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**Report of the
External Review Panel of the
International Council for Research
in Agroforestry**

September - December 1984

**Ralph W. Cummings (Chairman)
Jeffery Burley
Gelia T. Castillo
Luis A. Navarro**

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Dr. Bjorn Lundgren
Director ICRAF
P. O. Box 30677
Nairobi, Kenya.

Dear Dr. Lundgren:

We are pleased to submit herewith the Report of the Review Panel for the International Council for Research in Agroforestry. Again, we wish to thank you very much for your part in briefing and in providing us with all the documentation and background information for the Review, for your very constructive assistance at all stages, and for your most kind and generous hospitality. Will you please express, on our behalf, our most sincere appreciation to all your staff members for the full cooperation and assistance they gave us in the course of the Review.

We appreciated the opportunity of meeting with ICRAF's Board Chairman, Dr. Bosshard, and with the Programme Committee Chairman, Dr. Stepler, during the course of the Review. The meetings and discussions of the Panel Chairman with the Programme Committee in early December were helpful to us in adjusting the format and presentation of the report and in identifying features of the draft report needing clarification.

We commend the Council for the very impressive record of achievement to date. We hope that our report will be helpful to the Council as it shapes its future programme and operational pattern for the years immediately ahead. We extend our warmest best wishes for ICRAF's continuing progress.

Sincerely,

The Review Panel

Ralph W. Cummings, Chairman
Jeffery Burley
Gelia T. Castillo
Luis A. Navarro

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1. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The Review Panel, whose credentials are summarized in Appendix 1, carried out the review of ICRAF during the period between September 15 and November 15, 1984, on the basis of terms of reference established by ICRAF's Board of Trustees in consultation with a committee of ICRAF's supporting agencies. Its conclusions and recommendations may be summarized as follows:

(1) The Panel commends the Director and Staff of ICRAF on their very considerable progress toward the attainment of the objectives for which the Council was created, and on their sense of purpose and dedication thereto.

(2) The two papers entitled "A Strategy for the International Council for Research in Agroforestry" and "A Scenario for ICRAF for the Year Q", prepared by Dr. Howard Steppler in 1980-1981, have provided excellent guidelines on the short-range interpretation of ICRAF's mandate and for its internal organization, staffing pattern, general directions and programme emphasis to date. Under these guidelines the Director, who has just completed three years of service, has skillfully managed available resources (core funds, staff secondments and core-related special projects) to build a competent and well-rounded multidisciplinary staff and work programme.

(3) Over the past three years, the above team has been unusually productive in putting together, largely in-house, an imposing array of background documentation, data bases, state-of-the-art reviews, source books, and agroforestry system inventories, which should provide a good background for future programme projections. They have developed a "Diagnosis and Design" (D&D) methodology for assessing the agroforestry potentials and opportunities in developing countries.

(4) The relevance and applicability of the methods and approaches developed to date need to be tested and substantiated as to their effectiveness in meeting the needs of subsistence farmers in developing countries, with more field applications.

(5) The Panel believes that ICRAF's mandate, as set forth in its charter, is appropriate and sufficiently broad in scope that it need not constitute any handicap to the Council and its programme for at least the near term future. Revision of the mandate itself need not have high priority.

(6) The Panel suggests that the Council re-examines its interpretation of its mandate and prepares an updated and revised statement thereof. The interpretation of the mandate by ICRAF has been quite narrow and pragmatic up to the

present time, largely owing to the limited number and range of disciplines of the available staff, and the limited financial resources at its disposal. The Panel believes that this restricted interpretation has been appropriate and necessary during these initial years. It has enabled the Council to concentrate its attention and resources on the development of its in-house interdisciplinary staff competence, information base, methodologies, and programme conceptualization. Having passed through this phase, the Panel feels that the interpretation should now be broadened to permit projection of ICRAF's programme into action research programmes which can result in the generation of new technology and a broadening and extension of the knowledge in agroforestry beyond that now existing. We believe that this should be done in a collaborative mode in cooperation and partnership with national and regional agencies, rather than directly through the Council's independent operation.

(7) The "Group", which was responsible for the creation of ICRAF, retained certain residual powers set forth in the Charter, but failed to establish an appropriate identity for exercising these powers. The Panel recommends that this anomaly be resolved through a more formal establishment and identification of the "Group" and the delegation of these residual powers to the Board.

(8) The "Group", so established, might have the recognized continuing functions of keeping informed on the progress of the Council's programmes and of considering ways in which its members could consult and collaborate in assuring sustained support and productive functioning of the Council.

(9) The Panel concludes that ICRAF has earned and justifies the confidence of its donor supporters for placing larger portions of their funding support to core operations on a sustained basis. There will always be a place for support for special projects with limited objectives and shorter time frame for completion, but sustained progress in programmes involving perennial trees calls for substantial core funding to enable the Council to maintain continuity in programme direction and execution.

(10) The Panel endorses the projected future trends in the balance of ICRAF's main functions as set forth in Figure 1, page 74. This envisages greater emphasis in the future on dissemination and on technology generation. Information accumulation and analysis, and advances in methodology development and programme conceptualization should continue to occupy a very important place in ICRAF's programme. However, if the Council is to remain alive and vital, it must project its concern to field activities which apply and test its concepts and generate new information and technologies.

(11) Both in the application of methodologies and in technology generation, the Panel wishes to emphasize that

these functions be undertaken in a collaborative mode through national and regional programmes, with an active hands-on participation of ICRAF staff, rather than through independent activities under direct ICRAF management.

(12). The Panel suggests that the D & D guidelines place more emphasis in the future on site selection, giving attention therein to pre-appraisal of potential sites as to their suitability for studies that may lend themselves to broader extrapolation to other sites in the region, and as potential hubs for regional collaborative networks.

(13) The Panel recommends that the options for future study include higher inputs in addition to purely subsistence practices. Agroforestry must be able to demonstrate and prove its worth in terms of greater productivity, with positive economic benefits, along with improvements in conservation and in improved quality of the land base. In many cases, this may prove difficult in the absence of such higher inputs.

(14) As the Council moves more actively into dissemination and technology generation, it must have the ability and capacity to make projections on anticipated economic benefits and to evaluate programmes in terms of economic returns. The MULBUD computer programme provides a promising tool for economic modelling. The Council will need to continue to appraise its requirements as to the number of staff needed for economic analysis, and should be ready to add additional staff as needed to meet the growing needs of the field operations.

(15) ICRAF should strengthen and increase its staff in editing and publication. The technical staff have been remarkably productive in the accumulation of the essential background information and putting it into at least a temporarily usable form. The list of publications (Appendix 5) includes 2 bibliographies, 14 newsletters, 3 information brochures, 1 annual report, 8 books/proceedings, 1 booklet on the science and practice of agroforestry (with 8 in preparation), 16 reprints, 1 brochure on a system of computer modelling for economic analysis, and 18 miscellaneous working papers. Many of these publications, however, are still in the form of drafts or working papers, which need to be put in a more finished and permanent record for wider use. In addition, approximately 7,000 documents and 14 computerized data bases have been or are being prepared for the Library. The Council is rapidly becoming the world's leading source for comprehensive information on the subject of agroforestry, and demands on this function will inevitably increase rapidly. It is already having significant impact on the recognition and appreciation of this field in the developing world.

(16) The Panel is favourably impressed with the training programme and its accomplishments to date. ICRAF has

conducted three training courses related to the D&D exercises of the COSPRO programme, has awarded fellowships at the rate of about two per year, has hosted four interns to date, and has held six conferences and workshops with international participation on a range of topics and has issued proceedings thereof. Training will continue to be a major activity of the Council, a portion of which will be done at headquarters, and some of which can be done more effectively and with greater relevance to ecological zone applications away from headquarters. There will be a continuing need for a range of training courses, conferences, workshops, and symposia at headquarters. For these activities, present facilities are not adequate and will need improvement.

(17) The Panel recognizes the need for the continuation of the advisory services as a legitimate function of ICRAF and one for which a portion of the cost can be recovered through fees for services rendered. The Panel does not recommend, however, that this function be continued through a separate discrete unit. Frequently, the service required is for a particular type of professional competence or a combination thereof. We believe that the entire professional staff should, as is now the case, be available to be called on for specific advisory missions which fall within the recognized functions of the Council. Continuation of the advisory function at or near the present level will require some overstaffing in order to give the Council the total capacity to perform these functions and services without undue drain on its capacity to carry forward with its basic core programme. As present contracts of the staff for the Advisory Unit are concluded, extensions or new appointments could fill places in the interdisciplinary team in subjects needing additional manpower. Economics, publications, administration, and research management would naturally come high on this list.

(18) The Panel supports the declared aims of the Machakos Field Station programme, provided that the technical content and staff involvement are more precisely defined. The Panel stresses that the Field Station has principally a service function in support of ICRAF's research, training, and information programmes.

(19) The Council has plans well advanced for the establishment of its headquarters in a new building to be constructed on land provided by the Government of Kenya, adjacent to the recently constructed United Nations complex on the outskirts of Nairobi. This is designed to provide the building space and facilities required for ICRAF's growing senior and support staff, and for its training and conference activities, editing and publication, information assembly, analysis, and management, and information dissemination. A substantial portion of the necessary funds for this construction is in hand or in prospect, and the additional funds may perhaps be obtained through a concessional loan.

The Council has made a cost/benefit analysis of the various alternatives for meeting the projected space and facility needs, and has concluded that the alternative of the new building of its own would be favoured. This conclusion has been endorsed by the Board and its implementation is anticipated. Meanwhile, some additional leased space in Nairobi on a temporary basis will be required. The Panel believes that the addition of residential quarters (hostel, dining, and common room) to this complex would greatly improve its suitability for conducting training courses, conferences, and workshops. However, a decision on this would have to take into account not only the construction and maintenance costs, but also the projected occupancy rates, and the possibilities of future access to alternative living and dining facilities available, or likely to be available in the vicinity.

(20) ICRAF has now outgrown its initial administrative and management structure. Two new positions are recommended, namely (1) an administrative officer, and (2) an assistant or deputy director for programme direction. The Panel had extensive discussions with the Director, the Board Chairman, and staff members on the organization and administration of the Council. With a current staff of 18 senior professionals and more than 60 total staff members, and with growing internal and external demands, it has become obvious that the initial very informal centralized management with active participation therein of all staff members has become too cumbersome and that steps are required which will enable the Director to delegate more responsibility for day to day affairs. At the same time, the interdisciplinary character of the Council's philosophy and operational mode must be carefully fostered and preserved. This is discussed more fully in chapter 10.

(21) The recommendations and suggestions of the Panel have resource implications in the following respects:

- a) Addition of two positions in administration - the administrative officer and the assistant director for programmes.
- b) An additional senior information and publications officer, and perhaps additional staff in economics.
- c) Staff to be involved in hands-on participation as working partners in collaborative research and action programmes away from headquarters. It is anticipated that the headquarters staff members will devote an increasing proportion of their time to field activities and some of the field staff will be provided through collaborative special project funding. The additional demand on core funding for this function is difficult to estimate at this time.

- d) Some additional support staff at headquarters.
- e) Capital funds (non-recurring) for the headquarters building. After construction is completed and the new quarters are occupied and paid for, there would be a reduction in expenditure for space rental.
- f) Incorporation of the advisory function into the general staff of the other programme units. This would not add to staff numbers and would not necessarily require additional total funds.
- g) More unrestricted core funds in lieu of special project funds.

2. INTRODUCTION

BACKGROUND TO THE REVIEW

During ICRAF's first seven years of existence, the Council has undergone considerable evolution and has made an impressive record of accomplishment. After a few months hosted by the Royal Netherlands Institute of Tropical Agriculture in Amsterdam, its headquarters was established in Nairobi, Kenya. Its budget during early years was limited below the level thought necessary to bring together a sufficiently large staff with the desired disciplinary mix, and contained a relatively limited unrestricted core component. During an interim period, after the departure of the first Director of the Council, Dr. Howard Stepler served as Acting Director, pending the selection and appointment of the present Director. This was a landmark period during which Dr. Stepler developed the policy document entitled "A Strategy for the International Council for Research in Agroforestry" and a companion paper entitled "A Scenario for ICRAF for the Year Q". These documents have set the direction for the Council's program, staffing, and operations since that date.

The Board has provided continuing policy guidance and direction, the number of supporting agencies and their level of support have grown, and a staff of the projected size and disciplinary composition has been recruited. The Program Committee of the Board has been quite active in advising the Board and the Council's management. Its ninth meeting was held in March, 1984. At this meeting it had become evident that the Council had reached a stage at which a new look at programme directions was needed and that a long-term strategy should be appraised in terms of the progress achieved and the realistic opportunities and responsibilities which might be visualized for the future. Several different possible strategies could be considered, each having quite different implications on the shape of the Council for the future, and the support which could be anticipated.

The Programme Committee considered several different alternatives for long term development strategies for ICRAF. Recognizing that a shift in emphasis may require substantial additional resources, and that any change in mandate requires the consent of the "Group", and that there seems to be no consensus among the various donor agencies on the most appropriate strategies coupled with very strong indications that any shift in emphasis may affect the mode and level of support, the Committee therefore recommended to the Board that, so as to insure an effective treatment of the issue, the Board request the Donors to fund a review team to:

- evaluate ICRAF's performance;

- review critically ICRAF's mandate and strategy; and
- specifically evaluate and make recommendations on the future development options for the Council.

The Board accepted this recommendation of its Programme Committee and received support of a group of its donors to fund the Review.

TERMS OF REFERENCE

The Board resolution authorizing the review directed:

(1) That a panel of experts be appointed to generally assess the content, quality, impact, and value of the overall research programme of the Council; to examine whether the operations now being funded are being carried out in line with the declared policies of the Board and to the high levels of excellence expected of such a Council; and specifically to examine and make appropriate recommendations on the relevance, scope and appropriateness of the Council's mandate within the framework of present and possible future priority areas of work.

(2) That the following broad criteria in terms of professional background and experience should be used in identifying possible candidates to participate in the review team:

(a) Research management experience - ie. a person who has managed a research institution dealing with agriculture, forestry, and/or livestock and preferably dealing with those issues within the tropical zones on a regional or international basis;

(b) Farming systems research experience specifically within the context of developing country problems;

(c) Forestry, with particular interest and experience on social forestry, community forestry, and/or afforestation issues in developing countries;

(d) Social scientist with particular interest in rural development and experience on issues relevant to community participation, extension, etc. in developing countries.

(3) That the detailed terms of reference be developed in consultation with the Donor Committee appointed in a closed meeting within the framework of the CGIAR quinquennial review.

The Director was requested to co-ordinate the selection and identification of the candidates for the review in consultation with the Donor Committee. The Committee would be

requested to consider all relevant views and suggestions as appropriate and to submit a draft to the Programme Committee in November, 1984 and a final report in March, 1985.

The detailed terms of reference, supplementing the Board resolution, developed by ICRAF in consultation with the above mentioned committee, are as follows:

(A) Research Strategy, Quality, Value, and Impact

(1) The mandate

(a) The relevance, scope, and appropriateness of the present mandate to the immediate and long-term needs for agroforestry development in developing countries.

(b) The interpretation of the mandate with respect to present and future priority areas of work.

(c) Mandate, long-term plans and priorities:

What should be the principal features of the Council's forward plans for the next five years?

What are the viable possible alternatives?

e.g. Status quo

Expansion with global mandate but specifically in limited field,

e.g. technology generating research training and education

information "Centre of Excellence" with regional information centres, etc.

Expansion with specialization on limited geographical and/or ecological region

Other appropriate viable alternatives

What would be the resource implications of such expansion and/or specialization?

(2) The research programmes

The relevance, scope, and objectives of the present programme of work for the next four years within the framework of:

- the mandate, resources available, and particularly given other relevant ongoing activities by other international, regional, and national institutes;
- their relevance to the problems of agroforestry development particularly given the needs of subsistence farmers in developing countries;
- The basis for determining priorities and the composition and balance of the overall programme in the fields of research, training, documentation, and information exchange and related collaborative activities;

- the rationale for the policy, strategy, and procedures adopted and the mechanisms for their formulation.

(3) The content and quality of the research

- The quality as judged by past performance;
- The current and planned research and the role of the scientific disciplines therein;
- The quality and performance of the research staff in relation to advancing knowledge and initiating technology generation;
- The adequacy of research support and facilities;
- The information and training programmes, their methodologies, and the participation of all scientific staff therein;
- The overall coordination of the scientific activities.

(4) The impact and usefulness of the Council's activities

- The present and potential impact of the Council's activities;
- Its influence on research in regional and national programmes;
- The size, quality, and impact of its regional exchange and training programmes.

(B) Corporate Management and Organization of Resources

(1) The management

- The efficiency, quality, and effectiveness of the management from both a scientific and financial point of view;
- Appropriateness of management structure and/or organizational framework;
- Staffing procedures;
- Management information systems and internal communication;
- Extent of cooperation and/or collaboration with national, regional, and international research and development programmes in developing and developed countries.

(2) The resources

- The adequacy and stability of funding for the pursuit of the mandate and specifically for the realization of the programme of work;
- The adequacy of the facilities, buildings, and equipment;
- The adequacy of support staff;
- The relation between core and non-core resources and the implications thereof;

- The adequacy, quality, and calibre of scientific personnel.

(3) Management and the future

Given A 1 (c) above:

- Are the present facilities and equipment adequate?
- What are the future capital requirements and their rationale in terms of cost effectiveness?
- What personnel policy changes would be required?
- What organizational structures and/or management styles are deemed most appropriate?

COMPOSITION OF THE REVIEW PANEL

Keeping in mind the instructions of the Board and the Donor Group with respect to the spread in background experience desired in the Review Panel members, the following persons, whose summary biodata appear in Appendix 1, were selected to conduct the review:

- Dr. Jeffery Burley, Forester, Acting Head of the Department of Forestry and Director of the Commonwealth Forestry Institute, Oxford University, England.
- Dr. Gelia T. Castillo, Social Scientist, Professor, Department of Agricultural Education, University of The Philippines at Los Banos, College, Laguna, Philippines.
- Dr. Ralph W. Cummings, Research Administration and Organization, Emeritus Professor, North Carolina State University, Raleigh, N. C., USA (Chairman of Panel)
- Dr. Luis A. Navarro, Farming Systems, Technical Coordinator of Research and Training Project, CATIE, Turrialba, Costa Rica.

PROCEDURE FOR THE REVIEW

All members of the Review Panel were supplied, well in advance of their on-site visit to the Council headquarters, with copies of the Board resolution authorizing the review, its basic terms of reference and the more detailed terms of reference which had been prepared in consultation with a donor sub-committee. Various other documents supplied in advance included copies of ICRAF's charter, its agreement with the Government of Kenya, the descriptive brochure on the Council and its activities, relevant excerpts from the records of the Board and its Programme Committee, and several

of the publications and working papers which had been prepared by the Council and its staff. In addition, the Director and each programme co-ordinator provided summary reports.

Each member of the Review Panel spent at least two weeks at ICRAF headquarters, although due to previous commitments of some of the Panel members, it was not possible to make these on-site visits completely coincidental. R. W. Cummings and J. Burley were together at ICRAF from September 19 through October 5, 1984. They were joined there on September 28 by Luis Navarro, who continued at ICRAF headquarters through October 12. Since Dr. Castillo was unable to get to ICRAF at this particular time, she was furnished with the basic documentation and prepared a very thorough analysis of this material, supplemented with considerable additional relevant information drawn from other sources, along with a number of important observations, and made this available to the above three panel members at the time of their visit. After a briefing by the Chairman on the observations of the above three members, Dr Castillo visited ICRAF headquarters during the period October 23 through November 3. Finally the entire panel assembled in Washington, D. C. , USA for a week, November 5 through 9 to review its findings and to prepare the final draft of its report.

The Panel was provided with full documentation on Board and Programme Committee records, progress reports, programme projections, strategy papers, and all publications which had been issued or were in preparation. Briefing and discussion sessions were arranged with the Director, the staff collectively and in smaller groups, and with all the principal staff members then in residence individually. The panel members also met several of the donor representatives present in Nairobi, including those from Switzerland, The Netherlands, the USA, IDRC, and the Ford Foundation. Other donors were contacted individually by individual panel members at their home locations as opportunity permitted. The Chairman of the Board, Dr. W. Bosshard spent two days with the Panel and was joined for one day by Dr. Howard Stepler, former Interim Director and presently Chairman of the Board's Programme Committee.

Two days were spent in the field, visiting the Machakos Field Station, the Kenya collaborative programmes in the Machakos District, and the proposed site for ICRAF's headquarters building on the outskirts of Nairobi.

The Panel reviewed the reports of the COSPRO draft proposals for the Amazon Basin (Yurimaguas and Pucallpa, Peru), Malaysia, and India. While planning reports have been prepared and training programmes initiated for two of them, the projects have not yet progressed far enough in their implementation to justify site visits to them at this time.

The Panel wishes to express its appreciation to the Director and all the staff members for their full co-operation and

support in its conduct of this review, for the very thorough preparation, and for their forthright discussions and dialogue with the Panel.

3. ICRAF'S HISTORICAL BACKGROUND, DEVELOPMENT, and EVOLUTION

The International Council for Research in Agroforestry (ICRAF) was established in 1977, following an initiative by the International Development Research Centre (IDRC) of Canada. Its initial sponsors and financial supporters were IDRC, the Canadian International Development Agency (CIDA), the Swiss Development Corporation, and the Dutch Ministry of Development Co-operation. Its headquarters were temporarily established in the Royal Tropical Institute in the Netherlands, and were moved a year later to Nairobi, Kenya, after promulgation of the Charter, signed by representatives of the Governments of Canada, Senegal, Guyana, and of the IDRC, and the negotiation of an agreement with the Government of Kenya to host the headquarters and provide the necessary privileges and immunities of an international organization.

In 1977, the IDRC published a report entitled "Trees, Food, and People: Land Management in the Tropics" which attempted to (1) identify significant gaps in world forestry research and training; (2) assess interdependence between forestry and agriculture in low-income tropical countries and propose research leading to optimization of land use; (3) formulate forestry research programmes that promise to yield results of considerable economic and social impact on developing countries; (4) recommend institutional arrangements to carry out such research effectively and expeditiously; and (5) prepare a plan of action for international donor support. The report ended with the recommendation to "set up an internationally financed council for research in agroforestry, to administer a comprehensive programme leading to better land use in the tropics. The objects of such a council should be to encourage and support research, to acquire and disseminate information concerning agroforestry in developing countries of the tropics; and to create additional work opportunities in harmony with the wishes of the rural people."

Following three meetings of potentially interested donors, called together on the initiative of IDRC, the decision was made to proceed with the establishment of ICRAF along the lines suggested in the above report. A draft charter was approved and a Board of Trustees selected. IDRC was requested to serve as the executing agency to bring the Council into operation.

In the discussions leading up to the establishment of ICRAF, the consensus emerged that ICRAF should have a senior scientific staff of about 15-20 members and a core budget of about \$2-2.5 million. Some of the potential donors who had expressed interest in ICRAF were slow in getting approval to subscribe to its core budget and therefore the Council had to begin operations with a staff level considerably less than optimum. Other operational problems were encountered during

its first two years which resulted in a reluctance of some of the donors to commit themselves to longer range support of the Council. In fact, even today, the unrestricted core funds available to the Council are quite low, and a high proportion of its funds are earmarked for specific projects and several of its senior staff are placed with ICRAF on secondment by donors. This has limited ICRAF management in taking needed measures to strengthen its administrative structure, but the management has nevertheless been quite skillful in utilizing the restricted support to put together a very cohesive programme with a commendable sharpness of focus.

The Council selected Dr. Kenneth F. S. King as its first director and operated temporarily out of the Royal Tropical Institute in Amsterdam, pending the completion of the agreement with the Government of Kenya to host its headquarters. Its permanent headquarters were established in Nairobi, Kenya in July, 1978. During its first two years, a publication entitled "The Wasted Lands - The Programme of work of the International Council for Research in Agroforestry" and two progress reports were issued. It was evident, however, that ICRAF's supporters had had unrealistically high expectations for the Council in the short range, and that the creation of an effectively working interdisciplinary team of scientists working in a new field whose parameters were not clearly defined was more difficult and time consuming than had been anticipated. There were also disagreements between the Board and the Management on how to interpret the mandate and how the Council should operate.

In 1980, the Council reached a critical stage in its development and felt that a sharper definition of its programme and focus was required. Dr. Howard Stepler was requested to take charge as interim director, pending the selection and recruitment of a permanent director. During his term of service, Dr. Stepler prepared and gained approval from the Board of two very significant documents - "A Strategy for The International Council for Research in Agroforestry" and "A Scenario for ICRAF for the Year Q". These have provided the guidelines under which the Director, Dr Bjorn Lundgren, who took over his duties with the Council in September, 1981, has been able to assemble, with a skillful combination of secondments, special project funds, and the limited unrestricted funds, a competent core staff of eighteen senior members, with the range of disciplinary backgrounds envisaged in the strategy approved by the Board. These staff have an impressive record of accomplishment, bringing together a wide range of information from agroforestry literature, establishing several data bases, preparing several state-of-the-art papers, developing guidelines for agroforestry diagnosis and design exercises, and conducting several analytical exercises, conferences, and training projects in collaboration with potential collaborating countries in diverse ecological regions.

Up to the present time, the Council has of necessity interpreted its mandate somewhat narrowly, has concentrated

its activities to a large extent in-house, developing its definitions and concepts, and accumulating the background information necessary for it to have a basis for dissemination and projection.

The Director, in summarizing the focus and strategy behind the ICRAF programme to date, has stated that the point of departure for the work was an analysis of the nature of agroforestry and how ICRAF with its mandate and limited resources can best make an impact, recognizing that:

Agroforestry is a new and complex science. As a practice, there is an almost infinite number of potential components, combinations of components and management practices that may deserve scientific development.

If a small research council such as ICRAF did not develop a clear focus for its work, there would be a great risk (as partly shown by the first two years of work) of getting drowned in piece-meal and ad hoc activities. In this way, ICRAF would never have any major impact, particularly in view of its global mandate.

It was therefore felt that ICRAF should focus its resources on the development of an in-house capability to understand and analyze land use systems and to design agroforestry interventions (where relevant) to overcome diagnosed constraints and problems in land use systems.

The strategy to achieve this, and to have an impact, thus comprised originally three components:

The building up of a multidisciplinary team of scientists covering all important fields of expertise necessary to assess tropical land use systems (a minimum of eight such disciplines were identified).

The development, through this team, of an interdisciplinary methodology to diagnose land use systems' constraints and to design research projects leading to agroforestry technologies to overcome the constraints (in ICRAF's programme this has become known as the Diagnostic and Design methodology, or D & D).

The dissemination of the capability and methodology to developing country R&D institutions through training, publications, and collaborative research efforts.

The Director has stated that, in developing the Programme of Work, it was felt necessary to build into the focus and strategy the need for ICRAF to systematically assemble and "digest" knowledge on agroforestry systems, practices, and technologies, for the following reasons:

- to build up ICRAF's capability to answer requests for information, and to give advice on agroforestry technologies;

- the continued need to develop the concepts and methods of agroforestry;

- the gradually increased in-house need to systematically back up the D&D field exercises with technology options in the design phases.

During the past three years, ICRAF's work has thus had three primary foci:

(1) the development of interdisciplinary capabilities and methods to deal with land use systems,

(2) the building up of a systematic knowledge of agroforestry practices and technologies, and with methods on how to evaluate these, and

(3) the dissemination of these capabilities, methods, and knowledge.

With a very impressive record of accomplishment along this path, ICRAF must now face the question of the most appropriate way to assure continued progress toward achievement of its basic objectives. This has become a major pre-occupation of the Board, the Donor Group, and the staff, on which there does not seem to be a clear consensus. Questions are being asked as to the adequacy of ICRAF's mandate, its interpretation, and the best strategy for the future to assure that ICRAF's Programme continues to advance, to be innovative, to meet the demands on it for the future, and to progress in its capability to serve the needs of the developing world.

4. STAFFING PATTERN

The 1981 strategy paper, prepared by Dr. Howard Stepler and approved by the Board, identified the following disciplinary specializations as needed for the ICRAF staff:

Agricultural production systems scientist

Animal production systems scientist

Forestry production systems scientist

Economic botanist

Bioclimatologist

Land use classification scientist

Microeconomist

Sociologist/anthropologist

Documentalist

Training officer

With a severe limitation in core budget resources, it was obviously not possible to recruit and employ staff systematically on the basis of overall programme needs alone. However, through taking advantage of staff secondments to selected disciplinary requirements, identification of special projects requiring other needed skills, and supplementation from core budget resources to fill in the gaps, something fairly close to the desired range of disciplinary competence has been achieved. The current senior staff is as follows:

Director Dr. Bjorn Lundgren (Sweden)
Forester
Joined September, 1981

Secretary/Treasurer Mr. Karugor Gatamah (Kenya)
Public Accounting and Finance
Joined December, 1980

Agricultural Production Systems Peter A. Huxley
(United Kingdom)
Horticulturist/ Agronomist
Coordinator Agroforestry
Technology
Joined April, 1979

P. K. Ramachandran Nair
(India)
Agronomist/ Soil Scientist

Coordinator Field Station,
Machakos
Joined November, 1978

Dianne Rocheleau (USA)
Geographer/Systems
Ecologist
Initially seconded
Rockefeller
Joined February, 1983

Michel Baumer (France)
Range Management and
Marginal Lands
Joined September, 1983

Willem C. Beets
(The Netherlands)
Agronomist, Advisory Unit
Joined September, 1983

Animal Production Systems

Filemon Torres (Argentina)
Range Management and
Livestock Production
Specialist
Coordinator, Collaborative
and Special Projects
(COSPRO)
Joined June, 1979

Forestry Production Systems

Peter G. von Carlowitz
(West Germany)
Forester (multipurpose
trees)
Seconded West Germany (GTZ)
Joined June, 1982

Peter J. Wood
(United Kingdom)
Forester
Coordinator, Advisory Unit
Joined September, 1983

Denis Depommier (France)
Forester
Seconded France (CTFT)
Joined January, 1984

Economic Botanist

See list above for
Agricultural Production
Systems

Bioclimatologist	Till Darnhofer (Austria) Bioclimatologist/ Agrometeorologist Initially seconded Swiss Government Joined July, 1982
Land Use Classification	Anthony Young (United Kingdom) Land Evaluation/ Soil Science Joined January, 1983
MicroEconomist	Dirk A Hoekstra (The Netherlands) Farm Economist (Initially seconded by the Netherlands Joined March, 1982
Sociologist/ Anthropologist	John B. Raintree (USA) Ecological Anthropologist Joined January, 1982
Information/ Documentation	Richard Labelle (Canada) Information Officer Initially seconded IDRC Joined July, 1981 Richard C. Nturu (Uganda) Publications Officer Joined November, 1982
Training	Ester Zulberti (Argentina) Training Officer Joined September, 1982

The professional, administrative and support staff are still quite small in number, but we understand that some additional recruitment is under way or planned as financial resources and suitably qualified candidates permit. The total employee strength of ICRAF now stands at slightly over sixty persons.

As will be indicated elsewhere in this report, eight programme areas are recognized in the Council's programme, and a co-ordinator is identified for each. Moreover, each staff member may have a major portion of his time allocated to one or another programme, but it is understood that all staff members may be called on to participate in each of the other programmes. This naturally results in competing demands on the time and attention of the staff members. Staff motivation may, in part, include the desire and felt need to be able to publish research results, which also may compete for time. The resulting problems in administration and suggestions for addressing them are considered in a later section of this report.

5. SPONSORSHIP AND FINANCIAL SUPPORT

As indicated in Section 2 above, ICRAF's initial sponsors and financial supporters were IDRC, the Canadian International Development Agency (CIDA), the Swiss Development Corporation, and the Netherlands Ministry of Development Co-operation. In addition representatives of the Governments of Guyana and of Senegal signed the Charter for the Council and the Government of Kenya entered into an agreement with the Executing Agency and the Director of the Council to host the headquarters of the Council and provide the conditions for it to operate as a proper international body. Thus, it would appear that these seven agencies and governments could be considered as the initial sponsors and supporters.

Subsequently, other parties have come in to provide support in various ways. As of October, 1984, financial and other kinds of support are being provided by the following:

- Beijer Institute (Sweden)
- Canadian International Development Agency (CIDA)
- Dutch Ministry of Development Co-operation
- Ford Foundation
- France (Centre Technique Forestier Tropicale, Paris)
- German Agency for Technical Co-operation (GTZ)
- German Foundation for International Development (DSE)
- International Development Research Centre (IDRC)
- Government of Kenya
- Norwegian Ministry of Foreign Affairs
- Rockefeller Foundation
- Swedish International Development Agency (SIDA)
- Swiss Development Corporation
- U. S. Agency for International Development (USAID)

Others, including the World Bank, have expressed interest under certain conditions. Several countries have participated in training courses, diagnosis and design exercises, and planning workshops. The desirability of bringing the interested parties together into an informal but continuing association is discussed in Section 6 of this report.

The present pattern of funding reveals a quite unfavourable

balance between unrestricted core funding and restricted sources, a situation which needs to be improved in the interest of stability and systematic and objective programme planning and execution. The situation in this regard is shown by the following:

	Projected 1984	Actual 1983	Actual 1982	Actual 1981
Support received during the year	\$2,034,500	2,091,397	1,227,600	757,146
Unrestricted core	\$927,000	949,358	641,287	627,981
Restricted projects	887,500	869,685	366,298	62,565
Staff secondments	220,000	272,334	220,015	66,600

Although the total amount of funds provided by donors has increased substantially since 1981, the unfavorable relation between unrestricted core fund availability and restricted funds is a cause for concern. When ICRAF was established, there was a consensus among experts and donors participating that approximately \$2.0 to \$2.5 million of core funds, in 1977 values, would be needed to enable ICRAF to recruit the staff required to implement its mandated objectives. Only in 1983 did ICRAF receive a total of a little over \$2.0 million in current values, and over half of this has come in restricted funding - project support and staff secondments.

Thus far, donors have placed their restricted support against objects which have contributed directly to the Council's basic objectives. This speaks well for the kind of dialogue which has developed between the ICRAF management and the donor community. However, this fortunate situation cannot be relied on with confidence in the future. With the best of intentions and well guided mutual discussions, the Panel sees many potential problems likely to arise in the future from an indefinite continuation of this situation. It will be increasingly difficult to maintain the needed staff balance, quality, and stability, and to provide the basic back-up support needed for a stable programme with a consistent direction with a budget dominated by funds limited to support of individual project activities.

Among the problems is the decreased flexibility and ability to carry out a consistent and logical long-term programme of work. Some projects have more popular appeal than others, although the less glamorous activities are absolutely essential to back up the project activities. When a project is supported, the grant therefor rarely covers all costs. This results in tying up an increasingly high proportion of staff time supported by core funds in such project implementation. The Council's basic priorities thus have to be subordinated to project implementation requirements.

Another problem is the difficulty of long-term planning. Project funds are naturally time-limited and there are never

any assurances that the donor will support a new project of the same volume and with the same staff requirements as the one which has been completed. Out of the present absolutely critical minimum core staff of 16, about half are on short- or medium-term secondments or are paid through time-limited project support. A decrease of staff size downwards would seriously decrease ICRAF's overall professional capability. There is a real risk that, as present projects are completed, ICRAF must resort to a more desperate "hunting" for new projects. The question of whether such projects are relevant and logical in the context of ICRAF's mandate and planned programme of work cannot then continue to receive the same emphasis as would otherwise have been the case.

A third problem is the increased administrative load attendant on special project funding. Individual donors have different conditions related to reporting procedures, keeping of accounts, evaluation mechanisms, purchasing policies, etc. This is to a certain extent inevitable and applies to a degree to all grants, but is increased when each project has to be treated individually, rather than as a part of the overall Council programme. As will be discussed elsewhere in this report, the Council administration is already seriously overloaded and will need supplementation, even with its present programme plans and commitments.

While the Panel recognizes the continuing need and value of a substantial number of projects which can be completed within a limited time-frame and which contribute directly to the Council's objectives, it wishes to emphasize the very great importance of a stable and highly competent core staff for the Council to be able to do justice to such special projects and to get on with the discharge of its major responsibilities.

To date, as much as 60% of the Council's funds have been provided for special restricted purposes. Generally these have fitted in well with the Council's basic plans for achieving its central objectives. At the same time it is evident that too high a proportion of the Council's available funds have been designated for such special restricted activities and too little provided for unrestricted core to enable the Council to plan as effectively as it needs to do to give the needed continuity to its very high quality interdisciplinary mix of core staff. We shall address this problem further when we come to future directions and their financial implications.

6. CHARTER, LEGAL STATUS, AND GOVERNANCE

The International Council for Research in Agroforestry (ICRAF) was formally chartered on 21st November, 1978 as an autonomous, non-profit, international organization. The Charter was executed in the French and English languages and signed by representatives of the Governments of Canada, the Cooperative Republic of Guyana, the Republic of Senegal, and by a representative of the International Development Research Centre of Canada.

ICRAF was given legal status and juridical personality, along with international privileges and immunities, as a body corporate under the laws of Kenya, with the same objects and authorized activities as set forth in the Charter, under an agreement with the Government of the Republic of Kenya executed on the same date (21st November, 1978) signed by Kenya's Minister of Foreign Affairs, a representative of the International Development Research Centre (which had been designated by the Sponsoring Group as Executing Agency for the establishment of the Council), and by the Director-General-Designate.

The governance of the Council is entrusted to a Board of Trustees of not more than ten members, one of whom is appointed by the Government of the Republic of Kenya, one by the Food and Agriculture Organization of the United Nations (FAO), the Director General (ex officio), and up to seven appointed by the Sponsoring Group. The Director General is appointed by the Board and serves as a trustee only during his term as Director General. The Charter provides that, after the appointment of the initial Board, any additional trustee appointed by the Group shall be appointed in consultation with the Board. It further states that the Group shall delegate to the Board of Trustees its power to appoint at least five Trustees.

Under article XI of the Charter, the Charter may be amended by the Board and a procedure is set forth therefor. However, substantive amendments to articles IV (Objects), V (Activities), VII (Finance), and XI (Amendments) require prior approval of the Group.

Thus, it appears that the important residual powers are retained by the Group, a body which has never been formally organized, has no legal identity, whose composition is ill defined, and whose membership is likely to change from time to time. Initially, it appears that the "Group" consisted of those organizations and agencies which came together to agree on the establishment of ICRAF and to provide the initial financial support and support in kind. These consisted of the IDRC, FAO, Canada, Kenya, the Netherlands, Switzerland, Senegal, and Guyana. Some of these entities, including two of the signatories to the Charter are no longer active in ICRAF

affairs, and a substantial number of others have joined in support of the Council's programme. This places the Council in a somewhat anomalous situation legally, and some of the actions it may need to take with respect to the composition of its Board and the exercise of its functions may be subject to challenge. These anomalies should be addressed forthwith if more serious complications are to be forestalled for the future.

These questions have been referred to the legal counsel of the original Executing Agency, which has suggested a logical procedure for resolving these uncertainties. The suggestion is that the original donors be re-assembled and requested to delegate the residual powers of the Group to the Board of Trustees, and make a formal record of this action, signed by all the parties thereto. With this accomplished, the Charter could be amended by due process when and if needed (although the Review Panel does not see an immediate urgent need therefor), the Board would have its powers, duties, and responsibilities clarified, and its procedure for Board appointments and succession would be resolved.

With this resolved, the Panel would recommend that the Support Group, consisting of the present donors and certain other directly interested and participating parties, be constituted on a continuing basis. This Support Group could meet at intervals agreed by it (presumably at least annually) to review progress of the Council and consider ways in which they could consult and collaborate in assuring sustained support and productive functioning of the Council. The Group could agree on its own pattern of organization and operation, and record this in a simple statement adopted by the Group by mutual consent. As in the case of the CGIAR, it would not necessarily require any legal identity but would probably wish to retain its informal character. We believe that the establishment of such a Group could add a dimension of collective interest on the part of the various supporting agencies for the continuing health and programme continuity of the Council.

7. ICRAF'S MANDATE

The Mandate for ICRAF is set forth in articles IV and V of its charter under the headings "Objects" and "Activities", respectively, as follows:

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 relative to agroforestry systems, to facilitate the collection and dissemination of information relevant to such systems, and to assist in the international co-ordination of agroforestry development, and, specifically:

- a) to identify aspects of agroforestry systems generally, and tree components in particular, about which there is 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 co-ordination 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.

ACTIVITIES

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

- a) the collection, evaluating, cataloguing, and dissemination of information relevant to agroforestry, with particular emphasis on 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 fostering of co-operation in research relevant to agroforestry systems;
- c) the sponsoring of research relevant to agroforestry systems, or important species of trees and other crops

relevant to such systems, and on the harvesting, processing, and marketing of forest products;

d) the participating in the management and financing of pilot and experimental projects in 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 toward better land use; and

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

The Review Panel has considered that the above statement represents the Mandate for ICRAF and has used it as the point of departure for its analysis and deliberations thereon. The Panel is of the opinion that this is satisfactory and that there is no urgency for making any changes thereon for the near-term future. In fact, as will be discussed more fully later, some minor legal questions will require clarification before any formal change in the mandate statement can be made. However, the Panel does not believe that the present statement constitutes any handicap to the Council's programme development in the near-term future, and it is doubtful if it would present problems in the long term. We will have comments concerning its interpretation. This has been somewhat pragmatic and influenced in part by prospects of financial support levels. The programme priorities developed thereunder during the initial years have been well conceived in the light of circumstances which prevailed during this period, but we think that a somewhat broader interpretation and some clarification may now be needed and we intend to address this issue.

The working paper entitled "A Strategy for the International Council for Research in Agroforestry" and an accompanying paper "A Scenario for ICRAF for Year Q", prepared by Dr. Howard Stepler in 1980 provides an excellent interpretation of the mandate in terms of the Council's internal organization and staffing requirements and the general direction and emphasis in its work programme for the initial years. This has been endorsed repeatedly by the Board and its Programme Committee since that time. The Panel is in general agreement with the contents of the two documents and feels that they have provided a good basis for the development of ICRAF to date.

In conclusion, we believe that the Mandate for ICRAF, as set forth in the Charter, is satisfactory and that attempts to reformulate the Mandate need not have a high priority in the near term.

8. ICRAF'S PROGRAMMES, PRESENT STATUS, AND ACCOMPLISHMENTS

The Council has defined five operational programmes and two service programmes as part of its strategy for operation, under the leadership of the Director. The operational programmes are: Agroforestry Systems Research and Evaluation, Agroforestry Technology Research and Evaluation, Collaborative and Special Projects, Training, and the Agroforestry Advisory Unit. The service programmes are: Machakos Field Station and Information.

Even though a co-ordinator has been assigned to each programme, all programmes operate with the same multidisciplinary team. Each of the 18 senior staff professionals in ICRAF's team shares responsibilities for projects and/or activities in all programmes. Furthermore, the outputs of any programme constitute inputs needed by at least one of the other programmes.

This mode of operation ensures the interaction among professionals during the planning, implementation, and documentation of activities in all programmes. However, it is very demanding of an appropriate co-ordination and leadership to maintain the focus of the whole multidisciplinary team in all programmes to drive towards the common objectives, and to counteract the disintegrating forces which usually appear once the team members gain confidence with the subject matter or they reach a certain number. Further comments in this respect, as they apply to the need to maintain the interdisciplinary approach of ICRAF to research in agroforestry systems and to the scope and aim of its mandate, are given under "Organization, Administration, and Management" below.

A summary description of each programme and comments in relation to their pertinence to ICRAF's mandate and their present status, accomplishments, and projected plans follow. Particular attention is given to their perspectives for developing at the national level their institutional interest and methodological capability for research and development of appropriate agroforestry technologies to benefit society.

AGROFORESTRY SYSTEMS RESEARCH AND EVALUATION PROGRAMME (ASRE)

This programme was begun in 1981 and has been under the co-ordination of Dr. J. B. Raintree (Sociologist/Anthropologist). The ASRE programme scope and aim, as expressed in ICRAF's Programme of Work for 1984, include the following:

- 1) to develop a methodological capability to diagnose agroforestry-related land-use problems, design appropriate agroforestry systems, and to evaluate their

systems impact;

2) to identify, adopt, and develop practical and appropriate modelling tools and techniques to assist in the diagnosis, design and evaluation of agroforestry systems, from physical, economic, and social points of view;

3) to inventory and evaluate existing agroforestry systems in the developing world and to identify potentials for their improvement and wider applicability.

The ASRE programme has been declared "the main exponent of the systems approach adopted as the focus for ICRAF's work" (Plan of Work 1984). It is structured to co-ordinate several projects leading to the set objectives.

Diagnosis and Design Project

The purpose of this project, which began in 1981, is the development of an "interdisciplinary methodology for the diagnosis and design of agroforestry land-use systems" (Programme Co-ordinator's report to the Review Panel).

A method has been developed and is presently documented in the form of working papers for comments (WP 6 and WP 7). The development of this "Diagnosis and Design" (D&D) method included the review of closely related methods used by different institutes (usually in connection with the Farming Systems Research approach), the participation of different members of ICRAF's team as well as collaborating national scientists during the application, testing, and further refinement of the method in "more than twenty sites around the world" (Programme Co-ordinator's report).

The method includes the following:

A) Prediagnostic stage

Step 1 - Environmental and general description of the study area (biophysical and socio-economic)

Step 2 - Differentiation of land-use systems within the study area (identification and ordering by priority for attention)

Step 3 - Preliminary description of the selected land use system(s) (structure and function)

B) Diagnostic stage

Step 4 - Diagnostic survey (at farm and ecosystem level; land use problems and potential)

Step 5 - Diagnostic analysis (ordering by priority of problems and potentials)

Step 6 - Derivation of specifications for appropriate technology (tuned to the needs, problems and potential of the diagnosed land use systems)

C) Technology design stage

Step 7 - Technology appraisal (identification of candidate technologies and/or technology components)

Step 8 - Technology design (design improved land use systems and improved land use system components)

Step 9 - Design evaluation (ex-ante evaluation of proposed technologies and adjustments in the design, if appropriate)

D) Follow-up planning stage

Step 10 - Research needs (design of research to develop and/or test the technologies proposed; on farm and/or station)

Step 11 - Topics requiring further D&D attention (identification of topics)

Step 12 - Project implementation plan and guidelines: (a) major activities (research and/or dissemination), (b) project proposal, (c) project implementation plan, (d) mid-project working plans, as needed.

This method is intended for use by research scientists at national and international research institutes, land-use planners and resource managers, development project implementation staff, and rural development field workers. Manpower requirements will vary with circumstances; the minimal would be one or more representatives of: agricultural sciences, forestry, social sciences, and natural sciences. Generalists would be useful. The duration and training will vary from: (a) one to two months of preparatory data gathering plus two weeks for diagnostic survey, analysis of results and initial design, in the case of a "rapid appraisal plus follow-up", to (b) six months to a year to work through the complete D&D procedure (WP 6).

This project has been central for the ASRE programme and the whole ICRAF effort up to now. The amount and quality of the work accomplished is to be commended. Some 24 publications relating to the D&D methodology have been produced, the most important of which are the Guidelines and Resources for the Agroforestry D&D presented as working papers 6 (25 pages) and 7 (383 pages), respectively.

The impact of this project within the ASRE programme and ICRAF has been notable for promoting interdisciplinarity and providing guidelines for the ASRE Programme, a basic tool to design COSPRO projects at country level and material for the training efforts of the Council. Externally there has been

dissemination through conferences (7), publication distribution (requests from 43 countries), collaborative work with other international institutes and training of national and regional scientists during COSPRO missions and ICRAF short courses.

The advance in the development of the Agroforestry D&D methodology has been important. However, there is one aspect in which the method needs further development. This is connected with the requirement for the Council to make this method useful and usable for national research institutes considering their present mandates, scientific capabilities and resource endowments. This is already recognized by the scientific staff of ICRAF. Quoting from a memorandum by Raintree, Grandin and Torres dated September 21, 1984: "One of the lessons of our experience in trying to train people in the use of D&D is that, while the present methodology and materials may be sufficient to guide experienced multidisciplinary teams of scientists through a time-efficient procedure toward reasonable, complete and accurate diagnostic basis for technology design, we still fall short of being able to instruct our trainees on how precisely to diagnose particular types of land-use systems."

This further development could require from ICRAF a lesser involvement in direct application of the D&D methodology but more efforts in transferring it to pilot groups of national scientists and in following their experiences during application. Special attention should be given to the guidelines needed for properly identifying and describing the land-use systems, their problems, and their improvement potentials. What are the key observations, how to make them, how to interpret them? Equally important are the guidelines to confront the diagnostic results with the available technical knowledge to derive or design the prospectively most appropriate technologies. Can we translate all that is needed into a simple algorithm and present it in a "user-friendly" form to colleagues in developing countries? It is possible that, to obtain a simpler D&D method, simpler objectives and more specific users should be identified. The last could imply the development of specialized D&D methods for different users. However the "target users for ICRAF" need prior attention (those who are or will be responsible for developing appropriate agroforestry technologies within developing countries, particularly research and extension professionals. In the methodology of ICRAF, the D&D method sets the stage for agroforestry research leading to the development of appropriate agroforestry technologies for a given area or situation. It does not discuss, however, the possibility of including as part of the method, a strategic selection of specific areas on which to concentrate the research effort. Such selection is crucial when the resources are limited and the mandate area to be served is ample but heterogeneous, which is the case for most national institutes. At a global level this is also the situation for ICRAF.

As a further development of the D&D Guidelines, we suggest that a section be added at the outset on site selection. During the initial period, it appears that sites for D&D exercises have been pre-selected by the collaborating governments or national agencies. Such governments or agencies have undoubtedly had good reasons for their selection, but for future guidance, the Panel suggests that ICRAF have a fuller involvement in site selection. The sites selected for intensive D&D analysis in collaboration with ICRAF should be appraised in advance as to their suitability for studies that lend themselves to broader extrapolation to other sites in the region, and as potential hubs for regional collaborative networks.

It is recognized that, in many cases, sites are considered for introduction of agroforestry, which may be characterized by degraded soils of low fertility and low productivity. In planning the research needed, the options under study should not be limited to purely subsistence practices, but should include higher input practices as well. In all cases, provision should be made for careful analysis of the economic implications and results.

Agroforestry Systems Inventory Project

This project is under the responsibility of Dr. P. K. R. Nair (Agronomist) of ICRAF and the advisory support of Professor C.R.W. Spedding of Reading University (UK). Its purpose is a systematic collection of data about important and promising agroforestry systems and practices utilized in tropical and subtropical regions of the developing world. This data base should be organized to allow analysis and evaluations in order to identify restrictions and potentials for improvement and wider applicability of those agroforestry systems, updating of the information and rapid retrieval for dissemination and use by researchers and development workers. The method of operation included the identification of a group of qualified "Regional Co-ordinators" (RCs), who are given support in order that they, with other individual and institutional contacts and, on occasions with ICRAF staff in field visits, would collect the systems information within each region. The major regions include Southeast Asia, South Asia, Mediterranean and Middle East, East and Central Africa, the American Tropics, and the Pacific Islands and Papua New Guinea. Data have been collected from over 30 countries with some delays due to initial difficulty with the definition of agroforestry and what constitutes a distinct agroforestry system, sub-system, and practice. For similar reasons, difficulties with the use of the questionnaire/data collection format have been reported from the RCs. However, a project mid-term evaluation team from USAID considered such a format as adequate and encouraged its use. This team estimated that the first phase of data collection was six months behind schedule and recommended an extension to allow for its completion.

There is also some concern in relation to the variable and mostly descriptive and qualitative nature of the information being received, particularly from voluntary participants. The data handling is being adjusted to deal with the variability in the level of detail supplied. Efforts to improve its comparability are under-way at ICRAF and Reading University in preparation for computerized analysis. Four interim data bases have also been developed from a literature survey conducted at ICRAF as a supplement to the field survey. Ten papers of a series in Systems Descriptions are in press or have been received and accepted by the "Agroforestry Systems" journal.

The data base being prepared by this project is enhancing the ICRAF team's knowledge about agroforestry in the world and its capability for agroforestry technology design, counselling, and training. Externally the project has contributed to the projection of ICRAF by establishing a network of regional co-ordinators and other individuals interested in agroforestry systems, and also through publications, conferences, and the training programme. It is important that the methods, concepts, and results of the project are kept compatible with those of the D&D methodology, particularly in relation to the concept of agroforestry systems and the variables in them which should be observed and/or measured for description, diagnostic and design purposes. In fact it should be expected that both methodologies have evolved jointly as a result of the interdisciplinary effort of ICRAF.

Project on Economic Studies of Agroforestry Systems

This project is also complementary for the development of ICRAF's multidisciplinary capability for research and development of improved technology in agroforestry systems. Its central purpose is the identification and development of cost-effective methods and models to assist in the economic diagnosis, design and evaluation of agroforestry land-use systems technologies. It has been based on a systematic review of existing economic methods and data relevant to the study of agroforestry systems. It is under the leadership of Ir. D. Hoekstra (Farm Economist). Its progress includes the development of a computer software package and users manual for economic analysis of agroforestry systems, in collaboration with the Australian National University. This package is identified as MULBUD. Several working papers on economic analysis of agroforestry systems and technologies have also been produced. Internally to ICRAF, these advances have permitted the incorporation of ex-ante economic evaluation as part of the technology design process within the D&D method, particularly during its application in COSPRO activities. Externally, the MULBUD software package and users manual is being disseminated through a network of interested parties and through training courses. All these application and dissemination efforts should provide the opportunity for a close assessment of how appropriate are the methods and tools developed for economic analysis of agroforestry systems

and technologies, for different users and/or circumstances. In the view of the Review Panel, these efforts to develop the capability and methods for economic analysis need additional emphasis in ICRAF as part of its approach to agroforestry research and technology development and particularly as part of the COSPRO type of activities.

Land Evaluation Project

This project is under the responsibility of Prof. A. Young (Soils and Land Evaluation Specialist). Land evaluation is the process of assessing the suitability of land for specific purposes. It can help to answer questions of two different kinds: (i) for any given kind of land-use, where are the areas to which that use is best suited? (ii) for any given area of land, what is the most suitable use? These types of consideration are central to the purpose of the D&D method and also for the data collection and management in the Agroforestry Systems Inventory Project. They are particularly pertinent in relation to site selection for national and regional research centres.

The purpose of the Land Evaluation Project is the development of practical methods to assist comparative evaluation of land-use systems, considering their environmental impact and long term sustainability. This methodology is considered to be complementary in scale and approach to the D&D method. The D&D is thought to focus problems at small scale land-use and decision making units, while land evaluation methods are expected to assess the land-use system at a higher hierarchical level, i.e. water catchment level. An eventual synthesis of the two approaches as part of the D&D methodology is expected. Results from the project include a computerized environmental data base for agroforestry information and a working paper describing the information storage and retrieval system. The project has yet to be fully funded. A detailed draft proposal has been prepared. This activity should provide a key input into site identification for COSPRO activities, and in the extrapolation of information from regional centres through networks of national programmes throughout identified ecological regions.

Project on Land and Tree Tenure in Agroforestry

This special project is headed by Dr. J. B. Raintree (Sociologist/ Anthropologist) and has been developed with the collaboration of the Land Tenure Center at the University of Wisconsin. Its aim is to summarize, in an annotated bibliography, the state of knowledge and to identify priorities for research on the tenurial aspects of agroforestry. Thus far a manuscript for the bibliography under the title "Land, Tree, and Tenure" has been produced. An international workshop on the subject is planned for 1985 to assess: (i) the relevance of regional tenure issues to the development of perceived agroforestry potentials, and (ii)

the potential of specific agroforestry systems to solve or mitigate existing tenure problems.

Completed Projects

Two additional projects have been completed as part of the ASRE programme. They were (1) The ICRAF/BAT Project on Agroforestry and Cash-Crop-Based Land-Use Systems, and (2) Agroforestry Tree Seed Project.

The first project responded to the interest of the British American Tobacco Company to explore the potential of agroforestry systems to alleviate the fuelwood shortage and improve the general state of land-use in tobacco growing areas of Africa. It consisted of training of BAT field personnel for applying the D&D method in four case study areas of Kenya, an international workshop to discuss different case studies on the subject, and the publication of the workshop proceedings "Agroforestry Systems for Small-scale Farmers".

The second project was (1) to assist in the early development and testing of the D&D methodology for identifying appropriate tree species and agroforestry systems in a range of ecological zones of Kenya, and (2) to assess the problem of the farmers in those zones in obtaining good seed of the identified tree species. The D&D method was refined, a procedure for facilitating the importation of tree seeds into Kenya was established, and the findings were reported in the "Kenya Agroforestry Tree Seed Project Report".

General Comments

The progress attained by ICRAF through the ASRE is considerable. An in-house capability and a method for D&D of agroforestry systems and technology has been developed and documented. Further methodological advances and/or state-of-the-art reviews have been completed in relation to agroforestry systems in tropical areas, economic analysis of agroforestry systems and technologies as well as in land evaluation and land tenure in agroforestry. These methodological advances and data bases are all complementary and should soon be integrated as part of the D&D methodology.

The experience gained by ICRAF up to now has set the stage for a more direct effort to transfer the use of D&D and other tools to pilot teams of national scientists. This will allow ICRAF to evaluate and adjust the presentation of the method to the users or the method itself to facilitate its use, particularly by research professionals at the national level. Experience elsewhere has shown that such adjustments (in selected localities and interacting with the final users and beneficiaries sought for the proposed methods) help to maintain the methodological focus and flexibility as well as

those of the team as a whole by strengthening its interdisciplinary nature and balancing the socio-economic and bio-physical/technical considerations needed for an appropriate D&D. ICRAF is having this opportunity through the implementation of COSPRO activities and the increasing co-participation of the expertise and results obtained through the ATRE programme in the team.

All these observations and adjustments would also guide the preparation of appropriate training materials and the design of more efficient training strategies enhancing the overall counselling capability of ICRAF.

AGROFORESTRY TECHNOLOGY RESEARCH AND EVALUATION PROGRAMME (ATRE)

This programme has been under the co-ordination of Dr. P. A. Huxley (Horticulturist) since 1981. The ICRAF Programme of Work for 1984 stated that the aims of this programme were:

- to collect and evaluate existing knowledge on agroforestry technologies and data of relevance to agroforestry according to problem-oriented priorities;
- to increase ICRAF's ability to obtain more data and information through the development of methods to study appropriate aspects of technology.

Considering the "spread of research interests and varying demands on the ATRE programme from other programmes, an attempt is being made to concentrate the programme on research workers as the promising "target" for outputs; on research methodology as the area having the greatest "multiplier" effect; and on selected subjects (e.g. multipurpose trees) as key components in any agroforestry land use system" (Programme Co-ordinator's report). The basic method employed, under this programme, has been the review of literature and available data about agroforestry subjects (priorities). All projects point to the preparation of written material to be published as handbooks, manuals, annotated bibliographies, data bases, general guidelines, and series, through journals. Some workshops and seminars have been held on particular subject matters and also some field demonstrations in connection with requirements of support from the training and COSPRO programmes as well as from the Advisory Unit have been undertaken. The major thrusts in the programmes and their results and projections as presented by the Programme Co-ordinator are included in Table 1. The process used for setting priorities for projects is revealed in the following statement extracted from the Programme co-ordinator's report. "Some aspects are clearly definable in this category (priority issue) from our own knowledge of agroforestry and from extensive contacts world-wide (both scientists and field workers) - for

example, problems relating to multi-purpose tree (MPT) germplasm, the assessment of MPT species/provenances, aspects of land sustainability in agroforestry systems - and so on. In addition, ICRAF's out-reach programme (and in particular, COSPRO) generate the need to answer particular site-specific enquiries. Both sets of "prompts" need to be considered in selecting priority issues". Additional comments by the staff suggest that in several occasions the selection was also "opportunistic" in relation to a donor's interest and support.

The general picture is repeated for each one of the four research projects co-ordinated under this programme. A fifth project - "A manual on Agroforestry in Soil and Water Conservation in Dry Africa" - is due to begin, as soon as funds become available, under the leadership of D. Rocheleau (Plan of Work 1984).

Project on Agroforestry Reviews

This includes several sub-projects or functions-activities: (1) Food-crop production potential in agroforestry under the responsibility of W. Beets, (2) Fuelwood production in agroforestry (P. J. Wood), (3) Fodder production potential in agroforestry (F. Torres), (4) Agroforestry in soil and water conservation (A. Young), (5) Agroforestry in relation to man (J. B. Raintree). All these are in-depth reviews. At present the review on "Fodder production potential" is in the process of completion. The other four are under planning with the possibility of starting two during 1984 (Plan of Work 1984). Given the importance of these reviews and the resource limitation for them, ICRAF might study the alternatives of sub-dividing and/or sub-contracting them.

Project on Science and Practice in Agroforestry

Under the direct responsibility of P. A. Huxley, this project attempts to produce a series of booklets on a range of subjects, "both of a scientific and a practical nature" related to agroforestry. The first one "Some considerations of soil productivity under agroforestry land use" (by P. K. R. Nair) will be printed during 1984 and at least three other issues will be prepared (Plan of Work 1984).

Multipurpose Tree Studies

This project includes seven sub-projects. Their purposes are to derive guidelines, methods, and priorities on how to explore, develop, and use germplasm of multipurpose trees (MPTs). Specifically, they are: (1) Manual of research methodology for MPTs in co-operation with the US National Academy of Sciences. A manual on the "Methodology for the Exploration and Assessment of Multipurpose Trees", including an introduction and six volumes with a total of 1283 pages

has been prepared (P. A. Huxley); (2) Research networks and field studies on experimental techniques (P. A. Huxley); (3) MPT Germplasm Planning Workshop. This was held in Washington in May, 1983 by ICRAF with the co-sponsorship of IBPGR, CFI, and NAS (P. von Carlowitz); (4) MPT Data Bank. The data bank has been designed, a MPT questionnaire prepared and widely distributed and the data collection and processing has started (P. von Carlowitz); (5) MPT Seed Directory. The first draft of the directory is under preparation (P. von Carlowitz); (6) MPT Germplasm Demand/Supply Inventory (P. von Carlowitz); (7) MPT Field and Nursery Demonstration and Trials, at the Machakos Field Station (P. A. Huxley, P. von Carlowitz, and P. J. Wood) (Plan of Work 1984). Some of these are not operational yet but they are a logical group of activities fundamental to the use of trees in agroforestry systems. Their findings and products should be tested and/or applied as soon as possible.

Project on Design and Management Guidelines

This project is under the joint responsibility of P. A. Huxley, T. Darnhofer, and P. von Carlowitz. The purpose here is to respond to the needs felt within ICRAF and requests received in terms of guidelines or routines for solving field (research) problems. Six sets of research guidelines have been developed, three of which include preliminary microcomputer software.

General Comments on the Programme

Forty published papers, seven working papers, and a source-book of over 1000 pages on MPT exploration and assessment attest to the efforts and thoughts devoted to this programme. This is an impressive record of accomplishment. Stated explicitly, through the declared aims for the programme (Plan of Work 1984), or implicitly through the reported project activities and results, the final targets for this programme are the national research workers and the improvement of their research methods. The end objective is improved and appropriate agroforestry technologies to improve the decision-making process of groups of producers in given areas/situations. Some ICRAF staff members indicated that problems have been encountered during attempts to use parts of these materials in training, and that an improvement in presentation was needed. This comment suggests that this part of the research programme might operate more closely under field production conditions in order to discover the questions and requests to which the national scientists have to respond in agroforestry. ICRAF should devise appropriate tools required by those scientists to answer such questions. This seems to be the next natural step for ICRAF's work, particularly to project the results obtained thus far by the ATRE programme further into field situations. The COSPRO type of activities, if extended to include such considerations, would offer an excellent

MAJOR THRUSTS	KINDS OF ACTIVITIES	ACHIEVED OUTPUTS	COMMENTS	SUGGESTED REQUIRE FUTURE OUTPUTS a)-1984-86 b)-1986-on	COMMENTS	
A Collection, collation and/or appraisal of information and data about the components of AF systems, and the interactions of these within systems.	1. Publication Series	i) 5 Agroforestry Reviews	Two parts of the "Animal Potential and AF" Review completed (FT/PJR) and 4 other Reviews in planning stage with funding for all (?) likely.	a) Complete all 5 Reviews b) Consider need for others in more specialized technical areas.	To bear in mind COSPRO requirements for immediately required information. If programme resources allow.	
		ii) "Science and Practice of AF" Series (on-going)	One now published 5 others with text in preparation or being revised. 4 other titles in preliminary planning/preparation with authors.	a) Production of 3-4 more before end of 1985. b) Steady continuation of series (3-4 per year)	Titles so far have been "opportunistic" but a more prioritized approach may be possible.	
	2. Databases	i) NPT Database (8 countries) ii) Plant species with anti-pest properties iii) Woody species used in AF systems (management) iv) Woody perennials with fodder potential. - All are in stages of preparation.	The NPT database (GTE-funded) and Evaluation DB (SYSTEMS) and General AG Bibliog. DB (INFODOC) are being closely co-ordinated. All others are (A) will be structured to be interactive.	a) Completion to user-ready stage of the 4 listed. Completion of a NPT Seed Source "Directory" b) Priorities to be chosen.	Requires support as major output for ICRAF's technical and scientific information resources.	
Consideration, cognition, selection and re-formulation of priority areas of technology of concern in supporting the development of AF research.	3. Annotated Bibliographies	Several in preparation (but none yet completed)	Arising from work on "Reviews" DB as separate exercises associated with Databases.	a) Completion of existing involvements (2 bibliographies on Animal Production Potential and AF). b) Priority selection of other subject areas.	Both (a) and (b) require additional support staff.	
		Workshops	Bells Research in AF (1979) International Co-operation in AF (1980) Kango National Seminar in AF (1980) Plant Research in AF (1983) NPT Curriculum Workshop (1985)	All Proceedings published and distributed except NPT Curriculum Workshop which is due end 1984 beginning 1985.	a) b) To be decided	Publishing "Mini-workshops" arising from Network activities will be most cost-effective.
		Derivation of appropriate field research methodologies for AF	24 parts (in 6 major sections, totalling about 1800 pages). - 30 full sets distributed to Nat. Acad. Sci. Network, c. 10 requests for more (arising from casual contacts).	These source materials should be considered still in draft and the "Manual" as an on-going series. Six more parts are in preparation now. Major information dissemination and distribution intended late 1984 - early 1985.	a) Revision of appropriate materials from these source-documents in the form of more specific training or university course materials, field guides etc. b) After appropriate feed-back from field networks etc revision and publication in a more substantial form	Initial work was both in-house and involved outside sources. Future contributions should show an increasingly wide collaboration with other AF Scientists.
Interactions with and support for ICRAF's Dissemination Programme. (COSPRO, TRAINING, INFODOC) and the Advisory Unit.	2. Networks for deriving research methodology	Several loose "correspondence" networks available	Derived from previous workshop participants and others interested in AF research.	a) Set up highly specialized networks for key research areas and established field activities in testing research methodologies, e.g. in field layouts, assessment methods and tree/crop interaction studies. b) Maintain and extend this as a major activity.	This needs to be done both directly and through COSPRO.	
		1. Research and Management Guidelines	7 available	(Have been incorporated into "Manual of Research Methodology of NPTs) Wide range of Scientific background at ICRAF provides a rich opportunity for rapid progress.	a) A major thrust needed prioritized by COSPRO needs. b) To be expanded through the outcome of "Mini-Workshops" etc.	Primarily aimed at turning theoretical into practical, readily-usable protocols for research workers and for AF design producers.
		2. Handbooks and Field Guidelines.	1 planned	Soil and Water Conservation for AF Landuse Systems in Dry Regions.	a) Other Field Guides not yet discussed b)	
Interactions with and support for ICRAF's Dissemination Programme. (COSPRO, TRAINING, INFODOC) and the Advisory Unit.	3. Field Demonstrations	Various low-level On- and Off Station Trials/ Demonstrations.	So far more of an "opportunistic" approach rather than a well-defined programme.	a) Demonstrations of selected field layouts on ICRAF's Field Station. b) Possible link with "Networks" as as "extend Research Methodology demonstrations once these are of proven use.	An important way of extending and authenticating AF research methodologies.	

Table 1: Activities and outputs of the Agroforestry Technology Research and Evaluation Programme - 38A

opportunity to derive the appropriate mechanisms for setting research and training priorities for ICRAF as well as to determine better the contribution and role to be played by the Field Station and the ASRE programmes. Additional opportunities may be presented in training or consultancy activities as well as through direct research.

COLLABORATIVE AND SPECIAL PROJECTS PROGRAMME (COSPRO)

This programme is co-ordinated by Dr. F. Torres. It has two main purposes which delineate the programme scope and aim as well as its general methodology. As expressed in ICRAF's Programme of Work for 1984, these purposes are:

PRIMARY: to strengthen the capability of agriculture and forestry institutions of developing countries in the generation of appropriate agroforestry technologies to overcome productivity and/or sustainability problems in existing land-use systems. This will be accomplished by:

- i) gathering and processing secondary information for identifying institutions where activities are to be developed (in co-operation with the Information programme);
- ii) assisting inter-institutional teams in planning research projects derived from technologies designed as a result of the diagnosis of existing land management systems (in co-operation with the ASRE and ATRE programmes);
- iii) training multidisciplinary teams in the design and evaluation of alternative agroforestry technologies (in co-operation with the Training programme);
- iv) back-stopping teams implementing national agroforestry research for development projects (in co-operation with ASRE, ATRE, and Information programmes);

SECONDARY: to promote the development of networks of technology-generating projects that demonstrate the economic, technical and social feasibility of combining herbaceous, woody, and animal components to increase land productivity in a sustainable way.

Five wide geographical regions of the world have been identified for individual attention under the COSPRO programme. They are: American Tropics, Sub-Saharan Africa, South Asia, Southeast Asia, and the Mediterranean/Middle East. Each of these geographical areas is then divided into three or four ecological zones. This geographical/ecological matrix offers a total of 15-20 potential environments or

broad situations where COSPRO type of activities could be initiated.

The COSPRO programme was initiated in 1982 and is presently developing activities in seven sites within the geographical/ecological matrix. The site selection, thus far, "has followed more of an opportunistic than a systematic approach" in terms of interested institutions and fund availability. This has not permitted ICRAF to have a balanced representation of the geographical/ecological matrix (Programme Co-ordinator's report) but in any case, it would spread resources too thinly if ICRAF attempts to operate in each ecological zone.

The networking activities have been deliberately delayed until more COSPROs are operational. However, existing and compatible networks, including the Agro-Ecological Research Network in the Amazon, the All-India Co-ordinated Research Projects on Agroforestry in India, and the Committee on Food, Agriculture and Forestry of South East Asian Nations, are being identified as potential media for the networking objectives.

For a given site, a COSPRO development includes three stages: identification, formulation, and implementation. The first stage is related to the identification of the "partner institutions" within the designated zone and of potential for the agroforestry approach to improve existing land management systems. The formulation stage is considered as the most crucial and the one where the Council's contribution will be most relevant. It has been utilized to disseminate and validate ICRAF's methodology for deriving research objectives or the "Diagnostic and Design Method". It is carried out by an interdisciplinary team of local and ICRAF scientists; its product is the design of agroforestry alternatives to improve existing land management systems and of the research necessary to develop the required technology for the improved systems. The implementation stage is to carry out the research necessary to develop the preliminary or notional technologies designed in the previous step and to validate the research and experimental methods proposed. The responsibility for this stage is mainly on the partner institution; however, ICRAF envisages the possibility of a complementary participation during this stage, provided the necessary resources are available to the Council.

The present advancement and coverage of the COSPRO programme are summarized in Tables 2 and 3.

For ICRAF the initiation and development of different COSPROs has provided opportunities to further develop and test the D&D methodology and to adjust ICRAF's service training method and materials to make them more responsive and relevant to developing-country situations. According to the co-ordinator's report, eight of the ICRAF senior scientists have participated in at least one COSPRO exercise and the co-ordinator has participated in all seven. At least

TABLE 2 COSPRO PROGRESS SUMMARY CHART

GEOGRAPHIC REGION	ECOLOGICAL ZONE	PROJECT SITE	PARTNERS	PROJECT							
				NAT.	REG.	PLANNING			IMPLEMENTATION		
						ID	D&D	DOC	IA	DRP	EXP
AMERICAN TROPICS	Lowland Humid Tropics	Yurimaguas	INIPA/NCSU/ INFOR							→	
		Pucallpa	INIPA/INFOR/ IVITA	CIAT						→	
	Seasonally Dry Highlands	Puriscal	MAG	CATIE						→	
INTER-TROPICAL AFRICA	Bi-modal Sub-Humid Highlands	Kakuyuni	KARI/NDPS/ MIDP	ILCA?							→
	Lowland Humid Tropics	Cape Mount? Suakoko?	CAF-UL, CARI, FDA	IITA?	→						
SOUTH-EAST ASIA	Seasonally Dry Tropics	Tabango	VISCA/ PCARR	SEARCA?							→
	Lowland Humid Tropics	Batu Arang	UPM/FED/ MARDI	SEARCA?							→
SOUTH ASIA	Highland Humid Sub-Tropics	Bhaitan Watershed	ICAR	FF							→
MEDITERRANEAN & MIDDLE EAST	ID = Identification of country/site D&D = Diagnosis and design exercise DOC = Proposal Document Preparation IA = Institutional Arrangements DR = Detailed Research Planning EXP = Field lay-out experiments										

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Table 3 Number of non-ICRAF participant and collaborating institutions in different COSPRO Programme activities

COUNTRY	NON-ICRAF PARTICIPANTS	NATIONAL INSTITUTIONS	INTERNATIONAL INSTITUTIONS
Peru	4	<ul style="list-style-type: none"> ● Instituto Nacional de Investigacion y Promocion Agraria (INIPA) ● Instituto Veterinario de Investigaciones Troicales y de Altura (IVITA) ● Instituto Nacional Forestal (INFOR) 	<ul style="list-style-type: none"> ● North Carolina State University (NCSU) ● Centro Internacional de Agricultura Tropical (CIAT)
Kenya	2	<ul style="list-style-type: none"> ● Kenya Agricultural Research Institute (KARI) ● National Dryland Farming Research Station (NDFRS) ● Machakos Integrated Development Programme (MIDP) 	
Philippines	5	<ul style="list-style-type: none"> ● Visayas State College of Agriculture (VISCA) ● Philippine Council for Agricultural Resources and Research (PCARR) 	<ul style="list-style-type: none"> ● South East Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA)
Costa Rica	19	<ul style="list-style-type: none"> ● Ministerio de Agricultura y Ganaderia (MAG), including: Centro Agricola Regional (CAR) Direccion General Forestal (GGF) ● Asociacion Costarricense para la Conservacion de la Naturaleza (ASCONA) 	<ul style="list-style-type: none"> ● Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE)
Malaysia	8	<ul style="list-style-type: none"> ● University Pertanian Malaysia (UPM) ● Rubber Research Institute of Malaysia (RRIM) ● Forest Department (FD) ● Forest Research Institute (FRI) ● Kasetsart University (Thailand) 	<ul style="list-style-type: none"> ● South East Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA)
India	13	<ul style="list-style-type: none"> ● Central Soil and Water Conservation Research and Training Institute (CSWCR&TI) ● ICAR Regional Co-ordinators of the All-India Agroforestry Project ● ICAR All-India Dryland Agriculture Project ● Solan Agricultural University 	

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two and a maximum of five (in India) of these scientists have participated in a particular COSPRO exercise. Tables 2 and 3 report the number of non-ICRAF scientists (51) and institutions (19 national and 4 international) involved in the different COSPROs.

Comments on the COSPRO Programme

Without doubt the COSPRO activities are contributing to the institutional projection and the building up of ICRAF's practical capability for agroforestry research, particularly for D&D, setting the stage for the Council's outreach and networking in interaction with the national research institutions as well as motivating true interdisciplinary work with participation from all staff and all programmes.

The activities in the COSPRO programme have helped to identify and to create or motivate a demand for all ICRAF's support and it will continue to do so if expanded; "assisting national institutions in the planning and implementation of agroforestry research projects cannot be accomplished under the present circumstances without the full support of all other programmes, with the possible exception of the Field Station" (Programme Co-ordinator's report). Any plan for continuous expansion of the COSPRO activities should be based on ICRAF's true capability for providing such support. This may require additional resources but also a review of the present organizational structure and priorities for the different programmes; "ICRAF does have the capability but the lack of organizational structure and differences on priorities affect either the timing or the nature of such support" (Programme Co-ordinator's report).

Thus far ICRAF has been responding mainly to the requirements of the identification and formulating stages in a COSPRO. As such it has been acting somewhat as a specialized body for the identification and design of agroforestry research projects and with the additional benefit that it could also help to identify and obtain the funding for such projects. As those COSPRO's advance in their implementation phase, as in the case in the Kakuyuni water catchment in the district of Machakos, Kenya, more specific demands of a very practical nature will come to ICRAF, the promoting institution. Put in a different form, the present stage of development in the different COSPROs has called mainly on the D&D capability of ICRAF besides motivating a more active participation from the ATRE programme in the design phase. As those COSPROs evolve, a stronger demand for additional support and of a different kind will develop. On some occasions the different programmes will be prepared to respond and/or to further test and develop what has been worked out thus far; on others the required capability or knowledge will not be nearly developed.

Thus, the COSPRO activities, if carefully planned and their requirements, progress, and results carefully monitored, documented, and rationalized, could be used by ICRAF as the most appropriate method for identifying and justifying future thrusts and priorities for the different programmes, including the Field Station. The most immediate and obvious demand is for ICRAF to enhance its direct involvement during the implementation phase of the different COSPROs. To answer this, ICRAF will have to accept a more active role in technology development to enhance, improve, and fine-tune its present capability for advising, information gathering, and dissemination. This, which is not in conflict with the institutional mandate is, possibly, the most obvious way to enhance the whole staff competence, and thus to increase the Council's credibility.

A more direct involvement of ICRAF in selected COSPROs will possibly require at least one ICRAF scientist to belong to the research-implementing team on a continuing basis. This implies a change in the present work strategy and organization of ICRAF and will require additional resources, which will have to be understood by the donors. The participation of the ICRAF scientist in the research team should not be on an advisory basis, but as a working partner.

This participation would help to identify the most effective type of support and when to obtain it from ICRAF to reinforce the COSPRO research team. For ICRAF it would help to identify the demand for specific methods, tools, or special considerations during the agroforestry technology development work, which the Council could attempt to test or develop. One of those considerations is, for example, the concern for including in a more aggressive or explicit manner income-generating elements in the agroforestry technology or systems designs. They would help to make those technologies or systems more attractive to producers as well as to development institutions and, hopefully, also more adoptable by farmers. This concern has been manifested by various observers of the work being developed by the COSPRO at the Kakuyuni water catchment in the Machakos District (Kenya), for example. Apparently the "cost minimization" and "sustainability" elements have been predominant in the design, thus far. This may be logical given the highly restricted production circumstances in which COSPROs, such as the one in Kakuyuni, are being developed. However, if no additional efforts for enhancing income generation potential in the design of agroforestry technology or systems are made, the present efforts and advancement in agroforestry could lose attractiveness. They could tend to be confused with new attempts to introduce resource conservation practices without clear short-run benefits which have previously limited their acceptance by producers and therefore their impact. The addition of higher inputs among the options under study would be quite appropriate in this context.

This programme is likely to become the centre-piece of ICRAF's activities in the future, with the other programmes feeding into it and with this programme generating the technological information, system experience and validation, and providing the background for advisory services and the focus around which training programmes are planned. The administrative structure suggested in Chapter 10 would be appropriate for such a development. ICRAF involvement in the implementation of collaborative programmes would imply long-term commitment in principle to such involvement.

The designation "COSPRO" does not seem quite appropriate for this set of activities. The term "COPRO" would seem more suitable, denoting Co-operating Programmes. Special projects are not limited to this activity but could be developed on a limited time basis and for specific purposes in support of any or all phases of ICRAF's activities.

The Panel recognizes that the number of collaborative programmes in which ICRAF might potentially be requested to participate could be endless, in view of the great diversity of situations in which agroforestry practices might be applicable and the potential interest of collaborating countries. ICRAF should be cautioned against spreading its resources and talent too thinly. Five major ecological regions have been identified, each being subject to further sub-division. For the near-term future, the Panel suggests that a major project site for concentration be identified for each of these five regions (see suggestions on site identification in chapter 8), and that this be developed in its own right, and as a hub for a network of co-operating national projects in the same ecological region.

ADVISORY UNIT

As a council, the entire structure of ICRAF may be considered to be mandated to provide advice on aspects of agroforestry. Most members of staff already provide advice in their own fields to specific enquirers (although it is recognized that some staff do not have field experience in managing or operating research or development projects) and the Library/Documentation Service often gives advice on sources of information and materials as a core service. However, a special Agroforestry Advisory Unit was established in September, 1983, to provide advisory and consulting services in respect of research and development projects for donor agencies, development banks, private companies and others.

Based on a document provided by the Programme Co-ordinator, Mr. Peter J. Wood, a total of 51 serious contacts have been made by the Unit, of which 14 resulted in completed projects or signed agreements, six are still in negotiation, and one failed to develop. Of the remainder, the probabilities for completing

agreements are uncertain. These consultancies or contacts were distributed between donor agencies or foundations (29), international agencies (9), developing country agencies (8), and others, e.g. IUFRO, Club du Sahel, etc., (5),.

The Unit comprises three senior scientific staff - a range management specialist, a tropical agronomist, and a forester, who is also the co-ordinator of the Unit. Originally it was planned that the Unit should be totally self supporting to the extent of three man-years' costs per year. The Programme of Work for 1984 shows the following allocations of time (man-days) to advisory work for the three Unit staff: 138 (agronomist), 123 (range specialist), and 110 (forester); the remaining time would be made up by advisory or supporting work of other senior staff (ten days each). Assistance has been given by Information, Technology, Publications, Administration, and Photography, while several senior staff have undertaken consultancy missions.

The balance of time of the Advisory Unit staff is attributed to other programmes, including:

- lecturing and travel for training courses
- preparation of reviews on aspects of agroforestry, including fuelwood, range management, and intercropping
- inputs to COSPRO activities (to date Africa and India)
- inputs to the Technology programme (largely contributions to the Manual on the Evaluation of Multipurpose Trees)
- inputs to demonstrations and trials at ICRAF's field station in Machakos
- representation of ICRAF at international conferences

There is considerable controversy within ICRAF and outside it about the need for a special agroforestry advisory unit and about its cost. Many feel that it should be instantly self-supporting, an ideal that is impossible to attain since start-up costs of such an enterprise are high (especially staff moving expenses) and a reasonable time delay is inevitable before a pipeline of projects is established. There is no doubt that the AAU has cost considerably more than it has earned to date. However, the three staff have been extremely energetic in pursuing projects and the numbers of potential employments in the next year are increasing.

One anomaly apparent to date within the AAU is the fact that virtually all consultancies have been carried out by a single member of the Unit acting in the field alone (although projects are discussed fully by all members in the office before and after the field work). Only two missions involved two members of ICRAF staff and, ironically, one of these was conducted by two from outside the AAU (because all three members were occupied elsewhere).

One argument put forward for the maintenance of a special advisory unit is that it can respond instantly to urgent requests from donors or other employers whereas other ICRAF staff are committed to existing programme activities.

However, if the AAU becomes more widely known, its own work load will be complete making instant response to requests at short notice equally difficult.

Overall the Review Panel felt that, while the advisory function must be maintained, an identifiable separate advisory unit is unnecessary. If, as we propose, all senior ICRAF staff should be available for advisory service, this could take three forms:

- (i) activities that are recognized as part of core programmes;
- (ii) advice or assistance to developing-country institutions on request; and
- (iii) consultancy to donor and other agencies at economic cost.

Where requests for advice are consistent with the mandate, ICRAF should respond. However, this obviously places an increased load on staff and resources and will require careful consideration by ICRAF's Board and detailed planning. There appears to be the equivalent of two to three man-years of consultancy demand per year at present and the core staff of ICRAF should be increased by this number, in lieu of the same strength in the separate AAU, with considerable flexibility to meet changing demand in the future. As present contracts of the staff of the Advisory Unit are concluded, extensions or new appointments to these positions could fill places in ICRAF's interdisciplinary team in subjects needing additional manpower most critically. Basically, the consultancy service should be provided by any member of the senior staff as appropriate to the task. This will clearly entail closer scientific co-ordination and particularly careful attention must be paid to the links with COSPRO activities in identifying and preparing projects. There is no provision for personnel to accept private consultancies during leave or other periods unless the full economic cost is repaid to ICRAF. Terms for such external work should be clearly described in the personnel policy.

In addition, former trainees may be brought into advisory missions. This could provide manpower at lower cost to ICRAF while giving the trainees experience working with ICRAF's staff, thus expanding conceptually ICRAF's outreach programme.

TRAINING AND EDUCATION

As agroforestry is becoming recognized and formalized as a discipline, and increasingly adopted in development

programmes, there is a growing need for training and education at all levels in the social, technological, and managerial aspects of agroforestry systems. The scope of the problem is so large that no single institution could offer all types of courses and training materials required. Already many institutions include agroforestry in regular annual courses ranging from complete undergraduate university degree courses in agroforestry (e.g. UPLB, Philippines) to small modules in intensive courses for senior professionals (e.g. CFI, Oxford). Ad hoc short courses have been arranged by various international agencies and national institutions.

However, ICRAF, with its multidisciplinary team dedicated to agroforestry, and with a professional training officer, remains the leading centre for the development of training materials and curricula, the provision of in-house residential training, and the guide and stimulus for national initiatives in agroforestry training. It is particularly important that ICRAF identifies (through COSPRO, Advisory Unit and other activities) and trains outstanding individuals who will in turn be concerned with training others in their home country.

The work programme for 1984 shows that the Training and Education programme includes six projects/activities and these topics encompass the major training activities conducted by ICRAF since its inception, particularly since 1981. The accomplished and projected activities are shown in Appendix 3, Table 1, and are discussed briefly below.

Planning

The training officer, Dr. Ester Zurberti, co-ordinates the contributions of staff from other programmes who provide all technical teaching. The numbers of staff vary between courses from 15 in the first ICRAF/USAID course held in Nairobi (November 1983) to five in the Malaysian course (October 1984). Time scheduling is difficult since other staff's activity programmes may change at a late stage, but here is now a nucleus of some five staff who can cope with most aspects and by the end of five courses all senior staff should be capable of contributing. In addition all ICRAF staff have to be available to supervise participants in the fellowship and internship activities (see below).

Training Courses

The activity has concentrated on the development of the curriculum and material for 3-week training courses in "Agroforestry Research for Development: concepts, practices, and methods". Funded by USAID from 1982 to 1985, this has resulted in two courses in Kenya (November 1983 and June 1984), one in Malaysia (October 1984), with two projected for 1985 (Peru and India, Kenya, or West Africa still to be

determined). It is hoped that two further courses can be provided in 1986.

The courses follow the programme exemplified by the Malaysian courses and shown in Appendix 3, Table 2. Some 20 participants from the region attend each course, particularly from the host country of the associated COSPRO projects. Participants in the first courses commented favourably on the content and conduct of the courses and made suggestions for future consideration. Experience elsewhere suggests that the number of students on short courses should not exceed 25 if staff-student contacts are to be maintained.

It would be valuable to re-survey their opinions on the effectiveness of the course one to two years after their course finished and to determine the extent of their agroforestry activity since the course. Perhaps more important, but possibly less feasible for ICRAF, is the initial selection of participants. Those selected should be closely related to and active in field research. Courses should not be considered rewards for long service in headquarters. ICRAF should also seek ways of providing financial support for former course participants through such mechanisms as the small grant schemes of NAS, IDRC, and the Ford Foundation.

Courses to date and in the immediate future concentrate on ICRAF's diagnosis and design methodology, but in the longer term technology-specific courses, including links to the field extension level, may be required as local capability increases for teaching the basic concepts of agroforestry and the principles of diagnosis and design. However, there is likely to be additional requirement for many years for the basic course by countries with no COSPRO project activity and this could be offered annually in Nairobi (see also discussion on a headquarters building). Overall these short courses are major contributors to ICRAF's dissemination of its methodologies, capacities, and available knowledge.

Training Materials

In 1983 a package of information, references, case studies and field exercises was assembled to support the first course (under the ICRAF/USAID agreement). In 1984 this was further developed to include guidelines for diagnosis and design, practical exercises with economic analysis, and a set of slides on agroforestry practices in developing countries. These materials have been made available to other teaching institutions and there is an urgent need to produce similar sets in French and Spanish. In view of the large number of local languages in tropical countries it is considered the responsibility of the national institutions (particularly COSPRO collaborators) to produce or translate relevant teaching and extension materials. ICRAF should

conduct a follow up evaluation of any distributed materials to determine the extent of their use, content, applicability, ease of use, presentation, etc., in those languages.

Fellowship Scheme

The Training and Education programme co-ordinates a scheme of Research Fellowships to enable professional scientists from developing countries who are under 35 years of age and linked to a national institution, to undertake research in specified areas of agroforestry or information development. The fellowships are tenable at ICRAF headquarters for one year under the technical supervision of one member of the senior scientific staff and with access to all staff for advice. No degree is awarded and programmes are designed to meet the candidates' professional interests within ICRAF's priority subjects. Field work is possible within Kenya, particularly at the Machakos station and COSPRO project area. ICRAF should develop a research agenda such that students from both developing and developed countries can select projects that can meet ICRAF's objectives and also be considered for graduate degrees at collaborative universities.

The scheme commenced in 1983 and is funded by donor agencies or by candidates' employers. All costs, including ICRAF's, have to be met from external sources. To date there has been one research fellow in 1983 (Uganda, funded by Ford Foundation). Two further candidates (Colombia, funded by GTZ and Uganda, funded by Ford Foundation) are expected to take up their fellowships in December 1984, and 2 to 4 fellows are expected each year in 1985 and 1986, arising from COSPRO projects. Any increase in this number will depend on obtaining sponsors' support, on identifying suitable candidates, and on ICRAF's capacity to supervise the research fellows but the general opinion of senior staff is that this is a stimulating and mutually rewarding activity. The extra work load on scientific staff is discussed under "staffing pattern", below.

On-the-job Training

This activity provides for six-month on-the-job internships. It has a highly practical, hands-on approach to provide junior professionals from developing countries with an opportunity to participate in agroforestry research methodology and information development. The scheme includes little formal training and candidates are expected to carry out work related to agroforestry alongside members of ICRAF's team. Leave with pay is granted by the candidate's employing institution and the employer or a sponsor covers ICRAF's costs. Several donor agencies have expressed interest in supporting such internships and already the Ford Foundation has supported seven trainees in

the period 1982-1984.

The two joint reports by the two interns in 1982 and the two in 1983 were generally favourable. Their criticisms should assist future programmes and referred to timing (internship should not clash with the main ICRAF holiday period), literature (time taken to search and acquire), physical location (desire for more field work), position in ICRAF's activities (absorb intern directly into on-going projects) and pre-arrival preparation (to minimize the settling in period and increase the possibility of completing a research project). Careful planning of trainees' programmes would reduce the demands on staff time and make a positive contribution to the staff themselves.

Professional Education

An international workshop on professional education in agroforestry was organized by ICRAF in 1982 (funded by the German Foundation for International Development, DSE). Attended by 70 participants, it provided a range of useful information on the development of curricula, teaching materials, and institutions involved in teaching agroforestry. The training officer is preparing the proceedings of this workshop for publication and ICRAF is evaluating the recommendations of the workshop to define its role and level of involvement in professional education.

It is clear that ICRAF does not have the current capacity to mount university degree courses but it is able to advise institutions on curricula and provide some teaching material. If this were pursued, it might be valuable to compare alternative strategies for courses. This would require two local and comparable universities with sufficient resources to offer undergraduate courses in agroforestry. The universities of Nairobi (Kenya) and Morogoro (Tanzania) should be considered (although the Department of Forestry in Nairobi University is small and is being transferred from the Kabete Agriculture Centre to the Moi campus at Eldoret. Once university courses are established and begin to produce a regular output of qualified graduates, these will bring a higher level of skill to ICRAF's courses which must thus be upgraded with time.

The priority for this activity must be lower than for other core activities in view of the repeated claims of over-commitment by all the senior scientific staff. However, the draft report of the USAID review mission recommended a strong activity for ICRAF in professional education and this could only be pursued if additional project funds were obtained to provide staff to develop curricula and teach some modules. For each activity and any other ICRAF involvement in formal courses, the Council must attempt to influence classical agricultural and forestry teaching organizations.

General Comments

The impacts of ICRAF's training activities to date are appreciable. Sixty participants in short courses, two research fellows and seven interns have clearly benefitted from ICRAF's multidisciplinary approach and experience. The pool of experience increases and these staff should be in a position to extend the network of agroforesters, to disseminate concepts and information about agroforestry, and to contribute significantly to the planning and management of rural development projects in their own countries or regions. Teaching materials have been prepared and are now available for these and any other scientists involved in teaching agroforestry while the workshop on professional education provided basic material for those planning degree courses.

Representatives of the donors most closely concerned with ICRAF's Training and Education programme indicated satisfaction with achievements to date. The efficiency of organization, particularly of training courses, appears to justify a non-teaching training officer and this need will increase as the number of courses rises and a system of post-course follow-up evaluation is initiated.

As with all its programmes, ICRAF must develop those training activities in which it has a clear comparative advantage over other institutions, which are cost-effective, which can be provided by available staff, and which contribute to other programmes. The first priority of these are training courses (with increasing emphasis on specific technologies) and their associated training material (including French and Spanish versions). The predicted costs for 1984 given in the Programme of Work are \$187,270 for 46 participants in courses plus \$85,730 for training materials. If half this latter figure is attributed to external beneficiaries, the total cost of two courses approximates \$230,000 (\$5,000 per participant or \$1,667 per participant-week). In return the diverse participants input a range of experience and information to ICRAF and many of them facilitate the major ICRAF outreach programme through COSPRO projects.

The average cost of research fellowships appears to be approximately \$30,000 or \$600 per candidate week. Although this figure is only 36% of the weekly cost of course participants, it should be recalled that the only air fare involved is that of the fellow himself and the core costs to ICRAF are spread over 52 weeks rather than three. The cost to ICRAF in terms of senior staff time is not fully recovered and the input of experience is less from one fellow in a year than 20 course participants in three weeks.

Similar arguments apply to internships.

A list of all participants in courses, fellowships and internships is given in Appendix 3, Table 3.

In training for a new discipline, such as agroforestry, it is inevitable that recipients of training will be dispersed in agriculture and forestry organizations with no corporate understanding or structure for agroforesters. Also the inevitable staff turnover and wastage will dilute the effort. However, a critical mass will eventually be reached that merits recognition by employing organizations and COSPRO-related training will obviously approach the critical mass for a given country or region quicker than isolated or global courses.

The Panel was generally well impressed with the training programme of the Council and, while recognizing that this part of the Council's work is undergoing evolution and that relative emphases to the different types of training are likely to change with time, was satisfied that the relevant issues thereto are being assessed competently.

INFORMATION

Structure and Objectives

Information services form one of ICRAF's service programmes and are collectively known as INFO/DOC, comprising three activities - Library, Documentation Service and Publication Service. The general objectives are:

(a) the collection, evaluation, cataloguing and dissemination of information on agroforestry, particularly information that is useful to field workers; and

(b) the compilation, publication and dissemination of results of research and of other information on agroforestry.

The principal specific objectives include the following:

(a) to maintain at ICRAF an information specialist to organize and operate the service;

(b) to enable ICRAF to answer scientific and technical questions from agroforestry research institutions and scientists, particularly those involved in co-operative research with ICRAF;

(c) to reinforce links between ICRAF and agroforestry research projects; and

(d) to permit ICRAF to maintain a file of questions, answers to them, and sources used, as the basic resource for the information service.

In addition the programme acts as the major advertising agency for ICRAF and the staff commonly fulfill a public relations function for visitors.

The Programme Co-ordinator is R. Labelle, supported by Mrs. L. Teemba (Documentalist), S. Okemo (Library Assistant) and a secretary. Together they are responsible for the Library and for processing acquisitions, for subject analysis, for preparing input sheets for individual bibliographic units, and for assisting in answering requests for information. The Publications Officer (R. Ntiru) is responsible for the production of ICRAF publications and for translations among English, French and Spanish. The Programme Co-ordinator maintains the mailing list (currently being revised and approaching 800 names). Publications and Library Committees have been established with representatives from the research programmes.

The Library

The Library contains approximately 7000 documents of which 4000 are reprints making it one of the major concentrations of literature relevant to agroforestry. Most of these documents have been acquired at the request of staff members or to answer specific questions on agroforestry. ICRAF needs to extend its system for the automatic acquisition of certain journals and other relevant publications, in addition to the free exchange agreements in force with over 80 organizations.

Over half of the items in the Library have been computerized using the IBM PC and floppy disks with a hard disk on order (see section on computing, below), and retrieval is possible by subject, species, geographic area and ecological zone. Among ICRAF publications is a thesaurus of some 1000 agroforestry terms that will facilitate coding and retrieval (ICRAF Working Paper No. 8).

Since the Library holds little on the "pure" subjects related to agroforestry (e.g. soils, agriculture, forestry, economics) it would be valuable to list the personal libraries of individual scientists and make these widely known.

The physical premises for the Library are small but adequate for current holdings. Despite the attention of the Library Assistant, many items are missing. Between 10-20 outside users visit the Library each month and the Librarian answers over 100 general requests for information monthly. Although losses might be minimized by complete computerization, supplemented with manual retrieval by the Librarian, casual browsing would probably be reduced. The need to maintain better control and retention of library accessions is paramount, for the benefit of staff and local users as well as to improve response time to external requests.

Documentation

The documentation activity is intended to search and analyze literature in response to specific requests. In the last three years some 200 outside requests have been answered. Since mid-1983, 66 were received, 43 of which were from developing countries and 23 from developed countries. The main resources used to answer these queries were: the ICRAF Library and ICRAF staff, supplemented by the KARI Library; databases in ICRAF, IDRC, PUDOC and FAO; and specialized information services throughout the world. Excluding the contributions of the documentation activity to ICRAF's own research programmes, the cost of the question and answer service is high for the few developing-country requests so far received, but the quality of response in terms of coverage and interpretation exceeds that provided by many expert organizations.

In addition to this request service ICRAF has prepared, with help from a consultant, an annotated, selected bibliography of over 450 titles that will be generally highly valuable. In collaboration with the University of Wisconsin, ICRAF is preparing an annotated bibliography on tenurial aspects of land and trees in agroforestry. ICRAF collaborates with ILCA on microfilming "fugitive" literature in Africa and it collaborates closely with CAB, FAO/AGRIS and IDRC to ensure that all ICRAF publications enter the international information networks.

Data Bases

In addition to the computerized catalogue of ICRAF's library holdings, scientific staff have developed some twelve specialized data bases (see Appendix 4). Some are still experimental and will be developed further in relation to technical content or structure but more important is the urgent need to make them compatible and user-friendly so that they can all be held on one computer and used by all staff. This process is not necessarily the responsibility of the Information programme but additional temporary computing support (systems analysis and programming) may be required by ICRAF to facilitate it. (See section on computing below.)

Publications

ICRAF has an impressive list of publications (see Appendix 5) which includes 2 bibliographies, 12 newsletters, 3 information brochures, an attractive and informative annual report, 7 books/proceedings, 1 booklet on science and practice of agroforestry (with 8 in preparation), 16 reprints of leading articles by ICRAF staff, 1 brochure describing the MULBUD system, 24 staff working papers, 18 miscellaneous papers and a range of publicity material. Some seven guidelines for technology design and management are

also now available or in preparation. Among these publications, some represent duplicate publication of the same or closely similar material aimed at the same type of audience and may therefore be unnecessary. However, ICRAF should consider producing several versions of some publications for audiences of different levels of sophistication. For all publications a higher standard of peer review is desirable, which we understand is in the process of being implemented.

An additional senior and highly experienced staff member in information and publications is needed to enable ICRAF to project its image and programme more effectively. Among other things, the above array of publications attest to the high level of staff productivity. At the same time, a large number of them are still in the form of drafts and working papers, and need to be edited and put in final form for more formal publication and distribution to a wider audience.

In common with other services that may be demanded of ICRAF in future (i.e., assistance with computing), the services of information are expensive and will be required by different categories of worker (e.g. ICRAF staff, COSPRO associates, staff from other institutes in developed or developing countries, the general public). ICRAF must develop a policy regarding the extent and payment for services and a strategy and priority rating for responding to requests.

In addition the "house journal" is "Agroforestry Systems", published by Martinus Nijhoff/Dr. W. Junk in the Netherlands. Now that ICRAF has reached a high point in acquiring literature and information there is a need for more subject reviews and annotated bibliographies. The Working Papers are currently produced in-house and are considered interim documents too large to publish in journals. Nevertheless many contain extremely valuable ideas or results and consideration should be given to upgrading the production quality (and hence the implied permanence) of this series.

With the exception of "Agroforestry Systems", all ICRAF publications are freely available on request. A readership survey by questionnaire has identified some 800 addresses out of the 2500 on the total ICRAF mailing list and, to maintain credibility, ICRAF must ensure that appropriate material reaches each one. If selective dissemination of information is required, meticulous records of addresses and dispatches must be maintained. Better control of the entire publication system would be possible if more space were available.

Among the registered readers, approximately 250 are Francophone and 250 are Spanish speaking. These clearly justify publication in French and Spanish. At present Working Paper No. 6 is the only technical document translated into French, along with the Newsletter and the list of publications. Negotiations are in progress with

French Government agencies to provide translations and with Environmental Development in the Third World (Senegal) to undertake co-publishing. This effort must be strengthened and expanded to Spanish.

FIELD STATION

Description and Functions

ICRAF runs, as a programme, a 40-ha Field Station (FS), located in Kenya about 79 km southeast of Nairobi, and 7 km southwest of Machakos town in Machakos District. The terrain, of irregular shape and topography, was allotted free of cost and for 10 years to ICRAF by the Government of Kenya in 1981. The Field Station is bordered by the Maruba (Manza) river and the fields of the Farmers' Training Centre and the National Dryland Farming Research Station (NDFRS), Katumani, two governmental institutions (Ministry of Agriculture). The area lies at an altitude of about 1560 m above mean sea level in the sub-humid to semi-arid climatic zone with an average annual rainfall of about 700 mm and potential evapotranspiration of about 1800 mm per year. The soils were characterized as moderately good, porous and friable and highly erodible (Field Station Status Report, 1984).

The site is well located, for demonstration and training purposes, particularly because of its permanent access and vicinity to other governmental field facilities within the Machakos district. A rapid visit to the district suggests that the general physiographic and climatic conditions at least, are well represented in the Field Station. However, its relevance to the major climatic regions of Africa is debatable (see section on climatology).

As a programme of ICRAF, the Field Station at Machakos is co-ordinated by Dr. P. K. R. Nair (Agronomist) with the support of a Field Station Advisory Committee. This committee, composed of senior scientists T. Darnhofer, P. von Carlowitz, A. Young and W. Beets, was constituted in early 1984. Previous to that there was a "committee of all" to advise on issues related to the development and management of the Station. Based on the "Field Station Status Report for 1984", the permanent personnel for the station includes a manager (Mr. P. N. Wambugu), a research assistant (Mr. D. Wambuguh), a field assistant (Mr. G. Mwasambu) and one skilled worker (Mr. G. Kilonzo).

The same 1984 Plan of Work declares "It should be emphasized that the Field Station is neither intended nor has the size for large-scale technology-generating research on agroforestry systems". This statement partly conveys the difficulties faced by ICRAF to identify clearly the aim and scope of the Field Station as a functional and structural

element of the whole institution's work purpose and strategy. As expressed by different documents and during discussions with different senior staff, this apparent difficulty seems to be tied to the sometimes conflicting interpretation of the institutional mandate and/or identification of the strategies necessary to meet such mandate, which donors and other advisory groups have been suggesting to ICRAF, particularly in relation to the Council's involvement in agroforestry technology generation. Under these conditions the presently declared aims (Plan of Work 1984) for the Field Station programme are:

- to establish demonstration plots of appropriate agroforestry and soil conservation technologies for training purposes and for local and international promotion of agroforestry ideas;
- to establish a whole farm unit based on agroforestry principles and technologies relevant to the site, for the same purpose as the plots;
- to serve as a field base for research on development of methodologies;
- to serve as a field base for testing and screening limited components on agroforestry technology and management, mainly as a farm trial component of the Diagnosis and Design and other relevant activities.

Apart from the programme planning, three operational projects have been identified, all under the responsibility of Dr. P. K. R. Nair: Physical Development, Agroforestry Demonstration Plots and Services.

Half of the total 40 ha in the Field Station have been cleared and properly fenced, as part of the physical infrastructural development. It is thought that the strong wire-net road fence, which is atypical within the vicinity, will be replaced at a suitable opportunity by a "live fence". A semi-permanent one-story building, containing a small laboratory with the essential weighing, oven and refrigeration items, office space and a meteorology unit, was inaugurated in 1982. The proposed plan for extension includes a sample-processing area, a storage area and facilities for overnight stay (ICRAF F.S. A medium-term plan for its maintenance and development). Electricity, telephone and water (for irrigation and drinking) are available on the site. The irrigation facilities are limited and shared with the adjacent NDFRS, Katumani. An 80-HP tractor with essential accessories was purchased and an automatic weather recording unit set up in 1983.

Over 40 multipurpose trees (MPT) and shrub species with potential in agroforestry have been assembled at the Field Station for demonstration and monitoring. Four types of plots to demonstrate the soil conservation effect of agroforestry systems are being installed. They include contour strip cropping separated by rows of trees and grasses, contour bench terraces stabilized by perennial

grasses and woody species, "Fanya-Juu" terraces and hedgerow planting of *Leucaena leucocephala* at 4 m spacing across a 10-15 percent slope. These plots also include trials with tree shelters to facilitate quick and secured establishment of seedlings, and wind-break planting demonstration as well as intercropping in existing MPT stands. In 1984 new research/demonstration plots are being installed. They include a tree/crop interaction study with the intention of testing and for demonstrating in the field one particular experimental design, under the supervision of P. A. Huxley. A "high-potential" agroforestry demonstration, under the direction of P. K. R. Nair will observe the response of certain agroforestry systems to higher input levels. Other plots will include trials with hedgerow intercropping (C. Ssekabembe) and screening of woody species with agroforestry potential (P. J. Wood). The planning of the lay-out of an "agroforestry farm" unit is also expected during 1984.

The service activities include the functioning of the agrometeorological unit under the supervision of T. Darnhofer. Daily data recording includes air temperature and humidity, soil temperature and moisture, wind speed and direction, global radiation and rainfall. A soil monitoring programme is supervised by A. Young. After a comprehensive baseline sampling in 1983, samples and soil analysis will be repeated every year to monitor changes under the various and different plots (however, agreement has not yet been reached on the choice of analytical laboratory.) Arrangements are being completed to establish a nursery under the direction of P. von Carlowitz. The Field Station is and will continue to be used by participants of ICRAF's various training activities and by staff for demonstration to the large number of visitors.

Comments on the Field Station Programme

The Review Panel supports the declared aims of the Field Station programme but considers that they require a more precise definition in terms of technical content and staff involvement. The panel stresses that the Field Station has principally a service function in support of ICRAF research training and information programmes.

Besides their training and agroforestry promotion purposes, the proposed demonstration plots offer the opportunity for obtaining scientific information on the performance of the species included and of their interactions through observations and measurements.

In relation to the idea of installing a demonstration farm unit within the Field Station, the Review Panel anticipates questions in relation to its representativeness/extrapolability and its cost/benefits for ICRAF projection and training efforts. Instead, the Panel suggests that a designated area on the Field Station be set aside on which, progressively, the accumulated information

as to the best agroforestry land-use practices for the area may be applied by ICRAF for observation, adjustment and demonstration purposes. In addition ICRAF should consider the alternative idea of selecting a neighboring and representative farm to start introducing and monitoring some promising agroforestry propositions or adjustments in agreement and interaction with the producer. This will at least benefit (hopefully) one farm, have a greater demonstration effect both for visitors and producers and allow more flexibility to change farm or terminate the activity in the future. There are risks, however, usually tied to the maintenance of the producer's interest in what is being done and his permanence as producer in the selected farm.

Even though the declared aim of using the Field Station as a base for methodological research and screening components of agroforestry technology and management is also appropriate, it should be stressed that by the nature of its mandate ICRAF cannot develop all of its research and training activities on station (not even half of them). However, it is equally clear that some support is needed from a Field Station for carefully selected research steps, demonstration and training.

In addition to the declared aims, it was noted that a tree nursery is being established in the Field Station. In the view of the Panel, this nursery could provide tree seedlings for ICRAF's own research, it could provide facilities to conduct demonstration on seed and seedling handling and could act as a model for small-scale nurseries.

In the view of the Panel, then, if ICRAF is able to define and accept its involvement in technology development, adjust accordingly its organization and priority sets for the different programmes, possibly around the COSPRO program projection, it should be able to define a clear support position and objectives for the FS as part of the work strategy and organization. The concern should be a careful selection of the research, training and demonstration activities to be developed on the station and to minimize the proportion of resources, particularly senior staff time, tied to such work.

AGROCLIMATOLOGY AND AGROMETEOROLOGY

One senior scientist (T. Darnhofer), a professional meteorologist, is concerned with the service activity of the agrometeorological unit at the Machakos Field Station and with the agroclimatological aspects of the Agroforestry Technology Research and Evaluation programme (particularly the project dealing with technology design and management guidelines).

Machakos Field Station

A weather station has been established with sophisticated equipment recording measurements automatically on a data logger; the tapes can be read on the Wang and IBM microcomputers. The station does not duplicate the measurements made at the Katumani Agricultural Station (which has 20 years of data collected by less precise methods).

To become a microclimate station, considerably more equipment would be required (e.g. 100 sensors for soil moisture studies, 5-6 light pyranometers for inter-cropping studies and 5-6 anemometers for wind-break studies). A minimum capital budget of U.S. \$30,000 would be required in two stages together with one field assistant trained in climatic measurement technologies. To set up such research would require some 80 days of one senior scientist (T. Darnhofer) and 40 days of another (P. A. Huxley).

The objectives of such a station would be to conduct basic research on what factors to measure and optimum measurement technologies for agroforestry diagnosis and design (and to compare various simpler, cheaper assessment methods). The station would have high value for teaching and demonstration especially for comparing sophisticated with simple equipment. However, meteorological effects are highly specific to site and crop and the choice of Machakos may be questioned. It represents only 2% of Africa with a bimodal rainfall of 800 mm. Although Machakos is obviously accessible to ICRAF headquarters staff, and provides for the evaluation of systems of measuring and processing data, other locations in the Sahel or in the moist zone might be more representative of areas likely to be assigned for agroforestry development.

Technology Programme

Ideally site selection for COSPRO projects would be based on agroclimatological classifications before the diagnosis and design process begins. However, in practice, sites are usually allocated by the host country or institution and to date climatology has not been a major activity in the COSPRO programme. Nevertheless, in the technology programme, there is a clear need to develop guidelines for solving problems identified in other programmes and these include agroclimatological/meteorological description and explanation.

The specific inputs include (i) aspects of macroclimatology in agroforestry systems, in particular an evaluation of various climatic classifications and development of methods for their inter-conversion, and (ii) determination of the place of climatology in selecting components of agroforestry systems. The latter is particularly important for tree

components about which little is known and in which water requirements change with age and size of tree. Ideally data bases should be established that permit the description of climates, interpretation of sites and selection of agroforestry systems and components by homoclimal comparisons.

Conclusion

In the immediate future and if capital funds continue to be limited, attention should be concentrated on the technology programme and the development of simple, inexpensive agroclimatic and meteorological models for system description, prediction or evaluation. The Review Panel recognizes the desirability of the basic research proposed for the Machakos Station and its fundamental importance in model development, but bearing in mind the site and crop specificity of agroforestry meteorology and the low probability that developing countries would set up intensive microclimate stations for each agroforestry project site, it appears more valuable to develop interpretive techniques using the available methods and data.

COMPUTING

Introduction

Despite its youth ICRAF finds itself, in relation to computing, in a situation comparable to that of many older institutions that are concerned with research, training and information. It has a variety of tasks and objectives, a range of staff scientific disciplines and computing interests or skills, and considerable needs in administration or support. Superimposed on these are the bewildering variety and rate of change of computing hardware and software.

The major uses of computers in scientific establishments include word processing, library and data-base management, administration, data manipulation and analysis ("number crunching"), modelling, graphical representation, control of scientific equipment, and communications with other computers. For these tasks three main types of machine are available - main frames, minis and micro computers. For each of these, software may be commercially available or custom-produced by the scientist, an in-house programmer, or a contracted consultant.

The tasks of research, training and information provision have somewhat different, though overlapping, requirements. Thus research is commonly concerned with modelling and number crunching while the supply of information requires data-base management. Hardware and software are not

necessarily compatible between machines. Training may involve either of these but has the additional problems of deciding between (i) giving students the opportunity to see and use a range of computers and (ii) teaching principles of the particular scientific subject on one type of machine that may be well known to staff but not necessarily available to the students' home countries or institutions.

In long established and relatively well-funded institutions the trend with time in computing facilities has been as follows:

A	B	C	D
Main Frame	Mini	Micro (stand-alone)	Micro (network)
Initial; for large central service	Later; for smaller, specialized operations but with wide support applications (multi-user, multi-task)	Recent; for individual scientists (single user, single task)	Recent; for individuals to share data or common resource (e.g. disk drive or printer) or for training (include link to main frame)

ICRAF began and remains at stage C.

The Role of Computers at ICRAF

To date the major tasks for which computers have been used at ICRAF include:

- (i) Word processing (secretarial services and technical reports)
- (ii) Data base management (e.g. multipurpose tree data base; 14 data bases are listed in Appendix 4).
- (iii) Data manipulation
 - (a) Modelling or calculating (e.g. MULBUD and programmes for calculating spacing and rectangularity)
 - (b) Spread sheet analysis (of technical and administrative data)
 - (c) Data analysis (e.g. meteorological data)
- (iv) Library management (see earlier section on information services)

Future tasks should include accounting and graphical representation while in the longer term ICRAF may need communication with computers in other institutions (e.g. for searching other data bases or adding to them).

The Information Officer (R. Labelle) is knowledgeable about hardware and software currently available and provided two valuable documents to the Review Panel. One described the machinery and software now held by ICRAF and the other presented a scenario of the evolution of computerization at ICRAF. These documents reflect the views of the Computing Committee (which has representatives from the research programmes) and are largely supported by the Review Panel.

Reduced to their simplest form the current situation and future strategy are based on major commercial software and micro-computers of three major types. For word processing a distributed system with several work stations and stand-alone microcomputers will meet anticipated needs. The Wang OIS system has been chosen because of the company's reputation in word processing. The Wang Personal Computer (PC) will be used as an input station to the OIS system. It can also be used for stand-alone applications, such as data-base management and data manipulation, but unfortunately the OIS system is not compatible with any software that has not been produced by Wang. Thus, although some data-base management may be possible with the OIS using the Wang data-base management system, it should not be used for major ICRAF data bases but reserved for word processing at least until mutually compatible software is available. At present the KnowledgeMan data-base software package is usable on the Wang PC. Word processing will be particularly useful in ICRAF's publication efforts since it is becoming relatively simple for commercial printers to produce documents from floppy disks produced in-house.

For numerical applications and major data-base work the IBM Personal Computer has been selected with a 20-megabyte hard disk and tape back-up; data-base management software includes D-BASE II and KnowledgeMan. Several data bases have already been established (see earlier section on information services) and it is highly desirable to transfer these to the IBM system.

All tasks have been carried out also using the OSBORNE 1 computer. This was the first system purchased by ICRAF and it is still suitable for software development and limited calculations. A range of commercial software is held for word processing, data-base work and data manipulation while the ICRAF programme MULBUD was developed for the OSBORNE. The portability of the Machine makes it highly suitable for training courses outside Nairobi or Kenya. In the longer term the OSBORNE could be taken to field sites for data processing or for sending/retrieving information to/from data bases held in Nairobi or elsewhere. (For example, many Nitrogen-Fixing Tree Association collaborators send data for analysis by satellite links to the NFTA headquarters in

Hawaii.)

The Future for Computers at ICRAF

While the present situation has largely arisen through historical accident and the rapid development of microcomputers, the current strategy is understandable, namely concentration on one type of hardware for word processing and on another for data handling with a third for situations where portable computers are required. The various research workers and programmes have their own preferences but basically the above strategy should satisfy all requirements.

It is unlikely that ICRAF's data handling activities will ever require the use of main frame computers, and recent developments in IBM equipment promise the capabilities of minis or even main frames in desk top machines. Clearly ICRAF needs to follow such developments but staff should resist the temptation to demand the latest "state-of-the-art" technology before their need is obvious, before machinery is thoroughly tested and before commercial development costs have been recovered and prices lowered.

It is more important to provide compatibility between currently held hardware, software and data. It is also desirable to concentrate on only one or two types of machine and peripherals so that they can replace each other in cases of breakdown. ICRAF should give serious consideration to the costs (in terms of finance) and benefits (in terms of ease of use, transferability and reliability) of converting totally to IBM systems for data, word processing and portable needs. It will be particularly desirable to have the highest degree of uniformity if, in the future, data bases are shared with other institutions. The diversity and size of data bases, hardware and software at ICRAF are not yet so great that they would present a major obstacle to unification.

While the OSBORNE could continue to be useful in field situations, IBM offers portable machines and it is likely that IBM personal computers will soon be owned by research institutions or available for hire in many of the countries where ICRAF has COSPRO projects or training courses. Consideration should be given to the latest developments in brief-case size (9 kg) portable micros that are compatible with IBMs (e.g. Data General One).

All ICRAF staff working overseas should be able to carry floppy disks bearing data or teaching programmes and be familiar with the operation of IBM machines where, at headquarters, networking for word processing is possible.

ICRAF currently has two computer programmers and one research assistant from the Agroforestry Systems programme (Mr. E. Fernandez) who is knowledgeable about all the

various data bases and systems now in use. Otherwise all scientific staff and some secretaries use the microcomputers themselves with some mutual advice and assistance. The need for systems analysts or programmers is not yet widely appreciated although qualified staff are needed now to integrate data bases, to adapt purchased software, and to enhance compatibility. There is no need at present for statistical support; surprisingly few experimental data have yet been collected that require statistical treatment and, although this requirement will increase as more COSPRO projects and Field Station experiments mature, there is probably adequate statistical expertise in ICRAF, particularly if supported by formal or informal links with other institutions (e.g. CFI, Oxford, for courses in research methods and support in general statistical analysis and computing, or University of Reading for support in the statistics of mixed cropping), and by training of research assistants, especially if the rate of staff turn-over is high.

9. FUTURE PROGRAMME DIRECTIONS AND THEIR IMPLICATIONS

ICRAF has quite rightly concentrated heavily on in-house activities, all of which were necessary to establish a firm base from which sound programmes could be projected. Only during the last year has the minimum level of multidisciplinary staff recruitment been achieved. The Field Station has now been activated and developed to the point that it can serve as an observation and training facility. An impressive range of information has been accumulated and several essential data bases are in various stages of development. A good start has been made on a specialized library and the relevant literature is being documented, classified, described and computerized. Several state-of-the-art papers have been prepared and published in forms suitable for distribution to appropriate potential users. A draft working paper on "Guidelines for Agroforestry Diagnosis and Design" has been prepared, along with a companion paper on "Resources for Agroforestry Diagnosis and Design". These involved inputs from a large number of sources and the methodology has been tried out on a few locations with teams from ICRAF working with local personnel in the selected countries. Two three-week training courses have been held with personnel from the regions in which the diagnostic and design exercises have been carried out, involving scientists who may be prospective participants in regional collaborative networks.

This is not an attempt at a comprehensive account of the accomplishments of the staff to date, but it gives a few illustrations to indicate the fact that a vigorous effort has been made to establish a base on which ICRAF may indeed be an authoritative source of information on agroforestry. The Director provided an assessment of ICRAF's impact to date which is given as Appendix 6. Recognizing that there can be many ways of assessing impact of any programme, the Review Panel endorses the Director's assessment and is of the opinion that ICRAF has achieved most that could be expected of it given its resources, the early state of the Council's development and the present shape of agroforestry development globally. Looking to the future, it will be important that ICRAF continues to extend its base of information and methodology development and refinement with a strong interdisciplinary team at headquarters. However, it is visualized that this type of work will occupy a smaller proportion of the time and talent of the total staff, and an increasing proportion of ICRAF's resources will be devoted to a projection of agroforestry into national and regional programmes. This is illustrated in Figure 1 which will be amplified in the discussion of resource implications below.

The COSPRO projects offer real-life opportunities for on-site integration of inputs from the agroforestry systems inventory, the land evaluation project, the D&D methodology,

the economic analysis of AF land use systems and technologies, technology generation, dissemination and adoption, and training and education. The D&D methodology must be allowed to realize its full potential by carrying it through the research and development implementation phase so that the intended integration of research and extension can be tried and actually demonstrated. Most challenging of all is the potential application of the D&D methodology and agroforestry technologies at varying scales of analysis (intra-household, farm, ecosystem, community, regional). It is appropriate for regional development and settlement projects, and for special interest projects for fuelwood production, watershed protection, environmental rehabilitation on large-scale diversification of agricultural and forestry production. It is in these varying scales of application that agroforestry can play its role in rural development.

In 1983, a mission under the chairmanship of Dr. Robert F. Chandler, Jr. conducted a mid-term review of the project financed by USAID which supports activities in (1) developing a diagnostic and design methodology to identify land-use problems and to analyze constraints to improved land management; (2) making an inventory of important and promising agroforestry systems in the world, organizing this information into a data bank for analysis and dissemination; and (3) developing training courses in agroforestry. In its draft report, this mission gave a highly favourable report on progress in these projects but also made important recommendations on some broader issues with respect to ICRAF's programme operations, which we cite here as they have a bearing on interpretation of the Mandate and on our projections of ICRAF's future activities. These included recommendations that ICRAF (1) move more directly into technology generation as contrasted to, or in addition to, the synthesis, evaluation, and interpretation of existing technology; (2) give some attention to higher input agroforestry technology (as contrasted to subsistence technology); and (3) build on the experience in training to add a dimension of assistance in professional education.

Technology Generation

The first of these, namely, more direct involvement in technology generation, has been a subject of debate with sharply divided views expressed. The division of views on this subject has arisen, we believe, as a result of a lack of appreciation of the place of technology generation in development and apprehensions as to the implications for the procedures involved, the possible changes in deployment of staff, and the potential financial and management implications.

Technology generation is often considered merely as the design, management and assessment of field experiments and commonly referred to as "hands-on research". However, this

is an incomplete view since behind every field trial lies a long process that includes appraisal of research needs, collection and synthesis of present knowledge, identification of gaps, formulation of hypotheses, and design of experiments to test such hypotheses. Experiments are assessed, analyzed and interpreted leading to publication and dissemination of results.

Furthermore, in the special case of ICRAF, the diagnosis and design methodology identifies the type of technologies that are socially acceptable, environmentally suitable, and where appropriate, modelled on existing practices. Research of this kind can range from studies of agroforestry components to trials of practices or systems. The entire process is illustrated in Figure 2. Some knowledge of components can be drawn from research in agriculture, forestry or horticulture but some cannot; notably the whole range of tree-crop interactions. Thus technology generation in agroforestry needs studies of crucial components and tests of practices.

The Panel agrees that additional stress on technology generation is a logical and essential concern of the Council and should be addressed seriously. The assembly of existing information and its organization and analysis, the development of the documentary background and data banks, the development of diagnostic and design methodology, and the application of this methodology in collaborative research diagnosis and design exercises has been an efficient and effective strategy up to this point. However, if ICRAF is to maintain its credibility for the future, it must move into active involvement in implementation of the plans worked out, participate in putting the plans into effect, evaluating the results and feeding the experience back to advance understanding leading to improvements in approaches and methodologies.

The Panel believes that this can be accomplished without excessive additional budgetary requirements and in a manner consistent with the avowed intentions of strengthening national programmes and national research leadership. This could be done through a well planned direct participation in COSPRO project implementation and in regional network activities developing therefrom. In this mode, the research would be carried out in and through national programmes, with a limited number of ICRAF personnel on site as active partners. Headquarters would need to retain a strong interdisciplinary back-up team to carry forward the programme of work already initiated and to advance this as new information becomes available. However, current lines of work would not have to claim as large a proportion of staff time as they have to date and some staff redeployment should be possible. Some additional staff and resources would be needed, which we will discuss in another section of this report, but we do not think that this would have to be excessively large. The Panel would not recommend that ICRAF establish field facilities for research in the various

regions under its own management, control and financing. The cost of such a pattern of operation would be prohibitive and would not be cost-effective in achieving the objective of building strength in national programmes.

Types of Possible Collaborative Research

It is necessary to distinguish the general concept of collaborative research, between ICRAF and other institutions, from the design of the present COSPRO programme (including those stages not yet reached). That is to say, there are other possible ways of carrying out collaborative research.

A. Site-specific research

Present COSPRO research may be considered site-specific. By commencing with diagnosis, it ensures that research is relevant to farmers' needs. This strength implies that the results may not necessarily be applicable to a wide area. It is true that in choosing sites as the basis of diagnosis and design the regional representativeness of the area and thus the size of the potential extension domain is a factor which ICRAF takes into account; nevertheless, there remains a degree of compromise with institutional preferences and thus, from a purely scientific point of view, an element of chance, in the sites selected.

The Panel noted that the draft Guidelines paper begins with a study and analysis of a pre-selected site. It is suggested that a section be added at the beginning on criteria for site selection. In practice, this has not been ignored but the actual site selection has to a certain extent been opportunistic. We suggest that it may be well to begin with a limited number of ecological regions for consideration, and that when site selection is being considered for COSPRO exercises, the potential sites under consideration be pre-appraised in terms of their suitability for studies which might lend themselves to broader extrapolation to other sites in the region and which might serve as hubs of regional networks of several national programmes.

B. Ecozone-specific research

Research of this nature would commence with identification of a fairly broad climatic-landform-soil-vegetation environment, diagnosis of its major land-use problems, and identification of the most promising possibilities for agroforestry interventions. Examples of such ecozones are: (i) sloping lands of the permanently humid rain forest zone, with strongly leached soils (this is in fact the commonest environment of COSPRO sites to date); (ii) seasonally humid savanna lands with soils of low fertility, now degraded through over-cultivation, (iii) the semi-arid ("sahel") lands. Having picked one or a few key technologies, these

would be thoroughly tested on a site representative of the ecozone. Results of such research would require subsequent site-specific adaptation, but would have an in-built element of zone-wide applicability.

C. Problem-oriented (component-specific) research

By this is meant research which takes as its starting point some of the identified key problem areas in agroforestry, e.g. how trees respond to repeated pruning, root competition, designs for erosion control. Results would be widely applicable, but would require a subsequent stage of testing in agroforestry practices.

D. Methodological research

This includes testing and demonstration of the distinctive designs and methods needed for efficient agroforestry research. Results are of interest to national research centres. Clearly this must be done very well if it is to be done at all. It fits very appropriately into ICRAF's present role.

There would be a substantial element of overlap between these forms of research. For example, studies centred on moisture relationships would be identified as critical to the needs of the semi-arid zone; work on research methodology would additionally yield results on the components and practices employed in the research design. These should phase out relatively soon.

Agroforestry With Higher Inputs

That ICRAF should give attention to higher-input agroforestry technology would seem to be inevitable and necessary. Additional inputs may at times be necessary in order to raise the level of productivity of farms incorporating agroforestry practices to a high enough level to make them attractive and economically viable. We think that a thorough and realistic economic analysis should be an integral component of agroforestry design. The pressure of people on land resources is increasing inexorably and farmers cannot be expected to adopt improved technologies unless they are convinced that they are likely to improve their prospects to shelter, feed and clothe their families. Both higher levels of production and the protection, preservation, and improvement of the land resource are among the objectives of agroforestry technologies. Without prejudgment as to the combinations which will ultimately be proved feasible, we think that the research options should not be too narrowly restricted and that higher inputs should be included in the mix. We suggest that a pragmatic approach in this respect is essential.

We suggest that the planning of collaborative projects be imaginative and not constrained by what may be thought at a

given time to be practical or acceptable for farmers to implement. We suggest that ICRAF looks at the human and natural resources, including the land base, and examines what may be necessary to increase productivity and preservation and improvement of the land base. Higher levels of external inputs should, in our opinion, be included in the options under consideration and investigation. With the low level of fertility and productivity of many of the sites on which agroforestry practices are to be considered, we feel that interventions must increase productivity if increasing numbers of people thereon are to survive. We are not convinced that the viable solutions will always be found with zero inputs or inputs of labour only.

Training and Education

We see training as having a very important place in ICRAF's programme. The value of holding some of the agroforestry training courses in the regions in which COSPRO activities are undertaken is stressed. We anticipate that this may continue, especially as COSPRO activities are increasingly undertaken on an ecological-region basis. At the same time, we anticipate that a substantial number of courses and various types of workshops and training sessions will be required at headquarters.

ICRAF is already the leading institution to develop, or assist other institutions in developing, professional education curricula. This was recommended by the USAID mission and is endorsed by this Review Panel but there is no possibility for ICRAF to become deeply involved without considerable additional support. Nevertheless ICRAF, through its writings and personal contacts, should attempt to influence classical agriculture and forestry university faculties to include logical modules on agroforestry.

Relationships Among Programmes

The dynamic relationships among the eight presently recognized programmes of ICRAF and the main linkages between them are illustrated schematically in Figure 3, taken from material prepared by ICRAF and provided to the Panel as background information.

In the future, the Panel anticipates a substantial shift toward dissemination, technology generation, and advisory functions, in collaboration with national programmes, with strong back-up support from the information, technology and methodology base now being consolidated. The Panel has attempted to illustrate in Figure 4 the general direction toward which these relationships seem likely to evolve. The emphasis here is on the inter-relationships among, and inter-dependence of the functional components. The relative size of the circles in this diagram should not be taken as

an indication of the anticipated resource allocations needed for each.

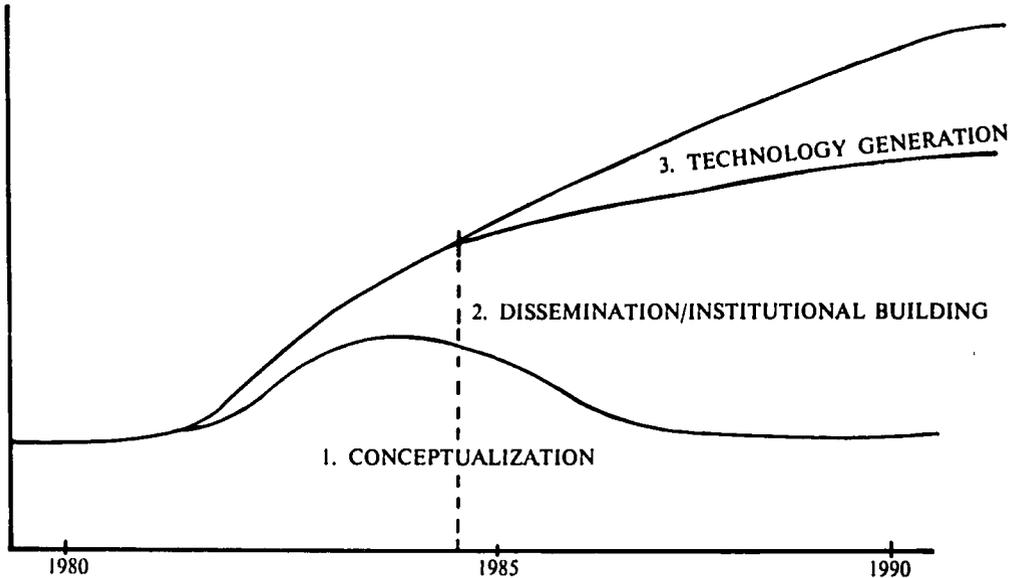


Figure 1. Anticipated Trends in the Balance of ICRAF's Main Functions

Explanatory note

The figure reflects ICRAF's long-term institutional strategy which can be translated into a three-stage development process.

The first, "conceptualization" stage, in which ICRAF is still very much involved, concentrated on the building of an information base, on the development of an in-house multidisciplinary team capable of working in an interdisciplinary fashion, and on the development of research methodologies specifically designed to the needs of agroforestry systems and technologies. In short, it aimed at laying the foundation of agroforestry as a discipline and of ICRAF as the international lead institution within this discipline.

The second, "dissemination/institution-building" stage, which ICRAF started to work on about two years ago, is now in a rapidly expanding phase. It aims at disseminating, through information and training programmes, the information, methods, and capabilities built up in phase one. Also, through more targeted collaborative field research projects and training courses, to help build the institutional ability to carry out AF research in some carefully selected national organizations in developing countries.

The third, "technology generation" stage, is being planned for a start in 1985 or soon thereafter. Its aim is not to carry out technology-generating research of its own, but to initiate and coordinate networking activities focussing on a few promising agroforestry technologies in each major ecozone, technologies which appear to have wide applicability in addressing major land productivity and sustainability problems.

ICRAF states that "all its work, and the raison d'etre for its existence, is to eventually help national and other institutions develop technologies that can help in improving the conditions of rural people." It has felt it necessary to put a great deal of effort on phase 1 in order to ensure the quality of its advice and activities in phase 3, and equally necessary to go through phase 2 to ensure efficiency in phase 3.

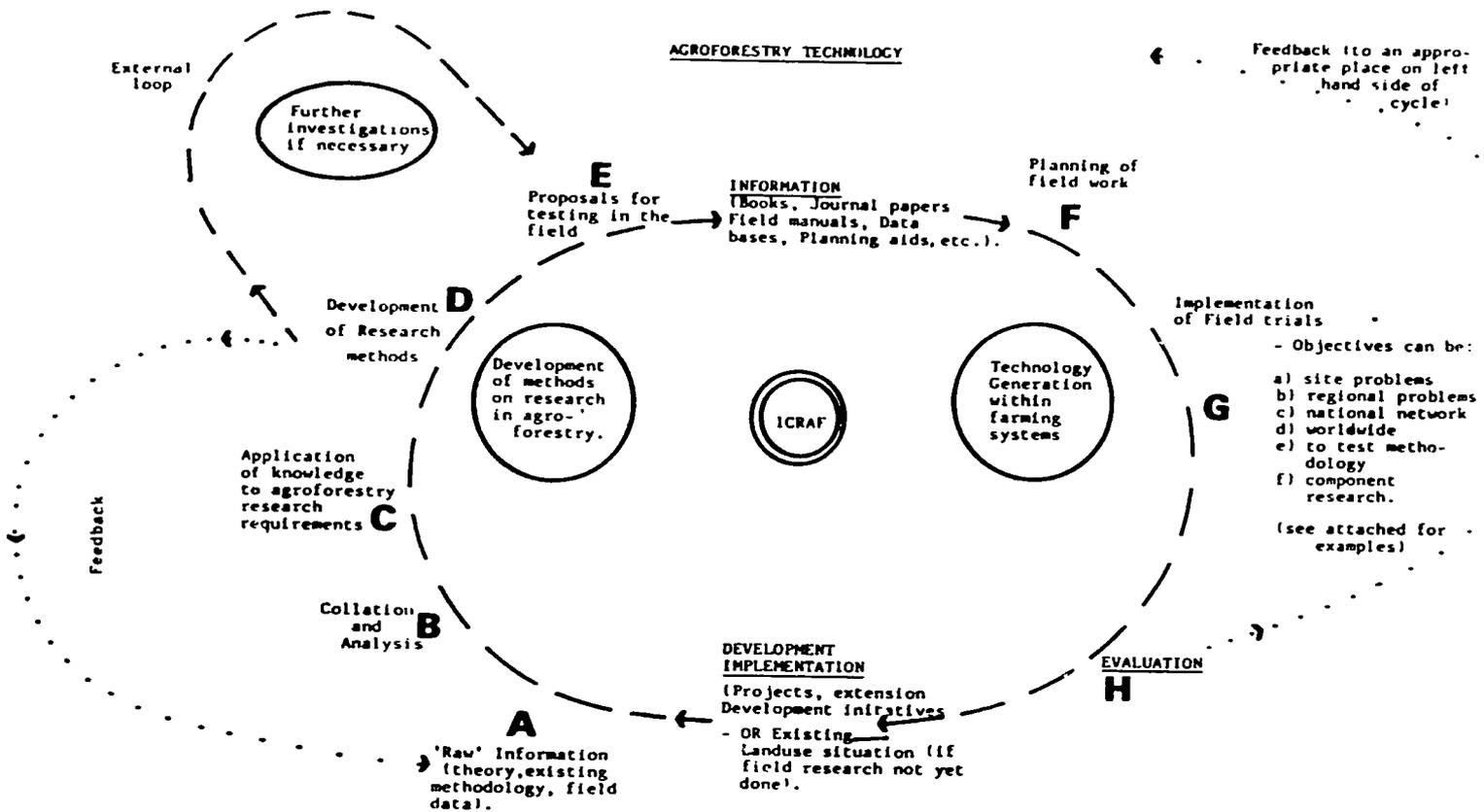


Figure 2: The agroforestry "Technology Cycle", showing the eight steps needed to generate technology in the field.

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Examples for Figure 2 Step G (Agroforestry technology)

- (a) Site-specific, e.g. COSPRO D&D site. May prove to be regional (but not India or Malaysia)
- (b) Regional, e.g. the place of agroforestry systems in maintaining soil productivity in tropical rain forest zones.
- (c) National networks are a method of approaching (a) and (b).
- (d) Global networks, e.g. genotype x site interactions studies.
- (e) Testing methodologies, e.g. evaluating geometric designs as a field layout for studying tree/crop interfaces.
- (f) Component research, e.g. on nitrogen fixation; tree, crop or soil management, etc.

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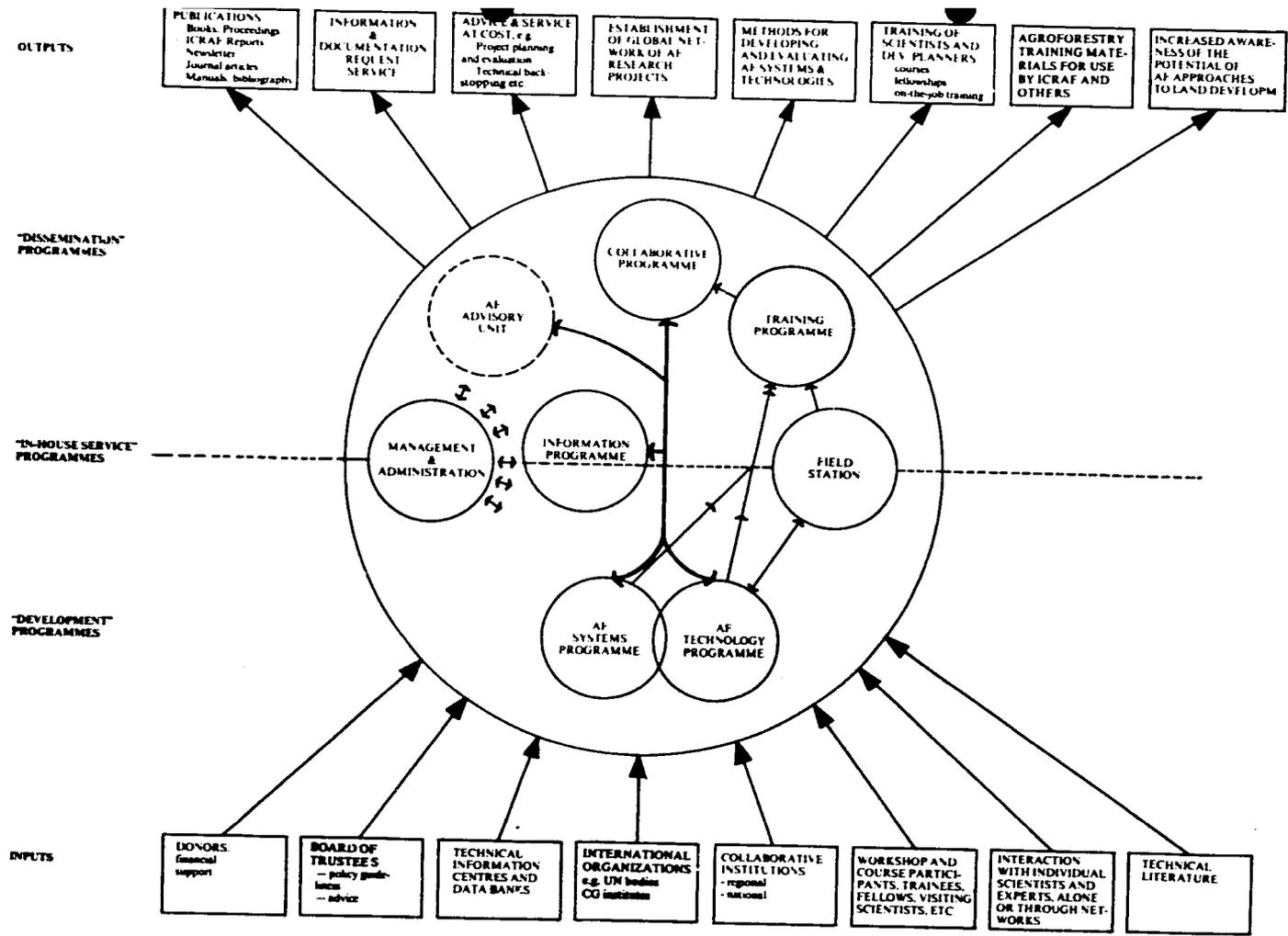


Figure 3.

Present relationships among ICRAF's programmes and between ICRAF and the "outside" world as seen in ICRAF's presentation material.

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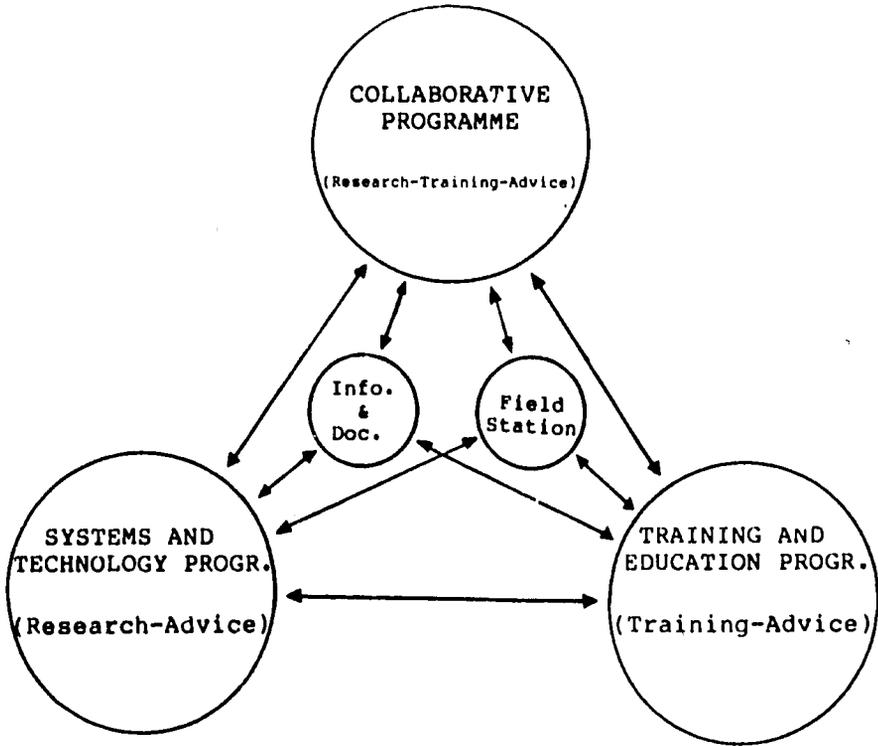


Figure 4. Proposed (by Review Panel) relationships among ICRAF's programmes

10. ORGANIZATION, ADMINISTRATION AND MANAGEMENT

When the present Director took over his post, the staff of the Council was small. Of the present staff, only the Director, the Secretary-Treasurer, and three additional senior professional staff members were then ICRAF employees. Obviously, a staff of this size did not require very much organizational structure. This core group could confer together, either formally or informally, for consideration of any matters of concern in Council management. The strategy laid out in the Stepler paper, which was endorsed by the Board, called for the recruitment of a better balanced multidisciplinary staff of somewhat larger size to enable the Council to begin addressing the major issues of agroforestry research.

During the intervening three years, the Director has been able to identify and bring to the Council thirteen additional senior staff members, bringing the total senior professional staff strength to eighteen. The total staff in all categories, including support and service personnel, now numbers over sixty persons. The staff is now approaching the level of strength in numbers and range of professional competence envisaged in the strategy paper. As this has been accomplished, the range and complexity of day-to-day decisions and action has increased very greatly, both internally and externally. The need for sharing the management load and for delegating some of these responsibilities has become increasingly apparent. While in the earlier years, it had been possible for the senior staff to meet and consider programme and management questions as a body of the whole, this has become too cumbersome with the larger staff and the Director finds his time and attention too heavily burdened with minor details which limit his time too severely in strategy, public relations, and programme direction. He has been restricted by limitations of unrestricted core budget from employing more senior staff in administration. Even more important perhaps is the need to develop the organization in such a way as to preserve and indeed to foster the interdisciplinary interactions among the staff drawn from a diversity of disciplinary competences.

As a first step, the Council recognized three major functions--service, development, and dissemination. Within these three functions, eight so-called work programmes were recognized, more or less as follows:

- | | |
|-------------|----------------------------------|
| Service | 1. Management and Administration |
| | 2. Field Station, Machakos |
| Development | 3. Agroforestry Systems |
| | 4. Agroforestry Technology |

- | | |
|---------------|---------------------------------------|
| Dissemination | 5. Information |
| | 6. Training |
| | 7. Collaborative and Special Projects |
| | 8. Advisory Services |

Considering the shift in emphasis suggested in Figure 1, from in-house to collaborative programmes with national and regional institutions, COSPRO becomes a major product of ICRAF's activities and therefore the central focus of its programme. This has two major implications--to guide the activities of each programme in ICRAF and to test and fine-tune the concepts and methodologies developed by these programmes.

A co-ordinator was originally identified for each of these work programmes and many of the programme development discussions then took place in smaller groups structured along the lines illustrated in Figure 3. However, with the limited total staff of the Council, each of the senior staff members was to be available to devote a proportion of his time to each of the other programme's activities. The co-ordinators could not be given line administrative and budget responsibilities without serious jeopardy to the interdisciplinary interactions so necessary to the attainment of the Council's objectives. The decisions on competing requirements among the various activities and even very minor decisions on deployment of equipment, staff time, travel, and various other matters still had to come to the Director's attention.

In considering this problem, the Panel has kept in mind the need to develop a system which could relieve the Director of some of the administrative load, maintain the very good esprit de corps, morale, sense of participation, and dedication of the staff, maintain flexibility in assignment of the staff among the various functions and programme activities of the Council, and continue to encourage and foster the interdisciplinary interactions among the staff. We suggest the addition of two additional positions to the administrative and management force, namely an administrative officer and an assistant (or associate) director on the programme side. We are not specific as to the exact title for these positions but wish to place emphasis on their functions.

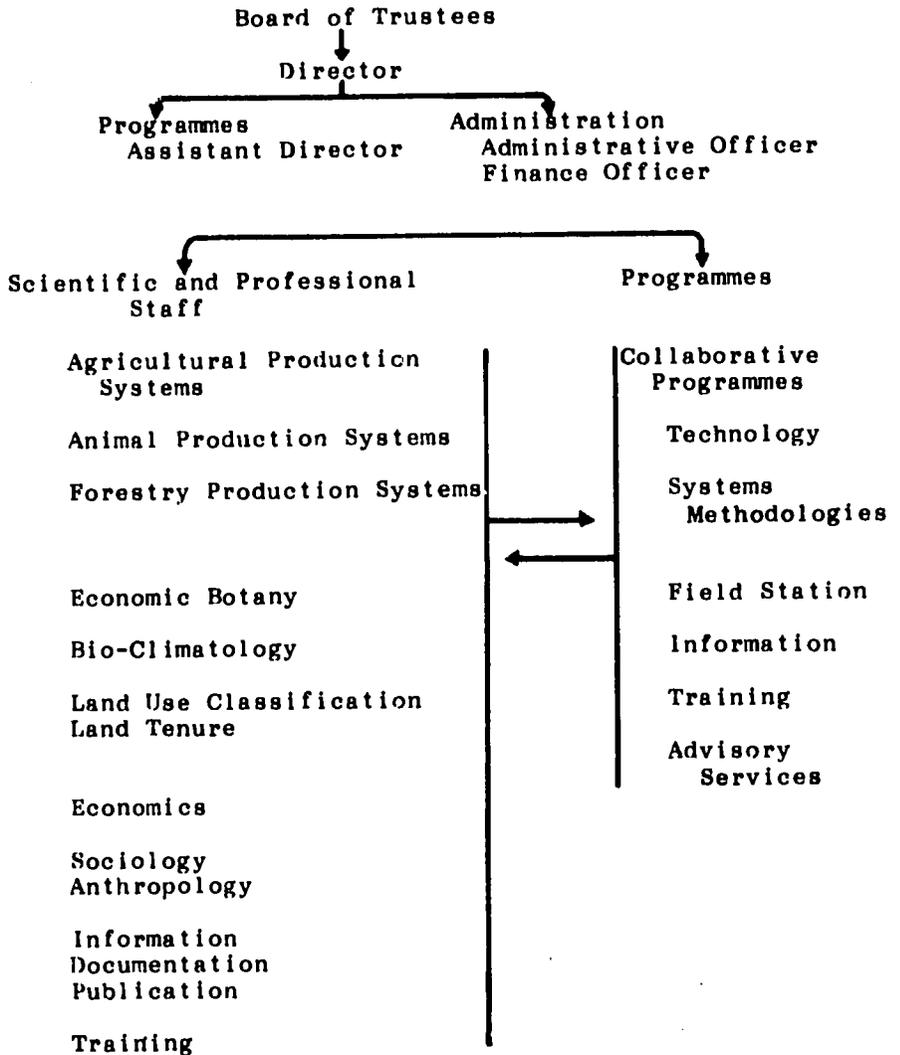
With these additions, which will require some additional core budget, the Director would be assisted by two staff officers to whom could be delegated most of the day-to-day work on general programme administration on the one hand, and on budget and finance administration, accounting and reporting on the other. The Review Panel did not consider itself charged with conducting a management review. It would be understandable if some problems of book-keeping and audit may have arisen during this early period, while the Secretary-Treasurer was heavily burdened with the multiple responsibilities for finance, personnel and general administration, legal matters and secretarial services to

the Board of Trustees. We saw no evidence, however, that such problems persist to a serious degree, and our recommendations on additional administrative personnel are made with the objective of enabling the Council to cope more effectively with its tasks for the future. The lines of responsibility visualized are illustrated in the accompanying chart.

The assistant (or associate) director would share the load of programme direction with the Director, could take over responsibility in the absence of the Director, and would work closely with all the professional staff in programme planning, allocation of professional staff time, scheduling of professional and support staff time, etc. While not exclusively so, his responsibilities would be concentrated heavily in-house. He would have to be well qualified in a relevant professional field, and of such breadth and stature as to be able to earn the respect of the professional staff of all disciplines. The Panel has given its views to the Director as to the qualifications and job descriptions for persons to be considered for these two new positions.

The Review Panel considered the needs and problems of staff professional development. Although the situation has not yet arisen, long serving core personnel should be encouraged to seek support for sabbatical leave at appropriate institutions. For all staff a series of regular seminars would provide the opportunity to discuss the activities of other ICRAF staff and to be exposed to other subject matter by visitors.

ICRAF Suggested Organizational Chart



11. RESOURCE IMPLICATIONS

The preceding discussion of individual programmes, of future directions, and of organization and management have implications for resources in three areas--staff, space and, of course, budget. We do not propose, and indeed no member of ICRAF's staff or Board has proposed, any major scheme for enlarging the organization. Nevertheless, our recommendations imply slight increases and in any case ICRAF must be allowed flexibility to respond to changing needs in developing countries or to capitalize on changing resources available from supporting sources.

Senior Staff

Additional staff are implied for three purposes (i) better administration and co-ordination (an internationally recruited Administrative Officer and an Assistant Director for research programming), (ii) information and publication (an additional senior officer), (iii) some additional staff in economics as collaborative programmes increase, and (iv) outposted staff on COSPRO projects; the number of this latter group will vary with the number of projects and the negotiated ICRAF input.

Supporting Staff

During the Review Panel's visit to ICRAF headquarters, we received conflicting views among senior staff on the sufficiency of supporting staff (equivalent to research assistants and technicians). Since many senior staff already spend considerable periods of time away from headquarters, and especially since the Review Panel recommends even greater involvement abroad, it may be difficult for all senior staff members to fully utilize a full-time assistant efficiently. We are not able to recommend precise numbers or proportions of supporting staff but consider that programming of senior and support staff time would be an important activity of the proposed Assistant Director. The Panel is assured that the needs for support staff are receiving careful attention by the ICRAF administration.

Buildings

At this present stage of growth, ICRAF needs more space and facilities at headquarters to meet the increasing demands for training, information, documentation, publication, library services and staff to support expanding programme activities. The Council has considered various alternatives in meeting these demands, including the rental of additional

space in Nairobi and the construction of a new headquarters building. The Government of Kenya has offered to provide a tract of land adjacent to the UN building complex for this purpose. Two donor agencies have set aside funds to cover a substantial portion of the cost of building construction.

The Council's staff has made a detailed analysis of the costs, advantages and other considerations with respect to these various alternatives. They have concluded that by supplementing the pledged funds for the headquarters building with a concessional loan, there are considerable advantages in constructing the headquarters building even over a relatively short-range period. This has been endorsed by the Board.

The Panel accepts this conclusion but suggests that, in planning for the new headquarters, the needs for residential facilities for conferees and trainees be carefully considered. As has been indicated elsewhere, it is visualized that some of the training activities will be conducted away from headquarters but that there will be a continuing need for a substantial amount of facilities for conferences, workshops and training courses at headquarters. Such activities could be much more effectively and efficiently carried out if residential accommodation on site or nearby were available. The Panel recognizes that a decision as to whether ICRAF should undertake to construct and operate such facilities would require more study to assess costs of construction and operation, as well as anticipated occupancy rates. Also, it is possible that alternative living accommodation for conferees and trainees may develop or be available in the vicinity outside the ICRAF headquarters compound.

Budget

Exclusive of the capital funds needed for a headquarters building, the suggested staff changes would clearly require additional recurrent funding. The Review Panel hesitates to estimate the extent of this funding because of the uncertainty about future ICRAF input to field projects by outposted staff and the extent to which it may be possible to deploy some of the basic "core" staff members for this purpose. Some costs of outposted staff would be met by the donors for COSPRO projects. The Panel feels that estimates of these costs should be made by management. The cost of the proposed Assistant Director for Research and the Administrative Officer, neither of whom should require excessive travel budgets, but both of whom would need support staff, would justify an addition to the core budget of approximately \$250,000. There should be no major change of core funding requirements in the proposal to abolish the Advisory Unit as an independent entity and to offer the same degree of service from headquarters staff, with varying fees according to the customer. The numbers of staff would remain the same, but these positions would be incorporated into the

core staff where needed most.

Figure 1 indicates the general direction of probable allocation of resources to the three major functions of ICRAF's future activities. It can be seen from the budgetary table in Section 5 that approximately 45% of ICRAF's funds are derived from unrestricted core, 44% from restricted projects and 10% from staff secondments. As projects and secondments terminate, their contribution to in-house core functions may decline and replacement funding will then be necessary to maintain the needed level of core functions.

APPENDICES

APPENDIX 1: BIODATA OF REVIEW PANEL MEMBERS

Curriculum Vitae

Jeffery Burley

University lecturer in Forestry; Fellow of Green College; Acting Head, Forestry Department and Director, Commonwealth Forestry Institute, Oxford University, England

- 3 years Officer-in-charge, Forest Genetics Research Laboratory, Agricultural Research Council of Central Africa (Malawi, Rhodesia and Zambia) - Employed by UNESCO
- 7 Years Forest geneticist, Unit of Tropical Silviculture, Oxford University, conducting co-operative research and providing advice and assistance to tropical developing countries in all aspects of their tree introduction and improvement programmes
- 7 years University lecturer (plant and tree breeding, wood structure and properties, arid-zone forestry, agroforestry)
- 1 year Acting Head of Department and Director of Institute
- 30 consultancies in project identification, preparation and appraisal for tropical afforestation and research programmes - employers included World Bank, FAO, UNESCO, UNCTAD, UK/ODA, Lutheran World Relief/Intermediate Technology Development Group and the United Nations University
- 3 panel memberships on fuelwood and energy forestry - NAS, USAID, UK Government
- 9 years - as external examiner in the Department of Forestry at the University of Ibadan, Nairobi and Edinburgh
- 3 years - as external examiner for M. Sc. course in the Department of Forestry, Oxford University
- Student Supervisor - 8 D. Phil.; 6 M. Sc. (research); 12 M. Sc. (course)

Other relevant activities - Deputy Co-ordinator, Division 2 (Forest plants and forest protections), International Union of Forestry Research Organizations. Executive Councillor, International Association of Wood Anatomists. Member, Commonwealth Forestry Association. Member, International Society of Tropical Foresters.

Publications and reports -

Single-author publications	61
Joint author publications	116
Government or international agency reports	32
Reviews	34

Home address - Woodside, Frilford Heath, Abingdon, Oxon, England
Tel. (0865) 390754

Curriculum Vitae

Gelia T. Castillo

Professor of Rural Sociology, University of the
Philippines at Los Banos, College, Laguna, Philippines

A. B. in Psychology (Magna cum laude) University of the
Philippines

M. S. in Rural Sociology, Pennsylvania State University

Ph.D. in Rural Sociology, Cornell University

She has been a member of the Boards of Trustees of the International Potato Center (CIP), Lima, Peru, where she was chairman last year, and the International Service for National Agricultural Research (ISNAR), The Hague, Netherlands. For 6 years she was the only woman board member in the entire CGIAR system. She is currently a member of the Board of Governors, International Development Research Centre (IDRC) Ottawa, Canada; the Advisory Group on Nutrition, UN Sub-committee on Nutrition c/o FAO Rome; the Advisory Committee, Street Foods Project, Equity Policy Center, Washington, D.C.; Research Adviser, ASEAN-Australian Population Project on Women in Development; and Consultant, Forestry Development Center, Los Banos. She has been adviser, consultant and member of many national and international development review teams.

Her publications include more than 75 articles and 3 books. She was chosen outstanding alumnus by the University of the Philippines System and by the University of the Philippines at Los Banos. In 1968 she was one of the 10 outstanding women in the Philippines and in 1976 was recipient of the Jose P. Rival Pro Patria Presidential Award for Outstanding Agricultural Scientists for "her revealing studies on Filipino farmers, rural women, agricultural extension and community development...and for presenting the social and economic implications of the new rice technology in her book, "All in a Grain of Rice".

A second book, "Beyond Manila: Philippine Rural Problems in Perspective, which she wrote as a Senior Research Fellow of IDRC in 1976, won her the 1978 Annual University of the Philippines Research award. A third book, How Participatory is Participatory Development: A Review of the Philippine Experience, contributed to her election to the National Academy of Science and Technology.

In 1983 she was awarded an honorary Doctor of Agricultural Sciences by the Agricultural University, Wageningen, The Netherlands, for excellence in the field of Rural Sociology.

Despite her many and varied international development activities, she is described by colleagues as a "practising nationalist" for her commitment to her own country.

Curriculum Vitae

Ralph W. Cummings

Emeritus Professor, North Carolina State University
Present address: 812 Rosemont Ave.,
Raleigh, N. C. 27607, USA

B. S. in Agriculture, N. C. State University
Ph. D. in Soil Science, The Ohio State University

He has served on the faculty of Cornell University for five years, and of the North Carolina State University for eight years, holding posts at the latter institution of Professor and Head of the Agronomy Department, Director of Agricultural Research, Chief of the North Carolina Agricultural Research Mission to Peru, and Administrative Dean for Research. He has worked in overseas programmes for the Rockefeller Foundation and the Ford Foundation for over seventeen years, having served as The Rockefeller Foundation Representative and Field Director for India, Associate Director for Agricultural Sciences for the Rockefeller Foundation, and Agricultural Programme Adviser for Asia and the Pacific for the Ford Foundation. While in India, he served as Dean of Post-Graduate Studies at the Indian Agricultural Research Institute, and as Chairman of India's Agricultural Universities Committee.

He has served successively as Director of the International Rice Research Institute in The Philippines, Director of The International Crops Research Institute for the Semi-Arid Tropics in India, and as Acting Director-General of the International Irrigation Management Institute in Sri Lanka. For more than five years, he was Chairman of the Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research. He has been called on for a large number of study and advisory missions in various parts of the world. He is currently an Emeritus Professor at the North Carolina State University and a consultant to the Ford Foundation and the International Irrigation Management Institute.

He holds honorary doctorates from the North Carolina State University, and from three universities in India. He has received numerous awards and special recognitions for his international public service. He is a Fellow of The American Society of Agronomy and of the American Academy of Arts and Sciences. He is listed in "American Men of Science", "Who's Who in America", and "Who's Who in the World".

Curriculum Vitae

Luis A. Navarro

Agricultural and Resources Economics Specialist
 CATIE, Turrialba, Costa Rica

- [REDACTED]
- B. S. in General Agriculture (Ingeniero Agronomo), Universidad Austral de Chile
 - M. Sc. in Agricultural Economics, North Dakota State University
 - Ph. D. in Agricultural and Resources Economics, Oregon State University

Professional Career:

Was Associate Professor at the Universidad de Chile. Joined CATIE in September 1975. Has been Professor and member of Academic Board of the CATIE/UCR Post-graduate Training Programme in Costa Rica. Has served as consultant for different national institutions in Latin America, in the design and evaluation of research projects as well as of research institutions. Has also been consultant

for FAO, CARDI, USAID, IDRC, IFAD, and Cornell University.

In CATIE, has been responsible for co-ordinating all research activities and the varied number of personnel working in socio-economics within the Crop Production Department and particularly national personnel working as part of the Farming Systems Research work of the Center. Participated in the design and development of the working methodology followed by CATIE today. Has served in different advisory groups and as interim chairman for the Plant Production Department within CATIE. Attended and presented papers to over forty international professional meetings.

Areas of specialization include econometrics, agricultural development, marketing, and computer programming and simulation.

Presently is Technical Co-ordinator within the Plant Production Department of CATIE and in charge of a research and training project as well as others in validation/transfer of technology with a joint staff of over 25 professionals at national and international level.

APPENDIX 2: PERSONS AND ORGANIZATIONS CONTACTED

ICRAF Board and Programme Committee

Dr. W. Bosshard, Board Chmn.
 Prof. H. A. Stepler, Chmn. Programme Committee
 Dr. M. Wessel
 Dr. Soekiman Atmosoedaryo
 Mr. O. M. Mburu

ICRAF Staff

Dr. Bjorn O. Lundgren, Director
 Mr. Karugor Gatamah, Secretary/Treasurer
 Dr. Michel Baumer
 Mr. Willem C. Beets
 Mr. Peter G. von Carlowitz
 Dr. Till Darnhofer
 Mr. Denis Depommier
 Ir. Dirk A. Hoekstra
 Dr. Peter A. Huxley
 Mr. Richard Labelle
 Dr. P. K. R. Nair
 Mr. Richard C. Nturu
 Dr. John B. Raintree
 Dr. Dianne Rocheleau
 Dr. Filemon Torres
 Mr. Peter J. Wood
 Prof. Anthony Young
 Dr. Ester N. Zulberti
 Ms. Lucille R. Majisu
 Mr. Erick C. M. Fernandes
 Mr. Peter Wambugu - Machakos
 Mr. Dennis Wambuguh - Machakos

Donor Representatives

Ford Foundation - Dr. Goran Hyden
 Dr. David Jones
 Dr. Norman Collins
 Dr. Roberto Lenton

IDRC - Dr. Ron Ayling
 Dr. Roger Kirkby
 Dr. Hubert Zandstra
 Mr. Bruce Scott
 Ms. Helen van Houten

The Netherlands - Mr. Arnold Parzer
 Mr. Leendert Ritterhaus

Switzerland - Mr. Pio Pata

USAID - Mr. James Seyler
 Dr. Donald Fiester
 Mr. John Koehring

Mr. Michael Bengé
Mr. Robert McColough
Dr. Robert Armstrong

The World Bank - Mr. John Spears

Others - Dr. Robert F. Chandler, Jr.
Mr. Francis arap Sang - Kakuyuni
Mr. Richard Mwendandu - "
Mr. Daniel Nyamai
Mr. Jeff Odera, Head Forestry, KARI
Mr. Richard Okumu
Dr. F. Owino, Forestry Faculty,
University of Nairobi Nairobi

APPENDIX J: TRAINING ACTIVITIES AND TRAINEES

Table 1: TRAINING AND EDUCATION ACTIVITIES, 1982 - 1983

PROJECT	OUTCOMES			PROJECTIONS	
	1982	1983	1984	1985	1986
SHORT TRAINING COURSES (USAID funded)	Start ICRAF/USAID Agreement Planning Phase	COURSE I in Kenya 1-18 November, 22 participants from 13 African countries	COURSE II in Kenya, 4-22 June, from Africa and Latin America COURSE III in Malaysia, 1-19 October for 22 participants from COSPRO collaborating countries, i.e., Thailand, Indonesia, Philippines and India.	COURSE IV in Peru June, for 22 participants from COSPRO collaborating countries in Latin America, in Spanish COURSE V in Kenya To be defined END OF ICRAF/USAID AGREEMENT	COURSE VI in collaborating (COSPRO) country in Africa (IDRC support) COURSE VII in India. To be defined according to available resources
TRAINING MATERIALS (USAID funded)	Same as above	Compilation of selected readings & resource materials on AF	Testing of existing training materials, development of practical exercises; slide set on "AF Practices in Developing countries."	Development of compendium and translation into Spanish and French, as needed	Continue development & adaptation to ecological zones according to available resources
ON-THE-JOB TRAINING FF - Ford Foundation Regional Office GTZ German Agency for Tech. Cooperation	Trainee I from Tanzania (FF) Trainee II from Kenya (FF)	Trainee III from Kenya (FF) Trainee IV from Tanzania (GTZ) Trainee V from Tanzania (FF)	Trainee VI from Zimbabwe (FF) Trainee VI from Tanzania (FF)	2-4 trainees per year from collaborating (COSPRO) countries and/or according to available resources	
RESEARCH FELLOWSHIPS		RF I from Uganda (FF)	RF II from Uganda (FF) to start programme in December 1984 RF III from Latin America or Southeast Asia (GTZ) (to start in early 1985)	2-4 Research Fellows per year from collaborating (COSPRO) countries and/or according to available resources	
PROFESSIONAL EDUCATION	International Workshop	Report	Proceedings	Follow-up according to available resources	

Table 2: UPM/ICRAF AGROFORESTRY COURSE, 1-19 OCTOBER 1984, SERDANG, SELANGOR, MALAYSIA*

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
FIRST WEEK — Morning (1) Opening session Registration procedures	(2) Course objectives ICRAF Programme The concept of AF	(3) Concepts in AF Technology a) trees	(4) (Technology cont.) d) crops c) economics	(5) Participants presentation of	(6) FIELD	(7) FIELD
Afternoon (all day)	Visit to UPM farm	b) animals c) aquaculture	e) soil f) social	Agroforestry Country Reports	DAY	FREE
Event Independent reading	Independent work	Independent work	Global overview of AF systems			
SECOND WEEK Morning (8) Introduction to D&D methodology Case study I Case study II	(9) Diagnostic	(10) Diagnostic	(11) Diagnostic analysis (all day)	(12) Diagnosed problems & potential AF interventions for system improvement	(13) FIELD DAY	(14) FREE
Afternoon Pre-diagnostic information on Malaysia case study	Survey (Batu Arang site)	Survey (Batu Arang site)		System specifications for candidate tech.		
Event Independent Work	Travel	Travel	Independent work	Independent work	RECEPTION	
(15) THIRD WEEK Morning Identification of candidate tech.	(16) Economic appraisal of a selected AF intervention	(17) Research & extension planning in AF	(18) (Exp. design cont.)	(19) Discussion on AF research priorities at national level vis-a-vis the potential contribution of a regional network	(20) Participants leave	(21) Participants leave
Afternoon	Practical exercises with MULBUD	Experimental design for a selected AF technology		Course evaluation		
Event Scientific & Tech. Info. Sources	Independent work	Independent work	Independent work			

Table 3(a): SUMMARY INFORMATION ABOUT PARTICIPANTS OF THE FIRST AGROFORESTRY TRAINING COURSE HELD AT ICRAF HEADQUARTERS FROM 1-18 NOV. 1983

NO.	NAME AND ADDRESS	PERSONAL INFORMATION	ACADEMIC BACKGROUND	PROFESSIONAL EXPERIENCE	AF INTERESTS
1.	ABU, Julius E. Forestry Research Inst. PMB 5054, Ibadan (Tel: 41441 or 414022)	28 years Married Nigerian citizen	Ordinary Diploma in Forestry, Univ. of Ibadan, 1974-1975 BSc Forestry, Univ. of Ibadan, 1977-1981	Research Officer II at Forestry Research Ins. Lecturer at School of Forestry 1982 to date Forest Assistant 1974-1976	Crop yields and their influence on forest crops development
2.	BARAGENGANA, Re'novat Directeur de la Station Institut des Sciences Agronomique du Burundi Bujumbura, BURUNDI (Tel: 3390)	28 years Single Burundian citizen	BSc Biology, University of Burundi, 1974-1978	Director 1979 Institut des Sciences Agronomique du Burundi Research on Potato programme 1978-1979	Crops and animals
3.	BASHIR, Jama Energy/Development International P.O. Box 62360 Nairobi, KENYA (Tel: 27553)	26 years Single Kenyan citizen	BSc Agriculture, University of Nairobi, 1979-1983	Agroforestry Centre Manager 1983	Potential of leguminous AF tree species. FGNF and multipurpose trees for fodder and fuelwood production
4.	BROOKMAN, Amisah J. Forest Products Res. Ins., Univ. of Sciences & Technology P.O. Box 63 Kumasi, GHANA (Tel: 5873)	51 years Married Ghanaian citizen	BSc Forestry, Edinburgh University, Scotland, 1955-1958 MSc. Ecological Sciences, Oxford Univ., England, 1961-1962	Registered Forestry Officer 1962-1967 Silviculturalist, Forestry Dept. 1967-1975 Research Officer 1975-1976 Senior Research Officer at Forest Products Research Institute 1976 to date.	Use of tree crops for maintaining soil nutrient status/crop yields. The multidisciplinary approach to AF.
5.	CHISIMBA, William K. National Council for Scientific Research Tree Dev. Res. Centre P.O. Box 21210 Kitwe, ZAMBIA (Tel: 215764)	Married Zambian citizen	BSc Biology, University of Zambia, 1974-1979 MSc Genetics - Univ. of Swansea	Scientific Officer (TIRC) Acting Head (TIRC)	Evaluation of woody perennials and legumes
6.	HASSANE, Moussa National Institute for Agricultural Research of Niger (INRAN) B.P. 225 Niamey, NIGER (Tel: 722714)	32 years Married Citizen of Niger	Technicien Agerieur Forestiere 1974 Institut Polytech - Rural Mali 1977-1974 Maitrise es Sciences agronomiques, Univ. de Niamey, Niger, 1978-1981	Directeur du DRF	Agroforestry techniques as they apply to agricultural management and their application in marginal and degraded sites.
7.	KAMWETI, David Univ. of Nairobi Dept. of Agriculture P.O. Box 29053 Kabete Campus Nairobi, KENYA (Tel: 721689 Ext 241)	42 years Married Kenyan citizen	BSc Forestry University of New Brunswick; 1963-1967 MSc Forest Law, Oxford Univ. 1977-1979	Assistant Conservator of Forests 1967-1972 Conservator of Forests 1972-1981 Lecturer - University of Nairobi, 1981 to date	Energy issues (fuelwood)
8.	LUSIOLA, Grace Ministry of Agriculture Soil Conservation Div. P.O. Box 30028 Nairobi, KENYA (Tel: 721680 Ext. 30)	34 years Married Kenyan citizen	Diploma in Agric. & Home Economics, Egerton College, 1969 BSc Home Economics, California State Univ. USA, 1980-1982	Home Economics and Forest Officer 1972-1980 Approach to School Programme - Soil Conservation Officer, 1980 to date	AF systems for small-scale farmers. Soil productivity under AF systems. AF as a source of fuel
9.	MATHU, Winston University of Nairobi P.O. Box 30197 Nairobi, KENYA (Tel: 592211 Ext 241)	Married Kenyan citizen	BSc Forestry, University of New Brunswick, Canada, 1967-1971 MSc Forestry, University of Dar-es-Salaam, 1975-1976 PhD Biometrics, Univ. of British Columbia, 1980-1983	D.F.O 1971-1975 Silviculturalist 1977-1978 Lecturer, University of Nairobi, 1978 to date	AF Research Methodology
10.	MUNYAKABERE, Ben Uganda Forestry Dept. P.O. Box 3 Entebbe, UGANDA (Tel: 20381)	36 years Single Ugandan citizen	BSc Forestry, Makerere University, 1970-1973 MF Forest Management, Univ. of New Brunswick, 1975-1978	Forest Officer, Uganda Forest Service, 1973 to date	AF for food and forestry products
11.	MWENDANDU, Richard Ministry of Agriculture Soil & Water Conservation Branch P.O. Box 30028 Nairobi, KENYA (Tel: 721689)	24 years Married Kenyan citizen	BSc Forestry, Univ. of Nairobi, 1978-1981	Agricultural Officer II, MINAG. Officer-in-Charge of Nurseries - Soil and Water Conservation Branch	AF systems research and evaluation

Table 3(a) continued

NO. NAME AND ADDRESS	PERSONAL INFORMATION	ACADEMIC BACKGROUND	PROFESSIONAL EXPERIENCE	AF INTERESTS
12. CHIYENDA, Simeon Bunda College P.O. Box 219 Lilongwe, MALAWI (Tel: 721455)	Malawian citizen			
13. MWIHOMEKE, Stephen P.O. Box 95 Lushoto, TANZANIA	32 years Married Tanzania citizen	BSc Forestry, Univ. of Dar-es-Salaam, 1975-1977 UNU Certificate CATIE	Forest Research Officer, 1977, Min. of Natural Res. and Tourism, Forest Division	Animal grazing and pasture production in forest plantations. Intercropping trees/food crops
14. NAMBOMBE, Vincent Forestry Training Inst. P.O. Box 943 Arusha, TANZANIA	30 years Married Tanzania citizen	BSc Forestry, Univ. of Dar-es-Salaam, 1973-1976 Training award to London for 3 months	Forest/Training and Extension, 1977-1982 in Olmotonyi Forestry Training Institute ICRAF On-the-Job Trainee	AF systems for highlands and savanna areas, among others
15. ODERA, Jephthan Forestry Department Kenya Agri. Research Institute (KARI) P.O. Box 74 Kikuyu, KENYA (Tel: 832173)	41 years Married Kenyan citizen	BSc Botany, Univ. of New Brunswick, 1963-1968 MSc Silviculture, Univ. of Nairobi, 1970-1973 PhD Biometrics	Asst. Conservator of Forests 1969-1973 Conservator of Forests, 1973-1981 Director FRD at KARI 1981 to date	Design and implementation of research projects
16. PELLECK, Richard USAID PRAIA Dept. of State Washington - DC 20520 U.S.A.	45 years Married American citizen	BSc Forestry, Univ. of Rutgers, 1956-1961 MSc Forestry, Univ. of Florida, 1969-1971	Terrestrial and Aquatic Vegetation Specialist, 1976-1978 Staff Ecologist, 1978-1980	
17. RAKOTOMANANA, Jean-Louis Dept. de Recherches Forestieres et Piscioles B.P. 904 Antananarivo, MALAGASY (Tel: 403-21)	38 years Married Citizen of Malagasy	BSc in Agricultural Engineering, Univ. of Illinois USA, 1964-1968 Faculte de Sciences Agronomiques de l'Etat Gamboux, Belgium Forest Soils 1973-1971	Research Engineer in Forestry Research Dept. 1969-1974 Head, Soils Division, 1974-1983, Forest Res. Department	Soil erosion and soil conservation. Forest fertility
18. RAMKISSON, Jiraj School of Agriculture Univ. of Mauritius Reduit, MAURITIUS (Tel: 54 1041)	34 years Married Mauritian citizen	BSc Agriculture, Univ. of Mauritius, 1971-1979 MSc Physiology and Biochemistry of Farm Animals	Scientific Officer, Min. of Agriculture, 1974-1975 Lecturer, University of Mauritius, 1975 to date	Crop/animal and pasture interactions with forestry. Comparative analysis of the alternative potentials of agroforestry in Mauritius
19. SARIAH, Gihron P.O. Box 124 Leshoto, TANZANIA	42 years Married Tanzanian citizen	Certificate in General Agric., Tanga, Tanzania, 1963-1965 9 months course in Farm economics, Rumania, 1970 Diploma in Farm Management, Mlingano, Tanzania, 1978-1980 3 months course in International Agric. Centre, Wageningen, Holland ICRAF On-the-Job Trainee	Assistant Agric. Officer Extension Co-ordinator, 1981-1983, Tanga integrated Rural Development Project (TIRDEP)	Extension, soil erosion control and AF
20. SSEKABEMBE, Charles Dept. of Crop Science Makerere University P.O. Box 7062 Kampala, UGANDA	26 years Married Ugandan citizen	BSc Agric. MSc Agric. (Agronomy) Makerere University ICRAF Research Fellow Short course on Cowpea production at HTA, Ibadan, 1981	Teaching Assistant, Makerere University, 1980-1983	Potentiality of different classes of land in line with soil fertility and plant growth
21. TEDLA, Abate International Livestock Centre for Africa (ILCA) P.O. Box 5689 Addis Ababa, ETHIOPIA (Tel: 18 23 15)	35 years Married Ethiopian citizen	Diploma in Agriculture, Ambo Inst. of Agriculture, 1969-1971 BSc Agriculture, Jamaica School of Agriculture, 1973-1977 MSc Agriculture and Agronomy, Univ. of Reading, 1980-1981	Technical Assistant in Pasture & Forage Section, Institute of Agric. Research (IAR) Forage Agronomist, Inter. Livestock Centre for Africa	Potentiality of different classes of land in line with soil fertility and plant growth
22. TEKLE, Haimanot Community Forest Dept. Forestry & Wildlife Conservation & Development P.O. Box 1034 Addis Ababa, ETHIOPIA (Tel: 15 33 40)	32 years Married Ethiopian citizen	BSc Biology, Addis Ababa University, 1969-1975 MSc Forestry, Pakistan Forest College, 1978-1980	Research Expert 1975-1978 Senior Forestry Expert of Community Forestry 1980 to date	Identification of appropriate agroforestry models applicable to Ethiopia

Table 3(b): SUMMARY INFORMATION ABOUT PARTICIPANTS OF THE SECOND AGROFORESTRY TRAINING COURSE HELD AT ICRAF FROM 4-22 JUNE 1984

NO.	NAME AND ADDRESS	PERSONAL INFORMATION	ACADEMIC BACKGROUND	PROFESSIONAL INFORMATION	AF INTERESTS
1.	ABUNAIB, Imadeldin Agricultural Research Council P.O. Box 2404 Khartoum, SUDAN	26 years Citizen of Sudan	BSc Forestry Post-graduate Diploma in Ecosystems	Research Scientist (NCR) Co-ordinator of forest research	AF for prevention of desertification Improvement of rangeland by cultivation of fodder trees/shrub
2.	ADEGBANKE, Samson ILCA P.M.B. 5320 Ibadan, NIGERIA	Citizen of Nigeria			
3.	AGBAHUNGBA, Georges Unite de Recherche Forestiere B.P. 06 707 Cotonou, R.P. BENIN	35 years Married Citizen of Benin	DUES 2. Biological Science, National University of Benin, 1971-1977 Diploma in General Agric. University of Ibadan MSc in Soil Science, 1976-1977	Head of Unite de Recherche Forestiere	Develop and modify agroforestry course programme Planted fallow for improvement of soil fertility and fuelwood production
4.	ARAP SANG, Francis Kenya Agric. Res. Inst. P.O. Box 74 Kikuyu, KENYA	40 years Married Citizen of Kenya	BSc Forestry, University of Aberdeen, 1968 MSc Forestry, University of Toronto, Canada, 1971 PhD Silviculture, Univ. of Nairobi, 1979	Assistant Conservator of Forests, 1968-1971 Forest Pathologist 1971-1978 Conservator of Forests, 1979-1981 Senior Asst. Secretary MENR, 1981-1983	Director of Dryland Agroforestry Research Project Kakuyuni (COSPRO)
5.	BA, Ibrahim Ecole des Eaux et Forests B.P. 5 Ziguinchor SENEGAL	34 years Married Citizen of Senegal	BSc Forestry, 1965-1969 ENPTEF, France Doctorat Agronomy and Forestry 1979-1981 ENSSAA	Technician Forestry Service 1969-1972 Head of Forestry Service, 1973-1979 Forestry Teacher EATEF 1981-1983	Elaboration of an agroforestry course adapted to the needs of Senegal Integration of agroforestry concepts into present course. Resolution of agroforestry problems specific to Senegal
6.	BIRIR, John Ministry of Agric. & Livestock Development P.O. Box 30028 Nairobi, KENYA	50 years Married Citizen of Kenya	BSc Agriculture Diploma in Crop and Animal Science	Head of AF Branch, Min. of Agric. & Livestock Development	AF and crops and livestock components
7.	CHACHU, R.E.O. Dept. of Forestry University of Science & Technology P.O. Box 1917 Kumasi, GHANA	Citizen of Ghana	BSc MSc PhD MI Biology	Ecologist/Silviculturist, Forestry Department Lecturer, Institute of Renewable Natural Resources, Univ. of Science & Tech.	
8.	CHAMSHAMA, S.A. Faculty of Agriculture, Forestry & Veterinary Science University of Dar-es-Salaam P.O. Box 3009 Morogoro, TANZANIA	39 years Single Citizen of Tanzania	BSc Forestry, Univ. of Dar-es-Salaam, 1974-1977 MSc Forestry, Univ. of Dar-es-Salaam, 1977-1978	Assistant Lecturer, 1979-1982 Tutorial Assistant, 1977-1979 Lecturer 1982 to date, Univ. of Dar-es-Salaam	
9.	GARCIA, Mario Ivita Research Centre Ap. 245 Pucallpa, PERU	Citizen of Peru		Veterinarian	
10.	KASOLO, Wilson Forest Department Ministry of Agriculture & Forestry P.O. Box 82 Jinja, UGANDA	29 years Single Citizen of Uganda	BSc Forestry, Makerere University, 1976-1979	Forest Officer, 1979-1980 District Forest Officer, 1980 to date	Initiation of agri-silvicultural use of land
11.	KIRINYA, Charles Kenya Agric. Res. Inst. P.O. Box 74 Kikuyu, KENYA	Married Citizen of Kenya	BSc Forestry, Michigan State University	Silviculture Research Designing agroforestry experiments	Agroforestry in the Kakuyuni Project (COSPRO) Intercropping maize and beans with <i>Acacia albida</i>
12.	MHUNGU, Johnson Rural Afforestation (Forestry Commission) P.O. Box HG 139 Harare, ZIMBABWE	30 years Single Citizen of Zimbabwe	BSc Forestry Makerere University, 1979-1982	Forest Officer Rural Afforestation, (Forestry Commission)	Agroforestry systems research evaluation
13.	MOMO, Jonathan College of Agriculture & Forestry University of Liberia Monrovia, LIBERIA	36 years Married Citizen of Liberia	BSc Forestry, Univ. of Liberia, 1971-1975 MSc Forest Economics and Policy, Univ. of Philippines	Teaching Counterpart, 1973-1976 Instructor, Univ. of Monrovia, 1976-1980 Acting Chairman, Dept. of General Forestry	Managerial and economic aspects of agroforestry

Table 3(b) continued

NO.	NAME AND ADDRESS	PERSONAL INFORMATION	ACADEMIC BACKGROUND	PROFESSIONAL INFORMATION	AF INTERESTS
14.	MORAPEDI, Ntwesile National Institute of Dev. Research & Documentation University of Botswana P.O. Box 0022 Gaborone, BOTSWANA	40 years Citizen of Botswana	BA Economics and History, UBLS, Roma, 1968-1972 MA Agricultural Economics, Leeds, U.K., 1975-1976	Principal 1972-1975, Botswana Government Planning Officer, 1976-1982 Botswana Gvt. Rural Development Res. Fellow, University of Botswana	Role of agroforestry in a) fuelwood b) soil conservation
15.	MUNOZ, Ramiro Direccion General Forestal Ministerio de Agricultura & Ganaderia Apto. 10094 1000 San Jose COSTA RICA	35 years Citizen of Costa Rica	Ing. Agric. Agriculture Licentiate University of Costa Rica, 1969-1976	Chief Forestry Reg. Prog., 1972-1982 In-Charge Agroforestry Program CATIE/GTZ 1982	Integration of forestry lands for agricultural and pasture production
16.	NYAMI, Daniel Kenya Agric. Res. Inst. P.O. Box 74 Kikuyu, KENYA	Married Citizen of Kenya	BSc Forestry, Univ. of Nairobi MSc Forestry, Univ. of Dar-es-Salaam, Morogoro	Agroforester	Agroforester with the Kakuyuni Project COSPRO
17.	OKORIO, John Ministry of Agriculture & Forestry P.O. Box 1752 Kampala, UGANDA	23 years Citizen of Uganda	BSc Forestry, Makerere University, 1976-1979	Forest Officer, 1979 to date	Agroforestry technology research & evaluation
18.	OMARA-OJUNGU, Peter Department of Geography P.O. Box 7062 Kampala, UGANDA	34 years Citizen of Uganda	BSc Geography, Makerere Univ. 1973-1975 MA Resource Management, Waterloo, 1975-1976 PhD Resource Management	Teaching Assistant Makerere University, 1973-1975 Senior Lecturer, Makerere Univ., 1980 to date	Problems & strategies of resource management in developing countries
19.	OYATOGUN, Moses Kainji Lake Resource Ins. P.M.B 666 New Bussa, Kwara State NIGERIA	30 years Citizen of Nigeria	BSc Forestry, University of Ibadan, 1973-1976 MSc Agronomy, Univ. of Ibadan, 1979-1981	Pupil Research Officer, 1977-1979 Research Officer Senior Research Officer, 1983	Establishment of shrub/ tree pasture/plantation for livestock within grazing reserves. Development of drought-resistant fodder species
20.	SAUNGWEME, Dorothy Agricultural & Rural Development Authority P.O. Box 8439 Causeway, Harare ZIMBABWE	30 years Citizen of Zimbabwe	MSc Agricultural Economics Sofia State University, Bulgaria, 1977-1982	Small Livestock Development Planner (ARDA)	Complementarity of livestock and agroforestry
21.	VILLANCIENCIO, Manuel Tropical Soil Project UNIPA - NCSU Yurimaguas (Loreto), PERU	35 years Citizen of Peru	MSc Agriculture	Director of Yurimaguas Project in Peru	
22.	WANDERA, Foustine P. National Dryland Farming Research Station (Katumani) P.O. Box 340 Machakos, KENYA	26 years Citizen of Kenya	BSc Botany & Chemistry, University of Nairobi, 1978-1981	Assistant Pasture Agronomist (trainee), 1981 to date	Alley cropping of cereal and legume shrubs. Use of shrubs and trees for fodder production
23.	KADZICHE, F.B.M. Energy Studies Unit P.O. Box 30452 Lilongwe (Observer) MALAWI	41 years Citizen of Malawi			

Table 3(c): SUMMARY INFORMATION ABOUT PARTICIPANTS OF THE UPM/ICRAF AGROFORESTRY TRAINING COURSE
Serdang, Selangor, Malaysia, 1-19 October 1984

NAME/ADDRESS	DEGREE	MAIN SUBJECT	NAME/ADDRESS OF EMPLOYER	PRESENT POSITION
1. Chairil Anwar Siregar Forest Research and Development Centre Jl. Gunung Batu, P.O. Box 66, Bogor Indonesia	Ir	Agronomy	Forest Research and Development Centre Jl. Gunung Batu, P.O. Box 66, Bogor, Indonesia	Researcher on Agroforestry
2. Yana Sumarna Forest Research and Development Centre Jl. Gunung Batu P.O. Box 66, Bogor, Indonesia	Drs	Riology	Forest Research and Development Centre Jl. Gunung Batu, P.O. Box 66, Bogor, Indonesia	Researcher on Silviculture
3. Veronica S. Suberc Visayas State College of Agriculture Baybay, Leyte, Philippines	BS. Ag. Education MS. Animal Science	Ag. Education Beef Production	Visayas State College of Agriculture Baybay, Leyte, Philippines	Asst. Professor
4. Etizardo B. Alberto Forest Research Institute College, Laguna 3720, Philippines	BS. Forestry MS. Forestry	General Forestry Tree Physiology	Forest Research Institute, College, Laguna 3720, Philippines	Centre Director
Roberto V. Dalmacio Department of Silviculture & Forest Influences U.P. at Los Banos, College of Forestry, College, Laguna 3720, Philippines	BS. Forestry MS. Forestry PhD Forestry	General Forestry Silviculture Silviculture & Forest Ecology	University of the Philippines at Los Banos College of Forestry, College, Laguna 3720 Philippines	Assistant Professor III
6. Felix M. Eslava Jr UPLB College of Forestry College Laguna Philippines			UPLB College of Forestry, College Laguna, Philippines	Assistant Professor IV
7. Gajendra Bahadur Singh Asst. Director-General (Agronomy) ICAR, Krishi Bhawan New Delhi	BSc. (Ag) MSc. (Ag) PhD.	Agronomy Agronomy Agronomy	Indian Council of Agricultural Research Krishi Bhawan, N. Delhi	Assistant Director-General (Agronomy)
Zainal Abidin bin Mohammed Fruit Research Division Malaysian Agricultural Research and Development Institute, Serdang Selangor, Malaysia	BSc. MSc. PhD.	Botany Applied Plant Sciences Plant Breeding	Malaysian Agricultural Research and Development Institute (MARDI) Serdang, Selangor, Malaysia	Senior Research Officer
9. Hashim Md. Noor Forest Research Institute, Kepong, Malaysia	BS. (Forestry)	Silviculture		
Tajuddin Ismail Rubber Research Institute of Malaysia P.O. Box 10150, Kuala Lumpur, Malaysia	Dip. of Agric. BS. MS.	Agriculture Agronomy Soil Science	Rubber Research Institute of Malaysia P.O. Box 10150, Kuala Lumpur, Malaysia	Senior Research Officer
1. Bahari bin Yatim Centre for Extension and Continuing Education	B. of Agric. Science MSc. EdD.	General Agric. Extension Educ. Curriculum & Instruction	University of Agriculture (PPPL) Serdang, Selangor, Malaysia	Lecturer
2. Aminuddin Mohamad Forest Research Institute, Kepong, Selangor, Malaysia	BSc (Forestry)	Forestry	Director, Forest Research Institute, Kepong, Selangor, Malaysia	Research Officer (Tree Physiologist)
3. Awang Noor Abd. Ghani Faculty of Forestry University Pertanian Malaysia, Serdang, Selangor, Malaysia	BS. (Forestry) MS.	Forestry Forest Economics	Universiti Pertanian Malaysia, Serdang, Selangor, Malaysia	Lecturer
4. Morlee Phothitai Forest Industry Organization Rajadamnern Road, Bangkok, Thailand	BS. (Forestry)	Wood Technology	Forest Industry Organization, Rajadamnern Road, Bangkok, Thailand	Head, Reforestation Sub-Division

Table 3(c) continued

NAME/ADDRESS	DEGREE	MAIN SUBJECT	NAME/ADDRESS OF EMPLOYER	PRESENT POSITION
15. Komon Pragtong National Forest Land Management Division Royal Forest Department Bangkhen, Bangkok 10900 Thailand	Master of Forestry Cert. of Public Adm. BF	Planning General	National Forest Land Management Division Royal Forest Department, Bangkhen Bangkok 10900, Thailand	
16. Supachai Bangliang Farming Systems Research Institute Department of Agric. Bangkhen, Bangkok, 10900, Thailand	BSc. MSc.	Agronomy Agronomy	Department of Agriculture, Farming Systems Research Institute, Bangkhen, Bangkok 10900, Thailand	Researcher
17. Monton Jamroenprucksa Faculty of Forestry Kasetsart University, Thailand	BSc. (Forestry) MSc. (Forestry)	Forest Resource Management Silviculture	Kasetsart University, Thailand	Instructor
18. Sultoni Arifin BPTP Jalan Cimaggu Kecil 2 Bogor, Indonesia	BA. MSc. PhD	Business Administration Ag. Economics Ag. Economics	Agency for Agriculture Research Development (AARD) Central Research Inst. for Food Crops (CRIFC) Bogor Research Inst. for Estate Crops	Agric. Economist and Project Leader for Upland Agric. Conservation project
19. M. Winarno	Ir (Insinyur) MSc. PhD.	Agronomy Plant Genetic Research Horticulture	Research Institute for Horticultural Crops, Jl. Wilis 10, Malang, Indonesia	Research Co-ordinator

Table 3(d): RESEARCH FELLOWSHIPS AT ICRAF, 1983-1985

<i>Dates</i>	<i>Name</i>	<i>Discipline/ Position</i>	<i>Institution</i>	<i>At present*</i>
1. Nov. 1983-Oct. 1984	Mr. Charles K. Ssekabembe	Agriculture/Teaching Assistant	Makerere University, Uganda	At ICRAF
2. Dec. 1984-Nov. 1985	Mr. Abdu M. Lubega	Forester/Teaching Assistant	Makerere University, Uganda	On study leave (PhD) in U.S.A.
3. May 1985-April 1986	Mr. Antonio Quiniones Repollo Jr.	Forester/Associate Professor and Vice-Chairman, Agroforestry Department	Don Mariano Marcos Memorial State University, Philippines	At DMMSU

* September 1984.

Table 3(c): SUMMARY INFORMATION ABOUT SELECTED CANDIDATES FOR ON-THE-JOB TRAINING AT ICRAF
(i) 1982 (FORD FOUNDATION)

NO. NAME AND ADDRESS	PERSONAL INFORMATION	ACADEMIC BACKGROUND	PROFESSIONAL EXPERIENCE	OTHER INFORMATION
1. Dr. Jumanne A. Maghembe P.O. Chuo Kikuu Morogoro, TANZANIA	30 years Married 1 child Citizen of Tanzania	BSc Forestry, University of Dar-es-Salaam, 1973-1975 MSc Forestry, Agric. Univ. of Norway & Univ. of Dar-es-Salaam MF. (Forestry), Duke Univ. N.C., 1977-1978 PhD Forestry, Univ. of Dar-es-Salaam, 1979-1982	Tutorial Assistant, 1975-1977 Assistant Lecturer, 1977-1980 Lecturer, 1980-1982 at the Univ. of Dar-es-Salaam in Morogoro	<i>Present duties</i> Senior Lecturer/Researcher at University of Dar-es-Salaam <i>AF Research/Study</i> Nursery techniques and tree establishment Biomass and nutrient accumulation in young <i>Prosopis juliflora</i> at Mombasa Recommended by Dr. A.B. Iwoga Dean of Faculty of Agriculture Forestry & Veterinary Science University of Dar-es-Salaam <i>Training Period</i> . July to Dec. 1982
2. Ms. Esther Kariuki KARI Forest Department P.O. Box 74 Kikuyu, KENYA	23 years Single Citizen of Kenya	BSc Forestry, University of Nairobi, 1978-1981	Forester, Seed Selection Unit of Kenya Agric. Research Ins. Oct. 1981 to date	<i>Present duties</i> Completing MSc studies at McGill University, Canada <i>AF Research/Study</i> Biomass and nutrient accumulation in young <i>Prosopis juliflora</i> at Mombasa Short notes on some multi-purpose trees grown at ICRAF Field Station, Machakos Recommended by Dr. J.A. Odera Deputy Director (FRD) KARI <i>Training Period</i> . July to Dec. 1982

(ii) 1983 (FORD FOUNDATION)

NO. NAME AND ADDRESS	PERSONAL INFORMATION	ACADEMIC BACKGROUND	PROFESSIONAL EXPERIENCE	OTHER INFORMATION
3. Mr. Richard Mwendandu P.O. Box 6945 Nairobi, KENYA	24 years Married 1 child Citizen of Kenya	BSc Forestry, University of Nairobi, 1978-1981	Agricultural Officer, 1981-1982 Soil & Water Conservation Branch, Ministry of Agric.	<i>Present duties</i> Agroforester, Kakuyuni Agroforestry Project in Machakos KENYA <i>AF Research/Study</i> Agroforestry design for soil conservation, fodder production and rehabilitation of overgrazed areas - Kathama <i>Recommended by</i> Mr. Paul Njoroge, Ministry of Agriculture <i>Training Period</i> May - Sept. 1983
4. Mr. Vincent Nambombe Ministry of Lands, Natural Resources and Tourism P.O. Box 9372 Dar-es-Salaam, TANZANIA	30 years Married 2 children Citizen of Tanzania	BSc Forestry, University of Dar-es-Salaam, 1973-1976	Forester/Training & Extension 1977-1982 in Olmotonyi Forestry Training Ins.	<i>Present duties</i> Planning Officer at the Min. of Lands, Natural Resources & Tourism in Dar-es-Salaam <i>Recommended by</i> Peter Salakana <i>Training Period</i> Nov. 1983 to April 1984

(iii) 1983 (GTZ)

NO. NAME AND ADDRESS	PERSONAL INFORMATION	ACADEMIC BACKGROUND	PROFESSIONAL EXPERIENCE	OTHER INFORMATION
1. Mr. Gibron Sariah P.O. Box 124 Lushoto, TANZANIA	42 years Married 8 children Citizen of Tanzania	Certificate in General Agriculture, Tengeru, Tanzania, 1963-1965 9 months course in Farm Management, Mlingano, Tanzania, 1978-1980 3 months course in International Agriculture Centre, Wageningen, Holland	Assistant Agric. Officer Extension Co-ordinator, Tanga Integrated Rural Development Project (TIRDEP), 1981-1983	<i>Present duties</i> Extension Co-ordinator, TIRDEP, Tanzania <i>AF Research/Study</i> Agroforestry design for soil conservation, fodder production and rehabilitation of overgrazed areas: Kathama <i>Recommended by</i> Mr. R. Tuni, Regional Agric. Dev. Officer <i>Training Period</i> May to Sept. 1983

Table 3(e) continued

(iv) 1984 (FORD FOUNDATION)

ID. NAME AND ADDRESS	PERSONAL INFORMATION	ACADEMIC BACKGROUND	PROFESSIONAL EXPERIENCE	OTHER INFORMATION
Mr. Johnson A. Mhangu Forestry Commission P.O. Box HG 595 Highlands ZIMBABWE	30 years Single Citizen of Zimbabwe	BSc Forestry, Makerere University, Uganda, 1979-1982 Diploma Forestry Cyprus College, 1977-1979	May 1982 to present Forest Officer - Rural Afforestation (Forestry Commission)	<i>Present duties</i> Related to monitoring and evaluation (Afforestation Project) <i>AF Research/Study</i> AF Systems Research and evaluation <i>Nominated by</i> C. Furness, Divisional Management Rural Afforestation. <i>Training Period</i> June to Nov. 1984
Mr. Stephen Mwihomeke P.O. Box 95 Lushoto, TANZANIA	32 years Married 1 child Citizen of Tanzania	BSc Forestry, University of Dar-es-Salaam, 1977	May 1977 to present Forest Research Officer at the Silvicultural Research Ins., Lushoto	<i>Present duties</i> In charge of establishment and tending of forest plantations, and AF studies in village <i>AF Research/Study</i> Multipurpose trees for fuelwood and fodder production <i>Nominated by</i> Head of Forest Division, Ministry of Lands, Natural Resources and Tourism <i>Training Period</i> Sept. 1984 to Feb. 1985

APPENDIX 4: LIST OF DATA BASES AT ICRAF

NAME OF DATA BASE	PROG-RAMME	NEED	HARDWARE	SOFTWARE	#FILES	STRUCTURE		#CHARACTERS	SIZE/RECORD	
						FIELDS	TYPE		PRESENT	FUTURE
Systems/Practices Bibliography	Systems (EF)	to present literature describing AF systems/practices	OSBORNE I	D-BASE II	1	15	C	877	59	
Species used in AF in LDC's	Systems (EF)	to present all available data on species used in AF systems/practices in D.C.	OSBORNE I	D-BASE II	1	6	C	281	107	
Plants with Anti-pest properties	Systems (EF)	to present plant spp. used traditionally, & having anti-pest properties. Pest used in wide sense, i.e., not strictly medicinal	OSBORNE I IBM-PC	D-BASE II KMAN	1	8	C	506	400	
AF systems	Systems (EF)	to present system descriptor, as obtained from AFSI	IBM-PC	KMAN	2	50 10	C.N.L.	2500 400	20	200
Economic Analysis	Systems (DH)	to present bibliographic info. on economics of AF, with abstracts	OSBORNE I	D-BASE II	1	15	C	1000	90	
Multipurpose Tree	Technology (PvC)	to present info. on multipurpose trees used in AF based on botanical identity, climatic range, management, uses and info. services.	WANG-PC	KMAN	5	2.8K/ record	C.N.	2500	200	
Environmental	Systems (AY)	to integrate ICRAF data on a uniform environmental basis to permit a first generalized selection of options for a specified site, i.e., tree, crop, practice, etc. to permit comparison of environmental suitability data from different sources	IBM-PC	Knowledge-Man	2	150 15	C.N.	1500 120	20 500	100 2000
Library	Info/Doc (RL)	to present every ICRAF library document by author, title, subject and species descriptors, etc., for quick retrieval in answer to ad hoc enquiries to increase the efficiency of the question and answer service and the no. of requests answered to prepare computerized library catalogue cards	IBM-PC	Knowledge-Man	1	20	C	1150	4000	8000
Mail List	Info/Doc (RL)	to store all names on ICRAF's mailing list to prepare specialized address labels to store information collected from ICRAF Reader survey to identify target audiences for ICRAF publications	IBM-PC	Knowledge-Man	1	28	CL	484	4400	?
Descriptors	Info/Doc (RL)	to present a list of terms for indexing AF documents (see Working Paper No. 8)	OSBORNE	D-BASE II	1	3	C	98	1006	1300
CLIMDATA	Field Station	to present climatic data measured at Field Station to calculate derived agro-meteorological parameters: evapotranspiration, evaporation, etc.	WANG-PC	MULTIPLAN	10					500KB

Appendix 4 continued

NAME OF DATA BASE	PROG-RAMME	NEED	HARDWARE	SOFTWARE	#FILES	STRUCTURE		#CHARACTERS	SIZE RECORD	
						#FIELDS	TYPE		PRESENT	FUTURE
FTCOMP	Technology	to present information related to feed value of trees and shrubs for retrieval, sorting by parameters, analysis, etc.	OSBORNE I IBM-PC	D-BASE II KMAN	1	27	C.N.	163	1515	2000
Woody & other fruit/spice plants with AF potential	Systems (EF)	to present environment, management and use data on species with AF potential (based on literature). Future need may be met by MPT data base (see below)	OSBORNE I IBM-PC	D-BASE II KMAN	1 1	21 21	C.N. C.N.	963	90	
Field Station Soil Analysis	Field Station (AY)	to store and permit analysis of data on monitoring of soil changes	IBM-PC	KMAN	2	25	C.N.	250	628	1000
Requests	Info/Doc (RL)	to permit reference to previous requests & replies given. to improve efficiency of Q & A service	IBM-PC	KMAN	1	20	C	350	10	400
Pasture	Systems (EF)	to present analyzed data on grasses and non-woody leguminous pasture species. The data have been extracted from AFSI system descriptions & various literature sources to facilitate rapid identification of potentially suitable species for various combinations of rainfall, altitude, soils & nutritive value	OSBORNE	D-BASE II	1	20	C.N.	911	50	300

Appendix 5 : ICRAF PUBLICATIONS (ISSUED AND IN PREPARATION)

JOURNALS

Agroforestry Systems

Agroforestry Systems is an international, multidisciplinary journal which provides a rapid publication outlet for all types of research concerned with the various aspects of agroforestry systems and for critical reviews on all sustainable land management systems which combine agriculture, animal husbandry and trees on the same unit of land.

Agroforestry Systems is published by Martinus Nijhoff/Dr. W. Junk Publishers in co-operation with ICRAF.

For subscription information, please write to:

Kluwer Academic Publishers Group
Distribution Centre
P.O. Box 322
3300 AH Dordrecht
THE NETHERLANDS

BIBLIOGRAPHIES

ORDER CODE	YEAR	
BIB1	1980	Teemba, L. A preliminary selected agroforestry bibliography. Nairobi: ICRAF. 17 pp. Mimeo. (Out of print).
BIB2	1982	Majisu, L. and R. Labelle. A selected bibliograpahy of agroforestry. Nairobi: ICRAF. 60 pp. 437 refs + index (includes items in previous bibliogrpahy). Mimeo.

NEWSLETTER

1979	No. 1	4 pp.	December (En)
1980	No. 2	6 pp.	May (En)
	No. 3	6 pp.	November (En)
1981	No. 4	6 pp.	March (En)
	No. 5	6 pp.	July (En)
	No. 6	8 pp.	December (En)

ORDER Code	Year	
	1982	No. 7 8 pp. May (En, Fr, Es)
		No. 8 8 pp. October (En, Fr, Es)
	1983	No. 9 8 pp. March (En, Fr, Es)
		No. 10 8 pp. September (En, Fr, Es)
	1984	No. 11 8 pp. January (En, Fr, Es)
		No. 12 8 pp. June (En, Fr, Es)
	1984	No. 13 8 pp. November (En, Fr, Es)
		No. 1-13 (Back issues available, some as photocopies).

INFORMATION BROCHURE

IB-1	1983	ICRAF. An account of the activities of the International Council for Research in Agroforestry. Nairobi: ICRAF. 36 pp.
IB-2	1984	ICRAF. Compte rendu des activites du Conseil International pour la Recherche en Agroforesterie. Nairobi: ICRAF. 40 pp.
IB-3	1984	ICRAF. Las actividades del Consejo Internacional para Investigacion en Agro-silvicultura. Nairobi: ICRAF. 40 pp.

ANNUAL REPORT

AR-83	1984	ICRAF. Annual report for 1983. Nairobi: ICRAF. 40 pp. (Limited circulation).
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BOOKS, PROCEEDINGS AND REVIEWS

B-01	1979	Mongi, H.O. and P.A. Huxley (eds). Soils Research in Agroforestry. Proceedings of an expert consultantion, Nairobi, 26-30 March 1979. Nairobi: ICRAF. 585 pp.
B-02	1980	Chandler, T. and D. Spurgeon (eds). International Co-operation in Agroforestry. Proceedings of an international conference, Nairobi, 16-21 July 1979. Nairobi: ICRAF. 469 pp. (out of print*).
B-03	1980	Nair, P.K.R. Agroforestry Species - A crop sheets manual. Nairobi: ICRAF. 355 pp. (out of print*).

*Contents pages of Proceedings that are out of print are available on request free of charge. Photocopies of individual papers may then be ordered (see pages 9-12)

Order code	Year	
B-04	1981	Buck, L. (ed). Proceedings of the Kenya National Seminar on Agroforestry, Nairobi, 12-22 November 1980. Nairobi: ICRAF/ University of Nairobi. 638 pp. (Out of print*).
B-05	1982	Etherington, D. and P.J. Matthews. MULBUD Users' Manual. Australian National University. 77 pp. + figs + tabs + printouts + appendix. (Limited availability; write for details.)
B-06	1983	Hoekstra, D. and F. Kuguru (eds). Agroforestry Systems for Small-scale Farmers. Proceedings of a workshop, Nairobi, 5-10 September 1982. Nairobi: ICRAF. 304 pp.
B-07	1983	Huxley, P.A. (ed). Plant Research and Agroforestry. Proceedings of a consultative meeting, Nairobi, 8-15 April 1981. Nairobi: ICRAF. 617 pp.

SCIENCE AND PRACTICE OF AGROFORESTRY

This is an on-going, low-priced series of small booklets aimed at high school and university students, resource planners and administrators, and the informed public.

SP-01	1984	Nair P.K.R. Soil Productivity Aspects of Agroforestry. Nairobi: ICRAF. viii + 85 pp. + figs + tables.
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In preparation (publication date will be announced in the ICRAF Newsletter):

Order code	Year	
		Lundgren, B. Agroforestry for Improved Productivity of Tropical Lands.
		Cannell, M.G.R., P.A. Huxley, T. Ledig, D.J. Connor and B. Pickersgill. Some Aspects of Associating and Managing Plants in Agroforestry.
		Burley, J.F. Global Needs and Problems of the Collection, Storage, and Distribution of MPT Germplasm.

Order
code Year

Johnson, D. Multipurpose Palms for Agroforestry.

Rocheleau, D. and F. Weber. Agroforestry for Soil and Water Conservation in Dryland Africa.

Hoekstra, D.A. The Economic Analysis of Agroforestry Land-use Systems.

Darnhofer, T. Shelterbelts for Agroforestry.

O'Keefe, P. (ed). Agroforestry in Kenya: An outline.

ICRAF REPRINTS

The ICRAF Reprints series, issued under the Council's own imprint, consists of articles by ICRAF staff or papers by other scientists first published elsewhere but as a result of the Council's own research activities.

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|-----|------|---|
| R-1 | 1983 | Nair, P.K.R. Multiple land use and agroforestry. Reprinted from "Better Crops for Food: CIBA Foundation Symposium 97". London: Pitman Books Ltd. pp. 101-115. |
| R-2 | 1983 | Lundgren, B.O. and L. Lundgren. Socio-economic effects and constraints in forest management: Tanzania. Reprinted from "Socio-economic Effects and Constraints in Tropical Forest Management" New York: J. Wiley and Sons Ltd. 1982. pp. 43-52. |
| R-3 | 1983 | Lundgren, B.O. and J.B. Raintree. Sustained agroforestry. Reprinted from "Agricultural Research for Development: Potentials and challenges in Asia". Report of a conference held 24-29 October 1982, Jakarta, Indonesia. The Hague: ISNAR. pp. 37-49. |
| R-4 | 1983 | Torres, F. Role of woody penennials in animal agroforestry. Reprinted from "Agroforestry Systems" 1: 131-163. |
| R-5 | 1984 | Nair, P.K.R. Tree integration on farm-lands for sustained productivity on small-holdings. Reprinted from "Environmentally Sound Agriculture". New York: Praeger Publishers. 1983. pp. 315-333. |

Order code	Year	
R-6	1984	Raintree, J.B. Strategies for enhancing the adoptability of agroforestry innovations. Reprinted from "Agroforestry Systems". 1 : 173-187.
R-7	1984	Huxley, P.A. Some characteristics of trees to be considered in agroforestry. Reprinted from "Plant Research and Agroforestry". Nairobi: ICRAF. 1983. pp. 3-12.
R-8	1984	Nair, P.K.R. Agroforestry with coconuts and other tropical plantation crops. Reprinted from "Plant Research and Agroforestry". Nairobi: ICRAF. 1983. pp. 79-102.
R-9	1984	Huxley, P.A. Comments on agroforestry classifications, with special reference to plant aspects. Reprinted from "Plant Research and Agroforestry". Nairobi: ICRAF. 1983. pp 161- 171.
R-10	1984	Huxley, P.A. The role of trees in agroforestry - some comments. Reprinted from "Plant Research and Agroforestry". Nairobi: ICRAF. 1983. pp. 257-270.
R-11	1984	Raintree, J.B. Bioeconomic considerations in the design of agroforestry cropping systems. Reprinted from "Plant Research and Agroforestry". Nairobi: ICRAF. 1983. pp. 271-289.
R-12	1984	Steppler, H.A. and J.B. Raintree. The ICRAF research strategy in relation to plant science research in agroforestry. Reprinted from "Plant Research and Agroforestry". Nairobi: ICRAF. 1983. pp. 257-305.
R-13	1984	Huxley, P.A. Phenology of tropical woody perennials and seasonal crop plants with reference to their management in agroforestry systems. Reprinted from "Plant Research and Agroforestry". Nairobi: ICRAF. 1983. pp. 503-525.
R-14	1984	Kozlowski, T.T. and P.A. Huxley. The role of controlled environments in agroforestry research. Reprinted from "Plant Research and Agroforestry". Nairobi: ICRAF. 1983. pp. 551-567.

Order code	Year	
R-15	1984	Torres, F. Potential contribution of leucaena hedgerows intercropped with maize to the production of organic nitrogen and fuelwood in the lowland tropics. Reprinted from "Agroforestry Systems" 1 : 323-333.
R-16	1984	Hoekstra, D.A. An economic analysis of a simulated alley cropping system for semi-arid conditions using micro computers. Reprinted from "Agroforestry Systems" 1 : 335-345

COMPUTER PROGRAMMES

MULBUD

A computer package for the economic analysis of multi-period and multi-enterprise farm budgets. (Developed at the Australian National University in collaboration with ICRAF and funded by the ANU and a grant from IDRC, Canada).

A brochure specifying the hardware requirements and availability of the programme is available on request.

ICRAF WORKING PAPERS

Working Papers are made available in limited numbers for comment and discussion and to inform interested colleagues about work in progress at ICRAF. Comments and suggestions are invited, and they should be directed to the author(s). Material in Working Papers may be cited but Working Papers may not be reproduced without permission.

Order Code	Year	
WP-1	1983	Raintree, J.B. Preliminary diagnosis of land-use problems and agroforestry potentials in northern Mbere Division, Embu District, Kenya. Nairobi: ICRAF. 16 pp.
WP-2	1983	Hoekstra, D.A. The use of economics in agroforestry. Nairobi: ICRAF. 43 pp. + refs.
WP-3	1983	Hoekstra, D.A. Leucaena leucocephala hedgerows intercropped with maize and beans: an ex ante economic analysis of a candidate agroforestry land-use system for the semi-arid areas in Machakos District. Nairobi: ICRAF. 7 pp. + refs + printouts.

Order code	Year	
WP-4	1983	Buck, L.E. Kenya agroforestry tree seed project report. With assistance from W. Teel, Mennonite Central Committee. Nairobi: ICRAF. 61 pp. + appendices.
WP-5	1983	Young, A. An environmental data base for agroforestry. Nairobi: ICRAF. 60 pp.
WP-6	1983	ICRAF. Guidelines for agroforestry diagnosis and design. Nairobi: ICRAF. 25 pp.
WP-7	1983	ICRAF. Resources for agroforestry diagnosis and design. Nairobi: ICRAF. 383 pp.
WP-8	1983	Labelle, R. A preliminary agroforestry word list, with definitions. Nairobi: ICRAF. 30 pp.
WP-9	1983	Hoekstra, D.A. Choosing the discount rate for analyzing agroforestry systems/ technologies from a farmer's point of view. Nairobi: ICRAF. 9 pp.
WP-10	1983	Hoekstra, D.A. and A. van Gelder. An annotated bibliography of economic analysis of agroforestry systems/ technologies. Nairobi: ICRAF. 44 pp.
WP-11	1983	Rocheleau, D. and Annet van den Hoek. The application of ecosystems and landscape analysis in agroforestry diagnosis and design: a case study from Kathama Sub-division, Machakos District, Kenya. Nairobi: ICRAF. 92 pp.
WP-12	1983	Huxley, P.A. Systematic designs for field experimentation with multipurpose trees. Nairobi: ICRAF. 6 pp. + annexure.
WP-13	1983	Huxley, P.A. Investigations into tree-crop interface or simplifying the biological/ environmental study of mixed cropping agroforestry systems. Nairobi: ICRAF. 20 pp. + annexure.
WP-14	1983	Darnhofer, T. Meteorological elements and their observation. Nairobi: ICRAF. 30 pp.
WP-15	1983	Huxley, P.A. Considerations when experimenting with changes in plant spacing. Nairobi: ICRAF. 32 pp. + appendix.

Order code	Year	
WP-16	1984	Hoekstra, D.A. An ex ante economic analysis of proposed mixed and zonal agroforestry systems for Batu Arang Forest Reserve, Malaysia. Nairobi: ICRAF. 16 pp. + annexure.
WP-17	1984	von Carlowitz, P.G. Multipurpose trees and shrubs: opportunities and limitations. Nairobi: ICRAF. 28 pp.
WP-18	1984	Torres, F. and J.B. Raintree. Agroforestry systems for smallholder upland farmers in a land reform area of the Philippines: the Tabango case study. Nairobi: ICRAF. 25 pp.
WP-19	1984	Hoekstra, D.A. Agroforestry systems for the semi-arid areas of Machakos District, Kenya. Nairobi: ICRAF. 28 pp.
WP-20	1984	Wood, P.J. Mixed systems of plant production in Africa, past present and future. Nairobi: ICRAF. 18 pp.
WP-21	1984	Beets, W. Aspects of traditional farming systems in relation to integrated pest management. Nairobi: ICRAF. 12 pp.
WP-23	1984	Young, A. Site selection for multipurpose trees. Nairobi: ICRAF. 30 pp.
WP-24	1984	Young, A. Land evaluation for agroforestry: the tasks ahead. Nairobi: ICRAF. 54 pp.

MISCELLANEOUS PAPERS

MP-1	1978	King, K.F.S. and M.T. Chandler. Wasted lands. (English, Spanish and French, all versions out of print). Nairobi: ICRAF. 32 pp.
MP-2	1980	King, K.F.S. Agroforestry and the development of tropical forestry. UNEP Meeting of Experts on Tropical Forests. Nairobi: ICRAF. pp. 32.
MP-3	1981	ICRAF. Fuelwood or food? Why not have both? Paper submitted to U.N. Conference on New and Renewable Sources of Energy, 10-21 August 1981. Nairobi: ICRAF. 5 pp. + appendix. Mimeo.

Order code	Year	
MP-4	1982	Buck, L.E. NGOs and agroforestry tree seed supply in Kenya: a case review. A supporting document prepared for a planning workshop to discuss international co-operation with regard to multipurpose tree germplasm. Nairobi: ICRAF. 16 pp. + appendix. Mimeo.
MP-5	1982	von Carlowitz, P.G. Concepts and constraints of education in agroforestry. Paper prepared for ICRAF/DSE International Workshop on Professional Education in Agroforestry, Nairobi, 6-10 December 1982. Nairobi: ICRAF. 7 pp. Mimeo.
MP-6	1982	Nair, P.K.R. Review of source materials for teaching soils and soil management in agroforestry. Paper prepared for the ICRAF/DSE International Workshop on Professional Education in Agroforestry, Nairobi, 6-10 December 1982. Nairobi: ICRAF. 20 pp. + refs. Mimeo.
MP-7	1982	Raintree, J.B. Readings for a socially relevant agroforestry. Paper prepared for the ICRAF/DSE International Workshop on Professional Education in Agroforestry, Nairobi, 6-10 December 1982. Nairobi: ICRAF. 17 pp. 136 refs. Mimeo.
MP-8	1983	Burley, J.F. Global needs and problems of collection, storage and distribution of multipurpose tree germplasm. Background document prepared for Multipurpose Tree Germplasm, a planning workshop to discuss international co-operation. ICRAF, IBPGR, CFI, NAS. 155 pp. Mimeo.
MP-9	1983	Ivory, M.N. Plant health registration and forest trees. Supporting document prepared for Multipurpose Tree Germplasm, a planning workshop to discuss international co-operation. ICRAF, IBPGR, CFI, NAS. 155 pp. Mimeo.
MP-10	1983	Johnson, D.V. Multipurpose palm germplasm. Supporting document prepared for Multipurpose Tree Germplasm, a planning workshop to discuss international co-operation. ICRAF, IBPGR, CFI, NAS. 37 pp.
MP-11	1983	Labelle, R. Training needs for a specialized information analysis and interpretation centre on agroforestry. Paper presented at the International Conference on Education and Training for Agricultural Library and Information Work, Nairobi, 7-12 March. Nairobi: ICRAF. 10 pp. + 10 refs.

Order code	Year	
MP-12	1983	Labelle, R. Information for decision making in research. Paper presented at the Workshop on Management of Food Research in Africa, organized by IDRC, Nairobi, 23-25 May. Nairobi: ICRAF. 7 pp. Mimeo.
MP-13	1983	Lundgren, B & B van Gelder. The potential role of agroforestry in fuelwood production. Paper prepared for the Beijer Institute, Stockholm. Nairobi: ICRAF. 16 pp. Mimeo.
MP-14	1983	Maghembe, J. and E. Kariuki. The need and level of agroforestry education. Paper prepared for the ICRAF/DSE International Workshop on Professional Education in Agroforestry, Nairobi, 6-10 December 1982. Nairobi: ICRAF. 6 pp. + 26 refs. (see WP 50).
MP-15	1983	Raintree, J.B. Une methodologie pour le diagnostic et la conception de Systemes agroforestiers d'aménagement des terres. Nairobi: ICRAF. 26 pp. Mimeo.
MP-16	1983	Raintree, J.B. Land use and labour intensity: factors affecting the adoptability of conservation farming practices under conditions of population pressure. Paper prepared for the Workshop on Conservation Farming, Colombo, Sri Lanka. Nairobi: ICRAF. 8 pp. + refs. Mimeo.
MP-17	1983	Raintree, J.B. The agroforestry approach to land development: potentials and constraints. Paper prepared for the seminar on Agricultural Research in Rwanda, Kigali, 5-12 February. Nairobi: ICRAF. 23 pp. + refs. Mimeo.
MP-18	1983	Turnbull, J.W. Tree and seed supply: a critical factor to the success of agroforestry projects. Supporting document prepared for Multipurpose Tree Germplasm, a planning workshop to discuss international co-operation. ICRAF, IBPGR, CFI, NAS. 155 pp. Mimeo.

GENERAL INFORMATION MATERIALS

ICRAF Information Packages

Individuals working in a field related to agroforestry and development agencies or information, documentation or publishing centres/institutions, or for other research institutions, are entitled to a free information package explaining agroforestry and the role of the Council.

This package includes:

- 1 copy of Information brochure*
- Publications list*
- Staff list
- Agroforestry Advisory Unit leaflet*
- Agroforestry Defined*
- Newsletter* (most recent)
- Agroforestry Systems flyer
- Selected Bibliography of Agroforestry

Items marked with * are also available in French and Spanish.

Please write to the Publications Officer for a free 'ICRAF Information Package'. (Note: In some cases, documents may be temporarily out of stock and the list may be shortened as a result.)

Reports and Brochures

Reports and brochures on professional activities are also available on specific request. The following reports and brochures are available as of 1 October 1984:

Report on the Consultative Meeting on Plant Research and Agroforestry, 8-15 April 1981. Nairobi: ICRAF. 29 pp. Mimeo.

Report on the ICRAF/DSE International Workshop on Professional Education in Agroforestry, Nairobi, 6-10 December 1982. Nairobi: ICRAF. 39 pp. Mimeo.

Agroforestry Training and Education at ICRAF. Nairobi: ICRAF. 8 pp. Mimeo.

The Fellowship Scheme. Nairobi: ICRAF. 6 pp. + application form. Mimeo.

On-the-job Internship. Nairobi: ICRAF. 6 pp. + application form. Mimeo.

Info/Doc ICRAF. An interactive, user-friendly agroforestry information request service. Nairobi: ICRAF. 4 pp. Mimeo.

Final Report of On-the-job Internship, May-November 1983. Nairobi: ICRAF. 70 pp. Mimeo.

Report on the First ICRAF/USAID Agroforestry Course, 1-18 November 1983. Nairobi: ICRAF. 4 pp. Mimeo.

ADDENDUM

Here included are documents that have not been listed in the ICRAF Publications List because they were in preparation.

Order	Year	BOOKS, PROCEEDINGS & REVIEWS
	1984	Burley, J. and P. G. von Carlowitz. Multipurpose Tree Germplasm. Proceedings of a planning workshop, Washington, D.C USA. June 1983. Nairobi: ICRAF
		SCIENCE & PRACTICE OF AGROFORESTRY
	1984	Huxley, P.A. (Compiler). Methodology for the Field Assessment of Multipurpose Trees. 24 parts, approximately 1500 pages. ICRAF:

Technology design and management guidelines available now (or in final preparation*)

For research workers

1. A manual of methodology for the exploration and field assessment of FGNGTs (MPTs)
2. Systematic designs for field experimentation with MPTs (together with a microcomputer programme for calculating dimensions of field layouts).
3. The tree/crop interface - or simplifying the biological environmental study of mixed cropping systems.
4. Considerations when experimenting with changes in plant spacing
5. Plant responses to the removal of parts.

For field workers

6. A simple tree-crop optimization procedure for field personnel.*
7. A procedure for forecasting plant/soil changes with time in tree/crop mixtures (together with a microcomputer programme).*

APPENDIX 6: DIRECTOR'S ASSESSMENT OF IMPACT

There are many ways of measuring and assessing the achievements and impact of an organization like ICRAF. Here are some of them:

1. analyzing to what extent the objectives of the Charter have been fulfilled;
2. examining the extent to which the aims and targets of the Programme of Work have been attained;
3. giving a quantitative account of the outputs, e.g. methods, publications, meetings, training courses;
4. making a qualitative assessment of how the concrete outputs and activities have been put to use by the groups for which they were targeted;
5. making an "indirect" assessment by looking at the demand for and interest in our work.

A few brief comments on these different ways of assessing ICRAF's achievements and impact may be relevant.

It is, of course, far too early to expect ICRAF to have had any impact in relation to its overall object as laid down in the Charter, i.e., to "increase the social, economic and nutritional well-being of people in developing countries". Since our main target groups are scientists, development planners, and, although so far to a lesser degree, policy and decision makers, it is obvious that regardless of how successful we are in reaching and influencing these groups there will be a time lag of several years - even - decades before any substantial impact of our work can "filter" down to the end-users, i.e., the farmers. It should be pointed out, however, that our approach very much aims at shortening this process by developing methods which target in on identifying adoptable technologies for R&D efforts.

It is easier to be quite confident in saying that we are gradually fulfilling the specific objects of our Charter (see Article IV, points (a)-(e), page 3 in the Charter). There is still much to be done but we are, in different programmes and projects, addressing all these object areas in a systematic way.

The second and the third ways of assessing achievements/impact are quite obviously related, or even two sides of the same coin. The degree to which the aims and targets of the Programme of Work have been attained is measured through the concrete output in relation to planned output. In this respect it can quite safely be argued that ICRAF has been very successful over the last two to three years. Although some projects and activities have been

postponed or delayed, for reasons ranging from wrong assessment of time required to failure to obtain funds, the concrete output from the Council has increased substantially, in some cases well above targets and aims.

The fourth way, a qualitative assessment of use of outputs, is probably the most relevant approach at this stage of the Council's development. At the same time, it is the most difficult one. In some cases we try systematically to monitor the impact we have. In the collaborative field projects under the COSPRO programme this is quite simple since ICRAF plays a continued role in the implementation of the projects based at national institutions. Similarly, the Training Officer has devised a system for continuously following up on how participants in our training courses and other schemes make use of the skills and knowledge acquired during the training period. Also the Information Officer sometimes follows up on how our responses to requests for information and advice have been used. It is much more difficult to assess how our publications are put to use, or how our presentations at various international scientific/technical meetings influence the thinking and subsequent actions/policies of participants.

The fifth way, indirectly assessing impact by looking at demand, is, of course, a rather superficial and sometimes dangerous, way of approaching the task. A high demand for a publication may, for example, be brought about by an attractive title or even cover. If the content does not measure up to expectations, the impact may be very negative, more so if the demand is high. However, looking at it in a more positive way, there is no doubt that if ICRAF's impact were to be assessed by the demand for and interest shown in our work there is all reason in the world to be extremely encouraged. The request for our services - publications, advice, etc. - have been rapidly increasing over the past few years. The number of applicants to our training courses outweighs the number of places available by five to one. The number of requests from national and international organizations for ICRAF collaboration in projects, meetings, etc., has reached a level where we have to turn down nine out of ten such requests because we simply do not have the resources. The number of invitations we receive to attend meetings and present papers has also reached a level where we have to say no more often than yes.

Impact at the National Level

The main target groups for all ICRAF's activities are developing-country land-use institutions, scientists, development planners and policy makers, with the ultimate aim of having, through these groups, a positive impact on land use. It is therefore more relevant than anything else when assessing ICRAF to look at the impact we have had, and what impact we may potentially have in the future, at the national level in developing countries. When doing this, it will be necessary to keep the perspectives clear in mind.

- o the developing world and the land-use problems therein are very large and ICRAF is a very small organization;
- o It is only during the last two years that ICRAF has reached a minimum critical size to produce, in a systematic way, "impact-oriented" outputs.

Although it is difficult to quantify our impact at this early stage, a scrutiny of the various programme co-ordinators' reports and the annual reports, particularly for 1982 and 1983, will clearly bring out two things:

- o we are rapidly increasing the number of "spot"-impacts, e.g. through participants in our training activities, through collaborative research project developments, through responses to requests for information and advice, etc.
- o we have started to lay a foundation from which we feel we can have a major impact in the not-too-distant future, e.g. through the expanding network of collaborative institutions in the COSPRO programme.

At the country level, it is quite natural that, so far, we have mainly had a partially measurable impact in our host country, Kenya. The number of trainees and participants in training courses, workshops, seminars, etc., from Kenya has been proportionally very high. The fact that our library and staff are here has led to a very intensive interaction with Kenyan scientists and institutions. We have a number of field demonstration activities on the ground, e.g. the Field Station, which are intensively used. We regularly give presentations on agroforestry to in-service training courses for agricultural extension officers and forest officers. A growing number of Kenyan professionals are directly employed by ICRAF as research assistants, project staff, etc. I think it is safe to say that ICRAF's activities here are a contributing (though not exclusive) reason why agroforestry is a "household" concept in Kenya today - politicians use it in their speeches, newspapers and the radio/TV refer to agroforestry without feeling a need to explain what it is, and, more importantly, a large number of land-development-related ministries, departments, projects, education institutions, etc., have "agroforestry" (in a wide or narrow sense) on their programmes.

It will probably take quite some time before ICRAF can claim a similar broad impact in any other individual country.

Impact at the International Level

The "international" impact of ICRAF's work is even more difficult to assess (if it is possible to assess it, that is) than our impact at the national level. If by "international" we mean all bodies and efforts working on land development in a wide sense in developing countries but not originating from

these countries, ICRAF has, since its inception, had a steadily increasing number of interactions with such bodies and efforts. Examples of such interactions, either concluded, on-going or in an advanced stage of planning, are:

o with CG institutions

- ILCA information project, D&D input into field project in Kenya (Kiboko)
- CIMMYT (East Africa): lecturing on each other's courses on farming systems research
- CIAT partners in Peru COSPRO projects
- IBPGR co-sponsors of workshop on multipurpose tree germplasm
- ISNAR invited to several ISNAR meetings, e.g. in Indonesia and Rwanda
- IRRI and ICRISAT invited to give demonstration workshop on MULBUD

o with UN organizations

- FAO several interactions through meetings, seminars, courses, consultancies, etc.
- UNESCO participation in each other's meetings, courses, etc., where mutually relevant
- UNEP advanced discussions on various consultancies
- ILO development of extension material for agroforestry (in Kenya)

o with developed country institutions

- University of Wageningen (The Netherlands) several post-graduate students have worked on ICRAF's project in Kathama
- Commonwealth Forestry Institute (U.K.) seconded CFI staff member to ICRAF for two years; joint production of manual for MPT research; co-sponsored (with IBPGR) multipurpose tree germplasm workshop
- Development Studies Center of ANU (Australia) joint development of MULBUD
- Center for Research on Economic Development of the University of Michigan (U.S.) also

involved in MULBUD

- Land Tenure Center of the University of Wisconsin (U.S.) joint project on land and tree tenure in agroforestry.

Naturally, interaction on a project or in any other form, such as described above, does not in itself necessarily lead to an "impact". However, we feel, and increasingly so, that ICRAF's collaboration is sought because we can contribute original and relevant know-how on agroforestry research methods and technologies. If, therefore, we manage to influence the "thinking" and programmes of the collaborating international institutions, not only through a general raising of awareness about agroforestry and its potential, but through actual adoption of our methods and know-how, there is no doubt that we can have a growing impact at the international level. The volume of this may not yet be substantial in terms of "field" applications, but it is growing. On the other hand, ICRAF's impact at a more general level is already significant (see below).

General Impact on Thinking

If there is any field where ICRAF can now claim to have had a significant and relatively evident far-reaching impact, it is in the general perception of agroforestry, its potentials and its constraints.

I think it is safe to say that among scientists, development planners, and, to a lesser but increasing degree, policy/makers decision makers involved in tropical/sub-tropical land development, both nationally and internationally, ICRAF has contributed to an increased awareness and re-thinking on two important issues:

- o The objective awareness of agroforestry potentials and constraints has increased considerably over the last two to three years. ICRAF's work on conceptualizing, and developing the foundation for, the science of agroforestry has strongly contributed to this.

In spite of our relatively small size, we have had a considerable coverage of scientific/technical meetings. This, together with presentations and discussions with visitors, trainees, etc., has resulted in a very wide exposure of ICRAF's ideas and progress to key groups of people within many different disciplines.

Although much still remains to be done to firmly establish agroforestry as an objective option, with a scientific basis, to land development in the minds of people and in the programmes of organizations, we feel confident that we have moved the discussion away from the presumptuous and generalized claims of agroforestry potentials (a panacea to all problems) which characterized the early promotion of the concept. Some of ICRAF's early work, including the

"definition" of agroforestry given in the Charter, no doubt contributed to the understandable doubts with which many serious tropical agronomists and foresters regarded agroforestry.

The second field in which we begin to see that we are having an impact on the way in which concerned people think is the gradual realization that agroforestry is not, and should not (if we wish to exploit its full potential) be regarded as, a sub-discipline of forestry. The growing acceptance of agroforestry ideas, concepts and technologies among agricultural institutions, both national and IARCs, is something we have contributed to by promoting agroforestry, not as forestry contributing to agriculture but as a systematic and scientific way of using trees and shrubs in farming systems in order to increase their productivity, sustainability and/or diversity of outputs. There is probably still a long way to go before this gradual change in thinking about and acceptance of agroforestry as a way of improving farming systems can have any significant impact on traditional institutional boundaries.