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INITIATIVE ON
Mixed Farming Systems

CO-DESIGNING SOCIO-TECHNICAL INNOVATION BUNDLES FOR THE SUSTAINABLE INTENSIFICATION OF MIXED FARMING SYSTEMS: A METHODOLOGICAL NOTE

About the Mixed Farming Systems Initiative

- The Sustainable Intensification of Mixed Farming Systems (SI-MFS) Initiative aims to provide equitable, transformative pathways for improved livelihoods of actors in mixed farming systems through sustainable intensification within target agroecologies and socio-economic settings.
- Through action research and development partnerships, the initiative will improve smallholder farmers' resilience to weather-induced shocks, provide a more stable income and significant benefits in welfare, and enhance social justice and inclusion for 13 million people by 2030.
- Activities will be implemented in six focus countries globally representing diverse mixed farming systems as follows: Ghana (cereal–root crop mixed), Ethiopia (highland mixed), Malawi: (maize mixed), Bangladesh (rice mixed), Nepal (highland mixed), and Lao People's Democratic Republic (upland intensive mixed/ highland extensive mixed).

Definition of the terms

Mixed farming systems (MFS) are complex systems where multiple components (e.g., livestock, trees, subsistence and cash crops, horticultural crops, aquaculture, value-adding activities) are tightly interlinked, and the whole system is managed towards the satisfaction of multiple productivity, economic, environmental, and societal goals (e.g., social inequality, food security, income generation, risk management, resource conservation, preservation of cultural values and traditions).

To improve the performance and sustainability of MFS, **socio-technical innovation bundles** (STIBs) need to be developed so that contextualized combinations of interrelated technical advances combined with social, organizational, and policy enablers are packaged for impactful implementation and scaling. To develop these STIBs for sustainable intensification of MFS, a process-based disciplinary-focused approach might not suffice, and a participatory systems' perspective is needed. **Systems analysis** allows an understanding of the characteristics, dynamics, and interconnectedness of different components and actors in the system, as well as their role in the overall system's performance. It also relates to the interrelations amongst system components and external (and internal) drivers of change. Systems analysis can be quantitative and qualitative and can be used for ex-post and ex-ante studies. In the context of agri-food systems, systems analysis investigates how current systems function and how they are likely to behave in response to relevant scenarios of change.

In transforming mixed farming systems, the term **systems design** means to define, conceive, implement, and assess an improved system with regard to a set of pre-defined objectives (e.g.,

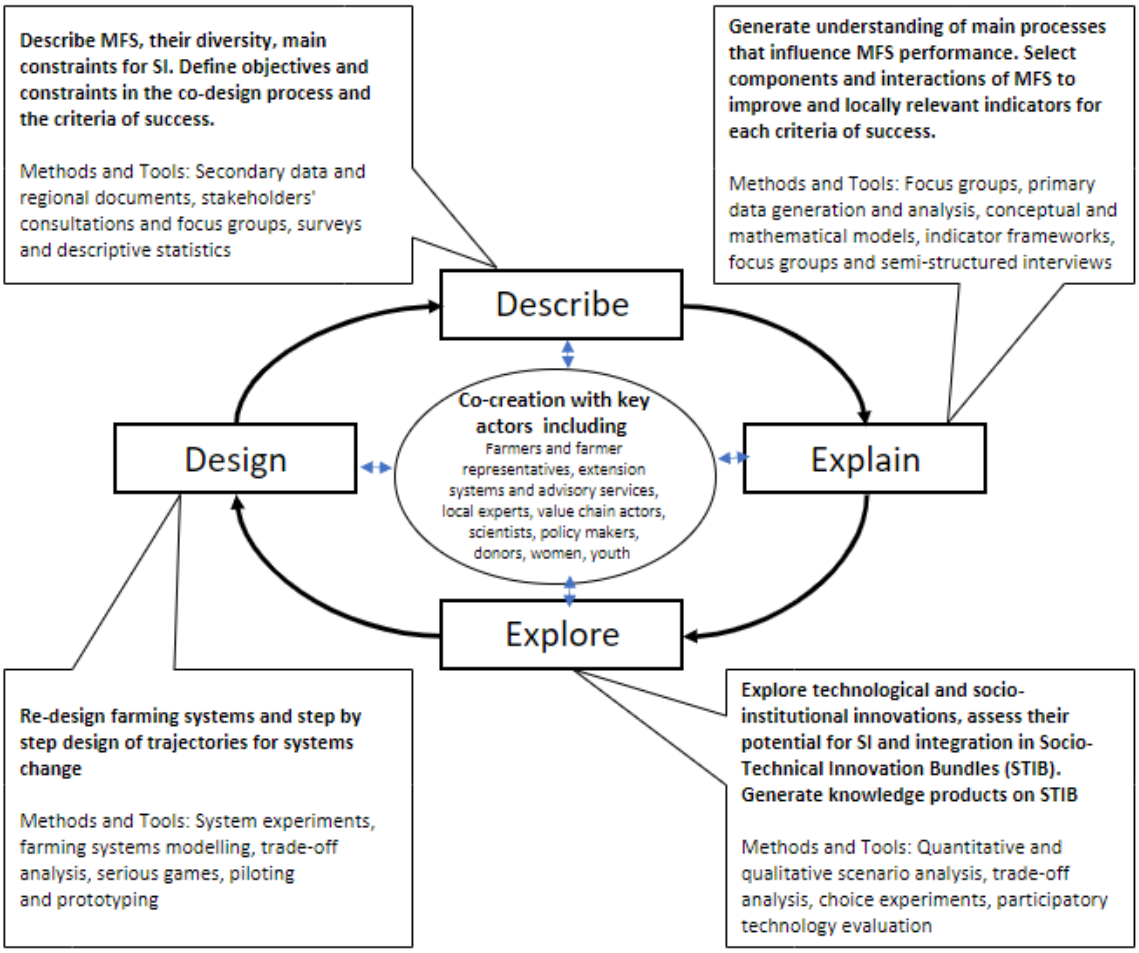
sustainability, resilience, climate smart, gender and social inclusion) and constraints imposed by the context (e.g., soil types, rainfall distribution, labour availability, market price, policy, and cultural norms etc.). The system at stake in the design process can be a component of a farming system (e.g., a crop or livestock enterprise, a crop rotation etc.), the integrated farming system (e.g., a forage-based crop-livestock system), or its integration into a value chain (e.g., a new crop into an environmental certification scheme) or a landscape (e.g., crop landscape mosaics with pest suppressive or water-saving objectives) or sociocultural context (e.g., interests, preferences and demands of end users).

Co-designing more sustainable mixed farming systems and the bundling of socio-technical innovations imply the engagement of multi-stakeholders throughout the whole design process and not only regarding them as 'users'. For the co-design of more sustainable mixed farming systems, a wide range of stakeholders (including farmers, farmer representatives, value chain actors, policymakers, development organizations, and civil society, among others) need to be engaged, and not only consulted, in the *definition of the system*, *identification of objectives*, *constraints*, and *opportunities*, the *development, and testing of innovations* as well as in their *assessment, adaptation,* and *promotion*. The engagement of stakeholders in all phases of the co-design process is a precondition for the generation and scaling of socio-technical innovation bundles for the sustainable intensification of MFS.

Pathways for co-designing socio-technical innovation bundles

The overall approach for the co-design of more sustainable MFS is based on the DEED (Describe, Explain, Explore, and Design) framework. Figure 1 shows the main objectives of each phase of the DEED framework and some methodological tools that can be employed to carry them out. The whole DEED framework must be centred on the knowledge, expertise, goals, and objectives of the key actors to ensure a co-learning and co-creation.

Figure 1. The DEED cycle for co-designing more sustainable Mixed Farming Systems and examples of methodological tools.



In the design phase of the DEED cycle, two main pathways can be followed: '**de novo**' and 'step-by-step' design. In the de novo or **transformational approach**, the focus is not on incremental change, such as improving system efficiency within the limits of sub-components of the system, but on a more global rethinking and design of the system. The aim is to transform the system into a better one or even change it to a totally new and desirable one. Hence, modeling approaches are used to explore various possibilities of system changes (e.g., manipulating system components by adding new components or objective-driven optimization) and assess their consequences. In this approach, co-designing (or co-redesigning) would mean bringing multi-stakeholders on board for system analysis, defining the desired state, and choosing system components to manipulate. The actual alternative systems design would fall in the hands of experts.

In the **step-by-step** or **incremental approach**, incremental changes are embraced. The aim is to change the system stepwise, implementing approaches for system change as understanding of the system and its interventions continues. The focus is on a pragmatic understanding of the current system, setting reasonable and practical visions of change, and mobilizing new or existing innovations to achieve the desired system change. This approach works better for narrower subsystems such as small ruminant value chains, wheat-based farming systems, etc.

In this approach, co-designing would involve bringing stakeholders together for a joint assessment of mixed farming systems, defining the desired state of and visions for system changes, identifying entry points for a system change, identifying/generating innovation bundles, deploying innovations, monitoring, evaluation and reflection, re-evaluating of changes and continuing the cycle for the next level system improvement.

To capitalize on previous research and development investments and because of the complexity of implementing interventions across farm components, an incremental approach is most often followed. However, a combination of both pathways (incremental and transformational) can also provide the basis for developing socio-technical innovation bundles for the mixed farming systems initiative.

Implementation of the co-design process in SI-MFS sites

Below we present the broad steps envisioned for the co-design process in SI-MFS. This is to provide a first guide only, allowing each case study team to adapt/implement the DEED framework considering (i) time and resources constraints, (ii) local partnership characteristics (e.g., some stakeholders already engaged in previous projects), and (iii) level of maturity/scaling readiness of innovations in the region from previous projects.

1. Ensure proper understanding and adaptation of the systemic approach by the research team
2. Share with multi-stakeholders and engage them at the relevant step of the cycle. Identify the target farming systems to be engaged in the process
3. Use Figure 1 to define the three years plan of the case study to ensure that the 'design' phase will have at least started at the end of the three years.

Innovation and scaling ecosystem development proposals for co-designing

Generation and scaling of socio-technical innovation bundles is a wicked, complex, multi-stakeholder, and multi-level challenge. Hence, co-designing entails setting up an innovation and scaling ecosystem for social learning, negotiation, and collective action. For this initiative, we are proposing farm, sectoral and cross-sectoral organizational setups.

Farm level: A modified and socially inclusive Farmer Research Group (FRG) approach (could be called living experiment, social innovation labs or learning labs) in which both research farmers and follower farmers (e.g., those involved in mother-baby trials) are brought together for deliberate problem identification, mutual learning, and collective action. The FRGs could be made to have a strong 'learning' focus, by introducing a seasonal learning agenda and developing a learning curriculum, like that of the Farmer Field School approach. An FRG could have 10-20 research and follower farmers working either directly with the researchers or learning lessons from fellow farmers. FRGs are often organized at the village level.

Sectoral level: At a little higher-level Communities of Practice (CoP)/Common Interest Groups (CIGs) could be set up around commodity/issue-based socio-technical innovation bundles. Communities of Practice 'are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly' (Wenger, 1998). With 15-30 key actors' membership, CoPs bring together male and female farmers, researchers, extension advisors, input dealers, financers, and politicians among others. The CoPs play a crucial role in facilitating social learning and steering collective action among actors. CoPs are often organized at the district level. CoP are often loosely connected actors with altruistic motives. For their sustainability, incentives for participation needs to be considered carefully. Hence, the vision should be to set them as 'local innovation and sustainable business units (LIBS)' to present the inculcate business and economic motives in their formation and facilitation.

Cross-sectoral level: Sectoral CoPs could come together and form an umbrella cross-sectoral structure, i.e., innovation platforms (IP). Multi-level IPs /hubs could be organized at local, sub-national, and national levels depending on country contexts. IPs bring together key actors across crops, livestock, and other sectors. With good facilitation and anchoring with key institutional drivers of change, IPs could support integration and coordination aspects in the generation and scaling of socio-technical innovations.

Reference

Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. New York: Cambridge University Press.

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