

INTERNATIONAL COUNCIL FOR RESEARCH IN AGROFORESTRY

(ICRAF)

Collaborative and Training Programs

Agroforestry Research Network

for Africa

(AFRENA)

- Sub-humid Bimodal Highlands Zone -

Cooperative Agreement

in response to an

unsolicited Proposal

from ICRAF

- PRESENTED TO USAID/S&T/FENR -

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EXECUTIVE SUMMARY

1. In the highlands of East and Central Africa, the need to feed a rapidly burgeoning population has led to widespread natural resource deterioration. Improved agroforestry methods are needed to meet food production requirements and maintain environmental stability on which agricultural productivity rests.
2. Research will be undertaken through this Cooperative Agreement to help selected African institutions develop improved agroforestry technologies through the selection, improvement and cultivation of multipurpose woody species for use in agroforestry systems. The research will be implemented through an intercountry collaborative research network for which ICRAF will provide technical backstopping and coordination.
3. As improved woody species are identified for each technology, ICRAF, in cooperation with institutions from developing countries and other donor organizations, will help produce seeds/plant material to accelerate the dissemination of the improved biological materials.
4. The multidisciplinary nature of this research requires the combined use of resources available in institutions from the agriculture and forestry sectors. Networking is the appropriate operational model to bring together these various disciplines, given its flexible nature and potential for using available resources in a complementary fashion. In northeast Africa, the research capabilities of most forestry/agriculture institutions is minimal, and it is anticipated that research networking will result in strengthening the capabilities of these institutions to do agroforestry research.
5. The intercountry collaborative research network approach is used to fully involve forestry and agricultural researchers from the participating country institutions. This involvement will include developing country participation in planning network activities and implementation of in-country research trials, along with formulating training needs. The network approach will also result in strengthening the capabilities of these institutions to do agroforestry research.
6. This Cooperative Agreement will be carried out over a period of 5-years with an evaluation occurring in the third year. The expected outputs at the end of the 5-year period are:

- a. Establishment of MPT agroforestry technology/species intercountry research networks involving at least four participating countries;
 - b. The identification of superior species and strains of multipurpose woody plants to be used in agroforestry systems;
 - c. Increased production of genetically improved seed/plant material for 5-10 selected MPT species;
 - d. The training of in-country agroforestry technical groups needed to implement the collaborative research in each of the cooperating countries;
 - e. Identification of location or country-specific agroforestry research problems.
6. In producing these outputs, collaborative efforts are proposed with other donors (e.g., GTZ, IBRD, IDRC, CTFT, the Swiss Development Corporation, etc.) and with CGIAR institutions (ILCA, ICRISAT, and IITA).
 7. A Cooperative Agreement best reflects the association of the Agency and the recipient (ICRAF) in carrying out research and training activities that are important to AID's future work in agroforestry, and at the same time, an integral part of ICRAF's overall program and long-term development.
 8. Since ICRAF's mandate is to strengthen an international network of agroforestry research and development institutions through this Cooperative Agreement, AID will be supporting the strengthening and expansion of a more formal network of LDC institutions in Africa that will sustain and increase agroforestry research and training.
 9. This proposal can contribute to the overall ICRAF Sub-Saharan Africa Agroforestry Research Network program under which networks will be organized on a broad ecological basis in four zones including: the lowland humid tropics of Western Africa, the Sahel, the sub-humid unimodal highlands of Southern Africa, plus the moist sub-humid bimodal highlands of Eastern Africa. Thus far, Canadian CIDA has committed funding for program activities in Southern Africa, Western Africa research will be financed by France, and the World Bank has allocated funds to support research to be done in the Eastern and Southern highlands. This Cooperative Agreement will support networking in the sub-humid bimodal highlands zone; participating countries within this zone will be Kenya, Rwanda, Burundi and Uganda.

10. The total amount for this 5-year Cooperative Agreement is \$4.0 million (grant). \$1.3 million of this amount is dependent upon mission buy-ins.

INTRODUCTION

1. In the highlands of East and Central Africa, the need to feed a rapidly burgeoning population has led to widespread natural resource deterioration. Improved agroforestry¹ methods are needed to meet food production requirements and maintain environmental stability on which agricultural productivity rests.
2. A number of land use systems exist in the zone and vary in predominance according to the agro-environment and socio-economic conditions. Broadly, six land use systems are identified. These include forests, shifting cultivation, mixed arable farming, plantation agriculture, grazing, and agroforestry systems.
3. Mixed arable farming is the most common in the zone. It is practiced mainly under mixed subsistence/cash cropping conditions. Of the several variations of arable farming, fallow systems are the most common. It is characterized by small landholdings on which permanent cash crops are planted and food crops are cultivated. The latter alternates with short fallow periods. Fallow vegetation consists of grass and crop residues used for grazing.
4. Arable farming systems are experiencing many production constraints which include:
 - a. Lack of fertility maintenance due to overcropping;
 - b. Soil erosion due to continuous cropping;

¹Agroforestry is the term used for land-use systems which combine the growing of woody perennials on the same piece of land with agricultural crops and/or animals, either integrally or sequentially. These different components interact ecologically and economically, in both positive and negative ways over time. Agroforestry is chosen over alternative land use systems in circumstances where this interaction of components results in higher productivity, sustainability, and/or diversity of outputs such as food, fodder, water, shelter, and energy plus soil fertility and stability.

- c. Serious conflicts between cash crops and subsistence food crops; and
 - d. Degenerating livestock economy due to lack of fodder.
5. Under these circumstances, the agroforestry approach of incorporating woody perennials into existing farming systems constitutes a sound practice, given the potential of trees to produce food or fodder in combination with fuel or timber, as well as to protect soils, and even restore soil fertility.
6. The role of agroforestry in mixed arable farming systems would be to:
- a. Increase effective land availability for food production through intercropping of food crops with tree crops (Melia azedarach, Olea welwitschii);
 - b. Improve productivity and sustainability through hedgerow intercropping and planted fallow;
 - c. Improve tree-crop productivity by addition of appropriate woody herbaceous "service" components (N-fixing and/or shade providing trees/shrubs; i.e. Trema orientalis, Lespedeza bicolor, and herbaceous living mulches); and
 - d. Introduction of multi-layer crop canopies for better soil cover utilizing deep rooting trees (Mimosa scabrella, Maesopsis eminii, Acrocarpus fraxinifolius) in nutrient recycling and increasing soil stability.

PROBLEM AND NEED

7. The agroforestry approach to land use has been practiced by farmers all across Africa for centuries, if shifting cultivation is considered an agroforestry practice, and is still being practiced by many, particularly small holders. But neither land use circumstances under which existing agroforestry technologies are applied, nor their structure and function, are, in most cases, properly understood. This retards both their wider dissemination and their potential improvement.
8. Efforts by existing research systems to generate new agroforestry technologies are also relatively scarce, when compared to those applied to cash and food crops. In inter-tropical Africa, research has been mostly confined to

three types of practices; "taungya"², practiced by forest departments bringing farmers into reforestation schemes with the main objective to reduce plantation costs; "alley cropping"³ for sustained maize production, as carried out at IITA; and browsing, where considerable information has been produced on the chemical composition of fodder from woody perennials.

9. The scarcity of knowledge on existing and potential agroforestry technologies stems from the relatively recent "re-discovery" of agroforestry, and the corresponding lack of institutional capabilities to confront pressing land use problems requiring an innovative approach.
10. There is also a scarcity of knowledge concerning the multipurpose woody species⁴--both native and exotic--which are most appropriate for use in the highlands of East and Central Africa. Species information concerning adaptability to soil, climatic and other environmental conditions, and people preferences are lacking. In addition, knowledge of how to select, genetically improve, and propagate these woody perennials is also deficient.
11. A primary objective of this cooperative agreement is to increase our knowledge of these multipurpose woody perennials and of how they can be most effectively used in agroforestry systems. Included will be the selection of species and provenances with quality characteristics suitable for different ecological environments and for multipurpose uses in these environments.
12. The research will be planned and implemented through an inter-institutional collaborative research network involving institutions from at least four African countries. ICRAF will take the leadership in initiating the network and will provide technical backstopping as well as orientation and training for in-country researchers involved in the network. The approach will be designed to help the

²The practice of combining seasonal crops with the initial stages of a more permanent tree crop.

³An agroforestry system in which food crops are grown in alleys formed by hedgerows of trees or shrubs.

⁴Trees/shrubs which are planted in agoforestry systems for a range of end uses including fruit, browse, shade and ground cover, fuelwood, building materials, etc.

countries strengthen their agroforestry research capabilities and especially those related to woody species improvement and integration into agroforestry systems.

13. The multidisciplinary nature of research on the agroforestry approach to land use requires the combined use of resources available in institutions from the agriculture and forestry sectors. In most countries, the implementation of such an approach faces a major constraint: it lacks a proper institutional "niche." The major challenge, therefore, is to develop viable and dynamic operational structures capable of integrating the efforts of research institutions from the agriculture and forestry sectors to achieve a more effective use of existing capabilities, both at national and regional levels. In this regard, there is considerable need for collaboration with the International Agricultural Research Centers (IARCs).
14. Networking is an appropriate operational model to face such a challenge, given its flexible nature and potential for using available resources in a complementary fashion. Networking is based on the development of information through research and the dissemination (or extension) of this information to other research facilities and to the user on the ground.

BACKGROUND

15. As the Cooperative Agreement aims to facilitate ICRAF's technical assistance to national research systems for generating agroforestry technologies, information pertinent to both the beneficiaries and the implementing agency will be examined. The intent of this project, as well as that of ICRAF as an organization, is to facilitate the strengthening of local forestry/agriculture institutions to carry out their own research geared towards solving local problems.

On the beneficiaries

16. In most countries of inter-tropical Africa, research systems cannot generate all the technologies required to overcome the spectrum of current land use problems. In spite of a steady increase in the number of scientists, such a situation arises from several causes: frequent reorganization of research structures; poor reward systems for scientists; lack of trained manpower; inadequate facilities; and budgetary stringencies, particularly operational funds.

17. Much of the generated technology has not been entirely appropriate to farmers circumstances, particularly small scale farmers, who constitute the bulk of the population and depend mostly on their own food production to satisfy family needs. The induced commodity-oriented research strategy may be partially responsible for the gap between research results and the adoption of recommended practices. Recognition of this problem has, lately, led to the application of a farming systems approach to research planning. The concepts and principles partially responsible for the farming systems methodology are valid for generating appropriate agroforestry technologies. But the purposes for which such a methodology is applied may be quite different.
18. In farming systems research, there are normally many validated technologies for improving the production of individual crops. Under these conditions the objective of systems research is to identify those farmers' constraints which hinder adoption of existing technologies. The latter are then adapted to meet prevailing circumstances. However, there are only a few research-validated agroforestry components in overcoming diagnosed land use problems, to specify their desirable characteristics, and to indicate appropriate spatial arrangements and management practices. In other words, it must be able to design and evaluate conceptual technologies from which research needs are then derived.
19. There is an increasing awareness in the region of the need to promote stronger cooperation and coordination among countries in matters of agricultural research. For example, the agricultural research cooperation among the so-called Southern Africa Development Co-ordination Conference (SADCC) countries, the "Comite International contre la Lutte et la Secheresse au Sahel" (CILSS), and the Forestry Education Committee for East Africa are examples of current efforts to address this need.
20. Agricultural research networks are expanding at an increasing rate; the great majority of them initiated by International Centres. For example, networks for testing germplasm and devising improved agronomic techniques for the major cereal and root crops are the ones on which most efforts are focused at present. There are, however, others in the fields of livestock diseases and "farming systems," the latter being of direct relevance to agroforestry research.
21. Unfortunately, there are no comparable networks concerned with woody perennials, their improvement and management in

agroforestry systems. There is just as great a need for such networks as for those focusing only on agricultural crops. The network to be implemented through this Cooperative Agreement will provide increased knowledge on the woody species and their management.

On the implementing agency

22. In September, 1982, the Agency for International Development (AID) and the International Council for Research in Agroforestry (ICRAF) entered into a Cooperative Agreement (Project No. 936-5545) for a total of US \$1,000,000 over a three-year period. The project's purpose was threefold:
 - (a) To utilize diagnostic methodology to identify agricultural and forestry land-use problems, analyze constraints, and recommend practices to mitigate these constraints;
 - (b) To assemble systematic documentation of existing world-wide agroforestry systems out of which new practices and systems can emerge; and,
 - (c) To develop and carry out training courses in agroforestry for LDC participants.
23. The development of such a program has enabled ICRAF to acquire the capability to assist national institutions in:
 - (a) Designing research projects to generate appropriate agroforestry technologies;
 - (b) Training cadres in the application of such a process; and,
 - (c) Collating information on existing agroforestry practices.
24. Such capabilities constitute the foundations on which this Cooperative Agreement is built and follow the recommendations of the Mid-term Evaluation Team for the AID-supported Agroforestry Research and Training project that states: "...in order to assist ICRAF to take a more active role in technology generation, we feel AID should examine the possibility of supporting the development and expansion of the Collaborative and Special Projects (COSPRO) programs." More specifically, AID could provide funds for a network of research projects under different ecological conditions (e.g. humid tropics, semi-arid tropics) that would have as their expected output relevant and profitable new agroforestry technologies.

25. ICRAF is proposed for this Cooperative Agreement because of its unique nature as an international agroforestry research institution. It is totally multidisciplinary in its project planning and implementation, is situated in Africa where much of AID's agroforestry work will be carried out, is located in the same city where AID has a Regional Office (REDSO/EA) with auditing, legal, contractual, and professional forestry and agriculture personnel (for assistance to S&T/FENR with project management), and has taken the leading role in agroforestry on a global basis. No other international, regional, or national institution provides this unique set of qualities that are needed to deal with agroforestry research and training on a global basis.

GOAL

26. To improve sustainable agricultural productivity through greater adoption of agroforestry technologies compatible with local land-use conditions thereby increasing national capability for food self-sufficiency in Africa. In particular, this project will focus attention on the selection and development of the most suitable woody species for agroforestry through linking in-country research in various countries by means of networks, and by providing technical support and backstopping for the efforts.

PURPOSE

27. To select and genetically improve multipurpose tree and shrub species to integrate with agricultural food crops into productive agroforestry systems for the sub-humid, bi-modal highlands of East and Central Africa.

OBJECTIVES

28. ICRAF shall build on the information previously derived for the Agency to accomplish the following:
- 28.1 To assist in the development, establishment, and coordination of an agroforestry research network in the ecozone focusing on multipurpose tree species, and tree improvement trials for incorporation into appropriate agroforestry technologies.
- 28.2 To collaborate with and provide technical support to national and international research institutions in the ecozone in the development of multipurpose tree species adaptation, tree improvement trials, and agroforestry technologies.

- 28.3 To assist national and international institutions and agencies in the choice and acquisition of quality seed/plant material for multipurpose tree species as components for agroforestry research efforts.
- 28.4 To train national institution personnel to evaluate land use systems (which involves the preparation of state-of-the-art reports on agroforestry for each country), and to apply agroforestry technologies to improve productivity and sustainability of production.
- 28.5 To furnish technical backstopping services for improved agroforestry systems in LDCs.

OUTPUTS

29. Through collaborative efforts, the expected outputs of this five-year Cooperative Agreement will be:
 - 29.1 The initiation of collaborative intercountry agroforestry research network involving participants from at least four countries.
 - 29.2 Initiation and implementation of woody species improvement trials in the network countries leading to the production of genetically superior, multipurpose seed/plant material to be used for identified agroforestry technologies.
 - 29.3 Establishment of improved agroforestry technology trials with selected, improved multipurpose tree species in at least four countries in the ecozone.
 - 29.4 Four Agroforestry Technical Groups (one per country) trained in agroforestry research design and implementation emphasizing species and technology trials.
 - 29.5 An operational plan for agroforestry network development including preparation of a prioritized plan for agroforestry research actions.
 - 29.6 Identification and prioritization of location or country-specific agroforestry research problems.

INPUTS

- 30.1 The total amount of this 5-year Cooperative Agreement is \$4.0 million. (\$1.3 million is dependent upon mission buy-ins.)

Of this \$2.4 million will come from the Africa Component of the Forestry/Fuelwood Research & Development Project (F/FRED) in the Bureau for Science and Technology.

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An additional \$0.3 million will be provided by the Bureau for Africa through the Strengthening African Agricultural Research (SAAR) project.

The Missions will be looked to for funding of in-country research and longer-term institutional development through buy-ins totaling \$1.3 million. Other donors will also be actively pursued for support of in-country research and institutional support.

- 30.2 Not included in this Agreement is the recruitment of a zonal coordinator.
- 30.3 The research coordinator will provide guidance and technical backstopping for the design and development of the species-specific and technology-specific research in the bimodal highlands zone. This person will organize and assist in implementing the various training sessions for the agroforestry teams from each of four countries, and will coordinate the establishment, maintenance, and evaluation of on-the-ground research conducted by host country nationals in each country.
- 30.4 ICRAF core staff will provide specialized technical assistance to the zonal coordinator and the research manager whenever necessary, and will provide assistance in planning, establishing networks, conducting training sessions, and designing research trials.
- 30.5 The budget details funds to cover operational costs (i.e. staff, training courses, networking) and the commodities needed to conduct multipurpose tree species/agroforestry technologies research in each country (i.e. equipment for research establishment and maintenance). Funding for in-country research will emphasize contributions from national (in-country) and bilateral donor sources available to the country. Initially this Cooperative Agreement may provide a portion of the operational costs if other sources are not available. After two years, it is expected that all in-country research operational costs will be funded by sources outside this Cooperative Agreement. Linkages formed between the parent Project (F/FRED) Data Base Management System (DBMS) and the ICRAF DBMS will facilitate the exchange of agroforestry information on a worldwide basis.
- 30.6 Various project design exercises and a design workshop will be held to develop research agendas and proposals.
- 30.7 Evaluation of the Cooperative Agreement will be conducted by specially formed teams at the end of the third year. Depending on results of this evaluation, the Cooperative Agreement may be modified. A final evaluation should be

conducted at the end of the fifth year when the Cooperative Agreement is completed.

ACTIVITIES

31. Network development

This activity will involve integrated planning and analysis among national institutions, and will analyze prevailing land-use systems in the ecozone to provide elements for decisions on the focus of agroforestry research and to propose organizational structures to conduct the research. Plan development, leading to research implementation and network development, will be undertaken according to the following approach:

31.1 Mobilization, Promotion, Organization and Information Gathering.

This activity will be guided by ICRAF specialists, assisted by the Data Appraisal Team for Africa (DATA, constituted by junior scientists recruited and supported through an IDRC funded project) and will include the early participation of the Zonal Coordinator. This team will assist in:

- a. Identification of participating national institutions from the agriculture and forestry sectors;
- b. Developing the organizational framework for multi-institutional cooperation in the planning and implementing of multipurpose tree species and agroforestry research projects within each country, including the designation of national coordinating mechanisms;
- c. Defining objectives, structure, and operational procedures for a zonal agroforestry research network;
- d. Training in methodology for the analysis of existing uses of land vis-a-vis agroforestry potential; and
- e. Assisting cooperating national institutions in analyzing secondary information on land use in the ecozone.

31.2 Introduction to Agroforestry networking and training.

This activity will be carried out using the methodology developed above with the participation of all National Technical Group members from the four countries (15-20 scientists) employing study materials developed by ICRAF's multidisciplinary team.

Country representatives in the ecozone are expected to participate in all steps of research planning: data evaluation, field assessment, and design of alternative agroforestry technologies.

31.3 Country-specific Agroforestry Systems Analyses.

Further in-country analysis of existing land use will be undertaken by the members of the National Technical Group in each country with periodic backstopping by ICRAF's Core Staff and the Zonal Coordinator. This activity will result in the preparation of a hard copy, state-of-the-art reports on agroforestry for each country which will include:

- (a) Identification and mapping of the major environmental regions of the country;
- (b) Quantitative description of the major land-use systems of each region, including their extent;
- (c) Identification and quantification of the nature and severity of problems faced by these land-use systems, including both problems of the farmer (or other land user) and problems of the environment;
- (d) Quantitative description of existing agroforestry systems and practices, traditional and modern, to be found in the country, with emphasis on the woody species used and their performance under particular climatic and soil conditions; and
- (e) Summarization of the present state of the capacity for agroforestry research in the country, including;
 1. research stations and their environmental conditions,
 2. details of current research, and
 3. principal results obtained.

32. Research Network Design and Implementation

32.1 Priorities identification workshop.

This workshop will take place in Nairobi with the participation of all Technical Groups from the four countries. Under ICRAF guidance, country-specific land use system analyses will be discussed and common problems and proposed agroforestry interventions will be identified and prioritized. Research priorities will be determined in

accordance first, with their importance at the national level, and second, by their regional significance. The end result will be an ecozone-wide action plan encompassing:

- (a) Selection of target species and ecozone significant agroforestry technologies to be used in testing the technologies;
- (b) Creation of an additional list of location or country-specific research actions; and
- (c) Preliminary discussion of guidelines for the selection of superior mother trees and the genetic improvement of desired species.

32.2 Research design and methodology training by country.

Using materials developed by ICRAF, National Technical Groups will be trained in research design methodologies to address problems identified in the workshop. Research design sessions will utilize ICRAF's Diagnostic and Design Methodology and will be held sequentially in each country. Specific topics will include:

- a. Development of a comparative testing and research design methodology compatible with international standards which may be employed for establishing trials and to rationalize ongoing or existing multipurpose tree species/agroforestry technology trials; and
- b. Development of seed/plant material collection and handling protocols for species in the following four categories (refer to Appendix 1 and Figure 1 for detailed activities regarding each category);
 1. locally utilized, well-known species (e.g., Grevillea spp., Maeosopsis spp.),
 2. locally utilized, little known species (e.g., Erythrina spp., Calliandra spp.),
 3. undomesticated native species with excellent potential (e.g., Albizia spp., Polycias spp., Markhamia spp.), and
 4. other untested exotic species with excellent potential (e.g., high altitude Leucaena spp.).

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32.3 Research mobilization.

In collaboration with local institutions, ICRAF will conduct visits to the respective countries in order to:

- a. Develop selection criteria for superior mother trees;
- b. Verify existence and availability of nursery sites and seed/plant material storage facilities;
- c. Help make selection of sites, determine the ICRAF and in-country contributions for establishment and operation of sites, and initiate actions to help establish the in-country research programs; and
- d. Initiate seed/plant material collection/procurement.

32.4 Research Implementation

The experimental phase of the species-specific and technology-specific research trials will be carried out with the guidance and backstopping of the ICRAF recruited Agroforestry Research Coordinator and the national committee implementation teams. These activities will utilize in part, the support funds earmarked under the budget, but funds obtained from national and other donor sources mentioned in section 30.5 will be used to supplement these resources and eventually take on all research activities. Technology-specific projects will be of a multi-station type with on-farm testing. The location or country-specific projects will be conducted on-farm.

The following three pronged approach for conducting agroforestry research will be utilized:

- a. Selection of promising agroforestry technologies for identified high priority land-use problems based on an evaluation of their adaptability to local farming systems;
 1. Consideration of appropriate management and/or cultural techniques based on an assessment of farmer preferences for both crop and tree outputs; and
 2. Collection of yield data and information on interactions among crops and trees in agroforestry systems used to revise agroforestry configurations and to provide parameters for assessing the performance of agroforestry tree/crop combinations.

- b. The choice of species/provenances of indigenous or well adapted exotic species (Appendix 1, Figure 1) to be tested in agroforestry configurations (identified above) including;
 - 1. Selection of plus trees from within provenances of indigenous or well-adapted exotic tree species based on selection criteria geared to compatibility with agroforestry applications; and
 - 2. Corroboration and/or applied research on seed/plant material handling and nursery techniques for seed/plant material production will be conducted to obtain successful planting of these tree species.

- c. Basic research with promising species involving;
 - 1. Procurement of seed/plant material of the desired tree species; and formulation of experimental designs(s) needed for conducting and evaluating field trials,
 - 2. Establishment of species/site trials; maintenance of field plots; and collection of data that is subsequently analyzed under ICRAF guidance,
 - 3. Outstanding species can be incorporated into the operational seed orchard program, or species/provenance trials can be started for additional testing of promising provenances before incorporating them into the production/applied phase of such a program, and
 - 4. Management trials. (e.g. coppicing, to be conducted in the future).

33. Improved Seed/Plant Material Supplies

Criteria developed per the above for selecting the best species, the best provenances within species, and superior trees within a provenance will lay the groundwork for eventual large scale improved seed/plant material production. Work will be initiated to support and further the establishment of seed orchards aimed at producing genetically improved seed/plant material. In some cases, this can be done by simply converting adequately designed species trial plots into seed orchards or establishing grafted seed orchards. Having developed criteria for particularly promising agroforestry species, technical

backstopping and support would be provided through this Cooperative Agreement to complement on-going national/donor seed improvement/production efforts funded by other donors (e.g. GTZ/KARI, Swiss/Butare, CTFT/Burundi).

34. Institutional development

34.1 Establishment of coordination mechanism.

In order for the envisaged concerted cooperation to become functional, there is a need to develop institutional "niches" that advance such an objective within and among countries, as well as between countries and non-host country regional agencies. As mentioned before, agroforestry research requires structures that promote joint efforts by institutions from the agricultural and forestry sectors for integrated planning and pursuit of common goals.

To satisfy such a principle, it is foreseen that concerted co-operation could be achieved by some kind of National committee constituted by representation from government organizations from both the agriculture and forestry sectors dealing with research, extension, development, and training. In each country, the Technical Group will be responsible for setting up and implementing an agroforestry research plan, for coordination of funds from various sources, and to encourage complementary and co-operative research projects implemented by member institutions. Networking among countries within the ecological zone will be achieved through zonal meetings composed of representatives from the different National Committees, that will pursue the development of a zonal programme for co-operation on agroforestry research.

Networking among the national institutions will serve to enhance the exchange of information thereby strengthening the learning and development process fundamental to achieving material capability for agroforestry research and development.

34.2 Personnel Development.

As part of the institutional development process, this Cooperative Agreement provides for training host country personnel.

Training of national cadres will be systematically coordinated with processes leading to the design and implementation of agroforestry research. It should be emphasized that as implementation activities are initiated under this Cooperative Agreement, personnel development

will evolve from training on research planning to training on experimental methods and field research techniques. Much of the training will be accomplished as national staff implement activities under this Cooperative Agreement in close association with the Zonal Coordinator, the Research Manager, and ICRAF backstopping personnel. More specifically, at least four training modules on key topics are planned for all participants under this Cooperative Agreement. These are:

- a. Multipurpose tree species selection for improved seed/plant material production;
- b. Land-use problem diagnosis and analysis of agroforestry applications;
- c. Agroforestry research priority identification and experimental design; and
- d. Case study-application of analytical tools at a real problem site.

35. Multipurpose Woody Species Data Base Operation

ICRAF will utilize its present MPT data base for accessing required species information and for storing the additional information generated in the course of research implementation. As a global data base is currently being developed under this Cooperative Agreement's parent project (F/FRED), every effort will be made to achieve compatibility of data bases (e.g., coordination, standardized descriptors, and software interchangeability).

36. Research Design, Action Plan and Annual Work Plans

Upon signing this Agreement ICRAF will prepare a Research Design and Action Plan for the life of project (LOP).

The Action Plan will describe the existing or proposed role of other donors in the other three zones and the relationship between activities funded by this Agreement in the sub-humid bimodal highlands zone with existing proposed activities in the other three zones. This Action Plan shall also indicate what actions are proposed for involving the other International Agricultural Research Centers (IARCs) in the Agroforestry Research Network for Africa.

A Work Plan shall be prepared each year describing the activities proposed for the year. This Work Plan shall include a statement on commitments made or anticipated by

host country research institutions for participation during the year. The Work Plan will require the approval of the A.I.D.'s co-managers.

37. Possible Extension into other Zones or Countries

Although this Agreement is specifically addressed to the sub-humid bimodal highlands zone of Africa, the possibility exists for expansion of the activities.

38. Project Management

The management of this Cooperative Agreement will be carried out jointly by S&T Bureau and REDSO/ESA. The A.I.D. Project Officer is S&T/FENR Ian G. Morison, his successor, or designee, who is also the S&T Program Manager, will have AID primary project management responsibility. The REDSO/ESA Co-Program Manager is James R. Seyler, his successor, or designee.

39. Program Description

This project will undertake activities according to the multipurpose tree (MPT) species/woody species continuum presented in Appendix 1. and Figure 1. ICRAF is expected to emphasize aspects of the continuum leading to the development of species/agroforestry technologies for a small number (5-10) of multipurpose woody species which will be jointly selected by ICRAF and the joint co-program managers. The project is expected to collaborate with other donors/institutions in the production of genetically improved seed of the species selected plus the further development and practical utilization of agroforestry cultural techniques.

IMPLEMENTATION PLAN

	1	2	3	4	5
1) MOBILIZATION (1-3) PRODUCTION/ORGANIZATION and information collection	<--->				
2) NETWORKING AND TRAINING IN LAND-USE ANALYSIS	<-->				
3) LAND-USE PROBLEM ANALYSIS (IN EACH COUNTRY (5-6-7))	<----->				
4) PRIORITIES ID WORKSHOP	<->				
5) RESEARCH DESIGN METHODOLOGY TRAINING (BY COUNTRY)	***				
6) RESEARCH MOBILIZATION-SPECIES SELECTION CRITERIA-SITE SELECTION SEED/PLANT MAT. (SEE APPENDIX 1.) COLLECTION (A CONTINUUM)	<----->	----->	----->	----->	----->
7) ESTABLISHMENT OF FIELD TRIALS		<->	<->	<->	<->
8) RESEARCH ANALYSIS		----->	----->	----->	----->
9) EVALUATION			<->		<->
10) CASE STUDY	<----->				
11) IMPROVED LAND-USE ANALYSIS	<----->				
12) LOCATION SPECIFIC PROJECT ID		<----->			
13) INFORMATION EXCAHNGE	<----->				
14) ANNUAL NETWORK MTG.		<-->	<-->	<-->	<-->

BUDGET SUMMARY

Salary and Wages	\$1,244,750
Fringe Benefits (30%)	373,425
Consultants	80,000
Travel and Transportation	80,000
Allowances and Per Diem	63,600
Expendable Equipment and Supplies	187,525
Publications	40,000
Participant Training	58,000
Workshops, Conferences and Studies	443,000
Contingency	375,000
Allowance for Inflation (5%)*	255,100
Overhead (27%)*	799,600

Total	\$4,000,000 **
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* Includes inflation and overhead costs for USIAD Missions and Africa Bureau.

** \$1.3 million of this amount will be provided by selected missions as buy-ins.

BUDGET

Inputs/Activities (Network Startup & Implementation - \$000)

Activities	YEAR 1			YEAR 2			YEAR 3			YEAR 4			YEAR 5		
	S&T	Mission Buy-ins	Africa Bureau												
1) ICRAF Program Coordinators	50.0			40.0			30.0			20.0			10.0		
2) Mobilization/Organizational Country Visits	25.0														
3) AF Networking Workshop	36.0														
4) Country-specific Land-use Analysis			11.2												
5) Priorities Identification Workshop	40.55														
6) Training Course-Multi-purpose Tree Species Selection							46.0								
7) Network Strengthening-in-country operational costs & Technical Assistance	70.0	70.0			70.0			170.0			170.0			170.0	
8) Network Development Research & Coordination	70.0			90.0			80.0			80.0			80.0		
a) Research Coordinator	50.0			100.0			100.0			100.0			100.0		
b) Research Implementation/Technology and improved plant/seed material generation, equipment, and supplies	60.0	70.0	88.8	60.0	70.0	100.0		170.0	100.0		170.0			170.0	
9) Annual Network Meeting				16.0			16.0			16.0			16.0		
10) Information Exchange & Publications				10.0			10.0			10.0			10.0		
11) Evaluations							11.0						12.0		
SUBTOTAL	331.55	140.0	100.0	306.0	140.0	100.0	293.0	340.0	100.0	226.0	340.0		228.0	340.0	
12) Inflation (5%)	--	--	--	15.3	--	--	30.0	--	--	35.6	--	--	49.1	--	--
13) Contingency	75.0	--	--	75.0	--	--	75.0	--	--	75.0	--	--	75.0	--	--
SUBTOTAL	406.6	--	--	396.3	--	--	398.0	--	--	336.6	--	--	352.1	--	--
14) Overhead (27%)	109.8	--	--	107.0	--	--	107.5	--	--	90.9	--	--	95.1	--	--
* TOTAL	516.3	140.0	100.0	503.3	140.0	100.0	505.5	340.0	100.0	427.5	340.0	--	447.2	340.0	
GRAND TOTAL															\$4.0 Million

* Total amounts for the USAID Missions and Africa Bureau do not show the inflation rate of 5% compounded annually nor the 27% overhead rate. Both inflation and overhead are included in the annual totals, but these will be paid through S&T F/FRED project to facilitate bookkeeping, (i.e., payments to ICRAF for overhead and inflation will come from one source).

Budget Notes

- 1) ICRAF Program Coordinators. (Collaborative and Training).
- 2) Mobilization/Organizational Country Visits - a 2 week mission to each of the four countries of the zone to include the zonal coordinator, one ICRAF staff member, and participation by host countries nationals.
- 3) Multipurpose tree species development, agroforestry networking, and land-use analysis training:
(2 weeks in Kenya)
travel: 4 persons x 4 countries x \$500 =\$ 8000.
per diem: 4 persons x 4 countries x 10 x \$75 =\$12,000.
ICRAF staff - 20 working days
@ \$350/day =\$ 7000.
Interpreters - 20 working days
@ \$250/day =\$ 5000.
Report preparation: Zonal
Coordinator + 5 days ICRAF staff =\$ 2000.
translation \$20 page x 100 pages =\$ 2000.
\$36,000.
- 4) Country-specific land-use analysis:
including: Zonal Coordinator and
4 participants x 2 weeks in-country
travel (per diem) @ \$50/day x 4
countries =\$ 11200.
1 week report preparation w/assistance
of Zonal Coordinator in each country = N.C.
- 5) Priorities Identification Workshop:
same as item 4 above =\$ 40550.
- 6) Training Course: Multipurpose tree species
selection criteria propagation methods, and
genetic improvement techniques =\$46,000.

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- 7) Network Strengthening: including country-specific additional land-use systems analysis, site-specific case studies and location/country-specific problem identification led by the Zonal Coordinator w/input from ICRAF Program Coordinators, core staff, and other technical assistance brought in as needed by ICRAF. Estimated in-country operational costs are \$17500/country in the first year and \$10000/country/yr in the following 4 years = \$160000. Remaining S&T costs are for technical assistance, bringing total S&T contributions to \$400,000. Mission buy-ins for program development inside the 4 designated bimodal highland countries, as well as outside the targeted countries, is phased-in with \$70,000/yr. for the first two years and \$170,000/yr. for the last three years for a total of \$650,000 contributed by the Missions.
- 8) Network Development Research & Coordination:
 - a. Funding for the Research Manager provided by S&T at \$50,000 for the first year and \$100,000/yr for the remainder of the project.
 - b. Includes USAID Mission buy-ins for work to be done by ICRAF. Agreements to carry out these efforts should be based on mutual agreement between the Mission and ICRAF. This also includes costs for seed handling, seed storage and nursery equipment needed to grow seedlings for research. Large-scale, improved seed/plant material generation will involve the establishment of seed production areas and seed orchards, in collaboration with other donors, using in part end-of-year funds made available from AID/W. See separate sheets on: Research Coordination Costs.
- 9) Annual Networking Meetings: similar to Workshops but one week in duration = \$64,000 year.
- 10) Information Exchange - preparation of reports of major project meetings periodic research reporting, and newsletter preparation.
- 11) Evaluations, mid-term and final, involving two persons each.
- 13) Contingency, cooperator workshops, etc.

RESEARCH COORDINATION COSTS - (LOP - 5 years)

The following list is tentative and subject to modifications according to local needs and conditions.

<u>DESCRIPTION</u>	<u>\$ COST</u>
- <u>Research Manager</u> - (full-time) x 4 1/2 yrs @ \$100000./yr	\$ 450000.
- <u>Senior Counterparts</u> (4) - part-time-salary	HCC*
- <u>Senior Counterparts</u> (4) - <u>infield per diem:</u> 5 days x 3 trips x 4 people x \$50/day x 3 yrs	\$ 9000.
- <u>Cooperators Workshops</u> (twice/yr) travel: 12 persons x \$500 x 2 x 5 yrs per diem: 12 persons x 5 days x \$75/day x 2 x 5 yrs	\$ 60000. \$ 45000.
	Total \$ 564000
- <u>Collaboration w/other institutions</u> (National/ donor) to initiate in-country research for improved seed/plant material generation, and for seed production area and seed orchard establishment, and large scale production of seed/plant material.	\$494,800
	<u>Total \$1058,800</u>

*Host Country Contribution

APPENDIX 1. - Multipurpose Tree (MPT) Species
Woody Species Continuum

General

1. The steps outlined on the MPT Species Continuum are geared towards the production of improved seed/plant material needed for conducting species/agroforestry technology evaluation and to develop MPT selection criteria and provide selected trees that can be used for the establishment of seed/plant material orchards.
2. ICRAF will emphasize the aspects of this continuum leading to the development of species/agroforestry technologies, and will collaborate with other donors/institutions in the establishment and management of seed/plant material orchards geared towards the production of large quantities of improved seed/plant material.
3. Tree selection criteria for individual species will be based initially on specifications for MPT "idiotype(s)," derived from characteristics of agroforestry technologies designed to address prevailing land use problems.
4. A small number (5-10) of MPT species are to be selected, based on current knowledge available and local preferences, for conducting the research envisaged in this Cooperative Agreement.

Categories of MPT species

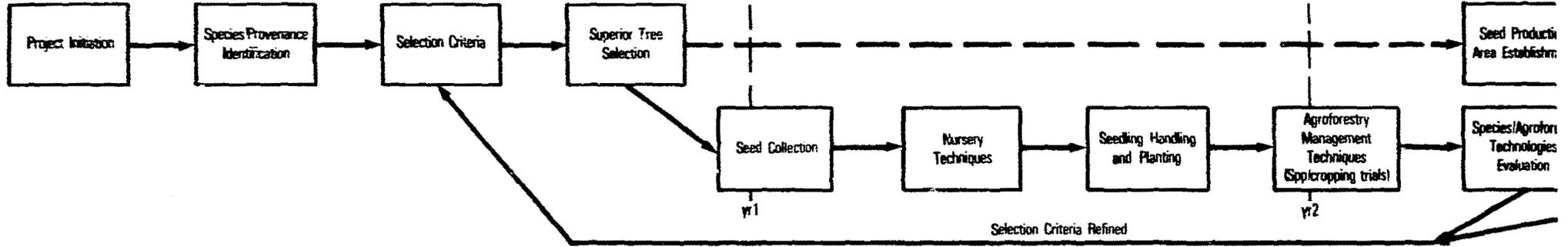
1. MPT species are divided into 4 categories.
 - a. Locally utilized, well-known species (indigenous or exotic);
 - b. Locally utilized, little-known species (indigenous or exotic);
 - c. Undomesticated native species with excellent potential;
and
 - d. Other untested exotic species with excellent potential.
2. Research phases for locally utilized, well-known species, are repeated in the other 3 species categories, but additional phases are added to each category continuum according to the amount of information that is available about a particular species. The research phases and approximate time frame needed to complete each category are as follows:
 - a. Locally utilized, well-known species (5 yrs);

- 1) Species/provenance identification (emphasis on provenances);
 - 2) Tree selection;
 - a) Selection criteria refined as additional data become available,
 - b) Seed/plant material production areas established based on needs, and
 - c) Seed/plant material collection.
 - 3) Cultural techniques using a limited number of agroforestry technologies and a limited number of species tested under specially developed experimental designs; and
 - 4) MPT species/agroforestry technologies evaluation.
- b. Locally utilized, little-known species (6 yrs).
- 1) Species/provenance identification.
 - 2) Tree and seed biology.
 - 3) Repeat phases as for 2a (1-4), above.
- c. Undomesticated native species with excellent potential (10 yrs).
- 1) Species/provenance identification.
 - 2) Species/provenance trials.
 - 3) Tree and seed biology.
 - 4) Repeat phases as for 2a (1-4), above.
- d. Untested exotic species with excellent potential (13 yrs).
- 1) Species/provenance identification.
 - 2) Species/provenance screening trials.
 - 3) Large-scale (1-2 ha) species/provenance trials using winners from d. 2).
 - 4) Tree and seed biology.
 - 5) Repeat phases as for 2a (1-4), above.

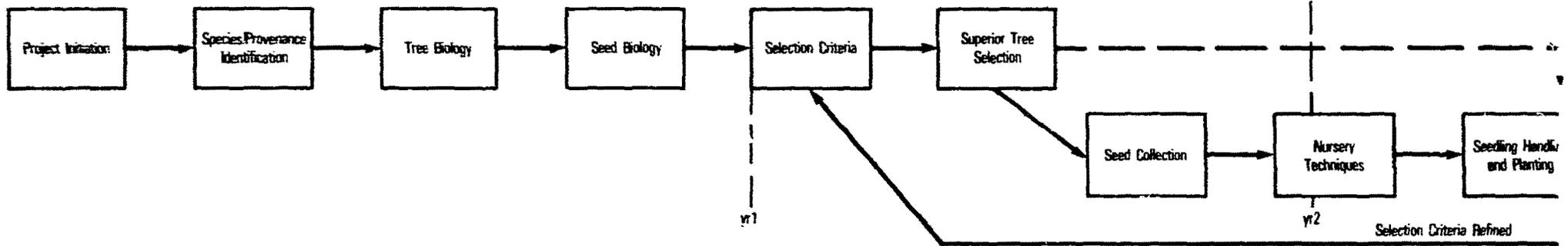
Figure 1. Tree Species Continuum*

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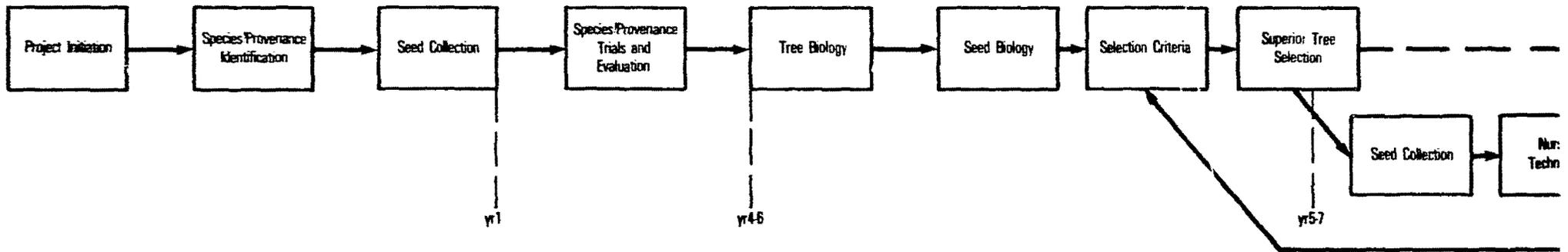
1. Locally Utilized, Well-Known Species, e.g., *Grevillea* (exotic); *Maesopsis* (indigenous)



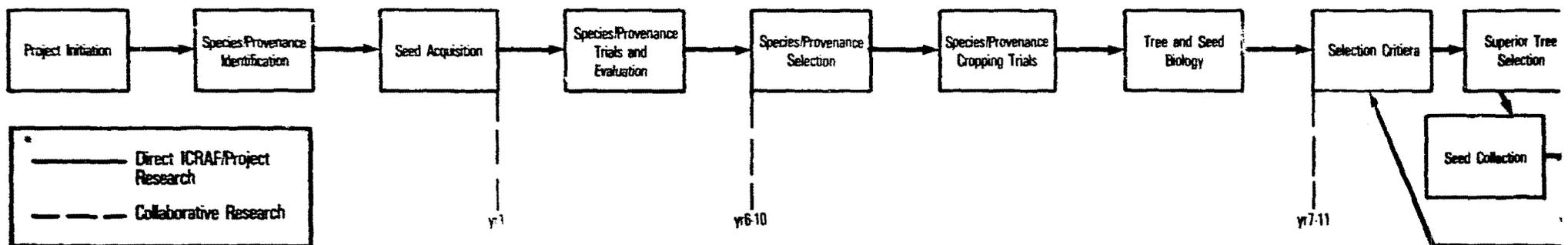
2. Locally Utilized Little-Known Species, e.g., *Erythrina* (indigenous); *Calliandra* (exotic)



3. Undomesticated Native Species with Excellent Potential, e.g., *Albizia* (exotic); *Markhamia*



4. Untested Exotic Species with Excellent Potential, e.g., *Leucaena*



*
 — Direct ICRAF/Project Research
 - - - Collaborative Research

