CL01

FORBIO

Assessment of the effects of tree species BIOdiversity on FORest ecosystem functioning

Cluster of the research projects Fefocon, Econet, Castec, Safe, Belfor, Xylobios, Impecvoc, Belgian Biodiversity Platform

DURATION OF THE PROJECT
15/12/2007- 31/03/2010

BUDGET
99.698 €

KEYWORDS
Ecosystem functioning, functional biodiversity, experiments, keystone species, mixed forests, forest conversion.

CONTEXT

Forests are biodiversity hotspots worldwide with 70% of terrestrial biodiversity being included in forested landscapes. However, deforestation, forest degradation and fragmentation lead to an increasing rate of species extinction. Hence, predicting the consequences of changes to the ecosystem in species numbers, in distribution patterns of taxa, and of shifts of dominance, has become a major challenge for community and ecosystem ecology. Recent research brings even more evidence that this biodiversity crisis is indeed not just an ethical problem, but a potential threat to ecosystem processes and services. Especially in grassland ecosystems an increased understanding of the function of biodiversity has been reached. Large-scaled experiments showed significant positive impacts of plant diversity and composition on ecosystem processes such as biomass production, nutrient use, decomposition, etc. However, the explanation for such relationships was controversial. Some authors attributed these relationships to pure 'sampling effects', i.e. the higher chance to include species with particular traits, while others proposed complementarity in resource use and/or facilitation as the principal drivers behind these relationships. Today, there is growing consensus that complementarity and/or facilitation do occur. However, until now the relationships between biodiversity and ecosystem functioning in forests have been largely unexplored.

Nevertheless, research on this topic could give an answer to important issues for sustainable forest management in Belgium and elsewhere. Now that many conifer plantations in Belgium (pine, spruce) get older, conversion to more mixed stands is an important management option. The latter is also supported by a range of international and national policy documents (e.g. the Pan-European Criteria and Indicators by MCPFE, EU Habitat Directive, Flemish Criteria for Sustainable Forest Management, Pro Silva guidelines). But will mixed forests be more productive, have a more pronounced microclimate, have more control over energy, water and material fluxes, be more resistant to disturbances, and/or allow higher biodiversity of associated species?

Although these questions have puzzled forest ecologists for a very long time (e.g. following statement by von Cotta in 1828: 'Since not all tree species utilize the resources in the same manner, growth is more lively in mixed stands and neither insects nor storms can do as much damage; also, a wider range of timber will be available everywhere to satisfy different demands….') and that some work has already been carried out on the ecological and socio-economic consequences of mixing (mostly commercially important) tree species, no unequivocal answers have been formulated yet due to methodological problems and the lack of a rigorous conceptual framework.

The challenge for this project is, therefore, to transfer the recent insights gained from the studies on synthetic grassland communities to mixed forest stands. This challenge will be tackled by clustering the Belgian scientific expertise on forest biodiversity around two concrete actions.

PROJECT DESCRIPTION

Objectives

The overall aims of this cluster project are:

(1) to review, synthesise and disseminate existing knowledge about the benefits and drawbacks of mixed stands vs. monocultures with respect to the three components of sustainability (ecology, sociology and economics). Next to being published in an international, peer-reviewed journal, the resulting synthesis will also be distributed to a wide audience of Belgian stakeholders via non-scientific publications, conferences and a website.

(2) to establish a highly innovative, large-scaled forest biodiversity experiment to evaluate the impact of increasing tree diversity on ecosystem functioning. This experimental platform will provide a highly innovative research facility for national and international scientists from a wide range of disciplines, with the purpose of deepening the understanding of the mechanisms behind diversity-ecosystem functioning relationships in forests.

SSD SCIENCE FOR A SUSTAINABLE DEVELOPMENT

FORBIO

Assessment of the effects of tree species BIOdiversity on FORest ecosystem functioning

EXPECTED RESULTS AND/OR PRODUCTS

The results for objective one will be:

- a scientific paper reviewing the social, economic and environmental aspects important in mixed stands vs monocultures;
- two publications (one in French and one in Dutch) synthesizing the main results from the review for a broader, non-scientific public;
- two conferences, one in Flemish and one in French, where the results of the review paper and the publications will be presented;
- a website linked with Belgian Biodiversity Platform (Belgian Forum on Forest Biodiversity).

The result for objective two will be a fully established experiment, one in the Kempen (Flanders) and one in the Ardennes (Wallonia), with synthetic communities of monocultures and plots with increasing tree species richness for long-term monitoring. Due to the slow development of forest ecosystems, no research results will become available during the course of this project, but on the longer run this experiment will potentially yield very valuable outputs.
A more general, important, output of the project will be the initiation of an active network (a 'community of practice') for forest biodiversity and ecology research and management in Belgium.

CONTACT INFORMATION

Coordinator

Prof. Dr. ir. Kris Verheyen
Ghent University
Department of Forest and Water Management
Laboratory of Forestry

Partners (non financed)

Prof. Dr. ir. Bart Muys
Katholieke Universiteit Leuven, Afdeling Bos, Natuur en Landschap; Leuven

Prof. Dr. Monique Carnol
University of Liège, Dpt Environmental Sciences and Management; Liège

Prof. Dr. ir. Quentin Ponette
UCL, Département des sciences du milieu et de l'aménagement du territoire, Unité des eaux et forêts; Louvain-La-Neuve

Dr. Pierre Gérard
Centre de Recherche de la Nature, de la Forêt et du Bois; Gembloux

Prof. M. Aubine
Faculté universitaire des Sciences agronomiques de Gembloux; Gembloux

Prof. Dr. ir. J.-C. Grégoire
Université Libre de Bruxelles; Bruxelles

Ir. Kris Vandekerkhove
Research Institute for Nature and Forests (INBO); Geraardsbergen

Prof. Dr. ir. Max Bruciamacchie
UMR INRA/ENGREF- AgroParisTech; Laboratoire d'économie forestière; Nancy (Fr)

Prof. Dr. Martin Hermy
Katholieke Universiteit Leuven, Afdeling Bos, Natuur en Landschap; Leuven

Dr. ir. Etienne Branquart
Belgian Science Policy Office
Bruxelles

Follow-up Committee
For the complete and most up-to-date composition of the Follow-up Committee, please consult our Federal Research Actions Database (FEDRA) by visiting http://www.belspo.be/fedra or http://www.belspo.be/ssd

SSD
SCIENCE FOR A SUSTAINABLE DEVELOPMENT

Belgian Science Policy
Wetenschapstraat 8 Rue de la Science • B-1000 Brussels
Tél. +32 (0)2 238 34 11 • Fax +32 (0)2 230 59 12 • www.belspo.be/ssd
Contact.Marc Van Heuckelom