Guidelines to writing graduation theses at the Albrecht Daniel Thaer-Institute of Agricultural and Horticultural Sciences at the Faculty of Life Sciences at Humboldt-Universität zu Berlin

1. Purpose of the guidelines
The following guidelines are intended to provide you with information and assistance which form and structure you should use to write your thesis appropriately. The guide contains recommendations and, however, do neither replace a conversation with the supervisor of the thesis and the examination office nor reading the subject-specific study and examination regulations. The provisions of the relevant regulations apply without restriction.

The examination office checks the compliance of formal criteria, i.e. the compliance of the processing time, the number of copies submitted (print and electronic), the conformity of the title on the cover sheet with the title on the application form for admission to the thesis and the existence of the declaration of independence.

2. Legal and organizational requirements
The legal and organizational requirements can be found in the currently valid version of the subject-specific study and examination regulations in which you are enrolled.

Information and documents for the registration of the graduation thesis can be found on the website of the examination office (index: Abschlussarbeiten Bachelor- und Masterarbeiten). There you will also find a template for a cover sheet and the declaration of independence.

3. Requirements for a graduation thesis
The bachelor's or master's thesis represents an independent examination at the end of the studies. It should prove that you are able to work on a scientific question independently using practical and scientific knowledge. It is intended to confirm that you can apply the learned methods of scientific work systematically and that you can present the subject-specific knowledge which you have acquired during the studies in an understandable manner. The main goal of a bachelor's or master's thesis is to develop a logical, conclusive argumentation that serves to answer an identified problem. In short, a research question or hypothesis is developed / derived in a graduation thesis. This question should be
answered with the methods described, respectively, the hypothesis is tested. The results are presented and finally discussed in the context of the existing literature. There are basically two types of graduation theses: theoretical / literary and empirical.

For literature work, published research literature is evaluated. Hence, a systematic research is of particular importance. A literature work is suitable, for example, for the presentation of the current state of research, e.g. in the form of a review. Further e.g. two different theses, research approaches, methods, ... can be compared. Furthermore, certain discourses can be systematically represented, e.g. positions of various social actors on a defined topic. It is important for literature work that it is precisely stated in which sources (literature databases, fact databases, internet search engines) you have researched, with which search queries (if necessary with reasons) and how you have determined the relevance of the literature. In empirical, experimental work, data is collected or research data is reused. A distinction is made between qualitative and quantitative research approaches and methods.

4. Scope of the graduation thesis

The scope of the thesis is specified in the applicable, valid version of the subject-specific study and examination regulations.

5. Suggestion for formal design

5.1. Page and text design

- Format A4: left margin 4 cm, right margin 2 cm, top 2.5 cm, bottom 2 cm
- Line spacing: 1.5
- Justification or flapping
- Page numbers
- Common fonts: Times New Roman (12 pt) or Arial (11 pt) recommended
- Underlining for emphasis should be avoided.

5.2. Headlines

- The use of chapter numbers should not exceed four levels (e.g. 3.1.2.1.; but not 3.1.2.1.3.).
- If a chapter or subchapter contains only one subitem, no heading is assigned to it. For example, if chapter 4 follows chapter 3 directly after a planned subchapter 3.1., section 3.1. is omitted and chapter 3 remains without a breakdown
- Subheadings for a clearer layout can be inserted in italics, they do not appear in the table of contents.
5.3. Paragraphs

- Content-related and conceptually related matters are summarized in a paragraph.
- A paragraph consists of several sentences that are related to each other. One sentence paragraphs should be avoided.

5.4. Tables and figures

Tables and figures are numbered separately throughout the thesis. Each table or figure contains a clearly defined heading (table) or signature (figure), from which its content emerges independently of the rest of the text. All tables and figures are referred to in the text: "Humboldt’s favourite parrot was sitting on the perch (Fig. 23)". There is no need for sentences such as: "The following figure shows that...".

5.4.1. Tables

Tables are useful if they contribute to a better understanding of the facts than a purely verbal description. If numerous tables are necessary, an appendix with tables can be recommended so that the continuous text remains legible. Tables are an integral part of the text. Therefore, the text must always refer to the tables in terms of content with the cross reference to the table number (Table 4). The first references to tables in the text always appear before the object to which reference is made. **There must be no tables that are not mentioned in the text.**

All tables used can be listed in a separate directory.

- Tables are understandable without reading the text.
- All abbreviations are explained in the table heading or as footnotes and the units of measurement are given for numerical values.
- The table is placed after the first mention in the text before the beginning of a new paragraph or at the beginning of a new page.
- The numbering is carried out consecutively (Tab. 1, Tab. 2, etc.), numbering per chapter is also possible (Tab. 4.1., Tab. 4.2.).
- Table headings are located above the table and should be as short and concise as possible.
- In the case of adopted tables, the source must be added to the table heading in brackets.

5.4.2. Figures

Figures are useful if they contribute to a better understanding of the facts than a purely verbal description. A graphical representation can often clarify complex relationships better than plain text. Figures are an integral part of the text. Therefore, the text must always refer to the figure in terms of content with the cross reference to the figure number (Figure 4). The first references to figures in the text always appear before the object to which reference is made. **There must be no figures that are not mentioned in the text.**
All figures used can be listed in a separate directory.

- Figures are understandable without reading the text.
- All abbreviations are explained in the figure signature or in a separate legend with a clear assignment.
- The figure is placed after the first mention in the text before the beginning of a new paragraph or at the beginning of a new page.
- The numbering is carried out consecutively (Fig. 1, Fig. 2, etc.), numbering per chapter is also possible (Fig. 4.1., Fig. 4.2.).
- Figure signatures are located below the figure and should be as short and concise as possible.
- Texts in figures (axis labels etc.) must be legible.
- In the case of adopted or modified figures, the source needs to be acknowledged (see chapter 7).

6. Language and style

- The applicable study and examination regulations for each study program regulate in which languages the thesis can be written. In consultation with the supervisor, a graduation thesis can usually be written in German or English. Therefore, in consultation with the supervisor, an application is made to the examination board to write in another language. This must be regulated before admission of the thesis. English graduation papers also require a German summary. The language used in the thesis is also applicable to figure and table labels.
- The current Oxford English Dictionary is decisive for English spelling.
- Clarity and precision of the presentation is an essential criterion for scientific writing. Even with complex contexts, writing should be straightforward, nesting sentences should be avoided – As a rule of thumb: sentences should not be longer than 3 lines.
- The expression should be differentiated, well-advanced and precise in the terminology.
- The repetition of facts should be avoided. Terms in turn should always be used consistently, even if this is repetitive.
- Avoid amplifiers like "extremely dry" or "the very best measure" and jargon.
- Footnotes in the text make it difficult to read fluently and, if really necessary, should be used sparingly. Footnotes must be numbered consecutively.
- Numbers at the beginning of a sentence are usually written out. Within the text (but not in tables) numbers less than 13 are written out as words if they are not connected to a unit, for example: ... "twelve parcels"; but: 12 km.
- There is a non-breaking space between numbers and associated units, e.g. 3 m; 15%; 41 °C.
• Latin names of genera and species are in typed in *italics* and are written out in full when they are mentioned for the first time.

### 7. Citation rules

Thoughts and statements taken from another author must be labelled as such. On the one hand, this serves to identify and appreciate the scientific performance of other scientists and, on the other hand, puts your own research in the context of the current state of knowledge. The obligation to cite is also derived from the rules of good scientific practice (German Research Foundation, 2019, p. 25) and German copyright law (UrhG, 2018) (intellectual property of others). Disregard is a scientific misconduct.

Usually it is distinguished between two types of quotations: the **literal quotation** and the **indirect quotation**. Literal quotations are rarely used in life sciences and mainly reserved for specific cases, such as definitions. Below are some tips for quoting verbatim, examples follow below:

• Literal quotations should only be used sparingly.

• Literal quotations are placed in quotation marks and reproduced verbatim.

• Omissions are indicated by three dots (...) at the location of the omission.

• Possible additions to the original text must be added in brackets [abcd].

• At the end of the quote, the source is given with the name of the author, year of publication and page number, e.g. (Scheffer and Schachtschabel, 2010, p. 55).

• Long literal quotations should always be avoided, as they interfere with the flow of reading. If the quote is very long (over 40 words), you should clearly distinguish it from the text: e.g. leave one line before and after the quote, indent the quote, change the font size, etc.

Mainly the **indirect quotation** is used, in which the content of the source is reproduced in one’s own words, i.e. is paraphrased.

• At the end of the quote, the source is given with the name of the author, year of publication and page number, e.g. (Scheffer and Schachtschabel, 2010, p. 55).

• Some citation styles include the addition "Compare" to identify indirect citations. Here the guidelines of the corresponding style must be considered.

**Example:** indirect quote vs. literal quote

Original text passage: However, it is important in all cases that you choose a citation method and use it consistently throughout the work.

Literal quote: "However, it is important in all cases that you choose a citation method and use it consistently in the entire work" (Kühl and Kühl, 2016, p.66).
Indirect quote: As Kühl and Kühl (2016, p. 66) explain, the uniform use of the chosen citation style is of particular importance in the entire work.

or

The uniform use of the selected citation style is of particular importance in the entire work (Kühl and Kühl, 2016, p. 66).

You can choose between different citation methods, which must then be applied stringently in the work. The author-year system (Harvard style) is mainly used in agricultural and horticultural sciences. In the author-year system, the author, the year and, if applicable, the page numbers are put in brackets in the continuous text and the full evidence of the reference is listed in the bibliography. In the numerical system, a running number is placed in brackets after the quotation in the text. With the help of this number you can find the full evidence of the source in the bibliography.

**Author-Year System**

Citation in the text: (Kremer, 2004, p. 55)
in the reference list:

**Numerical System**

Citation in the text: [1]
in the reference list:

The citation methods mentioned are translated into specific citation styles that are published by professional societies, scientific journals or publishers. Literature management programs can search for these styles to set and use the specific styles. In some cases, the citation style will be specified by your supervisor. If not, you should discuss the style with your supervisor. Do not hesitate to ask him/her.

It is advisable to use a literature management program right from the start of the work. Here, the references in the text and the bibliography are created according to the rules of the chosen citation style and are inserted into the document. The computer and media service (CMS) has currently acquired campus licenses for Citavi and Endnote. The university library regularly offers a training for both programs. Mendeley is a freely available software. The use of literature management programs helps to avoid plagiarism and saves a lot of time when managing and citing the literature which is used.

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1 https://www.ub.hu-berlin.de/de/bibliothek-benutzen/literaturverwaltung-1/literaturverwaltung
As a rule, only original results should be cited, secondary sources should be avoided. **Textbook and general knowledge can be assumed and does not have to be identified.** Exceptions are permitted, e.g. formulas.

In the following you will find a possible way of citation, other citation methods are also permitted.

It is important that the chosen citation method is followed consistently and that all necessary information is included.

- The cited source is given in the text with the surname of the quoted author (without academic title) and the year of publication in parentheses; with a single author e.g. (Herzog, 2010).

- The author’s details can also be included in the running text, the further details are then put in brackets, e.g. "Herzog (2010) identified that, ... ".

- In the case of two authors, both names are mentioned and the names are linked with "and" or "&" (Herzog & Meier, 2014).

- If a source cites more than two authors, it is sufficient to name the first author with the addition "et al."; the year of publication is added, e.g. (Zeitz et al., 2010) or used in the text "Zeitz et al. (2010) show that,... ".

- If the original publication is not accessible, it must be specified from where it is quoted, e.g. (Herzog 1936, quoted from Römer and Schäfer 1944).

- The exact page numbers are essential for book quotations. After the author and the year, the page number of the quoted position follows (separated by a comma), possibly with the suffix ‘f’ (another page) or ‘ff’ for ‘more following pages’ (e.g. Herzog, 1936, p.37 ff).

- Texts by the same author with the same year of publication are specified with a letter (a, b, c ...) after the year (Ulrichs et al., 2013a).

- The way of citing online sources is determined by the selected citation style (e.g. APA, Chicago, ...). The elements of this style are then included as a template in literature management programs. Typical elements of online sources are the internet address, the last access date and the publisher of the page (imprint). It is important, as far as possible, to provide a unique identifier as an Internet address that remains stable even when moving servers, such as DOI or URN.

Here is an example using the Citavi basic style:


- If you use images or figures from other sources, you must indicate this: Fig. 1.: Overview of citation methods (according to Müller, 2019, p. 89). If you change images, the addition "modified" is placed in front. It is also important that reference is made to the illustration in the text. However, the illustration must be meaningful and interpretable even without the associated text.

If documents such as presentations, written information or oral information are used, reference must be made to these with the name of the author (Hesse-Wilting, oral information). Depending on the citation program, such sources are not included in the bibliography. Please make arrangements with the supervisor. Letters and minutes of interviews can be reproduced in the appendix, if necessary.
8. Design of content

The individual parts of the work have to be arranged in the following order:

- Cover sheet
- Table of contents
- List of figures (if desired)
- List of tables (if desired)
- List of abbreviations (if necessary)
- Summary (possibly in German and English)
- Introduction
- (if necessary separately: literature report)
- Material and methods
- Results
- Discussion
- Conclusions (if necessary, conclusion and outlook)
- Bibliography
- Acknowledgment (if desired)
- Appendix (if necessary)
- Declaration of Independence

8.1. Cover sheet

The cover sheet should contain the following information: name of university, faculty, institute and department/division where the thesis was written, title of the thesis, study program, full name of the author; name of the supervisor as well as other examiners and submission date.

8.2. Table of contents

The table of contents contains the outline of the work, supplemented by the respective page numbers on the right side of the page. The table of contents is an essential part of the work, since it reflects the author's train of thought and therefore the logical structure of the work. Hence, one should not only take care to a clear subdivision of chapters, but also to make the individual headings understandable to the reader. Repetitions of individual headings or individual keywords should be avoided (instead of "definition", "term" or "characteristics" better "characteristics of different goat breeds"). The title and a subdivision point must not be named identically. A logically structured table of contents requires that points that are on the same level in terms of content are also assigned to the same level. In addition, each level must contain at least two points, i.e. subdevision 1.1. must be followed by at least one more subdevision 1.2..
8.3. List of abbreviations

Abbreviations should be used sparingly. They only make sense if long or cumbersome terms appear frequently. They should facilitate the reading of the work and, if necessary, save space, especially in graphics and tables. Abbreviations that are easy to remember are advantageous.

A list of abbreviations is only required for work-specific abbreviations. Abbreviations are explained in alphabetical order in the list of abbreviations. Common abbreviations such as "e.g.", "etc." or units of measurement according to the international system of units are not to be listed. An overview of the commonly used abbreviations can be found in the current edition of the Oxford English Dictionary. Abbreviations for convenience are unprofessional, e.g. soil fct.. For all the other abbreviations, the first time they appear in the text, they are added to the term in brackets, e.g. Food and Agriculture Organization of the United Nations (FAO).

8.4. Summary

The summary presents the contents of the individual chapters of the graduation thesis in a condensed form. The summary should contain a brief description of the theses, the methods, which are used and it include the most important results. It should not be longer than one A4 page. Every summary must be understandable by itself.

8.5. Introduction

The introduction should deal with the current state of research in a form as concise and clear as possible and contain the questions derived for the submitted work.

The introduction is intended to clarify the problem of the graduation thesis to the reader. In addition, on the basis of the relevant scientific literature, the state of knowledge on this topic should be compiled, knowledge gaps should be pointed out and the aim of the work should be formulated on the basis of this. The goal should be clearly described so that the further methodical approach can be justified. From the description of the goals, a hypothesis should be formulated that mentally have accompanied you throughout the work. It is helpful to formulate a written hypothesis before starting to write the work and to discuss them with the supervisor. A good introduction is funnel-shaped, i.e. it begins with more general thoughts and ends with the specific formulation of the goal of the work. This can imply the formulation of a research question, possibly with sub-questions.

Alternatively, you can structure it differently (in consultation with your supervisor):

Introduction (1 page) and then literature overview of the level of knowledge. This is followed by the derivation of the hypothesis / question. The introduction should deal with the current state of research in a form as concise and clear as possible and contain the questions derived for the submitted work. The literature section describes the current state of knowledge published in relevant scientific journals and dissertations (no textbook knowledge). For this purpose, contributions have to be taken into account which deal directly with the subject area of the thesis (methodological aspects and results),
but also with related or further topics. In a qualitative research, knowledge-oriented statements are used instead of hypotheses.

**Alternatively, you can structure it differently (in consultation with your supervisor):**

1. **Introduction** in which the scientific and social relevance of the topic, the goals of the work and the research question are presented (2-3 pages). It is advisable to formulate a comprehensive research question with three to five sub-questions.

2. **State of the literature.** The current state of knowledge published in relevant scientific journals and dissertations (no textbook knowledge) is presented here. At the beginning it should be shown which search terms were used in which databases to search for literature. At the end of this part there is a brief synthesis of the level of knowledge on the topic of the work and a brief description of the knowledge gap that will be addressed in the further course of the work. The hypotheses should then also be formulated here, with qualitative research using knowledge-oriented statements instead of hypotheses.

3. The third chapter presents the used methods and data basis. It should also be made clear which methodological alternatives were considered and why these alternatives were not chosen. At the end of this chapter, the possible weaknesses and limitations of the chosen method should be briefly explained and how they could have influenced the results.

4. **Results:** The fourth part shows the results of the empirical work (see below).

5. **Discussion:** In the discussion section, the results are related to the literature - where is the existing literature confirmed, where are new aspects or even contradictions to previous research results? It is advisable to structure this part along the research questions (see below).

6. **Conclusions** (2-3 pages in total): The last chapter contains a concise synthesis - not just a mere summary - of the results. A precise statement which new contribution the work makes to the state of knowledge should also be made (this should be as precise as possible and not exaggerated). A paragraph follows on possible limitations of the work, which mostly result from methodological and practical limits. Considering this, recommendations for politics and practice should be derived where possible: Who can learn from the results of the work (approx. one paragraph)? Finally, suggestions for further research should be formulated (one paragraph). The recommendations should be based closely on the results of the work and should be so precise that they could not have been formulated without the new knowledge.

**8.6. Material and methods**

The section materials and methods describes the approach how to deal with the questions derived in the introduction. Experiments, analyses, calculations etc. must be understandable based on the given information.
This part contains the entire methodological approach and practical implementation of the work. It is important to clearly explain to the reader why and how things were carried out ("recipe"). Ideally, another expert is able to repeat the experiment and obtains similar results.

This part includes e.g. the description of the study area (climate, geology, soil, hydrology, vegetation, use, etc.), the animals / plants used or the materials / data to be examined and where they come from, as well as the analysis methods, as far as not existent, easily accessible sources can be used. In the case of animal experiments, the official approval number and the place of execution as well as the keeping conditions are to be stated.

The description of the used methods follows almost in a protocol-like way, including detailed information about the extraction and analysis of the samples. Used equipment and additional resources are indicated with the designation and the name of the manufacturer. In practical experiments with animals, the ARRIVE guidelines or comparable standards should be followed as far as possible.

The entire methodological path must also be recorded in the statistical evaluation, i.e. it is not enough to mention which program was used for the evaluation, but also the use of the analysis methods (e.g. for the calculation of correlation coefficients or the choice of model) has to be explained and justified. The procedure for literature searches can be described: in which databases were the keywords searched? It is necessary to state the origin of the data sources and the publication data.

### 8.7. Results

In experimental works, all essential data relevant to the research question must be described objectively and without interpretation in the results section in the form of text, figures and tables. When using qualitative-interpretive methods, it should be aimed for a transparent presentation of the results and their methodical derivation.

The distinction between relevant and less relevant results is the most important challenge. The latter may therefore only be presented in the text, but not with an own illustration. For handling tables and figures see above.

Generally, there are two ways to write this part, both ways have advantages. In the first variant (mostly used) results and discussion are explained in two separate chapters. The obtained and processed results are presented in such a way that they are neither interpreted nor evaluated. Forms of data presentation are tables, graphics (illustrations) or simply describing the results in the text. The connection between the results are only presented in the "Discussion" chapter. In the results section, a neutral presentation free of evaluations is essential. When describing results from statistical tests, it is reader-friendly to describe the pattern of the result and to put the result of the statistical test in brackets at the end of the sentence. Instead of "The difference between the feeding conditions was significant.", "Milk from cows that were fed with chocolate had a higher cocoa content than milk from cows without added chocolate in the feed (F\text{14.67} = 25.48, p = 0.004)" would be better.

**Variant 2 (in consultation with the supervisor):** the results section and the discussion are described in one block. A sub-structuring can be used for this. The advantage is that the discussion can take place immediately right after the tables and graphics. The disadvantage is, that you quickly lose the overview as various results are interpreted immediately, although many have not yet been described.
Experience has shown that this variant is more suitable for presentations than for written work. All other remarks should be noted as in variant 1 above!

8.8. Discussion

The results obtained are interpreted in the discussion and compared with those of the literature.

This section is a very important part of the work. Here all results are compared in a clear manner and discussed as extensively as possible and necessary within the scope of the work. The discussion, like the introduction, is funnel-shaped, but in the opposite direction. You start with specific aspects of your work and your arguments become wider and wider. In the discussion, the results are not repeated in numbers, but interpreted in relation to the objectives and hypotheses and integrated in the current state of research. Confirmations or refutations of other studies and possible reasons for this should also be discussed. Ultimately, methodological difficulties should also be critically discussed here.

8.9. Conclusions and outlook

Attention! This section is often misunderstood as a summary. Especially here, the results of the discussion should be looked at in a larger context in a short and precise form: What is the greater importance of the obtained results? What is the contribution of the work to the state of knowledge? What is the (practical) impact of the knowledge gained during the work? What recommendations are derived from the new findings? In addition, the hypotheses are taken up again and assessed on the basis of the data obtained. Furthermore, an outlook for future research is given and open questions are presented.

8.10. Bibliography

All sources specified in the text - and only these - are listed in the bibliography in such way that the sources can be clearly identified. Once a format is chosen, it must be kept consistent. The literature is sorted alphabetically by the surname of the first author, or numerically in the numerical system (see above). The published order of the authors remains unchanged. If several publications by the same author are listed, they are arranged according to their year of publication. Publications by the same author with the same year of publication are specified with a letter (a, b, c ...) after the year of publication. This specification must correspond to the mentioning in the text. The following must also be stated: Title of the publication in the original language (translation, if not German or English). Depending on the type of document, in addition to information about the author and title mandatory elements are required. The arrangement and separators differ depending on the citation style chosen. In the case of journal articles, the journal title, volume number, page numbers (from - to) and, if applicable, unique identifier, e.g. DOI, are added. For books / monographs: publisher, place of publication, edition, chapter etc. are necessary. In the case of dissertations, the place of publication and the year of publication are replaced by the place of the doctorate and the year of the doctorate with the addition "Diss." (for "dissertation", e.g. "Diss. Munich 2019, unpublished").

Publications by corporations, institutions, authorities or companies are also listed alphabetically in the bibliography.
Electronic sources and images are to be cited completely as described above and included in the bibliography. Other formatting of the bibliography is also permitted. In any case, check the completeness of the bibliography by comparing it with the text (and vice versa) before submitting your thesis.

8.11. Appendix

The appendix is placed immediately after the text; the pages are counted using Roman numerals. The appendix contains elements that are not absolutely necessary to understand the text. It therefore proves to be particularly appropriate when further topic-related information is to be conveyed. Examples of parts of the appendix include own calculations for overviews, questionnaires or data sheets, original data, photos or source codes for modelling work.

8.12. Declaration of independence

At the end of the work, the affidavit is inserted and dated and signed by hand.

9. Further literature


van der Gaast, Koen; Koenders, Laura; Post, Ger (2019): Academic skills for interdisciplinary studies. Second, revised edition: Amsterdam University Press (Perspectives on Interdisciplinarity).


A selection of methodological literature can be found under the following links (Primus catalogue):

- Introduction to scientific work and scientific writing:


- Scientific writing Biology:


- Methods in Social Science:


10. Bibliography of the guide


Leitlinien zur Sicherung guter wissenschaftlicher Praxis. Kodex (2019). Bonn: Deutsche Forschungsgemeinschaft (German Research Foundation). Also available in English.

11. Contact

If you have any questions, suggestions or suggestions for correction, please contact: Dr. Deike Hesse-Wilting (deike.hesse-wilting@hu-berlin.de).

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