

## VII AGROFORESTRY

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## Agroforestry

Review, agroforestry, soil productivity, sustainability, soil constraints, nutrient cycling, organic matter, evaluation, SANCHEZ, P.A.

Soil productivity and sustainability in agroforestry systems. In: Agroforestry: a decade of development, eds. H.A. Stepper and P.K.R. Nair, ICRAF, Nairobi, 1987, pp. 205-223

Agroforestry systems are generally perceived to be sustainable and to enhance soil properties. Growing trees in conjunction with annual crops or pastures is believed to provide a more thorough plant cover to protect the soil from erosion and a deeper or more prolific root system to enhance nutrient cycling.

Evidence exists for the beneficial effects on soil of certain agroforestry technologies. There is a tendency toward over-generalization and extrapolation of soil productivity and sustainability benefits of agroforestry systems to other more marginal sites. The time has come to systematically test the effects of agroforestry systems on different soils.

A soil-dynamics methodology is proposed as a framework for such testing. The above- and below-ground interactions between trees and crops or pastures are likely to provide different results from those obtained in forests, cropped fields or pastures. Recognition of what the major soil constraints are in specific areas would improve the design of agroforestry systems. Scientifically based soil-agroforestry research will provide a realistic site-specific appraisal of whether agroforestry systems improve soil physical properties, maintain soil organic matter, or promote nutrient cycling.

The objective of this paper is to critically evaluate the various hypotheses that have been advanced on the soil productivity and sustainability aspects of agroforestry and to suggest future directions.

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## Agroforestry

Book, review, forest farming, ecological cultivation, planting, cropping, nuts, leguminous trees, fruits, oil, fodder, uplands, deserts

DOUGLAS, J.S. and DE HART, R.A.

Forest farming: towards a solution to problems of world hunger and conservation.

Intermediate Technology Publications, London, 1985, 207 pp.

This book discusses the role of forests and tree crops in farming and offers 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 forest farming schemes. The aim of the work is to encourage the adoption of multiple-usage methods and to foster the integration of forestry with farming to form one pattern of agrisilviculture, wherever this may be appropriate.

Farmers and foresters often find it difficult to obtain adequate information and advice on economic trees and shrubs for agrisilviculture in a convenient and consolidated form. This book is intended to meet the need for a handy reference and working manual. It has been written simply, but it contains enough technical material to serve the purposes of agriculturists and foresters in all countries and conditions, and seeks to provide useful guidance and practical instructions for extension workers, planners, government departments, institutions concerned with development and research, and indeed all those interested in tree-growing, whether they be laymen or professionals.

It is hoped that this work may be especially valuable to the developing nations in whose territories exist vast stretches of virtually uncultivated and desert or waste lands, as well as to the more advanced countries where great areas of presently marginal value still lie neglected or require reclamation for economic use. If, by means of forest farming, world production of foodstuffs and raw materials can be increased substantially and, where appropriate, tree crops linked with industrial development, something of real significance will have been achieved, both for the better sustenance of mankind and for the preservation and enhancement of our environment.

Authors' summary

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## Agroforestry

Africa, Kenya, agroforestry, shamba system, food production, forest areas, taungya system, intercropping

ODUOL, P.A.

The shamba system: an indigenous system of food production from forest areas in Kenya.

Agroforestry Systems, 4, 1986, pp. 365-373

The taungya system is a method of planting forest trees in combination with food crops. Its origin can be traced back to the 1850s in Burma, where it was used as a means of replanting teak plantations on badly degraded land. It is essentially a modification of the traditional shifting cultivation, but various forms of the practice can be found in different parts of the tropics. A highly developed form of this agroforestry system, known as the 'shamba system' is being practised on government (state) forest land in Kenya. The main difference between this system and many other forms of taungya being the considerable integration of cultivators into the Forest Department in the former.

When properly practised, the system allows sustained optimum production of food crops along with forestry species from the same land and thus meets most of the social and economic needs of the

shamba farmer. This paper briefly describes the system's productivity and functioning and analyses its ecological as well as socioeconomic characteristics. In future, the shamba system will continue to play a major role in forest plantation establishment in Kenya vis-a-vis tackling the food and fuelwood shortages. With high rates of population growth, unemployment and food shortages, the system will continue to play a leading role in the economy. The continuing threat on the natural forest is noticed in most areas but compensatory forest planting (clearing indigenous species to plant exotic species) should relieve the pressure in some areas. Crop yields in the system are bound to drop, as most of the cultivation is now in second-rotation plantation areas. In view of the importance of the system and large number of people supported by it, it is essential to undertake research to evolve appropriate technologies to improve the productivity and sustainability of the system. One of the immediate areas for research could be the management of various crops including fertilizer application to them, which could improve the productivity of not only the crops but also the trees and thus enhance the overall performance of the system. The provision of credit facilities to the farmers for the purchase of fertilizers and other inputs also needs to be properly organized.

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#### Agroforestry

America, Mexico, California, review, agroforestry, agroecosystems, sustainability, agroecological approach, production systems, research results, soil fertility, plant-insect interaction  
ALTIERI, M.A. et al.

Plant-insect interactions and soil fertility realisations in agroforestry systems: implications for the design of sustainable agroecosystems.

In: Agroforestry: Realities, Possibilities and Potentials, ed. H.L. Gholz, Martinus Nijhoff Publishers in cooperation with ICRAF, Kenya, 1987, pp. 89-107, ISBN 90-247-3591-2, paperback

In the last two decades, many scientists have started to apply ecological principles to study, design and manage agricultural systems. The goal is to design production systems tailored to the subsistence and income needs of local people and the resource base of regional agroecosystems. Understanding the complexities and dynamics of traditional farming systems through agroecological studies can provide important guidelines to direct this development strategy. Rural peoples' knowledge may be blended with modern science to improve progressively on the productivity of the proposed systems. Research results from studies in traditional agroforestry systems in Tlaxcala, Mexico and diversified apple orchards in northern California are used to illustrate the above points.

The central issue in sustainable agriculture is not achieving maximum yields; it is long-term stabilization. Vegetational diversity is a good strategy to cope with seasonality and variability. In

the traditional system, a wide ecological tolerance is attained in cropping systems by farmers who rely on a large number of agroforestry management strategies. In the abandoned orchards, natural ecological succession restores environmental balance and productivity. The challenge is to determine whether low-input agricultural systems are, across the board, good models which include properties of constancy of production, self-regulating mechanisms and sustained soil fertility. Concurrently, in developing countries, the elements of traditional agriculture that should be retained in the course of agricultural modernization must be identified.

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#### Agroforestry

Review, agroforestry, humid tropics, ecosystems, land-use, sustainability

VERGARA, N.T.

Agroforestry: a sustainable land use for fragile ecosystems in the humid tropics.

In: Agroforestry: Realities, Possibilities and Potentials, ed. H.L. Gholz, 1987, pp. 7-19, Martinus Nijhoff Publishers in cooperation with ICRAF, Nairobi, Kenya, ISBN 90-247-3591-1, paperback

As an ecological zone, the humid tropics have an immense potential for high biological productivity. Precipitation, ranging from 1,800 to 4,600 mm/year, exceeds evapotranspiration. A substantial amount of solar radiation is received to boost photosynthesis, since diurnal hours are almost uniformly long and insolation occurs most days of the year. There are no extreme seasonal temperature variations to cause periodic plant dormancy and considerable nutrient inputs are provided through rainfall and litterfall. The vast species diversity and the luxuriant growth of tropical rainforests are indicative of this productivity potential.

Humid tropical ecosystems are known to be fragile, i.e., prone to environmental degradation and loss of productive capacity when disturbed by human activities. Where temperature and moisture conditions are generally favorable, nutrients become the most important limiting factor in agro-based production schemes in the humid tropics. The ability of land managers to maintain soil nutrients at reasonably high levels at little or no cost is the key to success in sustaining productivity.

The most viable alternative for maintaining productivity is the application of low-cost agroforestry land-use systems which promote soil conservation and minimize nutrient losses.

Traditional swidden agroforestry, which draws its sustainability from the rehabilitative effects of forest fallow, can remain sustainable only where population pressure is sufficiently light to allow long "rest" or fallow periods, or where efficient fallow species can rejuvenate the site over shorter periods. Where population densities preclude fallowing, however, the better system appears to be integral agroforestry, which involves simultaneous and continuous cropping with annuals and perennials. Integrating

agroforestry through spatial manipulation of the crop components and selection of perennial species which maximize productivity and site protection promotes sustainability. Traditional and modern agroforestry systems are discussed.

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#### Agroforestry

Review, proceedings, workshop, agroforestry, education, problems, priorities, activities

ZULBERTI, E.

Professional education in agroforestry .

Proc. of International Workshop, ICRAF, P.O.B. 30677, Nairobi, Kenya, 1987, 324 pp.

The International Council for Research in Agroforestry (ICRAF), together with the German Foundation for International Development (DSE), undertook the organization of an International Workshop on Professional Education in Agroforestry, in Nairobi, to assess possible courses of action and priorities in agroforestry professional education. Seventy-three participants and contributors from national as well as international organizations attended the meeting and represented the main geographical regions of the world. The professional expertise represented appropriate academic levels in teaching, curriculum development, planning and implementation of educational programs and also included agroforestry, agriculture, forestry, ecology/biology, land planning, land-resource management and education specialists.

The workshop objectives were to debate and establish priorities, plans and procedures for future action in agroforestry professional education, in order to:

- assess manpower needs and review requirements for professional agroforestry education;
- review appropriate forms of teaching and particular institutional requirements for adopting agroforestry; and
- examine the details of how best to achieve the education required by reviewing teaching material as well as existing outlines of the contents of programmes/courses on a regional basis.

Participants' contributions were received in the form of regional submissions, position papers, reviews of source material to teach agroforestry, and working groups' recommendations.

Regional Coordinators were appointed for seven geographical areas of the world: Africa, America, Europe, the Middle East, Southeast Asia, the South Pacific and the Indian subcontinent. Each was to conduct a survey on the state of the art in agroforestry education. Results of the worldwide study were presented to the workshop audience during the first plenary session. Summaries of the regional submissions are contained in Section I.

Position papers were submitted by invited contributors on subjects related to the main objectives of the workshop. The papers aimed to focus discussions and stimulate ideas. Hence, no formal presentation of position papers took place. Abstracts of all contributions are presented in Section 2 together with the full, edited

text of selected papers. The reviews of source materials were prepared with a strong contribution from ICRAF staff and describe the scope and merit of existing information for teaching agroforestry. Edited versions of the reviews are presented in Section 3.

Six working groups were convened to discuss topics related to the main objectives of the meeting. Chairmen were nominated in advance for each group and invited to arrive in Nairobi a day ahead in order to draw a plan of action and discuss the general scope and expected outcomes of the groups. A summary of the work accomplished is presented in Section 4.

A two-day display of available publications in agroforestry and related fields was prepared by the organizers. Forty-six commercial publishers and institutions were invited to display brochures, booklets, books, handouts, posters etc. of potential use for teaching agroforestry. Exhibitions of different materials were arranged. The list of publishers who were invited to submit display material appears in Annex 2.

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#### Agroforestry

Review, report, semiarid tropics, ICRISAT, agroforestry research

VAN DEN BELDT, R.J.

Agroforestry research in the semi-arid tropics.

Report on the Working Groups Meeting at ICRISAT Center, Patancheru, Andhra Pradesh 502 324, India, 1986, 59 pp, ISBN 92-9066-116-X

A workshop was held at ICRISAT Center on 5-6 August 1985, with discussion designed to assist in exploring the potential of agroforestry in the semiarid tropics (SAT). The workshop brought together participants from Indian industries, research institutes, universities, and non-governmental organizations (NGOs), as well as representatives from foreign aid missions, ICRISAT and the International Council for Research on Agroforestry (ICRAF) to share ideas, methodologies and results of agroforestry research. The objectives of the workshop were:

- to review agroforestry research under way in India;
- to foster dialogue between the various sectors, in order to facilitate development in the SAT;
- to prepare broad guidelines on priorities for agroforestry research in the SAT.

Although the workshop was traditionally structured, with topical sessions, discussions, working groups and plenary sessions, this volume does not closely follow that structure. It is not a proceedings but rather a report on the workshop.

No formal papers as such were presented; rather, summaries of research methodologies and objectives of the various institutions were outlined. In this report more emphasis has been placed on the content of the papers rather than on authorship. This is particularly so in the section on the ICRISAT program, synthesized from contributions of six authors.

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## Agroforestry

Review, agroforestry, woody perennials, animals, fodder, productivity, palatability, pastures, negative effects, potentials  
TORRES, F.

El papel de las leñosas perennes en los sistemas agrosilvo-pastorales (Role of woody perennials in animal agroforestry).  
Turrialba, Costa Rica, CATIE, 1985, 46 pp., 186 refs.

Two main roles are identified in the review: the productive one, where woody perennial yield material output (fuel, fodder etc.), and the "service" type, with no tangible product (shelter, nutrient recycling etc). In their productive role, trees and shrubs may supply fodder in browsing systems, or industrial material, wood products and food in forest and plantation grazing systems. Service roles, rarely divorced from productive ones, arise mainly from relationships between woody perennials and the herbaceous vegetation growing in their vicinity. As a fodder source, the relatively low productivity and palatability of high protein content foliage from most woody perennials would indicate a supplementary role, particularly during dry seasons in arid and semiarid zones. In these type of lands, pod-bearing trees seem to have a greater potential from improving fodder production in silvopastoral systems. The negative effect of trees on pasture production in forest and plantation grazing is compensated by their contribution to the systems through other products. Available data would support the potential of certain species of woody perennials to foster pasture growing underneath, mainly through soil enrichment. Windbreaks can also indirectly benefit pasture growth, by decreasing water loss from the soil. It is postulated that research efforts in animal agroforestry should be focused on woody perennials for browsing, particularly on pod-bearing trees having beneficial effects on the herbaceous layer growing underneath.

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## Agroforestry

Review, book, humid tropics, rainforest lands, ecosystems, deforestation, soil degradation, effects, management practices, recommendations

VAN GOOR, C.P. and SCHMIDT, P.

Wise utilization of tropical rainforest lands.

Tropenbos Science Series 1; The Tropenbos Programme, Ede, 1987, 154 pp., US\$ 15.00, ISBN 90-5113-002-3; orders: Tropenbos, Galvanistr. 9, 6716 AE Ede, Netherlands

Tropical rainforests are the world's richest ecosystems and are a source of sustenance for millions of people. Destruction and devastation of these forests is growing to alarming proportions due to intense pressure by populations seeking food, energy, wood, shelter and economic reward. This large-scale deforestation is not

only of local or national, but even of worldwide detriment, and is gradually being recognized as one of the world's main problems. The direct and indirect effects of this process have far-reaching socioeconomic, environmental and ecological consequences, such as: serious reduction of the availability of wood and a wide variety of other forest products; elimination of unique habitats and of plant and animal species; 'desertification' of deforested land; disruption of the water regime of watershed areas, resulting in, among other things, erosion, flooding and siltation; possible changes in local and regional climate; possible changes of climate on a global scale.

In the present book, a basic approach is outlined and recommended for management of tropical rainforest land, which is essentially simple, but poorly observed or even neglected in most current tropical rainforest projects. Most of the minor constraints and perhaps even some of the major constraints could be solved if this approach were followed.

Fortunately, there is a fast-growing awareness in both tropical and nontropical countries that adequate action is now very urgent. Several valuable initiatives have been taken the last few years, among others, the Tropical Forestry Action Plan. The present contribution is an attempt to link up with these initiatives. The MAB-UNESCO Committee of the Netherlands considered it worthwhile to bring together a wide variety of professional knowledge concerning tropical countries and tropical rainforests in order to elaborate the above general approach for tropical rainforest land-use planning.

This was effectuated during a meeting held in Amsterdam in December 1984, assembling experts on forestry, ecology, economics, sociology, commerce and industry, government and politics. The result of this multidisciplinary seminar is found in the present book. It is composed of: 1) general contributions on aspects of demand, supply, land-use planning and constraints, and 2) case studies of tropical rainforest development and management projects in South America, Africa and Asia, and illustrating the issues discussed in the thematic chapters.  
Abstract from ISSS Bulletin

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## Agroforestry

Review, book, agroforestry, soil productivity, land-use systems, organic matter, physical characteristics, integrated approach  
NAIR, P.K.R.

Soil productivity aspects of agroforestry.

Science and Practice of Agroforestry, No. 1, 1984, 85 pp., ICRAF, P.O.B. 30677, Nairobi, Kenya, US\$ 10.00

In the context of the increasing awareness about the potential value of agroforestry as an approach to sustainable land use, especially in low-input situations and marginal lands, it is necessary to develop the scientific premises about agroforestry by a synthesis of existing knowledge. An evaluation of the relevant

land-use systems and an understanding of the role of trees in enriching and/or conserving the ecosystem are the two aspects to be considered in this context.

The author shows that land-use systems which incorporate woody perennials or trees should generally achieve a higher level of soil protection than systems without trees or shrubs. Analyzing widely practised land-use systems and the potential beneficial effects of shrubs or trees on soil productivity, he argues for an increased use of trees in those systems where trees are presently removed or not used (Chapter 1, Introduction).

Chapter 2 (Land use systems related to agroforestry) analyzes shifting cultivation, taungya, plantation agriculture with woody perennials, plantation forestry and multiple cropping. Each of these systems is presented with its techniques and components and a detailed discussion of soil management features, the role of trees in the systems and the respective relevance for agroforestry.

In Chapter 3 (The role of trees in soil productivity and conservation) an appraisal is made of the observed and potential contributions of trees, concerning addition of organic matter from roots and litter to the soil, nitrogen fixation and nutrient cycling. A simple model presented on input/output channels and the related biological processes in a forest ecosystem could also be applied to agroforestry with the modification that nutrient exports through harvests would have to be closely monitored.

Chapter 4 (Research results from some field examples of agroforestry) presents results from investigations carried out at IITA at Ibadan, Nigeria, with alley cropping using *Leucaena* and maize, and from Rwanda with *Grevillea robusta*, maize and other field crops. For semiarid regions encouraging results are reported from Senegal for the combination of *Acacia alida* with groundnut, *Acacia senegal* with various crops, bush fallow with livestock management and various indigenous multiple-use trees with millet cultivation in the Sahel. A very useful synopsis listing ecological requirements, growth and management aspects of various species in different climatic regions has been compiled at the end of this chapter.

In Chapter 5 (Soil productivity and soil management in agroforestry: some postulations and research approaches) and Chapter 6 (Summary and conclusions) some hypotheses concerning expected soil changes are formulated and conclusions drawn from the facts and results presented previously. They deal primarily with the expected positive effects of trees and woody perennials as stabilizing ecological components in presently practised land-use systems conforming to the idea and definition of agroforestry land use. The need for applying systems analysis for a better understanding of the complex relationships in agroforestry land use and the interrelationship between components is outlined.

#### Agroforestry

Review, book, agroforestry, Sahel, tree, shrubs, site requirements, management, propagation, multiple use, characteristics  
MAYDELL, H.-J. von

Trees and shrubs of the Sahel: their characteristics and uses. Schriftenreihe der GTZ, No. 196, 1986, 504 pp., French edition: Arbres et arbustes du Sahel, ISBN 3-88085-5; distributor: TZ-Verlagsgesellschaft mbH, Postfach 36, D-6101 Roßdorf 1, FRG

Geographically, the Sahel Zone as defined in ecological terms stretches over more than 6 000 km in an east-west direction. Within this vast area, environmental factors such as local climate, soils, topography, water availability and vegetation vary considerably. Water is the dominant constraint on subsistence and development. Rains generally fall between the end of June and early October. Land use has to be carefully adapted to these unpredictable but decisive climatic fluctuations and their effects on flora, fauna and man.

The extremely harsh macroclimatic conditions, in particular the dry season of 8-10 months, preclude the formation of closed forests. Trees and shrubs are encountered as essential elements of the landscape almost everywhere.

Trees and shrubs provide firewood and timber, food, forage, medicines and numerous other products. They have protective and beneficial effects on crop- and rangelands, and are used to halt environmental degradation and ultimately desertification. Trees and shrubs are amongst the few renewable resources of the region which contribute to employment and income and, last but not least, they are a basic element of African life and culture. Not only foresters but also national and international development and research agencies are urged to undertake all possible efforts to protect, improve, extend and re-establish the woody vegetation in order to secure the supply of its products and the benefits vital to people in the Sahel.

The main objectives of this book are to focus attention on the wealth, variety and multiple-use potential of the indigenous trees and shrubs of the Sahel, and to underline their significance for the survival and well-being of the people living in the Sahel countries.

After an introduction, this book deals with the following aspects:

- general remarks on the botanical descriptions
  - distribution and site requirements
  - propagation, establishment and silvicultural management
  - multiple use of trees and shrubs
  - trees and shrubs: their characteristics, silviculture and uses.
- In the appendices, the following characteristics are given:
- alphabetical list of botanical names and synonyms
  - families and genera in alphabetical order
  - vernacular names
  - list of botanical terms
  - site requirements
  - seed weights

- seeds and fruits
- references.

All persons concerned with maintaining the natural ecosystem in general and combatting desertification in the Sahel in particular should make use of the wealth of information given in this book.

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#### Agroforestry

Review, bibliography, trees, tenure  
FORTMANN, L. and RIDDELL, J.

Trees and tenure: an introduction.

Land Tenure Center, University of Wisconsin, and ICRAF, Nairobi, Kenya, 1985, 135 pp., softbound, US\$ 8.00; available from: Land Tenure Center, University of Wisconsin, Madison, Wisconsin, USA

In the face of growing landlessness among rural populations over much of the developing world, the use of trees to stabilize steep hillsides, to control erosion and to meet fuelwood needs means that land tenure decisions must be made on who gets access to the improved resources and on what terms. Among the most important institutional arrangements are land tenure arrangements. This book attempts very briefly to state some important dimensions of the relationship between tenure and trees and the implications of this relationship for sound project planning.

In this annotated bibliography, 43 publications on trees and tenure in general have been summarized, each requiring from a few sentences up to a page. However, the bulk of work are the country-specific publications:

- Africa 186
- Asia 131
- Latin America 42
- Oceania 12.

In addition, 24 annotated major works on land tenure and agrarian reform in the Third World are listed. The indices (land-use practices and impacts, tenure types, socioeconomics, countries, tree species) assist the reader looking for information in his field of work. An index of the authors of the publications is missing. This bibliography gives all interested in agroforestry a quick insight into the relevant aspects of trees and tenure.

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#### Agroforestry

Review, tropics, agroforestry, plantation crops, crops, livestock, integrated systems, smallholders  
NAIR, P.K.R.

Agroforestry with coconuts and other tropical plantation crops.  
ICRAF Reprint, No. 8, 1984, 22 pp.

Tropical plantation crops which include oil palm, rubber, coconut, cacao, coffee, tea, cashew and others, are usually cultivated

intensively, with a high labor inputs, and often on large holdings on a monoculture basis. Their economic produce, harvested regularly, forms after processing high value commodities in international trade. Permanent crops occupy over 8% of the total arable area in the developing countries. Most of such permanent crops belong to the category of tropical plantation crops; pineapple, sisal and sugarcane are of relatively shorter duration and can best be referred to as perennial field crops. They are not considered here. The high export value of tropical plantation crops, and the high input of manual labor required, make them very important, both economically and socially, in the major producing countries or regions. Research has helped to increase substantially the yields of many crops in the recent past.

Modern plantations maintain their traditional monocultural production strategy but smallholder farmers tend to adopt less well studied integrated and intensive land-use practices, often combining perennial cash crops with the production of food crops and livestock in what are, essentially, subsistence production units. Some of these systems are noted.

The coconut palm is one of the most widely grown tree crops in the tropics, mostly on smallholdings in densely populated areas. The growth habit of the palm is remarkably suited both to small-scale production and for combination with other crops. Integrated mixed farming in smallholdings and grazing of cattle under extensive stands of palms are also common. Where the intercrop and the coconut crop are properly manured and well managed, a substantial number of additional crops can be produced without impairing long-term productivity. Commensal interactions in some of such plant associations have been noted. Such intensified systems are well suited to smallholder situations.

The examples given of intensive coconut-based systems are relevant to other smallholder plantation crops using some form of plant association or mixed farming technique that will result in higher income and land equivalent ratios per farm.

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#### Agroforestry

Review, book, agroforestry, community forestry, farm forestry  
FOLEY, G. and BARNARD, G.

Farm and community forestry.

Energy Information Programme, Technical Report No. 3, Earthscan, International Institute for Environment and Development, London, 1984, 236 pp., £ 10.00

Farm and community forestry, closely related to agroforestry and often overlapping, have gained importance during the past decade. Forest resources in the integral development of society are no more the sole mandate of government forest services or industrial timber producers. The role of individual landowners and communities is emphasized and international, national and non-governmental agencies and organizations are contributing to

promote these forms of 'self-sustained forestry' by technical aid and financial incentives.

The book has five parts. Part I (General appraisal) provides background information on why farm and community forestry is needed, their emergence, growth of international support, the vital role of trees, traditions and constraints of tree growing etc. and defines both farm forestry and community forestry in their context. Part II (The context) goes into more detail with one chapter on traditions of tree cultivation (including agroforestry systems), the causes of tree depletion, and constraints of tree growing. Part III (Programme approaches) has chapters on farm forestry, tree growing for family uses, community forestry and land allocation schemes (e.g. taungya systems). Part IV (Aspects of programme design and implementation) goes into practical guidelines for extension work with chapters on programme promotion and implementation, technical packages, assessing the demands for wood, and programme design and planning. Finally, Part V (Country experiences) gives examples from China, Korea, India, Malawi, the Sahel, Tanzania, the Philippines and Nepal.

This book is easy to read, straight to the point, critical and constructive. It is an outstanding introduction to subjects which, both in practice and theory, need ever more in-depth analysis and evaluation. The book should be carefully read by politicians and all decision makers in rural development, by students, teachers and, last but not least, by those who are experts in agroforestry, community and farm forestry.

Abstract by H.J. von Maydell

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## Agroforestry

Review, proceedings, workshop, agroforestry, land, trees, tenure  
RAINTREE, J.B.  
Land, trees and tenure.  
Land Tenure Center, University of Wisconsin, 1300 University Ave.,  
Madison, Wisconsin, USA and ICRAF, P.O.B. 30677, Nairobi, Kenya,  
1987, 412 pp., ISBN 0-934519-01-3

This book is the result of an international consultative workshop held in Nairobi in May 1985. The purpose of the workshop was to bring together an internationally recognized group of experts on tenure and agroforestry in order to assess the current state of knowledge on tenure issues in agroforestry and to identify priorities for research. The general background papers (Part 1 of these proceedings) were commissioned and sent to participants prior to the workshop. Other participants were asked to prepare brief position papers (Part 2) reflecting their experience with tenure issues in agroforestry and to come to the workshop ready to focus quickly on the key issues (Part 3). Subsequent to the workshop, the authors of two of the background papers consented to prepare a summary postscript on the main research priorities identified by the workshop (Part 4).

In planning and organizing the workshop, every effort was made to achieve balanced regional, institutional and disciplinary representation. Although the regional balance was not as even as originally hoped, all of the regions had a reasonably adequate representation in the working groups. Among the disciplines present were agriculture, forestry, anthropology, sociology, geography, ecology, economics, political science, and law, representing a broad cross-section of research and development workers concerned with tenure issues in agroforestry. The papers are a mixture of analyses, solutions and, indeed, symptoms of the problems brought to light by the workshop.

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## Agroforestry

Review, book, Mediterranean zone, forestry, animals, fallow periods, breeding  
AFPF/CNRA

L'animal, les friches et la forêt (The animal, the fallow lands and the forest).

Fourrages, Numéros Hors-série, 1987, 1st issue 160 pp. 2nd issue 296 pp., AFPF, CNRA, Route de Saint-Cyr, 78000 Versailles, France

Twenty years ago, it was thought that the Mediterranean forest fires could be controlled by civil engineering such as firebreaks. As these methods were inefficient and costly, the problem had to be solved at the base. Whether Mediterranean forest, fallow lands or moors, the symptoms are often of a similar nature: loss of social structure, and weak and inadequate environmental management. Each of the special issues contains a series of scientific communications. The first one deals with pastoral amelioration (fire, clearing of brushwood, fertilization, pastoral management etc.) in experiments as well in large-scale implementation. The second issue analyzes thoroughly the problems of the forest, particularly under the historical aspect of utilization of woody species. It concludes that abandoned practices will have to be revalorized in the future, taking into consideration the recently acquired knowledge of research and new technology. Livestock, long considered to be destructive to forests, can - to the contrary - play a central role in its valorization: some simple techniques have to reconcile the urgent requirements of fire control with sufficient income possibilities for the livestock keeper. These involve control of seasonal animal birth, the complementarity of filling gaps by shifting etc. All aspects of the problem are considered: study of the vegetal production in the ecosystem forest-grassland, nutritive value and utilization by animals, technical problems and conflicts caused by livestock-keeping in forests etc. The reader will appreciate the position of scientific communications and reports on experimental results in different regions of the French Mediterranean zone. The merit of these publications is to give a general survey of this very current problem, even if the proposed solutions are only at a starting point.

Abstract from Agriculture actualité (GEYSER)

## Agroforestry

Review, book, tropics, agroforestry, pragmatic guide, systems design, management, evaluation, strategies

MONTAGNI, F. et al.

Sistemas agroforestales: principios y aplicaciones en los tropicos (Agroforestry systems: principles and applications in the tropics).

Organización de Estudios Tropicales (OTS), Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), San José, Costa Rica, 1986, 818 pp., US\$ 20.00

Within the last decade, agroforestry systems have been advanced primarily by researchers in developing nations in response to Third World needs. The serious long-term problems of soil erosion and loss of biodiversity are, however, as insidious in temperate climates as in tropical ones, and the principles advanced in the book under review are eminently applicable to temperate regions. Until now there has been no generally available textbook on the subject. This book is the first basic text and a solid cornerstone of information. It is about long-term solutions, and it will endure. The first six chapters are a pragmatic guide to design and implementation of agroforestry systems. They include an overview, planning, site characterization, systems design, management, evaluation, and strategies for diffusing agroforestry concepts. The seventh and last chapter is a research-oriented "Perspectivas de los sistemas agroforestales". But these seven chapters make up less than a third of the book. The appendixes are an overwhelming collection of invaluable information. Five detailed case studies are followed by sections of exercises, an instructor's guide, and 15 articles by the world's leading experts on the subject. The last three appendixes form an extensive annotated bibliography, 123 sources of information worldwide, a country-by-country review of institutions involved in agroforestry work, a world guide to sources of seed and genetic material, and sources of audiovisual and periodical media. The last appendix includes a 27-page index of plant species used in inventoried agroforestry systems in Latin America, and a 48-page catalogue of existing agroforestry systems in Latin America. Needless to say, this appendix is a compilation of an enormous amount of information, and completes the list of what this book is: text, teaching manual and reference work. The authors have taken a gigantic first step, and their book is an unquestionable must for anyone interested in agroforestry. Abstract by M. Jenning (amended)

## Agroforestry

Asia, Philippines, highland, agroforestry, land use, degradation, natural resources, constraints, sustainability, indigenous techniques, homegardens, proposals

SIEBERT, M.B.

Agroforstwirtschaft als standortgerechtes Landnutzungssystem in Gebirgsregionen der Philippinen (Agroforestry as an adapted land-use system in highlands of the Philippines)

Diss., Universität Freiburg, FRG, 1987, 223 pp.

The Philippines face an alarming degradation of natural resources, especially in the uplands. This development is due to several constraints, e.g. population growth, economic situation, land tenure, limited agricultural areas in the lowlands. It is unlikely that these constraints will be abolished within the near future. This situation therefore calls for immediate "on-farm" programs.

In order to recultivate eroded and deforested areas and to favor sustainable and appropriate land-use systems, agroforestry is now promoted by governmental, private and multilateral organizations. The integrated Social Forestry Program, handled by the Government, is one of the most important programs for the agricultural development of the uplands. The program includes also the introduction of agroforestry.

Aside from nationwide governmental programs, privately organized and individual agroforestry systems exist. The SALT (Sloping Agriculture Land Technology) project can be mentioned as one of the best-suited agroforestry schemes for upland areas.

The implementation of agroforestry should emphasize indigenous agricultural techniques which had been developed by ethnic groups. Observations show that these techniques lay stress on the integration of trees within agricultural production.

Homegardens represent another agroforestry system. Homegardens prove to be efficient systems for cultivating small areas by using several agricultural production techniques, e.g. multistorey farming, livestock, and recycling of waste through composting and mulching.

The design of agroforestry projects should be based on agroecological patterns and the socioeconomic environment. New directions in agroforestry should include the introduction of promising tree and field crops with economic value and the combination of agroforestry and aquaculture.

## Agroforestry

Agroforestry, soil fertility, sustainability, plant-soil interaction, organic matter, erosion control

YOUNG, A.

The potential of agroforestry as a practical means of sustaining soil fertility.

ICRAF Working Paper, No. 34, 1985, 27 pp.



The maintenance of fertility through soil biological processes requires management practices which control the quantity, quality and timing of decomposition of plant residues. Agroforestry is one of the major practical management methods which have the potential to bring this about. It is widely applicable, through many different kinds of practices, has substantial effects on the soil, and is relatively free from supply constraints. Trees restore soil fertility through their potential to increase the supply of organic matter and nutrients, to reduce nutrient losses, and to control the quality and timing of inputs. A first approximation to a plant/soil organic matter cycle under agroforestry is presented, showing that if the assumptions on which it is based can be verified, agroforestry has the potential for the design of land-use systems that combine production of annual crops with maintenance of soil fertility. The significance of work on different fractions of organic matter, and on root residues, is discussed: these studies suggest benefits from mixtures of woody and herbaceous litter. Results of work on soil rest period (fallow) requirements are summarized; it has yet to be shown whether spatially-based agroforestry systems can be more efficient, in terms of land requirements, than crop/fallow rotations. Current research in agroforestry suffers from overemphasis on a pragmatic approach at the expense of an understanding of basic processes. Research is needed on the decomposition of woody and herbaceous residues, singly and in combination, and their effects on soil properties. Author's summary

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## Agroforestry

Africa, agroforestry, agroecological zones, crop, livestock, farming systems, management strategies

TOTHILL, J.C.

Application of agroforestry to African crop-livestock farming systems.

ILCA Bulletin, 29, 1987, pp. 20-23

ILCA's interest in agroforestry is limited to its application to mixed farming systems in which animals are important. Two of its basic agroforestry-related activities are acquisition and evaluation of tree germplasm and screening of fodder trees for nutritional factors, including both anti-nutritive and anti-dietary. The third is on-farm application of an alley farming model with *Leucaena leucocephala* and *Gliricidia sepium* in the humid zone, designed to improve animal feed supplies and soil fertility. The value of tree legumes and constraints to their production in the different agroecological zones of Africa are assessed. Considerable research effort is required to solve the problems of germplasm availability and adaptation. Management issues, such as the identification of suitable entry points, are emphasized as the key factors determining the contribution of woody legumes to African farming systems. Depending on ecological conditions and the

farming system, different management strategies can be adopted, including alley or terrace farming, fodder banks or intensive feed gardens, compound planting and plantation farming.