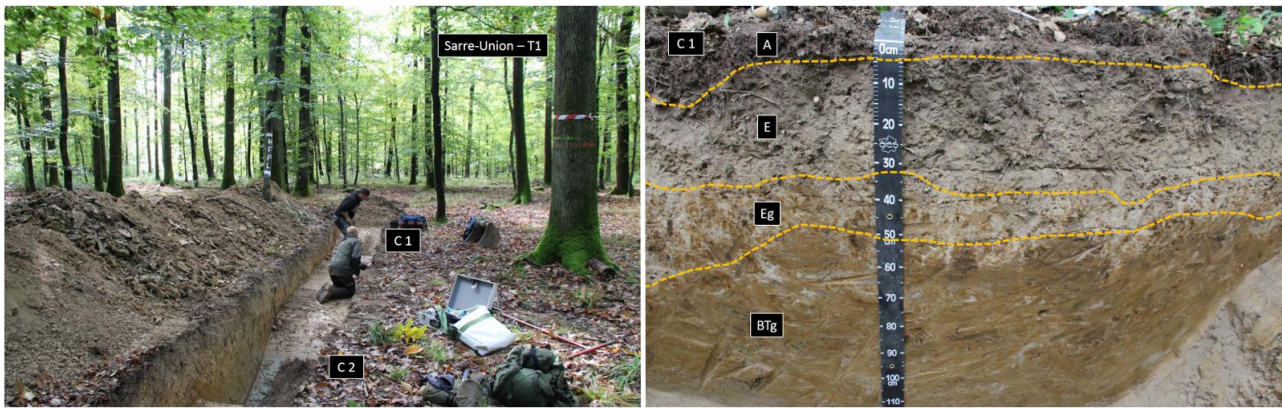
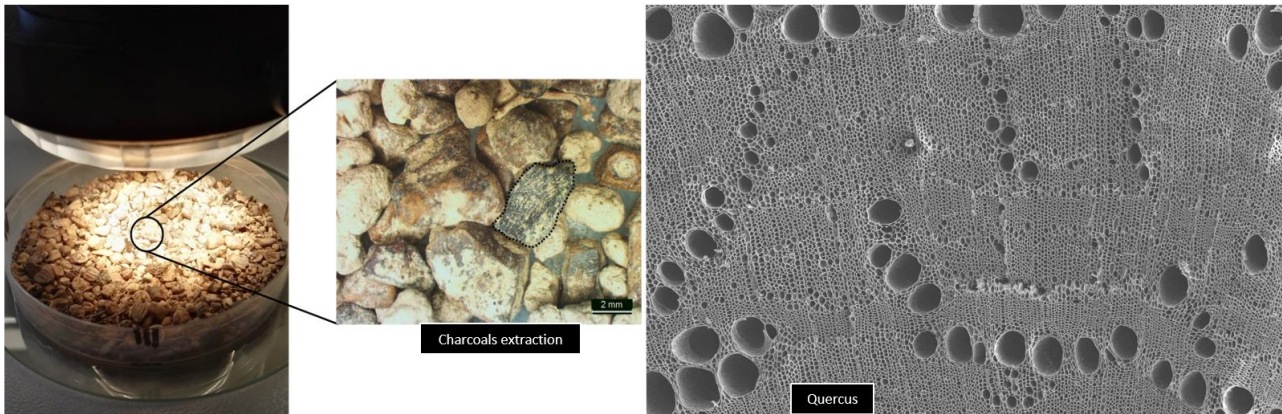


# HFPL



Project HFPL: Assessment of the Forest History of the Lorraine Plateau



## Assessment of the forest history of the Lorraine plateau

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**Context** — Beech is among the most competitive tree species in central European temperate deciduous forests. However, locally oak trees are often dominant, and beech remains sporadic. These species are components of the natural forest dynamics, but their distribution and frequency are influenced by on-going and past forest management. On the Lorraine plateau, oak trees, while supposed to be restricted to hydromorphic soils with clay level present at less than 30 cm depth, are also found on well-drained forest stand with clay level deeper than 30 cm, where theoretically beech trees should dominate. Thus, the actual ecological niches of these forest species remain unclear at fine spatial scale.

**Objectives** — To apply a phyto-historical approach which allows to test the hypothesis that past forest management on well-drained stand induced the substitution of beech by oak.

**Approach** — We conducted a soil charcoal analysis in 19 sites of mature oak stands on the Lorraine plateau by two methods:

- A trench, 10 m of length and with a depth varying according to the depth of the clay level, to determine the pedological context and to sample the soil per horizon, at two different columns.
- Three augers samples, spaced by 3 m, on two parallel lines that are perpendicular to each column of the trench, to consider the spatial heterogeneity of the soil charcoal records.

Macroscopic charcoal assemblages ( $\geq 0.8$  mm) were extracted of the soil samples by wet and dry sieving from the trenches samples. The charcoal pieces were then sorted-out and taxonomically identified. To complement this approach, four forest bogs will be sampled for palynological analysis.

### **Key results** —

- Preliminary results based on more than 3 000 charcoals clearly highlight the high anthracological potential of the Lorraine plateau.
- Each of the 38 columns contain wood charcoals.
- 13 species, genus of family are determined. From an ecologic point of view, this diversity is consistent with the study area.
- The oak is everywhere and is the dominant genus of the charcoal assemblages (50%).
- The hornbeam is the second species (14%).
- The beech is the third species (8%), also identified in all sites.

The 36 radiocarbon dates obtained so far indicate two major facts:

- The fire events cover the period Bronze Age – Modern Times.
- The oak and the beech have been growing together for millennia in well-drained soil conditions.

**Main conclusions including key points of discussion** — These first results seem to bring new arguments to the hypothesis that the historical forest management influenced the current distribution of forest species to a state that does not reflect the natural potential of the mature forest of the Lorraine plateau. The human indeed impact and model this forestland for more than 5 000 years.

**Future perspectives** — The treatment of the auger samples will significantly improve the robustness and the representativity of our results by integrating, in our analyses, the spatial variation, quantitative and qualitative, of the anthracological archives.

Our scenarios will then be compared with palynological data in order to apply a transdisciplinary approach at our interpretations and discussions.

Given that the current distribution of forest species, especially for the beech, is anthropogenic and not natural, we will be able to start thinking about area-species models, used to predict the impacts of climate change on the forest. These models are based on a wrong distribution of the forest tree species. Finally, we will then be interested in finding beech and oak in hydromorphic conditions (< 30 cm depth for the clay level), where, theoretically, beech should be absent, whereas he seems present according to prospective samples. That puts into question our current knowledge about the autecology of this species.

### **Valorization** —

#### **Scientific communication at international level**

10/2018: Historical dynamics of *Quercus* spp. vs *Fagus sylvatica* in the forests of Lorraine Plateau (France) documented by pedoanthracology.

International Conference on Ecological Sciences, Rennes (France).

07/2018: Assessment the history of forest of Lorraine Plateau. Oral communication.

IAVS 61st Annual Symposium, Bozeman, Montana (USA).

11/2017: Assessment the history of forest of Lorraine Plateau. Oral communication.

The third international workshop of pedoanthracology. Limoges (France).

#### **Scientific communication at national level**

10/2018: The contributions of SEM to the pedoanthracology in the assessment of forest history of the Lorraine Plateau. Oral communication.

CAZAC days 2018, Grenobles (France).

06/2018: Assessment the history of forest of Lorraine Plateau. Oral communication.

DocDay LIEC-UL, Metz (France).

**Technical reports**

2018 : Compte-rendu de la campagne de terrain pédoanthracologique.

Rapport interne INRA-LIEC-ONF-LABEX ARBRE-UEM.

**Communication partenaire**

09/2017 : Journée pédagogique sur la forêt et le projet pour les membres de la fondation UEM, dans la forêt domaniale d'Hémilly (Moselle).