Smallholder Tree Growing for Rural Development and Environmental Services

Lessons from Asia

Advances in Agroforestry

Volume 5

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Aims and Scope

Agroforestry, the purposeful growing of trees and crops in interacting combinations, began to attain prominence in the late 1970s, when the international scientific community embraced its potentials in the tropics and recognized it as a practice in search of science. During the 1990s, the relevance of agroforestry for solving problems related to deterioration of family farms, increased soil erosion, surface and ground water pollution, and decreased biodiversity was recognized in the industrialized nations too. Thus, agroforestry is now receiving increasing attention as a sustainable land-management option the world over because of its ecological, economic, and social attributes. Consequently, the knowledge-base of agroforestry is being expanded at a rapid rate as illustrated by the increasing number and quality of scientific publications of various forms on different aspects of agroforestry.

Making full and efficient use of this upsurge in scientific agroforestry is both a challenge and an opportunity to the agroforestry scientific community. In order to help prepare themselves better for facing the challenge and seizing the opportunity, agoroforestry scientists need access to synthesized information on multi-dimensional aspects of scientific agroforesty.

The aim of this new book-series, *Advances in Agroforestry*, is to offer state-of-the art synthesis of research results and evaluations relating to different aspects of agroforestry. Its scope is broad enough to encompass any and all aspects of agroforestry research and development. Contributions are welcome as well as solicited from competent authors on any aspect of agroforestry. Volumes in the series will consist of reference books, subject-specific monographs, peer-reviewed publications out of conferences, comprehensive evaluations of specific projects, and other book-length compilations of scientific and professional merit and relevance to the science and practice of agroforestry worldwide.

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Smallholder Tree Growing for Rural Development and Environmental Services

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Springer

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Foreword

Tree planting has always been considered a noble and respectable activity. In most places around the world, many ceremonious occasions are marked by planting trees to commemorate the event. There is hardly anyone who is famous – from royalty to politicians and movie stars to business tycoons – who has not planted a tree! But, for millennia, ordinary people have been planting trees as part of their routine chores without any external prodding and prompting and, of course, without the accompaniment of the paparazzi and publicity frenzy of the "dignitary tree-planting." Government-sponsored tree planting efforts such as large-scale reforestation and afforestation programs have been the main activity of modern forestry in many parts of the developing world during the past few decades. However, it is not unlikely that the trees planted successfully by ordinary peasant farmers in their (often small) landholdings in the tropics have far outnumbered those planted under such government-sponsored programs. Yet, tree-growing by small holder farmers has received relatively little attention from the scientific and development communities, and is often not even recognized by forestry departments. Any effort in recognizing and encouraging such smallholder tree planting is commendable; for that reason, the publication of this book is very timely and significant.

It is quite appropriate that the book draws from the experience in Asia. Asia is the cradle of agroforestry. The Asian experience of traditional agroforestry systems from shifting cultivation and taungya to homegardens and multistrata systems has paved the way for most of the recent agroforestry innovations and improvements. This book is no exception to this general trend. Presenting a series of case-study papers on tree growing in forest-deprived areas of the Philippines, the book compares the Philippines experience with similar experience in other Asian countries. This comparative analysis then leads to the conclusion that tree growing by smallholder farmers has the potential to play a significant role in sustainable land management. Coming as it does at a time when much of the existing literature about smallholder tree planting is somewhat dated, the new experiences, analyses, and discussions presented in the book are relevant and timely to most other developing countries.

Considering the enormous amount of patient work and persistent efforts needed in bringing out such a multi-authored volume, the editors of the book deserve highest

appreciation. I congratulate the editors and all chapter authors on their splendid accomplishment in providing such a valuable contribution to agroforestry literature.

January 2008
Gainesville, Florida, USA

P. K. Ramachandran Nair
Distinguished Professor, University of Florida
(Editor, *Advances in Agroforestry* Book-Series)

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List of Acronyms

ADB	Asian Development Bank
AECI	Spanish Agency for International Cooperation
ANB	Annualized Net Benefits
ANR	Assisted Natural Regeneration
ASB	Alternative to Slash and Burn, programme of the consultative group for international research in agriculture
ATFS	The American Tree Farm System
ATSAL	Agroforestry Tree Seed Association of Lantapan
BCA	Benefit-Cost Analysis
BCR	Benefit-Cost Ratio
BITO	Bakun Indigenous Tribes Organization
BMW	Black Magic Wood
BRASS	Bioeconomic Rubber Agroforestry Support System
CARES	Center for Agricultural Research and Ecological Studies
CARE Thailand	Collaborative Natural Resource Management, Thailand
CBD	Convention on Biological Diversity
CBFM	Community-based Forest Management
CBFMA	Community Based Forest Management Agreement
CBFMP	Community-Based Forest Management Program
CDM	Clean Development Mechanism of the Kyoto Protocol
CENRO	Community Environment and Natural Resources Office of the DENR
CEPT Agreement	ASEAN Common Effective Preferential Tariff Agreement
CHED Program	Program of the Commission on Higher Education
CI	Conservation International
CIFOR	Centre for International Forestry Research
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLT	Certificate of Land Transfer
CML	The Institute of Environmental Sciences-Leiden University
COE	Center of Excellence of Isabela State University-College of Forestry and Environmental Management under the CHED Program
COP	Conference of the Parties

CPPAP	The Conservation of Priority Protected Areas Project
CSA	The Canadian Standard Association
CSC	Certificate of Stewardship Contract
CVPED	Cagayan Valley Programme on Environment and Development
DA	The Department of Agriculture
DAR	Department of Agrarian Reform
DBH	The Diameter at Breast Height
DBP	Development Bank Philippines
DCF	Discounted Cash Flow
DENR	The Department of Environment and Natural Resources, the Philippines
DENR-ERDB	Department of Environment and Natural Resources-Ecosystems Research and Development Bureau
DENR-PAWB	Department of Environment and Natural Resources-Protected Area and Wildlife Bureau
DGIS	The Directorate-General for International Cooperation of the Dutch Ministry of Foreign Affairs in the Netherlands
EAR	Energy Accumulation Ratio
ECE	Energy Conversion Efficiency
EEPSEA	Economy and Environment Program for Southeast Asia
EFE	Energy Fixation Efficiency
EMS	Environmental Management Systems
ERDB	Ecosystems Research and Development Bureau
ERPA	Emission Reduction Purchase Agreement
ES	Environmental Services
ESCAP	Economic and Social Commission for Asia and the Pacific
EU	European Union
EUREP-GAP	Euro-Retailer Produce working group for Good Agricultural Practices (www.eurep.org)
FAO	Food and Agriculture Organization
FGD	Focal Group Discussions
FMB	Forest Management Bureau, the Philippines
FORRU	Forest Restoration Research Unit, Thailand
FPDP	The Lao Forest Plantation Development Project
FSC	Forest Stewardship Council
FSC-SLIMF	Forest Stewardship Council-Small and Low Intensity Managed Forests
FT	Fruit Trees
GDP	Gross Domestic Product
GHGs	Greenhouse Gases
GMPCI	Gabriela MultiPurpose Cooperative Inc
GNI	Gross National Income
GOLD	Governance and Local Democracy Project, the Philippines
GSAP	Gross Service Area Product

HCFV	High Conservation Value Forest
ICEM	International Centre for Environment Management, Brisbane
ICMM	The International Council for Mining and Metals
ICRAF	World Agroforestry Center
IDR	Indonesian Rupiah
ILO	International Labor Organization
Indonesian LEI system	Lembaga Ekolabel Indonesia certification system
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
ISO	International Organization for Standardization
ISU	Isabela State University
ITPP	Industrial Tree Plantation Project
ITS	Indigenous tree species
ITTO	International Tropical Timber Organization
IUCN	The World Conservation Union
JBIC	Japan Bank for International Cooperation
JOFCA	Japan Overseas Forestry Consultants Association
KEF	Kalahan Educational Foundation Inc.
KOFFCO system	Komatsu-FORDA Fog Cooling system
LA	Land Allocation
Lao-IRRI	National Rice Research Program, Lao PDR
Lao PDR	Lao People's Democratic Republic
LFPI	Landcare Foundation of the Philippines Inc.
LG	Land Grant
LGU	Local Government Unit
LLDA	Laguna Lake Development Authority
LPA	Lao Plantation Authority
LUP	Land Use Planning
MAF	Ministry of Agriculture and Forestry, Lao PDR
MAFAMCO	The Mt. Apo Farmers Cooperative
MAI	Mean Annual Increment
MANRIS	Manupali River Irrigation System
MBRLC	Mindanao Baptist Rural Life Center
MDF	Medium-Density Fibreboard
MDG	Millennium Development Goals
MMSD	The Minerals, Mining and Sustainable Development project
MPTS	Multi-Purpose Tree Species
MSC	Marine Stewardship Council
MTCC	The Malaysian Timber Certification Council
NAFES	National Agriculture and Forestry Extension Service
NAFRI	The National Agriculture and Forestry Research Institute, Lao PDR
NALCO	Nasipit Lumber Company
NAS	National Academy of Sciences

NCF	Net Carbon Flow
NGO	Non Governmental Organization
NIPAS	The National Integrated Protected Areas System
NIPF	Non-Industrial Private Forests
NORDECO	Nordic Agency for Development and Ecology
NPV	Net Present Value
NSC	National Statistic Centre Committee for Planning and Investment, Lao PDR
NSMNP	The Northern Sierra Madre Natural Park
NSO	National Statistics Office, the Philippines
NTFP	Non-Timber Forest Product
NVS	Natural Vegetative Strips
OM	Organic Matter
PAFO	Provincial Agriculture and Forestry Office, Lao PDR
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAWB	Protected Area and Wildlife Bureau
PCARRD	Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development
PCR	Project Completion Report
PCU	Project Coordination Unit
PEFC	The Programme for Endorsement of Forest Certification
PES	Payments for Environmental Services
PhP	The Philippine Peso
PICOP	Paper Industries Corporation of the Philippines
PLAN (International)	Child focused non-governmental international development agency (www.plan-international.org)
PO	People's Organization
PPTA	Preparatory Project Technical Assistance
PTFI	The Provident Tree Farm Inc.
ReV Chain	Reforestation Value Chain
RFD	The Royal Forest Department Thailand
RMAs	Rapid Market Appraisals
RMI	The Indonesia Institute for Forest and Environment
RUP	Resource Use Permit
RUPES	Rewarding Upland People for Environmental Services
SAFODS	Smallholder Agroforestry on Degraded Soils
SAMAKA Program	Samahan ng Masaganang Kakanin (a united effort to produce ample food for the family)
SCUAF	Soil Changes Under Agroforestry
SFE	Small Forest Enterprises
SFM	Sustainable Forest Management
SLIMF	Small and Low Intensity Managed Forests
SPAs	Seed Production Areas
SPLTP	Special Private Land Timber Permit

SSS	Small-Scale Sawmills
TAO	Tambon Administration Organization
TLA	Timber License Agreement
TRP	The Rainforest Project
TSI	Timber Stand Improvement
TT	Timber trees
UMN	University of Minnesota in the United States
UNDP	United Nations Development Programme
UNDP SGP PTF	The UNDP Small Grants Programme for Operations to Promote Tropical Forest
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
UPLB	The University of the Philippines Los Baños
WaNuLCAS model	Water, Nutrient and Light Capture in Agroforestry Systems
WB	World Bank
WCSP	Wildlife Conservation Society of the Philippines
WOTRO	The Netherlands Foundation for the Advancement of Tropical Research
WWF	World Wildlife Fund for Nature

Part I
Smallholder Tree Growing: Introduction

Chapter 1
Smallholder Tree Growing in South and Southeast Asia

D.J. Snelder[1]* and R.D. Lasco[2]

Abstract This chapter sketches the context of this book. It addresses the questions why we focus on smallholder tree growing and why we discuss the Philippines as main case study country. Relevant background information related to the aforementioned questions is given, including a historical sketch on smallholder forest management and the development of concepts on smallholder tree growing in South and Southeast Asia, a review of farmers' motivations and other controlling factors affecting tree growing activities, and a discussion on the need for sustainable land use and, related to this, recognition of farmers' potential to produce wood and provide other forest benefits and ecological services. The chapter ends with an overview of the different sections under which the various chapters in this book have been arranged.

Keywords small-scale reforestation, tree plantation, tree management, forestry concepts

1.1 Introduction

The protection, planting, exploitation and management of forest and tree resources are activities that have a long history in most Asian cultures. Tree growing is part of traditional land use in both tropical dry and wet zones. In recent years, the role of smallholder communities in the management and protection of remaining forests is regaining importance in government policies and programs in Asia and elsewhere.

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D.J. Snelder and R.D. Lasco (eds.), *Smallholder Tree Growing for Rural Development and Environmental Services.*

This tendency is associated with the moral argument that conservation goals should contribute to, and not conflict with, basic human needs and, for that reason, local communities should be more involved in designing and implementing forest conservation policies. The use of such argument is, however, not new but has been emphasized in development issues for the last three decades, especially in the 1980s – by some even called the decade of participation (Chambers 1983; Ingham 1993), when the concept of sustainable development made a great shift towards 'people centered' development, community involvement, cooperative management, power sharing, decentralization and devolution, and empowerment. The role of smallholder communities is likewise increasingly recognized in the reforestation of agricultural lands in the form of growing trees on farms and also near settlements and built-up areas, i.e., the so-called "trees outside forests". The latter are a crucial resource in terms of meeting future needs, both public and private, for timber, woodfuel, other forest products and a variety of environmental services, particularly in developing countries (FAO 1985, 2006a). There is evidence of spontaneous forest product diversification through implementation of tree systems on farms by smallholders who lack easy access to nearby forest resources (e.g., in Cebu, Philippines; FAO 1993; in western Kenya, Scherr 1995). The trees relieve the pressure on remaining forest resources and restore and safe-guard ecological and socio-economic sustainability in agricultural landscapes. Moreover, smallholder tree growing is perceived as a potential strategy for poverty alleviation in various, often agroforestry and community forestry, programs world-wide (e.g., Cacho et al. 2003; ICRAF 2003; Sales et al. 2005; FAO 2005, 2006a). The extent to which tree growing can alleviate poverty and increase food security is however not well documented or clear to policy makers (FAO 2006a).

Yet, research on smallholder tree growing falls behind when compared to research into large-scale forestry and agricultural (tree) crop plantations. Not enough is known about the dynamics of trees on farmlands and their corresponding contribution to the production of wood and other products and services (FAO 2006a). In order to understand current and potential contributions of tree growing to rural development and forest services, extensive research and good statistical data are required. The latter are, however, absent from most official statistics (FAO 2006b). Likewise, data on the actual amount of land occupied by smallholder tree growing systems are still lacking partly because of the multitude of systems that do exist. Generally, no distinction is made for this category of land use by statistics agencies or in case there are distinctions, they are not uniformly perceived (Jensen 1995). Smallholder tree growing systems may be included in several of the categories usually applied in land use statistics such as: forest land, wood land, degraded land, agricultural lands, urban areas (homegardens) and "other land use" (e.g. road side plantings). In addition, the statistics should generally be treated with some caution although processes of data gathering and analysis have been improved since the use of satellite imagery.

In this introductory chapter, we will first give a historical perspective on tree growing, community participation and associated policies in Asia and elsewhere in the world, then sketch the context in which smallholder tree growing receives an

ever-increasing role in reforestation efforts, which in turn leads us to giving additional explanations for our focus on smallholder tree growing. We will then discuss smallholders' motivations and controlling factors for growing trees on their farms and land elsewhere. We proceed with a review of the rise and development of various concepts related to smallholder tree growing for those Asian countries that will be discussed in the separate chapters of this book. The chapter will be closed off with an overview of the remaining chapters in this book.

1.2 A Historical Sketch

Records on the oldest practices of tree growing mostly refer to the growing of trees near dwellings in order to provide products for subsistence and home consumption, i.e., the so-called homegardens. Soemarwoto (1987) suggests, based on Brownrigg's literature review of 1985, the earliest evidence of homegarden cultivation in the Near Eastern region dates back to 3000 B.C. and possibly 7000 B.C. Yet, in a recent publication Wiersum (2006) relates the origin of homegardening to 13,000 to 9,000 B.C., a period during which fishing communities were living in moist tropical regions.

Early evidences of use and management of forest resources in China also date back to a distant past. For example, oracle-bone inscriptions with graphs of agricultural words from the Shāng dynasty (ca. 1600–ca. 1046 B.C.) suggest trees in Shāng agriculture played a role comparable to that of trees in agroforestry systems today (Menzies 1996). Early scripts written during the Zhāu dynasty (1122–256 B.C.) refer to systems of forest manipulation and tree cultivation directed at the maintenance of forest productivity through, amongst others, carefully scheduled timber harvesting activities (Menzies 1996). At this time, and also later during the Han dynasty (206 B.C.–A.D. 220; Needham 1986), forest-related activities were predominantly controlled by the nobles, i.e., the farmland-owning classes. Much later in the early 20th century, when the first western scientists started to work in the severely degraded forest areas of northern China, Lowdermilk (1926 in Menzies 1996) discovered indigenous systems of silviculture in protected temple forests, in forests owned collectively by villages and temple associations and in densely populated suburban areas.

In the western world it was only in the Middle Ages that forestry practices were formally developed under the rule of the nobility, i.e., the highest social class, and implemented by farmers and laborers of lower social classes in the, at the time, prevailing feudal system (Shepherd et al. 1998). The more systematic forestry practices for timber purposes are believed to have begun in the 16th century in the German states (James 1996). In the eastern world, plantation forestry started in Japan during the Tokugawa period in the 17th century as a response to the increasing demand for wood and the deterioration of forest resources. It was initially mainly aimed at water conservation and erosion control, for example in the northern part of the main island Honshu (Totman 1985), and in the 18th century increasingly directed at timber production, practiced on both land of feudal lords and

common lands managed by farmers (Iwamoto 2002). In Europe, the increasing importance of timber in the 18th century led to the founding of forest science as a specialist discipline in Germany from where it spread to other European countries and their colonies in the 19th century (Shepherd et al. 1998; see also Appendix).

With the technological development in the 20th century, large-scale logging enterprises and monoculture, even-aged forest plantations emerged in rural areas worldwide (Shepherd et al. 1998). Moreover, after the disintegration of most colonial empires around the first half of the 20th century, the Food and Agriculture Organization (FAO) helped forestry departments of former colonies to transform earlier weakly centrally-controlled forests into important timber-producing areas and so-called "political forests", i.e., forests put under state forestry services and affected by both ecological and political processes (Van der Geest and Peluso 2006). Small-scale tree growing activities were still performed by rural communities but received relatively little attention from governments and (inter)national organizations throughout the 19th and most of the 20th centuries. During the second half of the 20th century, forestry laws and binding regulations in support of sustainable land use were being developed and enacted in response to growing environmental awareness. The latter was instigated by the rapid decrease in natural forest cover and associated biodiversity resulting from the excessive rise in timber exploitation rates. Moreover, there was much concern about the ever-increasing gap between demands for fuelwood and availability of supplies in developing countries where local resource-poor farmers used more and more crop residues and animal manure as a source of fuel rather than a source of mulch and fertilizer, affecting soil productivity (Arnold and Dewees 1997; Photo 1.1).

Photo 1.1 Smallholders collecting fuelwood in the uplands in Isabela Province, the Philippines (©DJ Snelder)

The integration of trees into farming systems in the form of agroforestry has been promoted since the late 1970s as a strategy for sustainable land use particularly in support of the rural poor (King 1987, Young 1997, FAO 2005) and, at its earlier stage, as a means to narrow the so-called fuelwood gap (FAO 1997). With the introduction of rural integrated development programs in the 1980s, smallholder tree growing regained recognition because of its potential role in mobilizing rural resources for the generation of a wide range of tree products, for both subsistence and commercial purposes, including timber, wood fuel, fruit, leafy vegetable, fodder, resin, oil, and medicine. In this context smallholder tree growing is also considered in recent times as a policy option addressing the Millennium Development Goals (MDGs; see http://www.un.org/millenniumgoals/). Smallholder tree growing is further linked to environmental services and the agenda on global change. Under the nomenclature agroforestry, it has been identified as one of the thematic areas by the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD) in 1996. The CBD refers to agroforestry as a form of adaptive management, being "a method of sustainable agriculture that employ management practices and technologies that promote positive and mitigate negative impacts of agriculture on biodiversity" (Decision V/5 2.3). Likewise, there is a clear link to agrobiodiversity being described as having "all components of biological diversity of relevance to food and agriculture and all components that constitute the agro-ecosystem, i.e., the variety and variability of animals, plants and micro-organism, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes" (Decision COP III/11 in 1996). More recently, the role of tree farming including agroforestry in mitigating climate change primarily through carbon sequestration has also been highlighted (IPCC, 2000, 2007).

1.3 From Deforestation to Reforestation: An Urgent Need for Sustainable Land Use

The state of forest resources in countries world-wide has reached a critical point; never before have forest ecosystems been so greatly and rapidly affected by human activities as during last decades. Large stretches of the world's forests, that have served in the subsistence and development of humankind, have been converted to other uses particularly agriculture or are severely degraded. The global net change in forest area approximated −8.9 million hectares per year in the period 1990–2000 (FAO 2001, with corrected data in FAO 2006b; Table 1.1). Deforestation still continues at a high rate today.

Most forest losses occur in tropical countries, particularly Africa, South America and Asia. The highest rate of forest reduction in South and Southeast Asia has been recorded for Indonesia with a loss of 1.9 million hectares (or 1.7 percent reduction) per year for the period 1990–2000 followed by Myanmar and the Philippines with losses of, respectively, 0.5 million hectares (−1.3 percent) and 0.3 million hectares

Table 1.1 Forest resources distribution and changes for the period 1990–2005 in South and Southeast Asia (FAO 2006a)

Country/ area	Land area	Forest area 2005				Forest area change 1990–2005			
		Natural forest	Forest plantation	Total forest		Total forest		Forest plantations	
						1990–2000	2000–2005	1990–2000	2000–2005
	000 ha	000 ha	000 ha	000 ha	% of land area	000 ha/ year	000 ha/ year	000 ha/ year	000 ha/ year
Bangladesh	13,017	592	279	871	6.7	n.s.	–2	3.7	0.6
Bhutan	4,700	3,193	2	3,195	68.0	11	11	0	0.2
Brunei	527	278	–	278	52.8	–2	–2	–	–
Cambodia	17,652	10,388	59	10,447	59.2	–140	–219	0.5	–2.6
East Timor	1,479	755	43	798	53.7	–11	–11	1.4	0
India	297,319	64,475	3,226	67,701	22.8	362	29	85.1	84.2
Indonesia	181,157	85,096	3,399	88,495	48.8	–1,872	–1,871	79.3	79.4
Lao PDR	23,080	15,918	224	16,142	69.9	–78	–78	9.5	25.0
Malaysia	32,855	19,317	1,573	20,890	63.6	–78	–140	–29.7	–17.2
Maldives	30	1	–	1	3.0	0	0	–	–
Myanmar	65,755	31,373	849	32,222	49.0	–466	–466	30.2	30.6
Nepal	14,300	3,583	53	3,636	25.4	–92	–53	0.3	0.2
Pakistan	77,088	1,584	318	1,902	2.5	–41	–43	6.2	4.4
Philippines	29,817	6,542	620	7,162	24.0	–262	–157	–92.8	–46.4
Singapore	61	2	0	2	3.4	0	0	0	0
Sri Lanka	6,463	1,738	195	1,933	29.9	–27	–30	–2.1	–5.1
Thailand	51,089	11,421	3,099	14 520	28.4	–115	–59	43.7	4.4
Viet Nam	32,550	10,236	2,695	12,931	39.7	236	241	108.3	129.0
S & SE Asia	848,952	266,492	16,634	283,127	33.4	–2,578	–2,851	239.9	286.7
Total World	13,063,900	3,801,848	150,177	3,952,025	30.3	–8,868	–7,317	–	2,800

(−2.8 percent) per year (Table 1.1). For the period 2000–2005, the rate of forest loss remained unchanged for Indonesia and Myanmar but decreased to −0.2 million hectares (−2.1 percent) per year for the Philippines.

Efforts to counteract these losses have been directed at the establishment of large-scale forest plantations. Plantation forests have in fact increased throughout the world, at an estimated rate of 2.8 million hectares per year during the period 2000–2005, and tempered – together with natural forest expansion – the annual rate of net forest loss from 8.9 to 7.3 million hectares (Table 1.1). Yet, forest plantations have not been equally successful in the region. For example, Asia (with a net forest loss in the 1990s), experienced a net gain in forest area over the period 2000–2005, but this was mainly as a result of large-scale afforestation reported by China (FAO 2006b). Moreover, forest plantations still comprise only a small percentage, i.e., 3.8 percent (or about 150 million hectares), of the total forest area world wide (FAO 2006b). It is unclear how much of this percentage is accomplished by smallholder

tree growers, if at all included in the country records on which this figure is based.

Remaining forest resources are unevenly distributed over different continents and countries world wide. In South and Southeast Asia, large-sized countries like Indonesia and India with, respectively, 88 and 68 million hectares of forest account for over half of the total forest area in the region (2005 records; Table 1.1). Yet, when looking at the distribution of percentage land surface covered by forest, Indonesia is grouped among countries with intermediate coverage (48.8 percent) whereas India has to be categorized under countries with relatively low coverage (22.8 percent). Lao Peoples' Democratic Republic and Malaysia have well over 50 percent of their land area under forest. Pakistan and Bangladesh hold only small patches of forests covering respectively 2.5 and 6.7 percent of the country's total land area. Vietnam, Thailand, Nepal, and the Philippines take an intermediate to low position with, respectively, 39.7, 28.4, 25.4 and 24.0 percent of forest coverage.

In addition to declining forest areas, suitable areas for the production of food for present and future generations are dwindling as well. Mainly marginal lands remain, the fertile lands traditionally being utilized for various forms of crop cultivation. Consequently, agricultural intensification is currently being practiced in many parts of the world in order to increase crop production and provide food security. However, agricultural intensification has not automatically led to sustainable forms of land use; on the contrary, it has been accompanied by serious forms of land degradation, particularly in the developing world where roughly one quarter of all farmland has been degraded (Garrity 2004). Farmland is affected by soil nutrient depletion and soil physical degradation due to repeated cultivation and harvesting practices without periodic application of fertilizers or manure. The much needed farm inputs, or fallowing time, for restoring the soil are lacking whereas the knowledge on alternative, cost-effective methods of sustainable land use is limited.

The urgency to stop, or at least control, the destruction of remaining forests and the degradation of agricultural land and look into a wide spectrum of solution-oriented measures of sustainable land use has nowadays been recognized as crucial to our survival. This recognition has triggered projects and programs on forest conservation, reforestation, and agroforestry worldwide aimed at the integration of trees in denuded and predominantly agricultural landscapes and funded by institutions like the World Bank, the Asian Development Bank, the European Commission (EU), and FAO.

1.4 Why Focus on Smallholders?

Since the 1980s, there have been clear signs of a paradigm shift in the forestry sector throughout Asia and elsewhere in the world: whereas large-scale timber-oriented industrial estates and reforestation projects dominated past forestry approaches, there is a trend towards small-scale and multiple use systems of tree growing and community forestry (see also Harrison et al. 2002). Environmental concerns and

various processes of rural development have facilitated this shift in the forestry sector as will be outlined below.

Firstly, the rate of success among large-scale reforestation projects has been less than expected as discussed earlier. In addition, environmental degradation and social problems associated with large-scale reforestation projects have raised much debate (Sawyer 1993; Carrere and Lohman 1996; Cannell 1999). For example, native longhouse communities in Sarawak resisted the establishment of a 200,000 ha *Acacia mangium* plantation in a former concession area partly claimed by about 20,000 mainly Iban people under Native Customary Rights (Barney 2004). The plantation, to be managed in intensive seven-year rotations, was initiated in 1996 as a joint venture between the Sarawak state government and the Singapore-based Asia Pulp and Paper. Key to the social conflict was the displacement of longhouses and the unconditional resettlement packages, raising also protest among various Sarawakian non-governmental organizations (NGOs). However, an exclusive emphasis on resistance to forest plantations, as practiced by some NGO networks, may undermine the fact that there is also widespread smallholder participation in plantation production; a tendency that is likely to increase in the future (Barney 2004). In addition, in-depth analysis of some of the previously adverse environmental assessments of tree plantations with species such as *Eucalyptus* proved to be unfounded (e.g., Sayer et al. 2004).

In addition to forestry plantations, smallholders have increasingly been involved in on-farm tree growing through the establishment of agroforestry systems. However from the start of its promotion in the 1970s, smallholder tree growing has received considerably less attention from the (less) developed and scientific worlds, when compared to large-scale tree planting and reforestation. More recently, with the expansion of small-scale cultivation in many regions of the world, the awareness is mounting that lands controlled by smallholders are of increasing importance in both sustainable food production and safeguarding environmental services, such as biodiversity conservation, watershed protection and carbon sequestration. They more and more determine the environmental, economical and ecological value of the landscape. Whether smallholder tree growing does indeed make a difference, and if so, to what extent it contributes to sustainable development and environmental protection and conservation, needs further investigation.

Another reason for increasing interest in smallholder tree growing is related to the expansion of areas under forest protection. The latter has lead to a ban on logging and restrictive use of natural forest products in countries like Indonesia, Thailand and the Philippines. Smallholders are therefore in search of alternative sources of tree products and ways of integrating trees into their farming systems through on-farm tree growing and forestry plantations. Moreover, it is expected that, with mounting population and land shortage, the number of farmers with smallholdings will remain high or may even increase in the near future.

Yet, the implementation of tree-based farming systems still faces controversy and need further exploration, given for example their contested role in providing profits to farmers under present conditions of increasingly competitive world markets. Whereas a small number of tree crops (e.g., coffee, cacao, tea) played a critical role in setting off economic growth during past three decades in Southeast Asia, at