# TRADITIONAL AGRICULTURE IN SOUTHEAST ASIA

## A Human Ecology Perspective

edited by
Gerald G. Marten

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# Traditional Agriculture in Southeast Asia

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## About the Book and Editor

Many small-scale farmers in the tropics continue to employ a style of agriculture based largely on practices handed down from previous generations and highly adapted to local conditions. In this book, a group of agronomists, ecologists, and social scientists using a human ecology perspective describe how this traditional agriculture functions. They analyze the interactions between small-scale farmers and the agricultural ecosystems on which they depend, explain why traditional agriculture has been able to function on a sustainable basis for so many years, and discuss the ways in which these farmers are having to adjust their traditional practices to a changing world. Although many of the details presented are drawn from Indonesia, Thailand, and the Philippines, this book presents a comprehensive picture of the tropical agriculture as a whole. It provides an appreciation for the ecological and social realities in which agricultural development is taking place and suggests how agricultural scientists can utilize traditional technology to strengthen the development process.

Gerald G. Marten is a research associate at the Environment and Policy Institute, East-West Center.

# Preface

The concept for this book was conceived by the East-West Center Working Group on the Human Ecology of Traditional Agroecosystems, which convened at the East-West Environment and Policy Institute in June–August 1982. The group consisted of agronomists, ecologists, and social scientists from the United States and the Southeast Asian Universities Agroecosystem Network (SUAN). The working group set out to develop a conceptual framework for describing how traditional agriculture functions and to translate that framework into operational procedures for collaborative research on traditional agriculture that would involve both natural and social scientists. The ecosystem concept, in this case the agricultural ecosystem, served as a starting point.

The scientists from Southeast Asia were interested in ecological research because of problems that had arisen with new cropping systems being developed in their countries. The problems included soil degradation and crop losses due to drought, pests, and diseases. Some of these problems were particularly alarming because they became apparent only after a new cropping system was employed for a number of years. The scientists felt a growing concern about the risks inherent in promoting new cropping systems that had not yet proved themselves under local conditions.

There was also a need to incorporate social science into cropping systems development. Farmers often were not using new cropping systems, even though the new systems appeared to provide higher yields and higher economic returns than the existing agriculture. Because the new cropping systems were apparently not what farmers needed, the scientists concluded that efforts to develop better cropping systems would be enhanced by a better understanding of how agricultural households function and make their farming decisions.

As the scientists proceeded to address the ecological and social dimensions of local agriculture, they came to appreciate how well adapted it was to local conditions and how much of this could be attributed to traditional practices that had evolved over many generations. As a consequence, they were interested in drawing upon both traditional agricultural technology and modern agricultural science for new cropping system development. This

interest was stimulated further by concern for the rapid rate at which traditional agricultural practices and knowledge appeared to be disappearing under the impact of modernization.

Some of the U.S. scientists wanted to learn about traditional agriculture because of their interest in exploring alternatives for modern U.S. agriculture. Although U.S. agriculture is highly productive per unit of labor, it is also dependent on heavy inputs of energy and petrochemicals that could become scarce. U.S. agriculture also has problems of environmental pollution and soil degradation that raise doubts about its long-term viability in its present form. Because the self-sufficiency and centuries of sustainable use of much of traditional Southeast Asian agriculture are strong in ways that U.S. agriculture is not so strong, the traditional agriculture may provide a source of ideas for alternatives. While it is unlikely that many of the details of traditional agriculture from a tropical setting would apply to the very different environmental and social conditions in the United States, some of the principles on which traditional agriculture is organized could be of more universal application.

The working group reviewed existing knowledge on the ecology of traditional agriculture, drawing upon the scientific literature and personal experience. The inquiry was organized around the following series of questions:

*Agroecosystem Structure and Function*

What are the major types of traditional cropping systems in Southeast Asia?
How do the types vary in their spatial and temporal structure?
What are their design characteristics with respect to species richness and vertical and horizontal structure?
How does the structure of traditional agroecosystems relate to their productivity, stability, and sustainability?

*Soils*

How does the root stratification of mixed cropping systems contribute to full utilization of soil moisture and soil nutrients?
What kinds of soil problems do small-scale farmers face in the tropics? How do farmers recognize the problems? What are their strategies for overcoming them?
How do soil constraints determine the cropping systems that are employed? Do mixed cropping systems offer advantages on variable or marginal soil types? Do they reduce nutrient depletion on poor soils?
What are the impacts of mixed cropping agriculture on erosion?

*Pests*

What are the ecological mechanisms of pest control in traditional agriculture? How does the temporal and spatial diversity of crops in traditional mixed cropping systems limit pest damage? How are pest problems affected by the mosaic of agroecosystems in a rural landscape?

How do farmers define acceptable limits of pest damage to their crops? What are beneficial roles of "pests"?

*Decision Framework of Traditional Farmers*

How do agricultural and social systems interact in a traditional farming society?

What is the role of traditional knowledge in agroecosystem management strategies? How do traditional farmers perceive ecological factors that bear upon their management decisions? How do farmers adapt their cropping systems to local conditions (ecological and social)?

How is traditional agriculture changing as a consequence of contemporary changes in society? What factors influence the acceptance or rejection of new technology by traditional farmers?

Although the group was not able to answer many of the questions fully, it did make tangible progress toward its objectives. Group members concluded that understanding how traditional agriculture functions can be greatly facilitated by a human ecology perspective, a perspective that focuses on the interactions between small-scale farmers and the farm ecosystems (i.e., agroecosystems) on which they depend for a living. This perspective embraces the total system, including not only the biophysical agroecosystem but also the human social system that shapes the organization of an agroecosystem's soil, water, crops, and pests to generate desired outputs of goods and services. The human ecology perspective gives attention not only to the immediate consequences of changing agricultural practices but also to long-term consequences as the effects of a change reverberate through the biophysical ecosystem and between the ecosystem and the human social system.

This book presents the working group's results. Some of the chapters are composites of what different members of the group, with their different backgrounds, had to offer. Some of the chapters were augmented, and other chapters added, with contributions from other scientists in the Southeast Asian Universities Agroecosystem Network and the East-West Environment and Policy Institute.

An ultimate goal of research on traditional agroecosystems is to help agricultural scientists utilize traditional agricultural technology in strengthening the development process. This book is a step in that direction. It describes how traditional agriculture functions, conveys its strengths and weaknesses, and suggests the kind of role it can have in a changing world. There is no attempt to represent human ecology research on traditional agriculture as a replacement for existing modes of agricultural research nor to lay out recipes for research. The members of the working group developed methods for collaborative agroecosystem research among themselves, but they did not attempt to develop systematic methodologies for designing better agricultural systems, although this was an ultimate concern. There is already an effective array of agricultural research methods under the rubric of "farming systems," which aim at developing new agricultural

technologies for small-scale farmers. As with human ecology, the perspective of farming systems research is holistic, and many of the motivations for farming systems research are similar to those that led to this book. Although this book does not attempt to duplicate what a number of books on farming systems have already presented so well, many of the ideas should serve to augment the farming systems approach.

*Gerald G. Marten*

# Acknowledgments

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G.G.M.

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