



Forestry

"The challenge to forestry of contributing to bettering the condition of the rural poor is ... likely to entail a radical reorientation extending from policy all the way through to its technical foundations"

—Forestry for Local Community Development, FAO

Wood is a basic resource for meeting human needs. It has always been important as a cooking fuel and building material. But throughout history, expanding human settlements have threatened and eventually destroyed forests. To the individual farmer, the forest is often a nuisance to be cleared away so that the land can be farmed. To the villager, the forest is the provider of plentiful cooking fuel. And to the industrialist, the forest is the source of plywood, paper, cardboard, and lumber to meet the enormous demands of industrial societies. The result has been that a potentially renewable resource has generally been exploited as a one-time boon for the first to arrive.

The consequences of unrestrained deforestation are many. The cultivation of hillsides generally leads to rapid erosion of topsoil and loss of productive potential. The removal of trees reduces the soil's ability to retain water, leading to ever-increasing cycles of flood and drought in the lands below. Inefficient cooking methods and a lack of deliberate replanting of fuelwood trees have forced millions of the poor to spend a large part of each day hunting for fuel and carrying it long distances on their backs. An unequal portion of this burden falls on women. This time-consuming, exhausting work further guarantees their poverty. In search of maximum immediate production from a piece of land, lumbering companies

around the world have clear-cut the forests, leaving a devastated landscape vulnerable to erosion, and destroying any potential for sustained production.

"The humid forests of the tropics once occupied at least 1600 million hectares (4000 million acres), and have not only been the main centers for living species on earth, but have held the lands together, moderated and modified world climates, and helped to maintain a desirable balance of atmospheric gasses. Now they are vanishing at an incredible rate. There are reported to be 935 million hectares in actual humid tropical forest, a 40% reduction in total area. They are disappearing at a rate of sixteen million hectares per year"

—Ray Dasmann, "Planet Earth—1980", 1980

Some observers are convinced that the considerable local, national and international problems associated with deforestation will be followed by global climatic shifts if deforestation is not brought under control within the next ten years. World food production is directly threatened by local soil erosion, floods and droughts, and climatic changes that mean shifting rainfall patterns and expanding deserts.

*As the problems caused by deforestation are becoming better understood, development planners are scrambling to find temporary and long-term solutions. The skills of the forestry profession are in great demand. Yet on closer examination it becomes clear that more and better-funded forestry programs alone will not be enough. Major changes in attitude and strategy will also be required. In particular, foresters and planners cannot continue forest management focused largely on production for industry. Just as important, forestry programs can no longer be based on the strategy of preventing the community from gaining access to the forest. The FAO book **Forestry for Local Community Development** marks an historical shift in consciousness, as it describes the strategies and programs that can mean successful sustainable production of forest resources through community involvement. But for the most part,*

"In precious few countries have the energies of the foresters been bent upon helping the peasant to develop the kind of forestry that would serve his material welfare. This is why there are so few village wood lots and fuel plantations. This is why so little work has been done on forage trees, fruit and nut orchards. This is why so few shelterbelts have been created This is why forestry has been invoked so rarely to reclaim or rehabilitate land. This is why so few of the many possible agro-forestry combinations have been established which are specifically geared to meeting real local needs

"Agriculture-supportive forestry does not by any means exclude forest industries. Small rural industries are an integral part of agriculture-supportive forestry: fuelwood, charcoal, poles, stakes, fencing, hurdles, screens, farm tools and implements, building materials, simple furniture. But these activities, like all other agriculture-supportive activities, are activities that cannot be carried out on the required scale and in the required manner by a conventionally oriented and conventionally organized forest service. They will only be effective, and will only make sense, if they are carried out by the peasants themselves, for themselves. The role of the forester, wherever he may sit in the organizational structure, can only be

to stimulate, offer guidance and suggestions, impart techniques and carry out training."

—"Forest Industries for Socioeconomic Development", by Jack Westoby, 1978, formerly Director, Programme Coordination and Operations, Forestry Department, FAO

*The first books in this chapter discuss the extent of the deforestation problem, along with conclusions about sound practices to protect the forests while using them to satisfy human needs. **China: Forestry Support for Agriculture** offers a fascinating national case study of successful reforestation for maximum agricultural benefit, while **Reforestation in Arid Lands** represents a general practical manual. **Forestry for Local Community Development** sheds light on the requirements for successful village wood lots and other fuelwood replanting projects. **Tree Crops: A Permanent Agriculture** notes that trees conserve soil far better than row crops on hilly terrain, and argues that conversion to tree crops is the only choice that will maintain the long-term productivity of agriculture in these areas.*

*As firewood use continues to be a contributing factor in deforestation, the promotion of efficient low-cost locally-built cooking stoves appears to be a cost-effective first step towards conservation in many areas (see the chapter **ENERGY: COOKSTOVES**). Fast growing tree species are also getting a great deal of attention. The National Academy of Sciences book **Firewood Crops** is one new inventory of fast growing species, and other books reviewed here cover particular species and growing techniques.*

Village forest industries are the final topic in this chapter. Timber drying, through both regular kilns and solar dryers, is an important step in the production of good quality hardwood for tool handles and furniture. The use and repair of chainsaws, and chainsaw attachments for board production, are covered in the last few entries.

People and Trees: The Role of Social Forestry in Sustainable Development, MF 08-316, book, 273 pages, edited by Hans Gregersen, Sydney Draper, and Dieter Elz, 1989, \$17.95 from World Bank Publications, Box 7247-8619, Philadelphia, Pennsylvania 19170-8619, USA.

"The distinguishing feature of social forestry, as distinct from industrial and large-scale government forestry, is the involvement of local, generally rural, people in growing trees for their own use. Social forestry is often difficult to identify, since it seldom involves large blocks of trees or 'forests'. Instead, it involves a few trees here and a few trees there, a small village wood lot, trees along the road or interspersed in the fields. Yet the sum of these small-scale activities by millions of tree planters can be significant."

This is an excellent compilation of a broad range of material on social forestry. Major topics are social forestry and the environment, the role of trees in agriculture, the fuelwood crisis and improved stoves programs, employment income, planning issues, incentives for local participation, obtaining land, and various aspects of project organization and management.

Many "striking successes came about when programs were redesigned to focus on local participation. Instead of being viewed as government programs in which local people were expected to participate, they were seen as local programs supported by government."

Particularly illuminating are the examples of problems and successful projects sprinkled throughout the book.

"Whereas individual owners can always protect the crops on their land, protecting trees on lands belonging to village panchayats, railways, the public works or irrigation department, and so on, is difficult, primarily because everyone's property is no one's property One way to protect the trees, particularly on the roadside plantations, is to allot each tree to someone living close by. Those who protect the tree should also be allowed to share the benefits. In the case of fruit, flower, and seed trees, those who protect the trees should receive a share from the final felling of the trees. Advance publicity of the distribution pattern of benefits likely to accrue will foster the security of ownership so essential for the long-run protection of trees."

Environmentally Sound Small-Scale Forestry Projects, MF 08-289, book, 109 pages, by Peter Ffolliott and John L. Thames, 1983, \$12.95 from VITA; also available in Spanish and French; also available from ITDG and TOOL.

"This manual has been written for community development workers in developing countries who are not technicians in the area of forestry, but who want some general guidelines for planning environmentally sound small-scale forestry projects." The book opens with a discussion of process for project planning, and the relationship of forestry to the environment. Background for planning is given for multiple-use forestry, harvesting trees for wood products, fuelwood management programs, agro-forestry projects, shelterbelt or windbreak plantings, reforestation and afforestation. We recommend this book as an introduction to forestry principles.

Forestry Case Studies, Peace Corps Case Study CS-3, MF 08-292, booklet, 102 pages, 1982, Peace Corps, out of print.

Case studies can be valuable tools to help project planners learn from others' experiences and their mistakes. Case studies from Peace Corps projects in eight countries are presented, each one ending with a section which evaluates the success of the project and restates factors which seemed beneficial or detrimental. The last chapter is a summary of the factors which seem most important to success.

Forest Farming, MF 08-307, book, 197 pages, by J. Sholto Douglas and Robert de J. Hart, 1984 edition, £7.50 from ITDG; also available from VITA and TOOL.

Forest Farming, co-authored by J. Sholto Douglas (who wrote **Hydroponics: The Bengal Method**), updates and expands J. Russell Smith's classic **Tree Crops: A Permanent Agriculture** (see review). The authors show that "in food productivity alone tree crops can produce 10 to 15 times as much food per acre as field crops."

The authors discuss the role of forests and tree crops in farming and offer detailed advice and information on various economic species, the use of their products for food and raw materials, planting techniques and suggestions, and guidance for the layout and operation of schemes of forest farming.

Douglas and Hart state: "The 'tool' with the greatest potential for feeding people and animals, for regenerating the soil, for restoring water-systems, for controlling floods and droughts, for creating more benevolent micro-climates and more comfortable and stimulating living conditions for humanity, is the tree."

Tree Crops: A Permanent Agriculture, MF 08-302, book, 408 pages, by J. Russell Smith, 1953, reprinted 1978, Harper and Row, out of print in 1985.

"Forest—field—plow—desert—that is the cycle of the hills under most plow agriculture Field wash, in the United States, Latin America, Africa and many other parts of the world, is the greatest and most menacing of all resource wastes We are today destroying our soil ... faster and in greater quantity than has ever been done by any group of people at any time in the history of the world."

Written over 25 years ago, this is still considered one of the most important texts on the agricultural potential of tree crops. "Agriculturalists have completely overlooked the abundant food produced by such trees as the oaks, honey locust, persimmon, and walnut, which ... can outproduce, acre for acre, the best efforts of the grass family (corn, wheat, oats) on most lands in formerly forested areas. Moreover, tree crops require less care, bind and improve instead of depleting the soil, and provide a permanent source of income which increases annually."

"If much of the tropic forest is to be preserved, we must make use of tree crops. Tree crops will safeguard fertility while producing food for man. In most cases there can be an undergrowth of leguminous nurse crops of small tree and bush to catch nitrogen, hold the soil, make humus and feed the crop trees—nuts, oils, fruits, gums, fibers, even choice weeds."

"The crop-yielding tree offers the best medium for extending agriculture to hills, to steep places, to rocky places, and to the lands where rainfall is deficient."

Most of this extraordinary book consists of descriptions of the characteristics and uses of what Smith felt were the 35 most promising tree types for temperate and tropical climates. His photos and personal observations from years of traveling throughout the world add considerably to the impact of the book.

Forestry for Local Community Development, FAO Forestry Paper No. 7, MF 08-293, book, 114 pages, FAO, 1978, available in English, Spanish, and French, \$10.00 from FAO or \$14 from UNIPUB.

Here is a summary of what is known about constraints facing the rural poor that affect forestry, programs that address these constraints, and policy measures that have succeeded in different places. The study concentrates on programs in which rural communities process and use the forest products themselves; it excludes large-scale industrial forestry.

"Forestry for community development must ... be forestry for the people and involving the people. It must be forestry which starts at the 'grass roots'."

"The core of the problem for forest communities is ... usually that they derive insufficient benefits from the forest This ... is often attributable to conventional forest management objectives and administrative practices, an orientation towards conservation, wood production, revenue collection, and regulation through punitive legislation The task of forestry for the development of such communities is consequently to engage them more fully, positively, and beneficially in its utilization, management and protection. This may take the form of ... logging or sawmilling cooperatives ... production of honey ... the concurrent production of forestry and agricultural crops, or ... grazing of animals This can require quite radical reorientation of traditional forestry concepts and practices."

"A feature of most successful recent community forestry endeavors has been a strong, sustained technical support system, capable of providing advice and

essential inputs such as planting stock, and of maintaining such support through the period necessary to generate forestry as a self-sustaining activity in a particular area"

Key factors affecting success or failure of forestry programs are identified and summarized in seventeen brief case studies.

Highly recommended.

China: Forestry Support for Agriculture, FAO Forestry Paper No. 12, MF 08-286, book, 103 pages, FAO, 1979, \$11.50 from UNIPUB.

This is the report of an FAO/UNDP-sponsored study tour in 1977, "to observe and analyze the Chinese approach to forestry development whereby it is integrated into and supports agriculture."

"Stricken by a series of natural calamities throughout history, China appears determined to tame rivers, regulate water systems, reverse soil erosion, establish a favorable climatological balance and thus banish the feeling of helplessness against natural disasters. Forestry has played a major role in achieving these objectives."

The participation of the people has been a central concept in China's forestry efforts. Research activities concentrate on practical problems, and include commune members; much is learned from the practical experiences of field workers. Education of the people is seen as a requirement for successful tree planting programs. As a result the average Chinese is "much more knowledgeable about forestry than the average person in any other country," and protection of reforested areas is not a problem. Forested lands have doubled since 1949.

Tree planting has had direct economic benefits in the form of timber, fuelwood, livestock fodder, fruit and other products. In some areas shelterbelt forestry is considered the primary factor in dramatic agricultural gains, ahead of irrigation, fertilization, and improved seeds.

Planning for Agroforestry, MF 08-318, book, 68 pages, by Susan Huke and June Plecan, 1988, \$4.00 from Save the Children, Attn: John Salamack, 54 Wilton Road, Westport, Connecticut 06880, USA.

This practical handbook, of general value as a reference for planting trees in a rural community, was written for development project managers and fieldworkers who would like to introduce agroforestry activities into their ongoing programs. It is an action-oriented introduction to the topic of agroforestry, written in clear text with clear drawings and photos. There is good advice on working successfully with local communities, and on assisting farmers in planning where to plant what kinds of trees. The establishment of a nursery is also covered. While it is intended for low rainfall areas, much of the material is more widely relevant.

The material on integrating trees with farm crops is helpful as an introduction, but in most cases will need to be supplemented by additional information on specific crop/tree combinations. Appendices provide nursery management and planting information on selected tree species.

Manual of Reforestation and Erosion Control for the Philippines, MF 08-313 book, 569 pages, edited by H.J. Weidelt, 1976, 1988 edition DM18 plus postage from GTZ.

Despite its title, only the first 33 pages of this book are specifically for the Philippines. The remaining 500 pages form a general textbook on reforestation and

erosion control, most of which is applicable to other tropical countries.

The main topics covered are establishment, maintenance and protection of forest plantations, compass surveying and mapping, nursery techniques, erosion control, and forest tree seed. Techniques and tools presented are simple and low-cost. Management of natural forests is considered to be outside the scope of this book, and gains only brief mention.

A great deal of good information.

Tree Planting in Africa South of the Sahara, MF 08-312, booklet, 75 pages, by David Kamweti, 1982, The Environmental Liaison Center, Nairobi, Kenya, out of print.

This introductory booklet provides enough general information for someone without prior forestry experience to understand and carry out small tree planting projects. Simple techniques using hand tools are described and illustrated. The tree species and climates described are those of Africa, but people new to the topic of forestry in other areas may wish to use this as an introduction to the topic. The treatment of individual species is limited, so the reader will want to refer to other sources for further details.

Recommended as an introduction to this topic.

Reforestation in Arid Lands, MF 08-300, book, 335 pages, by Fred R. Weber, 1977, revised 1986, \$14.95 (overseas orders add \$3.00 for surface mail, \$5.00 for airmail) from VITA; also available in French; also available from ITDG and TOOL.

Though designed for use by people working on reforestation programs in sub-Saharan West Africa, this book would be useful in other arid areas. There are special sections on windbreaks, fire protection and sand dune stabilization.

Half of the book contains a directory of 165 tree varieties found in West Africa, and an expanded look at 30 of these, covering details on such topics as seeds, germination techniques, transplanting protection and uses.

"This manual assumes basic familiarity with reforestation terms and methods: for example, it takes for granted that the reader will be familiar with laterite soils and with the use of such forestry tools as climate maps and vegetation charts."

"Reforestation programs are part of larger conservation efforts. Increasingly they are being conducted with the realization that it is very difficult to separate reforestation from other revegetation efforts—range management, sand stabilization and similar activities. So while reforestation deals mainly with planting trees in locations able to support at least some species, it is important to think broadly of revegetation—planting trees, shrubs, bushes, grasses, and other ground cover in areas which do not have sufficient vegetation."

Revegetation is a concept that needs wider circulation. The planting of many different suitable types and sizes of vegetation makes the widest possible use of the capacity of a landscape to support plant life. A wide range of plant life also further expands the amount and diversity of animal life that the area can support, and this includes the human animal. A community of plants composed almost solely of trees ignores the potential that shrubs and ground covers can contribute to the productivity of a landscape: animal life, both wild (deer and fowl, for instance) and domestic (such as pigs, cattle and geese) will not do as well when there are only trees. Reforestation usually creates a place for humans to come and get lumber and

firewood and little else. Revegetation creates a place for a greater variety of plants and a larger number of animals, including humans, to live ... and provides lumber and firewood too.

"A conservation project must be supported by the people living in an area, or it will not work. Local people are the ones who may be asked to give land for a project, or to work on it. And often a reforestation effort will have to be supported by people for years before results can be seen. Therefore, a project should not be started before communities are ready to sustain the effort. And to make this commitment, residents must believe that (1) the project will affect their environment and their lives positively, and (2) the results will be worth the effort."

Savanna Afforestation in Africa, MF 08-320, book, 312 pages, FAO, 1979, Dfl. 47.95 from TOOL.

This is a collection of lecture notes and brief papers for a symposium on the planting of trees in African grasslands. Topics covered include a general discussion of African savanna, species introduction and seed handling, nursery practice, plantation establishment and maintenance, techniques for problem areas, plantation protection, and planning for plantations.

The presentation is academic in style, so that the reader will have to work to get practical information from the text. Still, for those working in forestry projects in tropical and subtropical grassland areas, this may prove a worthwhile book.

Firewood Crops: Shrub and Tree Species for Energy Production, Volume 1, MF 08-290, book, 237 pages, National Academy of Sciences, 1980, \$20.00 from BOSTID, HA-476E, National Academy of Sciences, 2101 Constitution Avenue N.W., Washington, D.C. 20418, USA.

"To alleviate the growing shortage of wood fuel is one of mankind's major challenges. In this connection, firewood research is vital and deserves concentrated financial support. It will take the combined efforts of government, industry, landowners, villagers, researchers, philanthropic institutions and development assistance agencies. Some activities that must be undertaken include:

- Preventing the extinction of existing forests;
- Instituting policies to relieve the often wasteful use of the firewood now available;
- Testing and developing fuel-efficient stoves;
- Instituting policies and programs to encourage the use of alternative energy sources such as biogas and solar heat;
- Testing the cultivation of native tree species for firewood; and
- Testing appropriate new species such as those identified in this report."

Firewood Crops describes woody species suited for use as fuelwood or charcoal in rural developing areas where firewood shortages are reaching a crisis point.

An introduction by Erik Eckholm points out the urgent need for fuelwood programs throughout the world—and the considerable difficulties in actually implementing them. A chapter entitled "Wood as Fuel" presents an overview of wood energy uses, firewood plantation, fuelwood management, harvesting techniques, species selection, and appropriate research methodologies. The intent throughout is to provide options, not specific recommended solutions.

Approximately 60 species for use in the wet-dry lowland tropics, Savannah

regions, arid areas, and tropical highlands are presented in the main body of the report. There are extensive photographs, references, seed and germplasm sources, and research contacts. For each species listed, other uses besides fuel are also cited.

"Woody plants ... can also be sources of: vegetable oil and fruits and nuts for food; edible leaves and shoots for sauces, curries, salads, and beverages; forage for livestock and silkworms; green manure for fertilizing soil; medicines and pharmaceuticals; extractives such as resins, rubber, gums, and dyes In times of hardship, (the tree owner) may sacrifice some tree growth to feed his family or animals with the foliage. In some cases, dense forests can produce a great deal of burnable materials without a living tree being felled. In others, the owner may sell the best farmed trees for timber or pulp and use the remainder as fuel. Having such options is important to a rural farmer, and in this report we note the main alternative uses for the species selected, even if they conflict with firewood use."

The technical appendices include a master list of firewood species, and firewood success stories from Ethiopia and South Korea.

Planting Tree Crops, Practical Guide to Dryland Farming No. 4, MF 08-323, booklet, 39 pages, 1989, \$4.00 plus shipping from World Neighbors, 5116 North Portland Avenue, Oklahoma City, Oklahoma 73112, USA; Indonesian edition from Studio Driya Media, Jalan Hariangbanga No. 2 Pav, Bandung, Indonesia 40116.

One of a series of illustrated booklets on conservation farming, this one is dedicated to tree planting in the tropics. Growing seedlings from seed, air-layering, and grafting techniques are shown. Intended for use by farmers and extension agents.

"'Air-layering' is a simple method of reproduction often used for fruit trees. First, the bark is peeled from a section of a branch of a healthy tree. The peeled section is then wrapped in moist material until new roots are formed. Finally, the branch is cut off and planted."

Leucaena: Promising Forage and Tree Crop for the Tropics, MF 08-296, book, 100 pages, by the National Academy of Sciences, revised 1984, \$9.00 from BOSTID, HA-476E, National Academy of Sciences, 2101 Constitution Avenue N.W., Washington, DC 20418, USA; also available from ITDG and TOOL.

"Of all tropical legumes, leucaena probably offers the widest assortment of uses. Through its many varieties, leucaena can produce nutritious forage, firewood, timber, and rich organic fertilizer. Its diverse uses include revegetating tropical hillslopes and providing windbreaks, firebreaks, shade, and ornamentation. Although individual leucaena trees have yielded extraordinary amounts of wood—indeed, among the highest annual totals ever recorded—and although the plant is responsible for some of the highest weight gains measured in cattle feeding on forage, it remains a neglected crop, its full potential largely unrealized."

Leucaena varieties can grow in arid areas (though they do best in moist conditions) and can tolerate periods of frost and high winds. It is especially useful in reforestation efforts where it is important to get quick results for ecological or economic reasons.

"There is a rising belief among agronomists and foresters that tree growing, crop production and/or animal raising should be combined to best preserve structure and fertility of fragile tropical soils. Trees provide the ecosystem, and an agricultural crop, livestock rearing, or fish culture can provide income while the

trees are maturing. Combinations of many different plant and animal species seem possible, but versatile leucaena appears to be an outstanding candidate."

"Leucaena helps to enrich soil and aid neighboring plants because its foliage rivals manure in nitrogen content, and natural leaf-drop returns this to the soil beneath the shrubs. Recent experiments in Hawaii have shown that if the foliage is harvested and placed around nearby crop plants they can respond with yield increases approaching those affected by commercial fertilizer."

The book covers the following topic areas: leucaena botany and cultivation; animal feed; wood products; fuelwood; soil improvement and reforestation; recommendations and research needs; sources of additional information; a list of leucaena researchers; and sources of leucaena seeds, nitrogen fixing inoculant bacteria, and wood samples. An excellent general survey of the potential of leucaena in tropical, sub-tropical and mild temperate climates.

Natural Durability and Preservation of One Hundred Topical African Woods, MF 08-298, book, 131 pages, by Yves Fortin and Jean Poliquin, 1974, out of print in 1985.

This is a report on the preservation requirements of 100 different tropical African woods. "Natural durability" refers to the ability of the wood to resist attack by biological agents—fungi, insects, and marine borers were chosen as specific cases. Many woods have certain uses which require little or no preservative treatment, due to this natural durability.

"The protection obtained from a preservative treatment is determined by the effectiveness of the preservative as well as the method of its application. The choice of a suitable preservative is mainly based on the conditions to which the wood is to be exposed. For example, before the wood is utilized, preservatives made of chemicals dissolved in organic solvents, and non-leachable salt preservatives usually give satisfactory protection."

The authors mention the hazards of use of some of the chemical preservatives, plus some safety instructions. Non-commercial preservation techniques are aimed at medium to large-scale operations, but small-scale operations will also find the book very useful.

Anyone using common African woods will find material of interest in this book. There is an extensive list of sources for further information.

The Propagation of Tropical Fruit Trees, MF 08-310, book, 566 pages, by R.J. Garner, S.A. Chaudhri and the staff of the Commonwealth Bureau of Horticulture and Plantation Crops, 1976, £20.50 from CAB International, Wellesbourne, Oxon OX10 8DE, United Kingdom; in Americas US \$39.00 from University of Arizona Press, 1230 North Park Avenue, Suite 102, Tucson, Arizona 85719-4140, USA.

This is a very welcome addition to the literature on tropical horticulture. This book contains a comprehensive review of the various techniques for the propagation (multiplication) of selected tropical fruit tree species of high economic and nutritional value. The book is divided into two parts—an overview and detailed description of the materials and methods used in tree propagation, and a review of propagation techniques for specific tree species. The book primarily covers simple, low-technology techniques which are easily understood by farmers given adequate training. The text is supplemented by basic line illustrations which are generally adequate for explaining the techniques covered. The book could have been improved by the inclusion of illustrations of the fruit species (i.e., tree profile, fruit

sections, etc.) covered in the second section and the addition of a simple glossary of horticultural terms. Nevertheless, this publication should be of value to agricultural researchers, fieldworkers, and trainers throughout the tropics.

"Many different kinds of intimate protection are used in nurseries. Glass structures, so widely used in temperate zones, quickly overheat in hot sun and are generally unsuitable for use in the tropics. Structures which have proved more useful have been a combination of partial shading overhead with moisture retaining covers below to provide the desired ecoclimate in the immediate vicinity of the plant Various materials serve for shading, including lathes, bamboo, banana leaves and palm branches. A favourite use in Malawi is composed of grass woven into two-inch (5-cm) chicken wire."

"Grafting with detached scions requires extra care in maintaining life in both scion and rootstock throughout the grafting process and until the composite plant is well established. Though it is thus more hazardous than approach grafting it demands less labour per graft and, by its relative simplicity lends itself to standardization essential in the exploitation of mass production techniques. The aim must be simplicity with efficiency"

A Pocket Directory of Trees and Seeds in Kenya, MF 08-309, book, 151 pages, by Wayne Teel, 1984, \$7.00 from KENGO, P.O. Box 48197, Nairobi, Kenya.

The author has geared this book to those people with limited tree planting experience. The opening 15 pages of general information in a question/answer format provide a good introduction to the topic. The book goes on to list local names, uses, preferred climate, information about the seeds, and sources of seeds in Kenya for 90 tree species. The trees and seeds of each species are clearly illustrated. With its focus on Kenya, this book will be most useful in that country. However, it may be useful to groups in other areas with similar climatic conditions.

Agroforestry Species: A Crop Sheets Manual, MF 08-319, book, 326 pages, by P.K.R. Nair, 1980, microfiche only from ICRAF, P.O. Box 30677, Nairobi, Kenya.

This is a good reference for those seeking information on the specifics of various crops suited to agroforestry. "Crop sheets" for each of 40 of the most important species provide information on such characteristics as uses and economic role distribution, plant characteristics, climate and soil requirements, nutritional composition, and diseases, as well as further sources of information.

The manual also presents "short notes" on about 50 underutilized and localized species of food crops, fruits and nuts, spices and condiments, beverages, medicinal and aromatic plants, and others. Tree species are also covered, except for tree crops which will be the focus of a future publication from ICRAF.

Much of the language used is technical, but a good glossary is provided.

A Forest Tree Seed Directory, MF 08-291, book, 283 pages, FAO, 1979, \$25.00 from UNIPUB.

This is a directory of sources of tree seeds of many varieties. It includes an enormous amount of information on tree seeds, including the number of seeds per kg, germination percentage, and seed treatment applied.

A special remarks section covers such things as germination techniques, ordering delays to be expected, quantities available, and rarity of the seed.

All of the text is in English, French and Spanish.

Short-Rotation Forestry, MF 08-301, report, 36 pages, by Dr. Geoffrey Stanford, 1976, \$5.00 from Greenhills Environmental Center, 7171 Mountain Creek Parkway, Dallas, Texas 75249, USA.

"Coppicing" has a long history in Europe. It consists of growing young trees very close together, and harvesting the growth after 3-5 years during the winter season. New growth comes up from the stump and the cycle is repeated.

This report contains an overview of coppicing history, principles, and yields. Coppicing "was not just a way of increasing the yield of fuelwood from stumps near to the village, it was a means for securing construction timber of the right size other than by selection from a natural mixed forest. These coppices also furnished the wood for the enormous quantity of baskets, barrels, tubs, and pails."

"Coppicing has two important advantages over mature timber: firstly, the yield/hectare/year can be many times greater; and secondly, repeated harvestings at intervals of 3-7 years provide a much shorter-term return on invested capital."

Wood Harvesting with Hand Tools, MF 08-322, book, 155 pages, International Labour Office, 1987, available from ILO.

To match the shift towards forestry that benefits rural communities, this book explores hand tools that in many cases will be the most affordable choices for people.

There is a drawing and description of each tool and its function and maintenance. Among the unusual items are skidding sulkies, wheeled sets that can be attached to logs to aid in their transport. Safe and effective tree felling techniques are discussed. Methods are suggested to minimize wood wastage.

"Grindstones can easily be made locally from 20 litres of good quality cement and 50 litres of quartzitic sand with 1 mm or smaller particle size. The sand must be sieved (e.g. with mosquito netting), be washed and clean from clay or salt. In addition, an iron tube or rod is needed, about 60 cm length and 2 cm diameter with a nail welded to its middle."

Land Clearance: Alternative Techniques for Removing Bees & Bushes, MF 08-295, book, 66 pages, 1981, ITDG, out of print in 1985.

This thorough review of the options available for land clearance could be a model text for matching technology to task in a rational manner. Includes labor and capital requirements (in 1981 prices), ecological and safety considerations, clear illustrations of all tools considered, and a brief bibliography.

Recommended.

Crosscut Saw Manual, MF 08-306, booklet, 27 pages, by Warren Miller, 1978, U.S.D.A. Equipment Development Center, stock no. 001-001-00632-7, 1988 edition \$2.00 from USGPO.

The large hand-operated crosscut saw is still commonly used in developing countries. A well-filed and cared for saw can perform remarkably well. "Only in recent years was a chainsaw developed that could beat a topnotch buckler in a contest. There is a record of a 32-inch Douglas fir log cut in 1 minute 27 seconds by one buckler." This manual will show you how to properly straighten, set, and file a large saw to make it operate smoothly and effectively.

Barnacle Parp's Chain Saw Guide, MF 08-284, book, 281 pages, by Walter Hall, 1977, Rodale, out of print in 1985.

The subtitle accurately states that this book helps you in "buying, using and maintaining gas and electric chain saws." These are very useful tools where large amounts of timber need to be felled, rapid cutting and processing is important, and a shortage of labor exists.

Basic parts, accessories, safety, and sharpening are presented. Manufacturers' addresses, specifications of currently available chainsaw and periodicals are listed. A very good section on the use of chainsaws is matched with clear descriptions of repair procedures.

The Chainsaw and the Lumbermaker, MF 08-285, booklet, 28 pages, Haddon Tool, out of print.

In the few rural parts of the temperate zones where forests are extensive, trees can be cut or bought and used as a low-cost construction material. While trees are usually sawn at a mill, a tool like the "Lumbermaker" described in this booklet can be used with a chainsaw to produce rough-cut lumber. The "Lumbermaker" allows one person to make straight cuts for boards by guiding the chainsaw along a piece of milled lumber (standard two-by-four) which is nailed to the log. The booklet shows how to use the "Lumbermaker" to saw boards of various sizes using different methods of attaching the guide board to the log. Also included are suggestions on sawing angles, braces, making a jig for cross-cutting, and simple log cabin construction. The "Lumbermaker" is a simpler attachment than that used for the Alaskan sawmill (see next review).

The price of the "Lumbermaker" in January of 1980 was \$45.00. Matched with a chainsaw, it may have a place in the South, between the two-person hand pit saw and the small motorized sawmill. Easily transported, it would seem most applicable in areas where transport of logs to a small mill is impractical. Chainsaws, however, make a wider cut and thus waste more wood than either of the other alternatives. The "Lumbermaker" will certainly be most widely used in parts of the U.S. and Canada where wood is still abundant and chainsaws have become widely owned tools in an affluent consumer society.

Make Your Own Precision Milled Lumber from Logs and Trees: Alaskan MKII, MF 08-314, promotional literature (leaflets and booklets), 1976, Granberg/Firmont Inc., California, out of print.

The Alaskan Mill is a marvelous tool for accelerating forestry operations in

developing countries, allowing for intermediate level, small-scale wood processing and lumber production. This device consists of an attachment to a standard gasoline powered chainsaw (6 horsepower minimum gear drive, with 2:1 gear ratio), which enables the users to cut lumber of any assortment of sizes from rough timber. One person to 3-person mills are available. According to reliable estimates, an average of 1000 board feet (approximately 2.25 cubic meters) of finished lumber can be achieved daily with the one person operation.

Small and Medium Sawmills in Developing Countries, MF 08-321, book, 149 pages, FAO, 1982, \$16.00 from UNIPUB.

This is a guide for planning, setting up, and running saw mills. The mills described here are beyond the financial resources of most Sourcebook users, involving startup capital investments of several hundred thousand dollars. However, the framework for analysis and planning presented here can be applied to much smaller sawmilling operations.

Part 1 covers sources of raw materials, marketing, industrial machinery and processing, cost estimates, financial projections and analysis, financing, and other factors relevant to sawmill start-up and operation. Part II presents three sawmill case studies.

Frame Saw Manual, FAO Forestry Paper 39, MF 08-317, book, 105 pages, FAO, 1982, available from FAO.

"This manual deals with the construction and operating principles of the frame saw. Many different kinds and makes of frame saws are in use. A very common type of Swedish origin, originally made in 1946, has been chosen as the example in this manual. Today's modern frame saw has the same basic function, although capacity, infeed and sawing accuracy is increased." Many frame saws are in use in developing countries.

The frame saw is a small-scale mechanized saw used in sawmills, with multiple straight blades held in a frame, hence the name. The frame dimensions determine the maximum width of the logs that can be cut (varies from 18" to 34") The outer edges of a log are removed using one frame. while another is used to cut the remaining core of the log into planks. Adjustments, safety, and maintenance are all covered.

Suggestions are provided for handling irregularly shaped logs. Well-illustrated.

Timber Drying Manual, MF 08-311, book, Big pages, by G.H. Pratt, second edition 1986, £20.00 from BRE Bookshop, Building Research Establishment, Garston, Watford WD2 7JR, England.

This book is a "... complete guide to all methods of drying timber. With a total of more than sixty illustrations, this book represents the culmination of nearly fifty years of research on timber drying at the Princes Risborough Laboratory."

It covers such topics as timber moisture, kiln operation, drying damage, air drying timber, kiln types, drying various types and loads of timber, and other drying methods (including vacuum, steam, vapor, and press methods, plus solvent and

salt seasoning) for both small and large-scale drying operations.

"Experience has shown that satisfactory kiln drying can usually be best accomplished by gradually raising the temperature and lowering the humidity of the circulating air as drying proceeds It has already been indicated that the rates at which different timber species can safely be dried, and the air conditions to which they can be subjected without suffering damage, vary very considerably, and the treatment should, therefore, depend to a large extent on the species that is being dried." The appendices cover most of the woods of the world and describe in detail the proper drying procedures for each type of wood. Other technical sections give specific details on testing humidity of wood and air, and redrying timber treated with chemical preservatives. There is an excellent section on troubleshooting timber drying problems, complete with tables of symptoms and cures.

The basic principles of kiln drying described here apply to small and large-scale operations, solar and traditional heating systems, and community or commercial undertakings.

Highly recommended.

Constructing and Operating a Small Solar Heated Lumber Dryer, Forest Products Utilization Report No. 7, MF 08-288, report, 12 pages, by Paul Bois, 1977, single copies free (limited supply) from USDA, Forest Service, Forest Products Laboratory, One Gifford Pinchot Drive, Madison, Wisconsin 53705, USA.

This report briefly describes the construction and operation of a small solar lumber dryer, designed for cold and temperate latitudes (modifications may be required for tropical operation). The advantage of this solar dryer is that hardwood lumber can be dried in it to a significantly lower moisture content than by air drying alone. Very dry wood is important for uses such as furniture.

Three photos and three small sketches of construction details are provided. The dryer uses an air collector and a fan to circulate the air.

Not intended for large, high-speed drying operations. The dryer has a capacity of 750-850 board feet of 8-foot lengths of hardwoods, requiring about 80 days to dry.

An Overview of Possible Uses of Sawdust, MF 08-315, book, 197 pages, by G.J. Arends and S.S. Donkersloot-Shouq, 1985, TOOL/CICAT/CICA, Dfl. 10.50 from TOOL

This unusual book does for sawdust what **Rice Husk Conversion to Energy** did for rice husks: compile and illustrate the many possible technologies that allow this material to be productively used. Both materials tend to be produced in large, unwanted piles at (rice and saw) mills. Both are bulky and expensive to move, and thus the best uses tend to be nearby or on site.

Sawmill operators may find this book valuable as a source of ideas for how to convert their waste problem into a resource for both their own operation and the surrounding community.

"As early as the beginning of the 19th century, people tried to make briquets from sawdust. First binders such as tar, resins, clay, etc. were used. However, none of these processes have attained any particular importance, because of the cost involved. In those days, briquets pressed without a binder were usually not successful, because temperature and pressure were too low. In the 1950s, several economical methods were developed to make briquets without a binder." These involved high temperatures and pressures. Examples of this and other equipment are provided.

ADDITIONAL REFERENCES ON FORESTRY

Fuel-efficient cooking stoves and improved charcoal kilns can both reduce the pressure on remaining trees; see **ENERGY: STOVES**.

The Draft Horse Primer contains 22 pages on the techniques and equipment used in logging with horses; see **AGRICULTURAL TOOLS**.