PD-AAM-582
ISN-28084

936554 / 01

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT IDENTIFICATION DOCUMENT FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE: [A] A = ADD, C = CHANGE, D = DELETE

PID

2. DOCUMENT CODE: 1

3. COUNTRY/ENTITY: WORLDWIDE

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 DIGITS): 936-5545

6. BUREAU/OFFICE: A. SYMBOL: DSB; B. CODE: 10

7. PROJECT TITLE (MAXIMUM 40 CHARACTERS): Agroforestry Research & Training

8. PROPOSED NEXT DOCUMENT: A. [3] 2 = PRP, 3 = PP; B. DATE: MM YY [0 3 8 2]

9. ESTIMATED FY OF AUTHORIZATION/OBLIGATION: a. INITIAL FY [8 2]; b. FINAL FY [8 2]

10. ESTIMATED COSTS ($000 OR EQUIVALENT, $1 =

FUNDING SOURCE		LIFE OF PROJECT
A. AID APPROPRIATED		1000
B. OTHER U.S.	1.	
	2.	
C. HOST COUNTRY		
D. OTHER DONOR(S)		
TOTAL		1000

11. PROPOSED BUDGET AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE: C. GRANT	D. LOAN	E. FIRST FY 82: F. GRANT	G. LOAN	LIFE OF PROJECT: H. GRANT	I. LOAN
(1) FN	149	910		1000		1000	
(2)							
(3)							
(4)							
			TOTAL	1000		1000	

12. SECONDARY TECHNICAL CODES (maximum six codes of three positions each): 970

13. SPECIAL CONCERNS CODES (MAXIMUM SIX CODES OF FOUR POSITIONS EACH): INTR | PART | TNG

14. SECONDARY PURPOSE CODE:

15. PROJECT GOAL (MAXIMUM 240 CHARACTERS)

To assist LDCs manage their natural resources and increase forestry's contribution to production of food, fodder, energy, water, and shelter.

16. PROJECT PURPOSE (MAXIMUM 480 CHARACTERS)

To develop a methodological tool for diagnosis of land use problems on marginal lands, design appropriate agroforestry systems, evaluate the impact of agroforestry land management options, train LDC personnel in the use of the diagnostic methodology and expand and strengthen an international system of cooperating agroforestry research and development institutions.

17. PLANNING RESOURCE REQUIREMENTS (life of project funds)

1 person/month of S&T/FNR direct hire professional staff.

18. ORIGINATING OFFICE CLEARANCE

Signature: William Feldbaum / Jennifer Telchman

Title: Acting Director, S&T/FNR

Date Signed: MM DD YY

19. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENT, DATE OF DISTRIBUTION: MM DD YY

PN-AAT-A

Project Identification Document (PID)
Agroforestry Research and Training
(Project No. 936-5545)

CONTENTS

Attachments:

February 23, 1982

Project Summary

This three-year project will contribute to achieving AID's mandate to assist Less Developed Countries (LDCs) manage their natural resources and increase forestry's contribution to production of food, fodder, energy, water, and shelter, by supporting research, development and training in agroforestry. The project will utilize an interdisciplinary approach to land management to focus on applied problem-oriented research and development rather than on academic studies. Training will stress problem identification and practical solutions.

Research will be in three areas: 1) an inventory of existing agroforestry systems throughout the world, 2) the development of a practical methodology to diagnose land use problems, and 3) the design of productive agroforestry management solutions.

Training in the use of the methodology to diagnose land use problems will be provided to research scientists, resource planners, and development agents throughout the world. Training will be done at farm sites where the diagnostic methodology has been applied and evaluated.

Training materials will be developed for each of these sites.

An international network of LDC agroforestry research and development institutions will be expanded and strengthened through the research and training activities supported by this project.

Implementation of the project activities will be through a cooperative agreement with the International Council for Research in Agroforestry (ICRAF) located in Nairobi, Kenya. Project resources will provide assistance to ICRAF to support the major part of two projects in ICRAF's "Programme 4; Agroforestry Systems, Research and Evaluation, and two projects in "Programme 3; Training and Education". AID will create a technical advisory panel to monitor and guide project activities, to provide close coordination with ongoing AID agroforestry projects, and to assure that AID's training needs in agroforestry are addressed.

Need for the Project has increased as a result of recognition that on much of the marginal and fragile soils where AID is attempting to assist small farmers, the market possibilities of forest products and agricultural production could be substantially increased and soil erosion, deterioration and depletion reduced through the combination of tree cultivation with agriculture. Agroforestry management options have been used by farmers since farming began. Very valid experiences are available, but they have not been evaluated and documented as to their merits and reasons for adoption. Since forestry and agriculture (and at times animal) sciences must be combined in the study and application of agroforestry land management, a new multidisciplinary network of institutions is needed to coordinate and support these activities.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project: From FY 1982 to FY 1984
Total U.S. Funding 1,000,000
Date Prepared: 1/27/82

2a

Project Title & Number: Agroforestry Research and Training (936-5565)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program Sector Goal: The broader objective to which this project contributes (A-1) To assist LDCs manage their natural resources and increase forestry's contribution to production of food, fodder, energy, water, and shelter.	Measures of Goal Achievement (A-2) Greater attention given by LDC governments to the creation of public sector forestry institutions for planning, research and education. Increased level of private sector resource allocation to the management of trees and forests.	(A-3) Review of LDC development assistance proposals, design of development projects, and annual budget.	Assumptions for achieving goal targets (A-4) Natural resource management will be improved and sustainable land use management methods adopted.
Project Purpose (B-1): To develop a methodological tool for diagnosis of land use problems on marginal lands, design appropriate agroforestry systems, evaluate the impact of agroforestry land management options, train LDC personnel in the use of the diagnostic methodology and expand and strengthen an international system of cooperating agroforestry research and development institutions.	Conditions that will indicate purpose has been achieved: End of Project status. (B-2) Diagnostic prepared, tested and evaluated; 60-80 LDC land managers capable of using diagnostic tool; system of collaborating agroforestry R&D institutions established.	(B-3) Periodic reports, ICRAF publications, attendance by USAID personnel at training courses, periodic meetings of collaborating institutions and annual donor's meeting.	Assumptions for achieving purpose (B-4) That A.I.D. inputs are assigned as planned to four specific projects in ICRAF's program, and that ICRAF functions during project period as per their present operating plan.
Project Outputs (C-1) 1. Diagnostic tool for land-use assessment including on-farm testing and evaluation. 2. Global inventory of agroforestry systems and establishment of a network of collaborating agroforestry research and development institutions. 3. Agroforestry training materials. 4. Agroforestry training courses for LDC resource planners, research scientists, and development agents.	Magnitude of Outputs: (C-2) FY 1982-First Approximation of Diagnostic tool developed and printed. -Publications on 5 case studies of farms surveyed. -Curricula and materials developed for 2-3 week course in agroforestry research techniques. FY 1983-First draft of Diagnostic handbook based on farm trials. -Publications on 5 case studies. -Global survey of agroforestry systems and research institutions. -one 2-3 week agroforestry course in Kenya. -one 2-3 week agroforestry course in Latin America or Asia. FY 1984-Final of Diagnostic Handbook. -Series of scientific, educational publications. -List of agroforestry research and development issues. -AF systems register and data bank. -Teaching and training package series for use by LDC institutions. -one 2-3 week agroforestry course in Kenya. -one 2-3 week agroforestry course in Latin America or Asia.	(C-3) Publication and dissemination of case studies, curricula, diagnostic handbook, and training packages. Formal establishment of cooperative activities with research institutions throughout the world. Periodic ICRAF reports. Attendance at training courses.	Assumptions for achieving outputs (C-4) Effective Fiscal and personnel management by ICRAF.
Project Inputs (D-1) Disbursements: FY82 - $1,000,000	Implementation Target (Type and Quantity) (D-2) Cooperative agreement signed and executed.	(D-3) Receipt of signed cooperative agreement.	Assumptions for providing inputs (D-4) -Approval of justification for cooperative agreement with ICRAF. -Availability of funds (FY 1982).

Project Identification Document (PID)

Agroforestry/Global Research and Training

I. Problem and Need

Agroforestry is the term used for land use systems which combine the growing of woody perennials on the same piece of land with agricultural crops and/or animals, either integrally or sequentially. These different components interact ecologically and economically, in both positive and negative ways, often changing over time. Agroforestry is chosen over alternative land use systems in circumstances where this interaction of components results in higher productivity, sustainability, and/or diversity of outputs such as food, fodder, water, shelter, energy, and soil fertility and stability.

Development efforts directed at improving the socio-economic condition of the rural poor in the less-developed countries (LDCs) are concentrating on geographic areas where soil fertility is low and where erosion is advanced or potentially high. In these areas, the prevailing ecological, technological, and socio-economic constraints will not permit sustainable use of modern methods of agricultural or forestry based on monoculture plantings, high inputs of fertilizers, and mechanization. It is on such marginal lands in the tropical and sub-tropical world where this deliberate use of woody perennials in combination with animals and/or food crops and animals is being

considered. The potential for agroforestry management alternatives is not limited to these marginal lands, since many successful small farmers' systems in the tropics are located on high potential sites and have proved to be highly competitive and, in some cases, economically superior to other alternatives. However, AID is working in natural resource management in predominantly marginal areas of the LDCs, and it is the potential of agroforestry to increase productivity and sustainability on these lands that this project will address.

Agroforestry may also be the favored land use alternative in situations where land tenure or lack of market economy infrastructure (e.g. roads, markets, transport) makes it necessary for individual farmers or small groups of farmers to produce most of their food, fodder, fuel, and shelter using their own land and labor.

Agroforestry has been practiced in many traditional farming societies and in commercial tree crop enterprises, but only over the last few years have scientists and development professionals given serious consideration to the contribution that agroforestry systems can make toward improved land management and higher farm incomes. This increased interest stems in part from widespread concern about increased desertification, deforestation, loss of arable soil through erosion, and rising fuelwood costs. This interest also derives from experiences that have shown the limitations of intensive agricultural technology in many areas of the tropics.

National governments and international aid agencies are spending hundreds of millions of dollars on so-called "agroforestry" development projects. AID, in fact, has numerous projects dealing entirely or in part with "agroforestry". These projects are often characterized by an ad hoc, trial-by-error approach which attempts to find easily replicated cropping combinations that can be applied immediately throughout poor, marginal areas to reverse the trend towards greater degradation of the soil resource and increased poverty. Unfortunately, there is a vast distance between the enthusiasm voiced for agroforestry systems and the actual knowledge of the potential of agroforestry management options and the incentives that lead to their use. The enthusiastic claims of agroforestry proponents are not supported by systematic quantitative information, nor are there relevent methods available on how to assess the social, economic, and ecological feasibility of complex agroforestry systems and how to compare their productivity to that of other forms of land use. In addition, there are very few people trained to conduct research and lead development in agroforestry. As a result, the information and experience already acquired in particular situations is either not available to others who could use it or, what is as common, it is transferred to dissimilar situations and mistakenly applied without the appropriate modifications necessitated by differing ecological or socio-economic conditions.

In synthesis, this project will address (1) the need for an institutional network for global agroforestry research and development coordination that recognizes the interdisciplinary nature

of agroforestry and, hence, provides personnel capable of working in multidisciplinary teams; (2) the need for scientific-based identification and quantification of the potential of different agroforestry land management alternatives; (3) the need for methodologies for research and development in agroforestry; and (4) the need for training materials and field-based training in analytical methods for determining land use potential and possibilities for agroforestry systems applications.

II. Project Description

A. Goal

The project goal is to assist LDCs manage their natural resources and increase forestry's contribution to production of food, fodder, energy, water, and shelter by supporting research, development, and training in agroforestry land management systems. By providing assistance to the nascent but increasingly active and respected International Council for Research in Agroforestry (ICRAF) to carry out the activities outlined in this document, AID will be strengthening and expanding an international research and development network of LDC institutions that will sustain and increase research and training in this field well beyond the three-year period of this project.

B. Purpose

The project's purpose is:

-to develop a methodology to diagnose land use problems on marginal lands,
-to design appropriate agroforestry systems,
-to evaluate the impact of agroforestry land management options,
-to train LDC resource planners, research scientists and development agents in the use of the diagnostic methodology in the implementation of agroforestry technology, and
-to expand and strengthen the international system of cooperating agroforestry research and development institutions.

C. Outputs

The proposed outputs of this project accrue throughout a three year period in four categories: (1) diagnostic methodology development, including on-farm testing and evaluation; (2) global inventory of agroforestry systems and expansion and strengthening of the network of collaborating agroforestry research and development institutions; (3) development of training materials; and (4) agroforestry training courses for resource planners, research scientists, and development agents from LDCs.

1. Diagnostic Methodolog/ Development. A multidisciplinary team will develop a diagnostic methodology to identify land use

problems, to analyze constraints to improved land management, and to identify agroforestry options that remove or reduce the effects of the constraints. This methodology will be tested at the ICRAF research center in Kenya and on farms in other regions, resulting in a practical, effective and quickly applicable diagnostic tool, practical indicators of land use problems, occasional publications and progress reports, a diagnostic handbook, and a methodological basis for outreach projects with cooperating institutions in other countries and regions. See Attachment AA for ICRAF's preliminary description of this diagnostic methodology.

This activity is crucial to the systems approach upon which the remainder of the activities in this project will be based.

2. Global Inventory of Agroforestry Systems and Expansion and Strengthening of the Network of Collaborating Agroforestry Research and Development Institutions. Systematic documentation of important and promising agroforestry systems will be collected worldwide, bringing relevant information on these systems together in one place for evaluation and dissemination. Based upon this information, agroforestry research and development priorities will be identified and a systems register and data bank established to record and update global statistics on trends in agroforestry. Collaborating institutions will be enlisted throughout the world for continued coordination of diagnostic testing, data gathering, research, and training.

Various publications will be printed to disseminate the information gathered in the global inventory, and a book will be published on characteristics and location of the major agroforestry systems.

3. Development of Training Materials. ICRAF has been collecting and evaluating great amounts of information on agroforestry since the establishment of the Council in 1979. Much of this material, as well as numerous in-house papers, contain useful training material. Very little of the material, however, is in a form suitable for training courses. To prepare for the training courses scheduled in this project for years II and III, curricula will be developed for 2-3 week training courses in agroforestry research and technology, including preparation of case study materials and documentation areas, lectures, practical field exercises, and audio/visual materials.

Materials will be developed not only for ICRAF-sponsored training courses, but will also be made available to collaborating institutions in other countries. Special emphasis will be placed on the preparation of materials using the language and case studies of the country and area where the materials will be used.

4. Agroforestry Training Courses in LDCs. The scope and content of various types of training courses will be defined by the project to undertake the practical and theoretical training of resource

planners, research scientists, and development agents in various aspects of agroforestry appropriate to their region.

During each of the last two years of this project, one 2-3 week course will be held in Kenya for 15-20 participants from Eastern Africa, and a similar course will be held in Spanish, French, or English with a collaborative institute in other regions (Latin America, West Africa, Middle East, Asian Sub-continent, South East Asia).

Since these courses will serve as models, and materials will be made available to other institutions, it is probable that additional courses will be held with additional funding from other donors or users.

D. Inputs

The principle AID-supplied input is $1 million, provided through a cooperative agreement, obligated in FY 1982 but expended by ICRAF during CYs 1982, 1983, and 1984 as per Attachment A.

Additionally, AID will establish an in-house advisory committee to monitor the activities funded by this project, and to advise ICRAF and USAID missions on ways that ICRAF's research, development, and training activities and results can contribute to the rest of AID's activities in agroforestry.

ICRAF is chosen as the cooperating agency for this project since it is the recognized leader in global aspects of agroforestry research and development, since it is located in an LDC where AID has a development program and a regional office (REDSO), and since it was established as an international coordinating body. No other institution appears to be as appropriate a recipient for carrying out the activities of this project.

ICRAF is in receipt of increasing contributions from other donors which will be added to the resources from this agreement to support additional activities in Programmes 3 and 4 (to which this project contributes) as well as in five other complementary Programmes (See Section II.H.).

E. End of Project Status

A diagnostic methodology will be developed, tested, evaluated, and disseminated, which identifies land use problems, constraints to improved land management, and which prescribes agroforestry management systems where appropriate. A global field survey of agroforestry systems will be carried out which reviews past experience with agroforestry management, identifies systems and system components of wider developmental potential, determines agroforestry research and development priorities, and establishes an agroforestry systems register and data bank. Various technical publications will be produced and disseminated on agroforestry options in land management, and a major book will be published on

agroforestry. A system of collaborating agroforestry institutions will be expanded and strengthened, with the possibility that membership in the Consultative Group on International Agricultural Research (CGIAR) system could be obtained at a future date. Curricula will be designed and training materials produced to carry out four 2-3 week courses, for 15-20 persons each, on agroforestry systems. The diagnostic tool, publications, training materials, and training course curricula will all be made available to institutions worldwide, after appropriate experimentation and modification.

F. Replicability

The diagnostic methodology and training materials being developed under this project are designed to be of use to a myriad of research, development, educational, and training institutions throughout the world. ICRAF does not plan to set up a service to carry out extensive site-specific research and land use prescription itself; the diagnostic and other materials and information are for use by others.

G. Beneficiaries

Agroforestry research, development, and training institutions throughout the world will benefit from this project by having state-of-the art information on agroforestry, a central institution to turn to for guidance and information, and training courses to which they may send key personnel. LDC rural development

institutions will benefit through the increased availability and rigor of research and training in the field of agroforestry. Large numbers of small farmers will benefit through the application of appropriate agroforestry management systems on marginal lands, resulting in increased soil productivity and increased production of food, fodder, fuel, water, and building materials.

H. Probability of Success

ICRAF, located in Nairobi, Kenya, is a council with a global mandate to promote, initiate and support agroforestry research in developing countries. ICRAF will fulfill its mandate through methodology development, a strong program of information dissemination, and a center for documentation and information on agroforestry. To carry out its work, ICRAF has outlined a coherent, multidisciplinary plan of work divided into seven "programmes":

-Programme 1; Management and Administration Director's Office, Board and Committees, Programme Planning and Coordination, Finance and Administration.

-Programme 2; Information Services Library, Publications, Documentation, Information research.

-Programme 3; Training and Education Agroforestry education workshops, Training materials, Training courses, Fellowship schemes, On-the-job training, curriculum development.

-Programme 4; Agroforestry Systems - Research and Evaluation Diagnostic methodology, Systems inventory and Evaluation, Systems modelling, Assessment methods, Workshop on "Agroforestry and Cash-Crop Based Land Use Systems".

-Programme 5; Agroforestry Technology-Research and Evaluation Agroforestry Reviews, Science and Practice Booklets, Crop Sheets, Fast-Growing, Nitrogen-Fixing Trees, and other projects/publications on individual elements or products of agroforestry systems.

-Programme 6; Field Station Machakos Station development, Evaluation of multipurpose trees, Nursery, Demostration plots.

-Programme 7; Collaborative and Special Projects American Tropics (Peru, Brazil, Costa Rica, Dominican Republic), Sub-Saharan Africa (W. Africa, Kenya, Tanzania), S.E. Asia (Indonesia, Philippines, Malaysia, Thailand), South Asia (Nepal, India, Burma, Bangladesh, Sri Lanka), Mediterranean/M. East (Syria, Pakistan, Tunisia).

This project will support critical portions of programmes 3 and 4, as has been explained throughout this paper. ICRAF's Charter is included as Attachment B.

Successful execution of the project will depend on ICRAF's ability to put together and support an interdisciplinary team of social and physical scientists drawn from the forestry and agricultural sectors. In addition, ICRAF will obtain increasing

amounts of financial and human resources (secundments) from donor institutions to carry out the many elements of their program not covered by this project. ICRAF will also need recognition and cooperation from international, LDC, and industrial country institutions in both the forestry and agricultural sectors. Attachment C lists the scientists that make up the ICRAF core staff. It is a very respectable group of individuals, providing a good balance between experience in different geographic areas of the world, practical field work, publishing of scientific work, and different disciplines of forestry and agriculture. This project would provide the means to establish an agricultural training capability, absent at this time and crucial for execution of the training activities. Success depends upon the individuals being able to work in teams, and receiving high quality guidance from their Board of Directors, which is also an excellent group of scientists. (see Attachment D).

ICRAF has confirmed funding commitments from donor development institutions for the period 1982-1984 for a total of approximately US $3 million, including the Canadian Agency for International Development (CIDA), the Swiss Development Corporation, the Netherlands Ministry of Development, the German Agency for Technical Cooperation (GTZ), the International Development Research Centre (IDRC), the German Fund for International Development (DSE), and the National Academy of Sciences (USAID Research Grants project on Fast Growing, Nitrogen Fixing Trees). Additional funding is likely for the period from IDRC, The Ford Foundation, and NAS. Confirmation of

approval of this AID support will no doubt serve to convince other donors to increase support of ICRAF.

With the appointment in 1980 of Mr. H.A. Steppler as interim Director of ICRAF, the institution reevaluated agency goals, adopted a more realistic and appropriate international role for ICRAF, and began to improve international respectability of the individual staff members and ICRAF as a whole. The present Director, Dr. Bjorn Lundgren, has continued ICRAF's redirection and has added to its professional reputation. He was named in absentia as co-chairman of the International Union of Forest Research Organizations (IUFRO) working group on agroforestry, at the 1981 IUFRO meeting in Kyoto, Japan.

ICRAF has a regularly published "Newsletter" (see Attachment E) and a growing list of agroforestry publications (see Attachment F), all of which contribute greatly to ICRAF's role as the lead international institution in agroforestry.

Attachment AA. Preliminary Description of Diagnostic Methodology

ICRAF

PROGRAMMES ON

COLLABORATIVE AND SPECIAL PROJECTS

AND

AGROFORESTRY SYSTEMS RESEARCH AND EVALUATION

CONCEPTS AND PROCEDURES FOR DIAGNOSIS OF EXISTING LAND MANAGEMENT SYSTEMS AND DESIGN OF AGROFORESTRY TECHNOLOGY

- A PRELIMINARY VERSION FOR COMMENT -

1. INTRODUCTION

It is now evident that trees and shrubs, which are important components of practically all indigenous land management systems in the tropics, play important roles in providing many non-food essentials, maintaining and restoring soil fertility, minimizing soil erosion, providing livestock feed and preventing degradation of the overall ecosystem. Unfortunately, there are many areas of the tropics where population pressure has reduced the effectiveness of indigenous systems, and man, in an effort to increase his food supply to meet immediate needs, is destroying trees which appear essential for his long term survival.

The agroforestry approach to land management appears as a promising way to mitigate this apparent conflict. Unlike other approaches focusing on the improvement of components or bioeconomic sub-systems, the agroforestry one considers the entire landuse system. In doing so it may integrate woody and herbaceous crops with livestock on the same unit of land to design a sustainable and productive system of landuse compatible with prevailing ecological, cultural and economic circumstances, and consistent with the development goals of local people and governments.

It is in this context that ICRAF has been given the responsibility of contributing to the promotion of research activities leading to the development of agroforestry technology. Land management systems constitute the object of such activities, and the Council's contribution will be mainly channeled through a methodological capability for diagnosing existing land management systems to design agroforestry alternatives, whenever appropriate.

Since land management systems are conditioned by the agro-ecological and socio-economic circumstances in which they operate, that institutional capability would be enhanced by exposing it to problems

different circumstances. As this could hardly be accomplished at a particular site, ICRAF decided to develop a Programme on Collaborative and Special Projects.

2. THE COLLABORATIVE AND SPECIAL PROJECTS PROGRAMME

The objective of the Programme is to develop a network of collaborative institutions interested in carrying out research on agroforestry, as an alternative approach to land management. It is expected that activities of network members will be complementary to each other in both the land-use circumstances involved and their contribution to the different stages in the cycle of technology development. In this respect, ICRAF's main contribution will be focused on the diagnosis and design stage, while the collaborating institution will emphasize the generation and dissemination of technology.

It is the strategy of the Programme to provide a framework to facilitate the implementation of and estimate resources involved in cooperative activities, by:

- defining agroecological zones where prevailing conditions indicate a potential for an agroforestry approach to landuse systems;
- identifying within target areas national and international institutions whose functions and infrastructures makes them potential partners for joint agroforestry endeavours;
- formulating joint projects aimed at understanding existing land-use systems for designing and disseminating alternative agro-forestry technologies;
- establishing for each case the specific nature of inter-institutional cooperation, including resource allocation and management;
- monitoring and evaluating project developments.

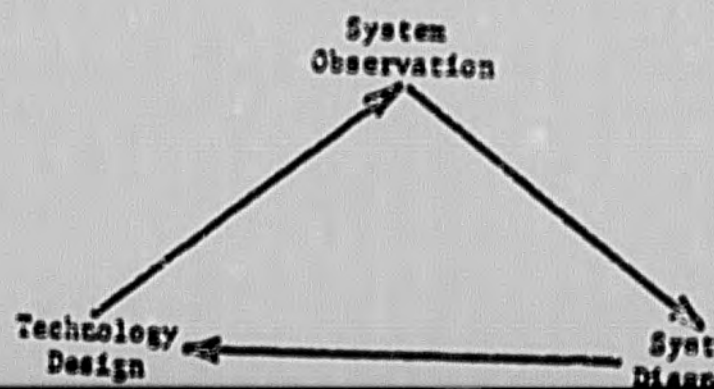
To achieve the mentioned complementarity with regard to land management

circumstances, research projects within the Programme will preferably be carried out on sites representing combinations of geographical and ecological regions. The underlying assumption is that geographical regions (Sub-Saharan Africa, Tropical America, South Asia, South-east Asia and Mediterranean) enclose broadly similar cultural conditions. Developing projects for different ecosystems within each region will expose the agroforestry approach to a spectrum of circumstances where it could play a role.

3. OUR APPROACH TO PROJECT DEVELOPMENT

The assumption which underlies our approach is that the most suitable basis for formulation of an agroforestry development project is a careful analysis of the actual circumstances and problems of land management in the project area. It is further assumed that the most appropriate and adoptable technology is one which is designed specifically to solve those problems. We also recognize, of course, that a quick turn around is necessary on survey activities in order to have an influence on the project planning cycle. The aim of our methodology development efforts, therefore, is to develop a practical, effective, and quickly accomplishable diagnostic protocol for use in a wide range of environments around the world. Fig. 1 depicts the basic logic of the technology development cycle.

FIG. 1: LOGIC OF THE TECHNOLOGY DEVELOPMENT CYCLE



The cycle begins, naturally enough, with OBSERVATION of the existing land management system whose improvement is sought. In the initial entry cycle, this observation takes a form analogous to a medical examination and results in a *description* of the landuse system in terms of the essential features of system structure and function against the background of prevailing agro-ecological and socioeconomic conditions. In subsequent cycles system observation takes the form of a "perturbation experiment" with extended monitoring and special studies.

With the results of the examination and the aid of rapid assessment survey methods and modeling techniques we arrive at a DIAGNOSIS of land management constraints and problems which, on analysis, allows us to identify the corresponding *potentials* for agroforestry type solutions. The diagnosis determines what problems are to be solved and specifies the functional attributes and other design characteristics of appropriate technologies. The final output of the diagnostic phase is a set of type-specifications which define the design problem to be tackled in Phase 3.

The internal workings of DESIGN phase are best understood by referring to the flowchart depiction in Fig. 2, together with the step by step outline that follows. Suffice it here to note that there are two possible kinds of outputs from the design phase:

1. Designs for improved land management systems incorporating known "off-the-shelf" agroforestry components and practices which are *deemed generally appropriate* and sufficiently promising to warrant immediate farm trial.

2. Notional technologies suggested by the diagnosis and design process which seem to hold promise for filling significant gaps in the current inventory of technology and which would appear to merit further R&D on a collaborating Research Station.

Assuming that the Diagnosis and Design phases find that there is a role for agroforestry in the project area, and if there is an appropriate agroforestry technology at the ready, the next step in the cycle is to submit the candidate

technology to FARM TRIALS. Conceived as a type of "perturbation experiment" designed to study the response of the system to an intervention, the purpose of these *in situ* trials is twofold:

1. To evaluate, through farmers' feedback and field measurements, the *specific appropriateness* of candidate technologies as effective and acceptable solutions to diagnosed land management problems.

2. To extend and refine the diagnosis by means of a kind of "diagnosis-by-treatment" procedure analogous to the practice followed by medical diagnosticians in the absence of a complete diagnostic laboratory.

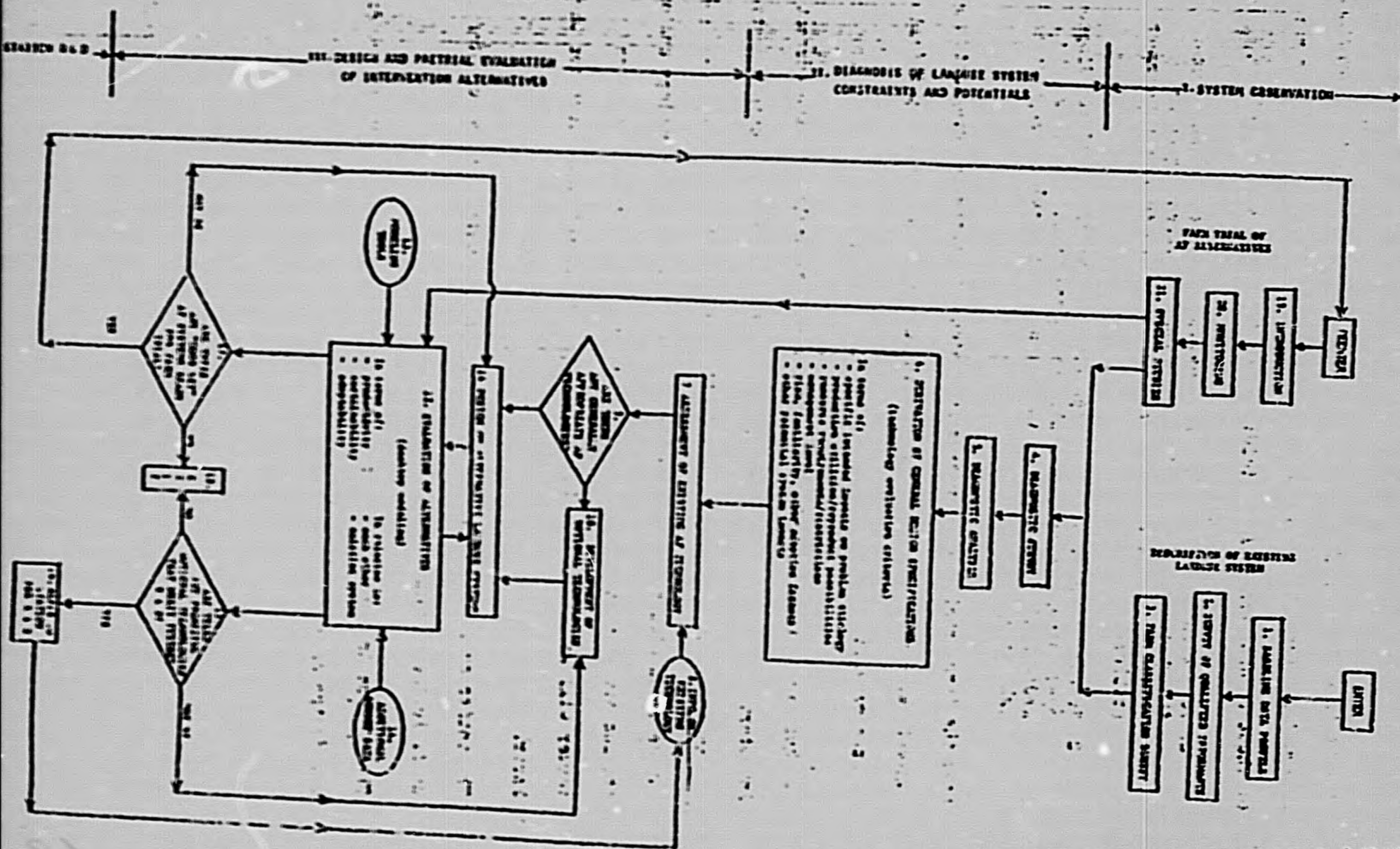
From the farm trials comes information which may modify the diagnosis and/or suggest redesign of the technology in the direction of a more optimized or adapted version.

If there is no readily applicable agroforestry technology in the current inventory, then the emphasis shifts to the development of promising notional technologies through R&D at the RESEARCH STATION. In practice, both pathways may be taken simultaneously: farm trials of good bet AF technology and on-station development of better ones. Feedback from farm trials of the former will enter into and improve the quality of the R&D effort for the latter.

The entire cycle represents an iterative process which may be repeated until further refinement is considered superfluous.

The diagram in Fig. 2 is a detailed implementation flow-chart for the diagnostic and design process.

Best Available Document



The following is a key to the diagnosis and design flow-chart.

PHASE I (Entry Cycle): SYSTEM OBSERVATION

Step 1. Baseline Data Analysis

Methods: Compilation and analysis of relevant geographical, historical and statistical information on the project area. (See Appendix 1).

Output: A preliminary classification and mapping of agroecological zones and landuse systems in the project area and a general picture of regional and local development needs and potentials.

Step 2. Survey of Qualified Informants

Methods: Informal individual and group interviews with qualified informants (articulate farmers, district officers, extension agents, project managers, other researchers, etc.), complemented by informal "windshield reconnaissance surveys" of the project area.

Output: Refinement of zonal landuse classification, an overview of local landuse history, a familiarity with typical management units and enterprise patterns, and a generalized understanding of major land management problems affecting the types of units.

Step 3. Farm Classification Survey

Methods: Rapid survey of farms in the project area (or other management unit) using a short formal survey instrument devised by senior diagnostic staff and administered by enumerators to a statistical sample of farms stratified according to agroecological zone; the survey focus is restricted to diagnostically salient factors.

Output: Classification of farms according to major farm types in each agroecological zone; a stratified sampling frame for the diagnostic survey.

PHASE II: SYSTEM DIAGNOSIS

Step 4. Diagnostic Survey

Methods: Structured but open-ended interview survey (See Appendix 2) and visual inspection of sample farms conducted by senior diagnostic staff. Survey oriented toward gathering data sufficient for: a) identification of problems in household basic needs supply subsystems (food, fuel, cash, shelter, raw materials; see Appendix 3) and trouble-shooting of antecedent causal factors and associated land management problems; and b) assessment of the sustainability of the present production system.

Output: Provisional spot diagnosis together with adequate data for subsequent detailed analysis (Step 5) of land management problems affecting the productivity and sustainability of the system.

Step 5. Diagnostic Analysis

Methods: a) graphic techniques (e.g. graphic overlays to identify climatic constraints, labour bottlenecks, etc.);

b) interaction matrices, causal network diagramming, etc. to identify and map interactions among system constraints (See Appendix 4);

c) hand calculator and microcomputer techniques to model critical system interactions;

d) forecasting methods and scenario construction techniques to assist in assessing system productivity and sustainability over time.

Output: Identification and rank ordering of significant problems, constraints and bottlenecks; analysis of problem etiology and

interrelationships among constraints; simple heuristic models of critical system interactions (e.g. qualitative simulation models); assessments of system performance over time under various scenarios. The main output or bottom line of this step is the identification of potential intervention points in the system where it may be possible to relieve constraints and improve system performance.

Step 6. Derivation of General Design Specifications

Method: The crucial link between diagnostic and design processes, this step proceeds by a kind of intuitive "lock-and-key" logic from the preceeding analysis of potential intervention points to a specification of the functional requirements for point specific interventions (e.g. Is runoff a problem? Then we need something to reduce runoff and increase infiltration). Other desirable attributes of candidate technologies (see Flowchart Step 6) are derived from analysis of survey data.

Output: A set of general specifications for design of appropriate (i.e. problem-solving and adoptable) technologies.

PHASE III: SYSTEM DESIGN

Step 7. Assessment of Existing Agroforestry Technology

Method: Using the criteria of appropriateness given by the diagnosis, sources of information on existing technology are consulted to identify potential "off-the-shelf" solutions, if any.

Output: Knowledge of candidate technologies; awareness of the gaps in the current stock of technology.

Step 8. Sources of Information on Existing Technology

Immediate information:

a) ICRAF and Project staff

b) Consultation with other agroforestry experts around the world

- Delphi method consultations with experts in ICRAF network
- Solicitation of input from a wider group of AF practitioners through publication of notices and articles in ICRAF Newsletter and the Agroforestry Systems Journal (published by Martinus Nijhoff in cooperation with ICRAF).

c) Bibliographic database searches conducted by ICRAF Information and Documentation Services.

d) Cumulative punchcard and microprocessor storage files on AF components and systems at ICRAF headquarters in Nairobi.

Longterm information:

a) Experience gained in other Projects in the Collaborative and Special Projects Programme.

b) Findings of ICRAF's world Agroforestry Systems Inventory and Evaluation Project in the Systems Research Programme.

Results of networking and research activities conducted under ICRAF's Technology Research and Evaluation Programme.

d) Results of research conducted at ICRAF's Machakos Field Station.

Step 9. Decision Step

Q: Are there any generally appropriate agroforestry technologies?

If NO, GOTO 10: Development of Notional Technologies

If YES, GOTO 11: Design of Alternative Land Management Systems.

Step 10. Development of Notional Technologies

Methods: Various techniques to aid the technological imagination, e.g. brainstorming sessions followed by critical evaluation.

Output: Promising notional technologies, still in the idea stage but with at least a hypothetical potential for filling identified gaps in the current technology inventory.

Step 11. Design of Alternative Land Management Systems

Method: The process of design involves integration of AF tree components and existing or potential herbaceous crops and livestock into viable space-time arrangements which are optimal within the limits of the landusers resources, production priorities and management capabilities. The general design specifications are given by the diagnostic activities described above. Components and practices for inclusion in a design are given by the technology assessment and development activities (Steps 7, 10 & 16). The design process is facilitated by various design tools and modeling aids (described under Step 12 below). In any process of design, of course, there is no substitute for imagination. The aim of the ICRAF methodology is not to replace the design imagination with a sterile mechanical formula, but to enhance it and empower it with greater relevance by contriving to present it with the maximally coherent and suggestive stimulus.

Output: Relevant designs for agroforestry land management systems.

Step 12. Evaluation of Alternatives

Method: Despite its close linkage with the preceeding activity, this step is formally separated from the preceeding design step for the reason that it is usually best to first open up thinking about alternatives before evaluating any of them in detail. In practice, of course, there will be feedback between the two

modeling tools (see following) the alternative land management systems are compared with each other and with the existing system and evaluated for their relative productivity, sustainability and adoptability. An effort is made to realistically evaluate the relative merits of agroforestry systems in comparison with conventional agricultural and forestry systems.

Output: A thorough pretrial understanding of factors affecting the productivity, sustainability and adoptability of alternative land management systems for a given site. This then serves as the basis for the decisions made in Steps 15 and 17.

Step 13. Modeling Tools

- graphic aids
- hand calculator and microcomputer/"slide rules" (e.g. for calculation of AF intercropping ratios);
- simple simulation models of system interactions over time (e.g. GSIM QUALITATIVE SIMULATOR);
- modest partial budgeting and simple linear programming models of intercrop and farm enterprise mixes at the field and whole farm level (LP design application).

The emphasis at ICRAF is on the development, use, and dissemination of practical, cost-effective modeling aids and design tools which are appropriate to the actual needs and resources of field staff and researchers in developing countries. This means that the hardware and software requirements should not exceed the now very respectable capabilities represented by the rapidly developing low-cost *microcomputer* technology and high-level *user friendly languages*, expected to become widely disseminated throughout the world in the near and medium term future.

Step 14. Additional Field Data

Methods: Surveys, in-depth interviews with local land users, direct observations, field measurements, monitoring, etc.

Output: Whatever additional field information is needed in the course of the design and evaluation exercise.

Step 15. Decision Step

Q: Are there any promising notional technologies that merit further R&D?

If YES, GOTO 16: To Research Station for R&D

If MAYBE, GOTO 10: Development of Notional Technologies

If NO, GOTO 18: Exit.

Step 16. To Station for R&D

Method: Controlled experimental evaluation of components and interactions.

Output: New AF technologies to add to current inventory (8).

Step 17. Decision Step

Q: Are there any "Good Bet" Agroforestry Technologies ready for Farm Trial?

If YES, GOTO 19: Farm Trials

If MAYBE, GOTO 11: Design of Alternative Land Management Systems

If NO, Exit.

Step 18. Exit Step

(Agroforestry is not the solution to every problem!).

PHASE 1 (Repeat Cycle) FARM TRIALS

Step 19. Introduction

Method: Layout and planting of agroforestry field designs on farmland in collaboration with cooperating farmers. Farmers in developing countries are more capable and willing to collaborate with researchers in explicitly experimental on-farm undertakings

Cooperation may include an insurance formula.

Output: Establishment of experimental agroforestry systems under realistic conditions on farmer's fields.

Step 20. Monitoring of Farm Trials

Farm trials, conceived as "pertubation experiments", are designed to probe system response to particular technological stimuli. Does the system respond in the intended way, (i.e. with a reduction in the problem condition, an improvement in system performance?). How does the farmer evaluate the intervention? What new design criteria come to light? How might the system be improved? Does the experience suggest whole new approaches? How does this modify the initial diagnosis? These are all questions to be answered through monitoring of the farm trials.

Methods: Regular collection of pertinent agronomic and farm management data by the "cost-route" method or other monitoring technique. Interview information complemented by direct field measurements whenever feasible. Monitoring duties accomplished by resident field staff and participating farmers.

Output:

a) Sufficient hard data from field measurements and summary feedback from farmers to render an objective assessment of the specific appropriateness of the experimental technology as an effective and acceptable solution to diagnosed land management problems.

b) Modification and refinement of the initial diagnosis in the light of the experimental evidence.

c) Redesign and improvement of the experimental technology (adaptive R&D).

d) Indications and priorities for controlled on-station research to adapt and optimize existing technologies, develop new prototypes,

and establish the scientific basis for optimum design of adaptive technologies across a broader range of agroecological conditions.

Step 21. Special Studies

Methodology: In-depth studies of topics with special importance to system management (e.g. charcoal production, rangeland management practices, the manure economy, the labour bottleneck, etc., etc.

Output: Information needed to complete the evaluation of system performance.

4. THE DEVELOPMENT OF A PROJECT

In developing ICRAF-promoted Collaborative Projects for each geographical region, three main stages are envisaged: identification, planning and implementation (of Projects). In each stage, a series of steps will be followed. They, specially those in the planning and implementation stages, should be carried out in close cooperation with the collaborating institution; implying that activities will be developed in house and abroad.

A tentative sequence of steps with the corresponding human resources and time involved is schematically presented in Fig. 3. A more detailed description of each step follows:

6.1. Identification Phase

Resources involved in this stage will be shared by all Projects within each region.

Step 1: Ecological zoning: an iterative process delimiting target areas on the basis of climatic, edaphic, topographic and landuse characteristics.

FIG. 3: STAGES OF PROJECT DEVELOPMENT

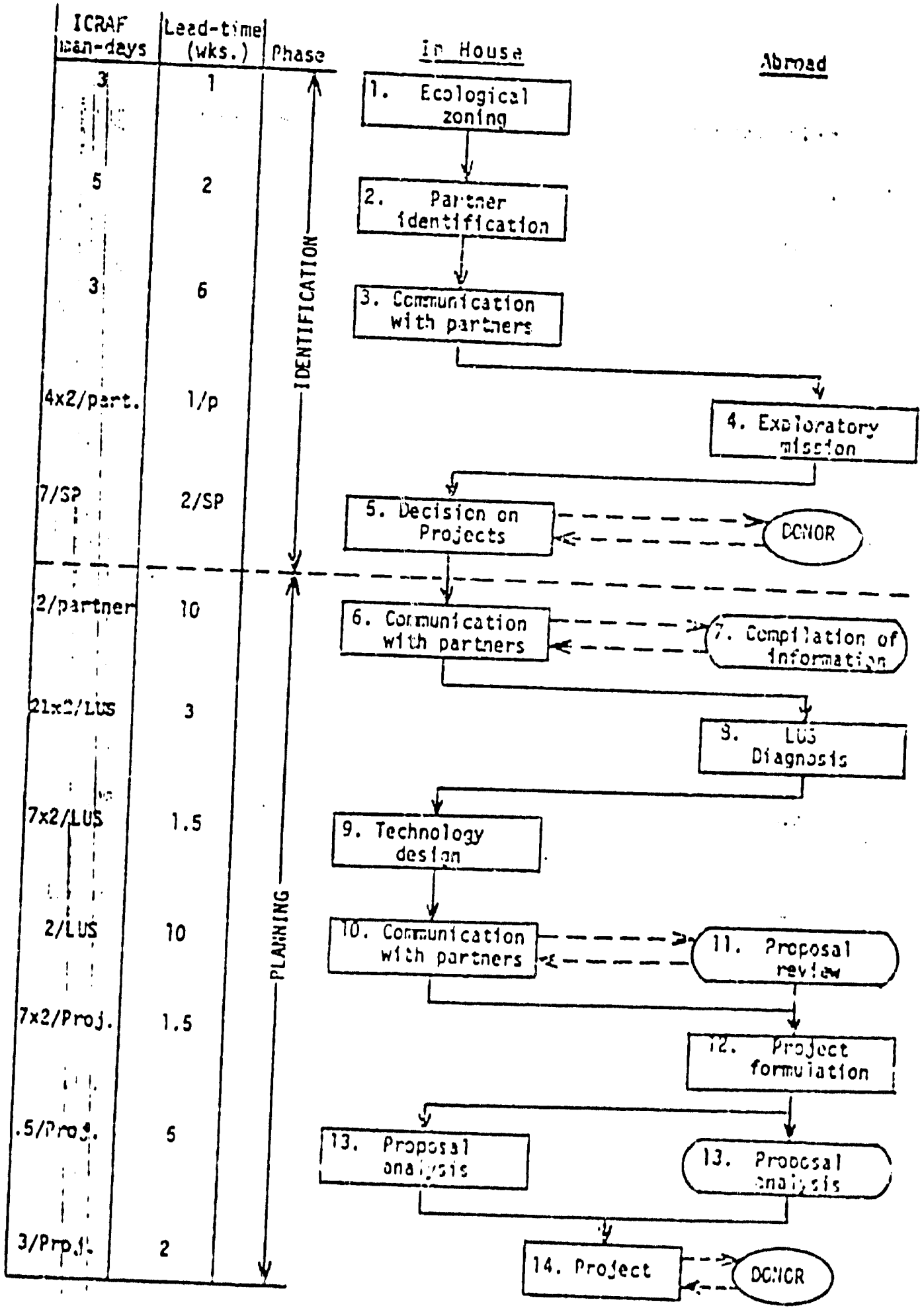
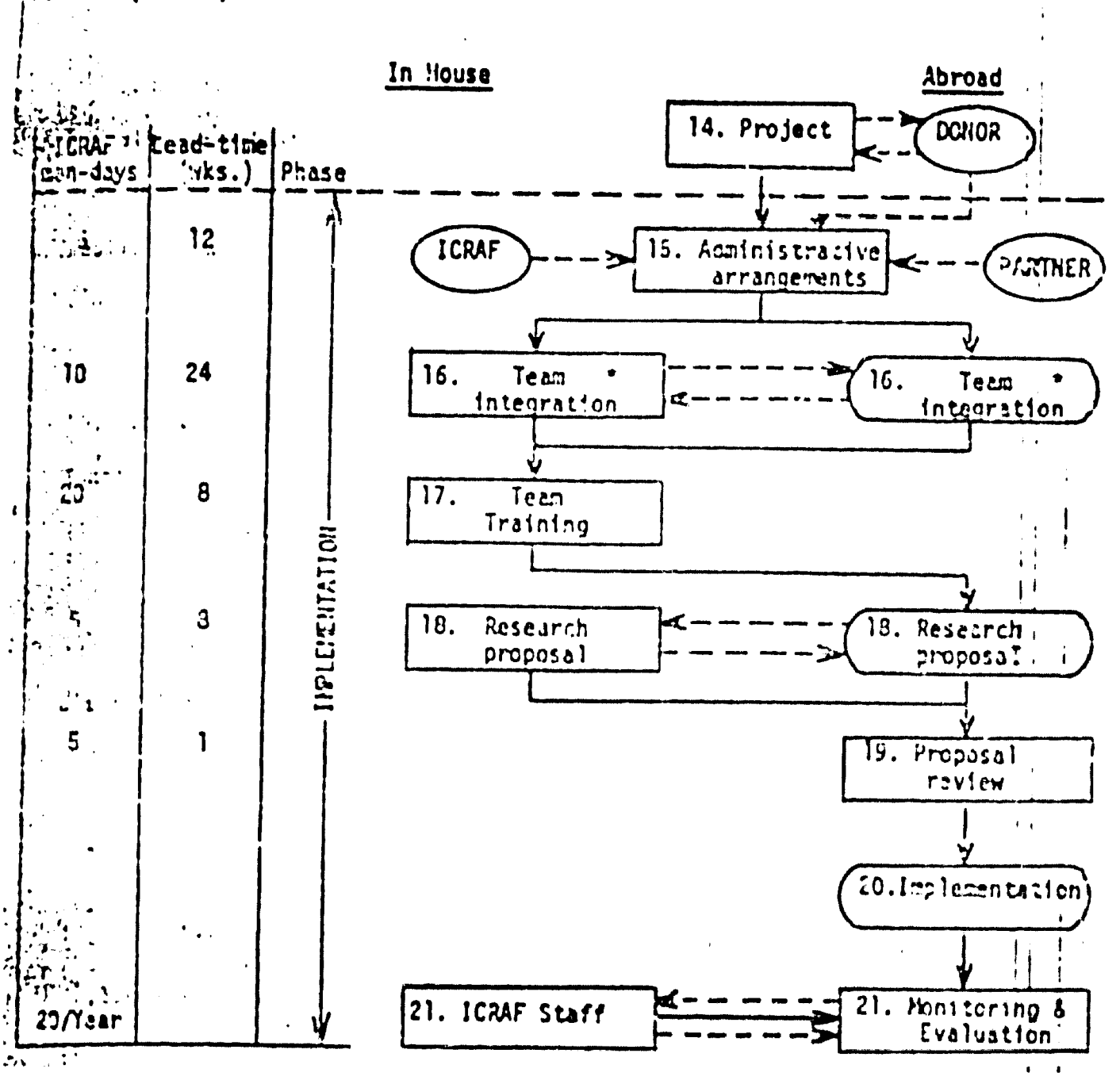


FIG. 3 (Cont'd)



ICRAF staff directly participating in activities

Only Partner or Project staff participating in activities

Personnel

Information

Step 2: Partner identification: a pre-selection of potential cooperating institutions within ecological zones, based essentially on their objectives, stability and infrastructure.

Step 3: Communication with partners: to let them know about our institutional objectives and programme, as well as the type of cooperation envisaged.

Step 4: Exploratory mission: visiting the interested partners to discuss institutional objectives, evaluate infrastructure, appraise regional landuse problems and explore avenues for inter-institutional cooperation.

Step 5: Decision on Projects: to be carried through the planning phase, based on information gathered by the Exploratory mission and Donor's interest.

6.2. Planning Phase

Step 6: Communication with partners: to indicate interest and remit a "tailored" LUS-description check list for their consideration.

Step 7: Compilation of information: to be carried by the partner's staff, based on the agreed check list (Step 1 of Fig. 2: D & DM)

Step 8: LUS Diagnosis: carried together with local staff to identify problem sub-system and main limiting factors. (Steps 2, 3 and 4 of Fig. 2: D & DM).

Step 9: Technology design: based on the identified problems and alternative role(s) of woody components to circumvent or ameliorate them. (Steps 5-17 of Fig. 2: D & DM).

Step 10: Communication with partners: on envisaged technological alternatives and additional information that may be required for the design stage.

Step 11: Proposal review: by the local staff, including collection and collation of new information, if required.

Step 12: Project formulation: a proposal on objectives, strategies, programme and resources necessary for on-farm and/or on-station research-cum-development activities.

Step 13: Proposal analysis: to be carried out by ICRAF and partner teams.

Step 14: Project: a final version of the proposal based on comments and suggestions by both teams.

6.3. Implementation Phase

Initiation of this Phase depends on firm commitments by donor institution(s), if needed.

Step 15: Administrative arrangement: to accommodate Project needs with institutional requirements.

Step 16: Team integration: which will be responsible for carrying out the Project.

Step 17: Team training: on ICRAF's agroforestry approach to LUS.

Step 18: Research proposal: by Team on specific objectives, methods and lay-out of experiment(s) to be carried out, in consultation with ICRAF staff (either core or consultants).

Step 19: Proposal review: by both ICRAF and partner research staff.

Step 20: Implementation: of research plan by Project's team.

Step 21: Monitoring and Evaluation: carried out by ICRAF and Partner's staff twice a year.

APPENDICES

Appendix 1. BASELINE DATA ANALYSIS

Purpose: To define the general characteristics of the project area in terms of:

- major agroecological zones
- basic landuse patterns
- local and regional development goals

Methods: 1. Analysis of existing sattelite and aerial photography

2. Interpretation of existing maps

3. Compilation, analysis and mapping (where appropriate) of the following information:

3.1. Biophysical factors

3.1.1. Climate

- description of the seasons
- monthly moisture balance
- monthly mean biotemperature
- growing period
- summary climate classification (e.g. Holdridge Life Zones)
- climate map of project area

3.1.2. Topography and Soils

- elevation
- landform
- hydrology
- soil types and toposequences
- soil map

3.1.3. Vegetation

- map of general vegetation type
- climax and successional patterns

3.2. Socio-economic Factors

3.2.1. Population

- density
- settlement pattern
- ethnic composition
- landuse traditions and history

3.2.2. Infrastructure

- roads
- markets
- processing facilities

3.2.3. Development goals

- overview of production needs and potentials as viewed from the regional, district and local levels
- overview of conservation needs

4. Output: A composite map showing major agroecological zones and landuse patterns

APPENDIX 2: SAMPLE DIAGNOSTIC SURVEY INSTRUMENT FOR A SEMI-ARID ZONE MIXED FARMING SYSTEM IN KENYA

AGROFORESTRY PROBLEM IDENTIFICATION SURVEY

(Short Form)

HOUSEHOLD RESOURCES

LABOUR

How many people belong to this household? Explanations:

resident _____

non-resident _____

total _____

Number and availability of workers

Worker Categories	Number	Availability
Men	_____	_____
Women	_____	_____
Boys	_____	_____
Girls	_____	_____

LAND

3. List number, use, size, and tenure of separate plots owned or used by household. Probe for: additional land elsewhere; rental or other use of non-owned land; whether land is also used by others.

Plot	Use	Size	Tenure

CAPITAL

4. What farm equipment does the household own? (e.g. plough, hoes, pangas, sprayers, axes, etc.)

5. What livestock does the household own?

Type	Number	Use

[illegible] RESOURCES

6. Does the household have enough land, labour, etc., or does it need more; what kind, what for? (Elicit rank order: e.g. "If you wanted to increase the production of your farm, which of these would help you the most, next most, etc.")

Resource	Have Enough	Need more	What kind?	What for specifically?	Rank
Land					
Labour					
Draught: Animals					
Equipment					

7. "If you had more cash to use for farming what would you spend it on?"

USE OF TREES

8. "Do you ever plant trees?" (Elicit description)

WOOD USE

9. List all household (domestic and commercial) uses of wood, person responsible for supply, rank order of amount used, and associated problems: (cooking, construction, brickmaking, charcoal making, etc.)

Use:	Person Responsible	Rank	Problems

OTHER TREE PRODUCTS/USES

10. Does the household use trees for any other purposes? (food, fodder, fiber, raw materials, fencing, shade, windbreaks, erosion control, etc.) VISUAL OBSERVATION

Use	Problems

FUELWOOD

11. What types of fuel does the household use? (firewood, charcoal, kerosene, etc.) and for which purposes (cooking, heating, lighting, etc.)?

Fuel	Use

12. What types of firewood are preferred? Why? What types are normally used? Why difference?

Preferred Woods	Reason	Woods Normally Used	Why difference?

13. Describe fuelwood supply pattern (for all major uses).

Use Type	Season	Source/Distance	Freq.x Time/Period	Problems

FOOD SUBSYSTEM

FOOD SUPPLY SITUATION

14. List staple foods and estimated annual requirements (bags). How much of each does the household expect to produce in a bad year (season), good year, normal year?

	Annual	Expected Production		
Staple Food	Requirement	Bad Year	Good Year	Normal Year

15. When do seasonal shortages normally occur? How does the household cope with production shortfalls?

16. When was the last time the household experienced a major crop failure? What was the reason? Is this the typical pattern or are there other scenarios?

17. How often, on average, does crop failure occur?

TROUBLE SHOOTING

Field Crops

19. What are the main problems with field crop production? (free response)

19. Elicit response to checklist ("Do you have any problems with _____?") Then elicit rank order of problems (e.g. "Altogether how you've mentioned problems with _____ (18 + 19); which of these is the most important problem, next most important, etc.")

Problem	Check	Comment	Rank
Low soil fertility	____	_____	_____
Soil erosion	____	_____	_____
Weeds	____	_____	_____
Insects	____	_____	_____
Other pests	____	_____	_____
Diseases	____	_____	_____
Weather (specify)	____	_____	_____
_____	____	_____	_____
_____	____	_____	_____
_____	____	_____	_____
_____	____	_____	_____
_____	____	_____	_____
(other)			

LIVESTOCK

20. What are the main problems with livestock? (Probe: seasonal feed shortages)

CASH SUBSYSTEM

21. Does the household ever buy food?

22. "If you had more money what would you spend it on?"

23. What are the most difficult annual household expenses to meet?

24. What are the main sources of cash? (List and rank)
    Probe for: a) cash crops; b) "What do the men do to earn money?";
    c) "What do the women do to earn money?"

Source of Cash	Rank

25. Troubleshoot on-farm cash enterprises (e.g. "What problems do you have with charcoal production?")

Appendix 3. NOTE ON THE ICRAF BASIC NEEDS APPROACH

As the concept of "basic needs" has been developed and applied in different ways in other contexts, it is important to specify clearly what is meant by this approach at ICRAF. The basic points are as follows:

1. In analyzing land management systems, we have identified the household management unit as a prime focus of decision-making and system modeling.
2. In our approach to the modeling of the household land management systems, we define the subsystems in terms of *outputs*. In other words, the *output subsystem* is defined as the set of all activities, resources and other landuse factors which are involved in generating an output which satisfies one of the major production objectives of the household.
3. In deciding specifically what output categories to consider in defining the major subsystems, it is important to satisfy two general requirements:
   a) general applicability, and
   b) adequate representation of the ideosyncracies.
4. To satisfy both requirements and also to facilitate subsequent linkage with categories of agroforestry potentials, a basic needs approach is indicated. The production outputs which we consider basic to the economic wellbeing of smallholders everywhere are:
   - food
   - fuel
   - cash
   - shelter
   - raw materials for local industries

5. The basic assumptions which underlie this approach are
   a) that the needs in the above list are basic and universal, and
   b) that local and regional landuse systems are organized to satisfy these basic needs.

6. It is important to emphasize that, in espousing this approach, the aim is to insure satisfaction of basic needs but *not* to restrict development efforts to only minimal satisfaction of these needs. We want *floors*, not ceilings. One implication of this approach is that, once subsistence needs are adequately satisfied, the emphasis shifts to improvments in the cash subsystem.

7. To further clarify this point, in referring to "basic" needs we mean basic *types* of needs, rather than basic *levels* of need satisfaction. For example, a particular household may be well above the subsistence level in its production of cash but, because of drought or deforestation may have serious problems in meeting its food and fuel requirements. Cash income, which is normally taken as the prime indicator of economic wellbeing, is not always readily convertable into a form which satisfies the other basic needs. For this simple reason, it is necessary to consider the performance of each basic output subsystem separately.

8. Having identified the subsystems in which the problems exist, and having traced the antecedent causal factors, analytical aids are used to model problem etiology and identify agroforestry potentials (see Appendix 4 for a specific example). For each subsystem the general question is: *Is there anything that trees can do to improve the performance of this subsystem?*

A partial list of the general types of answers which are possible is given below:

Food Subsystem

a) *Human food* from trees (fruits, nuts, cereal substitutes) at low input levels on marginal land

b) *Livestock feed* from trees (one step down the trophic chain)

c) *Fertilizer* from trees from improving the nutritional status of food and feed crops (through the *addition* of atmospheric nitrogen to the soil system by leguminous trees, through *improvement of access* to a greater volume of subsoil nutrients by the nutrient recycling action of appropriate trees and also by the *improved availability* of soil nutrients which accompanies the higher CEC levels associated with the higher organic matter levels and improved physical structure of tropical soils under the influence of appropriate tree canopies)

d) *Soil conservation* effected by trees in agroforestry intercropping systems has a direct and measurable long term benefit on the production of food crops from the protected fields

e) *Micro-climate amelioration* associated with properly spaced trees (e.g. the "shelterbelt effect") can also have a direct impact on food crop production (e.g. 30% increase in Russian wheat yields attributable to shelterbelts)

Fuel Subsystem

a) *Woodfuels*

i) firewood

ii) charcoal

b) *Methanol* (wood alcohol)

c) *Ethanol* (from fermentation of high carbohydrate fruits, e.g. *Prosopis* pods)

d) *Producer gas*

e) *Straight combustible gums and resins* (e.g. from the *Euphorbias*)

f) Other fuels and energy technologies under the general heading of *biomass*

Shelter Subsystem

a) *Building materials* for housing

b) *Shade trees* for humans and livestock (and even some heliophobic crops)

c) *Windbreaks* around settlements, fields and pastures

Raw Materials Subsystem

a) *Fiber* for weaving industries

b) *Wood* for a variety of craft uses

c) Ingredients for *medicinal preparations*

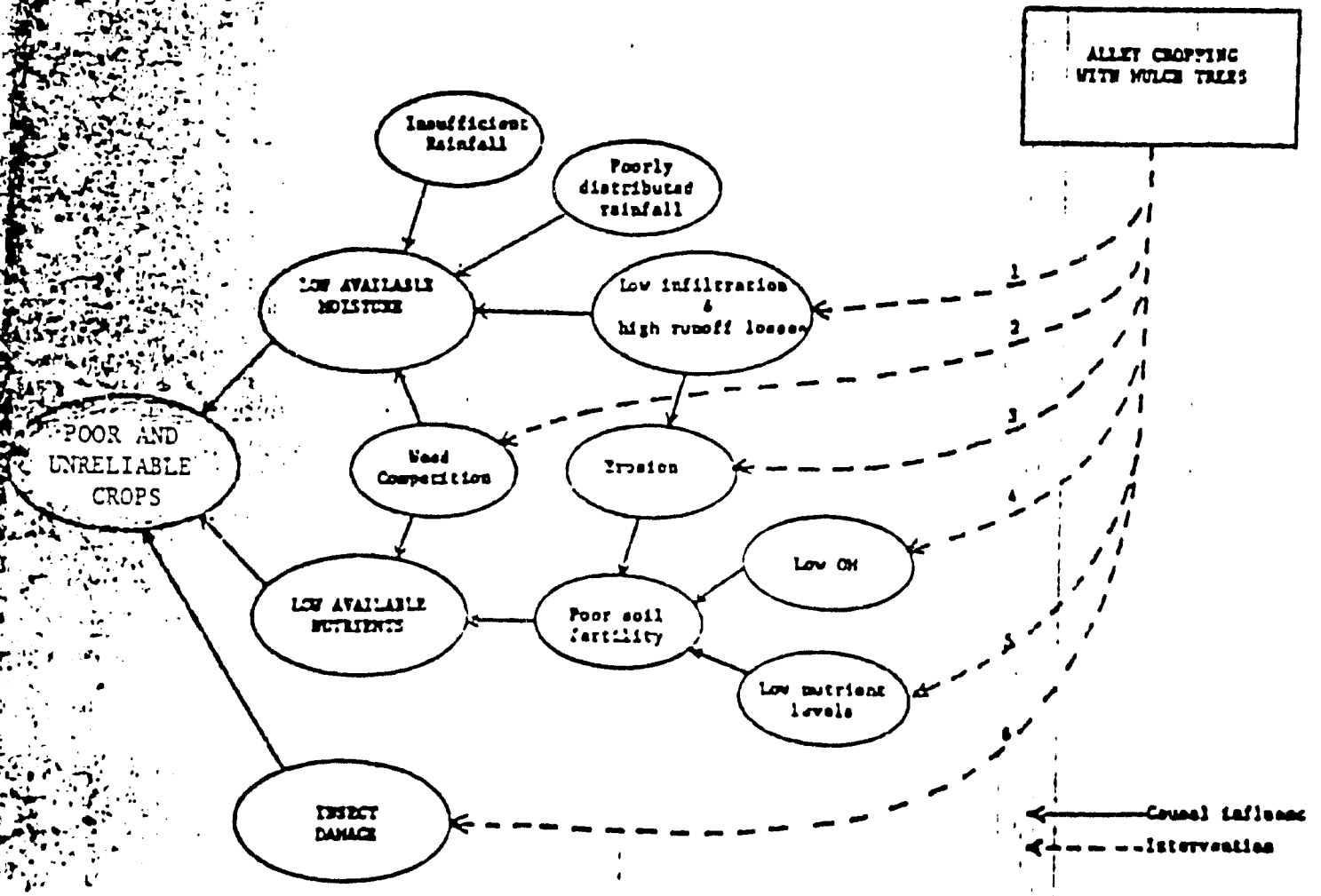
d) Etc., etc., etc.

Cash Subsystem

a) *Direct cash* benefits from sale of the above listed products

b) *Indirect cash* benefits of non-tree crop productivity improvements effected by trees (e.g. higher profits from savings in fertilizer costs).

Appendix 4(a): CAUSAL NETWORK MODEL AND SUGGESTED INTERVENTIONS



Potential Mulch Trees

N-fixing	Insect-repellent
Leucaena leucocephala	*Adhatoda vasica*
Mimosa scabrella	*Azadirachta indica*
Sesbania Sesban	*Derris indica*

Potential Interventions

1. Improved infiltration, reduced runoff
2. Weed control with reduced labour
3. Reduced splash and runoff erosion
4. Increased organic matter
5. N-fixation and nutrient pump action of deep penetrating roots
6. Use of insect-repellent mulch species.

SITE SUMMARY OF AGROFORESTRY DIAGNOSIS AND DESIGN INDICATIONS

Appendix: 4(b)

LOCATION	LANDUSE PROBLEM DIAGNOSIS		AGROFORESTRY POTENTIALS
	HOUSE SYSTEM LEVEL	LAND SYSTEM LEVEL	
Ishiara Location, Embu District, Kenya. Seasonal rainfall: 900 mm Population density: 25-100/km^2	**Problems in Basic Needs Supply Sub-Systems.** Food - seasonal shortage of farm-produced staple foods in all but good years; livestock feed shortage in dry season. Fuel - no firewood problems (plenty of bush around). Cash - reduced cash earnings and savings potential of livestock due to low milk yield and high calf mortality associated with dry season feed shortage; potential charcoal production curtailed by permit regulations design to control deforestation; need for cash crops. Shelter - timber trees and construction quality poles becoming scarce in the area. Raw materials - no problems	**Antecedent Causal Factors** Cropland 1. Insufficient moisture for good crops (low seasonal rainfall, drought-related famine every 5 years. 2. Weed competition. 3. Low soil fertility. 4. Accelerating Erosion. 5. Pests. Grazing Land/Bush 1. Poor quality of dry season forage. 2. Depletion of timber and pole trees. 3. Accelerated erosion due to increased hillside clearance.	**Specific Problem-Solving Agroforestry Technologies** 1. Alley cropping (mulch farming) for labour-saving terrace construction with mulching for erosion control, increased rainfall infiltration, moisture conservation, increased organic matter, nutrient cycling, nitrogen fixation, insect and weed control and supplementary dry season fo 2. Forage tree planting in grazing area to fill dry season feed g 3. Border plantings and internal hedgerows or fast-growing pole species. 4. Planting of charcoal species around borders of farm and in grazing area.

ATTACHMENT A

AGROFORESTRY RESEARCH AND TRAINING
BUDGET AND ACTIVITIES

ICRAF Project	1982 1000 US $	1982 Activities	FY 1983 1000 US $	FY 1983 Activities	1984 1000 US $	1984 Activities
Programme #4: Agroforestry Systems Research & Evaluation,						
• Diagnostic Methodology development/central Project-Machakos	65	-Farm surveys to identify constraints -Case studies of farming systems -Farm trials with AF components -1st approximation of diagnostic tool -Publications	150	-Farm surveys -Farm trials -Assessing information from collaborative projects and farm trials -Diagnostic handbook (1st draft) -Publications	100	-Final handbook -Scientific, educational publications
• Agroforestry Systems inventory & evaluation	40	Planning phase -Establish criteria for stratification and evaluation -Identify and contact regional and international contact persons and institutions	185	-Field surveys of AF systems -Identification of systems and systems components of wider development potential	135	-Identification of AF research and development priorities and projects -Establishment of AF systems register and data bank -Publication
Programme #3: Training & Education						
• Development of training material	20	-Develop curriculum for 2-3 week course in AF research and development techniques. -Preparation of case studies, Lecture series, Field practicals, A/V materials	60	-Continue activities from 1982 -Preparation of handouts and teaching manuals based partly on Diagnostic methodology project.	65	-Development of teaching and training packages fo use in LDC institutions without ICRAF participation.
• Agroforestry Training Courses	-	-	80	-one (1) 2-3 week course in Kenya for scientists, planners, and development agents. -one (1) similar course in Latin America, S.E. Asia, or other region.	100	-one (1) 2-3 week course in Kenya for scientists, planners, and development agents. -one (1) similar course in Latin America, S.E. Asia, or other region.
TOTALS	125		475		400	Total Budget 1,000,000

ATTACHMENT B

CHARTE DU

CONSEIL INTERNATIONAL POUR LA RECHERCHE EN AGROFORESTERIE

(CIRAF)

CHARTER OF

THE INTERNATIONAL COUNCIL FOR RESEARCH IN AGROFORESTRY

(ICRAF)

WHEREAS "agroforestry" is a sustainable management system for land which increases overall production, combines agricultural crops, including tree crops, and forest plants and animals simultaneously or sequentially, and applies management practices which are compatible with the cultural patterns of the local population,

WHEREAS a consortium of countries, donor agencies, and others directly interested (hereinafter referred to as the Group) has organized to increase the social, economic and nutritional well-being of peoples of developing countries through the promotion of agroforestry systems to achieve better land use in developing countries without detriment to their environments, to encourage and support research and training relevant to agroforestry systems, to facilitate the collection and dissemination of information relevant to such systems and to assist in the international coordination of agroforestry development,

WHEREAS the Group has proposed the establishment of the International Council for Research in Agroforestry (hereinafter referred to as the Council) to carry out these objectives,

WHEREAS the Group has designated the International Development Research Centre (hereinafter referred to as the Executing Agency) to act as agent to perform those activities that are necessary to establish the Council, including the conclusion of a necessary protocol with a host government to provide for the establishment and operation of the Council,

AND WHEREAS the members of the Group have requested the government of the Cooperative Republic of Guyana, the government of the Republic of Senegal, the government of Canada and the Executing Agency to sign the Charter on their behalf,

NOW THEREFORE the government of the Cooperative Republic of Guyana, the government of the Republic of Senegal, the government of Canada and the Executing Agency, on behalf of the members of the Group, are agreed that the Charter of the Council shall be as follows:

ARTICLE I - ESTABLISHMENT AND NAME

There is hereby established an international council called the International Council for Research in Agroforestry (ICRAF).

ARTICLE II - LOCATION

1. Subject to the conclusion of a necessary protocol, the headquarters of the Council shall be in Kenya.

2. The Council may establish operational units wherever it deems necessary.

ARTICLE III - LEGAL STATUS

1. The Council is an autonomous, non-profit, international organization consisting of a Board of Trustees appointed pursuant to Article VIII (2).

2. The Council shall possess full juridical personality.

3. The signatories to this Charter and the members of the Group shall not be responsible, individually or collectively, for any debts, liabilities or other obligations of the Council.

4. The Council, its personnel, their families and dependants shall enjoy such privileges and immunities as are detailed in a protocol with the host government signed with the Executing Agency or any other agency on behalf of the Group.

ARTICLE IV - OBJECTS

The objects of the Council are to increase the social, economic and nutritional well-being of peoples of developing countries through the promotion of agroforestry systems to achieve better land use in developing countries without detriment to their environments, to encourage and support research and training relevant to agroforestry systems, to facilitate the collection and dissemination of information relevant to such systems and to assist in the international coordination of agroforestry development, and, specifically:

a) to identify aspects of agroforestry systems generally, and tree components in particular, about which there is a lack of knowledge, and to support research thereon;

b) to support or stimulate research to identify or improve species of trees and other forest flora and fauna that are underused;

c) to assist in the coordination of agroforestry research for various ecological regions;

d) to facilitate the extension and implementation of the results of research in agroforestry; and

e) to encourage and support training in appropriate disciplines with the aim of developing the research capabilities of national institutions engaged in agroforestry research.

ARTICLE V - ACTIVITIES

The Council shall undertake all such activities as are conducive to the furtherance of its objects and, without limiting the generality of the foregoing, such activities may include:

a) the collection, evaluation, cataloguing and dissemination of information relevant to agroforestry, with particular emphasis for use by field personnel;

b) the stimulation of research relevant to agroforestry by governments, and by national and international, public and private organizations and agencies, by universities, and by individuals, and the fostering of cooperation in research relevant to agroforestry systems;

c) the sponsoring of research relevant to agroforestry systems, on important species of trees and other crops relevant to such systems, and on the harvesting, processing and marketing of agroforestry products;

d) the participation in the management and financing of pilot and experimental projects on agroforestry;

e) the conducting of seminars and the convening of working groups on agroforestry;

f) the promotion of the teaching of the principles of agroforestry in educational systems, including the teaching of tree sciences;

g) the promotion of the orientation of forestry and agricultural teaching towards better land use; and

h) the demonstration, publication and dissemination of research results and other information on agroforestry.

ARTICLE VI - POWERS

The Council, in furtherance of its objects may exercise any or all of the following powers, namely, the power:

a) to support or assist research relevant to agroforestry by governments, by national and international, public and private organizations and agencies, by universities, and by individuals;

b) to establish, maintain and operate information and other data centers for activities relevant to its objects;

c) to sponsor or support working groups, conferences, seminars and other meetings;

d) to enter into contracts or agreements with governments, with national and international, public and private organizations and agencies, with universities and with individuals;

e) to acquire and hold real property or any interest therein and alienate the same freely;

f) to acquire and hold any personal property including funds, rights and concessions by donation, exchange, bequest or otherwise, from any government, organization or person, and to hold, administer, own, operate, use or dispose of the same freely;

g) to institute legal proceedings in the country or countries of its establishment and elsewhere; and

h) to do such other things as are conducive to the carrying out of its objects.

ARTICLE VII - FINANCE

Without prejudice to the generality of its powers as set out in Article VI, the principal financial support for the Council shall be derived from voluntary contributions provided by various members of the Group, by governments and by national and international, public and private organizations and agencies based on regular estimates of budgetary requirements of the Council as approved by the Board of Trustees and on regular reports of Council activities.

ARTICLE VIII - STRUCTURE AND GOVERNANCE

1. The Council shall operate under the direction of the Director-General and in accordance with policies established by the Board of Trustees.

2. Board of Trustees

   The Board of Trustees shall consist of not more than ten trustees appointed as follows:

   a) one trustee appointed by the government where the headquarters is situated;

   b) one trustee appointed by the Food and Agriculture Organization of the United Nations (FAO);

   c) the Director-General of the Council; and

   d) up to seven trustees appointed by the Group.

3. The trustees appointed by the Group shall have experience, qualifications and recognized competence in the disciplines related to the objects of the Council, in other natural or social sciences or in administration, law or finance, and shall be selected to ensure adequate representation from the developing countries.

4. The Director-General of the Council shall be a trustee during his term of office as Director-General, but shall not be entitled to a vote at meetings of the Board of the Executive Committee.

5. All trustees other than the Director-General shall be appointed for three-year terms, with the exception of the initial members of the Board, one-half of whom shall be appointed for two-year and one-half for three-year terms.

6. After the appointment of the initial Board, any trustee appointed by the Group shall be appointed by the Group in consultation with the Board of Trustees.

7. The Group shall delegate to the Board of Trustees its power to appoint at least five trustees.

8. When the office of a trustee becomes vacant during the term of the trustee appointed thereto because of retirement, death, incapacity or any other cause, or when the term expires, the party (host government, FAO, Board or Group) that had the right to appoint the trustee to that office may appoint a trustee for the remainder of the term or for a new term, as the case may be.

9. Trustees shall be eligible for reappointment to the Board.

10. Powers of the Board of Trustees

The Board of Trustees shall:

a) elect a Chairman and a Vice-Chairman from among its membership for such period or periods as it deems appropriate;

b) appoint the Director-General of the Council for such period or periods as it deems appropriate;

c) establish and adopt by-laws and rules of procedure for the conduct of its meetings and for the general governance of the Council;

d) determine policies for the operation of the Council;

e) approve the Council's program of work developed by the Director-General;

f) consistent with generally recognized accounting principles, establish and adopt the general guidelines for the preparation of regular budgetary estimates and for the regulation of the financial affairs of the Council generally;

g) scrutinize and approve the regular budgetary estimates of the Council;

h) appoint independent, external auditors of recognized international competence to conduct annual audits of the Council's accounts and financial transactions; and

i) publish, within a reasonable time after the termination of each fiscal year, a report relating to the activities of the Council for that year, including the financial statements of the Council and the auditors' report thereon.

11. Executive Committee of the Council

a) There shall be an Executive Committee of the Board of Trustees of the Council consisting of the Chairman, Vice-Chairman, Director-General and two other trustees annually elected by the Board of Trustees.

b) The Executive Committee shall have the power to act for the Board on all matters which the Board delegates to it.

c) The Chairman of the Board shall serve as Chairman of the Executive Committee.

d) All actions of the Executive Committee shall be reported to the full Board at its next subsequent meeting.

e) The Executive Committee shall meet at least twice annually.

f) Three members of the Executive Committee present at a meeting of the Executive Committee constitute a quorum.

12. Other Committees

The Board shall appoint such advisory, standing and other committees as it deems necessary.

13. Meetings of the Board

a) The Board of Trustees shall meet at least once annually.

b) The annual meeting of the Board shall be held in the country where the headquarters of the Council is located or at such other place as the Chairman of the Board may designate.

c) Meetings other than the annual meeting shall be held at such times and places as the Chairman of the Board deems necessary.

d) Five trustees present at a meeting of the Board constitute a quorum.

14. The Director-General

a) The Director-General is appointed by the Board as the Chief Executive Officer of the Council.

b) The Director-General shall be, ex officio, a trustee of the Board during his term as Director-General.

c) The Director-General shall implement the policies established by the Board and shall be responsible to the Board for the operation and management of the Council and for ensuring that its programs and objectives are properly developed and carried out.

ARTICLE IX - RELATIONSHIP WITH OTHER ORGANIZATIONS

The Council shall establish a cooperative relationship with such governments, national and international, public and private organizations and agencies, and universities engaged in any activity relevant to agroforestry as the Council may deem necessary for the realization of its objects.

ARTICLE X - ACCESSION

1. At the invitation of the original signatories to the Charter, any country, Specialized Agency of the United Nations or any other international organization or institution may become a party to the Charter by depositing an instrument of accession with the Director-General by March 31, 1979.

2. The Director-General shall notify all other signatories of the Charter of such accession.

ARTICLE XI - AMENDMENTS

1. Subject to paragraph (2) of this Article, this Charter may be amended at any meeting of the Board by three-fourths majority vote of all voting members of the Board, provided notice of such proposed amendments, together with their full texts, shall have been mailed to all members of the Board at least eight weeks in advance of such meeting, unless such notice is waived by all members of the Board.

2. Any substantive amendment of Article IV (Objects), Article V (Activities), Article VI (Powers), Article VII (Finance) or Article XI (Amendments) shall require the prior approval of the Group.

ARTICLE XII - DISSOLUTION

1. If the Board determines by a majority vote of not less than three-fourths of all voting members, and the Group concurs, that the objects of the Council have been satisfactorily realized or that the Council is no longer able to function effectively, the Council shall be dissolved.

2. Any land or interests therein held by the Council and fixed capital improvements thereon shall, upon dissolution, revert to the government of the country where the land is situate.

3. In case of dissolution, the assets of the Council, other than land or interests therein and fixed capital improvements thereon, shall be distributed to an institution or institutions having purposes similar to those of the Council and agreed to by the Council and the government of the country where such assets are situate, after consultation by the Board of Trustees with the Group.

En foi de quoi, les soussignés, par l'intermédiaire de leurs représentants dûment autorisés ont signé cette Charte.

IN WITNESS WHEREOF, the undersigned by their duly authorized representatives have executed this Charter.

A/at Georgetown en/in Guyana le/the 24 jour/day de/of August, 1978.

Le Gouvernement de la République coopérative de Guyane

The Government of the Cooperative Republic of Guyana

A/at Dakar en/in Senegal le/the 27 jour/day de/of janvier, 1979.

Le Gouvernement de la République du Sénégal

The Government of the Republic of Senegal

A/at [illegible] au/in Canada le/the 23 jour/day de/of [illegible], 197[illegible]

Le Gouvernement du Canada

The Government of Canada

A/at Ottawa au/in Canada le/the 22nd jour/day de/of August, 1978.

Le Centre de recherches pour le développement international

The International Development Research Centre

RESOLUTION OF THE BOARD OF TRUSTEES OF THE INTERNATIONAL COUNCIL FOR RESEARCH IN AGROFORESTRY

Amsterdam, June 30, 1979

AMENDMENT OF ARTICLE VIII SECTIONS 2 AND 7 OF THE CHARTER

WHEREAS under Article VIII of the Charter of the International Council for Research in Agroforestry (the Council) the Board of Trustees of the Council (the Board) consists of not more than ten (10) Trustees;

WHEREAS it is deemed desirable to have wider range of representation from both the developed and the developing countries on the Board;

WHEREAS Article XI of the Charter provides that it may be amended at any meeting of the Board by three-fourths majority vote of all voting members of the Board provided notice of such proposed amendments together with their full texts is mailed to all members of the Board at least eight (8) weeks in advance of such meeting, unless such notice is waived by all members of the Board;

AND WHEREAS the Executive Committee of the Council which met in Nairobi, Kenya, on April 9-10, 1979 endorsed this resolution for adoption by the Board;

NOW THEREFORE the members of the Board assembled at its fourth meeting in Amsterdam, The Netherlands, on June 30, 1979, each member having received due notice and full text of the proposed amendment pursuant to Article XI of the Charter, hereby resolve to amend the Charter as follows:

ARTICLE VIII SECTION 2 to read:

"The Board of Trustees shall consist of not more than fourteen (14) Trustees ..."

ARTICLE VIII SECTION 2(d) to read:

"Up to eleven (11) Trustees appointed by the Group"

ARTICLE VIII SECTION 7 to read:

"The Group shall delegate to the Board of Trustees its powers to appoint at least nine (9) Trustees."

RESOLUTION OF THE BOARD OF TRUSTEES OF THE INTERNATIONAL COUNCIL FOR RESEARCH IN AGROFORESTRY

Amsterdam, June 30, 1979

AMENDMENT OF ARTICLE X OF THE CHARTER

WHEREAS the Charter of the International Council for Research in Agroforestry (the Council) has been signed by the Government of the Cooperative Republic of Guyana, the Government of the Republic of Senegal, the Government of Canada and by the International Development Research Centre (the original signatories);

WHEREAS Article X of the Charter provides that at the invitation of the original signatories to the Charter, any country, Specialized Agency of the United Nations or any other international organization or institution may become a party to the Charter by depositing an instrument of accession with the Director-General of the Council by March 31, 1979;

WHEREAS some countries, Specialized Agencies, international organizations and institutions other than the original signatories have expressed an interest in acceding to the Charter after March 31, 1979;

WHEREAS Article XI of the Charter provides that it may be amended at any meeting of the Board of Trustees of the Council (the Board) by three-fourths majority vote of all voting members of the Board provided notice of such proposed amendments together with their full texts is mailed to all members of the Board at least eight (8) weeks in advance of such meeting, unless such notice is waived by all members of the Board;

AND WHEREAS the Executive Committee of the Council which met in Nairobi, Kenya, on April 9-10, 1979 endorsed this resolution for adoption by the Board;

NOW THEREFORE the members of the Board of Trustees of the Council assembled at its fourth meeting in Amsterdam, the Netherlands, on June 30, 1979, each member having received due notice and full text of the proposed amendments pursuant to Article XI of the Charter, hereby resolve to amend the Charter by extending the date for accession to the Charter to December 31, 1980.

B. Lundgren, Sweden

Position at ICRAF: Director

Holds M.Sc. and Ph.D. degrees in Forestry from the Royal College of Forestry (Stockholm) and the Swedish University of Agriculture Sciences (Uppsala) respectively. Fields of specialization are tropical forest soils and land evaluation and in particular the effect of plantation forest management on soils. Field research in East Africa (Tanzania, Ethiopia) 1968-78. For a period of two years, in 1972-74, has been a Lecturer in Forest Biology at Makerere University, in Uganda and at the Faculty of Agriculture and Forestry in Morogoro, Tanzania. Since 1978 has worked as a consultant in Tropical Forest and Land Development, has travelled extensively in the tropics and has been engaged in projects in Central America, East and West Africa and Sri Lanka. Joined ICRAF Sept. 1, 1981.

K. Gatamah, Kenya

Position at ICRAF: Secretary/Treasurer

Holds an MBA from the University of Strathclyde (Glasgow, Scotland) and is a certified public Accountant of Kenya. Has worked in the Public Service (Civil Service) in the Government of Kenya and was Deputy Treasurer - Nairobi City Council at the time of appointment. Joined ICRAF Dec. 1, 1980.

P.A. Huxley, United Kingdom

Position at ICRAF: Senior Research Scientist (Agronomy/Horticulture)

Holds B.Sc. and Ph.D. degrees in Horticultural Botany from the University of Reading, U.K. Has been Senior Lecturer in Applied Physiology at Makerere University, Uganda; Director of Research at the Coffee Research Foundation, Kenya; Professor and Head of the Department of Horticulture, University of Reading, Professor of Crop Science, University of Dar es Salaam, Tanzania; visiting Professor of UBLS in Swaziland; and Project Manager of a UNDP/FAO project strengthening the Agricultural Research Centre in Libya. Has been a Member of the Governing Boards of East Malling Research Station, the Glasshouse Crop Research Institute and the National Vegetable Research Station, U.K. Was member of the Inter-University Council for Higher Education Overseas (IUC) in London. Is Fellow of the Institute of Biology and Fellow of the Royal Society of Arts. Has conducted research on coffee and other tree crop physiology, grain legume physiology, plant responses to environment, intercropping, experimental design, zero tillage, cassava and Amaranthus. Joined ICRAF April 1, 1979.

P.K.R. Nair, India

Position at ICRAF: Senior Research Scientist (Agronomist)

Holds B.Sc (Agri.) and M.Sc. (Agri.) degrees from the University of Kerala,

India, Ph.D. in Agronomy from the Agricultural University of Pantnager, India and Dr.Sc.Agr. from the University of Goettingen, Germany. Has been Lecturer in agronomy at the Agricultural College, Kerala, India; Post-Doctoral Fellow in soils and plant nutrition at Rothamsted, U.K.; Agronomist (soils) in charge of multiple cropping with coconuts at the Central Plantation Crops Research Institute (ICAR) at Kasaragod, India; and Senior Research Fellow (Alexander von Humboldt Foundation) at the Institute of Soil Science and Forest Nutrition, University of Goettingen. Areas of specialization: multiple cropping; farming systems involving coconuts and other tree crops; soil fertility under multiple cropping systems. Joined ICRAF November 1978.

J.B. Raintree, U.S.A.

Position at ICRAF: Senior Research Scientist (Anthropologist)

Holds A.B. in Psychology from Princeton University and M.A. and Ph.D. in Applied Ecological Anthropology from the University of Hawaii, U.S.A. Has been Lecturer in Anthropology at the University of Hawaii and Chaminade University; Social Science Research Council Post-Doctoral Fellow in Tree Crop Horticulture and Forestry at Oregon State University; Rockefeller Foundation Social Science and Agriculture Post-Doctoral Fellow in Agricultural Economics, Farming Systems Programme, International Institute of Tropical Agriculture (IITA), Nigeria; and Agroforestry and Rural Industry Advisor to the Government of Indonesia; Provincial Area Development Programme, Central Java. Has conducted research on agroforestry systems in the Philippines, Indonesia, Nigeria, Sierra Leone, and the U.S.A. Areas of specialization: socioeconomic aspects of agroforestry; culturalecology; landuse systems diagnosis; bioeconomic modeling; village level technology assessment; cross-cultural extension methods. Joined ICRAF as a Rockefeller fellow in January 1981. From January 1, 1982 on permanent staff.

F. Torres, Argentina

Position at ICRAF: Senior Research Scientist (Range Management & Livestock Production)

Holds B.Sc. in Crop and Animal Production from the University of Buenos Aires, Argentina and Ph.D. in Animal Nutrition and Animal Science from Cornell University, U.S.A. Has been Advisor to the Secretary of State for Agriculture, Argentina; Professor of Animal Nutrition and Co-ordinator of the graduate programme in animal production of Argentina's Graduate School of Agricultural Sciences; was leader of the Ruminant Nutrition section at the Balcarce Research Station of the National Institute of Agricultural Technology (INTA); and has worked as Consultant to the National Beef Research Centre of the Brazilian Agricultural Research Organization (EMBRAPA) on research programming and nutrition of the grazing ruminant (seconded by the Inter-American Institute of Agricultural Science, (IICA). Was President of the World Association for Animal Production (WAAP) and President of the IV World Conference on Animal Production, and is member of the Editorial Boards of Livestock Production Science and Journal of Animal Breeding and Genetics. Areas of specialization: research on beef production systems, with special reference to plant-animal relationships. Joined ICRAF in June 1979.

R. Labelle, Canada

Position at ICRAF: Senior Research Staff (Information Sciences)

Holds B.Sc. in Biology and M.Sc. in Plant Physiology from Queen's University in Ontario. Currently completing requirements for Diploma in Resource Management from Faculty of Forestry, University of Toronto. Has worked for Ontario Science Centre and for Parks Canada in science and nature interpretation and national park planning. On secondment from IDRC, Canada, Information Sciences Division. Joined ICRAF July 1981. Areas of specialization: acquisition, dissemination and management of bibliographic information on agroforestry.

Impending Secondments (Senior Research Scientists, arriving early 1982)

From Switzerland:	a bioclimatologist	Dr. Till Darnhofer
From Germany (GTZ):	a forester	Mr. Peter von Carlowitz
From The Netherlands:	a farm economist	Dr. Dirk Hoekstra

L.E. Buck, U.S.A.

Position at ICRAF: Project Coordinator on Consultancy Basis

Holds B.A. in Sociology and Psychology, B.Sc. in Recreation Planning from University of Colorado and M.Sc. in Resource Planning (National Science Foundation Energy Trainee Fellow) from College of Forestry and Natural Resources, Colorado State University. Has been Research Fellow of the Royal Swedish Academy of Science Beijer Institute, engaged in local and national level energy surveying and planning for Kenya's Ministry of Energy. Has consulted for USAID's Renewable Energy and Kitui Nursery Projects in Kenya, as well as others. Worked for EDAW, Inc., an environmental planning and landscape architecture firm, as socio-economic analyst and for University of Colorado's Bureau of Economic Research and the Oil Shale Corporation (TOSCO) in areas of socio-economic impact assessment and "boom town" planning. Currently Manager of Agroforestry Plots for Rural Kenya Project (Maringira Institute in collaboration with ICRAF, funded jointly by the Ford Foundation and the Government of The Netherlands).

LIST OF TRUSTEES

ATTACHMENT D

Name	Citizenship	Occupation	Main Discipline
Dr. M.S. Swaminathan	India (57)	Member Planning Commission India	Agriculture - Plant genetics, Research Administration and International Development.
Dr. W. Bosshard	Swiss (56)	Director - Swiss Federal Institute of Forestry Research	Forestry - Silviculture, Forestry research and teaching.
Dr. P. Alvim	Brazil (62)	Director CEPLAC	Agriculture - Plant physiology Research management and teachi
Mr. J. Bene	Canada (71)	Advisor to Canadian Government	Forestry - Forest industry management, forestry and land management.
Dr. J. Madamba	Phillipines (47)	Director General SEARCA	Agriculture - Beef & carabeef production Pasture & forage utilization.
Mr. O.M. Mburu	Kenya (46)	Chief Conservator of Forests	Forestry - Forest management.
Prof.Dr. von Maydell	Germany (50)	Prof. & Head of Department World Forestry Inst. Hamburg	Forestry - Forest products and forest products geography.
Dr. J.G. Ohler	Dutch (57)	Royal Tropical Institute	Agriculture - Tropical agriculture
Prof. L. Roche	Canada (55)	Head Department of Forestry - Bangor	Forestry - Plant breeding, silviculture, Forestry management, Genetics Research planning Management a teaching.
Dr. B. Lundgren	Sweden (36)	Director - ICRAF	Forestry - Forest Soils, Forest land evaluation, Silviculture.

ATTACHMENT E

NEWSLETTER

News and comment from the International Council for Research in Agroforestry

ICRAF No. 5 July 1981

ICRAF'S NEW DIRECTOR APPOINTED

At the last ICRAF Board Meeting (March 1981) Dr. Björn Lundgren was appointed the new Director of the Council. He will join ICRAF on 1st September this year.

Dr. Lundgren comes from Sweden. He holds M.Sc. and Ph.D. degrees in Forestry from the Royal College of Forestry (Stockholm) and the Swedish University of Agriculture Sciences (Uppsala) respectively.

His fields of specialization are tropical forest soils and land evaluation and he has particularly studied the effect of plantation forest management and soils in the northern Tanzanian highlands. For a period of two years, in 1972-74, he was a Lecturer in Forest Biology at Makerere University, in Uganda and at the Faculty of Agriculture and Forestry in Morogoro, Tanzania. Since 1978 he has worked as a consultant in Tropical Forest and Land Development with the Swedforest Consulting Company. He has travelled extensively in the tropics and has been engaged in projects in Central America, East and West Africa, and Sri Lanka. ●

REMINDER

UNCNRSE/NGO FORUM. This Newsletter will be out at the time of the UN Conference on New and Renewable Sources of Energy, which is being held in Nairobi, 10-12 August, accompanied by a Non-Government Organizations Forum through 9-16 August. These will, in part, be concerned with issues relevant to fuelwood supply and many of you will be interested in the reports, lists of participants etc, and ultimately, the Proceedings. Contact, respectively:

1. UNCNRSE Secretariat,
   United Nations,
   New York, N.Y. 10017,
   U.S.A.
2. NGO Forum on New and Renewable Sources of Energy,
   c/o Environment Liaison Centre,
   P.O. Box 72461,
   Nairobi, Kenya. ●

PLANT RESEARCH AND AGROFORESTRY

ICRAF's Consultative Meeting on this subject took place in Nairobi from 8-15 April, 1981. It was jointly funded by ICRAF and Swiss Development Co-operation.

Over 40 plant scientists from 17 countries participated to present papers and discuss how their specialities were related to the development and management of agroforestry land use systems. The Meeting was in four parts and abbreviated titles of presentations are given below:

HONEY PRODUCING TREES IN THE TROPICS

A large proportion of the honey produced in tropical areas comes from trees. The eucalyptus trees are possibly the single greatest producers of honey in Australia but only certain species are good honey producers. The introduction of *Prosopis juliflora*, sometimes called *Prosopis pallida*, into Hawaii made this area the world's largest producers of honey in the early 1930's. The Miombo Woodlands, in eastern Africa in particular, are well-known for this honey production from species of *Acacia Brachystegia* and *Julbernardia*. While the more temperate areas of the world produce most of their honey from forage crops, there are exceptionally valuable honey-producing trees as well, including the black locust (*Robinia pseudoacacia*)

In recent years there has been considerable emphasis placed on the use of trees for the dry zone areas of the tropics to provide food, fodder and to control desertification. In many of these very areas where this reforestation is being considered, beekeeping has been practised traditionally for thousands of years, and at one time for many of the tribes was a major part of their economy. Unfortunately in the choice of plants to use in these areas, little consideration has been given to honey production. There is evidence to show that beekeeping has increased the income of many people in Kenya by two to three times since it was promoted in that country. Serious consideration should be given to the selection of trees and species which are

Leucaena Leucocephala established by direct seeding as an intercrop with maize in an IITA "alley cropping" farm trial in Nigeria. Within a year, the leucaena will produce abundant green manure mulch material to benefit succeeding crops of maize. Fuelwood and forage are additional by-products of this conservation agroforestry system which enhance its attractiveness to farmers. (Photo: J.B. Raintree)

A PROBLEM!

We think of Canada as being a well-endowed land providing, especially, a richness of wheat and wood. V.J. Nordin, Dean of the Forestry Faculty at the University of Toronto, writing in a recent issue of the Canadian Pulp and Paper Industry (February, 1981), points out that the forest resource is dwindling. A fact now accepted in a report by the Canadian Council of Resources and Environment Ministers, which calls for a 50 percent increase in forest production by the year 2000, through re-planting, better management etc. Large sums of money are to be spent to rectify the situation – But even today Canada has only one professional forester for every 80,000 hectares of existing forest, rather than the objective of one in 40,000. So where are all the foresters to come from, asks Dr. Nordin?

He estimates that some 8,000 will be required in the next decade, and an immediate programme is needed to strengthen and develop Canada's six professional forestry schools, which graduate around only 400 foresters each year in all.

If such a strong effort is required to put Canada's already well-structured forestry the world's developing countries need to do to build up their vital programmes of agroforestry and community forestry? Agroforestry Education is essential to the practical development of agroforestry systems – there have to be professionally trained personnel to fill the necessary planning, management and research roles. There are encouraging signs that many Universities in both developing and developed countries are beginning to face up to the problem. But will the effort be adequate, and in time?

ICRAF is anxious to contact all Institutes teaching, or about to teach, agroforestry in one form or another. If you have any information please write in to Dr. Peter Huxley at ICRAF. ●

AGROFORESTRY INITIATIVES

Agroforestry in the Philippines

The Kang-Atis Pilot Community Development Project, to start this year, is part of the larger Lusaran Resettlement Project. One of its goals is the stabilization of the Lusaran catchment area in the vicinity of Kang-Atis, Lusaran, Cebu City.

The specific purposes to be achieved at the end of the three year period are to:-

- modify present land use practices and farming methods to reduce soil erosion on hilly lands;
- improve the income and social benefits for the initial groups of families to be resettled; and
- field test methods of relocation and resettlement to be used on a larger scale within and adjacent to the Lusaran catchment area.

The present project site is a proposed dam watershed in Central Cebu. The major problem here, however is 8000 residents on 6700 ha of land with no place else to go! Some form of agroforestry is seen as the best chance to generate food, fuel and income, whilst yet retaining a stable land use system. Other project activities include a demonstration farm (using *Leucaena leucocephala*).

For further information write to:-

Lusara Settlement Project Inter-Agency Committee,
Lusaran Dam Project,
3rd Floor HVG Arcade,
Subangdaku Mandaue City,
Philippines. ●

ICRAF'S BOARD OF TRUSTEES

Dr. M.S. Swaminathan (India) has been re-elected as Chairman, and Dr. W. Bosshard (Switzerland) Vice-chairman at the 7th Board Meeting (April 6-7 1981). After four year's service Dr. R.F. Chandler (USA) has completed his term of office; Dr. J. Diouf (Senegal) has

Dr. J. Hulse (IDRC) terminates his service as Vice-Chairman and member on completion of IDRC's term as Executing Agency.

Dr. Paulo de T. Alvim (Brazil) and Professor L. Roche (UK) have been

from page 1, col. 3

other uses when tropical reforestation is considered. This applies particularly to selection of species of *Acacia*, *Eucalyptus*, and *Prosopis*. Many of the best producers are legumes with nitrogen-fixing properties. The recommended varieties are as follows:

Prosopis – of the Algaroba group, particularly *P. juliflora*;

Acacia – *A. mellifera*, *A. tortilis* and *A. Senegal* for dry areas and *A. xanthophloea* and *drepanolobium* for the wet areas;

Eucalyptus–*E. melliodora*, *E. sideroxylon*, *E. citriodora*, *E. robusta*.

There are many other suitable trees found in other areas and often recommended for honey production, including *Dombeya goetzenii*, *Croton megalocarpus*, *Grevillea robusta*, *Nephilium litchi*, *Calliandra calothyrsus*, etc.

It is generally recognized that what is needed most in the desert or semi-desert areas of the tropics is a plant which will grow under difficult circumstances with low water requirements; something that will grow quite fast and will have a multiple use. I know of no plant which suits this purpose better than *Prosopis juliflora*. It is still recognized as the most important plant that was ever introduced into Hawaii. This variety should not be confused with *Prosopis glandulosa*, *Prosopis velutina* and *Prosopis ruscifolia*, which are considered to be damaging weeds in grassland areas of the southern United States.

Prosopis species, particularly *Prosopis juliflora*, are capable of producing fuel, fodder, honey and beeswax. The Indians in America used the fruit of *Prosopis* for flour. Its root system will penetrate up to 30 m or more thus making use of subsoil moisture. Under ideal conditions it can be producing seed within three years of seeding. It can be reproduced by seed, or vegetatively from root suckers and stem cuttings. Seedlings of *Prosopis juliflora* have, for the first four weeks, more rapidly penetrating roots than *Acacia tortilis*, thus helping it in establishment. In the Sudan it was shown that *Prosopis juliflora* was found to develop a deep taproot system contrasting with the shallow root system in other plants.

A rather interesting development program, using this species, has been introduced into Chile in the coastal desert of Piura. At the time the report was written, over 1,000 hectares of *Prosopis* greatest production of both seeds and honey it is recommended that the plants be established approximately 16-17 m (50 feet) apart. Since Prosopis *alone* is not the best source of food for livestock, it is suggested that between the plantings drought-resistant grasses should be planted. Grasses grow well under *Prosopis* as it provides both humus and nitrogen. In the Chilean situation land containing the planting was turned over to the families living on the project site within three years of its establishment. It was estimated that the project would be in full production by the fifth year. Besides the harvesting of the crops as a fodder and food, colonies of bees were moved onto the project for commercial honey production, and the plants were also grazed by the sheep or goats, preferably sheep, after the trees are grown to a size where the loss of their small branches will not interfere with the production of the pods. There are two harvests a year for the seed, the principal one occurring in December through to March with the second, a lighter harvest, in August and correspondingly two crops for honey and wax. A number of glowing reports and recommendations for the use of this plant as a multiple use reforestation item for desert areas have been printed, but apparently little attention has been paid to them; possibly because varieties of *Prosopis* found in the southern United States are considered as a serious weed in the livestock-producing areas. There are, however, some 44 species of *Prosopis* found throughout the world and they do not all carry these weed characteristics, many forming a large tree such as *Prosopis juliflora*, particularly if pruned during the first two to three years of growth.

It could be envisaged that a complete food economy could be built up in some of the desert areas around the growing of this plant, particularly if some of the drought-resistant grasses could be grown along with it. It could provide, in a very short time, sometimes within three years, fodder and feed from the pods, honey and beeswax, which is in great demand as a food and export item and is readily saleable. Thinning could produce charcoal and firewood; the livestock which it could support, particularly sheep or goats, could provide milk and meat. It is time that serious consideration was given to the use of this plant as there are few that can provide the same in similar circumstances.

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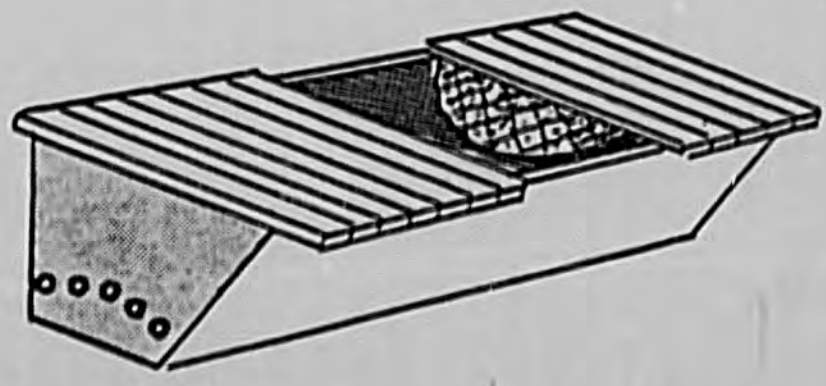
KENYA TOP BAR HIVE

A hive that shows particular promise for use by the beekeepers of Kenya is the top bar hive. This hive is intermediate between the log or box hive and the movable frame hive. It is designed after the Greek basket hive in which a series of parallel bars were used to form the top of the hive. The bees attach their combs to the bars, which can be lifted out of the hive for examination.

There are several basic principles that must be observed when constructing a hive of this type. African bees construct combs that are spaced 1¼" apart - centre to centre. Therefore the top bars must be exactly 1¼" wide if the bees are to build one comb on each bar. A strip of beeswax starter along the centre of each bar will help guide the bees to build their combs straight.

Cont'd on page 5, col. 1



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Part 1 — Plant associations in agroforestry

J. Coombs (with D.O. Hall Univ. of Reading and London UK) — *Biomass production in agroforestry for fuels and foods.*

G. Budowski (CATIE, Costa Rica) — *Quantification of practices in Costa Rica.*

C. Briscoe (JARI, Brazil) — *Integrated forestry-agriculture-livestock at Jari.*

P.K.K. Nair (ICRAF) — *Plant associations and land use practices with coconuts etc.*

B.N. Okigbo (IITA) — *Plants and agroforestry in West Africa.*

K. Rachie (Rockefeller) — *Intercropping tree legumes with annual crops.*

Tran Van Nao (FAO) — *Agroforestry systems and some research problems.*

Part 2 — The systems approach

R. Loomis and C.E. Whitman (Univ. of California, Davis USA) — *Systems analysis in production ecology.*

H.A. Steppler and J.B. Raintree (ICRAF) — *The ICRAF research strategy and plant science research for agroforestry.*

D. Connor (La Trobe Univ. Australia) — *Crop models — components and contributors in agroforestry associations.*

F.F. Brunig, (Hamburg Univ. W. Germany) — *Ecosystem structure and functioning.*

J. Raintree (ICRAF) — *Bioeconomic evaluation of agroforestry cropping systems.*

Part 3 — Plant science aspects applicable to management in agroforestry systems

B. Pickersgill (Univ. of Reading U.K.) — *Evolution in herbaceous and tree crops of relevance to agroforestry.*

R. Oldeman (Wageningen Univ. Netherlands) — *The design of ecologically sound agroforests.*

P.A. Huxley (ICRAF) — *Phenology of woody perennials and annual crop plants ref. their management in agroforestry systems.*

M. Huck (USDA, Auburn Univ. U.S.A.) — *Root distribution growth and activity in agroforestry.*

J. Jackson (East Malling Res. Stn. U.K.) — *Light interception by crop structures.*

L. Leyton (Oxford Univ. U.K.) — *Crop water use ref. mixed and zonal systems.*

E.F. Brunig/N. Sander (Hamburg Univ. W. Germany) — *Agroforestry and plant nutrient needs as effected by soil and cropping.*

L. Tieszen (Augustana College U.S.A.) — *Photosynthetic systems — implications for agroforestry.*

T. Kira/A. Kumura (Osaka City and Tokyo Univ. Japan). — *Dry matter production and efficiency in different plant canopies.*

T. Ledig (USDA, Pacific & SW Forest & Range Stn. U.S.A.) — *The influence of genotype and environment on dry matter distribution.*

M.G.R. Cannell (Inst. Terrestrial Ecol. U.K.) — *Plant management in agroforestry.*

D. Connor (La Trobe Univ. Australia) — *Plant stress factors.*

Part 4 — Poster papers

M.J. Magambo (Tea Res. Found., Kenya) — *Management of tea for biomass accumulation and yield*

B. Ndunguru (with J.F. Redhead and J.A. Maghembe Univ. of Dar es Salaam, Tanzania). — *Intercropping of grain legumes in agroforestry systems.*

G. Michon (Inst. Botanique, Montpellier, France) — *Village — Forest-Gardens in W. Java.*

W. Godfrey-Sam-Aggrey — (Univ. of Swaziland/FAO Swaziland) — *Agroforestry and arid-based cropping systems in Botswana and Swaziland.*

P.A. Huxley (ICRAF) — *The role of trees in agroforestry.*

H. Lamprey (UNESCO, Nairobi) — *The IPAL Project and arid zone agroforestry.*

M. Gwynne/H. Croze (UNEP, Nairobi) — *Renewable resource monitoring, GEMS.*

P.A. Huxley (ICRAF) — *Some characteristics of trees for agroforestry.*

Four Working Groups considered the implications of:

1. Plant-to-plant interactions in agroforestry
2. Ecological considerations
3. Plant types for agroforestry
4. Plant Management in agroforestry

ICRAF will be publishing the Proceedings towards the end of this year. ●

ICRAF STAFF

Karugor Gatamah, from Kenya, joined ICRAF as Secretary/Treasurer on February 1, 1981. He is a member of the Institute of Certified Public Accountants (Kenya), and holds an MBA from the University of Strathclyde. Karugor has worked for the Government of Kenya, and as Deputy City Treasurer to Nairobi City Council.

ICRAF will welcome, during July, a new member of staff, Richard Labelle, as Project Advisor, Documental/Information Services. Richard holds a 2-year assignment on secondment from IDRC. This is one of a number of assignments to be made by various governments and organisations starting this year in order to assist ICRAF to build up its multi-

NEW JOURNALS

Agroforestry Systems — An international quarterly journal to be published by Martinus Nijhoff/Dr. W. Junk BV in co-operation with ICRAF. Commencing in January 1982 this new journal will provide a rapid outlet for scientific papers and reviews in this field. Contributions can be on agroforestry research and research methodology, agroforestry systems (including sylvo-pastoral systems), the role of trees in multiple land-use, multi-purpose trees and crop plants suitable for agroforestry systems; economic and social aspects of agroforestry, the place of agroforestry, and eco-farming etc. in rural development; and so on.

Social Forestry — Published by the Himalaya Seva Sangh (Society for Service in the Himalaya), Rajghat, New Delhi 110002, India. First issue May, 1981. This publication arises from the interest shown by the participants in the FAO sponsored Seminar on the Role of Women in Community Forestry held at Dehra Dun in December, 1980. Its aim is to collect and disseminate information about social forestry in India and abroad.

Mountain Research and Development — An interdisciplinary international journal to be co-published by the United Nations University and the International

— AND NOW TREE PONDS!

The technique for establishing liman plantations –forested plots irrigated by runoff from small catchments – is described, and reference is made to their high evapotranspiration and fast growth. Liman plantations possess the potential for multiple use. In developed countries they provide thermal comfort for recreational activities in the summer, and in developing countries they can serve as an important source of fuel in otherwise treeless deserts. Data are given on the biomass and energy production of *Eucalyptus camaldulensis* and *E. occidentalis* in limans of the Negev desert. (Authors Summary).

From: "Tree ponds for recreation and fuelwood" by R. Karschon and J. Kaplan, pp. 17-21 in the March, 1981 issue (No. 13) of Arid Lands Newsletter; which contains many other articles of interest to agroforesters.

(Distributed free through University of Arizona, Office of Arid Lands Studies, 845 North Park Avenue, Tucson, Arizona 85719, USA). ●

Farmland grown *Sesbania grandiflora* feeds the fuelwood requirements of this lime kiln in a dry hill area of Java. Are border plantings of multipurpose trees the answer to fuelwood supply problems in your area? (Photo: J.B. Raintree)

from page 3 col. 3

Naturally built honey combs are somewhat elliptical in shape, with sloping sides and a rounded bottom. It has been found that if the sides of the hive are made to slope at approximately the same angle as the comb, the bees will not attach the comb to the hive walls. The sides of the hive should slope outwards to form an angle of about 110° to 120° with the bottom in order to meet this requirement. The diagram is reproduced from an Information Pamphlet issued by the Kenya Ministry of Agriculture, P.O. Box 30028, Nairobi. The hive has a flat lid and it can be strung by wire loops attached to the ends.

=See also K.I. Kigatiira (1974), "Hive designs for beekeeping in Kenya", Proc. Ent. Soc. Ontario, *105*, 118-

PROCEEDINGS OF THE KENYA NATIONAL SEMINAR ON AGRO-FORESTRY 12-22 NOVEMBER, 1980

Full proceeding of this meeting held jointly by ICRAF and the University of Nairobi will be available in early August (approx. 450 pages, mimeod). A limited number of copies will be available for wider distribution. Please write to ICRAF for further information. A copy of the Seminar Report, listing names, address, titles of presentations and the Working Group Recommendations is available, free, on request. ●

PAST MEETINGS

First Conference on Hillside Agriculture in Tropical America:

During the first week of December, 1980, approximately 35 scientists and agricultural development specialists met at CATIE, in Turrialba, Costa Rica, for the first conference on Hillside Agriculture in Tropical America (Seminario Internacional sobre Production Agropecuaria y Forestal en Zonas de Ladera de America Tropical). During the week-long meeting, 22 papers were presented by the participants which included anthropologists, historians, economists, biological and integrated rual development project leaders.

During the work sessions the delegates prepared a list of recommendations and conclusions which included the concept of developing a Hillside Agriculture Secretariat or Network. The goals of the proposed organization would be to support ongoing research, undertake new research, facilitate the exchange of information, and attempt to bring into focus, for policymakers, the options open to them in developing and protecting the steep-sloped areas.

Those interested in receiving copies of the conference proceedings (introduction and conclusion in Spanish and English; presentations in Spanish) should write to Andres Novoa R, Unidad de Communicaciones y Informacion, CATIE Turrialba, Costa Rica. All those with interest in the proposed formation of a Hillside Agriculture Network, inform Dr. Joshua L. Posner, The Rockfeller Foundation, 1133 Avenue of the Americas, New York, NY 10036, USAof your interest.

Dr Filemon Torres, from ICRAF, attended the recent Workshop on Agroforestry in the Humid Tropics (27 April–1 May). Proceedings are being prepared – Contact Professor P.R.O. Kio of the Department of Forest Resources, University of Ibadan, Nigeria or Mr. Lee McDonald of the National Resources Division of the United Nations University, 29th Floor, Toho Seimei Building, 15-1, Shibuya 2-Chome,

FUTURE MEETINGS

Workshop on Tropical Tree Legumes in Agroforestry

The Environment and Policy Institute of the East-West Center in Honolulu, Hawaii, will hold a workshop in November, 1981 on the selection of fast-growing, nitrogen-fixing, multiple-purpose leguminous trees that are suited to agroforestry and fuelwood production, and to evaluate their roles in promoting ecological stability and in increasing wood and food yields on a sustained basis. Expected outputs of the workshop will be manuals for extension workers to promote and implement agroforestry and fuelwood projects which may help stabilize shifting cultivation, and possibly some policy recommendations to modify certain policies on land-use allocation between agriculture and forestry.

For further information, contact:

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Honolulu, Hawaii 96848
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Professional Education in Agroforestry (ICRAF/DSE) – see Newsletter No. 3. This Workshop has, regretfully, now had to be postponed and will probably take place in the second quarter of 1982. ●

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Mountain Society, with additional support from UNESCO. Covering natural and human sciences, medicine, architecture, engineering and technology as concerned with highland areas. First issue May, 1981. Write to The Editor International Mountain Society, P.O. Box 3148, Boulder, Colorado 80307, U.S.A. ●

ICRAF

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UNEP (Gems). 1980. Selected works on ecological monitoring of arid areas. GEMS/PAC Information Services No. 1, 102 pp (6 documents). Global Environment Monitoring System, UNEP, P.O. Box 30552, Nairobi, Kenya. ●

SELECTED REFERENCES

Webb, D.E., Wood, P.J. and Smith, J. *1980*. A guide to species selection for tropical and sub-tropical plantations. Tropical Forestry Papers, No. 15. Commonwealth Forestry Institute Oxford, U.K.

National Academy of Sciences 1980. Firewood Crops – Shrubs and Tree Species for Energy Production; pp. 237. Another extremely useful production from this source: Free, while supplies last, to institutionally affiliated recipients in government, education or research upon formal (letterhead of organization) request to: Commissioner on International Relations, (JH 215). National Academy of Sciences – National Research Council, 2101 Constitution Avenue, Washington DC 20418, USA.

Herrera, A.O. 1981. The generation of technologies in rural areas. World Development. *9*: 21-35.

Barbier, C. and Courvoisier, C. 1980. An approach to the traditional use of medical plants in Java, pp. 64 – Annex. Diploma Studies in General and Applied Ecology. Universite des Sciences et Techniques du Languedoc. Academie de Montpellier, Place Eugene Battaillon, 34060 Montpellier Cedex, France.

Ledig, F.T. 1981. Silvicultural systems for the energy efficient production of fuel biomass, pp. 447-461 in "Biomass as a Nonfossil Fuel Source" (Ed. L. Klass). ACS Symposium Series, No. 144. Amer. Chem. Soc. Washington.

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ATTACHMENT F

ICRAF PUBLICATIONS

January 1982

1978

- King, K.F.S. (1978). Some aspects of land-use planning. Eighth World Forestry Congress, Jakarta, Indonesia, Oct. 1978, 14pp, refs.
- King, K.F.S. (1978). The future availability of wood. World Conference on Future Sources of Organic Raw Materials. Toronto, Canada, 32pp
- King, K.F.S. and Chandler, M.T. (1978). The Wasted Lands, ICRAF, Nairobi, 36pp. (English, Spanish and French, all versions out of print)

1979

- King, K.F.S. (1979). Land utilization in developing economies XVIII. H.M. Albright Conservation Lectureship. University of California, Berkely, 28pp. references
- King, K.F.S. (1979). Some principles of agroforestry (inaugural address). National Seminar on Agroforestry, India, 19pp, refs
- King, K.F.S. (1979). Agroforestry and fragile ecosystems p XXIX in H.O. Mongi & P.A. Huxley Editors, "Soils Research in Agroforestry", refs.
- King, K.F.S. (1979). Concepts of agroforestry p. 1-14 in T. Chandler and D. Spurgeon, Editors "International Cooperation in Agroforestry", refs.
- Mongi, H.O. (with S.O. Keya & P.M. Ahn) (1979). Standardization in soil research methodologies and strategy in agroforestry, pp. 539-568 in H.O. Mongi and P.A. Huxley, Editors "Soils Research in Agroforestry", ICRAF, Nairobi
- Torres, F. (1979). Research objectives in agroforestry: a conceptual approach, pp. 257-274 in Chandler, T. and Spurgeon, D., Editors, "International Cooperation in Agroforestry". ICRAF, Nairobi.
- Torres, F. (1979). Research in sylvopastoral systems, ICRAF, Nairobi. 30pp.

1980

- Chandler, T. (1980). Documentation of agroforestry literature and research, pp. 177-190 in Chandler, T. and Spurgeon, D. (Eds) "International Cooperation in Agroforestry", ICRAF, Nairobi

- Contant, R.B. (1980). Training and education in agroforestry, pp. 191-218 in Chandler, T. and Spurgeon, D. (Eds) "International Cooperation in Agroforestry", ICRAF, Nairobi

- Huxley, P.A. (1980). Agroforestry at degree level: New programme structure, pp. 219- 227 in Chandler, T. and Spurgeon, D. (Eds) "International Cooperation in Agroforestry", ICRAF, Nairobi

- Huxley, P.A. (1980). Agroforestry research: The value of existing data appraisal, pp. 275-315 in Chandler, T. and Spurgeon, D. (Eds), "International Cooperation in Agroforestry", ICRAF, Nairobi

- Huxley, P.A. (1980). The need for agroforestry and special considerations regarding field research, pp. 117-142 in "Nuclear Techniques in the Development of Management Practices for Multiple Cropping Systems", Proc. Advis-Group Meeting, Ankara, 8-12 Oct. 1979. IAEA Tech. Doc. 235. IAEA, Vienna (also supplementary appendices from ICRAF)

- King, K.F.S (1980). Agroforestry and the development of tropical forestry, pp. 32. UNEP, Meeting of Experts on Tropical Forests. ICRAF, Nairobi

- King, K.F.S. (1980). Forestry's contribution to social and economic development, Common. For. Rev. 59, 515-525

- King, K.F.S. (1980). Concepts of agroforestry, pp. 1-13 in Chandler, T. and Spurgeon, D. (Eds) "International Cooperation in Agroforestry, ICRAF, Nairobi

- Mongi, H.O. (1980). Agroforestry Extension: Needs and strategy, pp. 219-228 in Chandler, T. and Spurgeon, D. (Eds). "International Cooperation in Agroforestry" ICRAF, Nairobi

- Nair, P.K.R. (1980). Agroforestry research: A retrospective and prospective appraisal, pp. 275-296 in Chandler, T. and Spurgeon, D. (Eds) "International Cooperation in Agroforestry", ICRAF, Nairobi

- Torres, F. (1980). Research objectives: A conceptual approach, pp. 257-274 in Chandler, T. and Spurgeon, D. (Eds) "International Cooperation in Agroforestry", ICRAF, Nairobi

- Torres, F. (1980). El papel de la ganaderia en los sistemas agroforestales. Notas para una conferencia. Centro Agronomico Tropical de Investigacion y Enséñanza (CATIE), Turrialba, Costa Rica, 19 pp. (in Spanish). Paper prepared for the course on agroforestry techniques for the humid tropics. CATIE/DSE, Dec. 8-16

1981

- Huxley, P.A. (1981). Agroforestry - developing a new research discipline, pp. 56-68 in L. Buck (Ed) "Kenya National Seminar on Agroforestry", ICRAF, Nairobi

- Huxley, P.A. (1981). Experimental work with trees and shrubs for use in agroforestry systems, pp. 75-80 in L. Buck (Ed) "Kenya National Seminar on Agroforestry", ICRAF, Nairobi

- Huxley, P.A. The place of fast-growing nitrogen-fixing trees in agroforestry - discussion paper presented to National Academy of Sciences Programme Planning Meeting, 5-7 Oct. 1981, Washington. ICRAF, Nairobi

- Huxley, P.A. Some critical topics for plant research agroforestry, pp. 85-92 in L. Buck (Ed). "Kenya National Seminar in Agroforestry", ICRAF, Nairobi

- Huxley, P.A. Phenology of woody perennials and annual crop plants with reference to their management in agroforestry systems in P.A. Huxley (Ed) "Plant Research and Agroforestry", ICRAF, Nairobi

- Huxley, P.A. The role of trees in agroforestry. In P.A. Huxley (Ed) "Plant Research and Agroforestry", ICRAF, Nairobi

- Huxley, P.A. Some characteristics of trees to be considered in agroforestry in P.A. Huxley (Ed), "Plant Research and Agroforestry", ICRAF, Nairobi

- Huxley, P.A. Woody plants and land use. Paper presented to FAO/IAEA Consultative Meeting for the use of Nuclear Techniques in Improving Fertilizer and Water Management Technologies for Tree Crops, 9-13 Nov. 1981, pp. 17, Vienna (to be published in IAEA/FAO Tech. Doc.).

- Huxley, P.A. (Ed). Proc. of Consultative Meeting on Plant Research and Agroforestry, 8-15 April, Nairobi (in preparation). (Mimeod report available) ICRAF, Nairobi

- ICRAF, International Council for Research in Agroforestry (ICRAF), pp. 13. ICRAF, Nairobi (Mimeod.) 1981

- ICRAF, Fuelwood or food? Why not have both? Paper submitted to U.N. Conference on New and Renewable Sources of Energy, 10-21 Aug. 1981. Nairobi 100/NGO. pp.5 appendix, ICRAF, Nairobi, Mimeod.

- Nair, P.K.R. Soil management in agroforestry, pp. 251-277 in L. Buck (Ed) "Kenya National Seminar on Agroforestry", ICRAF, Nairobi

- Nair, P.K.R. Plant association and agroforestry land use practices with coconuts and other tropical plantation crops in P.A. Huxley (Ed) "Plant Research and Agroforestry", ICRAF, Nairobi

- Raintree, J.B. Conservation farming with multipurpose tree legumes: an under-developed branch of tropical agroforestry research, pp. 107-122 in L. Buck (Ed) "Kenya National Seminar on Agroforestry", ICRAF, Nairobi

- Raintree, J.B. Bioeconomic evaluation of agroforestry cropping systems in P.A. Huxley (Ed) "Plant Research and Agroforestry", ICRAF, Nairobi

- Steppler, H.A. and Raintree, J.B. The ICRAF research strategy in relation to plant science research in agroforestry in P.A. Huxley (Ed) "Plant Research and Agroforestry", ICRAF, Nairobi

- Torres, F. The role of livestock in small agroforestry systems, pp. 443-472 in L. Buck (Ed) "Kenya National Seminar on Agroforestry", ICRAF, Nairobi (1981)

1982

- Nair, P.K.R. (1982). Tropical deforestation and agroforestry. Malayan Nature J, 35 (March 1982), in press

SCIENCE AND TECHNOLOGY OF AGROFORESTRY SERIES

Huxley, P.A., P. O'Keffe and F. Owino (Eds). (1981). Agroforestry in Kenya - an outline (approx. 100 pp) ICRAF/Beijer Institute (in preparation)

Nair, P.K.R. (1981). Some considerations on soil productivity under agroforestry land use systems. pp. 46. ICRAF, Nairobi (in preparation)

PROCEEDINGS AND BOOKS

1979 Soils Research in Agroforestry, Proceedings of an Expert Consultation, Nairobi, 26-30 March, 1979. pp. 584 Pub. ICRAF, Nairobi. H.O. Mongi and P.A. Huxley (Eds).

1980 Agroforestry Species, A Crop Sheets Manya, pp. 335, P.K.R. Nair

1980 International Cooperation in Agroforestry, Proc. of an International Conference, Nairobi, 16-21 July, 1979 pp. 469 Pub. ICRAF, Nairobi (Eds. T. Chandler and D. Spurgeon)

1981 Proceedings of the Kenya National Seminar on Agroforestry 12-22 November, 1980, Nairobi (Ed. L. Buck) pp. 638. ICRAF, Nairobi

1981 Plant Research in Agroforestry, Proceedings of a Consultative Meeting, 8-15 April, Nairobi (2 vols). Pub. ICRAF, Nairobi, P.A. Huxley (Ed) (in preparation)

NEWSLETTER

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