

Tropical Forestry (I002705)

Course size *(nominal values; actual values may depend on programme)*

Credits 5.0

Study time 150 h

Course offerings in academic year 2026-2027

A (semester 1)

English

Gent

Lecturers in academic year 2026-2027

Hubau, Wannes

LA20

lecturer-in-charge

Van Acker, Joris

LA20

co-lecturer

Offered in the following programmes in 2026-2027

[Master of Science in Bioscience Engineering: Forest and Nature Management](#)

crdts

5

offering

A

[Exchange Programme in Bioscience Engineering: Land and Forest management \(master's level\)](#)

5

A

Teaching languages

English

Keywords

Tropical forest carbon balance, tropical biodiversity, tropical forest classification, tropical forest types, sustainable forest management, ecosystem services, reforestation, agroforestry, tropical forest inventory, tropical dendrology, tropical forest conservation

Position of the course

This course is oriented towards students with a strong interest in tropical forests and the current issues regarding their ecology, management and conservation. A first part describes tropical forest ecology, with a focus on climate, ecosystem ecology (mainly the carbon balance), community ecology (e.g. patterns in biodiversity) and forest classification (zonal and edaphic forest types). A second part highlights different general and technical aspects of tropical forest management, planted forests, reforestation, agroforestry and non-timber forest products. This part also focuses on international forest management and timber trade regulations. A third part is a practical exercise, where the students get the chance to analyse a real dataset from permanent forest inventory plots that were measured multiple times. Students will calculate different metrics describing forest structure, dynamics and biodiversity. As such, they will gain insight in differences among forest types. In the dendrology chapter, we will discuss geographic distribution, ecology and diagnostic field characteristics of the most dominant tree species in the dataset. Students will also compare characteristics and abundance of the dominant species versus the most important commercial timber species. Finally, we will invite guest speakers to talk about their field experience. These speakers will highlight specific forest management, conservation and ecology issues. All parts cover the three tropical forest areas (South America, Africa, Southeast Asia), except the practical exercise which focuses on African tropical forests. The formal lectures are illustrated with video films where possible. The course is based on widely recognised manuals and books, as well as top-notch recent research published in scientific journals. All students are required to prepare a report on the practical exercise.

Contents

PART 1 Tropical forest ecology

Chapter 1 Tropical climate

Chapter 2 Tropical ecosystem ecology
Chapter 3 Classifying tropical vegetation
Chapter 4 Tropical forest community ecology

PART 2 Tropical forest management

Chapter 5 Tropical forest management - general
Chapter 6 Tropical forest management - technical
Chapter 7 Planted forest and reforestation
Chapter 8 Agroforestry and non-timber forest products

PART 3 Practicum

Chapter 9 Computer exercise
Chapter 10 Tropical dendrology

PART 4 Guest lectures

Initial competences

No prior knowledge is required, except for a basic course on general ecology.

Final competences

- 1 Knowledge about the link between zonal parameters and edaphic factors and the occurrence and characteristics of tropical forest types
- 2 Be able to interpret (spatial) statistics on tropical forest cover
- 3 Understand dynamics of moist tropical forests due to natural and anthropogeneous causes
- 4 Describe differences (structure, composition, human use, ecosystem services,...) between zonal tropical forest types, and between edaphic forest types.
- 5 Understand and interpret definitions of tropical forest loss and degradation, and estimate their possibilities in an operational context.
- 6 Differentiate between proximate and underlying causes of tropical deforestation and fragmentation
- 7 Identify ecosystem services from video reports detailing tropical forest management issues
- 8 Understand sustainable tropical forest management, including current issues, future (research) challenges, current CGI's.
- 9 Have knowledge of the tropical forest certification process, and be able to comment on its challenges and achievements
- 10 To explain the current state of art in tropical forest management (including technical and research capacity) against issues and trends in the past, and discern and explain geographical differences.
- 11 To understand the concept, constraints and final objectives of domestication of moist tropical forests, and be able to illustrate the concept with bad and good cases of particular management systems.
- 12 To discuss the reasons why tropical planted forests are important
- 13 To explain the determining factors guiding the choice of tree species for planting in function of particular management objectives
- 14 To understand the technical issues of tropical tree nursery establishment and management
- 15 To understand the technical issue of planting trees in the tropics
- 16 To explain the biological and socio-economic features of an agroforestry system in general, and of the tree component in particular
- 17 To discuss typical (management) features of agroforestry systems in the three geographical tropical zones, including the provision of goods and services.
- 18 To produce a short or long term paper on a current issue in tropical forest management, and to present it orally to fellow class mates.
- 19 To have knowledge (botanical, silvicultural, ecosystem services,...) of selected tree species in the tropics, and be able to identify them from carefully selected photographic documents
- 20 To gain awareness of the importance of science-based evidence to support and implement tropical forest management
- 21 To have knowledge and understanding of management and planning strategies to optimally provide the goods and services of (semi) natural ecosystems required by society

- 22 Advanced knowledge of the components of (semi) natural ecosystems in Belgium and the world, insight into the processes that take place and insight into the influence of human actions on these components and processes
- 23 Applying qualitative and quantitative techniques to support forest, nature and landscape management (e.g. inventory and planning techniques, spatial information techniques, processing techniques of woody biomass)
- 24 Apply the national and international policy frameworks for forest and nature
- 25 Identify and analyze forest and nature management problems and formulate clear research questions with a view to achieving effective and potentially applicable solutions

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture

Extra information on the teaching methods

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Study material

None

References

Books

- Elliott S. et al. (2013) Restoring tropical forests. Kew: Royal Botanical Gardens
- Evans J. (1992) Plantation forestry in the Tropics (Oxford: Clarendon Press)
- Günter S. et al. (2011) Silviculture in the tropics. Heidelberg: Springer.
- Higman S. et al. (2006) The sustainable Forestry Handbook. London: Earthscan.
- Lamprecht H. (1984) Silviculture in the tropics (GTZ Eschborn)
- Meunier Q. et al. (2015) Les arbres utiles de Gabon. Les presses Agronomiques de Gembloux.
- Mille G. & Louppe D. (2015) Mémento du forestier tropical. Versailles Ed. Quae, 1198 p. ISBN 978-2-7592-2340-4
- Montagnini F. & Jordan C.F. (2005) Tropical Forest Ecology. Heidelberg: Springer.
- Poorter L. et al. (2004) Biodiversity of West African forest trees. Wallingford: CABI.
- Richards P.W. (1996) The tropical rainforest (Cambridge: CUP)
- Utteridge T. & Bramley G. (2014) The Kew Tropical Plant Families Identification Handbook. Kew: Kew Publishing.

Book chapters

- Richter M. (2014a) Classifications of Climates in the Tropics. In: Köhl M., Pancel L. (eds) Tropical Forestry Handbook. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-41554-8_35-1
- Richter M. (2014b) Climate Aspects of the Tropics. In: Köhl M., Pancel L. (eds) Tropical Forestry Handbook. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-41554-8_34-1
- Peters T. (2014) Climatic Types of Water Balances in the Tropics. In: Köhl M., Pancel L. (eds) Tropical Forestry Handbook. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-41554-8_2-1
- Peters T., & Richter M. (2014) The Atmospheric Circulation. In: Köhl M., Pancel L. (eds) Tropical Forestry Handbook. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-41554-8_36-1

Journal articles

- Bastin J.-F. et al. (2015) Seeing Central African forests through their largest trees. Scientific Reports 5: 1–8.
- Bauters M. et al. (2018) High fire-derived nitrogen deposition on central African forests. PNAS 115: 549–554.
- Bayon G. et al. (2012) Intensifying weathering and land use in iron age Central

Africa. *Science*, 335: 1219–1222.

- Brien R. J. W. et al. (2015) Long-term decline of the Amazon carbon sink. *Nature* 519, 344–348.
- Dargie G. et al. (2017) Age, extent and carbon storage of the central Congo Basin peatland complex. *Nature* 542: 86–90.
- Fauset S. et al. (2012) Drought-induced shifts in the floristic and functional composition of tropical forests in Ghana. *Ecology Letters*, 15: 1120–1129.
- Fauset S. et al. (2015) Hyperdominance in Amazonian forest carbon cycling. *Nature Communications*, 6: 6857.
- Feldpausch T. et al. (2011) Height-diameter allometry of tropical forest trees. *Biogeosciences*, 8, 1081–1106.
- Fine P.V.A. and Ree, R.H. (2006) Evidence for a time-integrated species–area effect in the latitudinal gradient in tree diversity. *American Naturalist*, 168: 796–804.
- Fine P.V.A. et al. (2008) The disparity in tree species richness among tropical, temperate, and boreal biomes: The Geographic Area and Age Hypothesis. In: *Tropical Forest Community Ecology* (Carson, W.P. & Schnitzer, S.A., Eds.). Wiley-Blackwell, Chichester, UK, pp. 31–45.
- Hua W., Zhou L., Chen H., Nicholson S.E., Raghavendra A., Jiang Y. (2016) Possible causes of the Central Equatorial African long-term drought. *Environ. Res. Lett.* 11, 124002.
- Hubau W. et al. (2019) The persistence of carbon in the African forest understory. *Nature Plants* 5: 133–140.
- Hubau W. et al. (2020) Asynchronous carbon sink saturation in African and Amazonian tropical forests. *Nature*, 579, 80–87.
- Lewis S. L. et al. (2013) Above-ground biomass and structure of 260 African tropical forests. *Philos. Trans. R. Soc. B* 368, 20120295 (2013).
- Lewis S. L. et al. (2019) Regenerate natural forests to store carbon. *Nature* 568, 25–28.
- Maley J. et al. (2018) Late Holocene forest contraction and fragmentation in central Africa. *Quaternary Research*, 89: 43–59.
- Malhi Y. (2012) The productivity, metabolism and carbon cycle of tropical forest vegetation. *Journal of Ecology*, 100, 65–75.
- Muscarella R. et al. (2020) The global abundance of tree palms. *Global Ecology and Biogeography* 29: 1495–1514.
- Neumann, K. et al. (2012) Comment on “Intensifying weathering and land use in iron age Central Africa”. *Science*, 337: 1040.
- Pan Y. et al. (2011) A large and persistent carbon sink in the world's forests. *Science* 333, 988–993
- Phillips O.L. et al. (2009) Drought sensitivity of the Amazon rainforest. *Science* 323, 1344–1347.
- Qie L. et al. (2018) Long-term carbon sink in Borneo's forests halted by drought and vulnerable to edge effects. *Nat. Commun.* 8, 1966.
- Schnitzer S.A. & Bongers F.B. (2011) Increasing liana abundance and biomass in tropical forests: emerging patterns and putative mechanisms. *Ecology Letters* 14: 397–406.
- Slik, F. et al. (2015) An estimate of the number of tropical tree species. *PNAS*, 112: 7472–7477.
- Sullivan M. J. P., et al. (2020) Long-term thermal sensitivity of earth's tropical forests. *Science* (80-.). 368, 869–874
- Sullivan, M. J. P. et al. (2017) Diversity and carbon storage across the tropical forest biome. *Scientific Reports*, 7: 1–12.
- Zhou L., Y. Tian, R. B. Myneni, P. Ciais, S. Saatchi, Y. Y. Liu, S. Piao, H. Chen, E. F. Vermote, C. Song, T. Hwang (2014) Widespread decline of Congo rainforest greenness in the past decade. *Nature*. 508, 86–90

Course content-related study coaching

Ufora

Assessment moments

(Approved)

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment, Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

not applicable

Calculation of the examination mark

Theory: 16/20

report practicum (Part 3): 4/20

De examiner kan de student die zich onttrekt aan periodegebonden en/of niet-periodegebonden evaluaties voor dit opleidingsonderdeel niet-geslaagd verklaren.