



Impact of Information about climate change in Forest

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Collaborations:

- Kene BOUN MY, IR CNRS, BETA, Campus Unistra, Strasbourg.
- Stéphane COUTURE, Chercheur INRAE, Unité de Mathématiques et Informatique Appliquées de Toulouse (MIAT), Castanet-Tolosan, France.
- Patrice LOISEL, Chercheur INRAE, UMR Mathématiques, Informatique et STatistique pour l'Environnement et l'Agronomie (MISTEA), Montpellier, France.

Thematic action concerned: WP4, Economics

Context — Natural hazards represent the main threat to forests in the world. However, climate change has an impact on the characteristics of natural events, which creates uncertainty in the decision-making of private forest owners, in particular with regard to the frequency of disturbances. There is therefore a lack of clarity on the knowledge and quantification of the characteristics of natural hazards. These risks are often poorly understood by forest owners and their quantification remains uncertain at present. Consequently, forest owners must make their decisions in a context of uncertainty where the dangers are assessed and perceived subjectively, according to their knowledge but also according to the information provided to them. However, new information on the knowledge of these disturbances, improving quantification and reducing uncertainty, can arrive over time and modify the management decisions of forest owners.

Objectives — The project aims to study the role of uncertainty and the arrival of information on the decision-making of forest owners. The main research questions are: what is the impact of uncertainty on the management decisions of forest owners? What is the value of the information to reduce / eliminate this uncertainty?

Approaches — The process is in two stages. The first step is to propose a theoretical model of forest management under uncertainty that will explicitly take into account the risk and ambiguity preferences of private forest owners. In a second step, it is a question of testing the theoretical results obtained via experimental economics.

1st step: The theoretical model

This step is complete, the article is referenced as a BETA Working Paper. It is currently submitted to the "Geneva Risk and Insurance Review".

Abstract: Storm is a major risk in forestry. However, due to the more or less pessimistic scenarios of future climate change, storm frequency is now ambiguous and only partially known (i.e. scenario ambiguity). Furthermore, within each scenario, the quantification of storm frequency is also ambiguous due to the differences in risk quantification by experts, creating a second level of ambiguity (i.e. frequency ambiguity). In such an ambiguous context,

knowledge of the future climate through accurate information about this risk is fundamental and can be of significant value. In this paper, we question how ambiguity and ambiguity aversion affect forest management, in particular, optimal cutting age. Using a classical Faustmann framework of forest rotation decisions, we compare three different situations: risk, scenario ambiguity and frequency ambiguity.

2nd step: The experimental test

We are in the process of finalizing the experimental protocol to test the theoretical results of the first stage. The experiment will be released in the first quarter of 2023. The aim is to carry out an online experiment with private forest owners in the Grand-Est region. For this, our work is based on a BETA platform, the LEES: Laboratory of Experimental Economics of Strasbourg and on the engineer in charge of the platform, Kene Boun My. <https://beta-economics.fr/platforms/lees/>

We would like a first draft of the article of the second step to be ready for submission to the annual conference of FAERE (French Association of Environmental and Resource Economists) that will take place in September in Montpellier.

Key results — The outstanding results relate to the first stage of the project, i.e. the theoretical article:

- Risk and risk aversion considerably reduce the optimal cutting age compared to a risk-free situation.
- Both types of ambiguity (on the frequency and on the scenario) reinforce the effect of risk, i.e. further reduce the optimal cutting age.
- Ambiguity aversion has no effect on optimal cutting age.
- The value of the information that resolves the ambiguity on the scenario is high, while it is nil for the ambiguity on the frequency.

Main conclusions including key points of discussion — We contacted the CRPF to disseminate the experience by email to private forest owners in the Grand-Est region. We hope it will work well and the response rate will be high. The robustness of our empirical results depends on the success of the experiment and the response rate.

Perspectives — The discussions we are currently having suggest two possible extensions: introduction of the insurance decision (in addition to the one already considered for classical management which relates to the final cutting date) and uncertainty about the amount of the damage (in addition to that already considered on the probability of occurrence of the hazard).

Valorization — Loisel P., Brunette M., Couture S. (2022). Ambiguity, value of information and forest rotation decision under storm risk. Working paper BETA 2022-26. <https://beta-economics.fr/working-papers/2022-26/>

Leveraging effect of the project — This project allows to establish several collaborations:

- A collaboration between Marielle Brunette, Stéphane Couture and Patrice Loisel. This collaboration had already begun during the writing of a previous article (Loisel, Brunette, Couture (2020). Insurance and forest rotation decisions under storm risk. *Environmental and Resource Economics*, 76: 347-367.)
- A collaboration between Marielle Brunette, Stéphane Couture and Kene Boun My. Indeed, Stéphane and Marielle had already worked with the LEES and its engineer before, as part of the FOR_UNCERTAINTY project and the associated article: "Are decision-makers sensitive to the source of uncertainty? ".