FOREST4EU

ITHub 2 – Forest Adaptation to climate change

FOREST4EU partner: CNPF
OG: SPNA
OG's country: France
Type of Innovation: Technological

BioClimSol: a decision support system integrating future climate and ground conditions

Introduction

"Forrecast by BioClimSol" is a digital application that enables foresters to benefit from the expertise of BioClimSol, a decision-making tool for helping forests adapt to climate change. It has been deployed in the Nouvelle-Aquitaine region as part of the SPNA operational group. The forest managers who use the application have all received the necessary training to gain access to it. This training enables them to acquire and validate the skills required for field diagnosis, and is also essential for a good understanding of how the models work and how to interpret the expert results provided by the tool.

Presentation of the decision support system BioClimSol

The aim of BioClimSol is to help forest owners and managers make management decisions at stand level that take account of the risks associated with climate change.

Two approaches have been developed:

1. an assessment of the risk of dieback of standing stands (for around fifteen heritage species that have been studied in a dieback process);
2. an assessment of the risk of ecological incompatibility (taking into account climatic, topographical and soil characteristics) for around forty other species that represent interesting afforestation solutions for the future.

To make its algorithms work, BioClimSol takes into account the effects of interactions between:

- biotic factors affecting the health of the stand (Bio);

- current climatic conditions in the plot and future conditions under different scenarios (Clim);

- the soil conditions in the plot (Soil), which can compensate for or catalyse the effects of stresses of all kinds (climatic, biotic, etc.).

This application is structured into modules, each of which represents a field data acquisition and/or calculation engine output interface. It should be noted that the climatic data and certain topographical data are filled in automatically via the GPS location of the plot by spatial models stored in the device's memory.

These data are linked using algorithms parameterised by statistical models unique to each species.

At the end of the calculations, BioClimSol provides its expertise in the form of indices that give a relative reading of the risk according to species and climatic scenarios. This can then be used to draw up management recommendations based on classes of vigilance associated with these risks of dieback or ecological incompatibility with the conditions encountered.

For each level of vigilance, depending on the type of stand (or afforestation project) encountered and the projected forecasts for future climate scenarios, silvicultural recommendations are proposed. These recommendations appear as general management advice for the adaptive management of forests in a context of climate change, and help to initiate a more in-depth technical reflection that can then be adapted to the local context (from the technical itinerary to the management strategies for forests and territories). When a level of vigilance is alerted, it is necessary to clearly identify the factors involved in the risk dimension, in particular by looking at the parameters that have the greatest influence on the decline of the species studied.

Lessons learned

Over the last twelve years, BioClimSol's expertise has grown and it has constantly innovated, particularly in its modelling methods (now validated and supported by research via the current thesis by Jean Lemaire, its designer at the IDF).

The development of this tool has enabled certain scientific conclusions to be drawn, opening up important areas of research:

- It is possible to model dieback with a high degree of accuracy, although this requires a large number of variables to be taken into account and therefore very consistent databases.

- Biotic and soil factors play a major role in the mechanisms involved, and climate does not explain everything!

- The specific nature of dieback phenomena often means that models can only be valid at regional level, and requires calibration over several regions for the same species.

In addition, the data on which BioClimSol has been able to build its models (40 field studies, 5,000 plots, 100,000 trees described, etc.), its digital application and its collaborative system (a community of 500 users who have already recorded more than 10,000 diagnoses in the database) make the BioClimSol tool a recognised example of technological innovation for foresters (winner of the 2021 LifeAwards and the 2022 ITAINNOV technical institute competition).

But it is its modular configuration and scalability that hold out the greatest promise of future opportunities and prospects. The various modules, which interact via digital algorithms and scripts, make it possible to automate the processing and analysis chains based on the field data that the user community is consolidating

in its databases, and also to integrate new parameters to answer the ever-increasing number of questions that the various dimensions of the risks associated with climate change are raising more and more every day.

Figure 1. logo of "Forrecast by BioClimSol" digital application.
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Further information

https://www.cnpf.fr/nos-actions-nos-outils/outils-et-techniques/bioclimsol

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