HORA

Mixing HORticultural crops and Agroforestry: A global evidence map, analysis of the farmer practices and assessment of performance

ABSTRACT

Agroforestry is considered as among the most effective system in supporting agro-ecological transition (Gliessman, 1995) and could contribute to food security and enhance climate change resilience (e.g. Saqib et al., 2019). In Southern countries, trees are often cultivated with horticultural crops (e.g. mango, citrus, papaya) in multi-strata systems, such as Creole gardens (West Indies), mango-market gardening systems (Senegal) or clove-agroforestry systems (Madagascar). These systems are particularly important in tropical regions to ensure nutritional balance, nutrients and vitamins inputs. The available knowledge on these complex systems and farmer practices are scattered, even for agronomists specialized in horticultural crops. These researchers tend until recently to ignore these systems or to isolate their components by describing them as orchards or vegetable plots. Under these conditions, the evaluation of practices, recommendation and support of farmers becomes difficult – this limit this type of agro-ecological transitions to larger scales.

Recently, the number of papers on agroforestry system has risen exponentially (Liu et al., 2019, Beillouin et al., 2019), and more and more studies highlight the role of horticultural crops for food security. A large set of papers and knowledge are 3 now available on this subject, but have not been yet synthetized. To make progress, we intend to exhaustively review the available knowledge and practices on such systems. Quantitative and systematic reviews of the literature (meta-analyses) are rigorous and transparent methods for summarizing heterogeneous experimental results (Gurevitch et al., 2018). This first step will allow to more precisely understand and promote the biophysical regulating processes in such systems. Yet, innovations on these complex systems often come from the farmers themselves, without having been tested experimentally or described in the scientific literature. To consider this type ok knowledge, we will review farmer practices in two areas (West Africa and Indian Ocean) based on the dense network of partners working on these themes.

Our objectives are to i) produce an evidence map of the knowledge and practices on such systems and produce a typology of the systems around the world. We hypothesize that:
• H1. The characteristics of the system (complexity, cultivated species, etc.) and their performance differ according to agro-ecological zones.
• H2. The experiments detailed in the scientific literature represent only part of the diversity of systems observed locally. This work will be a first step to quantify precisely the performance of such systems, and the ecosystem services associated (e.g. soil fertility, pest regulations). We hypothesize that:
• H3. The agronomic and environmental performance depends on the level of complexity H4. Agroforestry-horticultural systems provide higher environmental and production co-benefits compared to conventional systems.

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GOAL

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We hypothesize that :
• The characteristics of the system (complexity, cultivated species, etc.) and their performance differ according to agro-ecological zones.
• The experiments detailed in the scientific literature represent only part of the diversity of systems observed locally.

ACTION

Literature review, Evidence map and meta-analysis of Horticulture-Agroforestry systems in the tropics.
Objective : Global and exgaustive assessment of scientific available knowledge on agroforestry-horticultural systems.
- Prospecting campaign and analysis of experts and farmers' knowledge on clove-Agroforestry systems
Objective : Assessment of farmer knowledge and practices on agroforestry-horticultural systems in Madagascar, Mayotte and the Comoros

RESULTS

An open-acess literature database on scientific knowledge on horticulture-Agroforestry systems.
- A precise description ok knowledge and knowledge gaps on theses systems
- A Quantification of the performance of the systems
- A precise typology of Horticulture-Agroforestry systems in the tropics
- A quantification based on probabilistic expert elicitation of the performance of clove-tree agroforestry systems in Madagascar

PERSPECTIVES

Creation of a multi-institutional working group on horticultural -agroforestry systems