Health*	Minor part				
	Afternoon	Free choice & YAS-20303 Dev&Skills & YAS-20801 International study visits								
	B - Morning	Minor part				YAS-80312 BSc Thesis	*CBI-20306 Cell Biology and Health*		MAT-20306 Advanced Statistics	
	Afternoon						Free choice & YAS-20303 Dev&Skills & YAS-20801 International study visits		YAS-80312 BSc Thesis	

Note: Courses are colour-coded. In dark blue are orientation courses in Animal Sciences, in green are the basic Biology courses, in light blue are the chemistry, mathematics and statistics courses, and in orange the courses that are specific for the major. The recently introduced courses in the curriculum are indicated in bold and italic. In year 3 option A and B are interchangeable.

Master's Programme Animal Sciences

Year 1:		Pillars:
Advanced courses: Courses that prepare for an MSc thesis in a specific specialisation (≥ 12) Optional courses: e.g. to prepare for a minor thesis	Major thesis (*36*) Internship or Minor Thesis (*24*)	*Specialisation & deepening*

Year 2:		
Major thesis (*36*) Internship or Minor Thesis (*24*)	Academic skills training (*12*)	*Academic & Professional skills*

Figure 6: A schematic overview of the programme. The study credits for each part are indicated in italic between the brackets.

Students choose a specialisation (A ....F) and within a specialisation they choose one of the study tracks (RO1 to RO5). From the indented courses (A-courses; RO2A), students choose 1 out of 2 or 2 out of 4.

	course code	course title	credits	cluster	phase	period
A. Genetics and Biodiversity	ABG-30306	Genomics	6	RO1A	M1	2AF
	ABG-31306	Genetic Improvement of Livestock	6	RO1A	M1	2MO
	ABG-30806	Modern Statistics for the Life Sciences	6	RO1A	M1	5AF
	GEN-30806	Population and Quantitative Genetics	6	RO1A	M1	6WD
	ABG-70424	MSc Internship Animal Breeding and Genetics	24	RO1	M1/2	1,2,3,4,5,6
	ABG-80436	MSc Thesis Animal Breeding and Genetics	36	RO1	M2	1,2,3,4,5,6
	REG-31806	Ecological Methods I	6	RO2	M1	1MO
	REG-32806	Wildlife Resource Management	6	RO2	M1	2MO
	REG-70424	MSc Internship Resource Ecology	24	RO2	M1/2	1,2,3,4,5,6
	REG-80436	MSc Thesis Resource Ecology	36	RO2	M2	1,2,3,4,5,6
	HAP-31806	Molecular Regulation of Health and Disease	6	RO3	M1	1MO
	HMI-70324	MSc Internship Host-Microbe Interactomics	24	RO3	M1/2	1,2,3,4,5,6
	HMI-80336	MSc Thesis Host-Microbe Interactomics	36	RO3	M2	1,2,3,4,5,6
B. Nutrition and Metabolism	ANU-30806	Animal Nutrition and Physiology	6	RO1	M1	4WD
	ANU-30306	Nutrient Dynamics	6	RO1A	M1	5AF
	ANU-31306	Feed Technology	6	RO1A	M1	6MO
	ANU-70424	MSc Internship Animal Nutrition	24	RO1	M1/2	1,2,3,4,5,6
	ANU-80436	MSc Thesis Animal Nutrition	36	RO1	M2	1,2,3,4,5,6
	ADP-30306	Health, Welfare and Management	6	RO2	M1	1MO
	ADP-30806	Adaptation Physiology	6	RO2	M1	5AF
	ADP-70424	MSc Internship Adaptation Physiology	24	RO2	M1/2	1,2,3,4,5,6
	ADP-80436	MSc Thesis Adaptation Physiology	36	RO2	M2	1,2,3,4,5,6
	AFI-31806	Aquaculture Production Systems	6	RO3	M1	2MO
	AFI-32306	Nutrition, Welfare and Reproduction in Aquaculture	6	RO3	M1	5AF
	AFI-70424	MSc Internship Aquaculture and Fisheries	24	RO3	M1/2	1,2,3,4,5,6
	AFI-80436	MSc Thesis Aquaculture and Fisheries	36	RO3	M2	1,2,3,4,5,6
	CBI-30306	Human and Veterinary Immunology	6	RO4	M1	1AF
	HAP-31306	Development and Healthy Aging	6	RO4	M1	3WD
	CBI-70424	MSc Internship Cell Biology and Immunology	24	RO4	M1/2	1,2,3,4,5,6
	CBI-80436	MSc Thesis Cell Biology and Immunology	36	RO4	M2	1,2,3,4,5,6
	HAP-31306	Development and Healthy Aging	6	RO5	M1	3WD
	HAP-30806	Brain, Hormones and Metabolism	6	RO5	M1	5MO
	HAP-70424	MSc Internship Human and Animal Physiology	24	RO5	M1/2	1,2,3,4,5,6
	HAP-80436	MSc Thesis Human and Animal Physiology	36	RO5	M2	1,2,3,4,5,6

	course code	course title	credits	cluster	phase	period
C. Global and Sustainable Production	APS-30306	Sustainability Assessment of Animal Systems	6	RO1	M1	5MO
	APS-31306	Future Livestock Systems	6	RO1	M1	6AF
	APS-70424	MSc Internship Animal Production Systems	24	RO1	M1/2	1,2,3,4,5,6
	APS-80436	MSc Thesis Animal Production Systems	36	RO1	M2	1,2,3,4,5,6
	AFI-31806	Aquaculture Production Systems	6	RO2	M1	2MO
	AFI-33306	Sustainability in Fish and Seafood Production	6	RO2	M1	4WD
	AFI-70424	MSc Internship Aquaculture and Fisheries	24	RO2	M1/2	1,2,3,4,5,6
	AFI-80436	MSc Thesis Aquaculture and Fisheries	36	RO2	M2	1,2,3,4,5,6
	QVE-30306	Quantitative Veterinary Epidemiology	6	RO3	M1	5MO
	QVE-30806	Management of Infections and Diseases in Animal Populations	6	RO3	M1	6MO
	QVE-70424	MSc Internship Quantitative Veterinary Epidemiology	24	RO3	M1/2	1,2,3,4,5,6
	QVE-80436	MSc Thesis Quantitative Veterinary Epidemiology	36	RO3	M2	1,2,3,4,5,6
D. Adaptation, Health and Welfare	ADP-30306	Health, Welfare and Management	6	RO1	M1	1MO
	ADP-30806	Adaptation Physiology	6	RO1	M1	5AF
	ADP-70424	MSc Internship Adaptation Physiology	24	RO1	M1/2	1,2,3,4,5,6
	ADP-80436	MSc Thesis Adaptation Physiology	36	RO1	M2	1,2,3,4,5,6
	ADP-30306	Health, Welfare and Management	6	RO2	M1	1MO
	BHE-31306	Applied Animal Behaviour and Welfare	6	RO2	M1	5MO
	BHE-70324	MSc Internship Behavioural Ecology	24	RO2	M1/2	1,2,3,4,5,6
	BHE-80336	MSc Thesis Behavioural Ecology	36	RO2	M2	1,2,3,4,5,6
	QVE-30306	Quantitative Veterinary Epidemiology	6	RO3	M1	5MO
	QVE-30806	Management of Infections and Diseases in Animal Populations	6	RO3	M1	6MO
	QVE-70424	MSc Internship Quantitative Veterinary Epidemiology	24	RO3	M1/2	1,2,3,4,5,6
	QVE-80436	MSc Thesis Quantitative Veterinary Epidemiology	36	RO3	M2	1,2,3,4,5,6
	EZO-30806	Functional Zoology	6	RO4	M1	5MO
	EZO-30306	Developmental Biology of Animals	6	RO4	M1	6WD
	EZO-70424	MSc Internship Experimental Zoology	24	RO4	M1/2	1,2,3,4,5,6
	EZO-80436	MSc Thesis Experimental Zoology	36	RO4	M2	1,2,3,4,5,6
	APS-30306	Sustainability Assessment of Animal Systems	6	RO5	M1	5MO
	APS-31306	Future Livestock Systems	6	RO5	M1	6AF
	APS-70424	MSc Internship Animal Production Systems	24	RO5	M1/2	1,2,3,4,5,6
	APS-80436	MSc Thesis Animal Production Systems	36	RO5	M2	1,2,3,4,5,6

	course code	course title	credits	cluster	phase	period
E. Molecule, Cell and Organ Functioning	CBI-30306	Human and Veterinary Immunology	6	RO1	M1	1AF
	HAP-31306	Development and Healthy Aging	6	RO1	M1	3WD
	CBI-70424	MSc Internship Cell Biology and Immunology	24	RO1	M1/2	1,2,3,4,5,6
	CBI-80436	MSc Thesis Cell Biology and Immunology	36	RO1	M2	1,2,3,4,5,6
	HAP-31306	Development and Healthy Aging	6	RO2	M1	3WD
	EZO-30806	Functional Zoology	6	RO2A	M1	5MO
	EZO-30306	Developmental Biology of Animals	6	RO2A	M1	6WD
	EZO-70424	MSc Internship Experimental Zoology	24	RO2	M1/2	1,2,3,4,5,6
	EZO-80436	MSc Thesis Experimental Zoology	36	RO2	M2	1,2,3,4,5,6
	HAP-31806	Molecular Regulation of Health and Disease	6	RO3A	M1	1MO
	HAP-30806	Brain, Hormones and Metabolism	6	RO3A	M1	5MO
	HAP-31306	Development and Healthy Aging	6	RO3	M1	3WD
	HAP-70424	MSc Internship Human and Animal Physiology	24	RO3	M1/2	1,2,3,4,5,6
	HAP-80436	MSc Thesis Human and Animal Physiology	36	RO3	M2	1,2,3,4,5,6
	HAP-31806	Molecular Regulation of Health and Disease	6	RO4	M1	1MO
	HMI-70324	MSc Internship Host-Microbe Interactomics	24	RO4	M1/2	1,2,3,4,5,6
	HMI-80336	MSc Thesis Host-Microbe Interactomics	36	RO4	M2	1,2,3,4,5,6
	ABG-30306	Genomics	6	RO5	M1	2AF
	ABG-30806	Modern Statistics for the Life Sciences	6	RO5	M1	5AF
	ABG-70424	MSc Internship Animal Breeding and Genetics	24	RO5	M1/2	1,2,3,4,5,6
	ABG-80436	MSc Thesis Animal Breeding and Genetics	36	RO5	M2	1,2,3,4,5,6

	AFI-32806	Marine Resources Management	6	RO1	M1	3WD
	AFI-30806	Fisheries Ecology	6	RO1	M1	4WD
	AFI-70424	MSc Internship Aquaculture and Fisheries	24	RO1	M1/2	1,2,3,4,5,6
	AFI-80436	MSc Thesis Aquaculture and Fisheries	36	RO1	M2	1,2,3,4,5,6
	AFI-31306	Life History of Aquatic Organisms	6	RO2	M1	1MO
	MAE-30306	Marine Animal Ecology	6	RO2	M1	5MO
	MAE-70324	MSc Internship Marine Animal Ecology	24	RO2	M1/2	1,2,3,4,5,6
	MAE-80336	MSc Thesis Marine Animal Ecology	36	RO2	M2	1,2,3,4,5,6
	REG-31806	Ecological Methods I	6	RO3	M1	1MO
	REG-30306	Animal Ecology	6	RO3A	M1	6WD
	REG-33306	Disease Ecology	6	RO3A	M1	6WD
	REG-70424	MSc Internship Resource Ecology	24	RO3	M1	1,2,3,4,5,6
	REG-80436	MSc Thesis Resource Ecology	36	RO3	M2	1,2,3,4,5,6

F. Animal Ecology

Note: CS = compulsory;
RO = restricted optional;
M1/2 means year 1 or 2 of the MSc;
MO = morning; AF = afternoon, WD = whole days.

APPENDIX 4: PROGRAMME OF THE SITE VISIT

19 November 2018

8.45	11.00	Arrival of the panel, Preparation, documentation review
11.00	11.45	Interview with management (including Programme Committee)
11.45	11.50	Mini break
11.50	12.35	Students BSc
12.35	13.30	Lunch and deliberations panel
13.30	14.15	Teaching staff BSc
14.15	14.20	Mini break
14.20	15.05	Students MSc
15.05	15.15	Break
15.15	16.00	Teaching staff MSc
16.00	16.15	Mini break
16.15	17.15	Visit: Animal Experimental Facilities CARUS
17.15	17.45	Internal deliberation panel, short recap day 1

20 November 2018

8.45	9.45	Deliberations panel and documentation review
9.45	10.15	Examining board and Study Advisor(s)
10.15	10.20	Mini break
10.20	10.50	Alumni
10.50	11.00	Break
11.00	11.45	Final interview with management
11.45	14.00	Deliberations panel and formulating preliminary findings and conclusions + lunch
14.00	14.30	Feedback of preliminary findings and conclusions

APPENDIX 5: THESES AND DOCUMENTS STUDIED BY THE PANEL

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

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

BSc Animal Sciences
- CBI-10806 Introduction in Cell Biology
- HAP-21806 Behavioural Endocrinology
- YAS-33406 The Role of Livestock in Future Food Systems

MSc Animal Sciences
- ABG-30306 Genomics
- ANU-30806 Animal Nutrition and Physiology
- BHE-31306 Applied Animal Behaviour and Welfare