

## Table of contents

I. General introduction.....	13
II. Objectives of the study .....	14
III. Chemical composition of the green biomass of indigenous tree and shrub species in Galessa-Jeldu areas, Ethiopia: Implications for soil fertility management.....	16
3.1. Introduction .....	16
3.2. Materials and methods .....	17
3.2.1. Study site .....	17
3.2.2. Characteristics of the tree and shrub species.....	17
3.2.3. Methods of plant sample collection, sample preparation and laboratory analysis .....	17
3.2.4. Data management and analysis .....	18
3.3. Results.....	19
3.3.1.Water content of the aboveground plant tissues.....	19
3.3.2. Macronutrient composition of tree species .....	19
3.3.3. Contents of lignin and soluble phenolics .....	21
3.3.4. Ratios of C, lignin and soluble phenolics to N.....	21
3.4. Discussion.....	22
3.5. Conclusions .....	24
IV. Soil properties under four homestead grown indigenous tree and shrub species in Galessa-Jeldu areas, Ethiopia.....	25
4.1. Introduction .....	25
4.2. Materials and methods .....	26
4.2.1. Study site .....	26
4.2.2. Selection of the tree and shrub species.....	26
4.2.3. Soil sampling and analysis .....	26
4.2.4. Statistical analysis.....	27
4.3. Results.....	28
4.3.1. Soil pH, organic C, total N and available P .....	28
4.3.2. Exchangeable bases.....	29
4.3.3. Cation exchange capacity and base saturation .....	32
4.3.4. Correlation between soil properties .....	33
4.4. Discussion.....	34
4.5. Conclusions .....	36
V. Performance of eight tree species in the highland Vertisol areas of Ginchi, Ethiopia: Growth, foliage nutrient concentration and effect on soil chemical properties .....	37

5.1. Introduction .....	37
5.2. Materials and methods .....	38
5.2.1. Study site .....	38
5.2.2. Seed sources and raising of seedlings .....	38
5.2.3. Experimental design and management .....	38
5.2.4. Measurement, sampling, and soil and foliage analysis .....	39
5.2.5. Statistical analysis.....	40
5.3. Results.....	40
5.3.1. Growth of trees and shrubs .....	40
5.3.2. Biomass production.....	41
5.3.3. Foliage nutrient concentration .....	43
5.3.4. Total N and available P trends .....	43
5.4. Discussion.....	45
5.5. Conclusions .....	47
<b>VI. Tree species screened on the highland Nitisol areas of Holetta, Ethiopia: Biomass production, nutrient contents and effect on soil nitrogen.....</b>	<b>48</b>
6.1. Introduction .....	48
6.2. Materials and methods .....	49
6.2.1. Study site .....	49
6.2.2. Criteria and basis of tree species selection .....	49
6.2.3. Tree seed sources and soil quality .....	49
6.2.4. Experimental design and management .....	50
6.2.5. Tree and soil sampling and laboratory analysis .....	50
6.2.6. Data analysis .....	51
6.3. Results and discussion.....	51
6.3.1. Patterns of height growth and aboveground biomass .....	51
6.3.2. Macronutrient content.....	53
6.3.3. Trends of total soil N .....	55
6.4. Conclusions .....	57
<b>VII. Nutritional values of three indigenous woody fodder plant species in the Galessa-Jeldu areas of Ethiopia .....</b>	<b>58</b>
7.1. Introduction .....	58
7.2. Materials and methods .....	58
7.2.1. Study site .....	58
7.2.2. Description of the three indigenous woody fodder species .....	59
7.2.3. Samples collection, preparation and chemical analysis .....	59
7.2.4. Data management and analysis .....	60

7.3. Results and discussion.....	61
7.3.1. Mineral composition of fodder species .....	61
7.3.2. Crude protein, NDF, ADF, ADL, CT and IVDMD .....	62
7.3.3. Correlations between CP, CT, ADL, ADF, NDF and IVDMD.....	63
7.4. Conclusions .....	65
VIII. General conclusions and recommendations .....	66
IX. References .....	67
X. Index of tables .....	75
XI. Table of figures.....	76
XII. Appendices.....	77
XIII. Table of abbreviations .....	80
XIV. Curriculum vitae .....	82