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FARMING SYSTEM DESIGN FOR SUSTAINABLE AGRIFOOD SYSTEMS: THEORIES AND PRACTICES

**Proceedings of the 8th International
Farming System Design Conference**

Temporary version

*Marion CASAGRANDE, Marie-Hélène JEUFFROY,
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ClieNFarms-I3S: a network structure to codesign climate neutral farms

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Introduction

Agriculture contributes to 10.3% of the EU's greenhouse (GHG) emissions (EEA, 2019). EU agriculture is the only major system in the world that has already reduced GHG emissions (by 20% since 1990). However, despite these efforts agriculture is still one of the main sources of methane (CH₄) and nitrous oxide (N₂O) and at the same time, it offers a significant opportunity to sequester atmospheric carbon dioxide (CO₂) in grassland, trees, other plants and soils.

Carbon neutral agriculture, i.e. a farm that is neutral in terms of the GHG emission balance (CO₂, N₂O, CH₄) expressed in CO₂-eq, is possible, if appropriate farm management practices are adopted by reducing emissions and maximising GHG removals, and by considering potential synergies with biogeophysical effects as recommended by the IPCC (Calvin et al., 2023). Many solutions already exist. However, some may be costly or reduce production levels; others require collective activities among different farmers. Additionally, solutions should include the entire supply chain but also the banks, the citizens and the consumers which will increase options and might reduce risks for off-sets or other negative impacts. As for the agroecological practices, the general concepts have to be tailored depending on the production units, on the socioecological and sociotechnical systems at hand. Therefore, the different solutions have to be tested by, and adapted for farmers in an integrated, systemic and multi-actor approach. This climate-smart agricultural practices need to safeguard planetary boundaries or ecosystems services.

Methods

ClieNFarms is an Innovation Action project funded by the European Commission to support the European Green Deal. The general objective of ClieNFarms is to co-develop and upscale systemic locally relevant solutions (organisational, financial, technical) to reach climate neutral and climate resilient sustainable farms across Europe. To do so, we interactively integrated and improved existing solutions to achieve economically viable business models in farming systems by involving farmers, extension services, agri-food business, policy-makers, educators, finance and citizens. An original concept of ClieNFarms is its Living-Lab like approach called the Innovative Systemic Solution Space (I3S). The I3S consists of different components and actors who will test and disseminate tailored multi-actor, co-designed, locally relevant, innovative solutions to achieve climate-neutral farms within the supply chain and local geographical extent. Systemic indicates the inclusion of the surrounding ecosystem (suppliers, advisors, research, agro-equipment, etc.) beyond the farm. Solution space because different solutions are proposed and tailored for each (considering pedoclimatic conditions, resource availabilities and constraints). Innovative because the proposed solutions induce the adoption of efficient innovations (e.g. including the finance sector in collaborative proposals).

Creative arenas have been conducted in almost all of the 20 ClieNFarms I3S. These are participatory design workshops where action plans are sketched for a specific production system incorporating the surrounding stakeholders' ecosystem. At a given site, the replication structure is based on a dissemination upscale concept: demonstration farm (where risky solutions can be experimented/tested), lead commercial farms (early adaptors, where less risky but impact full solutions can be tested) and outreach farms (the full spectra of surrounding farmers). The supply chain plays a fundamental role in the outscaling approach. Based on farm archetypes, the project's various supply---

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