UNIVERSITY OF HELSINKI
FACULTY OF AGRICULTURE AND FORESTRY

Master's Thesis Handbook

First Name Surname

Master's Thesis

University of Helsinki

Master's Program of Forest Sciences

Forest Ecology and Management

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Tiivistelmä/Referat – Abstract

This handbook serves as a guide to write a Master's Thesis in the Master's program of Forest Sciences. The technical guidelines also apply for writing the research plan, which is needed before the data collection for the thesis can begin.

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Muita tietoja – Övriga uppgifter – Additional information
This handbook serves as a guide to write a Master's Thesis in the Master's program of Forest Sciences, in Forest Ecology and Management study line. It can be used as a guide for writing scientific papers in other study programs and majors, as well.

CONTENTS

1 MASTER'S THESIS

1.1 Foreword

This handbook serves as a guide to write a Master's Thesis in the Master's program of Forest Sciences. The technical guidelines also apply for writing the research plan, which is needed before the data collection for the thesis can begin. Both the research plan and the results of the thesis are also orally presented in the Master's thesis seminar. More instructions can be found from the seminar Moodle pages.

This guide has been formulated so that the layout (pages, fonts, marginals, line spacing etc.) corresponds to the layout of Master's Thesis. It includes readily formatted text styles for the body text, titles, figure and table captions and the list of references. It can thus be used as a template for writing the thesis and research plan.

1.2 In General

The purpose of the Master's thesis is to train the student in the following areas:

1) independent and systematic research work
2) research methods used in the concerned discipline
3) use of references
4) scientific presentation
5) written expression

The chosen topic should deal with a scientifically relevant problem in the concerned discipline. The goal is for the student to learn skills, which he/she may utilize after graduation in practical professional duties or as a researcher.

The thesis typically consists of the following parts (the parts in brackets are optional):

1. Title page
2. Abstract
3. Table of contents
4. (Preface / acknowledgements)
5. (List of Abbreviations)
6. Introduction
    a. Background information
    b. Summary of previous research on the topic (theoretical framework)
    c. Defining the research topic
    d. Research objectives, research questions, hypotheses
7. Material and Methods
8. Results
9. Discussion
10. Conclusions
11. References
12. (Appendices)

The thesis should be written in Finnish, Swedish or English and of good linguistic form. Good written expression is precise, logically structured, and terms and concepts are used as they are commonly known. Grammar and spelling should comply with the rules of the English language in the context of scientific writing. Differences in terminology and concepts should be explained and justified; uncommon and new concepts should be defined.

Good scientific text is characterized by the student's own creative contribution. Thus, the text should **not** only consist of a collection of thoughts presented earlier by others (plagiarism). The student should take a critical stance towards his/her references. He/she should assess the credibility of different sources and data, as well as determine how similar or dissimilar previous research findings have been.

1.3 Types of Theses

Most Master's theses are comprehensive *research reports*, which include research results. They typically follow the structure Introduction - Material & Methods - Results - Discussion - Conclusions - References. However, a Master's thesis may also be literature-based research report, which both analyzes and synthesizes existing literature on a particular forest sciences related problem. The structure of such a literature review is generally more flexible than that of a traditional research report. Thus, the above-mentioned structure is often adapted for the purposes of a literature review type of thesis.

2 STRUCTURE OF THE MASTER'S THESIS

2.1 Title

The title should describe the thesis topic, preferably concisely, but should be at the same time both informative and attractive. Title is placed in a title page (and in the cover, if the thesis is printed). The title page includes the title of the work, the information of the author and the date (month/year). Formatting follows the title page of this guide. Please note, that the text on the title page and the cover of the thesis are generally identical copies of each other.

2.2 Abstract

The abstract is a miniature thesis, revealing the essential contents of the actual thesis. On the basis of the abstract, the reader generally decides whether or not to read the entire thesis. It is a concise description of background, objectives, methods, results and conclusions. The abstract does not contain citations, tables, or figures. Results that are not presented in the actual thesis should not be included in the abstract.

The length of the abstract should not exceed one page and should be typed on a ready-made form, found e.g. in the E-thesis website. The abstract should be placed at the beginning of the thesis (after the title page but before the table of contents).

2.3 Table of contents

Table of contents (TOC) with page numbers. Formatting follows the TOC of this guide. In MS Word, TOC tool is found under References -tab.

2.4 Preface / acknowledgements

If you wish, you may include a Preface (a.k.a. foreword, acknowledgements) in your thesis. It is typically placed after the title page and abstract but before the table of contents. You may thank your co-workers, supervisors, family, friends or whoever you wish. It is also customary to list the funders of the research here.

2.5 List of Abbreviations

If your thesis contains many abbreviations and acronyms, you should list them here with their definitions.

2.6 Introduction

The purpose of the introduction is to arouse and maintain the interest of the reader (bait, hook and reel in, so to speak). In it one should explicitly and logically introduce the research problem and the research question(s). For clarity's sake, the structure of the introduction is generally divided into four parts: 1. Background of Research, 2. Summary of Previous Research, 3. Defining the Research Topic and 4. Research Objectives.

2.6.1 Background

The background of the research should be described in the beginning of the introduction. It is essential to tell what particular forest science or forestry problem area the research is concerned with, as well as explain why the chosen topic is important, significant, and timely.

2.6.2 Summary of Previous Research

The objective is to pull together previous research findings presented in scientific literature on the chosen topic. Such a literature review forms the *theoretical framework* of the intended research. A clear and concise summary of previously published domestic and international literature demonstrates that the student has adequately read up on the research topic.

One goal of Master's thesis is to show the mastery of the theory and methods in one's own discipline and research topic. Thus a thorough literature review of the theoretical background is sometimes presented as a separate chapter after the introduction. In this case, only the most essential scientific background, leading to the presentation of research problem, is given in the introduction.

2.6.3 Defining the Research Topic

By reviewing previous research findings, it is then possible to reveal the gaps in present knowledge, which one's own research intends to fill. At this stage, one can disclose the questions that were raised by the literature review. The research is then defined to focus on the desired problem area. One should not tell about all prior topic-related research findings, rather one should concentrate on those that are most relevant to one's research objectives.

2.6.4 Research Objectives

At the end of the introduction, the research problem and objectives are clearly defined. Such objectives should be both ambitious but nonetheless achievable. Special attention should be paid to formulation of research objectives, as this is one of the most vital

parts of the thesis. This section can be as a subchapter in the introduction, or given as a separate chapter.

2.7 Material and Methods

The purpose of this chapter is to describe the material and methods used for collecting the necessary data to solve the research problem. Additionally, the numerical handling means for sorting, processing, and managing the collected data should be described. The description of data collection should be comprehensive enough to ensure repeatability based on the given information. Models should be described accurately to allow their suitability to be assessed. The chapter should answer the following questions:

- What does the data consist of?
- How was the sampling carried out?
- What was measured?
- How were measurements made (and with what kind of accuracy)?
- What methods and tools for data analysis were used?
- How representative is the collected data?

In experimental work, research material, experimental design, and data analysis methods (i.e. statistical models) should be described in detail. The description of the experimental design should include answers to the following questions: What is being explained and by which variables/factors? Which variables are constant? As far as models are concerned, one must explain how your data has been incorporated into the model.

In inventory-type research, the sampling population is reported, the sampling design explained in detail and the quality and scope of the data described. It is also necessary to describe how the sampling design has been taken into consideration when analyzing results.

2.8 Results

In this chapter, the essential research results are presented in a logical manner. The research results should be based on the analyses and measurements made only in the study in question, and answer the questions and hypotheses posed in the chapter on Research Objectives. Report/describe only the results, as comparison and discussion against earlier research will be presented in the Discussion chapter. The collected data should be condensed and presented clearly. All major findings should be elucidated using tables and/or figures, with a reference in the text to each table or figure in question. When referring to a specific table or figure in the thesis text then the first letter should be capitalized (e.g. Figure 1, Table 3). Try to present silvicultural, ecological, biological, econometrical etc. results rather than statistical test. For example, write: "Fertilisation always increased the growth rate of the tree stands (Fig. 1)" rather than "The growth of the trees in all the fertilised treatments a, b and c was statistically significantly different ($p= 0.002$, $p<0.001$, $p=0.04$, respectively) from that in the control treatment d." Analysis results and statistical parameters should, however, be presented in great enough detail to permit the assessment of the validity and reliability of the analyses. This can often be done more clearly by using tables rather than listing parameter values in the text, especially if values to be reported are numerous. It is also necessary to report negative (contrary to the hypotheses) results should such arise.

2.9 Discussion

Here, the theoretical discussion presented in the Introduction is utilized and elaborated on further. The major results are restated and their meanings are discussed in the context of earlier knowledge on the research topic and study field. Your thesis results are compared with previous research findings presented in literature and it is discussed to what extent the results are consistent or conflicting with earlier findings. The goal is to create a synthesis of one's own findings and previous ones.

Furthermore, the research objectives, chosen approach, and methods are critically evaluated. The aim is to show which aspects of the study succeeded well or sufficiently enough, and where there is still room for improvement.

The representativeness of data and the possibility for generalizing results should also be examined: how well does the data represent the studied population and the phenomena to be explained? Reservations regarding the interpretation of results are also brought forward. New results are not presented, but rough calculations about the generalisation of the results, for example to the whole country or boreal zone, can be made. Also, new research needs, improvements to methods, implications to practical forestry etc., can be presented.

2.10 Conclusions

The purpose of this chapter is to formulate the most important research results into clear, concise conclusions. Furthermore, it may be considered how the obtained research results can be utilized in forest sciences and forestry and how the employed research methods may be applied or developed for further studies. Additionally, one can offer insight on what related questions were left outside the framework of the study. This chapter is evidently linked to the beginning of the thesis, in which the research topic and problem were described. Notice, however, that Conclusions chapter is not the summary or abstract of the study. Thus, do not restate all results, only the conclusions based on the results and their relation to earlier knowledge.

2.11 References

List all references with their bibliographic information (see chapter 4.3 for instructions).

2.12 Appendices

Here you can place material, which is too big to insert within the main text. For example large data tables, field data forms, maps, and any other material that contains useful infromation for repeating the study or checking the calculations etc. Appendices are numbered in the order of citing in the text (Appendix 1, Appendix 2, …). If the appendix includes many figures or tables, cite both in the text (e.g. Appendix 1, Figure 2). Page numbering continues to appendices.

3 FORMAT

3.1 General Guidelines

The thesis should be written on A4-sized pages, with line-spacing of 1.5. The body text font is Times New Roman, size 12. The main titles (level 1) are written with capital letters, font size 14. Page margins are 3 cm right and left, and 2.5 cm top and bottom. If the thesis is to be printed (for your own use), remember to leave 4 cm margin on the inside (and 2 cm outside) to allow room for the binding.

Justify the lines and hyphenate words. Separate titles from paragraphs and paragraphs from each other by a blank line, do not indent the first sentence of a paragraph. Enough space (at least one blank line) should be left before and after titles, Tables, Figures etc. so that they can be discerned from the text.

Number the pages consecutively, starting the counting from Title page, but starting numbering from the Contents-page (i.e. Title page and Abstract do not have page numbers). Place the number on the bottom right side of the page. The title and number of each appendix is placed on the top right corner of the page and they are numbered consecutively (e.g. Appendix 1 — Research plan).

3.2 Chapter Titles and Table of Contents

Titles of chapters are boldfaced. Chapters and subchapters are numbered consecutively and formatted as follows:

1 MAIN CHAPTER

1.1 Subchapter

1.1.1 Subsubchapter

Leave two empty rows before main chapters and one row before subchapters. At least five lines of text must follow the main chapter and three lines of text before subchapter before the page changes. Otherwise start the chapter from new page. Avoid using more than three heading levels. If a chapter has a subchapter, each subchapter needs a title.

For further examples of the Table of Contents pages, see Moodle pages of the seminar.

3.3 Decimal point

A period is used in the English language to delineate the decimal point (not a comma, as in Finnish), e.g. 5.66 cm.

3.4 Tables and Figures

The purpose of these visual aids is to supplement and clarify the text. Tables and figures and their captions should be made self-sufficient, so that they can be easily interpreted without relying on the body text. Use the same concepts and terms as in the body text. Remember to explain the units and variables either in the Figure/Table captions or in legends within the figures. Avoid unnecessary special effects such as 3D in Figures, as they usually make the message more difficult to read. Generally, vertical lines (partitions) are not used in Tables, use spacing instead. If symbols or abbreviations are presented in a Table, they should be explained below the Table as footnotes. Tables should be spacious and clearly titled. All tables should be uniform in style. If the table is too wide for portrait page layout then use landscape layout (on a separate page).

Figures and tables are numbered consecutively in the order they are cited in the text. Thus remember to cite every figure and table in the text, and place them in the text as soon after the first citation as possible. Place figure captions (titles) under the figure and table captions (titles) above the table. Use sans-serif font (e.g. Arial, Calibri) size 10 in the captions. In the table use the same font but the size can vary from 8 to 10.

Examples:

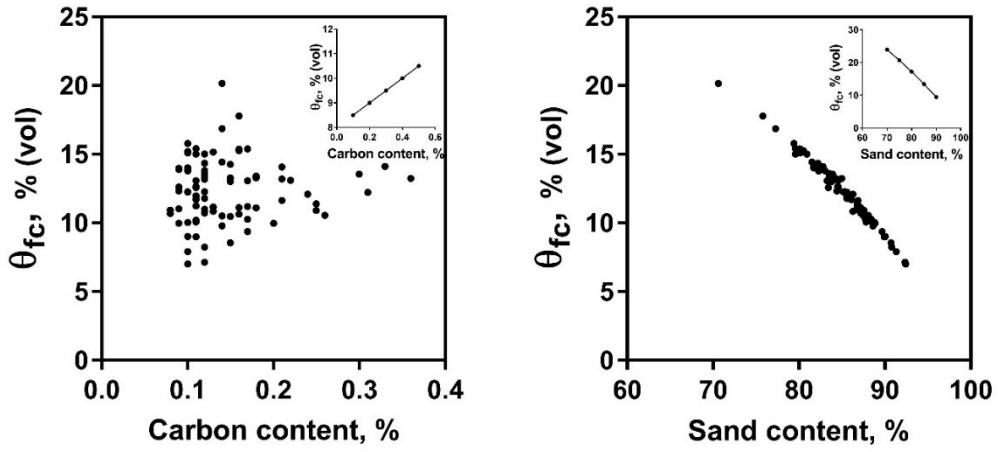

Figure 3. Relationship between modelled soil moisture contents at field capacity, θ_{fc} (Balland et al. 2008, eqn. 7. Values converted to volumetric values using bulk density) and soil carbon content (left) and sand content (right). Values are plot mean values. The inset graphs show the effect of carbon and sand contents on θ_{fc} when the other factor is kept constant.

(Source: Abaker et al. 2018)

Table 1. Forest characteristics (mean, median, minimum, maximum, and standard deviation) of the study plots by defoliation class *mild* (<20% defoliation) and *moderate to severe* (>20 % defoliation). dbh = diameter at breast height, h = tree height, No. of stems/ha = number of stems per hectare and BA = basal area.

Statistic	dbh (cm)	h (m)	No. stems/ha	BA (m^2/ha)	Defoliation (%)
Mild defoliation (n=21)					
Mean	20.5	19.2	565	18	10
Median	20.5	19.3	526	19	10
Min	16.5	16.4	320	10	1
Max	24.0	21.6	1057	29	19
Stdev.	2.1	1.4	184	5	6
Moderate to severe defoliation (n=7)					
Mean	20.6	18.9	446	15	54
Median	20.8	18.3	464	16	51
Min	16.4	15.4	283	9	26
Max	24.1	23.1	575	21	77
Stdev.	2.5	2.4	90	4	22

(Source: Kosunen et al. 2017)

3.5 Equations

Equations are numbered consecutively on the right side of the page in parentheses. The symbols included in the equation are explained below the equation.

Example:

Soil respiration (R_S, g CO_2 m^{-2} h^{-1}) was predicted with a model

$$R_S = a + b*WT \quad (1),$$

where a ja b are parameters and WT is the depth of the water table (cm).

3.6 Scientific Names

When using scientific nomenclature, refer to the most recent, reliable sources. Scientific names (Latin names of species) are written in italics (e.g. *Sphagnum teres*) The scientific names of the most common species are not generally mentioned, if it is not relevant for the study.

4 CITATIONS AND REFERENCES

4.1 Citing References in the Text

In the thesis, it should become evident which thoughts and ideas are the student's own and which ones are based on previous research findings. If text is not cited, it is assumed to be the intellectual product of the student.

Try to use original works, publications, research reports etc., because the writer's original message may become blurred when using second-hand sources. However, if the original work cannot be found or finding it requires undue effort, cite such sources as described in Item 1 below under "list of examples".

The citation is placed next to the text and always before the period. A paragraph should not be written based entirely on one source; it is the same as copying earlier text and ignoring the one's own creative contribution. If several different paragraphs refer to the same source, the citation is made by starting the paragraph series with an explanatory clause, e.g. "If not otherwise mentioned, the information in the following paragraphs is from Johnson (1985)."

Personal communications may also be cited. A personal communication can be personal interviews, letters, memos, emails, non-archived messages from discussion groups and bulletin boards, telephone conversations etc. When citing a personal communication try to provide as exact a date as possible and include initials with surname. The cited sources can also be listed under References if they are numerous. For example:

D. B. Duck (personal communication, April 1, 2002) estimates that ...

B. S Wilson, (personal communication, March 25, 2003) believes that University of Auckland students will find exceptional careers.
or (L. Golder, personal communication, July 27, 2002).....

If there are many oral references (as for example in interview studies) one should make a separate listing of them under the references.

When citing electronic sources, like www-pages that may not be permanently available and content unchanged, one should pay special attention to the quality and reliability of the sources. Such material should be assessed in the same way as traditional material.

For references in the text, the name-year system is used:

"Allen (1994) has shown..." or "It has been shown (Allen 1994)..."

Allen and Jones (1990)

Allen et al. (1996)

(Allen 1988, Smith 1991, Jones 1994)*

(Handbook of forest... 1991)**

* When reference is made to several publications, arrange them in chronological order.
** Where a publication has no known author or editor, the first 2-3 words of the title are quoted (followed by three dots), together with the year of publication. The term "Anonymous" should not be used.

Below is a list of examples:

1. If you cannot find the original source anywhere, and you need to refer to a source quoted in another source you cite both in the text:-e.g. A study by Smith (1960 cited in Jones 1994) showed that...Population growth puts immense stress on natural resources in developing countries (Jackson 1999 cited in Jefferson 2000).

2. If there are two authors the surnames of both should be given:-e.g. Matthews and Jones (1997) have proposed that…

3. If there are more than two authors the surname of the first author only should be given, followed by *et al.*, which should be italicized:-e.g. Office costs amount to 20% of total costs in most business (Wilson *et al*. 1997)

4. If the author's name occurs naturally in the sentence the year is given in parentheses:-e.g. In a popular study Harvey (1992) argued that we have to teach good practices…e.g. As Harvey (1992, p.21) said, "good practices must be taught" and so we…

5. If the name does not fit naturally into the sentence, both name and year are given in parentheses:- e.g. A more recent study (Stevens 1998) has shown the way theory and practical work interact. e.g. Theory rises out of practice, and once validated, returns to direct or explain the practice (Stevens 1998).

6. If a number of publications produced by the same author(s) during the same year are cited in the text, they are distinguished from each other with the letters a,b,c, etc.: (Lähde 1990a), (Lähde 1990b)

7. When citing a specific passage in a book/monograph, the citation should include page numbers i.e. (Kakkuri et al. 1974, p. 57); this does not apply to research articles!

4.2 List of References

In the list of references, information is given so that readers can find the source. Such information usually includes authors names, publication year, artile/book title, journal/book name, volume and issue number, publisher, publication place and page numbers. DOI-number or other links to electronic source is also given, if available. The standard number, ISBN in books, or STRN in reports, should be given for sources of low circulation at the end of the reference.

The format of the reference list varies between scientific journals. In this guide we follow (in most parts) the instructions of Silva Fennica (https://www.silvafennica.fi/). References are placed in alphabetical order according to the author's (or authors') last name. Publications by the same author are placed in chronological order, beginning with the oldest. Publications made by the author alone precede those in which his/her name is listed as the first co-author. Publications with more than two co-authors follow those with only one or two authors. In addition, if a publication has no obvious author or editor, the publication is listed in alphabetical order of its own title.

Please consult the examples below:

Order of References

Smith, C. 1996. Aspen. Timber 77(4): 369–384.

Smith, C. 1997. Silver birch. Timber 78(1): 17–23.

Smith, C. & Allen, A. 1995. Scots pine. Forest Management 15(1): 5–9.

Smith, C. & Harris, B. 1993. Scots pine. Forest Management 13(2): 105–119.

Smith, C., Harris, B. & Allen, A. 1990. Sawn goods. Timber 71(2): 131–140.

Smith, C., Allen, A. & Harris, B. 1995. Sawn goods revisited. Timber 76(3): 231–240.

Article in a Journal (or a newspaper)

Deleuze, C. & Houllier, F. 1997. A transport model for tree ring width. Silva Fennica 31(3): 239–250.

Article in a Book or Conference proceedings

Kirkinen, J., Minkkinen, K. & Savolainen, I. 2008. Greenhouse impact of the use of peatland for energy – scenarios considering peatland utilisation and after-treatment. Proceedings of the 13th International Peat Congress, June 2008. Vol 1, Oral Presentations, p. 117–119. ISBN 0-9514890-4-6.

Wilcove, D.S., McLellan, C.H. & Dobson, A.P. 1986. Habitat fragmentation in the temperate zone. In: Soulé, M.E. (Ed.). Conservation biology: the science of scarcity and diversity. Sinauer, Sunderland, Massachusetts. p. 237–256.

Monograph (= Book),

Ilvessalo-Pfäffli, M-S. 1995. Fiber atlas: identification of papermaking fibers. Springer Series in Wood Sciences. Springer-Verlag, Berlin-Heidelberg-New York. 400 p.

No author:

Finnish Statistical Yearbook of Forestry 2000. 2000. Finnish Forest Research Institute. Gummerus Printing Press Inc. Jyväskylä. p. 217-230.

References to Internet Sources

Author's /Editor's surname, initials OR name of event/site. Year. Title of document (if applicable) [online/internet site]. (Edition, if applicable). Place of publication, Publisher (if ascertainable). Available at/from: URL [Cited/Accessed Date].

Johannesburg summit 2002. 2003. [Internet site]. United Nations, Division for Sustainable Development. Available at: http://www.johannesburgsummit.org. [Cited 5 Feb 2003].

Holland, M. 2004. Guide to citing Internet sources [online]. Poole, Bournemouth University. Available from: http://www.bournemouth.ac.uk/library/using/guide_to_citing_internet_sourc.html [Accessed 4 November 2004].

CD-ROMs and DVDs

This section refers to CD-ROMs which are works in their own right and not bibliographic databases.

Hawking, S.W. 1994. A brief history of time: an interactive adventure. [CDROM]. Crunch Media.

Map

Originator's surname, initials (may be cartographer, surveyor, compiler, editor, copier, maker, engraver, etc.). Year of publication. Title, Scale (normally given as a ratio). Place of publication: Publisher. e.g.

Mason, J. 1832. Map of the countries lying between Spain and India, 1:8,000,000. London: Ordnance Survey.

Personal Communication

Surname, initials. Year. Personal communication, date. Title, profession, where employed, country.

Sarkkola, S. 2006. Personal communication, 16.3.2006. Doctor of Forestry, Researcher, Dept. of Forest Ecology, Univ. of Helsinki, Finland.

5. REFERENCES

Abaker W., Berninger F., Starr M. 2018. Changes in soil hydraulic properties, soil moisture and water balance in *Acacia senegal* plantations of varying age in Sudan. Journal of Arid Environments 150: 42–53. http://dx.doi.org/10.1016/j.jaridenv.2017.12.004

Kosunen M., Kantola T., Starr M., Blomqvist M., Talvitie M., Lyytikäinen-Saarenmaa P. 2017. Influence of soil and topography on defoliation intensity during an extended outbreak of the common pine sawfly (*Diprion pini* L.). iForest 10: 164-171. http://dx.doi.org/10.3832/ifor2069-009

APPENDIX 1 – THE MASTER'S THESIS RESEARCH PLAN

Preparation of the research plan

It is difficult to carry out good research without a good research plan. Without a proper plan or without having previously carried out similar research you may end up measuring the wrong things, and the research will not produce the information that you wanted or needed. If you do not take into account what resources are required, you may run out of time and money. Research is a long process and the planning phase is at least as important as its implementation. So start planning early.
Remember that your research plan must be completed, approved by your supervisor, and presented at the seminar before you start collecting material!

The research plan usually starts with 1) selecting the topic and forming the research questions. Choose a topic from your field of study area that interests you that you know well. Topics often come from research groups or from forestry agencies and companies, but you can choose the topic yourself. Your topic should be relevant (to science or practice, preferably to both) and your research should produce new knowledge and not just repeat what is already known. After selecting a topic, 2) familiarize yourself with previous research on the subject as thoroughly as possible (read relevant previous research). Think about how you could study the topic, what kind of experimental design and what kind of measurements are required. So read how others have done similar research and 3) think about the methodology for your own research. Make sure that 4) your resources are sufficient, that you have enough time and money to do the research. Consider 5) how you will draw conclusions when you have collected and processed the data. Which statistical method(s) will you use to test hypotheses and do you only use significant results, will you develop a mathematical simulation model and compare the results with measured results, or will base your conclusions on the results from an interview/questionnaire study?

Ford (2004) described these 5 research plan processes in his textbook, *Scientific Method for Ecological Research*. However, the subject for your Master's theses often comes from a research project in which subject, site and methods have already been decided and the research project provides resources and you have to collected the field data. Sometimes the measurements have already been made and you get the ready data to work with. Thus, the main task for you is to measure, analyse the material, draw conclusions and write a report (thesis). Even in these cases, it is still essential that the student knows the subject and methods used as well as possible. It is thus important to understand what are the research aims and research questions, to be familiar with previous research, to have a deep understanding of the method(s) used in the research, and what kind of material/data the method produces. Rarely is it a case of too much data, but there may be too little for the purposes of the research and your thesis. One must know how many plots, cases, and replications are needed to get enough data to answer the research questions. Consider what is the response variable, what explanatory variables should be measured, with what accuracy, etc. What if you fail to measure everything needed or if the instrument or equipment breaks? Can you

change the method or do you need to change the research questions? So you need to make a good research plan!

Structure of the research plan

The structure of the written research plan is very similar to that of the Master's thesis, except that the results and their examination and discussion are missing. Also the formatting of text, figures and tables, and use of source references is similar to that used in the thesis. The structure is as follows:

Title page

Table of contents
(Abbreviation List)

1. Introduction
   - Background
   - Theory
   - Research Problem
   - Aims and objectives

2. Material and methods
   - Collection of material
   - Analysis of data

3. Work schedule/timetable

4. Site/location and support/supervisor staff

5. Sources and references

The introduction first outlines the background, i.e. the importance of the research topic and relevance of the work to any larger project, etc. The theory section outlines what is already known about the topic (axioms), defines concepts and identifies the knowledge gap that shapes the research objectives and research questions. Asking questions in the form of postulates, or claims, often clarifies the objectives of the plan, but is not appropriate in all cases and is not mandatory. If there are many abbreviations / acronyms in the work, it is a good idea to make a separate list of these before the introduction. Otherwise, the terms are defined when they first appear in the text.

The material and methods should be described in as much detail as possible at this planning stage. The analytical methods should also described as accurately as possible. It is important to find out what and what variables are being measured, what / which response variables, and what is the distribution of the data. This information can be used to identify which statistical methods could be used and what values will be used to draw conclusions. What software (Excel, R, SPSS SAS-JMP,….) you

intend to use is less important than the statistical method (GLM, ANOVA, t-test, correlation, multiple regression PCA, etc). The section ends with a description of the work schedule (fieldwork, laboratory work, calculations, writing) and the site of the project (e.g. Department of Forest Sciences, LUKE, Metsäyritys Oy).

It is common at the planning stage that the methods of data analysis are not yet completely clear in mind. However, this is worth considering these because the better you know what you are doing and how you are going to do it, the less unnecessary work you will do and the more likely you are to get data to answer your research questions. But if you do not know the methods, do not postpone presenting your research plan because of this - you can get good ideas from other participants at the seminar.

A well-done research plan serves as the backbone for the thesis itself. Ideally, the Introduction and Materials and Methods chapters are already available, and only the Results and their Discussion remain to be written. So it is really worth investing in making a research plan - the work is not wasted! However, keep the research plan concise for the seminar so that the actual text (chapters 1-4) is no more than 10 pages long.

Presentation of research plan in the Master's seminar

The completed research plan is presented at the Master's seminar. Present your research using the same structure as the written plan: Title, background, theoretical framework, objectives and research questions (postulates / hypotheses), material and methods, and timetable. Use pictures and other means to make your presentation clearer and livelier. See the detailed instructions (schedules, length of presentations, etc.) on the course's Moodle pages and upload your presentation to Moodle in time to allow others to read it before the seminar and to consider good questions and comments.

APPENDIX 2 – EXAMPLES OF CONTENTS PAGES ?