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Trees and Farms in Asia:

An Analysis of Farm and Village Forest Use Practices in South and Southeast Asia

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Results from a

regional study conducted by scientists in the

Multipurpose Tree Species Research Network

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Executive Summary

This report presents a preliminary regional analysis of a study of farm and village forestry practices conducted in six countries in South and Southeast Asia. The study examined use of tree products by four classifications of households, and included the source of the products and identification of the species used. Thirteen researchers collected data from 26 villages in Bangladesh, Indonesia, Nepal, the Philippines, Sri Lanka, and Thailand. Two additional study participants coordinated the research.

Participants agreed on definitions of major social, economic and environmental phenomena with which to compare practices across the region. Farmsize was not classified by area alone, but by common characteristics of income level and relative poverty or wealth. Household was defined to represent the actual consumption and production unit, not the family unit.

In addition to collecting data for national and regional comparisons, each researcher conducted an individual case study.

This analysis identified four general trends in forest use practices. First, relative size of the farm affected the ways a household used tree products, including sources. The effect of farmsize differed for each type of product. Medium- and large-farm households use tree products as their primary source of fodder more often than small-farm households. Grasses tend to be the preferred fodder for all farmsize groups, but trees provide important secondary sources of fodder regardless of farmsize.

For all farmsize groups except landless households, the household farm is the primary source of fuelwood. However, small-farm households use state forests as a major source of fuelwood much more frequently than medium- or large-farm households. Charcoal use was found mainly in Nepal, the Philippines and Thailand. Where charcoal is used, large-farm households tend to use it more than other farmsize groups.

Medium- and large-farm households were more likely than small-farm or landless households to use timber regularly, whether for sale or for their own use. Small-farm households were most likely to use tree products for handicrafts. The landless were least likely to make handicrafts from tree products.

A second general trend is the apparent connection between agroforestry or tree-farming practices and the use of government extension services. However, further analysis showed that almost all farmers receiving extension services were in Indonesia, Nepal, and one pair of villages in the Philippines. The country or district where the household was located proved to be as important as receipt of extension services in

influencing the use of agroforestry or tree farming practices. It is likely that other social, cultural, or economic factors have as much influence on these practices as the availability of extension services.

A third trend is that the most common on-farm site for growing trees was in homegardens (or homesteads); the second most common on-farm source was trees scattered in crop fields. For those with easy access to state forests and purchased tree products, these were major sources of all types of tree products. The fact that, in some situations, villagers are willing to buy tree products for nearly all uses suggests the need for marketing studies. Where adequate markets are shown to exist, villagers might be encouraged to grow trees for sale.

The fourth trend identified in this analysis is that fruit and other food trees were the most popular and widely used multipurpose trees in the region, regardless of farmsize. The three most widely used species across the region were *Artocarpus heterophyllus, Mangifera indica*, and *Cocus nucifera* (English common names are given in Appendix C). Regional research on multipurpose trees should include food species. While restrictions on exchange of germplasm may make international research on high-value cash crops like *Mangifera* difficult, other species (e.g., *Artocarpus* sp., *C. nucifera, Tamarindus indica,* and *Azadirachta indica*) should be studied for use as sources of fuelwood, timber, and other products.

Species should be studied under the existing systems in which they are planted and managed. Farmers are likely to continue growing trees in homegardens or scattered in their fields. While some may adopt agroforestry or tree farming, more significant advances are likely to come through improved management of the trees that small-farm households already grow or of similar species.

This study represents an important first step in a process of systematic comparative analysis of forest use practices, and provides a basis for more thorough analyses of the trends identified.

1. Introduction to the Study: Background, Scope and Methods

This report presents an analysis of the effects of selected social and economic factors on the practices of villagers in Asia for using trees. The effects of farmsize on these practices is of particular interest. Data represent households in 26 villages in 6 countries that were included in a regional study on Farm and Village Forest Use Practices. This report presents only the first regional analysis, that is, the analysis of the combined data from all the villages. For the most part, data were not analyzed at the national or village levels for this report. National-level analyses for the Philippines and Thailand are being done separately. Village-level analyses are available through the Farm and Village Forestry Database and the accompanying village descriptions and case studies.

Fifteen social scientists and foresters from 6 countries in South and Southeast Asia conducted this comparative study of farm and village forest use practices. The study emerged from discussions at a Workshop on Standardized Methods for Farm and Village Forestry held in Kathmandu, Nepal, April 23-29, 1988. The workshop was co-sponsored by the International Center for Integrated Mountain Development (ICIMOD), Winrock International F/FRED, the International Development Research Centre (IDRC), and the Institute for Agriculture and Animal Sciences (IAAS) of Tribhuvan University. Workshop participants identified priority topics for comparative research and listed the minimal social, economic, cultural and environmental information considered necessary for understanding local forest use practices and implementing social forestry programs.[1] The regional comparative study focussed on several of these priority topics. A methodology for field research and data collection was developed and compiled in a handbook for use by the study participants.[2]

The study participants met in early 1989 to refine the research methodology, and conducted field research during the remainder of the year.[3] The F/FRED project's Global Research Unit with the University of Hawaii developed the Farm and Village Forestry Database for data storage. The participants met again in early 1990 to review the database and other issues relating to the study, including suggestions for future research. Funds for this meeting were provided by Winrock International-F/FRED and

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[1] The report of this meeting is presented in Taylor and Mehl (1988).

[2] See Mehl (1990). This handbook includes instructions for the Farm and Village Forestry Database.

[3] The U.S.A.I.D.-funded F/FRED Project, implemented by Winrock International, sponsored most of the research. The Thailand portion of the study was co-sponsored by the Ford Foundation. GTZ funded the Sri Lankan portion of the study. National-level coordination, analysis and meetings for the Philippines and Thailand were funded by the Ford Foundation.

the FAO Wood Energy Development Project. The study participants recommended priorities for regional analysis at this meeting.

The researchers who took part in the study were:

Bangladesh:	Syed Zahir Sadeque
Indonesia:	Junus Kartasubrata
Nepal:	A.K. Das Kailash Pyakuryal
Philippines:	Marian delos Angeles (national coordinator) Herminia Arocena-Francisco Bienvenido Maligalig Fe Mallion Elisio Ponce
Sri Lanka:	Anoja Wickramasinghe
Thailand:	Yongyuth Chalamwong Lert Chuntanaparb Charles B. Mehl (national coordinator) Uraivan TanKimYong Charit Tingsabadh
U.S.A.:	Ruiz Tabora (database development)

Each participant conducted field research except for the national coordinators and the database development specialist. Each of the 13 researchers selected two villages for study. Due to the time limit for field research (6 months), the researchers selected villages with which they were already familiar. This permitted quick collection of a large amount of background information, as well as detailed and sometimes sensitive information on land and forest use from villagers with whom the researchers had already cultivated trust and understanding.

Information was collected from at least 50 households in each village on farmsize category, land tenure and use, access to common property resources; household activities, sources of livelihood and income; basic demographic information and number of livestock; use of credit, participation in forestry projects, and use of extension and other forestry support services. Detailed information was collected from 25 of these 50 households on their forest use practices (that is, what tree products they use, the sources of these products, species used for each product, and which species they prefer to use

(whether available or not). The communities included in this study are listed in Table 1.1. Figure 1 shows their location in the region, and Table 1.2 presents characteristics of each village.

The scientists involved in the study first considered dividing the communities among major agro-ecological zones or other broad categories for the purpose of comparative, cross-national analysis. After considerable discussion, however, the researchers felt that not enough was known about farm- and village-forestry practices to cluster the communities **prior to** the study. Although several apparently logical, consistent categories presented themselves, none were guaranteed to be divisions with a basis in reality. Without first describing the basic social and economic aspects of farm and village forestry practices -- which we have tried to do with the results of this study through the interactive Farm and Village Forestry Database and accompanying village reports -- it would be fallacious to assume that one set of characteristics were more important than another in contributing to the differences in the ways people manage and use trees. Who can say with certainty *a priori* that geography and climate, for example, play a greater role in defining parameters of forestry practices than culture, politics, religion or economics?

The researchers were also reluctant to cluster the communities into broad agro-ecological or economic categories after the study on the basis of information from only 26 villages in 6 countries. Dividing these few communities into subgroups would leave too few in each category for sound analysis. Further research is needed, with many more sites throughout the region, before the communities can be grouped into meaningful and tenable categories for analysis.

Definition of Terms

To assure comparability across cultures and countries, the researchers agreed on the definitions of crucial social and economic phenomena. Farmsize, for example, could not be compared simply on the basis of area. A small farm in Northeast Thailand, where poor soils and low, irregular rainfall severely limit production, is much larger than some of the larger farms in the irrigated areas of Indonesia, Bangladesh, or even the valleys of North Thailand. The researchers divided all households into four farmsize categories: landless, small, medium, and large.

Landless households are those which neither own nor rent farm land. (Thus a household that does not own land, but "rents in" land to farm, would not be classified as landless in this study.) For small-farm households, the researchers used the FAO definition, which defines small farmers as low-income producers (below the national poverty line or below the national average farm income) with small-scale holdings. Their holdings (whether owned, rented or used for free) are either inadequate to meet their minimum needs or just sufficient to meet those needs. Medium-size farm households are

Table 1.1. Communities in the Regional Study on Farm and Village Forestry Practices.

	Community	Province/District	Country
1.	Belpukur	Rajshahi	Bangladesh
2.	Samsadipur	Rajshahi	Bangladesh
3.	Payungagung	Ciamis, West Java	Indonesia
4.	Karangsari	Ciamis, West Java	Indonesia
5.	Kankre	Ugrachandi, Kavre	Nepal
6.	Tusal	Ugrachandi, Kavre	Nepal
7.	Rakhi	Kaski	Nepal
8.	Lekhnath	Kaski	Nepal
9.	Jose P. Laurel	Laguna	Philippines
10.	Juan Santiago	Laguna	Philippines
11.	San Isidro	San Isidro, Leyte	Philippines
12.	San Miguel	Baybay, Leyte	Philippines
13.	Barangay Paiton	Nanjan, Oriental Mindoro	Philippines
14.	Sitio Banilad	Dulangan 3, Oriental Mindoro	Philippines
15.	Bila	Bauko, Mountain Province	Philippines
16.	Guinzadon	Bauko, Mountain Province	Philippines
17.	Madugalla	Udadumbara, Kandy	Sri Lanka
18.	Bambarabedda	Udadumbara, Kandy	Sri Lanka
19.	Parmoke	Saithong, Ang Thong	Thailand
20.	KM 7	Sanamchaikhet, Chachoengsao	Thailand
21.	Nongyang	Sanamchaikhet, Chachoengsao	Thailand
22.	Mae Phae Haeng	Sankumpang, Chiang Mai	Thailand
23.	Onklang	Sankumpang, Chiang Mai	Thailand
24.	Non Si Sawat	Nong Kung Si, Kalasin	Thailand
25.	Kam Kham	Nong Kung Si, Kalasin	Thailand
26.	Thap Chang	Muang, Nakhon Ratchasima	Thailand

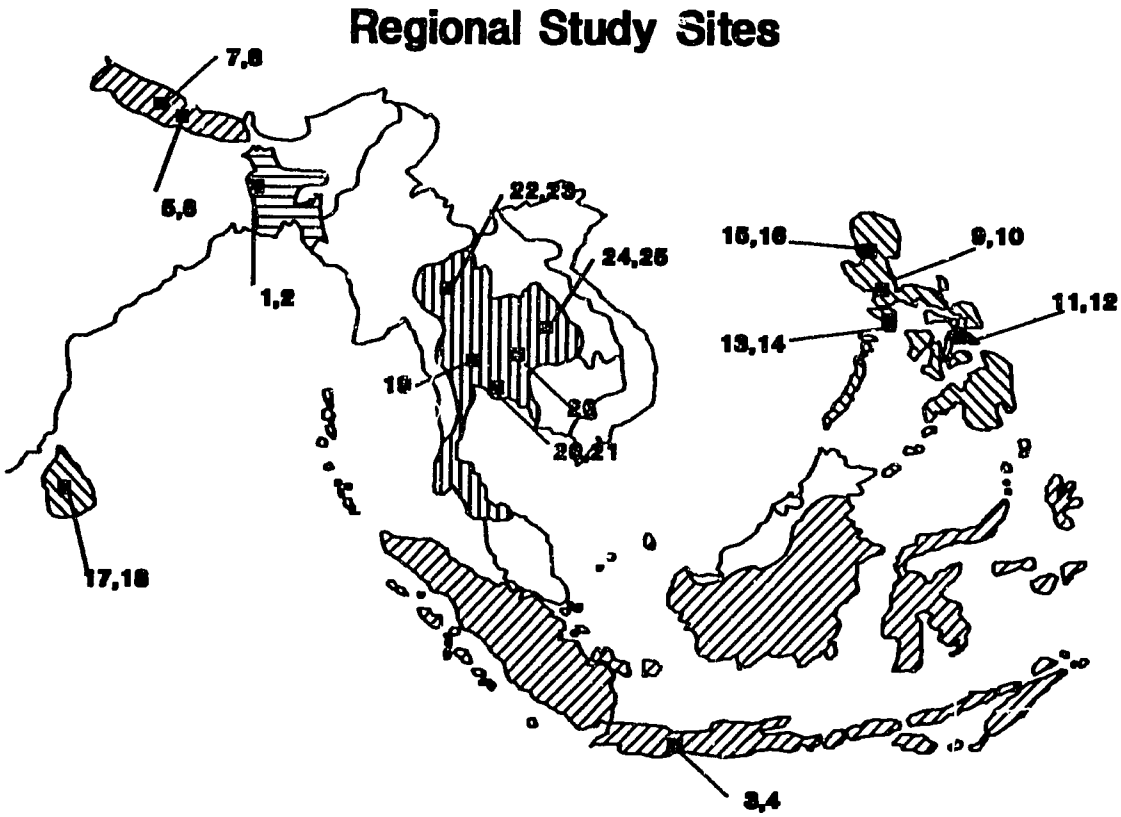

Figure 1. Map of South and Southeast Asia showing location of study communities.

Table 1.2. Characteristics of the study villages.

Village	Settlement pattern	Distance to nearest major daily market center (km)	Topography	Rainf all · (mm)	Forestry or tree-growing project (Y/N)	Access to common property areas (commons)
1. Belpukuria	Scattered	3.0	Flat	1500	Yes	Yes
2. Samsadipur	Scattered	1.0	Flat/Rolling Plain	1500	Yes	Yes
3. Payungagung	Clustered	5.0	Mountainous	2877	Yes	Yes
4. Karangsari	Clustered	2.0	Hilly	1743	Yes	Yes
5. Kankre	Clustered	6.0	Mountainous	2089	Yes	Yes
6. Tusal	Clustered	5.0	Mountainous	2089	Yes	Yes
7. Rakhi	Scattered	6.0	Hilly/Rolling Plain	3385	Yes	Yes
8. Lekhnath	Scattered	8.0	Rolling Plain/Flat	3385	No	Yes
9. Jose P. Laurel	Scattered	7.5	Mountainous	1952	Yes	No
10. Juan Santiago	Scattered	13.0	Mountainous	1952	Yes	No
11. San Isidro	Linear	3.5	Flat	2058	No	No
12. San Miguel	Clustered	5.0	Hilly/Flat	1496	Yes	No
13. Barangay Paiton	Clustered	24.0	Mountainous	3904	Yes	Yes
14. Sitio Banilad	Clustered	20.0	Mountainous	3904	Yes	Yes
15. Bila	Clustered	0.0	Hilly	2778	Yes	No
16. Guizadon	Clustered	0.0	Hilly	2778	Yes	No
17. Madugalla	Clustered	0.7	Mountainous	940	No	No
18. Bambarabedda	Clustered	0.6	Mountainous	940	Yes	No
19. Parmoke	Linear/ Clustered	2	Flat	1300	No	No
20. Komo 7	Clustered	18	Rolling Plain/Flat	1240	Yes	Yes
21. Nongyang	Clustered	17	Flat/Rolling Plain	755	Yes	Yes
22. Mae Pha Haeng	Clustered	25	Hilly/Mountainous	1600	No	No
23. Ongklang	Scattered	8	Hilly/Mountainous	1600	No	Yes
24. Non Si Sawat	Clustered	28	Flat/Rolling Plain	1050	Yes	Yes
25. Kam Kham	Loosely clustered	22	Rolling Plain/Flat	1050	Yes	Yes
26. Thap Chang	Clustered	10	Flat/Rolling Plain	1200	No	Yes

those with enough land to meet their minimum needs and at least occasionally produce a small surplus. Large-farm households were defined as those with significantly more than enough land to meet their needs. Absolute size of holdings, then, was not as important as income and the appearance or absence of poverty.

Researchers used their own judgement in determining the land-size categories of small, medium, and large farm households in their study location. Other measures of household wealth and occupation helped to exclude from analysis those small farmholders who are not poor or who earn substantial income from non-agricultural sources. The conditions of small farmers, whether working less than 0.2 hectares in Java or less than 4.0 hectares in northeast Thailand, can be compared if clear and rigorously defined categories are used to show that they share certain characteristics.[4]

This report attempts to determine if variations in forest use practices **throughout the region** can be attributed to farmsize and other selected social and economic factors. That is, do poorer villagers with smaller farms use trees differently from their wealthier neighbors with larger holdings? If so, are those differences similar throughout the region? Do small-scale farm households use different tree products, or get their products from different sources than medium or large-scale farm households? If so, are these patterns similar across cultures and countries?

In this respect the report stresses similarities among the populations studied and does not attempt an analysis of the differences among countries and societies. This is done for two reasons: (1) an adequate analysis of differences would require a much larger data base; this could be an area of follow-up research if it is determined to be a priority; (2) for policymakers and others who may use this report to guide program decisions, it is felt that common themes would be more broadly useful; for planners within the respective countries and societies, case study reports by the individual researchers may be of further use.

The study only covers the tree products used, the sources of these products (state forests, commons, farms, homesteads, etc.), and what species are used. The study did not obtain information on the amount of tree products used or the proportion of products from the various sources or species. Analysis, therefore, can show whether or not the four types of village households studied use the same products, or get these products from the same sources and species; it cannot show if these groups of villagers use different amounts of the products.

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[4] For background on the definitions used for this study, see Sadeque and Mehl (1990). Detailed descriptions of the field research methods, definitions, and data collected for the study are available in Mehl (1990).

2. The Social, Cultural and Economic Context

Social, cultural and economic conditions certainly affect the ways people use and manage their tree resources. Most research on these practices is limited to a single society or culture. This is understandable. The complex web of social, economic and cultural processes influencing the management and use of natural resources is difficult enough to understand within the context of a single society. Three examples show how unique social and cultural conditions help fashion the forest- and tree-use practices of each society.

The widespread encroachment of forests in Thailand is due as much to social factors -- inheritance patterns, a religious and social emphasis on individualism, and a general attitude that the forest is available for use by anyone -- as to economic pressures (See Amyot 1988; Komon and Thomas 1990; Kroekkiat 1978; Mehl 1986). Different social and cultural values, with different economic conditions, might have led to an intensification of existing agricultural area instead of an expansion of agriculture into the forests.

The relative success of the state-directed social forestry program in Java, Indonesia, can be attributed in large part to the social organization and culture of villages that have experienced centuries of tight state control. Under the highly structured plantation system, begun during Dutch colonial rule and continuing in independent Indonesia, farmers in much of lowland Java have long been told what and when to plant (Geertz 1965; Sediono 1987).

The tradition of communal forests, pasture, water and other resources in many villages in the mountains of Nepal and north India is closely tied the culture and social organization of relatively isolated, subsistence communities. Messerschmidt (1986), for example, describes how belief systems, local definitions, and local (traditional) forms of socio-political organization all contribute to the forest management systems in Nepali villages. As the hill villages get drawn into the market economy and integrated into the wider social and political organization, these systems are bound to change. Yet even when Nepali communities have become involved in commercial agriculture, the forest management practices that emerge are bound to differ from those of either the more mobile, individual-oriented Thais or the much more hierarchical Javanese.

The above examples illustrate the effect of a society's cultural values, organization and institutions on the use and management of trees in that society. What about variations in social and economic conditions within a society? Will farmers facing different conditions use trees and forests differently?

The basic hypothesis of this study -- at least for this regional analysis -- is that major differences in social and economic conditions within a society contribute significantly to variations in the ways different groups use trees and forests. The types

and relative importance of various tree products, their quality and source, and how they are managed are all likely to differ among various social and economic groups. In other words, large-farm households may well get wood, fuel, fodder from different sources and are bound to have access to better quality goods than their neighbors with small farms. Those with more training and access to formal credit and government extension services may practice more sound tree management than those with little training and few or no government support services available to them. Among the main hypotheses of this study is that poor, small-farm households will use trees differently than their wealthier neighbors with larger farms, and that these differences between small- and large- farm households, between poorer and wealthier villagers, and between the more and less educated, will follow similar patterns throughout the region.

This is not a radical concept, yet there is a paucity of comparative research on villagers' use of trees and forest. Even topics that seem to call for comparative analysis continue to be examined in the context of single societies. The homegarden is an important and well-studied component of farms in West and Central Java and in Bangladesh. Yet studies of the composition of homegardens and their role in providing households with needed tree products rarely touch on more than one society (see, for example, Abedin 1987, and Khaleque 1985 on homegardens in Bangladesh; Kartasubrata 1988, Michon 1983, and Widagda, et al. 1984 on homegardens in Indonesia). Even when comparisons are made, they are based on the largely descriptive, country- or society-specific studies (see, for example, and Rocheleau 1987, pp. 88-90, for an excellent summary of the role of homegardens in countries throughout the world).

As stressed from the beginning of this regional study, "A complete picture of social, cultural, and economic influences on forest-use practices . . .is not possible . . . Many social and cultural aspects of communities cannot be compared systematically" (Mehl 1990, p. 8).

The effect of each socioeconomic factor included in this report was analyzed separately, each of the forest-use practices was also examined separately. In other words, the effects of farmsize on use of fuelwood was analyzed separately from the effects of farmsize on use of timber; the effects of farmsize on use of fuelwood was analyzed separately from the effects of land tenure relations on the use of fuelwood; and so on. While we recognize the complexity of social, economic and cultural influences on the practices studied, we feel it is important at this stage to identify at least a few socio-economic factors that show general, widespread impact -- regardless of society and country -- on the ways people use and obtain tree products. Further analyses and more detailed inquiry of the trends identified in this study should follow.

3. Methods of Analysis Used

The sample size for most analyses in this study is 727 households from 26 villages in 6 countries. In each village, household heads of at least 25 households (more than 25 households in several of the villages) were interviewed regarding their forest- and tree-use practices. The sample size for the analyses of land tenure and use of extension services (Section 4.4) totalled to 762 households, with 35 households from various study villages added to the base 727 households. Since each household could give multiple responses for species used for different tree products, the sample sizes for the analyses of the locations of trees used for various products and the species used for those products were in the thousands.

Data analysis consisted of cross-tabulations and, where appropriate, Chi-square tests of significance. The nature of the data, in particular the nominal data of the dependent variables and several independent variables, limited the kinds of analysis that could be employed. Some of the variables could be converted for log-linear analysis. We suggest this be done first for national level analyses, where the social, economic and cultural conditions and their possible effects are adequately understood to develop accurate models to test.

Cross-tabulations were used to compare how the four major farmsize categories (landless, small, medium and large) used trees and obtained their tree products. Chi-square tests were used to determine if the observed differences were statistically significant at a .05 significance level.

Ten major categories of tree products and uses were studied: fuelwood, charcoal, fodder, fruit and food, timber and other construction materials, materials for industrial use, materials for handicrafts, other regular uses, materials to construct the interviewee's house, and other occasional uses.[5]

To examine farmsize category and forest-use practices, cross-tabulations were first made to see if people used each type of product, from trees or other sources. For example, *fodder* includes grasses, purchased feeds, food scraps, and any other type of animal feed. *Fuelwood*, at this stage, includes natural gas, manure cakes, and other substitutes for cooking or heating wood.

Cross-tabulations were then made for only those households that did use fodder, fuel, construction materials, etc., to see whether they used tree products or used other materials, as their primary source for that good. **Only the primary source of each good for each household was analyzed at this stage.** A household using grass as its major source of fodder and trees as a secondary source is listed as using non-tree products.

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[5] For definitions of these products or uses, see Mehl (1990).

If an adequate number of households used tree products as their primary source for a good, two more cross-tabulations were performed. The first looked at where they obtained the tree products (state forests, privately owned forests, common lands, the household's farm, or purchased). The final cross-tabulation included only those households for which trees on their farms served as the primary source of the product. The location and cropping arrangement of the trees was compared with the more "traditional" practices of trees on homesteads and trees left scattered in the fields. *Traditional*, in this context, is contrasted with *intentional* planting of agroforestry systems and of field entirely planted to tree crops.

Use of the terms *traditional* and *intentional* planting are a bit misleading. More often than not, farmers intentionally plant trees or let them grow on homesteads or scattered in their fields, and there are well-documented cases of traditional agroforestry practices throughout the world. The distinction is made, however, to compare practices generally promoted in farm forestry programs (the intentional planting of structured agroforestry systems or private tree farms) with other forms of tree management typically found on farms in the region.

Although many of the tables show less than 727 households, there are no non-respondents, simply different sub-groups of the respondents. Each set of tables for tree-use practices is like a decision tree: all respondents are included in the first table; those with a particular response are included in the next table: those without that response are excluded. The process continues to the last table of the set.

For example, all 727 households responded regarding whether or not they used fodder (Table A.1 in Appendix A). The first table on fodder in the main body of the text (Table 4.1.1) excludes landless households, leaving only 673 respondents. The next table in the text (Table 4.1.2) is labelled and described as those who use fodder, by source of fodder, excluding landless households. The number of respondents is 440, the same as those who said they used fodder in the previous table. Of these, 155 use tree products as their main source of fodder, and these are the total respondents included in the next table on fodder (Table A.2 in Appendix A). The last table on fodder use (Table A.3 in Appendix A) includes only those who use tree products from their own farm: those listed in the "on-farm" and "private tree farm" categories in the previous table.

4. Initial Findings

Six general relationships or conditions were studied for this initial analysis:

- how farmsize affects villagers' practices of forest and tree use,
- how differences in relative household wealth and income affect those practices,
- whether the use of land under various types of tenancy relations affect farmers' management and use of trees,
- how government programs such as provision of credit and extension services influence forest-use practices,
- where people get their tree products, and what national- or village-level differences can be ascertained regarding where they produce or extract the products,
- what species are most commonly used, for which products, and where they are obtained.

4.1. Farmsize Category and Forest Use Practices

The effect of farmsize on forest-use practices varied with the product or use. Farmsize does appear to influence the use of nearly all the tree products at some stage, whether in the decision to use the tree product or a substitute or forego the product, or in the source of the product, or in the way farmers manage trees to obtain the product. Two of the 10 practices -- tree-growing for industrial purposes, and tree growing for other regular use -- were employed by an insufficient number of farmers to show a significant relationship with farmsize category or any other factor. A third category, 'other occasional uses,' was such a mixture of uses -- ranging from collection of *Ceiba pentandra* (kapok) to construction of fish traps and chicken coops -- that it does not make sense to analyze it as a single use.

Fodder

Initial analysis revealed a significant difference by farmsize category in villagers' use of fodder (Table A.1 in Appendix A). As might be expected, this was due to the fact that most landless households do not use fodder simply because they do not have livestock to feed. When landless households are removed from the analysis (Table

4.1.1), there is virtually no difference among the farmsize categories regarding whether or not they use fodder. Small farms are just as likely to use fodder as medium or large farms. The main difference appears in whether or not they use tree products as their primary source of fodder.

Table 4.1.1. Use of fodder by farmize category, excluding landless households.

Farmsize Category	Do Not Use (%)		Use (%)		Percentage of Total
Small	17.5	(118)	32.2	(217)	49.8
Medium	10.8	(73)	22.4	(151)	33.3
Large	6.2	(42)	10.7	(72)	16.9
TOTAL	34.6	(233)	65.4	(440)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 673 (335 small-farm, 224 medium-farm, and 114 large-farm households). Chi-square = 0.71, df= 2, Significance >.10.

Among farm households using fodder, there is a tendency (statistically significant at the 0.05 level) for more small-farm households to use non-tree products as their major source of fodder than medium or large farm households (Table 4.1.2). In all three of these farmsize categories, farmers tend to use grasses as their primary source of fodder -- about 6 out of 10 medium- and large-farm households, and 7 out of 10 small-farm households. As we will see later in Section 4.6, a substantial number of farmers do use trees for fodder in some countries included in the study, but for most people trees are secondary or only occasional sources of fodder. The importance of trees for fodder is in the way they fill important niches, providing farmers with fodder when their primary sources are unavailable or insufficient.

Among farm households using tree products as their major source of fodder, there is no significant difference by farmsize in where they get these products (Table A.2 in Appendix A). Most (70%) of these 155 households obtain their tree fodder on their farm, with nearly all others using state forests (20%) and commons (7%) as their source. The main on-farm sources of tree products for all farmsize groups were homesteads and scattered trees in the fields (Table A.4 in Appendix A). Among the 112 households for which trees on their farm served as primary source of fodder, there was no significant difference by farmsize in where they obtained their on-farm tree fodder.

Table 4.1.2. Household use of tree products as primary source of fodder, by farmize category, excluding landless households.

Farmsize Category	Do Not Use (%)		Use (%)		Percentage of Total
Small	34.8	(153)	14.5	(64)	49.3
Medium	20.7	(91)	13.6	(60)	34.3
Large	9.3	(41)	7.0	(31)	16.4
TOTAL	64.8	(285)	35.2	(155)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 440 (217 small-farm, 151 medium-farm, and 72 large-farm households). Chi-square = 6.41, df= 2, Significance <.05.

Fuelwood and Charcoal

Virtually all households used fuelwood or some substitute, regardless of farmsize group. Nearly all of these (85% of those using fuelwood or a substitute) use tree products as their primary source of fuel (Table A.4 and Table 4.1.3). Yet there is an interesting and statistically significant (at the 0.01 level) difference among farmsize categories: more small-farm households (20%) use non-tree products than do landless, medium- and large-farm households (less than 10%).

Farmsize also seems to affect where households get their fuelwood (Table 4.1.4). For all groups except the landless, the household farm is the main source of fuelwood. However, small-farm households (35% of all small-farm households) are much more likely to use state forests as a primary source of fuelwood than medium- and large-farm households (about 25% of all medium- and large-farm households). Among households whose major source of fuelwood is their farm (Table 4.1.5), there is a greater tendency (significant at the 0.05 level) for those with small farms to get fuelwood from homesteads and from scattered trees in their fields (80% of those whose farms are the major source of fuelwood) than for those with medium or large farms (70 and 65%, respectively). It is crucial to note that these locations -- the homestead and scattered in the fields -- are by far the predominant sites of trees used for fuelwood by **all** households, including the landless.

Table 4.1.3. Use of tree products as primary fuel source, by farmize category.

Farmsize Category	Use Non-tree Products (%)		Use Tree Products (%)		Percentage of Total
Landless	0.6	(4)	7.1	(48)	7.7
Small	10.0	(67)	36.5	(245)	46.4
Medium	3.6	(24)	27.1	(182)	30.7
Large	0.9	(6)	14.3	(96)	15.2
TOTAL	15.0	(101)	85.0	(571)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 672 (52 landless, 312 small-farm, 206 medium-farm, and 102 large-farm households). Chi-square = 20.86, df= 3, Significance <.01.

Table 4.1.4. Source of fuelwood, for households using wood as primary fuel source.

Farmsize Category	State Forests (%)		Commons (%)		On-farm (%)		All Others* (%)		Percentage of Total
Landless and Small	17.3	(99)	6.1	(35)	24.7	(141)	3.2	(18)	51.3
Medium	8.6	(49)	1.6	(9)	18.2	(104)	1.8	(10)	31.9
Large	3.9	(22)	0.4	(2)	9.6	(55)	1.2	(7)	16.8
TOTAL	29.8	(170)	8.1	(46)	52.5	(300)	4.9	(28)	

*Private forests and purchased tree products.
Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 571 (48 landless, 245 small-farm, 182 medium-farm, and 96 large-farm households).
Chi-square = 28.23, df= 6, Significance <.01.

Table 4.1.5. On-farm source of fuelwood for households using on-farm trees as primary fuel source.

Farmsize Category	Traditional System (%)		Intentional System (%)		Percentage of Total
Landless and Small	40.1	(127)	9.8	(31)	49.8
Medium	22.7	(72)	10.1	(32)	32.8
Large	11.4	(36)	6.0	(19)	17.4
TOTAL	74.1	(235)	25.9	(82)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 317 (19 landless, 139 small-farm, 104 medium-farm, and 55 large-farm households). Chi-square = 6.68, df= 2, Significance <.05.

Charcoal is not used as widely as fuelwood. Only 27% of all households in the study used charcoal (Table 4.1.6). Nearly all of these were in Nepal, the Philippines, and Thailand. There is a tendency (significant at the 0.05 level) for large-farm households to use charcoal more than other farmsize groups. Among households that use charcoal, there is no significant difference by farmsize group in the source of wood used to make charcoal (Table A.5 in Appendix A). As with fuelwood, most obtain wood for charcoal from their farm (60%), followed by state forests (17.5%) and purchased charcoal (17.5%). Among the few households whose main source of charcoal is their own farm (Table A.6 in Appendix A), nearly all (91%) get the wood from homesteads or from scattered trees on the farm.

Table 4.1.6. Use of charcoal, by farmize category.

Farmsize Category	Did Not Use Charcoal (%)		Used Charcoal (%)		Percentage of Total
Landless	6.2	(45)	1.2	(9)	7.4
Small	34.0	(247)	12.1	(88)	46.1
Medium	23.1	(168)	7.7	(56)	30.8
Large	9.8	(71)	5.9	(43)	15.7
TOTAL	73.0	(531)	27.0	(196)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 727 (54 landless, 335 small-farm, 224 medium-farm, and 114 large-farm households). Chi-square = 10.13, df= 3, Significance <.05.

Fruit/Food

Almost all households surveyed use trees as a major source of food, mainly for fruit. As expected, most (65% of all households) get food from trees on their own farms (Table 4.1.7). Another 14% use trees in state forests as their main source of food, while about 10% purchase the major portion of their fruit or other tree-borne foods. Again, most farmers who get tree-borne food from their farms do so mainly from their homesteads or trees scattered in the fields (65% of those whose major source of fruit/food was the farm). While homesteads are often considered the traditional location for food-bearing trees, trees scattered in the field came a close second as the primary source for tree-borne foods (Table 4.1.8). There is a statistically significant difference (at the 0.01 level) between small-farm households and medium- and large-farm households in the on-farm source of food trees. Farmers for whom an agroforestry system or a field planted entirely to trees ("intentional" systems, in terms of this study) as the major source of fruit or other tree-borne foods are more likely to operate medium or large farms.

Table 4.1.7. Primary sources of tree-borne food.

Farmsize Category	State Forests (%)	On-farm (%)	All Others* (%)	Percentage of Total
Landless	0.7	5.0	1.0	6.8
	(5)	(34)	(7)	
Small	6.2	34.2	6.5	46.8
	(42)	(232)	(44)	
Medium	5.3	20.5	4.7	30.5
	(36)	(139)	(32)	
Large	2.5	10.6	2.8	15.9
	(17)	(72)	(19)	
TOTAL	14.7	70.3	15.0	
	(100)	(477)	(102)	

*Private forests, commons, and purchased tree products.
Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 679 (46 landless, 318 small-farm, 207 medium-farm, and 108 large-farm households).
Chi-square = 3.74, df= 6, Significance >.10.

Table 4.1.8. On-farm source of tree-borne food, for households using on-farm trees as primary source, excluding landless.

Farmsize Category	Traditional System (%)	Intentional System (%)	Percentage of Total
Small	46.4	8.2	54.6
	(198)	(35)	
Medium	23.2	7.0	30.2
	(99)	(30)	
Large	13.8	1.4	16.6
	(59)	(6)	
TOTAL	83.4	16.6	
	(356)	(71)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 427 (233 small-farm, 129 medium-farm, and 65 large-farm households). Chi-square = 7.09, df= 2, Significance <.05.

Timber and Other Construction Materials

The most important finding about use of timber and other construction materials is that there is a significant difference (at the 0.01 level) in use of these materials between landless and small-farm households on one hand, and medium- and large-farm households on the other (Table 4.1.9). Six out of 10 landless and small-farm households surveyed do not use timber or other construction materials on a regular basis. In contrast, 6 out of 10 medium- and large-farm households do make regular use of timber and other construction materials.

Table 4.1.9. Use of timber and other construction materials.

Farmsize Category	Do Not Use Timber, etc. (%)		Use Timber, etc. (%)		Percentage of Total
Landless	6.1	(44)	1.4	(10)	7.4
Small	25.9	(188)	20.2	(147)	46.1
Medium	13.5	(98)	17.3	(126)	30.8
Large	5.9	(43)	9.8	(71)	15.7
TOTAL	51.3	(373)	48.7	(354)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 727 (54 landless, 335 small-farm, 224 medium-farm, and 114 large-farm households). Chi-square = 36.33, df= 3, Significance <.01.

The farm remains an important source of timber and other construction materials. It was the major source for 43% of all those who used these goods regularly (Table 4.1.10). Two other important sources for timber were state forests (claimed by 23% of those using timber regularly) and purchased wood (27%). This shows that many villagers of all farmsizes prefer to get their wood free from state forests if such forests are easily accessible. If free timber sources are not available, and if on-farm or homestead trees are important sources of fuel, fruit, and other goods, villagers may prefer to buy timber rather than cut down their own trees.

Table 4.1.10. Source of timber/construction materials for households using tree products as primary source, excluding landless.

Farmsize Category	State Forests (%)		Purchased (%)		On-farm (%)		All Others* (%)		Percentage of Total
Small	9.8	(31)	13.0	(41)	19.6	(62)	3.5	(11)	42.4
Medium	8.5	(27)	10.8	(34)	17.1	(54)	3.2	(10)	36.4
Large	4.7	(15)	6.0	(19)	10.4	(33)	0.9	(3)	21.2
TOTAL	23.1	(73)	29.7	(94)	47.2	(149)	7.6	(24)	

*Private forests and commons.
Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 340 (145 small-farm, 125 medium-farm, and 70 large-farm households). Chi-square = 0.19, df= 6, Significance >.10.

Table 4.1.11. On-farm source of timber/construction materials for households using on-farm trees as primary source, excluding landless.

Farmsize Category	Traditional System (%)		Intentional System (%)		Percentage of Total
Small	39.7	(62)	4.5	(7)	44.2
Medium	23.7	(37)	10.9	(17)	34.6
Large	12.8	(20)	8.3	(13)	21.2
TOTAL	76.3	(119)	23.7	(37)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 156 (69 small-farm, 54 medium-farm, and 33 large-farm households). Chi-square = 13.31, df= 2, Significance <.01.

As with fruit/food trees, there is a statistically significant difference (at the 0.01 level) in the on-farm source of timber between small-farm households on one hand and medium- and large-farm households on the other (Table 4.1.11). While most medium- and large-farm households get on-farm timber from their homesteads and scattered trees in the fields, they are more likely than small-farm households to have an agroforestry system or a tree farm as their major source of timber.

House Construction Materials

Villagers were asked about the sources of materials used to build their houses. As this tends to be a single or occasional use of tree products, the scientists who designed the study expected that it might differ somewhat from regular use of timber and other construction materials. In fact, some of the statistical differences in use among farmsize categories turned out to be similar to those recorded for regular timber/construction use. Most households reported using trees or substitutes to build their houses, but a significant proportion (46%) did not report use of any construction materials for their houses (Table 4.1.12). This could be due to at least two factors: (1) under-reporting of house construction by the researchers, or (2) many villagers did not build their own houses (homes may have been inherited, or they may live with their parents or others). Both possibilities are likely when one considers that, more than the any of the landed farmsize groups, it was the landless who responded that they did not build their own houses. Landless people are more likely than the other groups to live in other people's houses (either rented or with parents who still own the land). The landless are also the most likely to under-report their economic activities. In contrast with the above analysis of their regular use of construction materials, small-farm households are as likely as the other farmsize groups to use timber or other materials to build their own houses (Table 4.1.13).

While there is no statistically significant difference among farmsize groups in their sources of household construction materials (Table A.7 in Appendix A), the sources reported differ somewhat from the sources of timber for regular uses. The main source of wood products for house construction remained the farm for slightly more than 40% of the households reporting this use. Yet nearly the same proportion (36%) reported buying timber as their main source for house construction. Most of these built their homes in recent years. Another 15% got their timber and other construction materials from state forests, but most of these built their homes some years ago. With wood from "free" sources (e.g., state forests, commons) becoming scarce, farmers are just as likely to buy home construction materials as they are to get them from their farm. A review of tree use by country showed this equally true for farmers throughout the region -- in Bangladesh, Indonesia, and Nepal as well as in the Philippines and Thailand.

Table 4.1.12. Use of timber and other materials for house construction, by farmsize category.

Farmsize Category	Do Not Use Timber, etc. (%)		Use Timber, etc. (%)		Percentage of Total
Landless	5.4	(39)	2.1	(15)	7.4
Small	18.8	(13)	27.2	(198)	46.1
Medium	14.3	(104)	16.5	(120)	30.8
Large	7.3	(53)	8.4	(61)	15.7
TOTAL	45.8	(333)	54.2	(394)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 727 (54 landless, 335 small-farm, 224 medium-farm, and 114 large-farm households). Chi-square = 18.49, df= 3, Significance <.01.

Table 4.1.13. Use of timber and other materials for house construction, excluding landless.

Farmsize Category	Do Not Use Timber, etc. (%)		Use Timber, etc. (%)		Percentage of Total
Small	20.4	(137)	29.4	(198)	49.8
Medium	15.5	(104)	17.8	(120)	33.3
Large	7.9	(53)	9.1	(61)	16.9
TOTAL	43.7	(294)	56.3	(379)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 673 (335 small-farm, 224 medium-farm, and 114 large-farm households). Chi-square = 2.11, df = 2, Significance >0.10.

Handicrafts

The last tree use analyzed was handicrafts. Although most households did not make handicrafts, a sizable proportion (33% of all surveyed households) did (Table 4.1.14). Landless households were the group least likely to engage in handicraft production (at a 0.01 significance level). They are probably too busy eking out a living from other activities. A similar proportion of the households in all the other farmsize groups tended to make handicrafts (Table 4.1.15). Most (69%) got their wood for handicrafts from their own farm, commonly from their homestead or from scattered trees in the field (Table A.8 in Appendix A). Another 15% of those who made handicrafts use state forests as their main source of the tree products. Nearly the same proportion (13%) bought the materials they used to make handicrafts.

Table 4.1.14. Tree-based handicraft production.

Farmsize Category	Do Not Make Handicrafts (%)		Make Handicrafts (%)		Percentage of Total
Landless	6.7	(49)	0.7	(5)	7.4
Small	28.6	(208)	17.5	(127)	46.1
Medium	21.0	(153)	9.8	(71)	30.8
Large	10.6	(77)	5.1	(37)	15.7
TOTAL	67.0	(487)	33.0	(240)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 727 (54 landless, 335 small-farm, 224 medium-farm, and 114 large-farm households). Chi-square = 17.60, df= 3, Significance <.01.

Table 4.1.15. Tree-based handicraft production, by farmsize category, excluding landless households.

Farmsize Category	Do Not Make Handicrafts (%)	Make Handicrafts (%)	Percentage of Total
Small	30.9 (208)	18.9 (127)	49.8
Medium	22.7 (153)	10.5 (71)	33.3
Large	11.4 (77)	5.5 (37)	16.9
TOTAL	65.1 (438)	34.9 (235)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 673 (335 small-farm, 224 medium-farm, and 114 large-farm households). Chi-square = 2.65, df = 2, Significance >0.10.

4.2. Wealth and Income

Although relative wealth, income, and sources of livelihood were all important data collected for the study, none seemed to influence farmers' use of trees as much as farmsize group. Relative wealth -- ranking of households as relatively poor, average or wealthy -- tended to influence forest-use practices in the same ways as farmsize, though the effect of relative wealth was much weaker. This could be due to the fairly subjective method of measuring wealth in this study. As described in the handbook for the study, the indicators of wealth "are used to determine the relative level of wealth for households in the village. Each researcher selects the indicators appropriate for the society and the particular community." Although general categories were suggested, the selection of indicators and the classification of households was necessarily left to each researcher, who was expected to know best the conditions and distribution of wealth in the study community. Still, a different researcher might select different indicators or, even if the same indicators were chosen, would likely classify the sample households differently. Only those clearly at either extreme would consistently be classified as "rich" and "poor." In between, the divisions are in every case fuzzy and thus subjective.

The other measures of wealth (income and source of livelihood), as measured, weighted and analyzed for this study, showed no statistically significant influence over villagers' forest-use practices. For each village, households were divided into quartiles

according to income.[6] For the regional analysis, they were then divided into four categories according to the quartile in which they fell within their village. Thus, a household in the bottom quartile was assigned a rank of "1", a household in the second quartile was assigned a rank of "2", and so on. The relative rank of income -- that is, whether a household was in the first, second, third or top quartile of cash income in its village -- did not show any clear effect on the use of tree products. A less ambiguous measure of income might show a clearer relationship between cash income and forest-use practices. Unfortunately, the participants in this study were not able to resolve the problem of comparing income between countries with very different standards of living. Conversion of amounts to a common currency (whether U.S. dollars, gold, or any other standard measure of wealth) cannot resolve the problem of comparing highly disparate measures and levels of income. An annual cash income equivalent to US$ 1,000 would make a rural Nepali household among the richest in its community; the same income would place a Thai household among the poorest.[7]

The measure of sources of livelihood led to a different problem of comparison. The proportion of a household's livelihood derived from each source of livelihood was recorded. These numerical measures (percentages) of different sources of income were correlated with use and non-use of tree products, and with the sources of the tree products. For the purposes of this measure, the sources of tree products were given the following order:

0 = did not use product
1 = gathered or collected non-tree product
2 = tree products obtained from state forests/lands
3 = tree products obtained from common forests or other common property
4 = tree products obtained from homestead or trees scattered on farm
5 = tree products obtained from private forest, tree farm, or intentional agroforestry system

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[6] For an indication of the distribution of households by income, refer to the screens on economic status in the summary databases for each of the villages included in this study.

[7] Each economist seems to have his or her own commodity or set of commodities as a index to measure and compare incomes across countries. The British magazine, *The Economist*, uses the price of a MacDonald's Big Mac as its index of income level. Their rationale is that MacDonald's hamburgers are one of the few commodities standardized in contents, in the quality and amount of those contents, and standardized in price. The average daily income of a country is divided by the cost of a Big Mac in that country, and the resulting number is the Big Mac Index. Countries where the daily income can buy more Big Macs are considered to have higher incomes. Unfortunately, this ingenious use of Big Macs breaks down when the contents in different countries are analyzed a bit more closely. The U.S., for example, allows soy meal to be mixed in the hamburgers, reducing the cost of the contents, while other countries do not allow the addition of soy meal. In any case, the absence of MacDonalds in South Asia for the foreseeable future renders it meaningless as a possible index of income for this and any future studies in the region. An alternative commodity suggested by Dr. Lee Medema of the University of Idaho could be chicken eggs, an item produced, readily available and commonly used throughout the world. The price of eggs could well be a measure of relative income levels.

6 = purchased tree products or purchased substitutes

The ranking was not arbitrary: it was intended as a scale of preferred sources of tree products. But by its nature, this ranking has serious faults. There is no intrinsic reason why the use of a product is in any way "better" than non-use of that product. Nor are tree products in any way better than non-tree products for the same use. (Do leaves provide better fodder than grass? Are branches a better fuel than dung and straw?) Nor are purchased products -- whether tree products or substitutes -- necessarily "better" as a measure of quality, or of household income, or even preference.

Even more important, the sources of tree products cannot be considered intrinsically "better" or superior to each other. Researchers, extension agents, environmentalists, foresters, may believe that use of trees grown on-farm is preferable to the use of trees from state lands or from commons. Yet villagers may, and often do, prefer to get their tree products from state forests or commons. As Malla and Fisher (1987) pointed out for Nepal, there is

> little room for optimism about the potential for private planting programs to benefit small farmers. Equity in tree ownership is clearly impossible in the context of the dramatically skewed distribution of landholding in Nepal, and there is little to increase the absolute numbers of trees owned by poorer farmers. (pp. 171-172).

Those interested in equitable access to tree and other forest products for all farmers, including smallholders, would likely agree that improved management of commons areas and state forests are needed. In that case, use of tree products from state forests or from commons might be considered "better" or preferable to tree products from the farm.

Given these problems in measurement, it was not surprising to find no significant correlation between any of the sources of income and the use and sources of various tree products. All of these measures of wealth and income, however, may prove more influential in the national-level analyses, where differences in income and non-cash sources of livelihood are much more comparable.

4.3. Land Tenure

The effects of land and tree tenure on tree-use practices is among the most studied issues in social forestry. Numerous cases from throughout the world are well documented by Fortmann and Bruce (1988) and Raintree (1987). Hundreds of articles on tenure issues affecting tree management and use are listed by Fortmann and Riddell (1985). Yet because forms of land and tree tenure are often specific to a society and even to communities within each society, the study of the effects of tenure on forestry

practices consists almost entirely of descriptive case studies.

An analysis of the influences of land tenure on farmers' forest use practices yielded few clear results. Very few households reported mortgaging out any land, and very few reported using other people's land for free, so that analysis of these tenure conditions would be meaningless (Table 4.3.1). Land rental and use of state lands were the two types of tenure relations studied that had enough respondents, but both are such general categories that the results of the analysis remain ambiguous.

Table 4.3.1 Respondents' Reports of Forms of Land Tenure

Forms of Tenure	Practiced This Form of Tenure	Did Not Practice This Form of Tenure
Renting in Land	125	637
Mortgaging in Land	32	730
Use of State Land	77	685
Free Use of Other Individual's Land	33	729

Rental

It is generally assumed that farmers renting in land are less likely to grow trees on that land, since trees represent a long-term investment while most rental arrangements are short-term. This analysis could neither confirm nor refute this assumption. It was not possible to compare villagers' use of trees on their own land with their use of trees on land they rented in. Furthermore, the number of farmers renting in all their farm land was so small that comparative analysis of their practices with those of villagers who owned all their farmland would have no meaning (too many of the cells for the Chi-square analysis would have cells with an expected frequency of less than five).

This general category of land rental included various share-cropping, cash rental, short- and long-term arrangements, and rental from family, neighbors, and absentee landlords. While some of this information is available from the study, the absolute numbers of villagers reporting different types of arrangements is again so small that no significant analysis can be made of their forest-use practices. Future studies using the Farm and Village Forestry Database might examine various rental arrangements and their effect on villagers' forest-use practices.

Use of State Lands

Analysis on the effects of using state lands on villagers' forest use practices yielded no clear results, because this category included a mixture of various uses of state lands. Illegal use of state forests, legal long-term leasing arrangements, and a range of tenure relations between these two extremes all fell within the same broad category. Further study at the national level, where the forms of use of state land might not be so diverse, may prove more illuminating.

4.4. Government Extension Services

Credit

An insufficient number of villagers reported using credit from government sources, banks, or cooperatives for analysis to be meaningful. There were enough reports of credit from informal sources (money lenders, merchants, family and neighbors), but there was no statistically significant difference between the forest-use practices of borrowers and non-borrowers. What is most notable about this information is the tremendous absence of borrowing from formal institutional sources by all villagers.

Extension Services

At first glance, there seem to be important and statistically significant differences in the forest use practices between farmers who use extension services and those who do not. Among the clearest differences are in the use of agroforestry or tree farming. Both of these practices are promoted by government agencies and other development organizations as preferred, more scientific applications of farm forestry. Farmers who receive government forestry extension services are more likely (at a .01 significance level) to get most major tree products from an agroforestry system or field planted entirely to trees than farmers who do not use government forestry extension (Tables 4.4.1 - 4.4.4). The same is true for fuelwood, tree food crops, and timber, among farmers who receive government agricultural extension services (Tables 4.4.5 - 4.4.8). Virtually the same results were found with farmers who used government horticultural extension services (Tables A.9 - A.12 in Appendix A), or government livestock extension services (Tables A.13 - A.16). An insufficient number of farmers reported receiving extension services from non-governmental organizations (NGOs) or other sources to allow analysis of the effects of these interventions.

Table 4.4.1. Use of forestry extension services, by farmers' on-farm management for fodder.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	23.5		46.1	
		(27)		(53)
Intentional	18.3		12.2	
		(21)		(14)
Total	41.7		58.3	
		(48)		(67)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 115 (80 traditional, 35 intentional). Chi-square = 5.86, df = 1, Significance <.05.

Table 4.4.2. Use of forestry extension services, by farmers' on-farm management for fuelwood.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	15.1		59.0	
		(48)		(187)
Intentional	16.1		9.8	
		(51)		(31)
Total	31.2		68.8	
		(99)		(218)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 317 (235 traditional, 82 intentional). Chi-square = 47.46, df = 1, Significance <.01.

Table 4.4.3. Use of forestry extension services, by farmers' on-farm management for tree-borne foods.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	16.8	(78)	67.5	(314)
Intentional	11.6	(54)	4.1	(19)
Total	28.4	(132)	71.6	(333)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 465 (392 traditional, 73 intentional). Chi-square = 85.88, df = 1, Significance <.01.

Table 4.4.4. Use of forestry extension services, by farmers' on-farm management for timber.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	13.4	(21)	63.1	(99)
Intentional	17.8	(28)	5.7	(9)
Total	31.2	(49)	68.8	(108)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 157 (120 traditional, 37 intentional). Chi-square = 41.91, df = 1, Significance <.01.

Table 4.4.5. Use of agricultural extension services, by farmers' on-farm management for fodder.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	26.1	(30)	43.5	(50)
Intentional	16.5	(16)	13.9	(19)
Total	42.6	(49)	57.4	(66)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 115 (80 traditional, 35 intentional management). Chi-square = 2.16, df = 1, Significance >.10.

Table 4.4.6 Use of agricultural extension services, by farmers' on-farm management for fuelwood.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	17.4	(55)	56.8	(180)
Intentional	12.3	(39)	13.6	(43)
Total	29.7	(94)	70.3	(223)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 317 (235 traditional, 82 intentional management). Chi-square = 15.87, df = 1, Significance <.01.

Table 4.4.7. Use of agricultural extension services, by farmers' on-farm management for tree-borne foods.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	21.3	(99)	63.0	(293)
Intentional	6.2	(29)	9.5	(44)
Total	27.5	(128)	72.5	(337)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 465 (392 traditional, 73 intentional management). Chi-square = 5.76, df = 1, Significance <.05.

Table 4.4.8. Use of agricultural extension services, by farmers' on-farm management for timber.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	21.7	(34)	54.8	(86)
Intentional	16.6	(26)	7.0	(11)
Total	38.2	(60)	61.8	(97)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 157 (120 traditional, 37 intentional management). Chi-square = 19.33, df = 1, Significance <.01.

However, further analysis showed that virtually all farmers receiving forestry extension services were in the study villages in Indonesia, Nepal, and one pair of villages in the Philippines. These same villages were the main recipients of government horticultural extension services. The same villagers, with the addition of some farmers in Bangladesh and a few in Thailand, were the main recipients of both government agricultural and livestock extension services (Tables 4.4.9 - 4.4.10 and Tables A.17 and A.18 in Appendix A).

Table 4.4.9. Use of government forestry extension, by country.

Country	Use Service (%)		Do Not Use Service (%)		Percentage of Total
Bangladesh	1.0	(8)	12.1	(92)	13.1
Indonesia	5.6	(43)	1.4	(11)	7.1
Nepal	7.7	(59)	5.5	(42)	13.3
Philippines	6.6	(50)	19.8	(151)	26.4
Sri Lanka	0.0	(0)	6.6	(50)	6.6
Thailand	0.7	(5)	32.9	(251)	33.6
Total	21.7	(165)	78.3	(597)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 762 (100 Bangladeshi, 54 Indonesian, 101 Nepali, 201 Philippine, 50 Sri Lankan, and 256 Thai households). Chi-square = 272.05, df = 5, Significance = <.01.

Table 4.4.10. Use of government agricultural extension, by country.

Country	Use Service (%)		Do Not Use Service (%)		Percentage of Total
Bangladesh	3.4	(26)	9.7	(74)	13.1
Indonesia	4.5	(34)	2.6	(20)	7.1
Nepal	9.6	(73)	3.7	(28)	13.3
Philippines	4.1	(31)	22.3	(170)	26.4
Sri Lanka	0.0	(0)	6.6	(50)	6.6
Thailand	3.9	(30)	29.7	(226)	33.6
Total	25.5	(194)	74.5	(568)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 762 (100 Bangladeshi, 54 Indonesian, 101 Nepali, 201 Philippine, 50 Sri Lankan, and 256 Thai households). Chi-square = 209.91, df = 5, Significance = <.01.

Additional analysis showed that the country or district was as important a "factor" as receipt of extension services in influencing farmers' use of agroforestry systems or tree farms (Tables 4.4.11 and 4.4.12 and Tables A.19 and A.20 in Appendix A). Thus, while it seems logical that use of extension services, especially use of forestry or horticultural extension, would affect farmers' use of trees, the relationship is not so clear. Given the results of this analysis, it is just as likely that other social, cultural or economic factors unique to particular countries and districts influence farmers' adoption of agroforestry or tree farming. Such location-specific factors would influence farmers' willingness to use government extension services (anything from the voluntary use of truly open, receptive extension services to the required use of imposed government services).

Finally, the causal relationship is not clear. Does the presence of extension services influence farmers' production and use of trees, or does their use of "advanced" farm forestry practices lead farmers to seek extension services? Farmers who practice

agroforestry or tree farming are more likely to seek assistance from forestry or horticultural extension services than those who do not practice these techniques. Livestock farmers who use tree fodder are more likely to seek horticultural extension services than farmers who do not raise livestock. And farmers who practice these "advanced" farming techniques are generally more likely to seek agricultural extension services. Clearly, further study is needed on the relationship between farm forestry practices and the use and availability of government extension services.

Table 4.4.11. On-farm tree management practices for fodder, by country.

Country	Traditional (%)	Intentional (%)	Percentage of Total
Bangladesh, Sri Lanka, and Thailand	21.7 (25)	7.8 (9)	29.6
Indonesia	5.2 (6)	15.7 (18)	20.9
Nepal	17.4 (20)	0.0 (0)	17 4
Philippines	25.2 (29)	7.0 (8)	32.2
Total	69.6 (80)	30.4 (35)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 115 (7 Bangladeshi, 24 Indonesian, 20 Nepali, 37 Philippine, 12 Sri Lankan, and 15 Thai households). Chi-square = 32.87, df = 3, Significance = <.01.

Table 4.4.12. On-farm tree management practices for fuelwood, by country.

Country	Traditional (%)	Intentional (%)	Percentage of Total
Bangladesh, Sri Lanka, and Thailand	40.1 (127)	1.6 (5)	41.6
Indonesia	9.5 (30)	6.9 (22)	16.4
Nepal	11.0 (35)	4.1 (13)	15.1
Philippines	13.6 (43)	13.2 (42)	26.8
Total	74.1 (235)	25.9 (82)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 317 (8 Bangladeshi, 52 Indonesian, 48 Nepali, 85 Philippine, 9 Sri Lankan, and 115 Thai households). Chi-square = 65.49, df = 3, Significance = <.01.

4.5. Location of Trees: Where Do Farmers Get Their Tree Products?

The most common sources of tree products among the villages studied were homegardens and trees found scattered on the farmers' own fields. Table 4.5.1 shows the distribution of 11,979 records of tree products (or substitute materials) used by the 727 sample households in all study villages, by country. These include secondary sources for the products as well as the primary sources analyzed in the previous section.

The largest number (3,053 cases) were products obtained from trees scattered in the farmers' fields. Another 2,837 cases were of products obtained from homegardens. About a thousand of these cases were of fruit and food from trees in the homegardens.

State or government forests were another major source of tree products, with 1,601 cases recorded. The primary use of forest trees was for fuelwood or to make charcoal (702 of the cases). It is significant that purchase of tree products is also an important source, with 1,781 cases reported of tree products bought, 885 of which were for regular use of timber and construction materials or for occasional use in building villagers' houses. Agroforestry systems and farm plots with only trees are less important. Common forests, other common areas, and private forests were the least-used sources of tree products.

Use of these sources varies considerably across countries. State or government forests were not used in the Bangladeshi or Indonesian villages. This is not surprising, given the lack of natural forests in most of Bangladesh and on Java. The villages in Bangladesh and Nepal account for nearly all reported use of private forests. Most use of common forests occurred in Nepal, with some also in the Philippines and Thailand. These three countries also account for nearly all the use of other common areas.

Agroforestry systems are limited to Indonesia (with half the reported use of products from agroforestry plots), the Philippines, and Nepal. The use of farm plots to grow trees alone is limited to the villages in Indonesia (again with over half the reported cases of this source), the Philippines, and Sri Lanka.

A look at summary village data from the Farm and Village Forestry Database reveals similar variations within countries having larger numbers of samples (namely, Philippines and Thailand). State or government forests are barely used in the Thai study villages in Ang Thong, Chachoengsao, and Nakhon Ratchasima provinces, nor are they used much in the Philippine study villages in Leyte and Mindoro. While use of products from agroforestry systems are reported in the two villages outside the Kathmandu Valley in Nepal, no cases were reported in the two study communities near Pokhara. Virtually all reported use of agroforestry in the Philippines was in Mindoro and Leyte; virtually none was reported in the study villages in Mountain Province or Laguna.

The only sources of tree products widely used **throughout the region** were homesteads and homegardens, scattered trees in farms (the Sri Lankan villages are a notable exception), and the purchase of tree products (somewhat less in the Indonesian villages than elsewhere). **It is clear that any regionwide program to improve villagers' use of trees or to introduce new tree species must take into account these practices. With few exceptions, villagers are more likely to grow trees in their homesteads, or leave trees scattered in their fields, or use state forests where available. It is also clear that villagers are willing to buy tree products for nearly all uses, including timber, materials**

for handicrafts, fruit, and fuel (especially charcoal), if the products they want are not readily available in their community or if it is more economical to purchase than to produce the products.

Table 4.5.1. Sources of tree products used by sample households, by country of study villages.

	Bangla-desh	Indo-nesia	Nepal	Philip-pines	Sri-Lanka	Thai-land	TOTAL
1. State Forests	1	0	314	460	227	599	1,601
2. Private Forests	123	0	141	36	3	15	330
3. Common Forests	2	0	290	69	2	26	389
4. Other Commons	2	0	41	79	1	51	174
5. Homegardens	817	241	552	501	118	608	2,837
6. Farm, Plot w/ Only Trees	18	397	151	23	77	3	669
7. Farm, Agrofo-restry System	9	437	137	265	14	20	882
8. Farm, Scattered Trees	440	354	725	720	0	814	3,053
9. Purchased Tree Products	188	45	752	218	94	484	1,781
10. Non-Tree Pro-ducts (Bought or Collected)	38	38	21	16	0	150	263
TOTAL PER COUNTRY	1,650	1,512	3,124	2,387	536	2,770	11,979

4.6. The Species: What Trees and How They Are Used

Several hundred species of trees and other woody perennials were identified as being used by respondents: nearly 130 species in the 8 study villages in the Philippines, over 100 species in the 8 villages in Thailand, another 80 in the 4 villages in Nepal, about 60 species in the 2 Sri Lankan villages, over 40 species in the 2 Indonesian villages, and nearly 30 species recorded in the 2 villages in Bangladesh. While many species are found and used in more than one country, others are recorded as being used entirely within one district or one country.

Most species are recorded used by only a few respondents. Most of these are also predominantly used for only one purpose. Review of the Farm and Village Forestry summary database for Tree Use Practices for each village indicates little significant variation among the different farmsize categories in the species used for each type of tree product. Widely used species appear to be just as likely to be used by small-farm households as by medium- or large-farm households. It is important to repeat that this study did not measure the quantity of the products used; therefore differences, by farmsize, in the amounts of higher or lower quality trees used cannot be assessed.

The main species used in each country (that is, the species most used in the communities studied) and the uses recorded for each species are presented in Tables B.1.A through B.6.A in Appendix B. The sources of these species (that is, where the trees were located) are presented in Tables B.1.B through B.6.B. A review of these tables reveals several general tendencies in villagers' access to and use of trees.

Fruit trees are among the most widely used species. In all but the Nepal villages, roughly 40% of the major species used by farmers were fruit trees or other species, such as *Azadirachta indica* or bamboos, that can be used for food. In Bangladesh, fruit/food trees make up two-thirds of the major species used by farmers. Some are used solely for their food. Others are among the most widely used multipurpose species. In addition to its use as food, *Artocarpus heterophyllus* is used for fodder, fuelwood, and timber in Bangladesh, Indonesia and Sri Lanka. It is occasionally used for these other purposes in the Philippines and Thailand. *Artocarpus lakoocha*, while rarely used for food in the Nepal study villages, is widely used for fodder, fuel, and timber.

Mangifera indica is a primary source of fodder, fuel, and timber in the Bangladeshi study villages, and is widely used for fuel in the Thai communities. It is occasionally used for fuel or timber in all the other countries.

As expected, *Cocos nucifera* is used widely in all countries, for a variety of purposes. In many of the study sites in the Philippines, *Cocos nucifera* is a primary source of food, fuel and fodder as well as construction materials for farmers' homes. It is among the main fuel sources in the Indonesian study villages, in addition to being used for construction and food. In the Sri Lanka study communities, it is mainly used for

industrial purposes, but it is also used for construction, fuel, and food. It is a primary source of materials for handicrafts as well as food in the Bangladesh study sites. Only in the Thai communities is *Cocos nucifera* used almost exclusively for food.

No other multipurpose, food-bearing species are as widely used throughout the region as *Artocarpus heterophyllus*, *Mangifera indica*, or *Cocos nucifera*. In each country, however, there are at least two or three other trees or other woody perennials used for food that are also widely used for other purposes.

In the Bangladesh study villages, *Aegle marmelos* is an important source of timber and fruit; *Musa paradisiaca* is used for fodder by several households; *Phoenix dactylifera* is widely used for handicrafts, food, and timber; and *Syzygium cuminii* provides fuel, timber, fruit and occasionally fodder.

In the Indonesian study villages, *Persea americana* is sometimes used for fodder and for fuel in addition to its primary use as food. *Arenga pinata* is mainly used as a source of fuel, and is occasionally used for food, primarily as a source of sugar.

The Nepali villages have the least recorded use of fruit/food species. Even so, several food species there are also used for other purposes. Among the most widely used trees in the Nepal study communities is *Castinopsis indica*, used mainly for fuel and timber but also occasionally for fodder and food. *Myrica naji*, primarily used for food, is also sometimes a source of fuelwood. Farmers use *Spondias axillaris* both for its fruit and as a source of construction materials.

The largest number of multipurpose, food species were found in the Philippines. *Chrysophyllum cainito* is sometimes used for fuel and for other purposes. The two most widely grown citrus species in the Philippine communities, *Citrus microcarpa* and *Citrus nobilis*, are both occasional sources of fuelwood. Farmers frequently use the branches of *Coffea arabica*, an important cash crop in parts of the country, for fuelwood. In some communities, *Musa sapientum* is a source of fuel and house construction material. Branches from *Psidium guajava* and *Sandoricum koetjape* also provide fuelwood.

As noted above, *Artocarpus heterophyllus*, *Cocos nucifera*, and *Mangifera indica* are the main multipurpose, food species in the Sri Lankan study villages. In addition, *Musa acuminata* and *Musa sapientum* are commonly grown perennials that are sometimes used for fodder and, in the case of *Musa acuminata*, for fuel. A few farmers in these villages also use *Tamarindus indica* for fuel and fruit.

Few non-food trees show the same widespread use on farms. The main exceptions are *Leucaena leucocephala* in the Philippines and Indonesia, and *Gliricidia sepium* in those two countries and in Sri Lanka. Other non-food species commonly found on farms tend to be particular to individual countries, at least in this study. *Acacia nilotica* is commonly used on farms only in the Bangladesh study villages. *Albizia*

falcataria, *Albizia procera*, *Maesopsis eminii*, and *Spondias dulcis* are widespread in Indonesia but rarely if at all used elsewhere. *Schima wallichii* is used by most households studied in Indonesia and by a few in Nepal. Much more popular in Nepal are various *Ficus*, *Prunus*, and *Quercus* species. *Shorea obtusa*, *S. siamensis*, *Dipterocarpus obtusifolius*, and *D. tuberculatus* are the most widely used non-food species in Thailand. Almost all of these are left scattered in farm fields. *Exacum trinerva* is the main non-food tree used in the Sri Lankan study villages.

5. Conclusion

The results of this initial analysis of data from the regional study on farm- and village-forest use practices are certainly less dramatic than the researchers first hoped. We remain far from the goal of being able to predict patterns of tree-use practices based on a knowledge of key social, economic, environmental and cultural information. This is only the first step in systematic comparative analysis. The methods of data collection, types of data to be collected, definitions, and methods of analysis need to be refined and retested. A much larger set of communities under a variety of agro-ecological conditions need to be studied. Only then will a clearer picture emerge of the many complex ways that social and economic conditions influence people's use of their forest resources.

This analysis has identified four general patterns in forest use that appear common to all the communities studied in the region. First, the most common on-farm sites for tree growing are homesteads (or homegardens) and trees scattered in annual crop fields. This holds true even in communities where farmers practice agroforestry and tree farming. Second, fruit and other food trees are by far the most popular, widely-used multipurpose trees in the region. Third, the relative size of a household's farm does affect the household's use of tree products and where those products are obtained. Fourth, there appears to be a link between the practices of agroforestry and tree farming and the use of government extension services.

There appears to be a strong link between farmers practicing agroforestry or tree farming and their use of government extension services. However, the strong correlations between a few countries and these practices, and between those same countries and the use of extension services cast doubt on the applicability of this finding for the whole region. Still, in those countries where it exists, the tendency for farmers who use extension services to practice agroforestry or tree farming is strong enough to warrant further study.

No overall pattern emerges regarding the effects of farmsize on forest-use practices. However, farmsize does appear to influence the use of every major tree product at some stage, whether in the decision to use the tree product or a substitute, or in the source of the product. If the tree product comes from the farm, farmsize may also affect where and how the source trees are grown. **Small-farm households do indeed seem to obtain and use tree-products differently than households with larger farms. Researchers, extension agents, foresters, and development planners cannot assume that farmers of all farmsizes will grow, manage, and use trees in similar ways.**

Perhaps the most important findings are on the species that farmers already use and where they are grown. It is clear that a regional research program for multipurpose trees should include research on the many uses of fruit and other food trees. It may be difficult to conduct international research on high-value cash crops like *Mangifera indica* (because free, international exchange of germplasm is unlikely). But *Artocarpus* species,

Cocos nucifera, *Tamarindus indica*, and *Azadirachta indica* should be studied as sources of fuelwood, timber, and other products.

Research should examine these species under their existing planting and management systems. Farmers are likely to continue growing trees in homegardens or scattered in their fields. While some small-scale farmers may adopt new agroforestry or tree farming practices, important advances for poor, small-farm households are more likely to come through improved management of the species they already grow, or through introduction of improved species similar to the multipurpose, food-bearing trees they already grow.

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Appendix A: Supplementary Tables to the Regional Analysis

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Table A.1. Use of fodder, by farmize category.

Farmsize Category	Did Not Use (%)		Used (%)		Percentage of Total
Landless	6.2		1.2		7.4
		(45)		(9)	
Small	16.2		29.8		46.1
		(118)		(217)	
Medium	10.0		20.8		30.8
		(73)		(151)	
Large	5.8		9.9		15.7
		(42)		(72)	
TOTAL	38.2		61.8		
		(278)		(449)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 727 (54 landless, 335 small-farm, 224 medium-farm, and 114 large-farm households). Chi-square = 50.91, df= 3, Significance <.01.

Table A.2. Source of tree fodder, for households with trees as primary fodder, by farmize category, excluding landless.

Farmsize Category	State Forests (%)		On-farm (%)		All Others (%)		Percentage of Total
Small	9.0		29.0		3.2		41.3
		(14)		(45)		(5)	
Medium and Large	11.6		41.3		5.8		58.7
		(18)		(64)		(9)	
TOTAL	20.6		70.3		9.0		
		(32)		(109)		(14)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 155 (64 small-farm, 60 medium-farm, and 31 large-farm households). Chi-square = .26, df= 2, Significance > .10.

Table A.3. On-farm source of tree fodder for households using on-farm trees as primary fodder source, excluding landless.

Farmsize Category	Traditional System (%)	Intentional System (%)	Percentage of Total
Small	32.1 (36)	10.7 (12)	42.9
Medium and Large	36.6 (41)	20.5 (23)	57.1
TOTAL	68.8 (77)	31.3 (35)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 112 (48 small-farm, 41 medium-farm, and 23 large-farm households). Chi-square = 1.53, df= 1, Significance > .10.

Table A.4. Use of fuelwood or substitute fuel (excluding charcoal), by farmsize category.

Farmsize Category	Did Not Use Fuelwood (%)	Used Fuelwood (%)	Percentage of Total
Landless and Small	3.4 (25)	50.1 (364)	53.5
Medium	2.5 (18)	28.3 (206)	30.8
Large	1.7 (12)	14.0 (102)	15.7
TOTAL	7.6 (55)	92.4 (672)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 727 (54 landless, 335 small-farm, 224 medium-farm, and 114 large-farm households). Chi-square = 2.22, df= 2, Significance >.10.

Table A.5. Source of charcoal, for households using charcoal as primary fuel source, excluding landless.

Farmsize Category	State Forests (%)	On-farm (%)	All Others* (%)	Percentage of Total
Small	8.6	31.0	8.0	47.7
	(15)	(54)	(14)	
Medium	4.0	19.0	6.9	29.9
	(7)	(33)	(12)	
Large	5.2	11.5	5.7	22.4
	(9)	(20)	(10)	
TOTAL	17.8	61.5	20.7	
	(31)	(107)	(36)	

*Private forests, commons, and purchased tree products.
Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 174 (83 small-farm, 52 medium-farm, and 39 large-farm households). Chi-square = 3.22, df= 4, Significance >.10.

Table A.6. On-farm source of charcoal, for households using on-farm trees as primary charcoal source, excluding landless.

Farmsize Category	Traditional System (%)	Intentional System (%)	Percentage of Total
Small	50.4	2.7	53.1
	(57)	(3)	
Medium and Large	41.6	5.3	46.9
	(47)	(6)	
TOTAL	92.0	8.0	
	(104)	(9)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 113 (60 small-farm, 33 medium-farm, and 20 large-farm households). Expected values for both cells under "Intentional System" are less than 5; too small for statistically valid Chi-square measure.

Table A.7. Source of house construction materials for households using tree products as primary source, excluding landless.

Farmsize Category	State Forests (%)		On-farm (%)		Purchased (%)		Percentage of Total
Small	9.7	(34)	22.9	(80)	19.7	(69)	52.3
Medium	5.1	(18)	15.4	(54)	11.7	(41)	32.3
Large	1.1	(4)	8.6	(30)	5.7	(20)	15.4
TOTAL	16.0	(56)	46.9	(164)	37.1	(130)	

Note: Private forests and commons are omitted from this table as primary sources of housing construction material because expected values for several cells were less than 5. Figures in parentheses are base Ns for the adjacent percentages. Total N = 350 (183 small-farm, 113 medium-farm, and 54 large-farm households). Chi-square = 4.57, df= 4, Significance >.10.

Table A.8. Source of handicraft materials for households using trees as primary source, excluding landless.

Farmsize Category	State Forests (%)		On-farm (%)		All Others* (%)		Percentage of Total
Small	7.9	(18)	35.1	(80)	9.6	(22)	52.6
Medium	5.7	(13)	21.5	(49)	3.9	(9)	31.1
Large	1.3	(3)	12.7	(29)	2.2	(5)	16.2
TOTAL	14.9	(34)	69.3	(158)	15.8	(36)	

*Private forests, commons, and purchased tree products.
Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 228 (120 small-farm, 71 medium-farm, and 37 large-farm households). Chi-square = 3.31, df = 4, Significance >.10.

Table A.9. Use of horticultural extension services, by farmers' on-farm management for fodder.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	20.0	(23)	49.6	(57)
Intentional	12.2	(14)	18.3	(21)
Total	32.2	(37)	67.8	(78)

Note: Figures in parentheses are base Ns for the adjacent percentages.
Total N = 115 (80 traditional, 35 intentional management). Chi-square = 0.94, df = 1, Significance >.10.

Table A.10. Use of horticultural extension services, by farmers' on-farm management for fuelwood.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	9.1		65.0	
		(29)		(206)
Intentional	8.8		17.0	
		(28)		(54)
Total	18.0		82.0	
		(57)		(260)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 317 (235 traditional, 82 intentional management for fodder). Chi-square = 18.15, df = 1, Significance <.01.

Table A.11. Use of horticultural extension services, by farmers' on-farm management for tree-borne food.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	11.6		72.7	
		(54)		(338)
Intentional	5.8		9.9	
		(27)		(46)
Total	17.4		82.6	
		(81)		(384)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 465 (392 traditional, 73 intentional management). Chi-square = 21.46, df = 1, Significance <.01.

Table A.12. Use of horticultural extension services, by farmers' on-farm management for timber.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	5.1	(8)	71.3	(112)
Intentional	13.4	(21)	10.2	(16)
Total	18.5	(29)	81.5	(128)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 157 (120 traditional, 37 intentional management). Chi-square = 43.85, df = 1, Significance <.01.

Table A.13. Use of livestock extension services, by farmers' on-farm management for fodder.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	20.9	(24)	48.7	(56)
Intentional	13.0	(15)	17.4	(20)
Total	33.9	(39)	66.1	(76)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 115 (80 traditional, 35 intentional management). Chi-square = 1.27, df = 1, Significance >.10.

Table A.14. Use of livestock extension services, by farmers' on-farm management for fuelwood.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	12.3		61.8	
		(39)		(196)
Intentional	8.2		17.7	
		(26)		(56)
Total	20.5		79.5	
		(65)		(252)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 317 (235 traditional, 82 intentional management). Chi-square = 7.61, df = 1, Significance <.01.

Table A.15. Use of livestock extension services, by farmers' on-farm management for tree-borne foods.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	15.1		69.2	
		(70)		(322)
Intentional	5.6		10.1	
		(26)		(47)
Total	20.6		79.4	
		(96)		(369)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 465 (392 traditional, 73 intentional management). Chi-square = 10.79, df = 1, Significance <.01.

Table A.16. Use of livestock extension services, by farmers' on-farm management for timber.

Tree Management Practice	Use Service (%)		Do Not Use Service (%)	
Traditional	13.4		63.1	
		(21)		(99)
Intentional	13.4		10.2	
		(21)		(16)
Total	26.8		73.2	
		(42)		(115)

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 157 (120 traditional, 37 intentional management). Chi-square = 20.28, df = 1, Significance <.01.

Table A.17. Use of government horticultural extension, by country.

Country	Use Service (%)		Do Not Use Service (%)		Percentage of Total
Bangladesh	0.0	(0)	13.1	(100)	13.1
Indonesia	3.3	(25)	3.8	(29)	7.1
Nepal	7.1	(54)	6.2	(47)	13.3
Philippines	2.1	(16)	24.3	(185)	26.4
Sri Lanka	0.0	(0)	6.6	(50)	6.6
Thailand	1.6	(12)	32.0	(244)	33.6
Total	14.0	(107)	86.0	(655)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 762 (100 Bangladeshi, 54 Indonesian, 101 Nepali, 201 Philippine, 50 Sri Lankan, and 256 Thai households). Chi-square = 225.82, df = 5, Significance = <.01.

Table A.18. Use of government livestock extension, by country.

Country	Use Service (%)		Do Not Use Service (%)		Percentage of Total
Bangladesh	2.6		10.5		13.1
		(20)		(80)	
Indonesia	3.4		3.7		7.1
		(26)		(28)	
Nepal	7.5		5.8		13.3
		(57)		(44)	
Philippines	0.9		25.5		26.4
		(7)		(194)	
Sri Lanka	0.0		6.6		6.6
		(0)		(50)	
Thailand	2.6		31.0		33.6
		(20)		(236)	
Total	17.1		82.9		
		(130)		(632)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 762 (100 Bangladeshi, 54 Indonesian, 101 Nepali, 201 Philippine, 50 Sri Lankan, and 256 Thai households). Chi-square = 200.11, df = 5, Significance = <.01.

Table A.19. On-farm tree management practices for tree-borne food, by country.

Country	Traditional (%)		Intentional (%)		Percentage of Total
Bangladesh, Sri Lanka, and Thailand	44.1	(205)	1.7	(8)	45.8
Indonesia	5.6	(26)	5.4	(25)	11.0
Nepal	9.9	(46)	0.0	(0)	9.9
Philippines	24.7	(115)	8.6	(40)	33.3
Total	84.3	(392)	15.7	(73)	

Note: Figures in parentheses are base Ns for the adjacent percentages. Total N = 465 (84 Bangladeshi, 51 Indonesian, 46 Nepali, 155 Philippine, 23 Sri Lankan, and 106 Thai households). Chi-square = 86.27, df = 3, Significance = <.01.

Table A.20. On-farm tree management practices for timber, by country.

Country	Traditional (%)		Intentional (%)		Percentage of Total
Bangladesh,	54.8		0.0		54.8
Sri Lank and Thailand		(86)		(0)	
Indonesia	9.6		14.6		24.2
		(15)		(23)	
Nepal	12.1		8.9		21.0
		(19)		(14)	
Total	76.4		23.6		
		(120)		(37)	

Note: Figures in parentheses are base Ns for the adjacent percentages.Total N = 157 (43 Bangladeshi, 38 Indonesian, 33 Nepali, 2 Sri Lankan, and 41 Thai households). Chi-square = 61.85, df = 2, Significance = <.01.

Appendix B: Uses of Trees Found in Each Country

Table B.1.A. Uses of trees in the Bangladeshi study villages.

Species*	Use**										Total
	1	2	3	4	5	6	7	8	9	10	
ACACNI	2	26	2		34		6		36	1	107
AEGLMA				27	11				9		47
ALBISP		9	2		22				25		58
AMOORO		5			5				3		13
ARTOHE	69	28	1	37	43				37	11	226
BAMBAR	5	24			10		59		19	100	217
BORAAE				34	1				7		42
CARIPA				10							10
CITRGR				19							19
CITRRE				10							10
COCONU		7		27			42				76
CORCCA		12									12
DIOSPE		9	2		4				4		19
LITCCH		1		40							41
MALUSY				17							17
MANGIN	85	64	6	56	50				33	1	295
MUSAPA	13			24						19	56
PHOEDA		19		10	1		79		1	74	184
PSIDGU	1			38			1				40
SYZYCU	3	22		17	26				25		93
ZIZYJU	7	10	1	2	2				2		24
Total per Use	185	236	14	368	209	0	187	0	201	206	1606

*See Appendix C for explanation of species codes.
**1 = Fodder; 2 = Fuelwood; 3 = Charcoal; 4 = Fruit/Other Food; 5 = Timber/Construction Materials; 6 = Industrial Uses; 7 = Handicrafts; 8 = Other Regular Use; 9 = House Construction; 10 = Other Occasional Use.

Table B.1.B. Location of trees used in the Bangladeshi study villages.

Species*	Location of Tree**										Total
	1	2	3	4	5	6	7	8	9	10	
ACACNI	1	2		1	19	2	1	52	29		107
AEGLMA					8	1		36	2		47
ALBISP		7			1	1		29	21		59
AMOORO					10			3			13
ARTOHE		41	1		135	3	2	28	15	1	226
BAMBAR		25			141	1	1	31	16	2	217
BORAAE		2			14	1	1	19	5		42
CARIPA					10						10
CITRGR					3			4	12		19
CITRRE					1				9		10
COCONU		2			51			19	4		76
CORCCA					2	1		1		8	12
DIOSPE		5			8			5	1		19
LITCCH		1	1		23			1	15		41
MALUSY					1				16		17
MANGIN		30			243	2	1	6	12		294
MUSAPA					21			23	11		55
PHOEDA		7		1	58	1	1	108	8		184
PSIDGU					33	1		3	3		40
SYZYCU		12			30			46	5		93
ZIZYJU					2	1		21			24
Total per Source	1	134	2	2	814	15	7	435	184	11	1605

*See Appendix C for explanation of species codes
**Locations: 1=State/Government Forests; 2=Private Forests; 3=Common Forests; 4=Other Commons; 5=Homesteads/Homegardens; 6=Farm; Plot w/ Only Trees; 7=Farm; Agroforestry System; 8=Farm, Scattered Trees; 9=Purchased Tree Products; 10=Non-Tree Products

Table B.2.A Uses of trees in the Indonesian study villages.

Species*	Use**										Total
	1	2	3	4	5	6	7	8	9	10	
ACHRZA				22							22
ALBIFA	90	160	2	2	118				44		416
ALBIPR	4	18	1		36				6		65
ARENPI		17		7							24
ARTOHE	19	3		38	1				6		67
COCONU		55	36	51	50				4		196
EUGEAQ				11							11
EUGEAR		1		64							65
GIGAAP		7			15				4		26
GLIRSE	20	5									25
LEUCLE	39	27			2						68
MAESEM	45	34		1	15				9		104
MANGIN		5		21							26
MANIUT	13	7									20
PARKSP				33							33
PERSAM	7	7		44	1						59
SCHINO		28			23		18				69
SPONDU				10							10
SWIEMA	1	22			21	1	12				57
TECTGR		19			19		4				42
TOONSU		3		1	6		1				11
Total per Use	238	418	39	305	307	1	35	0	73	0	1416

*See Appendix C for explanation of species codes.
**Uses: 1=Fodder; 2=Fuelwood; 3=Charcoal; 4=Fruit/Other Food; 5=Timber/Construction Materials; 6=Industrial Uses; 7=Handicrafts; 8=Other Regular Use; 9=House Construction; 10=Other Occasional Uses.

Table B.2.B. Uses of trees in the Indonesian study villages,

Species*	Location of Tree**										Total
	1	2	3	4	5	6	7	8	9	10	
ACHRZA					10		9	2	1		22
ALBIFA					5	117	155	125	10	4	416
ALBIPR					5	6	26	18	9	1	65
ARENPI						16	1	7			24
ARTOHE					3	22	14	27		1	67
COCONU					166	11	8	8	3		196
EUGEAQ					8		1	2			11
EUGEAR					2	53	6	4			65
GIGAAP					4	8	1	7	6		26
GLIRSE							24			1	25
LEUCLE					1	1	63	3			68
MAESEM						39	27	35		3	104
MANGIN					7	5	7	7			26
MANIUT							3	1		16	20
PARKSP						11	8	14			33
PERSAM					1	16	14	28			59
SCHINO						27	30	12			69
SPONDU					7		3				10
SWIEMA						30	14	12	1		57
TECTGR					2	6	9	12	13		42
TOONSU						5	1	5			11
Total per Source	0	0	0	0	221	373	424	329	43	26	1416

*See Appendix C for explanation of species codes.
**Locations: 1=State/Government Forests; 2=Private Forests; 3=Common Forests; 4=Other Commons; 5=Homesteads/Homegardens; 6=Farm, Plot w/Only Trees; 7=Farm; Agroforestry System; 8=Farm; Scattered Trees; 9=Purchased Tree Products; 10=Non-Tree Products.

able B.3.A Uses of trees in the Nepali study villages.

Species*	Uses**										Total
	1	2	3	4	5	6	7	8	9	10	
ALNUNE		63	3		65		1	1	57	8	198
ARTOIT				10	2				1		13
ARTOLA	30	15		1	6				5		57
ARUNSP	3						49				52
BERBAR				34							34
BETUAL	33	45	2		66		1		64	6	217
BOMXCE					15				6		21
CASTIN	20	98		19	56		4	2	62	4	265
CITRCH				102							102
DALBSI					28				5		33
DENDHA	3						42		2	1	48
DENDST	10	16			16				39		81
FICUGL	54	44									98
FICUHI	19	5									24
FICULA	53	37									90
FICUNE	39	3			1		1				44
FICURO	14	4									18
LEUCLE	11	6			1						18
LITSMO	25	10									35
LYONOV		27	1				2		1	1	32
MALUSY				40							40
MANGIN				71	3				1		75
MELIAZ	10	6			8		1		11	1	37
MYRINA		4		42							46
MYRSCA	5	2						1		9	17
MYRSSE	2	5		2				2		15	26
PIERFO	13	9		1	1						24

*See Appendix C for explanation of species codes.
**Uses: 1=Fodder; 2=Fuelwood; 3=Charcoal; 4=Fruit/Other Food; 5=Timber/Construction Materials; 6=Industrial Uses; 7=Handicrafts; 8=Other Regular Use; 9=House Construction; 10=Other Occasional Use.

Table B.3.A. (continued) Uses of trees in the Nepali study villages.

Species*	Uses**										Total
	1	2	3	4	5	6	7	8	9	10	
PINURO		19			6			2	6	1	34
PREMIN	19	7									26
PRUNCE	49	45	4		69		2		64	23	256
PSIDGU				76							76
PYRUPA	5	3		1			3			13	25
QUERGL	20	23			4		6	2	4	30	89
RHODAR		42					2		2	1	47
RUBUEL				27							27
SAURNA	23	3					1				27
SCHIWA	2	81	1		65		4	1	70	14	238
SHORRO					57			1	66		124
SPONAX	1			16	8				9		34
THYSAG	8						47				55
VITIVI				28							28
Total per Use	471	622	11	470	477	0	166	12	475	127	2831

*See Appendix C for explanation of species codes.
**Uses: 1=Fodder; 2=Fuelwood; 3=Charcoal; 4=Fruit/Other Food; 5=Timber/Construction Materials; 6=Industrial Uses; 7=Handicrafts; 8=Other Regular Use; 9=House Construction; 10=Other Occasional Use.

Table B.3.B. Location of trees used in Nepali study villages.

Species*	Location of Tree**										Total
	1	2	3	4	5	6	7	8	9	10	
ALNUNE	4	5	1		19	17	19	83	50		198
ARTOIT					7			3	3		13
ARTOLA		1			46			10			57
ARUNSP		1			19	6	6	6	14		52
BERBAR	1		33								34
BETUAL	6	3	3		15	27	25	81	57		217
BOMXCE	1		2		7			8	3		21
CASTIN	90	61	32	4	1	9	2	46	20		265
CITRCH					47			2	53		102
DALBSI									33		33
DENDHA	1	1			7	5	6	3	23	2	48
DENDST		1	1		35			43	1		81
FICUGL		1	1	14	33			49			98
FICUHI	1			4	10			9			24
FICULA	1	1	1	10	29			48			90
FICUNE					9	5	5	24		1	44
FICURO					6	1	1	10			18
LEUCLE					14			4			18
LITSMO	2	1	1	2	21			8			35
LYONOV	13		7		2		3	2	5		32
MALUSY			1		3				36		40
MANGIN					3				72		75
MELIAZ					8	4	1	18	6		37
MYRINA	1		43		1				1		46
MYRSCA	7	1	7			1		1			17
MYRSSE	12		14								26
PIERFO				1	20			2	1		24

*See Appendix 2 for explanation of species codes.
**Locations: 1=State/Government Forests; 2=Private Forests; 3=Common Forests; 4=Other Commons; 5=Homesteads/Homegardens, 6=Farm; Plot w/ Only Trees; 7=Farm; Agroforestry System; 8=Farm; Scattered Trees; 9=Purchased Tree Products; 10=Non-Tree Products.

Table B.3.B. (continued). Location of trees used in Nepali study villages.

Species*	Location of Tree**										Total
	1	2	3	4	5	6	7	8	9	10	
PINURO	17		3			2	1	4	7		34
PREMIN				3	14			9			26
PRUNCE	4	6			24	31	28	106	57		256
PSIDGU			1	1	45			1	28		76
PYRUPA	5	2	6		4		3	5			25
QUERGL	28	2	29			11	3	11	5		89
RHODAR	18		11		1	1	5	4	7		47
RUBUEL			27								27
SAURNA		1	2		2	6	3	13			27
SCHIWA	53	49	21	2	2	13	12	62	24		238
SHORRO									124		124
SPONAX			15		2		3	6	8		34
THYSAG					19	5	7	7	14	3	55
VITIVI					2				26		28
Total per Source	265	137	262	41	477	144	133	688	678	6	2831

*See Appendix C for explanation of species codes.
**Locations: 1=State/Government Forests; 2=Private Forests; 3=Common Forests; 4=Other Commons; 5=Homesteads/Homegardens; 6=Farm; Plot w/ Only Trees; 7=Farm; Agroforestry System; 8=Farm; Scattered Trees; 9=Purchased Tree Products; 10=Non-Tree Products.

Table B.4.A Uses of trees in the Philippine study villages.

Species*	Use**										Total
	1	2	3	4	5	6	7	8	9	10	
ALBIFA		14					1		1		16
ALNUMA	1	19									20
ALSTMA		17		1			1	1	4		24
ARTOHE		1	2	81			4	2	1	1	92
BAMBSP		3					5		15		23
CHRYCA		6	2	41				9		14	72
CINNME	2	3					2	15	1	5	28
CITRMI		4		17				2		2	25
CITRNO		20		53				5			78
CLEIOP		10	10		7				1		28
COCONU	18	66	11	69			9		21	1	195
COFFAR		64	1	112				1		2	180
DIPTGR		13	3		6			1	2		25
GLIRSE	1	85	19					2		3	110
LANSDO		2		16							18
LEUCLE	64	86	24						15		189
MANGIN		2		62			3	4		2	73
MUSASA		7		29			1	3	27		67
MUSSPH		15	14								29
PASPCO	37										37
PENTCO		14	9		5						28
PERSAM		1	1	73			1	5		10	91
PINUKE		105									105
PSIDGU		17	5	72				11		5	110
SANDKO		10	2	25			1	1		4	43
SHORAS		6	11		7			1	1		26
SHORNE		6	2		8				6	1	23
SHORPO	1	28	1		3		8		35		76
SHORSP							8		38		46
SYZYCU				4				11		6	21
THEOCA				16							16
TRISDE		10	6		1						17
VITEPA					1		1		20		22
Total per Use	124	634	123	671	38	0	45	74	188	56	1953

*See Appendix C for explanation of species codes.
**Uses: 1=Fodder; 2=Fuelwood; 3=Charcoal; 4=Fruit/Other Food; 5=Timber/Construction Materials; 6=Industrial Uses; 7=Handicrafts; 8=Other Regular Use; 9=House Construction; 10=Other Occasional Use.

Table B.4.B. Location of trees used in the Philippine study villages.

Species*	Location of Tree**										Total
	1	2	3	4	5	6	7	8	9	10	
ALBIFA	1			4			11				16
ALNUMA	2	6	4	4	2		2				20
ALSTMA	8			2	2		12				24
TOHE	1				36	1	17	26	11		92
BAMBSP				2	6		3	2	10		23
CHRYCA			1	1	36	1	3	20	10		72
CINNME	16					12					28
CITRMI					3	1	4	17			25
CITRNO	1				13			64			78
CLEIOP	28										28
COCONU	3	1		3	37	8	6	116	20	1	195
COFFAR	2	1		4	59		14	100			180
DIPTGR	19			1			3	2			25
GLIRSE	15		1	4	11		3	76			110
LANSDO					2			16			18
LEUCLE	11	3	2	13	23	6	54	69	6	2	189
MANGIN	2			2	16	2	3	30	18		73
MUSASA					18		4	17	27	1	67
MUSSPH	29										29
PASPCO	1				16			16		4	37
PENTCO	26							2			28
PERSAM	5			2	30		28	17	8	1	91
PINUKE	37	11	55	1		1					105
PSIDGU	2	4		7	63		1	23	10		110
SANDKO					13		1	29			43
SHORAS	26										26
SHORNE	16						5	1	1		23
SHORPO	40			6			25	2	3		76
SHORSP	3				1				42		46
SYZYCU					12		1	7	1		21
THEOCA	1				5			10			16
TRISDE	17										17
VITEPA	4					1		2	15		22
Total per Source	316	26	63	56	404	33	200	664	182	9	1953

*See Appendix C for explanation of species codes.
**Locations: 1=State/Government Forests; 2=Private Forests; 3=Common Forests; 4=Other Commons; 5=Homesteads/Homegardens; 6=Farm; Plot w/ Only Trees; 7=Farm; Agroforestry System; 8=Farm; Scattered Trees; 9=Purchased Tree Products; 10=Non-Tree Products.

Table B.5.A. Uses of trees in the Sri Lankan study villages.

Species*	Use**										Total
	1	2	3	4	5	6	7	8	9	10	
ALSTMA		3			1	7					11
ARTOHE	17	4		19	2	24					66
CAREAR		19			1	8					28
COCONU		8		5	5	32					50
EXACTR	24	23		1		2					50
MADHLO		12			1	7					20
MANGIN		4		32	2	4					42
MICHCH		3			1	11					15
MUSAAC	5	14		23		7					49
MUSASA	7			10							17
PERSGR				13							13
PHYLEM				12							12
PONGPI		10				2					12
PSIDGU		1		29							30
PTECMR		5		1	1	6					13
TAMAIN		5		2		4					11
THESPO		4		1	2	7					14
Total per Use	53	115	0	148	16	121	0	0	0	0	453

*See Appendix C for list of species codes.
**Uses: 1=Fodder; 2=Fuelwood; 3=Charcoal; 4=Fruit/Other Food; 5=Timber/Construction Materials; 6=Industrial Uses; 7=Handicrafts; 8=Other Regular Use; 9=House Construction; 10=Other Occasional Use.

Table B.5.B. Uses of species in the Sri Lankan study villages, by tree location.

Species*	Location of Tree**										Total
	1	2	3	4	5	6	7	8	9	10	
ALSTMA	7				1	1			2		11
ARTOHE	28				24	10			4		66
CAREAR	20				4	4					28
COCONU	2				20	3	1		24		50
EXACTR	26	1			8	11	3		1		50
MADHLO	13				3		1		3		20
MANGIN	14			1	13	7	1		6		42
MICHCH	6		1		1	1	1		5		15
MUSAAC	18	1			13	6	4		7		49
MUSASA	1				3	7	2		4		17
PERSGR					2				11		13
PHYLEM	9					1			2		12
PONGPI	6		1		1	3			1		12
PSIDGU	19				5	5			1		30
PTECMR	6				1	3			3		13
TAMAIN	8				2	1					11
THESPO	7				3	1			3		14
Total per Source	190	2	2	1	104	64	13	0	77	0	453

*See Appendix C for list of species codes.
**Locations: 1=State/Government Forests; 2=Private Forests; 3=Common Forests, 4=Other Commons; 5=Homesteads/Homegardens; 6=Farm, Plot w/ Only Trees; 7=Farm, Agroforestry System; 8=Farm, Scattered Trees; 9=Purchased Tree Products; 10=Non-Tree Products.

Table B.6.A Uses of tree in the Thailand study villages.

Species*	Use**										Total
	1	2	3	4	5	6	7	8	9	10	
AFZEXY			2		2			3	12	1	20
ANNOSQ		7	3	25							35
ARTOHE		4	4	51						1	60
AURIPO	1			69							70
AZADIN		14	11	5				2			32
BAMBNA		3		37	4	3	14			3	64
BAMBSP		6		2	5		18	14	3	16	64
CEIBPE		2	4	4		9	2	2		49	72
COCONU		1		37					2		40
COMBQU		17	12								29
DENDAS				21			1				22
DIMOLO		19	2	1							22
DIOSRH		12	9						1		22
DIPTAL		6	2		6		1	6	45	3	69
DIPTOB		6	10		23		7	1	19	2	68
DIPTTU		19	27		46		18	2	44	8	164
IRVIMA		16	30	1	2				2		51
LAGECA		1	1		1		11		13		27
LAGECU		7	4		2				15	1	29
MANGIN		21	10	81	2			2	3	1	120
MUSASA	2			20							22
PITHDU		9	10	2					1		22
PTECMA	1	12	7		6		5	4	23	4	62
SAMASA		14	10		1		2	3	10	1	41
SHOROB	1	111	62		72	1	9	1	63	13	333
SHORSI	2	79	31		55	2	3		33	4	209
TAMAIN		51	46	26		5	2				130
TECTGR		5			43			1	3		52
THYRSI				10			1	5		4	20
XYLIKE		11	13		9		6		35		74
XYLIXY	1	36	3		41			1	5	2	89
ZIZYMA		5	7	3							15
Total per Use	8	494	320	395	320	20	100	47	332	113	2149

*See Appendix C for list of Species Codes.
**Uses: 1=Fodder; 2=Fuelwood; 3=Charcoal; 4=Fruit/Other Food; 5=Timber/Construction Materials; 6=Industrial Uses; 7=Handicrafts; 8=Other Regular Use; 9=House Construction; 10=Other Occasional Use.

Table B.6.B. Uses of trees in the Thailand villages, by location of tree.

Species*	Location of Tree**										Total
	1	2	3	4	5	6	7	8	9	10	
AFZEXY	3				1			8	8		20
ANNOSQ					33			2			35
ARTOHE					48		1	6	4	1	60
AURIPO	50		2		1				17		70
AZADIN			1	1	6		2	21	1		32
BAMBNA	36		3	1	8			6	10		64
BAMBSP	2			2	37		1	5	17		64
CEIBPE				2	57		2	1	10		72
COCONU					37		1	2			40
COMBQU		4		5	4		1	15			29
DENDAS	5				2			15			22
DIMOLO				1	19				2		22
DIOSRH				4	4		1	13			22
DIPTAL	1				1			31	36		69
DIPTOB	12			2				47	7		68
DIPTTU	39		1	3	2			92	27		164
IRVIMA	8	1						34	8		51
LAGECA	5			1				13	8		27
LAGECU	1							23	5		29
MANGIN				1	91	1	3	18	6		120
MUSASA					22						22
PITHDU					20				2		22
PTECMA	11			2	2			36	11		62
SAMASA			2		32				7		41
SHOROB	131	3	3	6	7		1	115	67		333
SHORSI	87	2	2	4	6		1	54	53		209
TAMAIN	4		1	6	72		5	28	14		130
TECTGR	19		2		1				30		52
THYRSI	7		1		1			6	5		20
XYLIKE	11			3	1			37	22		74
XYLIXY	43		2					11	33		89
ZIZYMA		1			6			8			15
Total per source	475	11	20	44	521	1	19	647	410	1	2149

*See Appendix C for explanation of species codes.
**Location: 1=State/Government Forests; 2=Private Forests; 3=Common Forests; 4=Other Commons; 5=Homesteads/Homegardens; 6=Farm; Plot w/ Only Trees; 7=Farm; Agroforestry System; 8=Farm; Scattered Trees; 9=Purchased Tree Products; 10=Non-Tree Products.

Appendix C: Species

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Species Codes

Code	Species	Common English Name
ACACNI	*Acacia nilotica*	
ACHRZA	*Achras zapota*	
AEGLMA	*Aegle marmelos*	matoom
AFZEXY	*Afzelia xylocarpa* Craib	
ALBIFA	*Albizia falcataria* (*Paraserianthes falcataria*)	Maluccan sau
ALBIPR	*Albizia procera*	white siris
ALBISP	*Albizia spp.*	
ALNUMA	*Alnus maritima*	
ALNUNE	*Alnus nepalensis*	Nepalese alder
ALSTMA	*Alstonia macrophylla*	
AMOORO	*Amoora rohituka*	
ANNOSQ	*Annona squamosa*	sugar apple
ARENPI	*Arenga pinata*	
ARTOHE	*Artocarpus heterophyllus*	jackfruit
ARTOIT	*Artocarpus integra*	breadfruit
ARTOLA	*Artocarpus lakoocha*	
ARUNSP	*Arundineria spp.*	
AURIPO	*Auricularia polytricha*	
AZADIN	*Azadirachta indica*	neem
BAMBAR	*Bambusa arundinacea*	
BAMBNA	*Bambusa natans*	
BAMBSP	*Bambusa spp.*	
BERBAR	*Berberis aristata*	
BETUAL	*Betula alnoides*	
BOMXCE	*Bombax ceiba*	kapok
BORAAE	*Borassus aethiopium*	
CAREAR	*Careya arborea*	
CARIPA	*Carica papaya*	papaya
CASTIN	*Castinopsis indica*	
CEIBPE	*Ceiba pentandra*	kapok
CHRYCA	*Chrysophyllum cainito*	
CINNME	*Cinnamomum mercadoi*	
CITRCH	*Citrus chrysocarpa*	
CITRGR	*Citrus grandis*	
CITRMI	*Citrus microcarpa*	
CITRNO	*Citrus nobilis*	
CITRRE	*Citrus reticulata*	
CLEIOP	*Cleistocalyx opercalatus*	
COCONU	*Cocos nucifera*	coconut
COFFAR	*Coffea arabica*	coffee
COMBQU	*Combretodendron quadrialat*	
CORCCA	*Corchorus capsularis*	
DALBSI	*Dalbergia sissoo*	sissoo
DENDAS	*Dendrocalamus asper*	bamboo

DENDHA	*Dendrocalamus hamiltonii*	bamboo
DENDST	*Dendrocalamus strictus*	bamboo
DIMOLO	*Dimocarpus longan*	
DIOSPE	*Diospyros peregrina*	
DIOSRH	*Diospyros rhodocalyx*	
DIPTAL	*Dipterocarpus alatus*	
DIPTGR	*Dipterocarpus grandiflorus*	
DIPTOB	*Dipterocarpus obtusifolius*	
DIPTTU	*Dipterocarpus tuberculatus*	
EUGEAQ	*Eugenia aquea*	watery rose apple
EUGEAR	*Eugenia aromatica*	
EXACTR	*Exacum trinerva*	
FICUGL	*Ficus glaberrima*	
FICUHI	*Ficus hispida*	
FICULA	*Ficus lacor*	
FICUNE	*Ficus nemoralis*	
FICURO	*Ficus roxburhii*	
GIGAAP	*Gigantocloa apus*	
GLIRSE	*Gliricidia sepium*	madre de cacao
IRVIMA	*Irvingia malayana*	
LAGECA	*Lagerstroemia calyculata*	
LAGECU	*Lagerstroemia cuspidata*	
LANSDO	*Lansium domesticum*	langsat
LEUCLE	*Leucaena leucocephala*	leucaena
LITCCH	*Litchi chinensis*	lechi
LITSMO	*Litsea monopetala*	
LYONOV	*Lynoia ovalifolia*	
MADHLO	*Madhuca longifolia*	
MAESEM	*Maesopsis eminii*	
MALUSY	*Malus sylvestris*	
MANGIN	*Mangifera indica*	mango
MANIUT	*Manihot utilissima*	
MELIAZ	*Melia azedarach*	China berry
MICHCH	*Michelia champaca*	
MUSAAC	*Musa acuminata*	banana
MUSAPA	*Musa paradisiaca*	banana
MUSASA	*Musa sapientum*	banana
MUSSPH	*Mussaenda philippica*	
MYRINA	*Myrica naji*	
MYRSCA	*Myrsine capitellata*	
MYRSSE	*Myrsine semiserrata*	
PARKSP	*Parkia speciosa*	
PASPCO	*Paspalum conjugatum*	
PENTCO	*Pentacme concorta*	
PERSAM	*Persea americana*	avocado
PERSGR	*Persea gratissima*	
PHOEDA	*Phoenix dactylifera*	
PHYLEM	*Phyllanthus emblica*	
PIERFO	*Pieris formis*	
PINUKE	*Pinus kesiya*	
PINURO	*Pinus roxburghii*	

PITHDU	*Pithecellobium dulce*	
PONGPI	*Pongamia pinnata*	
PREMIN	*Premna integrifolia*	
PRUNCE	*Prunus cerasoides*	
PSIDGU	*Psidium guajava*	guava
PTECMA	*Pterocarpus macrocarpus*	
PTECMR	*Pterocarpus marsupium*	
PYRUPA	*Pyrus pashia*	
QUERGL	*Quercus glacuca*	
RHODAR	*Rhododendron arboreum*	
RUBUEL	*Rubus ellipticus*	
SAMASA	*Samanea saman*	rain tree
SANDKO	*Sandoricum koetjape*	
SAURNA	*Saurauia napaulensis*	
SCHINO	*Schima noronhae*	
SCHIWA	*Schima wallichii*	
SHORAS	*Shorea astylosa*	
SHORNE	*Shorea negrosensis*	
SHOROB	*Shorea obtusa*	
SHORPO	*Shorea polysperma*	
SHORRO	*Shorea robusta*	sal
SHORSI	*Shorea siamensis*	
SHORSP	*Shorea spp.*	
SPONAX	*Spondias axillaris*	
SPONDU	*Spondias dulcis*	
SWIEMA	*Swietenia macrophylla*	mahogany
SYZYCU	*Syzygium cuminii*	black plum
TAMAIN	*Tamarindus indica*	tamarind
TECTGR	*Tectona grandis*	teak
THEOCA	*Theobroma cacao*	
THESPO	*Thespesia populnea*	
THYRSI	*Thyrsostachys siamensis*	
THYSAG	*Thysanolaena agrostis*	
TOONSU	*Toona sureni*	
TRISDE	*Tristania decorticata*	
VITEPA	*Vitex parviflora*	molove
VITIVI	*Vitis vinifera*	
XYLIKE	*Xylia kerii*	ironwood
XYLIXY	*Xylia xylocarpa*	
ZIZYJU	*Zizyphus jujuba*	
ZIZYMA	*Zizyphus mauritiana*	