Study Guide Thesis Animal Nutrition Group

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1 Introduction

At the Animal Nutrition Group (ANU), a student can conduct research for a thesis with a workload of 18, 21, 24, 27, 30, 33 (Minor thesis), 36 or 39 ECTS (Major thesis). The aim of this thesis research is to train the students' academic skills by means of an in-depth, scientific study on a subject of interest. With completion of the thesis, you have demonstrated that you can conduct a research or a research-based design project individually and independently.

1.1 Learning outcomes

After successful completion of your thesis, you are expected to be able to:

- demonstrate commitment, perseverance, initiative and creativity when investigating a research question or performing a design project
- work independently and efficiently
- demonstrate that you know when to ask help from your supervisor and how to handle any comments
- plan and keep to the time schedule
- delineate and define your research or design question
- build a sound theoretical and methodological framework
- collect data in a systematic and verifiable manner
- analyse the data critically and correctly
- develop a design or design alternative (in case of a research-based design project)
- present the major finding(s) in a comprehensible manner for a specific audience, both orally and in writing
- formulate sound conclusions based on a comprehensive discussion of the results
- evaluate and discuss the contribution of your results to the development of the thesis topic
- write a comprehensive, consistent and concise thesis report.

1.2 Prerequisites

Specific requirements (e.g. mandatory courses) for each MSc thesis can be found in the online Study Handbook. In addition, please check with your study advisor for any specific requirements. You should be officially registered as a Wageningen University MSc student. Compulsory courses for a Major thesis in animal nutrition are Animal Nutrition & Physiology and Feed Technology or Nutrient Dynamics. Compulsory course for a Minor thesis in animal nutrition are Animal Nutrition & Physiology (animal-related subject) or Feed Technology (technology-related subject).

1.3 Supervision

The first (main) supervisor is always a staff member of the responsible Chair Group, but frequently, a second or even a third Chair Group may be involved in the supervision of a MSc thesis. All Chair Groups of Wageningen University use a thesis contract which includes details of all agreements regarding supervision. Students have to contact their primary supervisor at least once a week, unless circumstances do not allow such a frequency. The actual frequency of meetings may vary depending on the nature of the thesis project. Although the thesis project is a learning experience, students are encouraged to act independently as much as possible when resolving problems and in difficult situations. However, one supervisor will always be available for feedback and support.

1.4 This guide

This study guide informs you about the planning and execution of your research. There are only general guidelines described. Together with your supervisor you will make detailed agreements about your thesis, activities, and documentation.
We wish you good luck with your research and hope that you will enjoy working in our group!

Please note, that you can only start your thesis if you have completed your BSc education and if you have participated in the required MSc courses as mentioned on our website (anu.wur.nl/UK/; select Education).

2 Thesis

2.1 Start

One or two weeks before the start of your thesis work you should contact (personally or digitally) the ANU secretariat to report the start of the thesis. The secretariat will need a signed thesis agreement. You can find this document at www.anu.wur.nl/UK/Education/MScThesis/. After the secretariat has received all the required information you will be added to the mailing list for ANU-thesis students (to receive invitations for MaMi-presentations and colloquia). Also register for the thesis ring meetings by sending an e-mail to Dr Huyen Nguyen (huyen.nguyen@wur.nl).
If your work requires access to the experimental facilities you should ask your supervisor to send you the application form and protocols/information. Hand in the completed form (do not forget the initials and signature!) to the secretariat. They will arrange that your WUR-card gets activated. This will take approximately 1 week.
It is recommended to work at Zodiac during your thesis. There are workspaces available at the top floors of Zodiac, these are especially reserved for MSc thesis-students.
You are most welcome to join our tea and coffee breaks (approximately at 10 h and at 15 h).

2.2 General outline

A thesis will take approximately 13 to 27 fulltime weeks, depending on the number of ECTS of your thesis. You are expected to work a minimum of 40 hours per week. In case you would like to combine your thesis work with other activities (e.g. other courses), you should discuss the planning with your supervisor in advance.
A thesis can be divided in three stages. Please note that the timespan, order, and activities of these stages depend on the number of ECTS of your thesis, experimental work, availability of your supervisor, etc. Discuss with your supervisor at the start of your thesis how the activities can be planned in your project. Make a planning for the timespan of your thesis and have it approved by your supervisor. An intermediate evaluation (go/no go) is planned between student and supervisor, which is generally timed ~1/3 through the project. If you experienced any shortcomings in your supervision, then this is a good moment to discuss it and agree improvement. In case of severe problems regarding dedication, skills, knowledge or communication, your daily supervisor, together with the thesis examiner, may decide to terminate the thesis project. The thesis assessment form (see ANU website) can be used for the intermediate evaluation and provides a clear picture of what goes well and where improvement is needed. You need to achieve a grade of at least 5.5 for both categories 'Research competence' and 'Thesis report' in order to pass an MSc thesis project.

2.2.1 The initiation stage

In this stage you start reading background information about your thesis subject and reviewing relevant literature. You make a planning and write a research proposal (see § 3.2), which should be approved by your supervisor. You present your proposal to students and staff within the Animal Nutrition Group, during a MaMi-meeting (§4.1).

2.2.2 The execution stage

During the execution stage you perform the experiment and/or lab analyses and analyse the data. Make sure that you properly store samples and document the data. This makes writing of the final report much more easy.

2.2.3 The completion stage

In the last stage, you finalise your thesis. You summarise the results, interpret and discuss your data with the help of literature , and you draw conclusions. You complete the different sections of your report and present your colloquium. Preferably, you present your colloquium before you complete your thesis report, so that you can use the discussions at your colloquium to improve your thesis. Finally, you have your oral examination.

2.3 Examination

The final examination is an in-depth discussion about the content of the thesis, in which knowledge, understanding, insight, but also creativity and scientific attitude are evaluated. The final examination will be held by the professor of the ANU group or his representative and the supervisor(s) of the student.
The final mark of the thesis will be based on several criteria; for a detailed overview of the criteria and their weighing factors, please see the "Thesis Evaluation Form ANU" at our website.
You may be requested to adjust the thesis according to remarks of your supervisor and/or examiner. The final mark will be fed into the system by the secretariat after submission of the final thesis, in which these additional remarks are incorporated. Thus, reserve 1 or 2 days of your time after the oral exam to finalise your thesis.

3 Reports

The research proposal and thesis report should be written in English. Make sure that your manuscripts clearly communicate your message to the reader. Write clearly and accurately but be as simple and concise as possible. For more information, you can consult literature on scientific writing (e.g. Malmfors et al. 2004; Editorial Board Animal Feed Science and Technology, 2007). For formatting of the research proposal and thesis report, use the formatting tools in Word (check online manuals) and Endnote or equivalent for cited literature.

3.1 Thesis rings

A thesis ring is a group of students that share their written work and orally discuss the quality of the work together in meetings, chaired by an ANU staff member. By participating in thesis rings, you will learn to review each other's documents and how to give and receive feedback. Writing quality reports and providing constructive feedback in teams are important skills in almost every academic profession taken after their university training, often in a setting where teams are composed out of colleagues with varying backgrounds and cultures. Within the ring the development of these skills is facilitated by letting students review each other's texts and discuss aspects of scientific writing. A staff member is present at each meeting to chair the meeting, to supervise the process and the quality of given feedback. The thesis ring will allow you to improve the quality of your research proposal and thesis report and it provides you a broader view on the field of animal nutrition.
You are obliged to actively participate in all meetings of your thesis ring group, occurring once every 2 weeks, and submit at least 2 documents. You have to subscribe for the thesis rings by contacting Dr Huyen Nguyen (huyen.nguyen@wur.nl). You will be assigned to a thesis ring group and gain access to the thesis ring Brightspace.

3.2 Research proposal

The thesis research starts with the preparation of a research protocol. In some cases this research protocol will be part of a larger research proposal prepared by a staff member/PhD candidate. The research proposal is to be presented at one of the weekly MaMi-meetings (see §4.1). The proposal should contain the following elements:

Administrative information: Name and registration number, supervisor(s), course reference (code) and number of ECTS, date.

Title: Should describe the contents of the thesis work, but be as brief as possible. If applicable, indicate if it is a pilot study.
Introduction: Introduction should cover the following questions "What will I study? Why is it an important question? What do we know about it? How will this study advance our knowledge?". The introduction should address the following points:

- Motivation – put your research in a global context, formulate the problem
- Theory – summarise the current understanding of the problem you are investigating
- Current and gap(s) in knowledge – state what has been done by summarising relevant literature and state what has not been done
- Objectives, research questions and hypotheses – what are the objectives of your research (related to the knowledge gap), research questions and hypotheses (related to the theory)

Consider the difference between the subject you are studying and the parameters that you will use to explore the problem. For example, the subject could be protein quality of algae. The parameters to gain insight in the protein quality could be in vitro N digestibility or the amino acid composition. Each parameter has limitations (e.g. predictive accuracy of in vitro method, loss of amino acids during acid hydrolysis) which you will ultimately describe in the discussion.
Materials and methods: Give a clear and complete description of the proposed experiment, including chemical and statistical analyses. Describe your material and methods in such a way that a colleague within the field can reproduce your experiments. Materials and methods of a research proposal should address the following points:

- Experimental design. A flow chart illustrating your study design often helps. Make sure that your design is well related to your objectives.
- Experimental methods. Describe which variables are measured and how they are analysed.
- Statistical model and analysis. Make sure that your statistical analysis is consistent with the experimental design.
- Time schedule. Report all activities, including dates for presentations and hand in the final thesis.

References: List of relevant references cited.

3.3 Thesis report

Your final report should contain the following sections:

Cover: Including title and administrative information. Title should be clear, descriptive and short. All ANU thesis reports have a similar title page. Name of the author, course reference (code) and number of ECTS, supervisor(s), and date are all included on the cover page. The second page contains a message on copyrights. You will find examples of a thesis cover and a copyright format at our website.
Table of contents: With maximal 3 levels of the headings.
List of Abbreviations, Tables and Figures: For readability and rapid screening of main thesis outcomes.
Abstract/summary: Should be clear, descriptive and not longer than 600 words.
Introduction: See above.
Literature: See above regarding theory and state-of-the-art and knowledge. A literature review considering the scientific background of the thesis subject can be included. Discuss with your supervisor whether you should include this piece after Introduction or as a separate section in the Appendix.
Materials and methods: Should contain a detailed description of the materials studies, area description, research methodology, techniques and way of (data) processing.
Results: Report your data. Do not include any interpretations, preliminary conclusions, and references to literature in this section. Check the Instructions for Authors of scientific journals for common practice in formatting tables and figures.
Discussion: This section includes your interpretation of the results, including explicit reference to the research question and literature as mentioned in the introduction. Be clear in your conclusions whether, based on your findings, the hypothesis is accepted or rejected. Discuss in retrospect if the

methods used in the project were adequate in relation to the research question. Analyse the strengths and the weaknesses of the methods and the results and discuss the results in relation to relevant literature. Identify conclusions that would hold true in further scrutiny.
Conclusions and recommendations: In the conclusion section you link the outcomes of your research to the objective(s) described in the introduction. A thesis will generally have not more than five substantial conclusions. Do not introduce new results or insights at this point. Give recommendations for further research.
References: Make a reference list according to the guidelines of a journal in your scientific discipline. The entire report must be carefully cross-checked to ensure that the spelling of author names and year of publication are correct and correctly referenced in the text.
Acknowledgements: Conducting thesis research is team work and this is the place to acknowledge those that have supported you.

Optional: *Appendices*.

The structure of your thesis report may differ from the outline above, depending on your project. You may for example combine the discussion and results section or omit the literature review section and integrate the literature in the introduction and discussion sections. Discuss with your supervisor what structure can be used for your project. In agreement with your supervisor you may write a draft publication (with appendices for data) instead of a thesis.

Note: Plagiarism is considered to be a serious form of fraud. Consult the following website via the link for forms and avoidance of plagiarism: plagiarism. Examiners and supervisors may utilize plagiarism scanners to check any text presented to them by students.

You should submit your (draft) thesis to your supervisor and to your second examiner **via e-mail**, at least 2 weeks before the oral examination. After your supervisor has approved the final thesis you can send a digital copy of your thesis (**.pdf**) to the secretariat (Yvonne.vanholland@wur.nl). On request the secretariat can print 1 or 2 copies of your thesis.

4 Presentations

4.1 MaMi-presentation

Every Monday afternoon (in Dutch: MaandagMiddag) at 12.00 h there is a research meeting within the Animal Nutrition Group; the MaMi meeting. You are obliged to present your research proposal during a MaMi-meeting, preferably within 4 to 6 weeks from the start of your thesis. You can contact the MaMi-coordinator to plan your presentation. The person who coordinates the MaMi is indicated on the board opposite to the secretary office (outside wall of Room E0243). Guidelines for the presentation can be found at our website.
You should attend at least 6 MaMi-presentations doing a major thesis and 3 doing a minor thesis. Attendance of MSc students is recorded by the chairman of the MaMi and will be part of the thesis evaluation and examination.

4.2 Colloquium

You are obliged to present the results of your research during one of the colloquium-meetings.
Every third Thursday of the month there is a possibility for the BSc and MSc student to present their colloquium. Dr John Cone organises the colloquia and any queries or comments concerning anything to do with the colloquia can be directed to him via email (John.cone@wur.nl).
You should attend at least 6 colloquia doing a major thesis and 3 doing a minor thesis. Attendance of MSc students is recorded by the chairman of the colloquium session and will be part of the thesis evaluation and examination.

Guidelines for the presentation, evaluation form and the rubric can be found at http://www.anu.wur.nl/UK/Education/Documents+for+Students/. The colloquium is part of your thesis evaluation and will be graded.

4.2.1 Colloquium planning

Please contact John Cone by email in an early stage, **at least 5 weeks** before the colloquium date, to plan your colloquium. Upon planning, a tentative colloquium program will be made for the coming month and you will be contacted in the first week of the month to answer the following questions:

- Is your registration for this month a definite one and approved by your supervisor?
- If yes, what is the title of your colloquium, approved by your supervisor?
- Is the colloquium confidential, yes or no? If yes, for what reason?

For the colloquia, a formal invitation letter will be written and send to people inside and, in case of non-confidential colloquia, outside Wageningen University, interested to participate in the ANU colloquia. A copy of the invitation letter will be send to you.

4.2.2 Important issues

Room

- Presentations normally take place in Room E0243 but is definitely indicated on the invitation letter that will be prepared in the first week of the month.

Facilities

- Laptop and beamer facilities are arranged.
- We assume you will be using MS PowerPoint to give your presentation. Bring your own USB stick with your presentation on it to the colloquium.
- In addition send your PPT-file also to Dr John Cone no later than 09.00 am on the day of the colloquium (john.cone@wur.nl). In case of failure we will bring a second USB-stick with all the files on it.
- If you need other software, please contact Dr John Cone, Presentation
- Each speaker has 30 min (**20 min** for the talk, plus **10 min** for plenary discussion).
- Read and use the guidelines concerning quality of presentations at our website.

Supervisor

- At least one of your supervisors has to be present at the colloquium.

Language

- BSc students present their colloquium in Dutch or English; MSc students present in the English language.

Colloquium evaluation

- A standard evaluation rubric will be used to evaluate your colloquium presentation. Study this rubric and use it to score your own presentation when preparing it; it will help you to improve your presentation!

5 Facilities

5.1 Working at Zodiac

Zodiac is only open during weekdays from 7-18 h. For working in the evening or weekend, use the facilities at the Forum building (Monday till Friday 8-23 h; Saturday and Sunday 10-17 h).

5.2 Working in the laboratory

To be able to carry out work in the ANU laboratory, strict laboratory rules have been established ensuring the safety of yourself and your colleagues. Your supervisor is responsible to inform the laboratory about your work. You are obliged to make an appointment with Saskia van Laar (Saskia.vanlaar@wur.nl) and discuss your work and the laboratory instructions (see our website). You are not allowed to work in the lab without supervision so discuss with your supervisor and the laboratory coordinator (Saskia van Laar) when you can work in the lab.

Note: You are not allowed to work in the lab besides the opening hours. Only in special circumstances, under very strict conditions an exception can be made. You should make your request to work in the laboratory besides opening hours, at least 2 weeks in advance, at the coordinator of the laboratory (Saskia van Laar).

5.3 Working at the animal experimental facilities

The experimental facilities 'Carus' can only be entered when your WUR card has been activated. If you need access to these facilities you should contact the secretariat (see §2.1). You are not allowed to work in the experimental facilities without supervision.
Animal experiments can only be carried out once approval has been obtained from the Ethical Committee for Animal Experiments. Discuss with your supervisor whether there is approval of the committee and whether the management of the experimental facilities has been informed.

6 References

Editorial board (2007). "Some suggestions and guidelines for preparation of manuscripts for submission for consideration for publication. *Animal Feed Science and Technology*, **134**: 181-188.

Malmfors, B., Garnsworthy, P., Grossman, M., 2004. Writing and Presenting Scientific Papers, second ed. Nottingham University Press, Nottingham, UK.

7 Appendix

7.1 Student checklist

- ✓ Start the process of finding a thesis topic at least 6 months in advance, by filling in this intake form: https://forms.office.com/r/kvpUaW5nrL
- ✓ After completing the intake form, you will receive an e-mail to schedule an appointment with one of our thesis coordinators. If you have a question, you can contact the thesis coordinator via anu.thesis@wur.nl
- ✓ After the meeting with the thesis coordinator, contact the ANU secretariat to make an appointment with the corresponding ANU academic staff member(s) for a research subject (yvonne.vanholland@wur.nl)
- ✓ Read the student guidelines
- ✓ Download the "ANU Thesis contract" (see our website) and have it signed by your supervisor(s)
- ✓ If applicable, obtain access to Zodiac during evenings and weekends or the experimental facilities when required
- ✓ If applicable, read the laboratory guidelines
- ✓ Attend 6 MaMi-presentations and 6 Colloquia (33/36 ECTS) or 3 MaMi-presentations and 3 Colloquia (18/33 ECTS)
- ✓ Register for the thesis rings by contacting Dr Huyen Nguyen (huyen.nguyen@wur.nl), actively participate in all meetings of your thesis ring group and submit at least 2 documents

Further questions can be addressed to the MSc thesis coordinator via anu.thesis@wur.nl.

7.2 Guidelines supervision MSc-thesis

These guidelines describe several aspects of thesis work that the supervisors expect from the students. Though effective supervision is to some degree tailor-made, there are some general principles that supervisors of the Animal Nutrition Group adhere to. The following points provide some additional insight what to expect from your thesis and your supervisor in terms of the general process, responsibility, and feedback.

General process

- Two stages in the thesis process are defined:
  - Phase I: Preparation. Generally focussed at description of study/research: context, theory, aim, research questions, and hypotheses. Incl. Mami presentation and go/no-go decision.
  - Phase II: Execution and completion. Generally focussed at execution of the experiment, data analyses, interpretation and discussion of the results, and writing the report. Incl. colloquium presentation, report, and examination.
- Thesis output: Mami presentation, colloquium presentation, scientific report.
- The scientific report will be written as scientific article + literature review, unless the supervisor indicates otherwise. The journal guidelines to follow will be established at the start of the thesis.
- Within 4-6 weeks after the start, a go/no-go evaluation will take place. The decision will be based on the MaMi presentation and some written work (phase I). This can be (part of) a literature review, research proposal (if designing the experiment is part of the thesis project), or introduction (incl. context, aim, research questions, and hypotheses). It doesn't have to be a final/complete section, as long as the document allows the supervisor to judge scientific quality. The go/no-go evaluation will be based on the same competences as the final grade (see evaluation form), acknowledging the early stage of the thesis process.
- Students are always (co)supervised by a senior supervisor, i.e.: when PhD candidates act as supervisor, PhD candidates are coached by a senior supervisor.
- Thesis students are obliged to take part in thesis rings.

What is expected from students?

- Students are responsible for timely planning and communication to their supervisor. They are offered feedback moments but are responsible their selves for initiation.
- Students are responsible to define their personal learning outcomes and activities and discuss these with their supervisors.

What is expected from supervisors?

- Clearly explain procedures, expectations, and student's responsibilities. Initiate an introductory meeting where you explain expectations. Refer to the website for detailed information on aspects as MSc-thesis: contract, study guide, presentation guidelines, evaluation form and rubric, and example reports. Agree on the journal guidelines to be followed. Plan the go-no go meeting and agree on the tasks that will have to be fulfilled for the go/no-go decision.
- In case of thesis within a running project: Ensure a well-defined task for the student within the project. Discuss with the farm/laboratory about the time investments and supervision.
- In case of a 'free' project in the laboratory: Ensure there is a clear study design and detailed protocol. Make sure the required supplies are in place.
- Facilitate students to finish in time. The student is responsible for timely planning, but should not become victim of circumstances that are out of their control. In case of delays in results due to logistical problems with experiment/analyses, the student should be offered an alternative (e.g. finalize thesis with older dataset).
- Provide critical constructive feedback to allow students to develop themselves and successfully present and discuss (oral and written) scientific results, see below.

Feedback

Supervisors should provide students with sufficient critical constructive feedback to develop their scientific attitude, get the best out of themselves, and successfully complete their deliverables. To enable fair comparisons between students and to ensure the final output are still the work of the students themselves, however, supervision and feedback should be standardized and limited. The formal moments of supervisors' feedback are defined below. This doesn't mean that there are no more contact moments. It is assumed that there is a daily supervisor, that has regular meetings

with the student to discuss practical details. This can also be e.g. a PhD candidate, supervisor on location (in case of external thesis) or technical staff (in case of lab experiment). In addition, all MSc-thesis students will participate in thesis rings, to get feedback on writing skills. Feedback by the supervisor is focussing at development of research skills, scientific soundness of the work, theoretical underpinning, critical reflection, and clarity of reporting/presenting. Formal feedback is limited to the following aspects:

Presentations

1. Discussion Mami presentation. Provide feedback on sheets/story line.
2. Evaluation Mami presentation. This session is organised by the Mami chair, following the presentation. If needed, you can discuss in more detail after this meeting.
3. Quick check colloquium presentation: is the presentation suitable for presentation (to external contacts)? If not: provide feedback and offer rematch.
4. Evaluation colloquium presentation, preferably coinciding with final examination.

Report

1. Go/no-go evaluation. Discuss proposal/literature review/introduction and provide feedback.
2. Discuss outline thesis (incl subsections in (literature), results, and discussion sections).
3. Discuss results, statistical analyses, tables & figures.
4. Discuss draft thesis (can be in separate sections/moments) and provide feedback.
5. If needed: quick check final report: is this sufficient for examination? If not: provide feedback and offer rematch.
6. Final examination and evaluation. Provide feedback using the evaluation form and rubric.