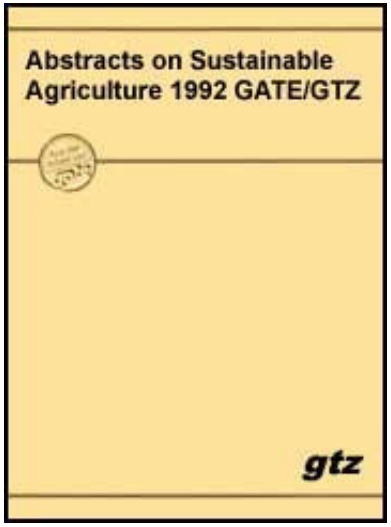
Home"" """"> ar.cn.de.en.es.fr.id.it.ph.po.ru.sw



- Abstracts on Sustainable Agriculture (GTZ, 1992, 423 p.)
  - Abstracts on agroecology
    - Acknowledgements
    - 1. Rural common property resources: a growing crisis.
    - 2. Making haste slowly: strengthening local environmental management in agricultural development.
    - 3. Farming for the future: an introduction to low-external-input and sustainable agriculture.
    - 4. Public policies affecting

natural resources and the environment.

- 5. Human development and sustainability.
- 6. Caring for the earth - a strategy for sustainable living.
- 7. Agriculture and natural resources: a manual for development workers.
- 8. Environmental guidelines for resettlement projects in the humid tropics.
- 9. Saving the tropical forests.
- 10. Values for the environment, a guide to economic appraisal.
- 11. Alcohol fuels - options for

developing countries.

- 12. Diffusion of biomass energy technologies in developing countries.
- 13 When aid is no help: how projects fail, and how they could succeed.
- 14. Natural resources and the human environment for food and agriculture.
- 15. World development report 1992 - development and the environment.
- 16. Species interactions and community ecology in low external-input agriculture.
- 17. Development strategies and

natural resource management for humid tropical lowlands.
18. Environmental management of the northern zone consolidation project in Costa Rica: strategies for sustainable development.
19. Environmental assessment: the valles altos project in Bolivia.
20. Environmental crisis in Asia-Pacific.

Abstracts on Sustainable Agriculture (GTZ, 1992, 423 p.)

Abstracts on agroecology

Acknowledgements

131 92 - 5/107

Agroecology

Review, Asia, India, rural development, common property resources, benefits, traditional management, public interventions, productivity, management systems, investment needs, technology focus, user groups, IIED

JODHA, N.S.

1. Rural common property resources: a growing crisis.

Gatekeeper Series No. 24; Internat. Inst. for Environment and Development (IIED), London, UK, 1991, 16 pp.

Common property resources (CPRs) are in decline throughout the developing world.

CPRs continue to be a significant component of the land resource base of very many rural communities. But they are threatened by neglect, over-exploitation, under-investment and expropriation.

This paper, by focussing on India, documents micro-level evidence on the contribution of CPRs to poor people's livelihoods, their steep declines in area and production over the last 40 years, the collapse of traditional management systems, and the pauperisation of the poor.

The author makes suggestions for immediate action to offset some of these alarming trends.

In detail the following aspects are discussed in this paper:

- Benefits of CPRs
- Quantifying benefits

- Depletion of CPRs
- Physical degradation of CPRs
- CPRs and pauperisation
- Privatization and the poor
- CPRs productivity
- The traditional management systems for CPRs
- Adaptation by the rural rich
- Adaptation by the rural poor
- Future prospects

The future prospects of CPRs are closely linked to an appreciation of their contributions, and changes in the public approach to strengthen them. Some areas requiring immediate attention are as follows:

- Positive CPR policies: Restricting the further decline of CPR areas should be the major component of CPR development. Promotion of user groups be a solution

to this.

- Investment needs: For sustained and effective contribution of CPRs, increases in their productivity is essential. This requires rapid regeneration, through protection and regulated use, and provision of substantial investments into CPRs.

- Technology focus: The rehabilitation of CPRs as productive social assets needs a new technological focus in terms of species, inputs, and technical methods of resource management. Besides productivity we must emphasize the diversity and usefulness of products.

- Management and regulation: The rehabilitation of CPRs is less of an investment-cum-technological problem and more of a resource management problem.

This cannot happen unless the CPRs are reconverted from 'open access resources' to 'common property resources'. In operational terms this would mean the re-establishment of usage regulations and user obligations towards CPRs.

- User groups: The institutional arrangement to fulfil such requirements can take the form of CPR-user groups. There are no unique models to pattern such groupings in dry areas.

The two relevant features which have emerged as by-products of the recent development history of India, and which may obstruct the growth of user groups are: the ever-increasing tendency of the state to expropriate the initiative and activities which belong to people, and the increased internal differentiation of rural communities and its impact on the operation of village-level initiatives. Despite such potential

obstructions, the success of recent initiatives in the management of community resources by user groups and NGOs do inspire considerable hope for the resources and for the poor who rely upon them.

1132 92 - 5/108

Agroecology

Review, book, Peru, Africa, Burkina Faso, Mali, Kenya, Latin America,

Asia, Indonesian Sri Lanka, environmental management, agricultural development, land management, legal aspects, economics, project approaches, case studies

SAVENIJE, H. and A. HUIJSMAN

2. Making haste slowly: strengthening local

environmental management in agricultural development.

Publ. of the Royal Tropical Institute (KIT), Amsterdam, The Netherlands, ISBN 90-6832-040-8, 1991, 232 pp. + appendices

This book deals with environmental management of smallscale agriculture in marginal areas.

Approximately 60% of the developing world's poorest people live in highly vulnerable ecological areas. In many of these areas degradation of natural resources and ecosystems has become a major problem and, in many instances, immediate action appears to be essential.

In many areas of the world natural resources are under strong pressure; quality is rapidly declining due to overexploitation and improper management. The nature and extent of

environmental degradation differs from area to area, but the underlying problem in developing countries is the same.

Environmental implications are usually insufficiently taken into account in decision making.

Based on a two-day workshop held 1990 in Amsterdam, the book contains knowledge from almost 40 Dutch specialists and includes case studies from six African, Asian, and South American countries.

The authors plead to build on existing institutions, going ahead only with the support of the population and with institutionally viable programmes that fit the society.

In part I, the first chapter gives an overview of issues discussed in more detail in succeeding chapters, which consider local environmental management development from

several perspectives.

Part II provides cases based on a number of projects (in Burkina Faso, Indonesia, Kenya, Mali, Peru, and Sri Lanka), which focus on approaches to environmental management in various geographical, ecological and socioeconomic situations. These case studies illustrate the great diversity seen not only in environmental problems, but also in approaches being used to solve these problems.

In this book, emphasis is given to the small scale agricultural sector in marginal areas, where environmental degradation is most evident. The contributors specifically address the organizational and institutional aspects of environmental management.

Incorporating local information in policy, planning and implementation decisions is a precondition for long-term

sustainability.

1133 92 - 5/109

Agroecology

Review, book, sustainable development, low-external-input agriculture, farmer, agroecosystems, ecological principles, technologies, participatory technology development, techniques and practices, ILEIA

REIJNTJES, C. et al.

3. Farming for the future: an introduction to low-external-input and sustainable agriculture.

The MacMillan Press Ltd., London, UK, ISBN 0-333-57011-1, 1992, 162 pp + appendices

In recent years, the negative environmental and social impacts of high-external-input agriculture have become increasingly obvious.

The call for sustainable agriculture is increasing.

'Farming for the future' examines the strategies and techniques of low-external-input and sustainable agriculture (LEISA) in the tropics.

It is based on eight years' work by the Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA) in conjunction with the ETC Foundation in the Netherlands.

The scientific principles behind the various LEISA systems and techniques have been analysed, with the advisory support of staff members from the Agricultural University of Wageningen and independent professionals.

The focus in this book is on farmers who presently operate with low levels of external inputs, either because they are not available or because they are too costly. The intention is to provide background theory, practical ideas and sources of further information for persons and organisations who are working together with such farmers in trying to solve technical problems and open up potential at the farm level. The solutions to farmers' problems is as diverse, complex and site-specific as their farming systems, but the principles involved in finding the solutions will be of wider validity.

The first part of the book provides background information about the need for sustainable agriculture, and draws attention to the central role played by farmers in achieving it.

Part II draws from scientific agroecological findings to give the theoretical background of sustainable agriculture.

Part III draws from field experiences in developing smallholder agriculture to show how the process of technology development by farmers can be linked with the insights of agroecological science in a participatory approach to development which strengthens farmers' innovative capacity and complements other methods of technology development.

The rather extensive appendices are intended to provide some technical information as well as further sources of information, in order to support fieldworkers and farmers in their combined efforts.

Appendix A presents a selection of some technical options for LEISA development.

A glossary of key terms used can be found in Appendix B, and sources of further information are indicated in Appendix C.

The central concern of the book is how development workers can assist small-scale farmers in making the best use of low-cost local resources to solve their agricultural problems. Emphasis is on methods of Participatory Technology Development (PTD) to find site-specific solutions and to raise the overall productivity of farming in a sustainable way.

The authors have taken an interdisciplinary approach, providing a broad framework of background theory as well as practical ideas and sources of up-to-date information. Numerous examples from the field are given to illustrate key principles and techniques of LEISA.

'Farming for the Future' is written for agricultural development staff in extension, research and training. The book should also be of great interest to lecturers and students of agriculture and rural development, as well as to research scientists and to planners and donors of agricultural and related projects.

This book is an excellent source of information for the newcomer to the aspects of sustainable development as well as for the veteran practitioner and planner.

1134 92 - 5/110

Agroecology

Latin America, Caribbean, case studies, natural resources, environment, public policy, NGO's, DESFIL

GAMMAN, J.K.

4. Public policies affecting natural resources and the environment.

A Publ. of the Development Strategies for Fragile Lands (DESFIL), 3,

Washington D.C., USA, 1990, pp. 6-7

In recent years, national governments in developing countries and development assistance agencies have adopted new policies to protect limited or fragile natural resources. In many instances, these policies are failing. This paper explores reasons for these policy failures.

Limited or fragile natural resources should not necessarily be left undeveloped in their natural state. When development does occur, however, natural resources that are affected should be protected from needless damage and degradation. This approach, in turn, may hinder future economic growth.

The case studies describe what happened when attempts were made to protect natural resources associated with large development projects on the Eastern Carribean islands of St. Kitts, St. Lucia, and Barbados. In each case, a benign resource

use supported by environmental policies or legislation competed with a more destructive use of the same resource.

In each case, the more destructive resource use was adopted. The research differentiates between organized interest groups and stakeholders - that is, unorganized groups that stand to gain or lose in common ways because of the way resources are allocated. Those parties who are included or who are left out of development decisions are described, as is the working of interest group politics - how decisions are made and who is represented or is not - on the three islands.

The research supports the thesis that the relationship between interest groups within a country and a policy-making process that excludes key stakeholders causes decisions to be made that override environmental policies. The failure of environmental policies can be explained by examining the way interest groups use their relationships with political leaders to

exert control over the development process.

National political leaders want to maintain their power. They do this by supporting large development projects that are environmentally destructive but highly visible to voters. Civil servants seek to enforce policies that protect fragile natural resources but depend on politicians for their jobs. This dependency prevents them from enforcing environmental policies. Major stakeholding groups, including resource users (farmers, herders, fishermen, and charcoal producers) and local nongovernmental organizations (NGO's) are generally excluded from the decision-making process. This relationship hinders the implementation of environmental policy.

New public policies, often required by donor agencies as conditions of development assistance, fail because they do not take account of political, cultural, and economic conditions at the local level.

A more open system of policy making also has to consider the relationship between local cultural norms and politics and the culture of decision making. Culture and political decision making are inseparable. Politics in many developing countries are intensely personal; they are affected by a history of dependency, insularity, and distrust of outsiders. Innovation in policy making requires that politicians and civil servants take risks, which is difficult to do without upsetting political leaders. The important role of opposition politics is often not understood by outsiders.

In addition to the obstacles created by national politics and the culture of decision making, there are other reasons why public policy initiatives, such as environmental policies, fail. The research concludes that donors need to undertake specific efforts to improve the implementation of environmental policy by increasing their understanding of four key factors: politics within host countries, politics within donor agencies, the

culture of decision making, and the reliance on short-term development strategies.

1135 92 - 5/111

Agroecology

Review, sustainability, developing countries, human development, agricultural sector, training, economy theory, systems approach, holistic thinking

WOODS, B.M.

5. Human development and sustainability.

In: Proc. of the Seventh Agric. Sector Symposium - Sustainability Issues in Agricultural Development - The World Bank, 1818 H Street, N.W.

Washington, D.C. 20433, U.S.A., 1987, pp. 80-91

Sustainable development requires the necessary human skills, attitudes, motivation, understanding, leadership, organizations, policies, plans, and administrative and financial systems for whatever activities are involved - as well as the necessary infrastructure, funds, and physical inputs.

Despite all the resources and dedication that have been applied to development, shortcomings in "institution building" and "human resource development" remain, and a great many well-intended projects and programs have failed to be sustainable as a result.

A better understanding of the reasons for this persistent difficulty in development would be half way to its solution.

This paper addresses this issue and draws together the

separate conclusions of authorities in a variety of relevant fields. They show the reason to be simple, but the solution to affect some of the underlying assumptions and philosophies on which development assistance has been based.

The paper considers findings in the agricultural sector; it touches on economic theory; examines the learning process on which human development depends, and how this has been approached in "development"; and it describes an underlying cause of a pervasive problem.

The paper summarizes that one can view the human development required for sustainability first in the context of what is needed within the agricultural sector, and in the context of what is needed for the total universe of learning on which development depends and then concludes within agricultural sector:

- that the staff profile, skills, language, and perceived role of the sector have led to great emphasis on the technical/physical, and economic/financial dimensions of agricultural development, but excluded equal attention to the human dimension;

- that development has to be effective in the human dimension to achieve sustainability, but prevailing conventional wisdom and the mental programming of most development planners and practitioners which derive from traditional education systems currently prevent wide success in that dimension;

- that the imbalance between the three dimensions through "reprogramming" of those involved in the sector can be corrected;

- that there is a need to focus on the root cause of the

problem which lies in the reductionism of traditional educational systems, and in agricultural education especially.

Beyond the agricultural sector there are other essentials, ingredients of sustainable development on which the sustainability of agricultural development depends. These include particularly the extent to which development approaches deriving from the technical sectors now in place are unable to deal with the whole spectrum of adult learning needed for development. The addition of the organizational structures, expertise and resources needed to achieve this whole spectrum of adult learning offers new opportunities for investment and for success in development.

But it calls for a move toward holistic systems approaches and away from the reductionist thinking styles which have dominated development assistance to date.

1136 92 - 5/112

Agroecology

Review, book, sustainable development, human life, sustainable society, ecological diversity, carrying capacity, integrated systems, nature conservation, energy, agriculture, forestry, water, industry, implementation strategies

IUCN/UNEP/WWF

6. Caring for the earth - a strategy for sustainable living.

Publ. of IUCN/UNEP/WWF, Gland, Switzerland; ISBN 2-8317-007-4; 1991, pp. 185 + annexes

The Earth has its limits; with the best technology imaginable, they are not infinitely expandable. To live within those limits and see that those who now have least can soon get more, two

things will need to be done: population growth must stop everywhere, and the rich must stabilize, and in some cases reduce, their consumption of resources.

The unprecedented increase in human numbers and activity has had major impacts on the environment.

The capacity of the Earth to support human and other life has been significantly diminished. In less than 200 years the planet has lost six million square kilometres of forest; the sediment load from soil erosion has risen three-fold in major river basins and by eight times in smaller, more intensively used ones; water withdrawals have grown from 100 to 3600 cubic kilometres a year.

Atmospheric systems have been disturbed, threatening the climate regime to which we and other forms of life have long been adapted. Since the mid-eighteenth century, human

activities have more than doubled the methane in the atmosphere; increased the concentration of carbon dioxide by 27%; and significantly damaged the stratospheric ozone layer.

The strategy in this book deals with a kind of development that provides real improvements in the quality of human life and at the same time conserves the vitality and diversity of the Earth. The goal is development that meets these needs in a sustainable way. Today it may seem visionary, but it is attainable. To more and more people it also appears the only rational option.

Most current development fails because it meets human needs incompletely and often destroys or degrades its resource base.

This book has three parts and comprises 17 chapters. While linkages are indicated by a system of cross references, it is an imperfect system and it would be useful to read preferably the

whole text.

'Caring for the Earth' sets out a broad and explicit world strategy for the changes needed to build a sustainable society.

Any strategy has to be a guide rather than a prescription.

The principles and actions in the strategy are described in broad terms.

They are meant to be interpreted and adapted by each community. The world needs a variety of sustainable societies, achieved by many different ways.

'Caring for the Earth' is intended to be used by those who shape policy and make decisions that affect the course of development and the condition of the environment.

Sustainable living must be the new pattern for all levels:

individuals, communities, nations and the world. To adopt the new pattern will require a significant change in the attitudes and practices of many people.

1137 92 - 5/113

Agroecology

Review, manual, guidelines, case studies, development workers, natural resources, environmental conditions, agricultural practices, economics, sociology, cultural aspects, market, people, livestock husbandry, crop husbandry, fisheries, forestry, horticulture, education, research, information networks, VSO

AMERENA, P.

7. Agriculture and natural resources: a manual for development workers.

Publ. by Voluntary Service Overseas, 317 Putney Bridge Road, London 5W15 2PN, UK, ISBN 0-9509050-3-8, 1990, 92 pp. + appendices; price: £9.95, hardback looseleaf

The aim of this manual is to provide development workers with practical guidelines and background information to facilitate the evaluation of Agriculture and Natural Resource requests.

Agricultural projects often fail because farmers are unreceptive to changes which will be bad for them; and there have been numerous instances of technologically and culturally inappropriate agricultural development schemes in the past.

For any development scheme to be sustainable, the right questions must be posed at the planning stage and the beneficiaries should be involved in the decision-making.

Based on their considerable practical experience Voluntary Service

Overseas (VSO) has prepared this manual to help their field staff appraise and describe requests for assistance in the agricultural and natural resources sector. It is an useful practical guide which will be of value to any development agency or organization.

The book is based on over 20 years of VSO experience in 25 developing countries and is divided into four sections:

- Appraising requests,
- Practical examples of country programme initiatives,
- Factors affecting the success or failure of development workers and
- Sources of information.

An extensive appendix deals with the recruitment of natural resource personnel in the UK.

'Agriculture and Natural Resources' extensively covers the questions to be asked when assessing different types of natural resources programmes, and offers a framework for deciding which forms of outside skill may be appropriate.

The greatest proportion of the manual is devoted to the key tasks of defining and evaluating requests for assistance and to recruiting the right people. It sets out some key questions which will help the 'non-expert' to identify the nature of the job and the specific qualities and skills needed.

'Agriculture and Natural Resources' is published by VSO as part of the ECOE Programme (Evaluating and Communicating our Overseas Experience).

1138 92 - 5/114

Agroecology

Review, booklet, environmental guidelines, humid tropics, resettlement projects, environmental principles, checklists, environmental assessment, FAO

BURBRIDGE, P.R. et al.

8. Environmental guidelines for resettlement projects in the humid tropics.

FAO Environment and Energy Paper No. 9, FAO, Rome, Italy; ISBN 92-5102754-4; 1988, 67 pp.

The environment has become one of the principal concerns of the late 20th century. Recently there has been an increasing focus on the potentially negative effects of development

activities on the environment. A new science, Environmental Impact Assessment (EIA), has come into being to deal with conflicts between the interests of development and environment.

The Food and Agriculture Organization of the United Nations (FAO) has produced a report 'Environmental guidelines for resettlement projects in the humid tropics' which attempts to help the specialists who formulate resettlement (the relocation of individuals, families, or villages) and other development projects.

Resettlement refers to the relocation of individuals, family groups or entire villages.

These guidelines deal mainly with planned resettlement, however they can be used to review spontaneous resettlement activities.

Over 90% of the forecast increase in world population is expected to occur in the developing nations. Many of these nations are located in the humid tropics where there are major constraints on the intensification of land use and the sustainable development of resources. Resettlement is one of the major options available for coping with the increasing population; however, due to the fragile environment very careful planning will be required to implement successful resettlement schemes.

Where environmental assessments indicate resettlement as feasible, great care must be taken to avoid the creation of adverse environmental impacts through poor project design or management which may reduce the sustainability of projects and could foreclose future development opportunities.

These guidelines are designed to serve two purposes.

Its first part is devoted to an overview of resettlement projects in the humid zones, and the second identifies the environmental principles for the formulation and assessment of these projects.

In practice, both purposes serve to improve the sustainability of resettlement projects, the returns from the capital invested, and the conservation of natural resources.

Emphasis is therefore placed on the identification of key factors which have a major influence on the successful formulation, design, implementation and on-going management of resettlement projects. If these factors are addressed early in the project formulation process, potential adverse impacts can be avoided or reduced to acceptable levels through improved project design.

Checklists are provided in assisting project formulators in

identifying the key factors applicable to resettlement projects and to consider issues, outside their disciplines, which could be affected by their decisions.

The 67-page booklet is the ninth in the FAO Environment and Energy papers and contains a full bibliography of source material.

1139 92 - 5/115

Agroecology

Review, book, tropics, Latin America, Africa, Asia, tropical forests, deforestation, projects, case studies, forest conservation, sustainable agriculture, natural forest management

GRADWOHL, J. and R. GREENBERG

9. Saving the tropical forests.

Earthscan Publication, London, U.K., 1988, 207 pp., USD 12.95

A lot of books and articles have been published in recent years deploring the loss of tropical forests. "Saving the Tropical Forests" is one of the few publications, however, that offers tangible suggestions for mitigating the problem.

The introductory sections of the book provide a brief but accurate sketch of tropical deforestation, its causes, and its potential consequences. But the real value of the publication lies in the presentation of 38 project case studies that provide examples of positive approaches to tropical forest conservation. An underlying theme of the case studies is that, to survive, forests must be used for the benefit of people. Discussion centers on project activities in the lowland, humid

tropics, with a primary focus on Latin America (two-thirds of the case studies are from the tropics of the New World).

Addresses of individuals familiar with each case study and lists of recommended references are provided for readers who want to learn more about specific efforts.

The case studies are arranged in four categories: management of forest reserves, sustainable agriculture, natural forest management, and tropical forest restoration. Each section includes a summary of the elements of each project's success. These summaries indicate that nearly every project emphasizes early and direct economic benefits for local people (even in forest reserves), small-scale initiatives, and active local participation in planning and implementation.

The book presents a wide range of project activities, but several important strategies for saving tropical forests are

neglected. The authors recognize, for example, that misgided government policies are a principal cause of deforestation, yet the book fails to discuss any ongoing effort to bring about reform of forest policy (for example, the Tropical Forestry Action Plan or the efforts of the International Tropical Timber Organization). Another strategy that deserves greater attention is environmental education. Although some case studies highlighted in the book have small components on environmental education, none of the broad-based campaigns of public awareness initiated by nongovernmental organizations in tropical countries is discussed. In addition, almost no attention is given to forest plantations that are intensively managed, even though this strategy may be one of the best for relieving pressure on remaining natural forests.

Readers intimately familiar with specific projects presented in the book will discover some inaccuracies in the descriptions and some embellishment of project accomplishments. The

authors acknowledge that the project descriptions are not intended to be exhaustive studies; rather, they are meant to spark debate and further research. In that respect, the book is likely to be highly successful. It is not a blueprint for halting the destruction of tropical forests, but it does an excellent job of stimulating readers to think about solutions and opportunities.

1140 92 - 5/116

Agroecology

Review, book, guide, practitioners, environmental economics, economic appraisal, sustainable development, project planning, environmental effects, environmental policy

WINPENNY, J.T.

10. Values for the environment, a guide to economic

appraisal.

Publ. by HMSO, P.O.B. 276, London SW8 5DT, UK; ISBN 0-11-580257-6; 1991, 277 pp., UKL 14.95

'Values for the environment' provides advice to economists and other professionals in applying economic values to the environmental effects of development projects, using cost benefit analysis as the decision framework.

The book begins with an assessment of what sustainable development implies in practice. The case for putting economic values on environmental effects, while recognizing the problems this involves, is the subject of Chapter 1. Chapter 2 describes the environmental problems of a number of different habitats and identifies the main functions of the environment for mankind. Chapter 3 introduces the main economic techniques available to value these functions and Chapter 4

reviews how far they have been tried in practice. Chapter 5 is laid out for the benefit of project planners and appraisers. It gathers together, sector by sector, environmental effects to be aware of, and a judgement about which of them can be valued, and how. A broader and more general picture is presented in Chapter 6 which is concerned with the impact of various kinds of policy on how projects perform.

The book is mainly addressed to practitioners in, or concerned with, developing countries, from which most of the illustrative, case-study material is drawn.

Abstract from SPORE

1141 92 - 5/117

Agroecology

Review, book, developing countries, alcohol fuels, biomass

sources, ethanol production, methanol production, environmental impact, economics, sociology

BOSTID

11. Alcohol fuels - options for developing countries.

Publ. by Nat. Academy Press, 2101 Constitution Avenue, NW, Washington, DC 20418; ISBN 0-309-03386-1, 1983, 106 pp.

This report summarizes information on alcohol fuel technologies for planners, investors, and technical assistance agencies in developing countries. Although the information is primarily aimed at the non-technical reader, it does include some details of the technologies; references are included for those who wish more specialized information.

In developing countries, government and industry are considering the use of locally produced alcohol fuels to reduce

the burden of foreign exchange payments for petroleum products; some have already begun constructing facilities to produce alcohol fuels from indigenous materials.

To substitute alcohols for petroleum fuels must create diverse considerations:

- The technical capability exists to substitute the lower alcohols, methanol and ethanol, completely or in substantial part for all types of liquid fuels currently derived from petroleum.

- The technical capability exists in almost all countries to produce ethanol from a broad spectrum of renewable biomass resources, specifically from many varieties of plants and from agricultural, food processing, and urban wastes. The components in these raw materials from which ethanol may be

produced are sugars, starches, cellulose, and hemicelluloses.

- In many situations, alcohol fuels may be the most convenient alternative to gasoline, but on a small scale there may be other energy sources that require less capital, organization, and management.

- The economic consequences that can ensue from adopting biomass- based alcohol fuels must be carefully analyzed; for example, positive indirect-economic factors associated with the replacement of imported petroleum by a home-based fuel industry as opposed to the possible negative effects on food prices and energy costs in different sectors.

- The environmental implications of a biomass-based alcohol fuel strategy are far-reaching but little

understood. They range from the extremely damaging, such as deforestation to produce the wood needed for a cellulose-based alcohol industry, to beneficial, such as improved forest management practices leading to higher productivity with better ecological balance. The energy plantation approach to biomass production raises questions about vulnerability to pests, water requirements, and pollution by runoff.

- The substitution of alcohols for petroleum-based vehicle fuels can affect air quality. Although evidence suggests that the overall results may be beneficial, experience with alcohol fuels is too limited to permit unequivocal conclusions.

- The most critical effects are likely to result from the way in which production of alcohol fuels benefits those involved. The adoption of a biomass-based alcohol fuel

policy will have other social impacts, depending on which of these two extremes tends to predominate, and will particularly affect land use and ownership.

Finally it can be stated that developing countries must develop or expand their own capabilities to monitor and audit their energy needs, assess their biomass resources, weigh competing requirements, define fuel markets, and evaluate the technologies needed to convert local resources into fuel to meet local needs. These countries should also identify and evaluate, to the extent possible, all potential impacts economic, environmental, and social arising from the implementation of a biomass-based alcohol fuel strategy.

1142 92 - 5/118

Agroecology

Review, book, developing countries, renewable resources, technology transfer, sustainable development, social needs, energy technologies, technical factors, cultural acceptability, economics

BOSTID

12. Diffusion of biomass energy technologies in developing countries.

Publ. by National Academy Press, Washington, D.C., ISBN 0-309-03 442-6, 1984, 95 pp. + bibliography

This report is concerned with the factors that influence the introduction and diffusion of selected biomass-based renewable energy technologies in developing countries.

This book is also based on visits to seventeen developing countries in the course of this study to observe renewable

energy projects. The countries are: Brazil, Colombia, Dominican Republic, Ethiopia, Fiji, Honduras, India, Indonesia, Jamaica, Mauritania, Papua New Guinea, People's Republic of China, Philippines, Sri Lanka, Tanzania, Thailand, and Upper Volta. Selected observations based on these visits are incorporated into this report.

The technologies discussed in this book include the generation of biomass through fuelwood plantations and agroforestry and the use of biomass in improved cooking stoves, charcoal manufacture, thermal gasification, and the production of biogas and fuel alcohol. These were selected because of their relevance to agricultural productivity and the dependence of the poor on biomass as an energy source.

For each of these technologies, the technical, economic, social, and cultural factors affecting their introduction and diffusion are considered.

The report also covers the nature of the diffusion process, energy and development, needs of the rural and urban poor, the characteristics of the technologies, and their feasibility and acceptability by the poor.

Further, developing country experience with these technologies is briefly described, followed by conclusions and recommendations.

The term diffusion applies both to dissemination of information about a new technology and dissemination of the technology itself; for instance, new cooking stoves.

Meeting the energy needs of a country through biomass-based technologies will not in itself significantly reduce a nation's petroleum use. Most of the poor already rely heavily on biomass sources - firewood, charcoal, agricultural residues, and dung - and will probably continue to do so. The value of

the various technologies described lies in increasing the availability of the materials currently in use, ensuring that they are used effectively, and providing alternative employment opportunities.

New technologies that mesh with indigenous systems of resource allocation, work organization, goods distribution, social and authority structures, and prevailing values and religious beliefs have the best chance for success.

Concluding, it can be stated amongst other that:

- All biomass-based energy technologies have inherent limitations in supplying national energy needs, and it is difficult for planners to make informed judgements about appropriate mixes of these technologies for different situations.

- Maintenance of the environment, revegetation, protection of forest resources, and diffusion of suitable biomass technologies are problems that are too large and complex to be tackled only by individuals and small communities. They must be the responsibility of society as a whole.

- Many aspects of biomass-based energy technologies are highly location-specific. A great deal of local experience with these technologies is required to make informed judgements about their potential to contribute to national energy budgets.

- Although the use of renewable energy technologies remains very limited compared with the needs, there are some striking examples of success.

Development assistance and funding agencies require

predominantly economic information on the returns from investment in the proposed projects. To make assessments of funding needs for these technologies, however, technical feasibility studies will be required to provide data on benefits and returns at both the national and community level.

Technical and sociocultural details, in addition to economic data, will be necessary.

1143 92 - 5/119

Agroecology

Review, book, case studies, Asia, India, Philippines, Bangladesh,

Africa, Sudan, Ethiopia, Mali, projects, developing countries, international cooperation, guidelines, IFAD

MADELEY, J.

13 When aid is no help: how projects fail, and how they could succeed.

Intermediate Technology Publications, 103-105 Southampton Row, London WC1B 4HH, UK; ISBN 1-85339-077-1, 1991, 125 pp. + appendices

The book tries to show why most of the projects are not achieving their aims, but it looks too at those which are having success, examining what is going right as well as wrong.

This book is critical of certain IFAD and United Nations Development

Fund for Women (UNIFEM) projects.

This book considers official aid projects that have tried to help the poorest. It shows that despite such attempts, most of the poorest are still losing out which means that the global aid effort is failing in perhaps its most crucial task: helping the neediest. The book looks closely at such projects in Mali, the Philippines, Bangladesh, Nepal and India. It probes the reasons why well-intentioned projects are failing to try and pinpoint the exact nature of the problem and the implications for policy.

The book also looks at official aid projects in Asia and Africa, where assistance is getting through to the poorest peoples and it looks at why these are working. The poorest often lose out in aid projects because they are not aware of their possibilities. As the book shows, non-governmental organizations can play a role here.

Part 1 is an overview of aid and the poorest; Part 2 presents

case studies of how aid is failing to reach them. The shorter Part 3 looks at examples of how aid is reaching some of the poorest in Asia and Africa, and at the contribution of NGOs.

The book asks what are the lessons of experience and draws conclusions as to how official aid needs change to help the poorest:

- A project must devote careful, patient and painstaking attention to detail. The people must be consulted at the design stage and genuinely participate in the process of the project.

- Too many projects are insufficiently grounded in poverty considerations. Projects must genuinely correspond to local realities.

- Projects must involve non-governmental

organizations at the design stage wherever possible.

- Training people in organizational skills can form part of project design.

- Projects must ensure that technology is low cost, human scale and appropriate.

- Projects must aim to raise the level of rural development in poor communities.

- projects must carefully assess whether local institutions are suitable.

- Community-based health structures should be in place before new technology comes in.

- Projects must treat people as partners.

- Low-cost credit programmes must be supported.

- Projects must not gamble with the people involved.

The book contributes to a better understanding of the issues indicated and helps towards removing the obstacles that stand in the way of getting aid to the poorest.

1144 92 - 5/120

Agroecology

Review, book, ecological zones, natural resources, human environment, food, environmental impact, high-input agriculture, pollution problems, food contamination, land-use, desertification, shifting cultivation, legislative aspects

FAO

14. Natural resources and the human environment for food and agriculture.

FAO Environment Paper No. 1, FAO, Rome, Italy; ISBN 92-5-100967-8; 1980, 62 pp.

FAO has prepared this report on Natural Resources and the Human Environment for Food and Agriculture.

This publication is the first in the technical series on natural resources and the human environment.

This report is an attempt to focus on global level population pressure, natural resources use and management, with particular reference to increased food and agricultural demand and environmental issues.

The demand on the natural resources that sustain man's existence has increased enormously with the unprecedented

rise in numbers that has occurred in recent times.

The past population growth has already placed considerable pressure on natural resources, and has in many cases led to their degradation and depletion. In the future this pressure will become even greater.

At the global level, the world's natural resources appear to be adequate for mankind's likely needs. However, they are unevenly distributed in relation to the population and its demands on them, and their utilization thus creates environmental problems in particular areas.

In developing countries, the major environmental concern is not so much the pollution of natural resources as their degradation or depletion.

The rapid increase in the population of these countries has

placed great pressure on natural resources. The consequent drive to intensify production has caused the dislocation of traditional agricultural systems, and has led to sometimes hasty attempts to replace them by modern agricultural systems and technologies that are not compatible with the prevailing ecological and socio-economic conditions.

Although the environmental problems of the developed and developing countries are different, their experience in overcoming them could be mutually beneficial. There are a number of main types of action that are required at the national and regional levels for the assessment of natural resources and for their rational management so that the demands on them can be met on a sustained basis:

- It is necessary to reduce the knowledge gaps in the assessment of natural resources, by means of adaptive research on the introduction of new technologies in

traditional agricultural systems.

- A further requirement for the improved assessment of natural resources is the development of coherent networks of data on these resources.

- There is a need for integrated land use planning.

- It is important to concentrate the intensification of agricultural production as far as possible in the most suitable areas. This will reduce the pressure on marginal lands which are ecologically fragile and subject to rapid degradation if they are exploited beyond their productive capacity.

- A further requirement is the promotion of well-adapted systems of production that integrate modern technology with the traditional systems of resource

management.

- It will be necessary to develop adequate rural institutions and infrastructures, including extension, credit and marketing services that are adapted to the needs of small farmers.

- It is necessary to develop a legal system to define the rights and duties of individuals or groups in relation to the utilization of natural resources in the light of their ecological limitations.

- Education on the better management and conservation of the natural resources used in agriculture is another requirement.

With respect to the existing degradation and loss of natural resources, the highest priority attaches to the control of soil

erosion, soil salinity and desertification and the conservation of fish stocks and of genetic resources. Soil erosion must be controlled and eroded land reclaimed on a watershed basis, through appropriate practices for the management and conservation of soil and water resources. Salinization should be controlled and saline soils reclaimed through proper irrigation practices and drainage systems. Desertification control requires the management of vegetation according to ecological principles, including massive programmes of reforestation. The pressure on marine fish stocks can be reduced not only by agreed international measures but also by the development and promotion of aquaculture. A further major priority is for the conservation of endangered genetic resources.

This report is not exhaustive. It is a first approach and will need to be progressively improved and refined. Although global in scope, it uses illustrations and draws on specific data

from a number of countries. It also provides a framework for other similar studies at national, regional, and village levels.

1145 92 - 5/121

Agroecology

Review, book, world development, environmental priorities, markets, sanitation, water, air pollution, energy, industry, land-use, environmental policy, resource management, greenhouse effect, biological diversity, economics, development indicators

WORLD BANK

15. World development report 1992 - development and the environment.

Publ. by Oxford University Press, Inc. 200 Madison Avenue,

New York, USA; ISBN 0-19-520876-5, paperback, 1992, 178 pp. + appendices

Recent years have witnessed rising concern about whether environmental constraints will limit development and whether development will cause serious environmental damage, impairing the quality of life of this and future generations.

Environmental values have been neglected too often in the past.

This report explores the relationship between development and the environment. It describes how environmental problems can and do undermine the goals of development.

The report also explores the impact of economic growth on the environment. It identifies the conditions under which policies for efficient income growth can complement those for

environmental protection and identifies trade-offs.

Because this report is about development and the environment, it focuses primarily on the welfare of developing countries. The most immediate environmental problems facing these countries are unsafe water, inadequate sanitation, soil depletion, indoor smoke from cooking fires and outdoor smoke from coal burning.

Industrial countries have a crucial role to play in helping to improve the environments of developing countries:

- Developing countries need to have access to less-polluting technologies and to learn from the successes and failures of industrial countries' environmental policies.

- Some of the benefits from environmental policies in

developing countries, the protection of tropical forests and of biodiversity, for example accrue to rich countries, which ought therefore to bear an equivalent part of the costs.

- Some of the potential problems facing developing countries - global warming and ozone depletion, in particular-stem from high consumption levels in rich countries; thus, the burden of finding and implementing solutions should be on the rich countries.

- The strong and growing evidence of the links between poverty reduction and environmental goals makes a compelling case for greater support for programs to reduce poverty and population growth.

- The capacity of developing countries to enjoy

sustained income growth will depend on industrial countries' economic policies; improved access to trade and capital markets, policies to increase savings and lower world interest rates, and policies that promote robust, environmentally responsible growth in industrial countries, will help.

Policy reforms and institutional changes are required to bring about accelerated development and better environmental management.

The main message of the report is therefore the need to integrate environmental considerations into development policymaking.

The report also argues for a careful assessment of the costs and benefits of alternative policies, taking account of uncertainties and irreversibilities that may be associated with

ecological processes.

This report includes the World Development Indicators, which give comprehensive, current data on social and economic development in more than 180 countries and territories. These data will also be available on diskette for use with personal computers.

1146 92 - 5/122

Agroecology

Discussion, low external-input, agriculture, community ecology, species interaction, non-renewable sources, intercropping, polyculture systems, pest, diseases, cover crops, environment changes

GLIESSMAN, S.R.

16. Species interactions and community ecology in low external-input agriculture.

American J. of Alternative Agriculture, II, No. 4, 1987, pp. 160

External production inputs have contributed greatly to the remarkable increases in crop yields achieved during the past several decades. These inputs take many forms, including fertilizers, pesticides, irrigation water, various soil amendments, machinery and labour. Most of these inputs have been developed to both stimulate farm system output as well as replace materials that have been removed with the harvest. Limited concern has been given to the long-term availability of these inputs as long as farming produced a net profit. Relatively little attention was paid to understanding the biological and ecological bases of interactions occurring within the cropping system as long as such interactions were not considered detrimental to yields. But today agriculture is

confronted with the need to assess the long-term sustainability of its production practices. It must consider the availability and cost of inputs and the impacts of conventional practices on the environment, food safety, and the quality of life for people involved in food production and consumption. In essence it is now as or more important to understand agroecosystems processes that promote productivity in the short term and sustain it over the long term than it is to concentrate on how much is produced.

Polyculture systems can be managed for nutrient cycling efficiency and pest and disease regulation using knowledge of multi-trophic level interactions and application of recent developments in mutualism and competition theory. A mechanistic model of additive and removal reactions on the environment is proposed as a means of studying species interactions.

The agroecosystem can be examined as a complex set of species assemblages with many levels of organization that build upon the basic understanding of the ecology of interactions at the individual organism level, emerging at the ecosystem level to understand the dynamics of what makes the entire system function. This is especially important as the understanding of ecosystem level processes of sustainable agriculture then interface with yet more complex aspects of the social and economic systems within which agroecosystems function. Eventually such an integration of social system and ecological system knowledge about agricultural processes will not only lead to a reduction in external inputs used for maintaining productivity, but will also permit the evaluation of such emergent qualities of agroecosystems on long-term environmental quality, the importance of the human element to production, the long-term effects of different farm input/output strategies, and the relationship between economic and ecological components of sustainable

agroecosystem management.

It is time to redirect a large portion of the resource that have generated all of the knowledge about single-species cropping systems towards the integration of both ecological and agronomic knowledge, with a broader goal of developing the ability to quantify the ultimate mergent quality of the agroecosystem - its sustainability. This is an extremely complex process, requiring a systems-level approach and the interaction of many disciplines, but with the outcome of being able to understand where and how effective change in agriculture can come about.

1147 92 - 5/123

Agroecology

Latin America, humid tropics, lowlands, review, conference,

natural resources, development strategies, protected areas, ecotourism, nontimber forest products, indigenous agriculture, pastures, plantation agriculture, plantation forestry

CARLS, J.

17. Development strategies and natural resource management for humid tropical lowlands.

Report of Humid Tropical Lowlands Conference; Development Strategies for Fragile Lands (DESFIL), Panama City, Panama, 1991, 11 p.

Tropical deforestation is one of the major fragile land issues of the 1990s. Therefore, in late spring 1991 a conference has been organized in Panama, to examine strategies for and management approaches to the sustainable development of humid tropical lowlands in Latin America and the Caribbean.

The technical sessions are summarized as follows:

- Topics addressed under the "Stewardship of the Forest Lands" were agroforestry, biosphere reserves, conservation of biological diversity, and protected areas.

- A panel of Panamanians was then discussing management aspects of

"Panama's National Parks".

- "Promising Timber Management Strategies" was the subject of session

III. Different managment practices in Costa Rica, Mexico and Ecuador were discussed.

- Session IV dealt with "Nontimber Forest Products and

Extractive

Reserves". In this session about 25 presentations on a variety of related subjects such as the Brazil nut industry, extractive reserves in Guatemala, palm products from Colombia, the value and diversity of plant medicines in Mexico, and the prospects of ecotourism in Costa Rica were discussed.

- In session V "Secondary Forest Management" speakers were invited to present papers on secondary forest ecology, line planting, silvicultural experimentation, and secondary forests in Trinidad.

- The final technical session was entitled"Implications of Forest Land

Conversion". Papers covered four topics:

- indigenous agriculture,

- pastures,
- plantation agriculture and
- plantation forestry.

The main results and conclusions are summarized as follows:

The causes of nonsustainable use of tropical forest resources are grouped in three broad categories:

- Poverty
- Ignorance
- Institutional failure, which has two facets: market failure and policy failure.

High deforestation is an outgrowth of the interaction among these causes.

The necessary reforms for correcting institutional failures, particularly policy failures, are correction of constant

underpricing of tropical forest resources, initiation of environmental accounting within national income frameworks and reduction in infrastructure projects encroaching upon tropical forests.

Activities designed to cope with natural resource degradation such as incentives for reforestation and soil conservation, should be functionally integrated into a particular country's economic development model.

A broad definition of "protected areas" must be used to describe examples that range from low impact agriculture to national parks. The "protected areas" and "natural parks" concept are accepted in Latin America as important tools for the establishment and management of large areas. The basic requirements for developing the human and physical infrastructure for managing natural parks areas are listed in priority order:

- On site staff with professional training in sufficient quantities.
- Organizational and management planning.
- Protected area policy, law policy, law regulations and fee collection.
- Environmental education outreach programs.
- Research facilities.

A diverse array of products can be extracted from "protected areas" without adversely affecting the ecosystems: medicine, germplasm, fruits and nuts, craft materials, products for industrial uses, for instance fiber, ornaments, fish/game, etc.

Small-scale, tropical rainforest cultures developed a complex system of subsistence technologies that have permitted hundreds of years of continuous exploitation of the forests. Political, economic and technological changes in the last two decades, have disturbed these traditional patterns of

exploitation.

The protection and management of the tropical lowlands must therefore involve the participation of the peasants and indigenous societies that exploit these fragile areas.

Indigenous management appears to be the next best thing to primary forests for species diversity, and the best for ethnobotanical species.

Apart from extracting products from forests, there exists the chance to enhance ecotourism as an instrument of sustainable development. In future, it is essential to guarantee that a certain amount of this money will be channeled to the conservation of nature.

1148 92 - 5/124

Agroecology

Latin America, Costa Rica, development strategies, environmental management, land settlement, crop diversification, community development, road rehabilitation, AID

TOLISANO,J.

18. Environmental management of the northern zone consolidation project in Costa Rica: strategies for sustainable development.

Publ. of Development Strategies for Fragile Lands (DESFIL), Washington, D.C. 20001, 624 9th Street, N.W., 1989, 138 pp. + annex

This paper highlights a field review and technical analysis of a project in the Northern Zone of Costa Rica.

The evaluation team addressed the following environmental

management concerns:

- Support to land settlement and titling,
- Support to crop diversification,
- Support to community development,
- Support to road rehabilitation/upgrading.

The project is expected to amplify the economic bases for the productive and sustainable development of the Northern Zone of Costa Rica through the following activities:

- Increasing non-traditional export-oriented crop production

- Developing a self-financed system for road maintenance and rehabilitation

- Supporting basic social infrastructure improvements, including potable water projects, schools, and

community health centers

- Consolidating current settlement activities through land purchases, titling services and integrated management plans for settlement areas.

In terms of population distribution and per capita income, the Northern Zone of Costa Rica represents one of the least developed regions in the country.

Ecologically, the Northern Zone includes a wide variety of life zones and biological communities. Using the Holdridge system of life zone classification, which integrates climatic, vegetative and other critical factors, at least seven distinct ecological zones can be identified in the project area.

The high rainfall, combined with a wide range of available habitats has encouraged a significant degree of biological

diversity in this region, both in terms of plant and animal communities.

The activities for environmental management include measures to facilitate the following:

- Land-use planning and monitoring of environmental conditions
- Watershed management
- Community-based production forestry
- Conservation of wildlands and wildlife
- Environmental education and extension.

1149 92 - 5/125

Agroecology

Latin America, Bolivia, project evaluation, environmental assessment, environmental strategy, technical assistance,

training, community participation, rural communications, natural resource management, pesticide pollution, USAID

EHRLICH, M. et al.

19. Environmental assessment: the valles altos project in Bolivia.

Publ. of DESFIL, Washington, D.C. 20001, USA, 1988, 28 pp.

The AID Andean Regional Environmental Adviser determined that the planned Chapare Regional Development Project Amendment for the Valles Altos region in the department of Cochabamba, Bolivia, required an environmental assessment (EA) before implementation of the project.

The need for an EA was determined by the fragile balance of the natural and agricultural ecosystem in this arid zone near Cochabamba and by the degraded nature of parts of the

region. The area shows extensive over-grazing, steep and often eroded slopes and severely salinized soils in some parts.

As a result of the study, it was decided to amend the project paper and to expand the geographical focus of project activities to the Valles Altos region of the department of Chochabamba. This will be done to help encourage a large number of Chapare farmers and laborers who, having migrated to the Chapare from the Valles Altos in large numbers during the last several years, are now returning to their places of origin.

It is hoped that these farmers will forsake their involvement in coca production and processing as control activities proceed. The effort will be a large-scale test of a model of integrated investments to improve the social and economic development potential of selected areas of origin, to accelerate return migration, and to increase retention of the existing

populations. If successful, the funding of a much larger effort to expand the impact of these activities to more areas will be considered.

For strategic and practical purposes, the implementation of the environmental/resource management strategy involves immediate activities, pre-investment studies, and technical assistance.

Essential preliminary activities are the relatively detailed land capability assessment and the hydrological studies needed before investments are made in irrigation systems.

The environmental strategy consists of the following major components:

- Early collection of baseline data on those resources and systems that are essential to planning, or that

may be altered by project activities. Examples of these data types are water quality, flow rates, and sediment loads for potable water and irrigation activities; land-use capability assessments for potential agricultural and natural resources protection activities; floristic, faunistic, and habitat distribution data for activities required to protect or restore endangered or critical ecosystem components.

- Continuous or periodic monitoring of water, soils, and biotic elements that may be adversely affected by project activities, or changes that may adversely affect sustainable continuation of project activities.

- Environmental education of local residents.

- Reforestation of upland areas for work production, soil conservation, and water retention. This will

include both plantations of native species and exclosures where feasible, to allow for the regeneration of native biotic communities and to protect and increase diversity in these xerophytic forests.

- Institutional support to develop the human resource base.

- Support to the implementation of rural infrastructure activities such as roads, irrigation systems, hydroelectric power development, and riverine protection works with goals of assuring utilization and minimizing environmental impacts.

- Establishment of management plans for the protection of ecosystems, communities, and species that are endangered or threatened.

1150 92 - 5/126

Agroecology

Asia, Pacific, review, book, environmental crisis, natural resources, food, agriculture, health, toxic wastes, people's movements, NGO's, environment network

SAM

20. Environmental crisis in Asia-Pacific.

Publ. by SAHABAT ALAM Malaysia 37, Lorong Birch Penang, Malaysia, 1984, 52 pp.

This booklet summarizes the declaration and resolutions of a seminar on "Problems of Development, Environment and the Natural Resource Crisis in Asia-Pacific".

Countries all over Asia and the Pacific are beginning to be affected by the impact of development and environmental crisis in the region. The range of problems are similiar throughout.

In the Asian-Pacific Environment, a few major issues can be identified for special attention, taking into account the reality behind many of the problems that are affecting people in the rural and urban areas.

These include:

- Food and agriculture
- Forests, land, wildlife and national parks
- Minerals and energy resources
- Human settlements and urban environment
- Industrial policies and environment
- Rural environment and effects of development

- Environmental education, media and non-governmental organisation

In Asia and the Pacific, as in Africa and Latin America, the best resources are being used for the benefit of the rich countries - exporting to them the energy, the fish, the raw materials and using labour resources to extract and export these materials and all at low prices and poor terms of trade.

The rich countries with 20 percent of the world's population are consuming and using up 80 percent of the world's resources.

Given this situation, one should not divorce environmental and development issues and priorities in this analysis, deliberations and suggestions. Development and the environment are inter-twined issues.

Unjust economic relations lead to ecological disturbance, resource depletion and environmental degradation. These environmental crises in turn have a disastrous effect on the development efforts of the developing countries.

In this context many individuals and groups have got together in the Asia-Pacific region representing grass-roots action organisations, media institutions, United Nations agencies, and scientists and academics, to deliberate on the environmental crisis in the region.

The seminar was attended by participants from India, Sri Lanka, Bangladesh, Thailand, Malaysia, Indonesia, the Philippines, Hong Kong, Japan, Australia and the Pacific.

The participants had opportunity to identify the various common issues related to problems of development and the environment and the depletion of natural resources in the

Asia-Pacific region.

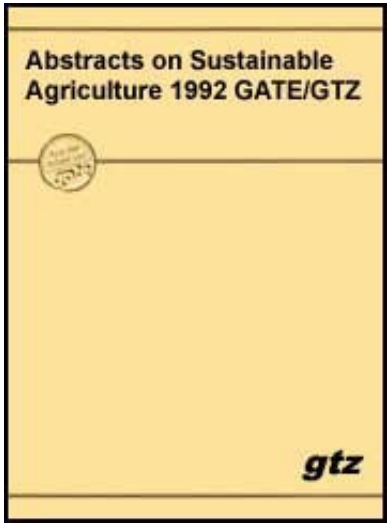
Participants reviewed the role of regional environmental agencies, government agencies, research and education institutions, media and information agencies and non-governmental organisations in their efforts to fight environmental problems.

Specific recommendations and measures for action plans were formulated on environmental pollution and natural resource depletion problems, to cooperate with and among individuals, organisations and agencies in the region and plans to make representations on behalf of the people whenever and wherever needed on problems regarding the environment.

Participants also examined the need for an effective follow-up Coordination Programme of Links, Documentation and Action Network among the non-governmental organisations, research

and educational institutions, the environmental agencies and the media in the region.

Home"" """"> ar.cn.de.en.es.fr.id.it.ph.po.ru.sw



Abstracts on Sustainable Agriculture (GTZ, 1992, 423 p.)
Abstracts on agrometeorology
Acknowledgements
1. Air pollution and agriculture.
2. The greenhouse effect and primary productivity in european agro-ecosystems.
3. Vegetation and the

- atmosphere:
- 4. Microclimate: the biological environment.
- 5. Microclimate management by traditional farmers.
- 6. Environmental stress in plants.
- 7. The impact of climate variations on agriculture.
- 8. Drought spells and drought frequencies in west-Afrika (dure et frquence des priodes sches en Afrique de l'ouest.)
- 9. Potential effects of global climate change on cool season food legume productivity
- 10. Weather and rice.

Abstracts on Sustainable Agriculture (GTZ, 1992, 423 p.)

Abstracts on agrometeorology

Acknowledgements

1151 92 - 6/30

Agrometeorology

Review, article, industrialized countries, developing countries, agriculture, air pollution, pollutant impact, yield losses, environmental pollution

ASHMORE, M.R.

1. Air pollution and agriculture.

Outlook on Agriculture, 20, 1991, 139-144

Air pollution has long been known to damage plants.

Up to the middle of this century, the problem was very largely restricted to urban and industrial regions of Europe and North America.

Over the past two decades, however, it has become evident that pollutants can be transported over long distances, and hence their impact may be felt widely over rural regions. The rapid pace of industrial development and urbanization in many developing countries means that adverse impacts on agriculture are beginning to be felt in many parts of the world.

The major pollutants of concern in relation to agriculture are summarized in this article and some important sensitive crop species and the approximate concentration at which adverse effects are observed. The pollutants may conveniently be divided into primary pollutants, such as sulphur dioxide and

ammonia, which are emitted directly into the atmosphere, and secondary pollutants, such as ozone, which are formed by subsequent chemical reactions in the atmosphere.

Although particulates act primarily by reducing light interception, certain particulates (e.g.cement dust) have chemical properties which may lead to more specific injury. Other particulates may contain high concentration of heavy metals, such as lead and zinc, which may contaminate foliage directly, or contribute to an increased soil burden.

Other primary gaseous pollutants which may be of concern around industrial works include hydrogen chloride, chlorine and ammonia.

Apart from ozone, the most important secondary pollutants are acid mists and rain which contain high concentrations of nitrate and sulphate, produced from the oxidation and

dissolution of nitrogen oxides and sulphur dioxide. Acid rain has been shown to cause soil and fresh-water acidification in areas with poorly buffered soils. Ozone is undoubtedly the most important gaseous secondary pollutant in terms of impact on agriculture, but other gases have local impacts on sensitive crops too.

These pollutants are photochemical and are produced in high concentrations under hot, sunny conditions.

National estimates indicate crop losses of about 5% in the USA and Netherlands, but these estimates do not take into account indirect effects, via altered pest and pathogen performance, which could substantially alter the economic loss assessment. The greatest concern in the coming decades should be the impact of air pollution on food production in the developing countries. There is a need, in particular, for an objective assessment to identify the regions and pollutants of greatest

concern; improved rural monitoring of pollutant concentrations; evaluation of the pollutant sensitivity of local crops and cultivars; and field experiments to quantify impacts of air pollution. A great contribution could be made to these needs by the governments and scientists of developed countries where agricultural impacts of air pollution are of less immediate relevance for the welfare of the population.

1152 92 - 6/31

Agrometeorology

Review, book, Europe, primary production, agriculture, greenhouse effect, climatic change, crop distribution

GOUDRIANN, J. et al

2. The greenhouse effect and primary productivity in european agro-ecosystems.

PUDOC, Wageningen, The Netherlands, ISBN 90-220-1026-0, 1990, Dfl. 40, USD 23

This slim volume of 96 pages contains the proceedings of an international workshop on primary productivity of European agriculture and the greenhouse effect, held at Wageningen in April 1990. The synopses or abstracts of the 24 papers presented cover the results of recent work carried out since the Villach conference held in 1985.

Several contributors discuss the effects of climatic change expected in the future on the basis of increased concentrations of atmospheric CO2 and other gases giving rise to the 'greenhouse effect' with increasing temperatures, greater UV-radiation intensity and associated phenomena.

Geographic distribution of crops is expected to change, making wheat and even maize production possible in hitherto marginal

northern areas.

Plant productivity is likely to increase through greater photosynthesis, but other aspects are less reassuring, notably accelerated development of winter cereals and possibly reduced growth periods, enhanced survival of weeds which would help pest and disease organisms to overwinter, increased weed growth due to better seed production and more life cycles, and inadequate mineral supply for increased plant growth. Crop and climate modellers have looked at possible trends, but there is a paucity of primary data and, up till now, inadequate dialogue between different groups of workers.

Several contributors discuss historical aspects and economic consequences of the greenhouse effect. There has been climatic change in the past, as shown for example by the cultivation of wheat in Iceland and of grapes in England and

Belgium during the High Middle Ages, and thus a temperature rise limited to 1.5 to 2.0 C by 2050 is not considered disastrous. What is likely to be more important in Western Europe, quite apart from the cost of increased sea defences, is the likely prospect of even greater overproduction of agricultural produce which, in the face of a shrinking and ageing population, will lead to still greater surpluses of food. Future politicians will thus have to determine, how much longer local farmers can be protected and whether marginal land can be retained for agriculture or needs to revert to forest.

Many of these and other aspects were raised at the workshop, and it is valuable to have them recorded.

Abstract by R.H.M. Langer, shortened.

1153 92 - 6/32

Agrometeorology

Review, book, vegetation, atmosphere, principles, case studies, ecology, weather, soil, ecosystems, microclimate

MONTEITH, J.L.

3. Vegetation and the atmosphere:

VOL. 1 PRINCIPLES; VOL. 2 CASE STUDIES

Academic Press, London, UK, 1975

In the post war period, especially after 1950, a deliberate effort has been made to achieve a better balance between weather and soil studies in the study of vegetation in relation to its environment, in which soil conditions had been privileged for a long time. Stimulus for this work comes from, among others, (tropical) ecologists concerned with changes in

the microclimate that occur when the equilibrium of an ecosystem is disturbed. The two volumes have been prepared to take stock of current knowledge and to ask whether ecological science is getting the full benefit from all the information now available about physical processes and mechanisms in plant communities. The first volume, as the introductional chapter states, deals with the main contributions of micrometeorology to ecology in terms of a matrix where mechanisms, processes and states are used against air, plants and soil. This leads to review chapters on radiative transfer in plant communities, momentum, mass and heat exchange of plant communities, the hydrological cycle in vegetation, the movement of particles in plant communities, micrometeorological models and instruments and their exposure. In the first part of the second volume chapters on relatively heavily studied crops like temperate cereals, maize and rice, sugar beet and potatoes, sunflower and finally cotton show (and occasionally state in their conclusive chapters) that

much is known on (consequences of) radiation characteristics, less on (consequences of) detailed heat and water balances, appreciably less on (consequences of) momentum balances and carbon dioxide balances, overall enough to try to use some of it in relatively simple but economically useful attempts of crop climate management and manipulation, but that a synthesizing attempt for that purpose is far from possible. Only in either a modelling approach, like in the chapter on townsville stylo, or in controlling certain confined aspects (frost, solar radiation) of the microclimate, like in the chapter on citrus orchards, such simple but useful attempts are actually exemplified. The chapter on coniferous forests is one of the earliest attempts to apply in detail the same approach as for the well studied crops. In less detail, because less is known, the same is done for deciduous forests. And still more limited in scope but rather unique is the micrometeorological work reported on tropical rain forest. The last three chapters, on swamps, grassland and tundras show

how micrometeorological concepts can be applied to whole ecosystems. It is important for our purposes that the following ecological topics are listed in which the potential contributions of micrometeorology have still to be realized: "measurements of states outside the temperate climates in which most micrometeorological groups have hitherto worked", "measurements of process rates over a whole growing season", "the description of plant communities as 2- or 3-dimensional systems: in particular, the application of micrometeorology to row crops and to systems of inter-cropping which are an integral part of traditional farming practice in many tropical areas; the micrometeorology of isolated trees or small groups of trees valuable for amenity or shelter; the measurement and specification of root systems", "analysis of the relation between weather and disease in terms of mechanisms, processes and states (including dispersal)", "the measurement of atmospheric pollutants in plant environments".

1154 92 - 6/33

Agrometeorology

Review, book, tropics, microclimate, environment, biometeorology, agronomic practices, yield

ROSENBERG, N.J. et al.

4. Microclimate: the biological environment.

Wiley & Sons, New York, 1983, (2nd Ed.)

This book contains twelve chapters:

- on the radiation balance;
- soil heat flux and soil temperature;
- air temperature and sensible heat transfer;
- wind and turbulent transfer;

- atmospheric humidity and dew; modification of the soil temperature and moisture regimes;
- evaporation and evapotranspiration;
- field photosynthesis, respiration and the carbon balance;
- windbreaks and shelter effects;
- frost and frost control;
- water use efficiency in crop production;
- human and animal biometeorology.

This is a textbook close to the climate aims of understanding modification practice and potential. Especially microclimatic influences of different mulches and shelters and the manipulation of evaporation and frost climate are quantitatively dealt with. It is summarized that the literature of shelter effect is reasonably consistent in its conclusions that: shelter alters microclimate; shelter reduces potential evapotranspiration; shelter reduces actual evapotranspiration;

shelter improves internal water relations, for example greater internal water potential, lower stomatal resistance; shelter provides improved opportunity for photosynthesis; shelter generally increases yield. On the one hand these benefits may be most dramatic in dry years or when moisture shortages are critical, but on the other hand the literature also suggests that benefits in terms of actual yields may be more consequential under irrigation than on dry lands. Scattered trees as shelter have not been dealt with. As methods of frost protection are treated: site selection; radiation interception; thermal insulation; air mixing; direct air and plant heating; application of water; chilling to prolong dormancy and soil manipulation. The book is full of very relevant tropical and other Third World examples from the experience of the authors and many other sources.

1155 92 - 6/34

Agrometeorology

Review, bibliography, project, microclimate management, traditional farmer, field reports

WILKEN, G.C.

5. Microclimate management by traditional farmers.

Geogr. Rev. 62, 1972, pp. 544-566

This bibliography covers the only international project existing on "Traditional Techniques of Microclimate Improvement". The paper relies on field reports in its identification of farmers' reasons for using particular management practices and wants to produce sufficient evidence to justify the nomination of (micro)climate to that group of environmental factors over which traditional farmers exercise significant control. Two aspects of field microclimate are distinguished: preservation of

desirable characteristics and generation of these characteristics within the crop zone. Examples of shade management, the manipulation of albedos, surface geometry and longwave transfers are separately dealt with. In a section on heat and moisture, tillage systems, surface mulches and dew are dealt with. Sections on wind, rain and hail and on maintaining microclimates close this valuable paper. In footnotes the widely scattered existing literature on basic concepts and examples is very adequately covered. The paper nevertheless concludes that its coverage is less than comprehensive, and for good reason. Crop climate management is so widespread and assumes so many forms that a complete catalogue of practices would fill volumes. Nor can extensive quantitative evaluation be attempted, since neither field nor laboratory research has produced much data on the results achieved by traditional methods. The paper concludes that traditional farmers employ an impressive array of climate-ameliorating techniques. But information on these

practices comes mostly from scattered field observations, with few indications of the results achieved. Measurement of radiation, heat, and moisture fluxes under a variety of crop and field conditions are sorely needed to determine the effectiveness and extent of these climate-control measures. Questions as growing seasons and production are affected by these practices need to be dealt with.

1156 92 - 6/35

Agrometeorology

Review, book, plants, agriculture, environmental stress, ecology, drought, salinity, temperature, heat, frost

CHERRY, J.H.

6. Environmental stress in plants.

Springer Verlag, NATO ASI Series G: Ecological Sc., 19, 1989, ISBN 3-540-18559-3, DM 188,-

Probably at no time in the past has there been a more concerted research effort aimed at improving understanding of fundamental mechanisms by which plants respond to their environment. 'Environmental Stress in Plants - Biochemical and Physiological Mechanisms' provides a recent summary of those efforts, the volume arising from a NATO-sponsored meeting held in Norwich, UK, in 1987.

The volume is divided into groups of chapters, each group dealing with a specific area of stress, namely: drought, salinity, anaerobic, low temperature and heat. Mineral nutrient deficiency and mechanical impedance are omitted but the coverage of the general area of stress in higher plants is otherwise comprehensive. Typically, each paper is brief, but well focussed, so that the reader is quickly in tune with the

important issues that preoccupy investigators. Unfortunately, a few contributions comprise a single-page abstract, without references; such skimpy offerings detract from a volume that is otherwise carefully edited and printed to a high standard. It is also curious to find a paper on accumulation of metabolites by a prokaryote (Salmonella typhimurium) in a volume otherwise dedicated to higher plants - one questions its inclusion.

Although it can be argued that many of the presentations in this volume have appeared in reference journals, the value of this book is that it provides a useful collection in a single volume and reasonably current summaries of the field. The volume will be useful mainly to teachers, students and those working in other disciplines who wish to become acquainted quickly with this area of plant science; it is unlikely to appeal to the specialist researcher who is already current with the literature.

1157 92 - 6/36

Agrometeorology

Review, book, cold climate, semi-arid climate, climatic variations, agriculture, impact assessment, IIASA

PARRY, M.L. et al.

7. The impact of climate variations on agriculture.

VOL. 1: ASSESSMENT IN COOL TEMPERATE AND COLD REGIONS.

VOL. 2: ASSESSMENT IN SEMI-ARID REGIONS.

Kluwer Academic Publishers, Dordrecht, 1988; Vol. 1: 876 pp., Paperback

220 Dfl.; Vol. 2: 764 pp., Hardback 200 Dfl.

These two substantial volumes arise from a project to investigate the impacts of climatic variations on the agricultural sector, carried out at the International Institute for Applied Systems Analysis (IIASA) in Austria, under the direction of Martin Parry, the leading editor.

The underlying idea, as set out in the preface, was that the impact assessments should be designed, conducted, and reported in a compatible manner even though they took place in different countries, with everything that implies in terms of economic, technical, and cultural diversity. Thus it should be possible to compare the results of one assessment with those of any other. The intention was not to look simply at the first-order (or direct) effects of climate on agriculture but also at the higher-order effects on regional and national economies.

Although the title of the book concerns climatic variations rather than climatic change, in fact much of the content, particularly in Volume 1, is devoted to impacts arising from the greenhouse effect. There are 11 case study regions altogether, with papers contributed by a team of 2-3 scientists in each. All the contributions were reviewed, and abstracts are given at the beginning of each section.

Volume 1 collects together the papers on cool temperate and cold regions: Saskatchewan, Iceland, Finland, subarctic USSR, and Japan. It opens with a set of background papers. These cover, on the one hand, discussion of regional climate scenarios for a high-CO2 world and, on the other, impacts and first-order impact models. There are two papers applying the results of a climate scenario to estimate impacts on forest productivity in Northern Hemisphere high latitudes, and the higher-order effects on the world timber trade.

Volume 2 covers semi-arid regions in Kenya, Brazil, Ecuador, India,

Australia, and European USSR. The background papers take only 120 pages as against 220 in Volume 1 and are of much less interest. One summarizes the results of the semi-arid case studies, one looks at first-order impact models, and one is a general essay on semi-arid climates.

There is a clear dislocation between the two volumes. The production of Volume 1 is much better, although potential purchasers might like to check for missing pages between 309 and 341. Volume 1 is oriented very much towards CO2-related impacts whereas Volume 2 looks almost exclusively at present-day climatic variability. On this basis we may say that the project failed in its stated aim. However, the subject matter and quality of Volume 1 is such that I would recommend people to buy it.

Abstract by J. Palutikof

1158 92 - 6/37

Agrometeorology

Review, book, Afrika, Burkina Faso, Mali, Niger, Senegal, drought occurence, dry spells, crop variety, irrigation needs, crop water requirements

ICRISAT

8. Drought spells and drought frequencies in west-Afrika (dure et frquence des priodes sches en Afrique de l'ouest.)

ICRISAT Research Bulletin No. 13, ISBN 92-9066-182-8, 1991, Order Code RBE 013; LDCs: USD 14.31, HDCs: USD 33.11; Bilingual: English, French

This publication is bilingual (English and French). Recurring droughts and decreased agricultural productivity during the last two decades in West Africa have pointed to the need for a clearer understanding of the length of dry spells, their frequencies and probabilities. A comprehensive review of various definitions of droughts has been presented to develop the basis for analysis of droughts. Using the specific definition of onset of rains in each year as the sowing date, the length of dry spells was calculated from the historical rainfall data for 150 stations located in Burkina Faso, Mali, Niger, and Senegal.

The relationships between mean annual rainfall and average frequency of dry spells for the selected locations in West Africa showed distinct patterns and permit the prediction of the frequency of dry spells from annual rainfall totals. Applications of dry-spell analysis for the choice of a crop/variety, supplemental irrigation, and crop water requirements have been described with examples.

1159 92 - 6/38

Agrometeorology

Syria, Israel, Netherlands, study, faba beans, climate change, temperature rise, CO2 increase, yield stability, ecology

GRASHOFF, C. et al.

9. Potential effects of global climate change on cool season food legume productivity

Publ. of the Dep. of Production Ecology, P.O.B. 430, 6700 AK Wageningen and Centre for Agrobiological Research, P.O. 14, 6700 AA Wageningen, Netherlands, 1992, 18 pp + Annex

In this paper a feasibility study of effects of climate change on growth and production of faba beans is described.

The increasing presence of atmospheric trace gases such as CO2, CH4 and N2O due mainly to human activity, directly or indirectly, may influence the Earth's climate by transmitting incoming solar radiation, while partly blocking outgoing terrestial black body radiation. The increased "greenhouse" effect may cause temperature rise. This may affect the functioning of various agro-ecosystems in general and faba bean growing more specifically.

Different processes are influenced by various factors that are affected by climate change. CO2-increase affects the stomatal conductance and increases photosynthesis rate and water use efficiency. Temperature rise may increase development rate of the crop, resulting in an adverse effect on crop production. Evaluation of the effects which work in contrary directions with direct qualitative or quantitative methods is difficult. Crop growth simulation models may be used for such an evaluation as the causal relations between rate variables and forcing

variables is present in such models. The consequences of CO2-increase and temperature rise may be evaluated with these models.

Climate change may have strong effects on faba bean growing, as this crop is very sensitive to water shortage and has a high yield variability at the present climate.

A simulation study was done with a well tested and validated model for crop growth and production of faba beans.

The used model was a version of SUCROS87, including a water balance.

For three locations differing in climate (Tel Hadya, Syria; Migda, Israel; Wageningen, Netherlands) at least 8 years with detailed weather data were used to simulate the consequences of temperature rise and increase of atmosheric CO2 (based on

assessment of the Intergovernmental

Panel on Climate Change IPCC), separately and combined. It appears that temperature rise causes a decrease in seed yield of rain-fed crops in Wageningen and Migda, due to a shortening of the growing season. At Tel Hadya, seed yield of rain-fed crops increases, due to an accelerated start of the reproductive phase and consequently an 'escape' from water shortage later in the season. For fully irrigated crops, temperature rise causes at all locations a decrease in seed yield, most in Migda, and smallest in Tel Hadya. CO2-enrichment causes in all situations an increase in growth and production of faba beans, which compensates the decrease due to temperature rise. The effects are not completely additive at all locations. Yield increases due to CO2-enrichment are much higher than the yield decrease due to temperature rise. In Wageningen, Tel Hadya and Migda the positive net effect of the two considered effects is respectively 12%, 68%, 28% for

rain-fed crops and 5%, 16%, 13% for fully irrigated crops, assuming an increase of CO2 concentration to 460 ppm and a temperature increase of 1.7 C. Fully irrigated crops show a remarkably smaller yield variability than rain-fed crops in all these assessments. In rain-fed crops, the variation in yield over the years stays the same or is somewhat reduced due to the reduced sensitivity to water shortage. Thus the net effects on productivity and stability due to the scenarios used for global climate change are at all locations positive. Other effects, such as for example morphological effects may overrule these physiological effects.

Such effects are not taken into account in this study.

1160 92 - 6/39

Agrometeorology

Review, book, tropics, Asia rice, weather, project proceedings, workshop, physiological responses, biological stresses, cropping systems, deterministic models,

IRRI

10. Weather and rice.

Proc. of the Int. Workshop on the Impact of Weather Parameters on Growth and Yield of Rice; IRRI, Philippines, 1987, 320 pp. + annexes

Rice is the staple food of about half of mankind. At least 1.125 billion people, comprising 225 million rural families, depend on rice as their major crop; the majority of them are subsistence farmers.

Rice is cultivated under diverse climatic, hydrological, and edaphic conditions.

Its wide adaptability is illustrated by rice cultivation at latitudes from 40 S to 53 N at elevations ranging from below sea level to more than 2,000 m; under upland conditions with no accumulated surface water and lowland conditions with no accumulated surface water and lowland conditions with 5 m deep water. Temperatures and humidity also vary widely. The importance of studies to determine the impact of weather variables on rice crop performance is apparent.

The World Meteorological Organization has implemented a number of programs, including the World Climate Impact Studies (WCIP), to which the undertaking of this workshop is relevant.

In the Philippines, specifically in the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA), a system to assess climate impact for agriculture started in January 1985. Its objective is to provide a reliable

and timely, yet inexpensive, weather-based information system that will continuously monitor and assess the impact of weather (such as drought, floods, typhoons, etc.) on rainfed agriculture.

Summarizing the main recommendations of the workshop are:

- Weather and biological stresses:

The extent to which information on the prevalence of rice pests under different cultural types and climatic conditions is quantitative or qualitative needs to be reviewed.

Information on the current status of major pests in different rice-growing environments should be collected in a central data bank.

Pest monitoring should be incorporated into studies on rice-weather relationships, including data on both research plots

and adjacent farmers' fields.

Provision for measuring or calculating leaf wetness, an important parameter in disease epidemiology, should be added to the basic data set. Continuous temperature and humidity records are desirable.

- Weather and rainfed rice:

The constraints to upland rice production can be grouped as environmental, environment-dependent, and site-specific.

The constraints to rainfed rice production include:

- Climate: rainfall amount and variability, solar radiation, and temperature.

- Technology: insect pests and diseases, weeds, and rats and birds; land preparation; planting methods;

soil nutrient management; soil erosion and other physical problems; cropping patterns; and water conservation.

- Genotype: seed dormancy and vigor, rooting characteristics, insect and disease resistance, resistance to temperature extremes, drought resistance, and crop duration.

- Socioeconomic: production incentives, labor, markets, infrastruture, and credit.

Most of these constraints can be related directly or indirectly to climatic factors or site characteristics.

Water balance is the best tool for determining soil water availability or deficiency throughout the crop season.

Because of the socioeconomic problems in rainfed rice regions

and the complexities of environmental constraints on rainfed rice, international collaboration is the only avenue with the potential to contribute significantly to increased and stabilized production.

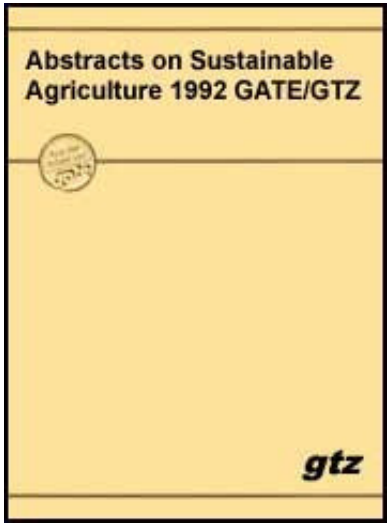
- Rice modeling:

Several recommendations to rice modeling were made.

Because of the importance of the impact of weather on the rice crop, the major importance of the crop, and the success of the UNDP-funded Rice-Weather Project in initiating the collection of essential basic information on weather and rice crop yields, and noting that the project has already established a basis for prediction models for rice yield and shows potential for developing forecasting models for pest outbreaks, the workshop recommends that appropriate donor agencies make funds available to IRRI to continue the rice-weather project,

encompassing as far as possible the recommendations of the working groups.

Home"" """"> ar.cn.de.en.es.fr.id.it.ph.po.ru.sw



- Abstracts on Sustainable Agriculture (GTZ, 1992, 423 p.)
  - Abstracts on agroforestry
    - Acknowledgements
    - 1. Tree products in agroecosystems: economic and policy issues.
    - 2. Sustainable use of plantation forestry in the lowland tropics.

3. The palcazu project: forest management and native yanesha communities.

4. Opportunities and constraints for sustainable tropical forestry: lessons from the plan piloto forestal, quintana roo, Mexico.

5. The taungya system in south-west Ghana.

6. Planning for agroforestry.

7. Sowing forests from the air.

8. Agroforestry pathways: land tenure, shifting cultivation and sustainable agriculture.

9. Food, coffee and casuarina: an agroforestry system from the Papua New Guinea highlands.

- 10. Agroforestry in africa's humid tropics - three success stories.
- 11. Agroforestry and biomass energy/fuelwood production.
- 12. Regeneration of woody legumes in Sahel.
- 13. Medicines from the forest.
- 14. Potential for protein production from tree and shrub legumes.
- 15. Agroforestry for sustainable production; economic implications.
- 16. Living fences. A close-up look at an agroforestry technology.

17. Homestead agroforestry in Bangladesh.
18. Guidelines for training in rapid appraisal for agroforestry research and extension.
19. Erythrina (leguminosae: papilionoideae): a versatile genus for agroforestry systems in the tropics.

Abstracts on Sustainable Agriculture (GTZ, 1992, 423 p.)

Abstracts on agroforestry

Acknowledgements

1161 92 - 7/75

Agroforestry

Review, Africa, Asia, agroecosystems, tree products, economics, policy issues, household inputs, agricultural inputs, employment, income, natural resources, social forestry, tree management, farmer, tenure

ARNOLD, J.E.M.

1. Tree products in agroecosystems: economic and policy issues.

GATEKEEPER Series No. 28; IIED London, UK, 1991, 21 p.

This paper reviews trends in the use of, and rural reliance on, forest products; it examines the role of common property resources (PRs) as a source of these products; and characterises trends in the growing and management of trees in farming systems. Throughout, the impact of national

policies and of programme and project interventions on these two sectors is examined in the respective sections.

Trees are planted and managed in the farming system, and in the neighbour wood to provide inputs needed in order to complement those available from on-farm resources. These non-forest sources of production are becoming increasingly important with the growing decline and degradation of nearby forests and the increase in demand for fuel, fodder, and other products.

There are three broad categories of use of forest products: direct use by the household as fuel, food, etc; inputs into the agricultural system such as fodder and mulch; and sources of rural household income and employment. These categories are discussed in detail in this paper.

Rural people draw much of their forest products from areas of

forest, woodland and 'waste' land to which they have access as common property resources (CPRs). These outputs often constitute a major component of the overall agricultural system - filling gaps in the resource and income flows from other resources, and providing complementary inputs often critical to the continued functioning of agricultural and household systems.

The nature and magnitude of the relationship varies with the characteristics of the surrounding ecological and agricultural systems.

Examples from Asia and Africa are outlined.

Social forestry woodlots and joint management on forest land are explained.

In recent times farmers everywhere have sought to shift the

production of outputs of value on to their own land by protecting, planting and managing trees of selected species. In many situations farmers now depend on their own tree stocks for some products, and on common property resource sources for others. The process of adding trees to farming systems has been accelerated or transformed by the growing commoditisation of fuelwood and other tree products, and the consequent emergence of the growing of trees as a cash crop. Examples in which tree planting occur in Asia and Africa are mentioned.

Within a particular agroecosystem, farmer involvement in tree growing appears to be largely related to changes in the availability and employment of land, labour and capital, and to the progressive commoditisation of tree products such as fuelwood and poles. Variations in tree growing patterns seem to reflect variations in the efficiency of operation of factor markets, different stages in the process of agrarian transition,

and different patterns of tenure.

Concluding the author outlines implications for future policy considerations.

1162 92 - 7/76

Agroforestry

Latin America, Asia, Africa, lowland tropics, plantation forestry, tree species, genotype environment interaction, tree breeding, tree yields,

DESFIL

EVANS, J.

2. Sustainable use of plantation forestry in the lowland tropics.

In: Proc. of the Humid Trop. Lowlands Conference, Panama City, Panama, 1991, pp. 55-68

This paper lays down the principles governing successful plantation forestry in the lowland, humid tropics and seeks to address the issues which underpin sustainability: land capability, species choice, and management. Relevant examples are drawn from across the tropics.

While plantation forestry is often associated with industrial plantations the enormous expansion in social forestry is not neglected.

Accurate data for areas of tropical plantations are notoriously difficult to obtain. Gathering information from just over 100, mainly developing countries inevitably leads to a variety of definitions, confusion over units, optimism by some of equating seedlings supplied or planted with plantation

established, lack of proper inventory, and so on. Nevertheless, from the available data, it seems clear that some 20 million ha of forest plantations of various forms have been established throughout the tropics and hotter subtropics in the last 10 years to give a global figure in excess of 40 million ha.

The virtual doubling of plantation forest area in the last 10 years arises from a massive social forestry program in India, though the quality and stocking of much new 'plantation' is questionable; a clearer picture of afforestation in tropical China; and programs of steady expansion in many countries. The bulk of the increase in the neotropics has occurred in Brazil, owing to the fiscal incentives program which ran from 1967 to 1986 and averaged some 300,000 ha per year from the early 1970s, but has since diminished to about one-tenth of this level.

An examination of tree planting schemes in the last 10 years

shows a shift from one of replacement of natural forest formations, e.g. Jari, Brazil, to afforestation of already badly degraded land or natural savanna, cerrado, or grassland. This change is both laudable from a conservation point of view and reflects the fact that huge areas of land, since long deforested, are suitable for tree planting but not a lot else. The 40 million ha of Imperata grassland in Indonesia are a striking example.

Correct choice of species for a given site is fundamental to sustainable plantation forestry. Poor species choice will not only give poor yields about may increase risk of pest and disease damage. The ingredients of successful matching of species to site include first climate matching followed by attention to soil factors.

Industrial plantation forestry has been dominated by planting of a very few species in the lowland tropics. Indeed Pinus caribaea, Gmelina arborea, teak, and Eucalyptus grandis, E.

camaldulensis and E. urophylla probably account for 90%.

The last 10 years has seen a significant broadening. Increased use of little tested species, promotion of nitrogen fixing trees, and advances in vegetation propagation technology have contributed to this.

In addition to variation due to provenance, and to all sources of variability, there is evidence of an interaction between the selected genotype and the site. The highest ranked provenances, varieties, families or clones will not necessarily be the same on all sites. This is known as genotype x environment interaction (GEI) and breeding strategies must recognize this feature.

Plantation forestry is a feasible silviculture in the lowland tropics provided attention is paid to sound practice to ensure properly matched species and sites and regular management

inputs. It is not a cheap form of forestry, but with commitment over time to a project, including tree breeding programs, the large investment can repay in highly productive forest which appears to be sustainable on most sites.

1163 92 - 7/77

Agroforestry

Latin America, Peru, study, project, forest management, Indians, land tenure, forestry cooperative

STOCKS, A.

3. The palcazu project: forest management and native yanesha communities.

Journal of Sustainable Forestry, 1, (1), 1992, pp. 97-123

This paper presents some of the background and the current operations of a novel management system incorporating landholders in tropical forestry.

The Palcazu Valley ist mostly in the Cerro de Pasco department in the central selva region of Peru.

The Palcazu project began in 1981 as a part of the larger scheme of regional development in the central selva of Peru. The regional plan was part of an even larger national plan for development of the tropical

Andean foothills.

The Palcazu forest project is socially as well as ecologically oriented.

The pilot program is taking place among native Amazonian Indians, the Yenesha of eastern Peru.

The two features of the forestry component of the Palcazu project that make it unusual are its involvement with Amazon Indians and the uniqueness of the strip-shelterbelt natural forest management system.

As this paper emphasizes, the social ties, knowledge of the forest, values placed on forest preservation, communal land tenure patterns, and willingness to work toward a common goal all militate for involvement of the project with the Yanesha in forest management.

For the forest management system to spread as a general model, people other than Indians will need to be included.

As this article attempts to make explicit, there are a number of ecological reasons why this kind of forest management should be promulgated. A balanced perspective would probably be that the social model proposed by the Palcazu project

requires investment in quite different sectors than the usual forest exploitation with attendant high training costs, but that the extra effort may well be worth it if the outcome is rational forest management and stable social systems.

Technically, some problems have surfaced with the extraction system, especially the use of oxen with a population that has no tradition with them as draft animals. Oxen also require superior forage which involves an entire other subsystem of pasture maintenance just for the draft animals. There may be relatively low-cost and low-ecological-impact mechanical means of removing logs from the strips that can be developed.

Economically, the project still requires some subsidies both in supports to cooperative workers and in technical assistance. This support is currently being provided by World Wildlife Fund.

On the positive side, the market for preserved posts, initially very weak, has improved recently.

Failure of the forestry cooperative would have severe socioeconomic and political consequences for the Yanesha people, perhaps calling into question their very survival as an indigenous culture.

The Palcazu project points the way for future natural forest management projects, both in its unusual approach to forest management and in its social assumptions. Its survival during more than five years of national and regional political turmoil is largely due to the strong sense of ownership and commitment by the Yanesha cooperative members.

1164 92 - 7/78

Agroforestry

Latin America, Mexico, study, tropical forestry, mahagony forest tenure, silviculture, tree yield, research, DESFIL, USAID

SNOOK, L.C.

4. Opportunities and constraints for sustainable tropical forestry: lessons from the plan piloto forestal, quintana roo, Mexico.

In: Proceedings of the Humid Tropical Lowlands Conference, Panama, 1991, pp. 65-83

The Plan Piloto Forestal (PPF) of Quintana Roo, an 8-year-old community forestry project on the Yucatan peninsula of Mexico, has been heralded as a model for sustainable tropical forestry. In order to extract useful lessons from this experience, it is important both to evaluate its current and future potential as a sustainable system, and to understand

the opportunities and constraints that have defined its development.

Such an analysis should yield insights applicable not only to the continuing evolution of the PPF, but to the design of sustainable forestry projects elsewhere.

The first premise of this article is that the achievements of the PPF in community forestry are a product of both circumstances and the approach followed by the development team. The ecological characteristics of the forestand, the history of land and forest tenure and use in Quintana Roo created a favorable setting for community forestry based on timber harvesting. Nonetheless much of the success of the project can be attributed to the development philosophy, political connections, and long-term-commitment of the international team which initiated and has fostered the Plan Piloto Forestal (PPF).

The second premise is that while favorable ecological and institutional circumstances are necessary predictions for the establishment of successful tropical forestry projects, the long-term sustainability of forest activities depends on the design and application of appropriate silvicultural practices. This in turn, requires the capacity to define and acquire the necessary information on forest and species ecology and the impacts of forestry, and to develop and modify forestry practices accordingly.

During its first eight years the PPF has capitalized on existing opportunities and overcome a series of obstacles to accomplish its primary objectives of reorganizing forestry in Quintana Roo and contributing to socioeconomic development.

The benefits obtained from forestry activities by local people with secure tenure to their forest lands and decisionmaking power provide an incentive for managing forests with a long-

term perspective.

1165 92 - 7/79

Agroforestry

Africa, Ghana, study, taungya system, forest types, timber production, farmer attitudes, commercialisation

BROOKMAN-AMISSAH, J.

5. The taungya system in south-west Ghana.

In: FAO Soils Bulletin No. 53, 1984, pp. 183-185

This study uses a rather narrow definition of intercropping agricultural and forestry crops without regard to who owns the agricultural crop, so as to bring out variations. It also sees the Tropical High Forest Zone in the country as covering South-

West Ghana.

The taungya system, as it was developed in Burma, involves peasant farmers in afforestation or reforestation. This system interplants trees with agricultural crops, particularly the local population's staple foods, and so serves to satisfy the farmer's quest for arable land.

This type of forest reaches the coastline for approximately a quarter of its length and thereafter is separated from it by a belt of mangrove, scrub and coastal savanna formations, which fan out from west to east.

The zone is characterized by uniformly high temperatures, a rainfall regime with two peaks, mean annual precipitation ranging from 2135-3000 mm in the southwest to 1250-1375 mm in the northeast, and a high relative humidity. The humid environment maintained by the forest cover enables the

cultivation of such cash crops as cocoa, oil palm, rubber and kola nuts. Cocoa and timber are the two major export commodities.

The taungya system was introduced with two objectives: to establish plantations of fast-growing, useful timber species and, second, to meet the peasant farmer's demands for arable land, using forest reserves where land was genuinely needed.

The size of the forest land allocated annually depended on the demand and the ability of the Forestry Department to cope with it. The latter was largely determined by the stock available. On a few occasions, farmers were asked to raise seedlings themselves.

In exchange for this privilege, farmers were asked to assist in establishing the plantation by preparing the site. They provided pegs, tended the planted tree crop alongside other

food crops and also were governed by restrictions as to choice of species and spacing imposed by the Forestry Department. Farmers continued to receive allocations only if they adhered to these conditions.

Peasant farmers were generally pleased. These allocations gave them the opportunity to raise crops on relatively fertile forest land, increasing crop yields and improving the standard of living. Preparing sites in the Tropical High Forest is the most expensive operation in plantation establishment. The farmer did not reap the full benefit of this investment, but this did not concern him unduly. He had no opportunity cost for his labour and in so far as he could handle the work, involving his family, all his produce was profit. He expressed his gratitude to the forester by adhering to the rules, and generally becoming increasingly cooperative.

The large-scale reforestation scheme gave rise to yet another

type of farmer, the big time city dweller, who used hired labour to cultivate food crops on the plantation sites.

The Forestry Department felled big trees and allocated plots to these "entrepreneur farmers" for a fee. The system resulted in a number of powerful farmers too difficult to control and consequently it failed.

The poor peasant farmer was excluded from these areas.

The advantages of the taungya system is that the forester may be able to raise a tree crop at a lower cost, and at the same time increase food production. The farmer always has the advantage of being able to use land which has been kept fertile under a forest cover.

1166 92 - 7/80

Agroforestry

Latin America, Africa, review, book, field experience, agroforestry approaches, agroforestry planning methods

BUDD, W.D. et al.

6. Planning for agroforestry.

Elsevier Science Publishers, Amsterdam, The Netherlands; ISBN 0-444-88634-6, 1990, price USD 89.75, Dfl. 175.00

This book incorporates selected contributions from an international symposium held in 1989 at Washington State University in the USA. It provides an overview of planting methods for agroforestry research and development projects, based on experience from the Centro Agron_mico

Tropical de Investigaci_n y Enseanza (CATIE), CARE International, ICRAF, Washington State University, and the University of Wageningen (The Netherlands), among others.

Discussions cover methods already in use and others currently under consideration.

Four chapters present various approaches to agroforestry planning, among these the diagnosis and design methodology developed at ICRAF. The rest of the book is devoted to accounts of field experience in Costa Rica, India, Indonesia, Kenya, Malawi, Sudan, and the islands of the Pacific.

Some of the key questions are:

- Planning for whom: Who are the farmers? What are their objectives and priorities? Or is the focus on the needs of the research, extension or government institution?

- Planning for what and in what context: Is the aim to design a project for research, for development, or

both? Is the scale of planning at the macro (national, regional), meso (community, watershed, land-use system) or micro (household, farmer) level?

- What criteria should be used: How relevant are considerations such as biophysical and socio-economic indicators, adaptability/transferability, sustainability, institutional complementarity or scientific value?

- What method should be used: Techniques are available from fields such as land evaluation/landscape analysis, farming systems research and development, diagnosis and design, and agroecosystems analysis.

Each has strengths and they could be combined depending on objectives and resources.

As the editors state, "all these questions cannot be addressed

with one planning method". However, there are a few important factors that must be considered in any planning exercise for agroforestry. These are integration, iteration, participation and sustainability. This book presents a range of both proven and new, innovative options.

It will be a valuable reference for anyone with a serious interest in agroforestry. It addresses the complexity of the planning process, focuses on critical issues and priorities, and provides much food for thought.

1167 92 - 7/81

Agroforestry

Review, book, tropics, temperate climate, forests, sowing methods, aerial seeding

BOSTID

7. Sowing forests from the air.

National Academy Press, Washington, D.C., ISBN 80-83796, Third Ed., 1986, 57 p. + annex

This report discusses reforestation in which the seed is broadcast from a plane or helicopter. It relies mainly on experiences in Australia, New Zealand, Canada, and the United States.

Sowing forest seed directly on the site to be forested is known to foresters as direct seeding, broadcast seeding, or broadcast sowing. The availability of chemicals for coating seeds to repel birds, rodents, and insects has made this a practical and more reliable method of reforestation.

In many parts of the world, deforestation has reached critical proportions. Africa, Asia, and Latin America have vast areas of

once-forested land that is now denuded. Many have been left largely unplanted.

These enormous areas of virtually unproductive land are increasing.

Traditional revegetation methods should be applied more extensively, but the time also seems right for examining alternative methods.

Dropping seed from planes or helicopters is a well-known and well-established technique for sowing pastures as well as agricultural crops such as soybeans, wheat, and rice. Forests have also been established in this way. However, aerial seeding of forests is largely unappreciated, even by most foresters.

When conditions and species are right, and seed supplies

sufficient, aerial seeding could be an important technique for reforesting large areas. It is easy to organize and seems well suited for reforesting sites that have rough terrain, debris, or difficult access. If it can be developed for sites and objectives in developing countries, aerial seeding could offer opportunities for vastly accelerating their reforestation programs.

Aerial reforestation is not a replacement for planting seedlings by traditional methods. It is best considered as a potential complement to conventional planting and to natural seeding, an additional tool for foresters to use when the needs, sites, and species are appropriate.

Sowing tree seed directly in the field is an old technique, but it was little used until the development of repellents to protect seed from insects, rodents, and birds.

It was learned that an additional coating of commercial insecticide would guard the seed against insects and rodents. These findings signalled the beginning of large-scale aerial seeding of forests in USA.

New Zealand demonstrates its success. Some of these forests have been established despite seemingly adverse conditions - for example, on steep slopes and on overburden from strip mines.

Aerial seeding is unproven in the tropics. The panel's purpose is not to recommend it over conventional reforestation techniques but to suggest trials of aerial seeding as a possible supplementary tool.

This book is not a textbook nor a practical guide to aerial seeding: details of the operations and techniques can be found in the selected readings. The purpose is to show

administrators and foresters that this fast and often economical technique can be successful on appropriate sites, at least in temperate climates. The authors hope that the report will stimulate trials with, and research into, direct seeding (with or without the use of aircraft). In particular, trials are needed in the tropics where deforestation is most severe.

Aerial seeding presents many challenges for researchers, especially those in developing countries. While technology and techniques are developed and available, they are yet to be tested and adapted for use in those Third World areas now suffering devastating deforestation.

Because experience with aerial seeding of forests in the humid tropics is limited, little is known about predators and the best species to sow.

Aerial seeding could be an expensive failure unless small-scale trials show that direct seeding can be successful for the given species and sites.

Initially, these trials do not require use of aircraft. It is necessary only to broadcast a small amount of seed (pretreated, if necessary) on a small patch of the area being tested with conventional tree-planting methods.

The existing knowledge on seed coating and pelleting should be reviewed.

Successes and failures are reported in different situations.

Seeds can be targeted accurately (often within a meter or two). Thus direct seeding might prove feasible for filling in the widely scattered breaks in the forest left by slash-and burn farmers with useful species that best protect the vulnerabale

soil.

1168 92 - 7/82

Agroforestry

Review, tropics, subtropics, developing countries, land-use systems, land-tenure, shifting cultivation, sustainable agriculture, marginal lands, fallows, alley cropping, intercropping, trees, agropastoral systems, mixed farming

RAINTREE, J.B.

8. Agroforestry pathways: land tenure, shifting cultivation and sustainable agriculture.

Unasylva 154, 38, 1986, pp. 2-15

From a project standpoint there are two fundamental ways of

arriving at agroforestry: by integrating trees into farming systems or by integrating farmers into forests.

Appropriately selected woody components may contribute to both the productivity and sustainability of farming systems on marginal land in several ways: by enhancing the production of organic matter; by maintaining soil fertility; by reducing erosion; by conserving water; and, by creating a more favourable microclimate for associated crops and livestock. These "service roles" are above and beyond the direct "production roles" trees can also play in supplying food, fodder, fuelwood, building materials and other raw materials for rural industries. In traditional land-use practices, agroforestry is also important in maximizing and diversifying the productivity of even highly fertile lands. Intensive agroforestry systems are most commonly found in areas with a long history of population pressure, indicating their general efficiency as a land-use system.

All tropical land-use systems exhibit varying degrees of "leakiness" with respect to the cycling of nutrients held in the soil-vegetation complex, although systems such as irrigated rice paddies, permanent tree crops and forests are inherently more sustainable than others. It is a fundamental contention of agroforestry that trees have good prospects for plugging many of the holes in tropical farming systems. The degree of "infilling" can vary from slight to virtually complete. Essentially, the decision as to how many and which kind of trees it is profitable to add to the existing pattern of land-use depends on what useful niches for trees can be identified. An agroforestry "niche" in this sense has three components: a functional role within the land-use system; a place within the landscape; and a time within the life cycle of a particular land-use system.

Although many of the recent research thrusts in agroforestry have been directed toward the integration of trees into

farming systems, agroforestry also has a role to play in the preservation of forests and the improvement of forest management systems. By providing farmers with a means of producing fuelwood, timber, building poles and other forest products on farmland, agroforestry can significantly reduce the demand on forests and natural woodlands. By doing this in ways that enhance and sustain agricultural productivity, agroforestry can also alleviate some of the pressure for the conversion of forest land into farmland.

Moreover, the integration of farmers into forest management schemes through the use of "compromise" land-use systems based on agroforestry may be one of the few realistic ways of sustaining forestry production on agriculturally pressured forest land.

The purpose of this article is to provide some mental images of the scope and potential role of agroforestry to serve as a

background to the discussion of tenure issues. The main assumption is that the interactions between agroforestry and tenure issues are basically of two types: first, tenure factors may pose constraints to the realization of the potential ecological and socio-economic benefits of agroforestry in many land-use systems; and second, agroforestry may offer ways of resolving some existing tenure problems. Tenure issues are far more varied and complex than are reflected here. However, attention is focussed on some of the major changes in tenure that arise in conjunction with the main development trends in tropical land-use. These changes are then viewed in ecological and evolutionary perspectives.

Agroforestry can perhaps provide a simple, equitable, all-round solution in developing countries to the related problems of biomass energy supply, decentralization of rural industry, and the participation of pastoralists in national development.

The purpose of this article has been to raise some questions and provide some images for a positive approach to tenure questions in agroforestry.

1169 92 - 7/83

Agroforestry

Pacific, Papua New Guinea, highlands, coffee, casuarina, food, ICRAF

BOURKE, R.M.

9. Food, coffee and casuarina: an agroforestry system from the Papua New Guinea highlands.

In: Agroforestry Systems in the Tropics; Kluwer Academic Publ., Dordrecht, The Netherlands; 1989, pp. 269-275

The paper describes an agroforestry farming system from the Papua New Guinea highlands (1,400-2,100 m) that has been developed by village farmers since about 1960 and has expanded rapidly since about 1970.

The majority of new coffee plantings made by smallholders in recent years have been in agroforestry systems that incorporate annual and perennial food crops, coffee and shade species. One such system is described here.

Major components of the system are numerous species of annual and perennial food crops (especially bananas), Arabica coffee and Casuarina oligodon. This system provides food, a cash crop and timber for construction and fuel.

C. oligodon is a fast-growing woody species that provides shade and timber for fencing, house construction and firewood. Its timber is easy to split and it burns well. The food

crops include bananas (Musa cvs) (mostly triploid cultivars at these altitudes), taro (Colocasia esculenta and Xanthosoma sagittifolium), sugarcane (Saccharum officinarum), maize (Zea mays), highland "pitpit" (Setaria palmifolia), Amaranthus spp., Oenanthe javanica, Rungia klossii and others. Other components which may be present are nut pandanus (Pandanus jiulianettii) at altitudes above 1,800 m and oil pandanus (Pandanus conoideus) below 1,700 m. Pigs commonly graze under established coffee/casuarina/banana stands, but they are not a critical component of the system. Cassava (Manihot esculenta) is an important component of a similar system used on better drained soils, but not in this system on the wetter soils.

The basic structure of the system is that mixed vegetable gardens are gradually converted into coffee/banana gardens and eventually into coffee/casuarina stands.

The system described here is an extension of the traditional mixed vegetable garden system and it is the most widely practised of the recently developed integrated food/coffee/timber systems.

The overall performance of the system has not been quantified and hence not evaluated. Judging by the system's rapid expansion and widespread adoption, it is much more efficient than the officially promoted method of establishing coffee.

Because the canopy is maintained continuously by a sequence of faster and slower growing species, the need for weeding is minimized.

It is a conservation system in that the soil is protected from the direct action of the elements by continuous vegetative cover.

A reasonable level of managerial ability is needed to manage the system, but this is within the capability of most village growers. The level of management may be more difficult to attain when larger plantings are being established in a limited time, for example areas larger than 3 ha.

The research needs for this system are numerous and urgent, given that this farming system and similar ones are the most important ones that are used to establish new plantings.

Once farmer practices have been documented, innovations and potentially superior techniques need to be evaluated in controlled experiments. The growth pattern, nitrogen-fixing ability and ecological requirements of

Casuarina also require immediate study.

1170 92 - 7/84

Agroforestry

Africa, Benin, Nigeria, Zaire, humid tropics, ICRAF, case studies, traditional farming systems

KANG, B.T. et al.

10. Agroforestry in africa's humid tropics - three success stories.

Agroforestry Today, April-June 1991, pp. 4-6

This article describes three traditional agroforestry systems that combine multipurpose woody species with food-crop production on low-fertility soils in humid tropical Africa.

Efforts to increase food-crop production in the humid tropics by importing high-input 'modern' technologies have repeatedly led to disappointing results. For this reason, there has been a

resurgence of interest in the traditional farming systems that have proven successful over the years.

The traditional slash-and-burn cultivation system of tropical Africa appears to be biologically stable as long as there is enough land to allow sufficient periods of natural fallow. The productivity of the traditional system declines rapidly with intensification of land use. In response to increasing pressure on land, farmers in some parts of the region have developed innovative production systems combining trees and crops. These systems are well adapted to prevailing soil and climatic conditions and help meet local needs for food and other products.

In Benin's Mono Province bordering Togo, the Adja people practice an improved-fallow system involving the replacement of the traditional bush fallow by densely planted oil palms (Elaeis guineensis). They grow these trees primarily to

produce palm wine, which is often further distilled to make a popular local drink. Fruits from the trees also provide palm oil and the leaves are used for fodder, fencing, roofing, and baskets.

When the trees are felled, the trunks, roots, and other biomass left in the fields help renew soil fertility.

Acioa barteri is one of the three most important woody species in the bush-fallow system of southeastern Nigeria.

This shrub is planted or retained by farmers for nutrient cycling, weed suppression, staking, browse, and domestic uses.

Farmers plant acioa in hedgerows at intervals of 2 to 3 metres. At the beginning of the cropping cycle, the shrubs are burned and the stems cut to a height of 10 to 20 centimeters above ground. Some stems are collected for yam staking or for

sale. Plots are then interplanted with yam, cassava, and sometimes maize. During the second cropping year, only the cassava remains, growing between the acioa hedgerows. In the third year, the hedgerows cover the entire field.

Farmers have practiced this rotational hedgerow-intercropping (alley-cropping) system for generations.

In the Bas-Zaire region of southwestern Zaire, pigeonpea (Cajanus cajan) is the third most important grain legume after groundnut and phaseolus beans. Pigeonpea is grown most intensively along with cassava in the Songololo area. It fills a crucial protein gap in the local diet between September and December before the harvest that follows a long dry season. After the pods are harvested, farmers apply the leaves as green manure on intercropped cassava.

This pigeonpea/cassava system of Bas-Zaire, which produces

food and a little cash, may be a candidate for wider adoption. Experiments are in progress at M'Vuazi and Kimpese, Zaire, to test different spatial arrangements and timing of operations that might improve the traditional system.

These three examples show that farmers are fully capable of developing agroforestry systems that are well suited to their environmental and economic conditions - and without chemical inputs. Although the practices described here may not be as productive as more intensive, high-input systems, they achieve effective nutrient cycling and a degree of sustainability by combining deep-rooted woody species with food crops.

It might be possible to make these traditional systems more productive without losing their advantages, for example by adding low levels of fertilizer or other inputs, or by incorporating more nitrogen-fixing trees. There is a danger

that these systems will be replaced by unstable 'modern' approaches, emphasizing short-term gains at the expense of long-term sustainability.

Research on these well-adapted traditional systems might lead to ideas for making them even better. Insights gained in these areas might also provide a basis for developing more sustainable and productive food-production systems in other parts of the region.

1171 92 - 7/85

Agroforestry

Review, developing countries, fuelwood production, biomass energy, forestry, firewood species, farm forestry, community forestry, woodlots, land-use systems

NAIR, P.K.R.

11. Agroforestry and biomass energy/fuelwood production.

In: Agroforestry Systems in the Tropics; Edt. P.K.R. Nair, Kluwer

Academic Publishers, Dordrecht, The Netherlands; 1989, pp. 591-597

The fuelwood situation in many developing countries has become alarming in recent times.

Recent studies have indicated that fuelwood cutting is second only to clearing land for agriculture as a major cause of deforestation.

Although fuel for cooking is the most important use of firewood, there are also other uses such as heating and lighting. Wood remains the main fuel source even in areas

where forests are rapidly disappearing.

Trees and shrubs constitute the main source of firewood and other forms of biomass energy.

The problem of fuelwood shortage cannot be tackled in isolation from other aspects of rural development. The rather unimpressive performance of large-scale forestry and reafforestation programmes in the developing countries offers a good lesson.

The chances of a programme for fuelwood production being successful are greatly enhanced if it can be tackled the production not only of fuelwood but also of food crops.

Agroforestry can be of value in this context by:

- Incorporating and integrating appropriate species of woody perennials on farmlands along with other

components of the farming system not in a competitive but in a complementary way;

- Integrating herbaceous crops and livestock on forest land according to the agroforestry management schemes so as to facilitate simultaneous production of wood and food crops; and

- Employing agroforestry techniques for reclamation of degraded lands and proper utilization of "wastelands".

Integration of appropriate fuelwood species on crop- and livestock-production units thus seems to be one of the best strategies for fuelwood production in the rural areas of the developing countries.

The greatest scope for improving their efficiency and obtaining tangible results in such a programme lies with initiatives in

smallholdings.

1172 92 - 7/86

Agroforestry

Review, book, Africa, Sahel, semi-arid zones, wood, legume species, natural regeneration, seed dispersal, seed predation, seedlings, seed germination, ecological conditions.

TYBIRK, K.

12. Regeneration of woody legumes in Sahel.

Publ. of Botanical Institute, Aarhus, University in cooperation with DANIDA Forest Seed Centre, Denmark; ISBN 87-87600-35-8, 1991, 90 pp.

Woody legumes are a major feature of the semi-arid

vegetation zones of West Africa and are very important economically in the region, but there is little published information on their natural regeneration. In this short book, Mr. Tybirk gives an overview of the regeneration strategies of 36 species found in West Africa's Sahelian and dry Sudanian zones.

Most of the legumes covered are indigenous, but the author also includes a few exotic species.

He discusses in separate chapters four phases in the natural-regeneration process - seed dispersal, seed predation, germination of hard-seeded plants, and growth of young seedlings. Based on the morphology of the diaspore, personal observations and the literature, he suggests that about 50% of the species covered are dispersed primarily by wind (hemi-legumes or samaras), nearly all species are dispersed either primarily or secondarily by passage through animals (most by

ungulates and a few also by birds and/or primates), and a few species are secondarily dispersed by water.

The chapter on seed predation focuses mainly on predation by the beetle family Bruchidae, which has a major ecological and economic impact on woody legumes in the region. Lists of host-predator associations, host-predator-parasite associations, and seed-predation percentages are compiled from the literature.

The chapter on seed germination presents a general description of seed characteristics, dormancy-control mechanisms, seed banks in the soil, the germination process, and environmental factors affecting germination in the region. The chapter on seedling growth describes seedling development, vegetative regeneration, and environmental factors influencing growth.

The author emphasizes throughout the text that successful natural regeneration depends on complex ecological interactions involving dispersal, predation, germination, timing, grazing, fire, drought, soil type and other factors. He illustrates this complexity with many examples, some of which have important implications for ecosystem management. In the last two chapters, he discusses some general implications for long-term management and sustainable use of woody legumes in the region and provides a useful summary of regeneration characteristics for each species.

This book is a valuable contribution to our understanding of the natural regeneration of woody legumes in the Sahel. It should also stimulate further research in this important area.

1173 92 - 7/87

Agroforestry

Developing countries, review, medicine, medical drugs, plant screening, forests, future strategies

SPORE

13. Medicines from the forest.

SPORE, 37, 1992,. p.5

The medicines in the United States show that 38% contained one or more products of plant origin as the therapeutic agent. Not all plant-derived drugs originated in the tropics but many did so and tropical forests are the richest potential source of new medical agents.

In Ghana, for example, more than 800 woody plants and many other herbaceous species are known for their medical properties. In Asia and the Pacific it is estimated that over 4% of indigenous flora has been utilized in traditional medicine.

Latin America and the Caribbean, particularly the Amazon forests, are widely recognized for their contributions to human health in the past and their potential for future discoveries.

Over half of all plant species are natives of tropical forests.

It is estimated that half of the tropical forests have been cleared already. Destruction continues at 25 to 30 million hectares per year and the majority of plant species are vanishing before they have been recorded or investigated. The fund of knowledge carried by the forest dwellers who are displaced is also being lost.

New strategies must be developed to safeguard them.

The best hope for saving the remaining forests, the potential medicines that they contain and the peoples who know most about them may be in developing what has been termed

"chemical prospecting". This permits commercial organizations to collect and identify plant materials with potential for medical uses in exchange for proper remuneration to the host country.

A similar strategy is to develop "extractive reserves" for sustainable development of forests where forest dwellers would collect rubber, nuts, coca, palm products and medicinal plants for sale. Brazil already has some such reserves and the World Wide Fund for Nature (WWF) supports a project in Cameroon in collaboration with the Cameroons Centre for the Study of Medicinal Plants. In eleven villages local people helped researchers investigate the plants of the surrounding forest, leading to a collection of hundreds of herbal remedies.

A UK company acts as a broker to find potential buyers for medicinal plants on behalf of tropical countries and has supplied major pharmaceutical companies with plant material

from Africa and Asia.

To-date the main focus of activities appears to be in Central and South America and parts of Asia.

1174 92 - 7/88

Agroforestry

Tropics, Caribbean, study, protein production, legumes, trees and shrubs, livestock production, CTA

CUMBERBATCH, R.N.

14. Potential for protein production from tree and shrub legumes.

In: Proc. of a Seminar "Forage Legumes and other Local Protein Sources as Substitutes for Imported Protein Meals",

Kingston, Jamaica, 1987, pp. 50-55

This paper attempts to outline and give some information on the production of protein from tree and shrub legumes.

Certainly it does not attempt to cover all that is known about the more widely used and adapted legumes in the tropics. The author feels that there is need to investigate the legumes that are not so widely used, thereby exploiting the natural sources that may exist within the tropical cattle grazing areas.

In the tropics, forages usually have inadequate levels of proteins and minerals. The low levels severely affect livestock production, resulting in restricted growth rates, slow maturation and lower production.

The leguminous trees and shrubs have not only persisted but have become more diverse, with more than 18,000 known

species. The tree legume family is thus one of the most numerous due to its adaptive traits and efficient use of the earth's natural resources, especially through the symbiotic mechanisms developed in its root structure.

Their rapid growth and high protein content makes them useful as a forage supplement. At the same time, the chemical linkages between the phenolic substances and the leaf proteins makes these resistant to bacterial attack, thereby making them more valuable as sources of nutrients.

Livestock producers are placing greater emphasis on the use of forage legumes in developing ruminant production systems. These legumes are fed either fresh, or are preserved in the form of hay or silage, to be used as a high protein supplement in the diet.

The tree and shrub legume species mentioned in this paper

are:

- Aeschynomene americana L. is a tropical annual adapted to flooded soil conditions, exhibiting much diversity in plant form and growth habit.

- The crude protein content of Aeschynomene is higher than that of alfalfa, with beef cattle making greater weight gains on Aeschynomene than alfalfa in Florida.

- Codariocalyx gyroides, is a shrub indigenous to Southern Asia, reaching heights of over 3 m under fertile conditions.

- Cajanus cajan L. although not usually used as a forage legume in the tropics, does possess excellent characteristics. It is an annual or, more usually, a short-term perennial shrub growing up to 4 m high

and woody at the base.

- Desmodium ovalifolium is of Asiatic origin and used widely in plantation agriculture as a cover crop.

- Desmanthus virgatus, a small nearly erect shrub, 2 to 3 m tall, found in the West Indies and from Florida to Argentina, is not widely used as a pasture species. The legume grows in sandy soils under a rainfall regime of 1000 - 1500 mm and prefers soils of pH 5.0 to 6.5.

- Indigofera hirsuta L. is a legume native to tropical Africa and Asia. The plant grows from 1 to 2.5 m tall, having an erect habit with few lower branches and with medium to fine stems becoming woody as the plant matures. The literature states that Indigofera can be used as a green manure or cover crop

producing up to 5 tonnes of organic matter, and with proper management can make an excellent livestock feed, because of its high protein value and digestibility.

- Stylosanthes guianensis. The genus Stylosanthes has many species, which could be considered as shrub type legumes. Because of the apparent lack of importance of the other species, only S. guianensis is discussed.

- Gliricidia sepium (syn. Gliricidia maculata) trees grow up to 5- 15 m in height. The plant is native to Mexico and the West Indies, with a wide usage including live-fencing, wind breaks, shade trees and fodder.

- Leucaena leucocephala has it origin in Mexico but has spread throughout the tropics. It is a good browse

species but prefers alkaline soil conditions.

The development work with tropical tree foliages as protein sources has been in the field of ruminant production systems. The positive results obtained in early trials proved to be sustainable under a wide range of commercial farm conditions and the rate of uptake of the technology by farmers has been rapid.

Attention should being given to their potential role in the diets of monogastric animals, with special emphasis on their use as supplements to liquid fibre-free feed resources such as sugar-cane juice and molasses. The first observations with pigs indicate that it is feasible to reach forage intakes that theoretically will satisfy the protein needs.

1175 92 - 7/89

Agroforestry

Review, book, economic analysis, finances, incentive schemes, technical issues, economic modelling, cost benefit analysis

PRINSLEY, R.T.

15. Agroforestry for sustainable production; economic implications.

Publ. by the Commonwealth Science Council; Commonwealth Secretariat Publication, Marlborough House, London, SWIY 5HX, K, ISBN 0-85092-342-5, 1992, 417 pp., price £6.50

If a country's man-made assets (factories, machinery) depreciate faster than they are replaced, it is clearly living beyond its means and economic growth is not sustainable. In conventional economics no such concept applies to the depletion of natural resources. As they are used up, no decline

in value is registered to reflect the fall in future potential production. For developing countries which are more dependent on natural resources for income, the danger of treating natural resources as valueless is even greater. There is a clear need for estimates of the costs and benefits of investment in their conservation and use, and Agroforestry for Sustainable Production addresses that need.

The book takes the form of a collection of papers presented at a Commonwealth Science Council workshop held in Swaziland in 1989. Part I is a discussion paper of the key issues involved in the financial and economic analysis of agroforestry. Part II includes papers about incentive schemes, technical issues, economic modelling and cost benefit analysis.

1176 92 - 7/90

Agroforestry

Review, tropics, living fences, agroforestry technology, ICRAF

WESTLEY, S.B.

16. Living fences. A close-up look at an agroforestry technology.

Agroforestry Today, 2, No. 3, 1990, pp. 11-13

Living fences are lines of trees or shrubs planted on farm boundaries or on the borders of home compounds, pastures, fields or animal enclosures.

Their mean purpose is to control the movement of animals or people. This purpose is what differentiates them from other agroforestry technologies based on trees planted in lines, such as boundary plantings, contour strips or hedgerow intercropping. Besides their main function to control human and animal movement living fences may provide fuelwood,

fodder and food, act as windbreaks or enrich the soil, depending on the species used.

In Central America many farmers adopted living fences. The reasons are:

- Increasing population, decreasing farmland, and declining food subsidies were forcing more intensive agricultural production.

- Living fences do not require a large labour input - generally less than one day's work for planting and one or two hours a month for maintenance.

- Living fences provide a secondary benefit in the form of fuelwood.

Living fences/hedges are permanent, densely spaced, single or multiple lines of woody plants. They are regularly pollarded

and trimmed.

Live fenceposts are permanent, widely spaced, single lines of woody plants that are regularly pollarded. They are used to support wire or other inanimate material, such as sticks or dead branches.

Living fences/hedges may be thicker than live fenceposts and may comprise more than one species, including trees, shrubs and smaller plants. They usually do not include wire or other inanimate material.

Farmers in Costa Rica and Honduras supplement their incomes by selling branches from their live fenceposts to neighbours wishing to establish new fences.

Many different tree species are used for living fences, depending on the ecological zone, the availability of stock and

the specific needs of farmers. The most common species in Central America, northern south America and several Caribbean countries are Gliricidia sepium, Bursera simaruba, Spondias purpurea and Erythrina berteoana.

Living fences of G. sepium and Erythrina spp. are harvested to provide fodder for cattle, goats, rabbits and chickens (providing up to 25% of total intake), and the thicker branches of Gliricidia are used for fuelwood. Edible fruits and flowers can also be important, for example the 'jacote' fruit of S. purpurea, which is sold in markets in many Central American countries.

Living fences are a familiar feature throughout much of the African landscape. They appear on the densely populated hillsides of western Cameroon and in Rwanda and Burundi, marking small cultivated plots. In the dry rangelands of Northern Africa and the Sahel they form livestock enclosures

and pathways to protect croplands and pasture from moving animals.

Species used for living fences in Africa include plants with good natural defence systems, such as long thorns, spines or unpalatability.

Examples are Dovyalis caffra (kei apple), Agave sisalana (sisal) and Euphorbia spp. Depending on site conditions and available plant material, a variety of other woody species may be used, including Ziziphus mauritiana, Z. mucronata, Commiphora africana, Erythrina abyssinica and Gliricidia sepium.

As the trees and shrubs grow, they must be pruned, usually on an annual basis. Otherwise, they may take up too much space or cast too much shade on adjacent crops. Root competition may also be a problem.

Well-established living fences may be difficult and expensive to remove, so they should be sited carefully before planting. If planted on a boundary, a living fence will affect more than one land user, so it is important that all land owners and users should agree on its establishment.

1177 92 - 7/91

Agroforestry

Asia, Bangladesh, survey, evaluation, project, homestead agroforestry, land-use system, ICRAF

LEUSCHNER, W.A. and K. KHALEQUE

17. Homestead agroforestry in Bangladesh.

In: Agroforestry Systems in the Tropics; Ed. P.K.R. Nair; Kluwer

Academic Publishers in coop. with ICRAF, Dordrecht, Netherlands; 1989, pp. 197-210

This paper evaluates the general conditions with respect to homestead agroforestry in Bangladesh and reports the results of a field survey.

Trees in the homesteads play an important role in the rural economy of Bangladesh. Often called homestead forests, such plantings are particularly important sources of fuelwood because fuelwood cannot be transported long distances from existing forest areas.

In the absence of other wood sources, improved village forestry and homestead agroforestry are important to the development of Bangladesh and the well-being of its people.

The Homestead Agroforestry Research and Development

Project, being formulated by the United States Agency for International Development (USAID) - Dhaka Mission, has been proposed as a means to increase fuelwood supplies from homestead agroforests.

The many woody species grown in the homesteads are a significant source of fuelwood; they also provide fodder, building materials and other forms of wood. In the context of the prevailing shortage of fuelwood and excessive deforestation in Bangladesh, this homestead agroforestry system needs to be strengthened.

A field survey was undertaken to assess the prospects and feasibility of initiating a programme for the improvement of homestead agroforestry systems.

Concluding, the authors state that the conditions in Bangladesh seem favourable for the successful implementation

of a homestead agroforestry project. Many persons there own their own homesteads and farms, thereby eliminating the disincentive of planting trees which someone else will harvest. Moreover the farmers are familiar with trees and their cultivation, and they believe that they have room to plant more trees.

Thus the level of basic knowledge and perception of opportunity among the farmers is satisfactory.

Channels of distribution for planting stocks must exist or be built.

Plant varieties better adapted to local growing conditions, generally improved growing stock and exotic can enhance programme success, although management practices for these plants must often be taught.

Existing government nurseries and extension services are appropriate institutions for distribution and teaching to start with.

Forest services have traditionally managed only trees grown in large forested areas. Many foresters consider working with other species unprofessional or demeaning. Foresters must shift part of their emphasis from the traditional forest trees to multipurpose trees which people desire. In addition, management practices for multipurpose and other species are important. These should include practices for individual and small groups of trees, as well as large planted areas.

The study shows that women play an important role in collecting fuel and in planting and cultivating trees. This implies that programmes should strongly consider modules to inform women of the new plant materials and to teach them new cultural and management practices.

1178 92 - 7/92

Agroforestry

Review, book, guidelines, rapid appraisal, agroforestry research, extension

ABEL, N.O.J. et al.

18. Guidelines for training in rapid appraisal for agroforestry research and extension.

Publ. of School of Development Studies, University of East Anglia

Norwich NR4 7TJ, UK, ISBN 0-85092-337-9, 1989, 117 pp.

The Commonwealth Science Council and the Forestry Commission of Zimbabwe collaborated in a training and

research exercise in Shurugwi Communal Area in Zimbabwe in 1988, which resulted in the publication of "Guidelines for Training in Rapid Appraisal for Agroforestry Research and Extension", published by the University of East Anglia UK, and funded by the Ford Foundation.

The guidelines will help research and extension personnel in rapid appraisal methods for the development of agroforestry in peasant land-use systems.

The authors say that four key principles underlie the methods used: the first is "interactive research" whereby agroforestry interventions are identified and developed through working with and learning from farmers and the local community, as well as through conventional resource assessment. The second, "learning by doing", assumes that interactive research is best learned through real application rather than through lectures or classroom exercises and simulations. The third

principle is "inter disciplinary", and is the key to successful interactive research.

Finally, agroforestry interventions are developed from an understanding of constraints and conflicts existing within the rural community over access to production resources.

This is a practical, easy-to-read, spiral-bound book, which takes the reader through the project step-by-step with charts, diagrams, clear text, and colour photos.

1179 92 - 7/93

Agroforestry

Review, tropics, Central America, multipurpose tree, Erythrina, legume tree, CATIE

RUSSO, R.O.

19. Erythrina (leguminosae: papilionoideae): a versatile genus for agroforestry systems in the tropics.

J. of Sustainable Agriculture, 1, (2), 1991, pp. 89-109

Some of the most common uses of Erythrina species are discussed in this review related to specific agroforestry applications.

Although common throughout the tropics, the many species of Erythrina have not received much attention from researchers or development workers. Yet these trees of the family Leguminosae grow quickly and have considerable potential for supplying fodder, fuelwood and other products, for providing shade to coffee and tea, and for restoring eroded sites.

The genus Erythrina is of special interest in the development of agroforestry systems because of its adaptability to several

uses (e.g., live posts for fences, shade trees for perennial crops such as coffe and cacao, forage for livestock, and others).

They thrive in hot climates, with mean annual temperatures from 30 to more than 38 C. Although well adapted to drought, they also grow well in areas with annual rainfall of up to 1200 millimetres. They can survive in soils with a pH of 8.7 and up to 0.11% salt concentration.

With their rapid growth and extraordinary nodulation, the Erythrinas are a good source of organic matter for green manure. Dry foliage contains from 1 to 3% nitrogen. When incorporated into the soil, it improves fertility, moisture, nutrient retention and general tilth.

In Costa Rica, for instance, the use of Erythrina for shading or nursing other crops is a common agricultural practice in both

coffee and cacao plantations. There is a great deal of evidence showing its value as a "natural fertilizer" supplier and nutrient cycling helper. The calculated figures show that the return of nitrogen to the soil and nutrient cycle in coffee, cacao, and also in maize, can save up to 200 kg N/ha per year.

A considerable research effort in working with this genus has been done in the Tropical Agricultural Center for Research and Training (CATIE), Turrialba, Costa Rica through the Erythrina Project.

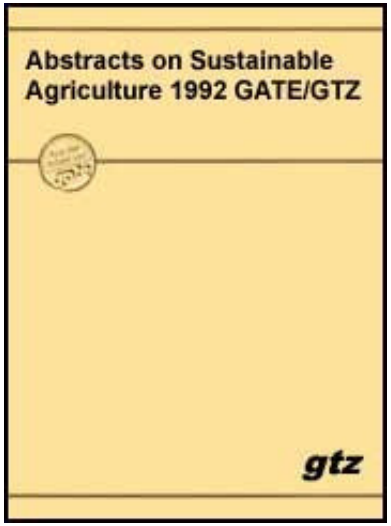
This research project supported by the International Development Research Center (IDRC) from Canada, produced a large amount of research and also compiled a substantial bibliography on the genus.

Field trials would be useful to compare different Erythrina species and varieties in terms of growth rates and fuelwood

and fodder quality.

There is also a need to test the potential of different species as sources of good-quality paper and pulp.

Home"" """"> ar.cn.de.en.es.fr.id.it.ph.po.ru.sw



Abstracts on Sustainable Agriculture (GTZ, 1992, 423 p.)
Abstracts on homegardens
Acknowledgements
1. Household gardening projects in asia: past experience and future directions
2. Vegetables research and development in the 1990s - a

strategic plan

- 3. Biotechnology developments in tropical vegetables.
- 4. Characteristics of the bio-intensive approach to small-scale household food production.
- 5. Sustainable agriculture intensive feed garden.
- 6. Handling and storage of cowpea vigna unguiculata (l.) Walp. As a leaf vegetable.
- 7. Dry-season gardening projects, Niger

Abstracts on Sustainable Agriculture (GTZ, 1992, 423 p.)

Abstracts on homegardens

Acknowledgements

1180 92 - 8/41

Homegardens

Asia, proceedings, workshop, household gardens, sustainable development, nutrition, projects, failures, successes, AVRDC

MIDMORE, D.J. et al.

1. Household gardening projects in asia: past experience and future directions

AVRDC Technical Bulletin No. 19; Workshop Report, Bangkok, Thailand, Mai 1991; price developing countries USD 3.50, elsewhere USD 5.00

Food production near human settlements has been a major food security and survival strategy, particularly in the developing world. Since household gardens have been around almost since the beginning of agriculture, they have been taken for granted and their benefits sometimes go unnoticed.

At AVRDC the household garden concept is receiving renewed attention because of its considerable potential as a development tool. Such food gardens contribute substantially to the nutritional and economic status of the poor.

The benefits and advantages of household garden projects as well as the constraints and implementation strategies were among the issues discussed in a 3-day workshop organized by AVRDC, the Users Perspective with Agricultural and Rural Development (UPWARD) and the International

Development Research Centre (IDRC) for practioners in Asia

and elsewhere on 12-15 May in Bangkok.

Participants came from Bangladesh, Indonesia, the Philippines, Sri Lanka, Taiwan, Thailand and the USA.

The participants discussed the constraints and factors that have contributed to the success and failure of particular garden projects.

Too often, homestead or underutilized marginal land is the only resource available to the landless and near-landless groups and urban slum dwellers. Intensive gardening can turn this space into a productive source of food and economic security. The technology requires little capital investment and risk.

Household gardens are efficient users of soil, water, sunlight and household wastes, and therefore present an ecologically

sound land management system. As a multiple cropping system, they prevent depletion of soil nutrients and represent repositories of diverse plant genetic resources. They also do not use toxic chemicals in contrast to field-based agriculture.

Household gardens are also an efficient way of using limited resources such as time, energy, money and land among the low-income groups. They offer women, who are usually the providers of family meals, with an important means of earning income without overtly challenging cultural and social restrictions on their activities. In addition, other family members such as the children and the elderly can provide labor.

One of the glaring reasons identified by the participants for the failure of garden projects was the lack of a long-term commitment of development and funding agencies and project personnel. This can be attributed to the perception that

household food production is easy to promote, which is hardly the case.

Reaching the poorest segments of the population is actually more difficult than getting through to the large-scale commercially-oriented farmers due to psychological, educational, social, motivational and behavioral barriers.

Promoting household food production requires qualified and committed project personnel who understand the local situation. Furthermore, there is a need to develop technologies that are compatible with household needs and resources.

To ensure the long-term success of this development intervention, integrated support for family gardens within the existing national agricultural development framework must be promoted.

A summary of the recommendations of the participants for successful implementation of garden projects follows below:

- Build upon user needs from the beginning of the project.

- Use secondary information and cost-effective appraisal techniques to assess the limiting constraints in the project.

- Formulate clear and achievable objectives.

- Use already available potential solutions to constraints faced in household production.

- Offer complete technology packages to promote household gardens since marginal households are selective and adaptive in their adoption and use of recommended practices and technologies.

- Emphasize locally-adapted species, but not to the complete exclusion of commercially exotic species.

- Direct training at users, through community-based garden promoters and the judicious siting of demonstration plots.

- Employ social marketing techniques to build up motivation and provide nutrition education.

- Exercise caution in evaluating the difficult-to-assess social benefits of garden projects.

- Motivate project participants to take up household production for its own intrinsic value rather than for free inputs which distort incentives and affect the sustainability of results.

1181 92 - 8/42

Homegardens

Developing countries, Asia, Africa, Latin America, strategic plan, vegetables, economic value, agroecological zones, production systems, research, training, technology, transfer, monitoring, international cooperation

AVRDC

2. Vegetables research and development in the 1990s - a strategic plan

AVRDC Publication No. 91-362; AVRDC, P.O.B. 205, Taipei 10099; ISBN 92-9058-050-x, 1991, 61 p.

This 10-year strategic plan outlines the nature of the challenge and describes AVRDC's vision of the future. It reviews AVRDC's current status as an institution and analyzes the choices it has made in revising its strategy and planning

its future activities and programs.

Vegetables are important foods and vegetable production, marketing and processing are significant contributors to income. Population growth and urbanization are creating increased demand for food, and concerns are rising about malnutrition, especially in peri-urban areas. There is also growing concern that unenlightened methods of vegetable production are having adverse effects on the environment.

Economic trends suggest that vegetables will increasingly contribute to improved diets in the developing countries in the future. The adoption of improved varieties and efficient methods of vegetable production has the potential both to raise incomes and give greater equity in their distribution, while improved cultural practices will help to protect the quality of the environment and conserve natural resources. But several obstacles - technical, economic, and institutional -

stand in the way of achieving this potential.

Increased production and improved handling of vegetables have great potential to enhance the nutrition of the rural and urban poor in the developing countries, as well as to increase their incomes and provide greater opportunities for employment. Unfortunately, the national institutions charged with the responsibility for vegetables have, for the most part, only limited capacity to solve the problems and accelerate progress. Consequently, there is tremendous scope for international collaboration to meet these needs for vegetables in ways that have already proved successful with the cereals and other staple food crops.

In its evolving program strategies, AVRDC will position itself to exploit the special strengths of an international center. It will help accelerate capacity building of its national partners and promote synergy and complementation among them and with

its own efforts. It will move progressively towards greater emphasis on strategic research, forging new links with advanced research laboratories to keep abreast of the rapidly advancing frontiers of science and technology. It will strengthen its activities in all aspects of the conservation and distribution of genetic resources; expand its information services; and reorient its training program to focus on research training at headquarters and conduct most of the production training in its regional programs.

While retaining its emphasis on crop improvement as the most cost-effective means of increasing productivity, AVRDC will support an integrated set of research activities aimed at improving both the crop and the environment in which it is grown. It will restructure its programs to give a more comprehensive coverage of problems in vegetable production - from seed production to postharvest handling and distribution.

1182 92 - 8/43

Homegardens

Tropics, vegetables, biotechnology methods, clonal propagation, disease elimination, plant breeding, axillary branching, adventitious shoot formation, crops, analysis of the situation

QUERESHI, A.

3. Biotechnology developments in tropical vegetables.

In: AVRDC Publ. No. 90-331, ISBN 92-9058-043-7, 1990, 194 p.

This paper gives an overview of recent developments in biotechnology in vegetables, where plant tissue and cell culture techniques have been most effectively used.

The primary goals of the in vitro propagation of vegetable crops include production of large numbers of plantlets from species in which plant development from seed is difficult, clonal propagation of a large number of genetically identical plantlets, production of virus-free materials, crop improvement through various techniques of genetic modification, enhanced axillary branching using stem tips and lateral buds as the explants, an adventitious shoot formation.

Biotechnological methods are applied in the following way:

- Clonal propagation:

It is possible by conventional breeding to produce one whole shoot from one cutting under perfect natural conditions. Thus the asexual multiplication of rare and elite varieties of crops has to be handled with great care. It is possible through tissue culture techniques to produce millions of identical shoots from

one portion of a plant within a very short span of time. Thus, rare genotypes can be multiplied and conserved.

- Disease elimination:

A reasonable assumption is that all plants that are propagated asexually by traditional methods (e.g. by cuttings, grafting, bulbs, tubers, etc.) are often infected with one or more pathogens, particularly viruses and other agents. Plant tissue culture is also an asexual method of breeding plants. The superiority of the technique is warranted by the fact that perfectly healthy clones could be produced by the technique of meristem culture. The philosophy of the methodology is that the terminal 2-3 mm portion of plants (meristems) are almost free from viruses, because cell divisions in such parts are very rapid and active. Virus particles, on the other hand, divide comparatively slowly after heat treatment and lag behind. Such meristems could be made to grow into complete healthy

shoots, on nutrient media, under controlled environmental conditions.

- Plant breeding:

Plant breeding by tissue culture could save time, space and money.

These techniques can be used to aid traditional means of breeding.

Embryo culture can be used to overcome incompatibility barriers that exist in nature, while ovule, ovary, pollen and anther culture are being employed to reduce the breeding cycle by producing homozygous lines in the first or second generation. Cell and protoplast culture are new developments for an efficient screening system for mutations.

Homozygous mutations can occur even in somatic tissue

culture giving this technique an edge over conventional mutation breeding.

- Axillary branching:

The advantage of this type of micropropagation is that very little callus is formed and the degree of genetic abnormalities is often reduced. Once the explants are established and axillary bud development enhanced, the cultures can be subcultured for many generations, resulting in increased shoot formation. Shoots, can be excised after elongation and generally rooted either in vitro or in a growth chamber or greenhouse environment. Vegetable crops that have been micropropagated using these techniques include asparagus, broccoli, brussels sprouts and sweet potato.

- Adventitious shoot formation:

Adventitious shoot formation has also been used to propagate vegetable crops in vitro. Lettuce and cabbage are examples of vegetable crops in which adventitious plantlets have originated directly from the primary explant. Adventitious plantlet formation from callus has been reported with asparagus, broccoli, brussels sprouts, chives, cabbage, carrot, garlic, kale, lettuce, pepper, potato, tomato and sweet potato. The disadvantage of adventitious plantlet formation is that genetic variability often increases, especially when the plantlets are derived from callus. The genetic variability generally tends to increase as the length of time the callus remains in culture increases. The genetic variability commonly observed in these cultures includes variation in phenotypic expression, yield variability and loss of organic potential, and is generally the result of chromosome abnormalities and/or ploidy changes in chromosome number.

A state of the art report regarding the various methods used

in vegetable production is outlined in this article.

Concluding it can be said that biotechnology offers considerable scope for the improvement of most tropical vegetables. Such techniques can be safely used in conjunction with conventional breeding practices to boost vegetable production.

1183 92 - 8/44

Homegardens

Asia, Philippines, China, developing countries, food production, sustainability, small-scale households, low-input system, recycling, space-intensive, labour-intensive, water conservation, appropriate technology, nutrition, pest control, genetic resources, ecology

GONSALVES, J.F.

4. Characteristics of the bio-intensive approach to small-scale household food production.

AVRDC Publ. No. 87-273, Proc. of the Vegetable Improvement Gardening

Workshop; AVRDC, Shanhua, Tainan, Taiwan, ISBN 92-9058-028-3, 1988, pp. 93-99

The bio-intensive approach, as the name suggests, is a biological (as opposed to chemical) form of agriculture in which a small area of land is intensively cultivated with the use of nature's own ingredients to rebuild and then maintain the soil's productivity.

At the heart of the approach is the effort to improve the soils capability to nurture and sustain plant life. What a bio-intensive gardener tries to do on his small plot is to stimulate

or replicate a natural forest (with the constant recycling of nutrients and maintenance of soil, moisture, and microbial conditions). Many countries of the world (and China is particularly notable) have farmed biologically for thousands of years and have been able to sustain output levels over those years. In sharp contrast the "efficient" but short-sighted approaches being used in many Western and Third World countries have often been disruptive of the natural resource base.

Farmers in many parts of the world are experiencing the fact that they have to use steadily increasing quantities of fertilizers and pesticides to sustain previous yield levels.

In the bio-intensive approach being recommended here for small-scale plots, the soil is gradually enhanced and the composition of beneficial microbial life actually improves from season to season. The soil structure and humus content is also

supported. The nutrient content of the soil is built up, rather than depleted, after each crop. A healthy soil means a healthy stand of plants, and that means less insects and diseases. In the bio-intensive approach, yields continue to rise for the first few years and then tend to stabilize at an overall higher yield.

Such systems and the outputs (i.e. yields) are easily sustained at that level for many years with unchanging or even reduced levels of material and labour inputs.

The bio-intensive system is characterized by a greatly reduced dependence on expensive inputs that are generally used in conventional food production approaches. Many of these nonrenewable inputs, such as chemical fertilizers and pesticides, are produced at high energy costs (usually petroleum-based). Instead of chemicals, plant and animal wastes and natural mineral substitutes are used. In the methods being advocated here, the inputs required are bones,

wood ash, eggshells, compost, ipil-ipil leaf meal or fish meal.

Locally available seeds are advocated rather than hybrid and other imported substitutes. Experience suggests that it is feasible to achieve a 100% self-reliance in recurring input needs. Other than hand tools, all material inputs are usually available locally or within easy access.

This reduces significantly or eliminates the need for cash outlays. It also provides the producers with a sense of control over the required production resources. Finally, by emphasizing the use of local and biological resources, rather than energy-intensive, fossil-fuel-based chemical imports, a small step is being made in the direction of conserving the world's nonrenewable resources.

The bio-intensive approach to food production at the household level differs considerably from the conventionally

introduced gardening systems because of its stress on deep-bed preparation, nutrient recycling, building up of the soil's biological base, diversified cropping, and a balanced and integrated ecosystem.

1184 92 - 8/45

Homegardens

Asia, Africa, feed garden, fodder production, legume trees, shrubs, grasses, marginal lands, livestock, integrated systems

5. Sustainable agriculture intensive feed garden.

Sustainable Agriculture, 3, No. 1, 1991, 14-16

The concept of an Intensive Feed Garden (IFG) was adapted and tested in the Philippines by the International Institute of Rural Reconstruction (IIRR), based on a design originally

developed by the International Livestock Centre for Africa in Ethiopia. IFG aims at maximizing the cultivation of fodder production per hectare through intensive cultivation of leguminous trees/shrubs and grasses on a small area (10m x 20m). This technology is recommended for marginal lands, areas where land is scarce, areas where it is compulsory to confine livestock and is most appropriate for areas where feed is not readily available for a cut-and-carry system.

An IFG provides renewable sources of nutritious and palatable fodder, fuel and green manure; curbs soil erosion, conserves soil moisture and increases soil fertility; increases the productivity of a given piece of land by interplanting diverse species of fodder trees, shrubs and grasses; provides a stable agricultural system for the semi-arid tropics; and reduces the danger of toxicity problems from noxious weeds and contaminated poisonous fodder.

An intensive fodder garden is usually established on a small piece of land (10m x 20m). Larger plots may, however, be used, depending on the number of animals to be maintained. One of the recommended designs of an IFG (yield: 20 tons dry matter/ha) incorporates legume trees, shrubs and grasses. A spacing of four meters between rows of trees is maintained.

The space between trees in the row is one meter. The grasses are spaced 75 cm, between rows and 30-40 cm between hills. While grasses and leguminous shrubs/vines are mature for cutting in six to eight weeks, they should be cut on a 10-12 week cycle for optimum productivity. More frequent cutting will reduce total productivity.

The land should be cleared of all weeds before land preparation and planting. Since forage grass (i.e., Panicum) seeds are small, they require a fine seedbed. If vegetative planting materials are used, a rough seedbed is tolerated.

Flamengia, Rensonni and Gliricidia can be planted either on a flat or ridged land and must be planted ahead of the forage grass to minimize shading for the first six weeks. Forage trees may be planted by direct seeding or by nursery seedlings. Direct seeding is easier, cheaper and feasible in areas where annual rainfall is 1,200 mm or more with a minimum growing season of about 200 days. Planting of seedlings is recommended at the start of the rainy seasons. If irrigation is available, planting can be done anytime of the year. The ideal depth of planting should be about 2.0 cm, with two to three seeds per hill.

The following fodder trees, grasses and legumes are recommended:

- Fodder trees: Gliricidia sepium, Leucaena leucocephala, Cajanus cajan, Sesbania grandiflora.

- Grasses: Pennisetum purpureum, Panicum maximum, Brachiaria mutica, Cynodon plectostachyus, Digitaria decumbens, Pennisetum clandistinum, Dicanthium aristatum, Bracharia decumbens, Chloris gayana.

On fertile land, fertilizer may not be necessary; however, on moderate to low fertility soils, decomposed animal manure could be incorporated in the soil at least two weeks before planting. If manure is not available, a side dressing of 15-15-15 fertilizer (in the initial year of establishment only) at about 150 kg per hectare (four to six weeks after planting) can boost the initial growth of tree seedlings and forage grasses. After one to one-and-a half year of establishment, the fertilizer requirements of the grasses can be met by returning 50 to 70 percent of the cut leaves from the tree species back to the soil in the form of mulch. All the grasses and one-half to one-third of the tree leaves can then be used as animal feed.

In the first year, IFG production in a plot measuring 200 square meters would be sufficient to supply 25 percent of the daily intake of 3.6 small ruminants (goats or sheep). Foliage yields in the first year range from 9 to 20 tons/ha dry matter. Increased yields can be expected during subsequent years. To maintain a cattle fattener, there is a need to develop 400 meters of intensive feed garden area.

1185 92 - 8/46

Homegardens

Africa, Latin America, study, cowpea, leafy vegetable, grain legume, post harvest, quality loss, handling, storage

BITTENBENDER, H.C.

6. Handling and storage of cowpea vigna unguiculata (l.) Walp. As a leaf vegetable.

Trop. Agric. (Trinidad), 69, No. 2, 1992, p. 197-199

This study examines the effects of temperature and package ventilation on the storage life of fresh cowpea leaves.

Cowpea, Vigna unguiculata (L.) Walp., is a popular leaf vegetable and grain legume in many parts of Africa.

Most commonly, leaves are served boiled to accompany a starchy porridge; fried and fresh in relish are other popular methods.

The cowpea has many desirable horticultural characteristics not usually associated with leaf vegetables. It is an efficient nitrogen-fixing, heat- and drought-tolerant legume. A single planting yields leaves, immature pods, and immature and mature seeds. Cooked leaves contain two-thirds the protein, seven times the calcium, three times the iron, half the

phosphorus, eight times the riboflavin, five times the niacin and several hundred times the asorbic acid and beta-carotene of the cooked seed. Amino acid composition indicates that cowpea leaf protein is superior to seed protein.

Drying boiled or blanched cowpea leaves is a widespread method of preservation.

"Vita 7", a erect cowpea cultivar with short trailing vines was selected for the study.

It was released by the International Institute for Tropical Agriculture, Ibadan, Nigeria, for its high yields and adaptability throughout Africa and Brazil.

Storing cowpea leaves in shaded, closed polythene bags or any container with minimal ventilation at ambient temperature increases storage life of cowpea leaves compared with open

storage. Minimal cooling lengthens the period of storage, but temperatures below 15 C will induce chilling injury. If leaves are cooked immediately after removal from cold storage as would be expected if leaves were stored in the home, chilling injury might not be detrimental. Leaves in cold storage below 15 C at the whole sale or retail level would not remain edible after purchase.

Additional research should determine if ventilation greater than the closed bag but less than the next level tested (25 times greater) can extend the storage life and reduce the development of off-odours at high temperatures due to reduced oxygen levels.

1186 92 - 8/47

Homegardens

Africa, Niger, dry season, gardening projects, Lutheran World Relief

COTTINGHAM, R.

7. Dry-season gardening projects, Niger

In: The Greening of Aid; Ed. Czech Conroy and Miles Litvinoff; Earthscan Publ. Ltd. and IIED, London, 1988, pp. 69-73

The Lutheran World Relief (LWR) programme in Niger started in 1974 a project. This project was designed to truck seeds from Nigeria to the southern parts of Niger and Chad.

The villagers' immediate need was for vegetable seeds. While tomato and okra seeds could be dried and collected, and manioc cuttings could be replanted, other vegetables which would broaden the diet and nutritional base were generally not available. Composting was almost unheard of and difficult

in dry areas, and with the loss of livestock and their manure these people were left to grow a few food items in low-quality soil.

These factors generated the first few modest project attempts. The larger amounts of food grown using chemical fertilizer gave encouragement to the men and women involved, but success was short-lived.

Insecticides in small amounts were imported to control the nematodes.

Villagers were encouraged to hand-exterminate external pests, while the Nigerian agriculture services demonstrated the safe use of insecticides and distributed them. It was rediscovered that nitrogen-fixing legumes (chickpeas) not only provided nutritional vegetables for additional food but were easy to dry, store and replant. If intercropped with other

vegetables they provide nitrogen to the needy soil and cut down on nematode infestation.

Strong, hot wind caused erosion and sand dunes and sapped the life out of vegetables struggling to survive the intense heat. In response, a number of indigenous trees and bushes were planted on pond perimeters and around garden plots. These local varieties of hedges became a simple, effective way to keep out livestock and counter the relentless winds. The effect was to reduce water consumption, to add the new colour of green on vegetables and to strengthen wilting varieties of legumes; the shade given to the earth in the gardens greatly lowered ground temperatures.

Traditional well problems took longest to solve. Work was begun on designing a simple technology to meet the requirements of local replicability and durability.

This technology solved well cave-in and dirty water problems and had the advantages of low cost, simplicity and ease of maintenance.

The most easily measured economic impact is the increased availability of garden vegetables. People have increased food for themselves, which was the primary goal, but most gardeners have surplus vegetables to sell.

Less easily measurable economic benefits are increased production of animal feed from the use of windbreaks and live fencing.

Environmental effects are positive. Live fencing utilizing indigenous species is possible and within the capabilities of local people. Its use has reduced pressure for the use of live and dead thorn-tree branches.

Twelve years' experience in Niger has shown that these dry-season gardens are self-sustaining. People are aware that rain-fed agriculture may never be as it was in past years because of the decline in rainfall.

Dry season garden projects and wells have been replicated in more than 20 areas of Niger with the same success as in the original 8. Burkina Faso, Mali, Senegal and Western Sudan were surveyed for areas with water tables that would allow replication of most of the components of these dry-season gardens.