Chapter 1

Agro-ecological pest control options for improved eco-efficiency of smallholder farming systems in the face of invasive alien pests

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Abstract

This chapter examines agro-ecological pest-control strategies that enhance eco-efficiency by optimising multifunctional landscapes through biological interactions, landscape complexity and cultural practices based on locally available resources. Focusing on smallholder farming systems in developing countries, we explore the potential efficiency gains from integrating various sustainable pest-control options. We demonstrate how adoption of such technologies into multifunctional landscapes can sustain yield stability, biodiversity conservation and ecosystem services. For policy purposes, we evaluate the socio-economic and socio-psychological dimensions of adoption, with particular emphasis on participatory extension, knowledge-sharing, co-creation and co-production of knowledge, and the influence of perceptions and attitudes as catalysts for uptake. Our synthesis offers a roadmap for practitioners and policy-makers committed to low-input, high-resilience agriculture. We propose a paradigm shift towards system-based pest management that reconciles the imperatives of efficient crop protection with the safeguarding of agroecosystem health.

Keywords: Agroecology, agro-ecological pest management, eco-efficiency, farming systems, invasive alien pests, smallholders