

Table of Contents

I. Summary.....	11
II. Kurzfassung.....	15
1. General Introduction	19
1.1. Temperate forests: Sessile oak (<i>Quercus petraea</i>) in Southwest Germany.....	21
1.2. Tropical forests: Native species in Central America.....	23
1.3. The process-based forest growth model <i>3-PG</i>	27
1.4. Research goals	29
1.5. Thesis overview	30
References Chapter 1	32
2. Changes in sessile oak (<i>Quercus petraea</i>) productivity under climate change by improved leaf phenology in the 3-PG model	39
2.1 Abstract	40
2.2. Introduction.....	40
2.3. Modelling approach for a dynamic growing season length of temperate, deciduous tree species.....	41
2.4. Methods	45
2.5. Results.....	47
2.6. Discussion	53
Acknowledgments.....	57
Appendix A: 3-PG parameter table.....	58
Appendix B: Climate data and climate change projections.....	60
Appendix C: Model performance.....	62
References Chapter 2.....	64
3. Broad-scale and long-term forest growth predictions and management for native, mixed species plantations and teak in Costa Rica and Panama.....	69
3.1 Abstract	70
3.2. Introduction.....	70
3.3. Methods	72
3.4. Results.....	78
3.5. Discussion	87
3.6. Conclusions	92
Acknowledgements.....	93
Appendix 1.....	94
Appendix 2.....	96
References Chapter 3.....	98
Supplementary 1.....	103

Supplementary 2.....	107
Supplementary 3.....	109
4. Sharp decline in future productivity of tropical reforestation above 29 °C mean annual temperature	113
4.1. Abstract	114
4.2. Introduction.....	114
4.3. Results.....	117
4.4. Discussion	121
4.5. Materials and Methods	125
Acknowledgments.....	131
References Chapter 4.....	132
Supplementary Materials.....	138
5. Concluding Discussion	151
5.1. Temperate forests: Impacts and drivers of climate change scenarios and the growing season elongation on the growth of sessile oaks in Southwest Germany	151
5.2. Tropical forests: Impacts and drivers of climate change scenarios on reforestation growth in Central America	154
5.3. Modeling uncertainties	157
5.3.1. Parameter estimation	157
5.3.2. Climate input data.....	158
5.3.3. Mortality processes	159
5.3.4. CO ₂ fertilization processes.....	159
5.4. Practical implications and outlook	160
5.4.1. Forest growth modeling.....	160
5.4.2. Temperate forests.....	161
5.4.3. Tropical reforestation.....	161
5.5. General Conclusions	162
References Chapter 5.....	163
Acknowledgements.....	169