PhD research position on ecological intensification of cattle ranching in the Amazon

(TerrAmaz project)

Phd Description

Background

Through deforestation and degradation of pastures, cattle ranching in the Amazon has been responsible for a huge waste of natural resources, as well as for major greenhouse gas emissions. However, the ecological footprint of cattle ranching varies greatly depending on the practices implemented at the field, farm and landscape levels, which opens up possibilities for action towards sustainable development. With appropriate agro-ecological intensification practices and approaches, cattle ranching in the Amazon offers promising possibilities in terms of mitigation of global warming, preservation of biodiversity, protection of soils and regulation of the local water cycle. In coherence with zero deforestation strategy, cattle ranching can provide meaningful ecosystem services for the region.

Technologies prioritized by policies, financial institutions and technical support services are very selective as they depend on investments, inputs, mechanization, knowledge, and management capacities. Given the conditions that drive Amazonian territories and the livestock sector, such technologies are only viable in intensification clusters or on elite farms and remain inaccessible to most farmers. Extensive livestock farmers are prevented from incorporating new forest soils in their production systems: they are progressively trapped in a soil and pasture degradation process that reduces their profitability and undermines their capacity to invest in soil restoration and improved pasture management.

Financing restoration and intensification is also hindered by the risks to the reputation of financial institutions prepared to work with these ranchers. The public image of the livestock sector in the Amazon is so degraded that it threatens the institutions involved. The Amazon livestock sector lacks appropriate tools to attract responsible investors, i.e., tools able to measure environmental performance and to reliably communicate virtuous and widely used livestock practices. It is the responsibility of institutions and scientific teams to fill this gap, and this thesis represents one step in that direction.

This thesis will search for ways to enable moderate viable intensification technical, institutional and financial solutions that can be accessible to extensive livestock farmers.

Methodology

The thesis will focus on practices that can improve the efficiency of livestock farmers in their use of natural resources and ecosystem services, and on the methods for monitoring the associated environmental footprints.

In recent years, analysis of the trajectories of livestock farms engaged in intensification processes in the eastern Brazilian Amazon, combined with analysis of the decision systems that drive these trajectories, revealed the spatial dimension of these processes plays a key role (Plassin, 2018; Osis, 2019). Pinillos (2021) showed that the spatial organization of land uses is also a key factor in the production of ecosystem services.

The thesis will build a methodological approach based on spatial organization and evaluation of production techniques, in order to (i) better understand the mechanisms that enable the efficient use of natural resources on the farm, (ii) include solutions that are easily accessible to all types of farmers, including the most extensive ones, and (iii) help identify trade-offs between intensified forage production and forest restoration in the landscape.

The thesis will be based on a combination of hypotheses, all focused on the spatial organization of livestock farms:

- The spatial organization of different production practices is a relevant way to improve the economic and environmental performance of Amazonian livestock farms.

- Modifying spatial organization is not an overly demanding process for livestock farmers; simple solutions are available that will allow livestock farmers to progressively engage in an agroecological transition adapted to their particular conditions.

- Spatial management of a farm can be expressed at the plot and farm level, resulting in new landscapes management and re-balancing between pasture intensification and forest restoration.

- Spatial management methods are identifiable and measurable; their environmental impacts are known or measurable.

Two types of measurements will be made in a network of farms, each with a specific objective:

- At the plot level, the thesis will measure the capacity of the farms to produce forage and transform it into animal products by using efficiently available resources. Infrared spectrometry will be the main evaluation tool. The calibration of multispectral images produced by drones and satellites will enable the definition of spatial indicators of each mode of pasture management and its performance.

- At the farm level, the thesis will measure the efficiency of the landscape for cattle production, while taking the space allocated to forest restoration into account. This efficiency is linked to the use of the soil, depending on its aptitude for forage production on the one hand, and for the production of forest ecosystem services on the other. The use of digital terrain models (DTM) and geographic information systems will make it possible to measure landscape efficiency indicators, to be completed by a life cycle analysis at the farm scale.

Those results at farm level will be extrapolated to the concerned territories (communities, local jurisdictions, agro-industry supply network) by using farm typologies.

Expected results

The thesis will produce important references to characterize the impacts and services rendered by cattle ranching in Amazonia, identify potential margins for progress according to the practices and the spatial organization of the farms.

The thesis will build and validate a methodological approach to achieve these three aims and validate a set of multi-criteria evaluation tools that can be replicated in other study areas.

The information produced will allow local institutions to:

- Improve advice and technical assistance to farmers, especially the most extensive ones, by proposing appropriate spatial management strategies.

- Use a set of multi-criteria evaluation tools adapted to their monitoring, transparency, and communication needs, to attract responsible investors.

References

Osis, R., 2019. Relations spatiales entre les ressources biophysiques et les dynamiques d'occupation du sol du front pionnier en Amazonie orientale. Le Mans Université, Le mans.

Pinillos, D., 2021. Perspectives for multifunctional landscapes in the Amazon: analyzing farmers' strategies, perceptions, and scenarios in an agricultural frontier. Montpellier SupAgro, France, and Wageningen University, Wageningen, the Netherlands, Montpellier, Wagueningen.

Plassin, S., 2018. Élever des bovins dans des paysages éco-efficients. Comprendre et modéliser le processus d'intensification dans les fermes d'élevage d'Amazonie Orientale brésilienne. Agroparistech, Paris.

Your profile

- A university degree (MSc or equivalent) that qualifies for a PhD program in ABIES doctoral school (http://www2.agroparistech.fr/abies);
- Focus disciplines: Geography, agronomy or animal science.
- Expertise in GIS, statistics and calculation software.
- Background in a laboratory and handling samples is desirable.
- Capacity to produce scientific and/or technical publications on sustainable development in rural areas, particularly in issues involving cattle ranching will be appreciated.
- Ability, experience and aptitude for field work in rural and tropical areas required.
- Research or development experience in the targeted countries of the TerrAmaz project (Brazil, Colômbia, Ecuador, Peru).
- Fluent in either Portuguese or Spanish, and proficient in English. French language skills will be considered as a plus.
- Driving license

Additional information

- Deadline for application: August 25, 2021 (curriculum vitae and cover letter)
- Thesis presented to the ABIES doctoral school (http://www2.agroparistech.fr/abies)
- The position is based in France with field trips to South America (Brazil and Colombia) for approximately six months per year.
- Start of the position: the thesis starts in October 2021, requiring your presence in France from this date onwards.
- We offer a scholarship of 1330 €/month (net salary) for the 3 years of the PhD.
- For further information please contact:
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  o Philippe Lescoat philippe.lescoat@agroparistech.fr

See also https://www.cirad.fr/en/news/all-news-items/press-releases/2020/amazon-transition-sustainable-agriculture-fight-deforestation