Preface

Keith M. Moore

Small farmers globally are grappling with the linked problems of poverty and environmental degradation. To address the multiple, complex factors shaping these conditions, this book presents an evolving, adaptive management approach to sustainable agriculture and natural resource systems. The goal is to provide development practitioners with the knowledge, understanding, and tools to improve the capacity of smallholders to better use and manage their assets. The principal objective is to empower natural resource managers at all levels through a participatory approach. In this way, smallholders themselves can learn to adapt their own practices for sustainable, food-secure livelihoods and environmental conservation. The book also aims to encourage policy maker and donor support for stakeholder innovation and adaptive management practices.

Adaptive management is a structured process of learning by doing. It is based on a flexible framework that allows managers to adapt their practices as the relationship between people and the environment changes. Scientific methods and disciplinary knowledge help to structure this experiential learning and to facilitate informed decision making; however, this process involves some degree of uncertainty. Adaptive management implies that current actions are based on the best available knowledge, but these trial-and-error actions involve risk. Thus, the actions and system responses must be monitored constantly to respond to new opportunities and risks. There is no "best way" or silver bullet. Rather, adaptive management presents a set of guiding principles that can be adapted to changing circumstances to improve system resilience and stakeholder livelihoods.

Effective adaptive management operates within dynamic networks of multiple agents—human, animal, vegetable, mineral, microorganic—each responding to others' actions in an emerging environment. The competition and cooperation among these agents constitute complex adaptive systems that continually reorganize themselves. To improve decision making for effective complex adaptive system management, five landscape systems—field, farm enterprise, community/watershed, ecosystem, and policy/markets—are used to differentiate networks of agents temporally and spatially. Each system requires a distinct set of expertise. Combining multiple disciplines and the tools they employ allows managers to move beyond a simple understanding of the immediate drivers of poverty and environmental degradation. Recognition of adaptive and nonlinear relationships allows managers to see opportunities for innovative practices that can reinforce sustainable development or reverse downward spirals. Improved technologies in themselves are not sufficient. The objective is to provide development practitioners with the knowledge to coach all resource managers to adapt those improved technologies for use in strategies to manage constantly evolving challenges and opportunities.

This approach is new in that it facilitates innovation and adaptation by integrating both scientific and local knowledge. Despite the introduction of Green Revolution technologies, small-

holders still face poverty, while natural resource managers face new and growing environmental degradation. A second Green Revolution is needed. To sustainably achieve this revolution, small farmers, research scientists, development practitioners, and donors must work as a team. No one person, discipline, or administrative agent can master it all. Resource managers are involved in complicated systems that constantly evolve in response to both management decisions and external conditions. To manage these systems in a sustainable manner, thereby improving livelihoods and preserving and/or restoring essential ecosystem services, complex adaptive management techniques must be employed.

Part I introduces the Sustainable Agriculture and Natural Resource Management (SANREM) landscape systems, describes the principles for adaptive management for complex adaptive systems, and provides a historically based application of the approach.

Part II of the book includes a chapter on each of the landscape systems as well as chapters on governance and communication for innovation and adaptive management. Each of these chapters describes critical system components and their cause-effect relations and interactions, highlights the timeframe(s) for component processes, identifies links between system processes across temporal and spatial scales, and demonstrates how to act strategically to promote innovation.

Concrete examples illustrate system properties and principles of adaptive management, decision-making criteria, and cross-scale impacts and unintended consequences.

Each chapter operates at two levels. The first level provides insights and a conceptual framework for agricultural and natural resource management science, explains how properties and processes are relevant to sustainable improvements in livelihoods and environmental services, and reveals linkages among systems that may facilitate or hinder successful development.

At the second level, each chapter equips development agents and donors with a toolkit of innovation principles and options for adaptive management, a portfolio of techniques for dissemination of technological and institutional improvements, and project designs that empower stakeholders to be innovative.

Part III of the book presents a set of case studies that demonstrate the application of landscape system adaptive management principles. In particular, these chapters highlight the cross-scale interactions critical to reducing poverty and improving long-term sustainability through holistic, multisystem, and multiscale presentations of real cases: wetlands comanagement in Bangladesh; watershed management in Ecuador; and community-based natural resource management in Mali. These case studies show how the landscape systems adaptive management approach can lead to successful sustainable agriculture and natural resource systems.