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On-farm challenges and solutions for small-scale farmers to establish agroforestry: A case example from Cambodia

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Abstract

Agroforestry addresses food security challenges in tropical and subtropical countries by helping to adapt to climate change and improving soil fertility. To successfully disseminate the approach, it is crucial to understand how it is feasible for farmers to establish agroforestry. While many studies have shown the potential of agroforestry ecosystem services, few have looked at farmers' challenges in establishing such social-ecological systems. To identify 1) on-farm challenges faced by farmers and 2) locally adapted solutions in a transdisciplinary manner, a longitudinal action research study was conducted 2021–2024 in northern Cambodia. A learning group of 24 small-scale farmers was engaged in implementing agroforestry. The farmers identified challenges and potential solutions through workshops and group discussions, and reflected on these in semi-structured interviews accompanied by farm visits. The action research revealed that although agroforestry has the potential to overall improve climate resilience, the challenges of implementing agroforestry are increasing due to climate change effects. Critical threats faced by farmers were extreme weather events like flash floods and prolonged drought periods which e.g., caused difficulties in establishing tree seedlings. These challenges were interrelated with land degradation, leading to stagnant water and increased pest problems. Potential solutions identified include integrating small-scale water management practices, mostly applied to balance extreme drought periods during the dry season and water oversupply during the rainy season. Solutions were adapted to the specific on-farm conditions integrating swale and canal systems, ponds, and micro watershed dams. However, a prerequisite for their implementation are investments and ensuring satisfying water quality, the latter addressed by using *Azolla* and Lemnoideae. Further, soil management was essential to increase water infiltration and improve soil and plant health. Adding organic matter and legume cover crops were the most important soil strategies. Soil improvement, diversification, integration of natural enemies and botanical pesticides were suitable pest management strategies. Identifying resilient plant species and short term companion species for income generation during establishment was also deemed a crucial strategy. Therefore, transdisciplinary identified solutions based on ecosystem services to overcome on-farm challenges imposed by climate change effects are crucial to establish agroforestry.

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