UNIVERSITY OF HOHENHEIM

GUIDELINES FOR THE PREPARATION OF A MASTER THESIS

Institute of Agricultural Sciences in the Tropics
Animal Nutrition and Rangeland Management in the Tropics and Subtropics (490i)

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1. Introduction

This document lists and describes the main sections to be included in a bachelor or master thesis submitted to our department. Guidelines on specific sections are also presented along with recommendations on the formatting of the final version of your written document. Please make sure that you adhere to these guidelines, because the quality of the formal preparation of your thesis will be considered in the evaluation.

2. General guidelines

There is neither a minimum nor a maximum number of pages required for your thesis. Its length will depend on the topic, the type of research performed and your writing style.

Font: Arial

Font size: 11 pt

Line spacing: 1.3

Margins: Left 2.5 cm, Right, 3.0 cm, Top 2.5 cm, Bottom 2.5 cm

Latin words, including scientific names, should be written in italics

2.1. Thesis structure

If you pursue an experimental work, the thesis should contain the following sections:

1. Title page
2. Declaration
3. Acknowledgements (Optional)
4. Summary
5. Table of contents
6. List of tables, figure, appendix and abbreviations (optional)
7. Introduction
8. Literature review (optional)
9. Materials and methods
10. Results
11. Discussion
12. Conclusions
13. References
14. Appendix (optional)

2.2. Numbering:

Pages starting at the *Declaration* until *List of abbreviations* should be numbered with roman numerals. Every page of the thesis starting from the *Introduction* should be numbered continuously using Arabic numerals. Page numbers should appear at the bottom-right corner of the page as in this document. In the text no reference should be made to page numbers. If necessary, you can refer to sections appropriately referenced.

2.3. Headings

Main section headers (first-level header, *e.g. Abstract*, *Introduction*, *References*) are written in bold, capital letters and centered. Second-level headers are written in bold and only the initial letter is in capitals, they are placed at the left margin.
Third-level headers are written in italics and only the initial letter is in capitals, they are placed at the left margin.

First-level headers must be sequentially numbered with Arabic numerals (*e.g.* 1, 2, 3). Second-level headers should be numbered 1.1, 1.2, 1.3; third-level headers numbered 1.1.1, 1.1.2, 1.1.3. If you must include subsequent sub-sections you can decide the formatting of them (no need to number them), make sure that you use the formatting consistently throughout the entire document and that you do not generate too many hierarchical levels of sub-sections

3. Description of specific sections

3.1. Title page

The title page should present the following descriptions in exactly the same order:
1. Name of the university and faculty as well as the logo of the university;
2. Title of your thesis;
3. Legend: *"Submitted for the degree of Master of Sciences in XXXX (*i.e.* Agricultural Sciences in the Tropics and Subtropics) by YYYY (*i.e.* your name)"*
4. Name of your supervisor(s) and his/her/their affiliation(s).
5. Place and date (*e.g.* "Hohenheim, August 2014")

The title of your thesis should be concise and informative. Avoid using any abbreviations in the title.

3.2. Declaration

In this section you have to state that the work you present is original, independently prepared and that the results have not been submitted to the award of any other degree. You should also state that the content and wording of the document is entirely your own work and that you are aware that the document will be checked for plagiarism. You should include the name(s) of your supervisor(s) along with your name, signature and date. Please check the homepage of the examination board for the exact wording (https://agrar.uni-hohenheim.de/plagiate.html?&L=1).

3.3. Acknowledgements (optional)

If you had an entity financing your studies and/or graduation work, it is advisable to acknowledge them in this section.

3.4. Summary

This should be a one-paragraph abstract and should not exceed 400 words. It should contain information on the purpose of the study/problem addressed, the experimental methods, factors studied, results and conclusions. Numerical results and probability values are recommended to be presented but make sure not to overload this section with them. Undefined abbreviations are to be avoided.

3.5. Table of contents

Include the main sections of the thesis in the order in which they appear throughout the manuscript. It is advisable not to include more than third-level headers (Figure 1). Please make sure that the respective page numbers and section headers are in concordance with those in the running text.

3.6. List of tables, figure, appendix and abbreviations (optional)

List of tables, *figures* and *appendix* should be presented including their complete header and in conformity with the page number used in the text.
Define abbreviations that are not standard units according to the International System of Units (SI units: e.g. m, L, kg).

3.7. List of abbreviations.

Consider the following points:
- Each abbreviation used must be defined the first time you mention them in the body of the document (see Example 1).
- Do not use abbreviations in any header.
- Do not start a sentence with an abbreviation
- Use abbreviations sparingly. Ideally, use them for terms that frequently appear in the text and/or that are very long.
- Any abbreviation used in the *Summary*, in tables and in figures should be defined, even if they were previously defined in the text.

Make sure you use all abbreviations consistently throughout the document.

Example 1:

"Constraints on use of rumen undegradable protein (RUP) include decreased microbial biomass production…"

3.8. Introduction

The Introduction should outline the issue(s) addressed in the thesis. This section should provide an adequate background to the topic and reasons for the research problem to be addressed. The introduction starts at an unspecific level giving an overview of the state of the art in the topic, but avoiding a detailed discussion of previous studies or a literature review. Finalize your introduction by clearly stating the objectives of the work and your hypothesis (and predictions). Keep in mind to follow up these objectives and hypothesis throughout your document, especially in the discussion and conclusions sections.

3.9. Literature review (optional)

This section should present the state of the art on the topic you have studied without discussing previous publications or including your own opinions. You might divide this section in sub-topics in order to better organize your *Literature review*. It helps the student to build a good knowledge on the scientific topic studied which will be of great value when discussing the results obtained.

3.10. Materials and methods

This section should cover all materials, procedures, protocols and experimental designs followed to perform the study. *Materials and methods* section should provide sufficient detail to allow the work to be reproduced by others. Methods already published might be indicated by a reference making sure to describe any relevant modification. Any instrument, should be described referencing the model, manufacturer and location of manufacturer (See Example 2). Similarly, any relevant material or reagent should be referenced by source, manufacturer and batch number if applicable (See Example 3).

Example 2:
"Microbial fraction was ground using a ball mill (Retsch, MM200, Haan, Germany) and stored for further analyses."

Example 3:
"Saponins from *Gypsophilla paniculata* (SELVA Lot 03118, Elektrophoresis GmbH. Heidelberg, Germany) were utilized for the *in vitro* fermentation experiments."

3.10.1. Equations.

Write equations in a separate line, include between parentheses the consecutive number of equations throughout the thesis (See Example 4).

Example 4:
$$CH_4 \text{ (mmol/mol VFA)} = (0.45 \times \text{Acetate}) - (0.28 \times \text{Propionate}) + (0.40 \times \text{Butyrate}) \qquad (1)$$

When referring to an equation in the running text use: Equation (1) (see Example 5).

Example 5:
"Rumen methane was calculated according to a relationship based on VFA proportions [(Equation (1)]" or "Equation (1) was used to calculate methane based on VFA proportions."

3.10.2. Statistical analysis.

The statistical methods utilized to analyse the data should be presented in this sub-section. Statistical procedures and software should be mentioned here (See Example 6). Refer to differences between treatments only if they are statistically significant ($P < 0.05$) or if a statistical trend is observed ($0.10 > P > 0.05$) (See Example 7). This should be indicated by adding the actual 'P' value obtained from the analysis. When describing your results, please give the exact P-value at a level of two decimal places. The letter 'P' should be capitalized (See Example 7). If a regression analysis has been performed, make sure to report your final equation, including regression coefficients and their corresponding measure of dispersion (e.g. standard error). If possible include a measure of the goodness-of-fit (e.g. R^2).

Note: Depending on the type of data you have, methods different than ANOVA might be required, hence some of the parameters presented in this section might also change (e.g. Chi-Square test).

Example 6:

"Regression analysis was done using the GLIMMIX procedure of SAS (Version 9.1). Pearson correlations among all variables were determined using the CORR procedure of SAS (Version 9.1). Conditional ($R^2(c)$) and marginal ($R^2(m)$) coefficients of determination were calculated according to Nakagawa and Schielzeth (2013) using the function *lmer* in the R package lme4 (version 0.999375-42; Bates et al., 2011)."

Example 7:

"The addition of monensin decreased number of protozoa (P = 0.02), but did not change the true protein content of the microbial fraction (P = 0.23). Sugar content of the microbial fraction tended to decrease on addition of monensin (P = 0.08)".

3.10.3. Units.

The International System of Units (SI) should be used (http://physics.nist.gov/cuu/Units/units.html). Spaces should be used between all values and their units (e.g. 20 g, 250 mL), except for degrees and percent (e.g. 20°C, 33%). Percent is only used to indicate relative changes (See Example 8). If you would like to describe compositional information of *e.g.* a feed or a solution g/kg, g/L, mL/L, mol/mol, M or ppm will be accepted (see Example 9). Specify units (*e.g.* g/kg DM, g/ml milk) and never percent values.

Similarly, nutrient digestibility and degradability should be expressed as coefficients and not as percentages, and the content of, *e.g.* the digestible component should be expressed as g/kg: thus, the coefficient of digestibility of dry matter is 0.82 (Not 82%), while the content of digestible dry matter is 820 g/kg DM.

Example 8:

"Compared with the control, garlic oil and cinnamaldehyde decreased methane production by more than 70% (P = 0.01)."

Example 9:

"The concentrate mixture was supplemented with soybean oil (10 g/kg DM) and coconut oil (5 g/kg DM). Furthermore, monensin was added to the water (0.25 mL/L) before the morning feeding. The expected monensin concentration in the rumen was 25 ppm"

3.11. Results

Results should be clear and concise. If possible, use tables and figures to summarize the results. Describe the results avoiding repeating what is obviously stated in the tables/figures. Focus on the most important results. Remember that tables, figures, and descriptions in the running text should be complementary.

3.11.1. Tables and Figures.

Number tables/figures consecutively in accordance with their appearance in the text. Each table/figure should have its own explanatory title to allow the table/figure to be understood without reference to the text ("Milk production and milk composition of dairy cows supplemented with two levels of a blend of essential oils" is preferred over "Milk production"). Tables and Figures will be consecutively cited in the text using "Table 1" or "Figure 1" (see Example 10).

Example 10:
"Essential oils did not affect milk production in dairy cows (Table 1), but increased diet digestibility after one month of supplementation (Figure 1)."

Tables should be as simple as possible. Generally, variables are presented in rows and treatments in columns. If required, use footnotes below the table/figure body and indicate them with superscript consecutive numbers starting with 1 (See Examples 11 and 12). The title of tables will be presented above the table; whereas the title of figures will be presented below the figure body (See Example 11 and 12). Any abbreviations or sign in the body of the table/figure should be define, even if it has been previously defined in the text. You can use footnotes for this purpose (See Example 11 and 12).

Example 11:
Table 1. Milk production and composition in dairy cows supplemented with different sources of fat (n = 4)

| | Treatments[1] | | | SEM | P-value |
	Con	CO	SO		
Milk (kg/d)	19.5^a	19.8^a	17.9^b	0.727	0.04
Milk fat (g/kg milk)	40.5^c	42.5^b	44.9^a	0.093	0.02
Milk protein (g/kg milk)	34.1	35.1	35.9	0.077	0.11
Lactose (g/kg milk)	45.4	44.2	44.3	0.054	0.12
Milk NPN[2] (mg/dL)	28.7^B	33.9^A	35.6^A	0.055	0.07

$^{a-c}$ Means within a row with different superscripts differ (P < 0.05).
$^{A-C}$ Means within a row with different superscripts tended to differ (P < 0.1)
[1] Treatments: Con = control (no fat); CO = coconut oil (100 g/kg DM); SO = soybean oil (100 g/kg DM)
[2] NPN = non protein nitrogen

Example 12:
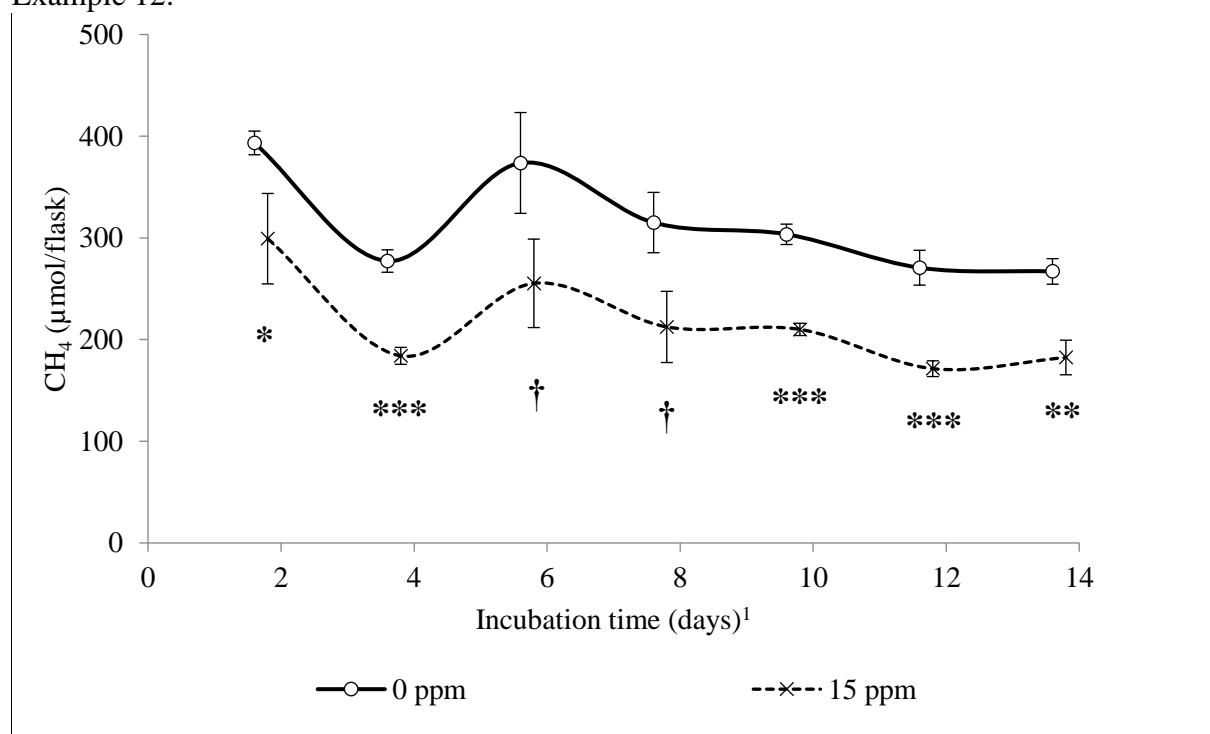
[1] Days after the start of the incubation
* P < 0.05; ** P < 0.01; *** P < 0.001
† Tendency P < 0.1

Figure. 1. *In vitro* methane production (µmol/flask) from consecutive 48 h batch incubations over 14 days in control (0 ppm) and with essential oils at 15 ppm (n = 12)

3.12. Discussion

The *Discussion* section should explore the significance of the results of the work. Be careful not to repeat the description of your findings as in the *Results* section. When preparing this section you should always keep your objectives/hypothesis in mind. In this section you may use published literature to compare your results and to try to explain the causes and implications to your findings. You will use here additional literature to that presented in the *Introduction,* but avoid extensive citations or discussion of previous results. This is a very important part of your thesis, the intellectual challenge of this section should not be underestimated and enough time must be allocated for preparing it. Based on previous experience in our department, we suggest students to start with their *Discussion* at least <u>6 weeks</u> prior to the date of submission.

3.13. Conclusions

The main conclusions of the study may be presented in a short *Conclusions* section. This section should only include statements from the findings of your own research. In this section you state the take-home message of your study. Take into account that the conclusions of your work have to be in line with your objectives and research questions that you stated at the beginning of the research. You can include in this section further research activities that might follow up to your work.

3.14. References

All publications cited in the thesis should be presented in a list of references and vice versa. In the text refer to the author's name and year of publication (see Example 13). If reference is made to a publication written by two authors, refer both names (see Example 14); if the publication was written by more than two authors, the name of the first author should be used followed by "et al." (See example 15).

Example 13:
"Hydrolysable tannins have an anti-herbivores action by inhibiting the digestion, and, at high levels, could cause toxicity (Makkar, 2003)" from:
Makkar, H.P.S., 2003. Effects and fate of tannins in ruminant animals, adaptation to tannins, and strategies to overcome detrimental effects of feeding tannin-rich feeds. Review. Small Ruminant Res. 49, 241–256.

Example 14:
"Microbial protein synthesis was determined according to the method described by Makkar and Becker (1999)", from:
Makkar, H.P.S. and Becker, K., 1999. Purine quantification in the digesta from ruminant animals by spectrophotometric and HPLC methods. Br. J. Nutr. 81, 107–111.

Example 15:

"The higher molar proportion of propionate in the *in vitro* fermentation system and lower protozoal counts are consistent with the higher efficiency of microbial protein synthesis (Makkar et al., 1995)", from:

Makkar, H.P.S., Becker, K., Abel, H. and Szegletti, C., 1995. Degradation of condensed tannins by rumen microbes exposed to quebracho tannins (QT) in rumen simulation technique (RUSITEC) and effects of QT on fermentation processes in the RUSITEC. J. Sci. Food Agric. 69, 495–500.

References cited together in the text should be arranged chronologically (see example 16).

Example 16:

"The two nutritional factors most likely to limit microbial protein synthesis in the rumen are carbohydrate and protein (Hoover and Stokes, 1991; Shabi et al., 2001)."

In the *list of references* the names of all co-authors should be mentioned. References should be arranged alphabetically on first authors' names. If more than one reference from a first author is presented, arrange this based on the name of the second author and so on. If the name of author(s) is the same for two or more references, arrange this chronologically. Journal's name should be presented abbreviated according to the journal tittle abbreviations of the Caltech library (http://library.caltech.edu/reference/abbreviations/). Follow the reference style required by the *Animal Feed Science and Technology* Journal (http://www.elsevier.com/journals/animal-feed-science-and-technology/0377-8401/guide-for-authors#68000), there you will find further examples when referencing to a book, to a chapter in a book and to web reference.

3.15. Appendix

In this section you can include any material which you consider important to justify the results of a thesis, but is either too detailed or too extended to be presented in the main body of your document.

4. Further reading

Further reading on plagiarism
http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml#acceptable1
http://www.plagiarism.org/plagiarism-101/what-is-plagiarism
Further reading on good scientific practices
https://www.mpg.de/197494/rulesScientificPractice.pdf
http://www.meduniwien.ac.at/homepage/fileadmin/HP-Relaunch/pdforganisation/buero_rektor/GSP_2013.pdf

5. Final comments

Take your time to prepare your document. Be consistent in the writing throughout the document. Major inconsistencies with the guidelines presented here might lead to the delay of your submission or failure.

6. Appendix

A1. Example of a Table of content including first-, second- and third-level headers