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**Thesis proposal**

**How can biodiversity help ruminant farmers from upland areas to adapt to climate change?**

**Background :**

The effects of climate change are increasingly visible with more frequent droughts and heat waves. This raises forage autonomy issues for farmers from grassland-based upland areas. In order to adapt to climate change, livestock farmers are implementing various strategies including increasing forage stocks by increasing grassland fertilization, sowing temporary grassland, planting annual crops or irrigation. Others aim to reduce fodder requirements by reducing herd size or reduce production costs by limiting mowing and fertilization. Finally, some are seeking to make better use of grazing by developing rotational grazing, promoting the complementarity of animal species, etc. These different practices have direct and indirect effects on the floristic diversity and functional traits of grasslands. We will try to understand which mechanisms relating farming practices, biodiversity and farm performance are known by livestock farmers. Among the theoretical frameworks, the portfolio effect states that plant communities with high species diversity are likely to include complementary species that can adapt to any condition of a fluctuating environment, and thus would make it possible to stabilize production and ecosystem services. Enhancing grassland diversity, within and between plots, could thus represent a key lever to trade-off production (including its stability) and biodiversity conservation. Our goal is to address this issue at the farm level, taking into account farmers’ constraints and production objectives, and to articulate solutions based on grassland biodiversity with other adaptations to climate change.

**Objectives:**

The objectives of the thesis are to 1) analyse the strategies of farmers from grassland-based upland areas to adapt to climate change and how they integrate biodiversity into these strategies, 2) explain the relationships between practices, biodiversity and performance in relation to these adaptation strategies, 3) identify configurations of livestock systems (grassland management, herd size and management of fodder stock) to enhance biodiversity and secure farmers' income under climate change scenarios.

**Methodology :**

The PhD student will organize focus groups to assess how farmers from upland grassland-based areas perceive the effects of climate change and their strategy for adapting to it. We will try to understand how they perceive plant diversity (is it an opportunity or a constraint?), and how they integrate it into their adaptive farm management.

A conceptual framework will be proposed in order to highlight the costs and benefits related to the use of multispecies grasslands at forage system scale for enhancing farm fodder autonomy in a context of increasing frequency of climatic hazards. Simulations will be carried out to estimate the effects of different biodiversity enhancement strategies on the resilience of production and economic results. These simulations could be partly based on pre-existing models.

The data to calibrate the model could come from:

* the literature or biodiversity databases,
* experimental data obtained by the promoters of this thesis at either plot scale (Forbioben EU project, Foraging for biodiversity benefits, ACBB Environmental Research Observatory) or farm scale (PDSR-4 Poeete project, Reflecting polyculture-livestock farming at the scale of farms and territories, Floris project, Local and regional filters effects on the biodiversity of permanent grasslands, etc.), as well as from projects in progress (overseeding trials conducted at UREP to analyse their resistance to drought),
* regional or national grassland typologies,
* possibly new field observations in the farms surveyed,
* simulations performed with biophysical models.

**Presentation of the host laboratory (material and human environment, specify the referent and the host institution) and of the PhD student's supervision team**

The student will be positioned at Herbivore Research Unit (UMRH) within the Conception, Modelling and Evaluation of Livestock Systems (COMETE) team. Researchers in this team are conducting work to design herbivore farming systems that reconcile economic and environmental performance, by valorising fodder and other resources that do not compete with human food. He/she will be supervised by Claire Mosnier (agro-economist) and Frederic Joly and Bertrand Dumont (agro-ecologists). He/she will also be supervised by Nicolas Gross, an ecologist at the Grassland Ecosystem Research Unit (Urep) working in the field of functional and community ecology.

**Profile sought:**

- Bac+5 with a background in agronomy, agroecology, or ecology.

- Interest in livestock farming systems

- Interset in modelling

- Writing and synthesis skills

- Organisational skills, autonomy and flexibility

- Fluent written and spoken English and good level of spoken and read French

**Material aspects:**

- place: INRAE de Theix, 63122 St Genès-Champanelle

- thesis start: November 1st

- remuneration: approx. 1420€ net /month

**Send your application (cover letter and resume) to** [**Claire.mosnier@inrae.fr**](mailto:Claire.mosnier@inrae.fr) **before the 6th of September 2020**