INSTITUTIONAL OPTIONS FOR ENTRY OF FORESTRY INTO THE CG SYSTEM

CGIAR/TAC Forestry Panel
Phase III

Discussion Paper for TAC 51 Meeting
to be held in Rome
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INTRODUCTION

1. This report, prepared for TAC 51 in Rome in March 1990, represents the culmination of a review, assessment and identification process started by the TAC in mid 1989, when the Chair appointed a TAC Forestry Panel to provide technical background to the TAC for its deliberations on an appropriate institutional mechanism for bringing forestry into the CG system. The Panel has produced five documents, including the present one. The four earlier papers are:

   - INTERNATIONAL AND REGIONAL ORGANIZATIONS AND NETWORKS INVOLVED IN TROPICAL FORESTRY RESEARCH: A STOCK TAKING, May 30, 1989. Phase 1 TAC Forestry Panel.

   - THE IUFRO SPECIAL PROGRAM FOR DEVELOPING COUNTRIES (SPDC): A STOCK TAKING. May 31, 1989. Phase I TAC Forestry Panel.

   - PRIORITY FORESTRY RESEARCH AREAS WITH POTENTIAL FOR INTERNATIONAL CENTRALIZATION. August 24, 1989. Phase II TAC Forestry Panel.

   - DEVELOPING INSTITUTIONAL OPTIONS FOR FORESTRY IN THE CG SYSTEM: A SUGGESTED PROCESS. November 28, 1989. Phase III TAC Forestry Panel. (Annex I attached summarizes some alternative institutional options that were put forward by the TAC Panel in the Novermber 28 paper as a starting point for discussion.)

2. The present paper is built on the results of these earlier assessments and on comments received from many experts worldwide concerning the conclusions and recommendations contained in them. Such responses were requested and received during each phase of the Panel's work.

3. This paper starts out by discussing the factors influencing the Panel's definition and choice of institutional options which it felt the TAC might want to consider for forestry research within the CG system (Chapter 1); taking into account the helpful suggestions and comments received from some of the 50 external reviewers of the Phase II Process Paper. (These comments are summarized in Annex II attached.)

4. In Chapter 2, it describes the five options which the Panel recommends for discussion by TAC 51 as under:

Option A	Regional CGIAR Agroecological Research centers (RARC's) with a Small International Center for Forestry Research (ICFR)
Option B	The Same Regional Agroecological Research Model without an International Center for Forestry Research
Option C	Three Stand-Alone Regional Forestry Research Centers Located respectively in Asia, Africa and Latin America
Option D	One International Forestry Research center with a "Trees as Commodity" Research Focus and Simultaneous Collaborative and Contractual Research Activities Supported Through Existing Lead Regional or National Research Centers in the Other Main Geographic Regions
Option E	An International Center for Forestry Research Supporting Existing Research Activity in the Regions through Contractual or Networking Arrangements with Existing Regional and National Institutions

5. Chapter 3 provides a preliminary assessment of the five options, based on a number of criteria and dimensions which the Panel, the TAC/CG Secretariats, and the extended experts panel felt were important in making a choice among alternatives (Annex III attached summarizes the Panel's own evaluation of the options.)

6. Parallel to this initiative, a separate paper is under preparation dealing with the topic of institutional options for agroforestry. TAC 51 will review the interface between forestry and agroforestry and recommend ways of ensuring effective linkages between these two areas of research.

CHAPTER 1

FACTORS INFLUENCING THE DEFINITION OF INSTITUTIONAL OPTIONS FOR ENTRY OF FORESTRY INTO THE CG SYSTEM.

1. During the first phase of this work (July-October 89), i.e., up to the point of defining the three institutional options set out in the TAC III Process Paper (summarized in Annex I attached), the main factors that significantly influenced the TAC Forestry Panel's approach to defining institutional options were:

   (a.) In the context of the donor community supported Tropical Forest Action Plan (TFAP), the earlier Bellagio II Task Force on forestry research had already provided a comprehensive global overview of forestry research needs incorporating the perceptions of some 80 developing country research institution scientific/administrators and of the main development agencies.

   (b.) Whatever the recommendations of the Bellagio II Task Force about the wide range of forestry research topics needed adequately to back the Tropical Forest Action Plan, it seemed unlikely that the CGIAR would be able effectively to cover all these research needs. A process had to be devised for identifying those selected research topics that could most benefit from centralization and CGIAR support. That was the main purpose of the exercise carried out in the TAC Forestry II Paper and reviewed by TAC in October 1989.

   (c) Many of the outside reviewers to whom the TAC II Forestry Panel Report was circulated (a wide range of donor, national research institutions and scientific interests) broadly subscribed to the initial selection of key research topics identified in the TAC II Forestry Paper. They were also endorsed by TAC as a whole during the ICW 89 review of the TAC II Forestry Paper Conclusions.

   Where reservations were expressed by a significant number of respondents about some of the suggested topics (e.g., the proposal in the earlier draft to include a discrete "New" biotechnology center for forestry), such topics were dropped from the later TAC III Forest Panel Process Paper.

(d.) Because several previous international forestry research meetings have focused on the need to strengthen national research capability and to develop regional research networks on high priority topics, earlier donor efforts have strongly supported that approach (particularly through support to the IUFRO/SPDC Program). For that reason, initial approaches to the CGIAR on forestry options continued strongly to pursue that model. However, early signals from TAC and some donor representatives suggested that the notion of a CGIAR forestry research institution(s) with no hands-on research responsibility and operated entirely through a subcontractual networking mode would find it difficult to maintain a high standard of scientific excellence and to ensure sustained CGIAR donor support.

(e.) Recognizing the already existing scientific talent in the CG System and the fact that several IARCs have already made a start (albeit rudimentary) in moving into either agroforestry or forestry research, it would be sensible in defining institutional options for forestry to consider building on these existing initiatives where possible;

(f.) In addition to seeking a consensus on the areas of forestry research that would benefit from centralization, it would also be necessary as part of the process to seek agreement on the range of appropriate functions for a CG forestry research initiative. Suggested functions were summarized in Option C of the TAC III Process Paper (See Annex I attached).

(g.) In general the above signals favored a move towards centralized global (or regional) CGIAR institutional support for forestry research on selected topics of significant relevance to developing countries. However, taking into account the wide range of agroecological site specific research issues in forestry and the fact that many respondents to the TAC II Forestry Paper and participants in the earlier Bellagio II Task Force continued to put very strong emphasis on the need to involve and strengthen existing national institutions, the TAC Forestry Panel considered it necessary to include an institutional option that would make it possible to combine these objectives. Option C of the TAC Forestry III Panel Process paper was an attempt to achieve that. It

envisaged a regional hands-on forestry research center(s) with strong linkages to well developed forestry research networks (such as the USAID-supported F/FRED and IDRC-supported Bamboo/Rattan networks in Asia).

Responses to the TAC Forestry III Process Paper

2. The main purpose of the TAC Forestry III Process Paper circulated in December 1989 was to share with a wide cross section of research scientists and donors the TAC Forestry Panel's initial thinking on the three institutional options summarized in Annex I attached and to make this a more transparent process. The prospects for a speedy and productive conclusion to this debate on institutional options for forestry are likely to be enhanced, if the main supporters of the CG System and their technical advisors have been given opportunity to contribute to the dialogue and can be satisfied that their views have been adequately taken into account.

3. The 50 extremely helpful responses to the paper received between mid-December and mid-January 1990 (summarized in Annex II attached) reinforce some of the earlier premises outlined above but also suggest the need for some significant modifications to the three tentative institutional options outlined in the Process paper. Specifically:

4. In relation to OPTION A (All forestry to be built into the Programmes of the existing IARCs):

Despite the fact that no respondents felt that this option on its own could adequately meet forestry research needs, many felt that IBPGR in relation to woody germplasm conservation[1] and enhancement and IFPRI in relation to forestry policy could become focal points for forestry research on those topics. Similarly several reviewers commented they would favor building on the existing agroforestry activities of IITA, ILCA, CIAT and ICRISAT. ISNAR's potential role was less clear but at least two reviewers argued for ISNAR to become involved in evaluation of national forestry research programs, research methodology and training.

5. In relation to OPTION B (merging of forestry and agroforestry research under one roof in ICRAF)

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[1] With the exception of strong reservations from FAO (see Annex II p.22)

5.1 None of the respondents favored the concept that all centralized CGIAR forestry supported research could be integrated with ICRAF. There were two main concerns: (a) several argued that ICRAF already has its hands full developing its own agroforestry research programs. To try to graft forestry on top of that would overload the institution; and (b) ICRAF's management has several times in the past expressed concern about the need for ICRAF to retain an agricultural/multi-disciplinary bias. There has been some apprehension that if merged with forestry, ICRAF's independent agroforestry focus would become too diluted by technical forestry thinking and expertise.

5.2 Having said that, many reviewers commented that they perceived the need to maintain very strong linkages between forestry and agroforestry research. Some went as far as to say that developing such linkages is <u>essential</u> if tropical forestry research and agroforestry research needs are to be adequately served. Some reviewers argued that in the event that the CGIAR opts for setting up a centralized Tree Research Center as a focal point for forestry research in the CG system (one of the options discussed later in Chapter 2), then there could be substantial advantages in locating such a center on the same site as ICRAF.

5.3 A specific task of TAC 51 scheduled for March 90 will be to discuss this issue of the interface between forestry and agroforestry research. A separate paper on institutional options for agroforestry is in preparation.

6. <u>In relation to OPTION C (the stand-alone forestry research option)</u>

6.1 More than half of the respondents commented that whilst they liked the idea of an independent, centralized forestry research center (as one component of a broad based forestry research system), they felt only one would be quite inadequate and they argued strongly for at least three such regional centers, one in each of Asia, Africa and Latin America. However many recognized that limitations of funding may constrain immediate establishment of three forestry centers. If the system has to start with one center it should preferably be located in a country which contains a wide range of agroecological zones so that hands on research related to natural forest management and tree breeding and improvement of multipurpose species could be conducted over a range of forest types and key multipurpose species.

6.2 Opinions on the main focus of such a single initial center varied quite significantly. Some (particularly in CGIAR)

argue that it should focus on hands-on research in areas that are likely to demonstrate early pay off. For example this initial center might be based on a "Trees-as-a-Commodity" concept with research focussed on the basic biology of trees and ways of increasing their productivity as components of fuelwood, agroforestry, industrial or land reclamation schemes. Others argue that this central forestry center should play mainly a servicing/information/training role. Obviously these two options are not mutually exclusive and a combination of the two could be one possible way to go.

6.3 In developing arguments in favor of more than one center, several respondents emphasized the advantage of closely linking forestry research with other regional and/or agroecological zone focussed agriculture, land use, and ecosystem conservation research. This same issue of how effectively to integrate natural resource management/conservation research (e.g., soil, water, forestry, fisheries into the CG System) has surfaced several times in recent months in the context of the Non-Associated Centers debate.

6.4 One option currently being discussed by some members of TAC is whether this could most effectively be done by incorporating such research activities into several existing (or new?) CGIAR-supported regional/agroecological multi-disciplinary research centers (RARC's). Such centers would have no commodity mandate. The assumption is that parallel to these RARC's there would be retained in the CG System strong commodity-oriented centers working on specific crops such as rice, wheat, roots and tubers, vegetables, animals (and possibly trees).

6.5 Clearly this is a "radical" option since it would imply considerable restructuring of much of the existing CG System. Nevertheless the TAC Forestry Panel sees some obvious advantages in linking both forestry and agroforestry research into several regional/agroecological specific CG centers and for that reason has included such an option in its revised list of institutional options in Chapter 3 below.

6.6 There was almost complete agreement from the 50 reviewers on the suggested <u>functions</u> of a CG Forestry Research Entity as defined in Option C (namely the importance of the institution(s) undertaking the functions of information data base collection, dissemination, monitoring of research quality, research training, and provision of a central focal point within the CG System for forestry research).

6.7 Many respondents reiterated the importance of directly involving national institutions and strengthening of forestry research networking activities (a topic discussed in more detail in para. 7 below). Strong arguments were developed by one respondent (Nyle Brady) for creation of Technology Generation Centers in existing national research institutions carrying out CGIAR-supported research on high priority topics with central backing from IBPGR and IFPRI.

6.8 On a more general level, several reviewers emphasized the importance of strong linkages between CGIAR-supported forestry research and that being conducted by other lead agencies, particularly IUFRO (these were identified in the TAC I Forestry Panel Paper).

6.9 Finally, several reviewers drew specific attention to the potential for mobilizing greater private sector support to contribute to forestry research (the CAMCORE model was cited as one good example of an existing largely private sector-funded research network). The well-publicized tree breeding program of the Aracruz Company in Brazil is a second example. There are many others, particularly in the area of forest products utilization. How effectively to link CGIAR and private sector supported forestry research will be an issue for discussion in TAC 51 and further ideas on that issue will be developed beyond that meeting.

7.0 CGIAR Involvement in Forestry Research Networks

7.1 In reviewing networking options, the TAC Forestry Panel was significantly influenced by a paper recently prepared for the TAC subcommittee on the Interface between IARCS and NARS[2] and the discussions of that subcommittee which took place in Washington between January 10 and 12.

7.2 The paper defined various types of networks as under:

> "Centre involvement with national systems will either involve an IARC in contributing resources (funding, technical assistance, etc.), or it will not. Let us first define those that do not, as "collaborative" relationships, whether they are concerned with research, training, the flow of information, or some other activity. Then, other relationships that are not "collaborative" will, by definition, involve the provision of resources. Let us define these as either "contracting" arrangements or "enabling."

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[2] Activities and Modes of Operation within the CGIAR System: Options for the Future. Revised Draft 7.1.90

7.3 Under a contracting arrangement the center will fund (from core or extra-core sources) a particular piece of research, or a training project that is within its mandate and forms part of its approved programme. Under an enabling arrangement the center might contribute personnel (i.e., technical assistance), capital, or recurrent costs to enable a national system to do its own research or training in the center's mandated area, or to enable it to participate in a collaborative or contractual relationship.

7.4 These definitions can be applied whether the center is involved with an individual national system, or with a group of national systems in a networking mode. Consequently, similar principles will broadly apply to both sets of circumstances."(3)

8.0 Collaborative Networks

8.1 There are compelling arguments for CGIAR strongly supporting 'collaborative' forestry research networks. This is in fact a mode that has been successfully used by IUFRO in developed countries for many years. The problem in applying this formula to forestry research networks in developing countries is that many national research institutions lack the financial resources that would enable their scientists effectively to participate in such collaborative research arrangements. The formula described on page 7 of the TAC Modes of Operation Paper (that has been developed by ACIAR for funding collaborative research between developed and developing country scientists) is one obvious way around that dilemma. If a CGIAR Forestry research entity (ies) comes into being, then in would be useful if its budget could include a fund that could be used specifically for financing developing country scientists more regularly to participate in collaborative forestry research activities with CG Centers.

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[3])Since drafting this section some TAC/CGIAR reviewers have expressed concern that this classification may be too rigorous because in practice some networks combine two or all three of the above functions. However for the purpose of this report the TAC Forestry Panel found this a useful classification as a starting point for discussion. The qualifications introduced in paras. 10.1 and 10.2 below are intended to take into account the need for a flexible interpretation of the above suggested network classification.

9.0 Contractual Research Networks

9.1 There are also strong arguments in favor of CGIAR support for contractual research networks. An example might be a subcontract drawn up between a CGIAR forestry research entity located, say, in the Asia region and Winrock which currently manages the F/FRED multipurpose tree breeding and improvement network in that region, or with the CSIRO Australian Tree Seed Center which already has a well established developing country network relating to tree species of Australian origin.

10. Enabling Networks

10.1 In relation to enabling networks, the TAC Forestry Panel identified at least two quite different situations. If for example a "modest" level of CGIAR forestry research scientific staff support were to be needed to help plan, initiate and monitor a network in a situation where most of the research institutions participating in the network already possess a reasonable level of scientific capability and can contribute to the network objectives to a significant degree, then direct CG involvement would, on the one hand, ensure a close linkage between upstream and adaptive research and help strengthen capability of the weaker institutions of the network and, on the other hand, need not be overdemanding of CG staff resources or technical assistance input needs.

10.2 By contrast, there will be other situations (such as that which existed at the time of designing the proposed IUFRO/SPDC Tree Breeding Network Program for the Sahel Sudanian zone) where it appeared that only two out of the participating nine research institutions in the region really possessed strong scientific capability in this area. It will require a very heavy input of funding and sustained technical assistance over many years to strengthen national research capability up to the point in time where these weaker national institutions will be able effectively to contribute to the network objectives.

10.3 Under this latter scenario there could be advantages in looking outside the CGIAR System for the possibility of obtaining separate donor support to finance other agencies (such as for example FAO, IICA or CORAF?) to take on this work. Clearly this would not preclude the possibility of a close association between regional CGIAR Centers and such non-CG operated networks (there could be collaborative arrangements at a Steering Committee level and in relation to exchange of germplasm, etc).

10.4 This latter arrangement of encouraging other agencies to retain a major responsibility for strengthening of national institutions would relieve CG of the financial responsibility of developing such networks and avoid the risk that the CG System would lose its scientific focus and capability to deliver research results if it were to become too heavily involved in "developmental/technical assistance" as opposed to "research" activities.

10.5 The weakness of this approach is how to ensure that high priority research activities to be undertaken by national institutions without CG involvement will secure adequate and sustained funding? The past history of the IUFRO/SPDC program for example suggests that unless there is a very well developed mechanism at the regional level for mobilizing such funding, much research and necessary technical assistance for institutional strengthening will remain underfunded.

10.6 A key point in this debate is that some bilateral agencies have expressed their willingness and intention to continue directly supporting national research institutions. Similarly, FAO has expressed a strong interest in maintaining a significant role in the strengthening of national research institution capabilities, as for example it plans to do in relation to the FORSPA forestry network in the Asia region.

CHAPTER 2

INSTITUTIONAL OPTIONS REDEFINED

1. Based on the earlier analysis in Chapter 1, the TAC Forestry Panel has defined the five institutional options that would most effectively capture the range of concerns outlined above. TAC members are invited to review these and to be prepared at the TAC 51 meeting in Rome in March to reach a decision on the most favored option.

2. Dependent on the outcome of that meeting, the most appropriate option would be further developed prior to the mid-term CGIAR review meeting scheduled for The Hague on May 21-25 19 90 at which the donors and CG System as a whole will be invited to review this analysis and to endorse TAC's recommendations.

3. The five options proposed for TAC discussion are as under:

Option A	Regional CGIAR Agroecological Research centers (RARC's) with a Small International Center for Forestry Research (ICFR)
Option B	The Same Regional Agroecological Research Model without an International Center for Forestry Research
Option C	Three Stand-Alone Regional Forestry Research Centers Located respectively in Asia, Africa and Latin America
Option D	One International Forestry Research center with a "Trees as Commodity" Research Focus and Simultaneous Collaborative and Contractual Research Activities Supported Through Existing Lead Regional or National Research Centers in the Other Main Geographic Regions
Option E	An International Center for Forestry Research Supporting Existing Research Activity in the Regions through Contractual or Networking Arrangements with Existing Regional and National Institutions

Common Elements in the Four Options

4. Before describing the differences among the options, it should be pointed out that they all, at this stage, include

certain elements in common. For example, among the priority research areas considered, tree improvement, soil microbiology, policy, natural forest management and conservation research are areas that should all receive some form of support regardless of what institutional option is chosen.

5. Secondly, all of the above options assume that IFPRI, IBPGR, and ISNAR would be reorganized/expanded to take forestry into account in their respective areas of expertise--policy research, germplasm conservation, and research management training and technical assistance. The reasoning behind the decision to include forestry in these existing CG institutions relates to cost effectiveness, technical complementarities, and the existence of opportunities for both agriculture and forestry to benefit from interaction and consolidation of the functions of the above centers.

5.1 Third, there is an underlying assumption for all five models that they would all develop collaborative and contractual research activities with existing regional or national institutions . Depending on the nature and potential strength of participating institutions there may be a case for CGIAR support to selected enabling networks.

The key features of each option are summarized in Table 1 attached.

Option A:

REGIONAL CGIAR AGROECOLOGICAL RESEARCH CENTERS (RARC's) WITH A SMALL INTERNATIONAL CENTER FOR FORESTRY RESEARCH (ICFR)

6. This option involves establishment of:

(a.) Forestry research components within each of several broader regional/agroecological research centers (RARC's) that would provide a research focus for regional natural resource and land use issues, including those related to soils, water and watershed management, forests/trees and farming and other issues. The assumption is that some of the existing centers such as CIAT, IITA, ICARDA and ICRISAT would over time be transformed into RARC's, incorporating a forestry and agroforestry dimension. Dependent on further review of this option, it may prove necessary to consider at least one new RARC for the S.E. Asia region humid, wet tropics where currently there is no CGIAR center with a multicrop/agroecological mandate.

(b.) These RARC's would be complemented by a small international center for forestry research (ICFR) that would provide focus to forestry within the CG system and would be involved globally with functions that do not fit specifically within a regional agroecological framework.

Regional Agroecological Research Centers (RARC's)

7. The RARC's would have strong forestry/and agroforestry components that would:

(a.) carry out hands-on research in the areas identified in the TAC Forestry Panel II and interim Panel III reports. The main categories of research would include, for example:

- woody germplasm conservation and enhancement (in association with IBPGR);

- tree breeding and improvement research (species selection, provenance trials, clonal propagation and breeding (e.g., for drought conditions, disease and insect resistance, etc.); special reference would be given to work on multi-purpose trees for fuelwood, fodder, industrial uses and for reclamation of degraded lands (e.g., saline sites or imperata grassland).

- soil microbiology, soil/nutrient relationships (particularly mycorrhizal associations);

- natural forest management (silviculture for natural forests/productivity, natural forests for multiple products, alternative multipurpose utilization and management systems, and in close collaboration with IFPRI, research on the socioeconomics of natural forest management and conservation and related policy issues);

- agroforestry/silviculture (crop/livestock/tree interactions, socio-economics of trees in farming systems, management options for trees in farming systems;

- watershed management (in this area, forestry would be one component in a broader research program focusing on physical/biological and economic/social issues related to land use/water management.

(b.) develop collaborative and/or contractual research relationships in the above areas of research with leading existing national/regional forest research institutions;

TABLE 1 – MAIN COMPONENTS OF THE FIVE OPTIONS CONSIDERED

OPTION A	OPTION B	OPTION C	OPTION D	OPTION E
Participation of IFPRI/IBPGR/ISNAR	Participation of IFPRI/IBPGR/ISNAR	Participation of IFPRI/IBPGR/ISNAR	Participation of IFPRI/IBPGR/ISNAR	Participation of IFPRI/IBPGR/ISNAR
RARC's (eventually 6 - 10)	RARC's (eventually 6 - 10)	RFRC's (minimum of 3)	one IFRC	one ICFR
one ICPR	—	—	Add-on investment in existing national/regional research centres (non-CG);	add-on investment in existing national/reg. centres (non-CG);

RARC's - Regional agroecological research centres would provide a CG regional research focus for priority regional natural resource and land use issues. They would carry out hands-on research on such topics, including those related to soils, water and watershed management, forest/trees and farming/agroforestry and other land use systems. They would focus on issues related to the emerging concern with the sustainability of technology advances made in traditional isolated sector and/or commodity (agriculture, livestock, forestry) research centres. As regional centres, they would become involved with training, national research institution building, regional networks, data base management and contract/grant research in the regions.

RFRC's - Regional Forestry Research Centres would carry out hands on research on a select number of key regional forestry research topics, with a likely focus on a) tree improvement research, and b) natural forest management and conservation research. These would stand-alone centres that focus entirely on well-defined forestry research topics. The focus would primarily be on productivity of natural forests and plantation species for multiple purposes or outputs (goods and services). As regional centres, they would become involved with training, national research institution building, regional networks, and data base management.

IFRC - International Forestry Research Centre would be involved with hands-on research focusing initially, at least, on basic tree biology and tree improvement research; eventually it might get into natural forest management, ecology and conservation research. It also would provide a central focus for CG activity in forestry and would be involved in training, contract and grant research in existing national and regional centres, training, national research institution building, regional contract and collaborative network, and data base management.

ICFR - International Centre for Forestry Research would not carry out hands-on research; it would be involved with functions that do not appropriately fit within any of the RARC's. It would provide central focus for CG forestry related activity; in Option E, it would have expanded functions which would include a heavy emphasis on contract and grant research in existing national and regional centres, training, national research institution building, regional networks, and data base management

(c.) identify, initiate, support a few selected high priority enabling network activities in the regions. Direct CGIAR involvement in enabling networks would only be applied in situations such as those described in para. 10.1 of Chapter 1. It would not be applied in situations as described in para. 10.2;

(d.) get involved with training activities of various sorts in the regions served;

(e.) develop and maintain a forestry research data base and associated services, both for the region and for international use.

International Center for Forestry Research (ICFR)

8. The ICFR would not perform hands-on research. Rather, it would be involved with functions that do not appropriately fit within any one of the RARC's. It would provide a central focus for CG forestry activity and would:

- initiate and maintain a central data bank for use globally, e.g., in the area of data on species trials of various sorts, seeds, availability, etc;
- provide a central information clearing house function for forestry research;
- bring RARC forestry researchers together periodically to develop research strategy and to look at overlaps in RARC research, complementarities, potentials for spill-overs from one RARC to others.
- identify, initiate, fund and manage international networking activity which does not fit specifically within the jurisdiction/context of one of the RARC's (e.g., NFTA type networks); such network activity would be contracted to other agencies;
- work with IFPRI, IBPGR, ISNAR and other groups in facilitating their work that is of a multi-regional nature.

9. Some of the more obvious pros and cons to this RARC/ICFR option are:

- It would provide a more holistic approach to forestry and agroforestry within the overall context of land use and natural resource management and conservation (such as envisaged by Bellagio II reports and recommended strongly by

a number of reviewers of the preliminary discussion draft of TAC Forestry Panel III report ,--see Chapter 1, para. 6.3).

- It would take care of the concerns of many reviewers of earlier TAC Forestry Panel drafts that forestry and agroforestry should be closely integrated.

- It would avoid the need for some investment in separate "bricks and mortar" as would be needed for Option C below which envisages new centers that focus exclusively on forestry (nevertheless there would still be the need for some investment in expanded facilities at existing CG centers).

- Through the ICFR, it would provide a central focal point for forestry in the CG System; and a logical means for taking care of high priority functions that do not properly fit within a regional context (thus avoiding possible duplication of effort among RARC's).

9.1 An option which might be considered further along, when the agroforestry analysis is completed, is the idea of a combined forestry-agroforestry center that would perform the information, training and networking activities envisioned above for the ICFR as well as centralized activities which the agroforestry panel identifies for agroforestry. This would ensure integration of forestry and agroforestry research both at the regional and global levels.

9.2 Notwithstanding the obvious attraction of the ICFR component to the forestry community, it has to be acknowledged that the component runs counter to the views expressed by TAC and some donors that they have not been enthusiastic so far about a CG Forestry Institute that plays only a "servicing"/coordinating/brokerage role i.e., no hands-on research functions (see Chapter 1, para. 1(d)).

One variation of this ICFR model that could take into account some of these concerns would be to combine the functions of ICFR as defined above with the creation of a centralized "Trees-as-a-Commodity" research institution carrying out activities as further described in Option D below (para. 14).

Option B

THE SAME REGIONAL AGROECOLOGICAL RESEARCH CENTER MODEL WITHOUT AN INTERNATIONAL CENTER FOR FORESTRY RESEARCH

10. Taking into account possible reservations as set out in para. 9.2 above, this option would be exactly the same as A, except that no ICFR would be created. Instead all necessary

functions would be divided among the RARC's, with some of them having to take on global functions in addition to regional/agroecological functions.

Most of the points raised for Option A would be relevant here, except:

- this would be a lower cost option, since no ICFR would be created;
- it would not provide a central focus for forestry in the CG system.

Option C

THREE STAND-ALONE REGIONAL FORESTRY RESEARCH CENTERS LOCATED RESPECTIVELY IN ASIA, AFRICA AND LATIN AMERICA

11. This option which is a further development of Option C in the TAC Process Paper (see Annex I) involves establishment of stand-alone regional forestry research centers (RFRC's) that would:

- carry out hands-on research in the same areas listed for the RARC's in para. 7(a) above, but excluding agroforestry and watershed management;
- support research on high priority topics in national and other regional organizations with grants and contracts, mainly through a collaborative and contractual mode.
- provide training for national researchers and research managers;
- organize and manage a forestry research information and dissemination service.

12. Given the concerns expressed by many of the respondents to the TAC III Process Paper about the limited geographic coverage of this model as it was defined in the earlier version of the TAC III Process Paper (See Chapter 1, Para. 6.1) this option envisages starting with three regional centers, i.e., one in each of the Asia, African, and Latin American regions. These could be located so as to cover a range of agroecological zones, e.g., South East Asia (wet, humid tropics), Africa (arid, semi-arid), Latin America (humid, warm or upland, cool tropics). As in the case of the other options, Option C envisages the reorganization/expansion of IFPRI, IBPGR and ISNAR and

involvement in networking activity as mentioned in para. 5.1 above.

13. With regard to this option:

- It would provide a focal point for regional forestry research and would make forestry a clearly identifiable entity. (This is something which many forestry researchers and administrators would like to see. Many fear that merely by linking forestry into the broader CG System forestry will be subsumed by agriculture.)

- It would include hands-on research in a limited number of areas identified as priorities by Bellagio II.

- It would provide the maximum opportunity for early interaction between CGIAR forestry and national forestry research institutions.

Conversely:

- It would not provide for the integration of agroforestry research with forestry research, nor would it adequately cover the issues associated with arid land use management and watershed management.

- It would be the costliest of the five options, requiring a bricks and mortar investment in 3 new centers (unless it proves possible to absorb an existing national institution).

Option D

ONE INTERNATIONAL FORESTRY RESEARCH CENTER WITH A "TREES-AS-A-COMMODITY" FOCUS AND SIMULTANEOUS COLLABORATIVE AND CONTRACTUAL RESEARCH ACTIVITIES SUPPORTED THROUGH EXISTING LEAD REGIONAL/NATIONAL CENTERS IN THE OTHER MAIN GEOGRAPHIC REGIONS

14. This option would involve establishment of one international forestry/tree research center (IFRC) with a "Trees as a Commodity" orientation as per Chapter 1, para 6.2). This IFRC would work on basic biology of trees and tree improvement research (species selection, provenance trial support to national institutions, vegetative propagation and breeding, soil microbiology and soil nutrients, nursery management). Dependent on further discussions, there may be a case for combining those functions with those proposed for the ICFR as set out in paras. 8 and 9.2 above.

14.1 This model envisages the CG investing (through contracts and grants) in complementary activity in other, existing, research institutions, particularly in regions other than the one in which the IFRC is located. For example, if the region chosen for the IFRC were Africa, then activity in Asia might involve investment in an expansion of the F/FRED and IDRC bamboo/rattan networks, or subcontractual work with e.g., the CSIRO Australian Tree Seed Center, and expansion in Latin America of CIAT's and CATIE's work to include more forestry/agroforestry components. If the chosen region for the IFRC were Asia, then the CG might do as above for Latin America and invest in establishing forestry research capacity in ICRAF or expanded work on forestry with IITA.

The center would initially focus on basic tree breeding research, but might eventually become involved with natural forest management, ecology and conservation research.

15. The advantages of this option would be:

- a strong case has been made by many reviewers of the TAC II Paper for centralization of basic biological research on trees. Such a commodity oriented tree research center would in the same manner as other CGIAR commodity centers provide a focal point for upstream scientific research on trees as components of fuelwood, fodder, wasteland reclamation and industrial development projects.

- it provides for simultaneous and early support for forestry research in all regions.

- It satisfies the forestry community's aspirations to retain a clear identity for forestry.

- It makes good use of some of the existing research capacity/facilities.

Conversely:

- It fails to integrate forestry with agroforestry and with broader land use research issues.

- Several reviewers questioned whether a single Tree Research Center can effectively meet global needs. To be effective, a single commodity-oriented Tree Research Center would have to have the flexibility to develop strong contractual arrangements as defined in para. 14.1 above. The issue is whether a CGIAR center with a high degree of dependence on subcontractual research can ensure high standards of scientific excellence and useful research output?

Option E

AN INTERNATIONAL CENTER FOR FORESTRY RESEARCH (ICFR) SUPPORTING EXISTING RESEARCH ACTIVITY IN THE REGIONS THROUGH CONTRACTUAL OR NETWORKING ARRANGEMENTS WITH EXISTING NATIONAL INSTITUTIONS

16. This option is based on the earlier IUFRO/SPDC model but with the difference that the ICFR would become more directly involved in organizing funding and managing network activities and research contracts. It envisions that the ICFR would not carry out hands on research. Rather it would:

- provide focus for CGIAR activity related to forestry;
- develop linkages with leading national and international research institutions; including IARC's;
- fund research through contracts and grants
- monitor and evaluate research progress and output;
- be involved in dissemination of research results;
- organize, fund, and oversee research network activity;
- develop and maintain a forestry research data base and associated services;
- work with ISNAR in providing support for building up national research capacity;
- train research administrators and researchers;
- process, present and control budgets.

17. As in the case of Option D, it could involve add-on investment in existing programs such as CATIE, ICRAF, and ICIMOD; in networks such as F/FRED, IDRC, ACIAR networks; and in strong national research programs. The ICFR would essentially act as a broker and in some cases a contractor for forestry research.

18. On the positive side:

- It would provide focus to CG activity;

- It would provide for the functions which are widely agreed upon as being needed in any CG activity in forestry and it would respond to the widespread recognition that much of the necessary forestry research in the tropics is agroecological site specific.

- It would make maximum use of existing regional and national research programs and help to increase their effectiveness.

- It would be a low cost option.

Conversely:

- It runs counter to the consensus expressed by TAC and some donors that such a loosely structured, subcontractual research system would find it difficult to maintain high standards of scientific excellence and to ensure sustained CGIAR donor support (see Chapter 1, para. 1(d)).

- It would less effectively link forestry and agroforestry than the RARC options defined in A and B above.

CHAPTER 3

EVALUATION OF INSTITUTIONAL OPTIONS FOR ENTRY OF FORESTRY INTO THE CG SYSTEM

1. In approaching this topic and attempting to accommodate the wide range of concerns expressed by the reviewers of the earlier Process Paper (see Annex II), the TAC Panel has been mindful of Abraham Lincoln's observation[4] that,

   "While you can please some of the people some of the time, you can't please all of the people all of the time"!

2. Perceptions of the most favorable of the five options discussed in Chapter 2 are likely to differ sharply between, for example:

   - Donors, many of whom are currently responding to strong environmental pressures to increase development aid support for forestry and other natural resource conservation, who would probably find options such as "A" and "B" appealing since they address broad issues of forest/land use/management and environmental concerns in the context of a fairly wide range of regional/ agroecological zones;

   - Developing country research institution administrators, who would be understandably concerned to secure additional resources and external support for subcontractual or networking research activities which offer promise to strengthen the capability of their own existing institutions. Seen from that perspective they would probably most favor Option "E";

   - The Forestry Community (including e.g., practicing foresters in the developing countries and technical advisers from the aid agencies), who might be expected to lean towards an option that gives the clearest identity and greatest level of financial support to discrete forestry research institutions (e.g., Option "C").

3. While the TAC Forestry Panel has been mindful of such interests, it has focused this preliminary evaluation on criteria that are more likely to reflect the emerging long term Strategies and Priorities of the CGIAR system in the area of Forestry and the likely concerns of the CGIAR sponsors. In broad terms these criteria relate to:

---

[4] Somewhat modified.

(a) A need to ensure that whatever option is selected offers the best assurance for rapid development of scientific capability and a sustained standard of scientific excellence;

(b) A concern of the CGIAR system to produce early and tangible research results that will impact a large number of disadvantaged developing country people and contribute to improved quality of life (e.g., through more ready access to fuelwood supplies); to sustainable agricultural productivity (e.g., via improved on-farm tree management or the incorporation of leguminous trees into farming systems); to increased rural incomes (e.g., via trees grown as cash crops) or to protection of the underlying natural resource base (e.g., forest soils, water supplies).

(c) The CGIAR's objective of developing strong linkages between IARC's and existing national research institutions with emphasis on rapid adaptation and adoption of emerging technologies and on training of national research scientists.

4. Taking into account such CGIAR-driven perspectives, the criteria summarized below were adopted by the Panel as a starting point for discussion and evaluation the five options. This first cut at a possible approach to evaluation and ranking of the options is in no way intended to preempt TAC's debate of this issue. The purpose is merely to provide a framework for discussion and a preliminary view of the Forestry Panel's assessment of the options. TAC may want to develop an alternative or expanded list of criteria.

4. A common feature of all five options is that, as indicated in Chapter 2, IBPGR, IFPRI and ISNAR will all take on added forestry related activities in their respective areas of specialization.

6. Suggested Criteria for Preliminary Assessment of the Institutional Options

A. Minimum Cost Considerations

- Likely minimum required initial investment cost ($ million)

- Likely minimum annual operating cost to make the option effective ($ million)

B. Evaluation Criteria

Effectiveness in Terms of:

- Rapidly achieving and maintaining a high standard of scientific excellence.
- Involvement in hands-on research.
- Coverage of key researchable forestry problems in major agroecological zones as defined in the TAC Forestry Panel II Paper.
- Achieving early research results that will positively affect a large number of developing country people.
- Making a positive contribution to containing deforestation, sustainable land use and ecosystem conservation.
- Effective integration of forestry and agroforestry.
- Giving a clear identity to and a central focus for CG forestry research.
- Involvement with existing IARC's.
- Involvement with other existing national or regional research institutions.
- Developing and managing productive networks.
- Providing international data base management services.
- Training researchers.
- Flexibility in relation to evolving CGIAR structure.

Note: Scale of 1 (low/poorest) to 5 (high/best)

7.0 Summary of Panel's Conclusions

7.1 The Panel's evaluation (see Annex III) gave the highest rankings to the regional/agroecological Option "A" and to Option "D" (the Trees-as-a-Commodity research Center).

7.2 Of the two regional/agroecological approaches, "A" had the edge over "B" because it included provision for an ICFR that could provide a focal point for forestry in the CG system.

7.3 The main factors that make "A" an attractive option are:

(a) The fact that this option makes provision for early and simultaneous application of hands-on forestry and agroforestry research in several different regional/agroecological zones and presents the best opportunity for dealing with the wide range of forest types, species that are important for developing country forestry and agroforestry;

(b) The fact that this option closely integrates forestry research with other areas of natural resource conservation and land use management (soils, water resources, watersheds, etc.).

(c) The fact that forestry would have the possibility of building onto existing scientific capability in the existing CG system (assuming that some of the existing CG centers would be restructured to become RARCs). This should help to ensure a build-up of a minimum critical mass of high quality scientific expertise.

(d) This would be a lower capital cost option than Option "C" (the Stand Alone Forestry Centers Option).

7.4 Notwithstanding the above conclusion, the Panel recognizes that Option "A" (and also "B") are based on the premise that there would need to be a radical restructuring of the CG system, before forestry could be incorporated into the RARCs work programs. It seems possible that the debate about the desirability of such a restructured CG will take time. It could feasibly be spread over a period of several years. There is also a possibility that the notion of such a radically restructured CG system might not find favor with the CG's donors and therefore RARCs might not materialize at all.

7.5 For these reasons the Panel reviewed the other three options, "C," "D" and "E," from the perspective of choosing that which would allow an early start to be made on forestry research within the system but which would leave considerable flexibility to move in the direction of more regional oriented research at a later stage.

7.6 Dealing first with Option "E," this presented the Panel with the problem that it depends on subcontracted research with the central ICFR playing more of a "coordinating" role with little or no "hands-on research" capability. Given the poor prospects for maintaining a high standard of scientific excellence and sustained donor support for such a loosely-structured networking approach, the Panel would be inclined to reject this option.

7.7 In relation to Option C (the Stand Alone Regional Forestry Center model), despite the obvious attractions of that model to the Forestry Community the Panel has some doubts about the likely readiness of the CGIAR donors to support from the outset such a major capital intensive entry by forestry into the CG system. The minimum "bricks and mortar" cost alone of this option is likely to be in the range of US$60 to US$100 million.

7.8 By a process of deduction, the Panel therefore favored the Option "D," i.e.:

"A Single International Forestry Research Center with a "Trees-as-a-Commodity" focus and Simultaneous Collaborative and Contractual Research Activities on a Broader Range of Subjects Supported by Existing Lead Regional/National Centers in Other Main Geographical Regions."

7.9 As noted earlier in Chapter 2, para. 15, the advantages of this option include the fact that a strong case has been made by many reviewers of the TAC II Paper for centralization of basic biological research on trees, with prospects for early results. Such a commodity-oriented tree research center would in the same manner as other CG commodity centers provide a focal point for upstream scientific research on trees as components of agroforestry, fuelwood, fodder, wasteland reclamation and industrial development projects.

7.10 This option could provide for simultaneous and early support for forestry research in all regions (through subcontractual arrangements). It satisfies the forestry community's aspirations to retain a clear identity for forestry. Flexibility would exist to work with restructured RARCs at a later stage or to develop separate regional mechanisms for forestry.

7.11 As suggested in Chapter 2, para. 14, dependent on further discussions there may be a case for combining such hands-on basic biological research work with the functions of an ICFR related to data base collection, information dissemination and research training.

7.12 Should it be decided at a later stage that there is a case for ICRAF to be brought into the system as the focal point for agroforestry research, there may be a case for combining these International Forestry and Agroforestry Centers under one roof with shared common services (IFARC). The pros and cons of that option will be further discussed in the parallel paper on institutional options for agroforestry (currently in preparation).

ANNEX I

THE THREE INSTITUTIONAL OPTIONS AS DEFINED IN THE TAC III PROCESS PAPER OF DECEMBER 1989

Option A - All CG forestry research in existing IARC's

This is a "no change" scenario in terms of the present structure of the CG System. It would examine the extent to which forestry research needs could be met by integrating them into the programs of the existing CG centers. Table 2 attached summarizes the extent to which existing CG centers already are engaged in forestry and agroforestry related research. As noted, the main involvement is with agroforestry research.

This option will explore the extent to which, for example:

- All areas of conservation of woody germ plasm, tree breeding and improvement could be handled by IBPGR
- Soil microbiological research needs by, e.g., IITA, ICRISAT, ILCA, and CIAT
- Forest Policy research by IFPRI
- Forestry research management planning and training needs by ISNAR and so on.

Clearly there will be some gaps in this approach (for example there is no obvious existing CG center that could take on silvicultural and utilization research). Nevertheless given the potential cost savings for this option, the prospect for firmly integrating forestry with other aspects of the CGIAR System and the opportunity to benefit from the considerable scientific expertise that already exists in the IARC's--this option needs serious consideration.

Option B - Combined forestry and agroforestry in one new center

This option would examine the possibility of integrating all areas of both forestry and agroforestry research under one roof (i.e., by integrating forestry research with ICRAF). The rationale would be that these two aspects of forestry are complementary and their direct integration could benefit both.

It may be pertinent at this point to set out some preliminary ideas on the complementarity of agroforestry and forestry.

Agroforestry, which connotes land use systems combining trees and agricultural crops in a farm system, does capitalize on the potential of trees to contribute to sustainability, increasing production, and multiple benefits.

Trees already exist within the farming systems of even the most heavily populated zones in the tropics; strengthening their contribution can, therefore, benefit a very large part of the agricultural population.

- The presence of trees and forests contributed to farm household and community stability and growth in a number of important ways: nutrition, income, stability of the soil and water resource base, reduction of risk.

- Conditions are emerging in many land-use situations which favor an expanded component of trees in farming and livestock systems; in order to strengthen both their physical and economic sustainability.

- The potential for tree/crop/livestock associations varies with agroecological situations, and within this framework by population density, land use intensity, access to markets, etc., and so this research task can be reasonably well-defined for any given situation.

- Farmer experience with tree management suggests that interventions which build soundly on this experience could experience a reasonably high rate of adoption and spread.

At the same time, conservation and improving the productivity of forests and savannah woodlands is also of critical importance for sustaining agriculture and the natural resource base. The conservation of natural forests is necessary for production, germ plasm conservation, protection of soils and water supplies, and for the maintenance of populations of biological agents of use in the maintenance of both the natural plants and the agricultural crops.

Translating these perceptions into research thrusts, one possible approach to defining the boundary lines between agroforestry and forestry research is to concentrate agroforestry research on improving understanding of, and potential productivity gains from, tree/agriculture/livestock interrelationships. Agroforestry is essentially a farming systems approach. Bellagio II recommended particular emphasis be given to the more systematic measurement of these relationships so as to present farmers with a clear picture of the potential benefits of various tree/crop combinations and benefits of different methods of on-farm tree management.

Forestry research focused on conservation of woody germ plasm and tree breeding and improvement of individual multipurpose tree species complements agroforestry research by providing improved tree planting material for incorporation into agroforestry farming systems.

Forestry research that focuses on sustaining and increasing productivity of arid zone woodland or upland water catchment forest will also make a direct contribution to fuelwood and livestock fodder needs in addition to protecting soil and water resources. (Note, for example, that about one-third of arid zone Africa's dry weather livestock feed requirements are derived from woody shrubs and tree species that occur in the region's natural savannah woodlands).

Option C - Establishing a new forestry research center

This option would develop the case for establishment of a new, separate forestry research entity that would be incorporated into the CG system to cover the full range of research problems, functions and activities discussed earlier. It would combine a commodity focus (increased production of, e.g., fuelwood) with and ecosystem mandate for initiating CG sponsored research in a specific agroecological zone (s).

Option C probably would incorporate most effectively the functions proposed earlier as being critical for success of a CG effort in forestry, and it could do so in the holistic fashion recommended by the Bellagio II participants and the Bellagio II Task Force. It would give a focus to forestry research within the CG system, and with close cooperation with other CG centers could build on the complementaries which would exist. The main disadvantage, of course, is cost. Ultimately, it will come down to a weighing of the additional costs against the potential increases in effectiveness with which an independent research center could accomplish the agreed upon functions needed to meet CG goals for forestry.

To summarize so far, in Part IV of the forthcoming TAC Forestry Panel Phase III Report, we plan to develop at least three main institutional options as defined above. They are not the only possibilities and should alternative options emerge during the course of the forthcoming dialogue, they could be added or substituted for options "A" to "C" above.

For each option to be studied we plan to develop a preliminary profile of the type of institution(s); areas of research to be covered; probable scientific and support staff requirements and a preliminary assessment of likely capital investment and annual operating costs. Each option will be assessed in terms of how

efficiently and effectively it could carry out the agreed-upon functions.

We do not intend to develop a research program for each of the priority research topics. That work would more logically be undertaken by whichever agency is appointed to move ahead with creation of a CGIAR-funded research entity and/or by existing IARC's if it is decided to pursue option "A" above. Our main purpose in the forthcoming paper will be to provide enough of a preliminary profile of research needs and the pros and cons of different institutional options so that the CGIAR can reach agreement on an appropriate institutional option by mid 1990.

ANNEX II

COMMENTS OF EXTERNAL REVIEWERS
OF
TAC FORESTRY PANEL
PHASE III PROCESS PAPER

TAC FORESTRY PANEL PAPER III

SUMMARY OF PROCESS PAPER RESPONSES

A. AREAS OF RESEARCH PRIORITY

General agreement by many respondents about the general thrust of the TAC II Panel conclusions about areas of research that could benefit from centralization.

Specific reservations on some of the suggested areas of priority from:

1. Gordon, Poore Bass and Myers — Query the relevance of CGIAR agriculture experience model and argue for more emphasis on natural forest ecosystems, ecological, land use oriented research (Kemp Pereira, Nair and Brooks also strong on the integrated land use watershed management research approach).

2. Palmer (IUFRO/SPDC) and Lanly (FAO) — Argue that the case for centralization of research is not adequately made and greater clarity is needed on the rationale for this in areas such as tree breeding and clonal propagation.

3. Wood and Hulse — Concerned about the high profile of given to genetics versus silvicultural and agroforestry farming systems.

4. Hunziker (Swiss AID) — Concerned that Bellagio II recommendations not adequately covered.

5. There were conflicting views on silvicultural research. McGaughey, El Lakany, de Camino, Wadsworth, Salleh Nor, Keogh, Wood, Hulse and Kemp want it in. Webb, Palmer, Wencelius emphasize that is has to be local and site

specific. Souvannong argues for CGIAR support for silvicultural research methodology.

6. Neglect of utilization research deplored by Youngs and Wencelius.

7. Several (e.g., McFadden, Myers, Bentley, Gordon, Poore) want to see more emphasis on socioeconomic research.

8. Ryan argues caution in the area of centralized microbiological research (high cost dubious/payoff if too narrowly focussed on N fixation and rhizobial research).

9. Kio urges greater emphasis on industrial forestry crops.

B. FUNCTIONS OF A CGIAR FORESTRY RESEARCH ENTITY

1. No strong disagreement on the range of functions for a CG Forest Research Entity as suggested on pages 10-11 of TAC II, namely:

   - Hands on research in areas of priority identified by TAC II
   - Policy research (Several feel this should be done by IFPRI)
   - Focal point for design and scientific methods of woody germplasm conservation (Several see IBPGR taking a lead role)
   - Development, implementation and quality control of networks
   - Training
   - Information systems
   - Act as focal point for coordination of all CG forestry research.

2. Palmer (IUFRO/SPDC) argues that no single center could meet global needs of the above, as well as carrying out hands on research. He argues for a split between hands on research and other functions. Wants to see the main emphasis of the central body (an International Forest Research Center) on coordination, information collection, data bases, research methodology, training, etc. à la Bellagio II recommendations. (However several TAC members have in the past expressed concern about a CG Forestry Research Entity that is not engaged in hands on research.)

C. INSTITUTIONAL OPTIONS (See previous Annex I for a summary of the 3 options)

1. Totally in favor of an unmodified Option A -- Nil
However several respondents, (e.g., Brady, Wencelius, Krugman, Kemp, Williams, Fugalli, Hulse, Bentley, Nair) argue for some existing CG institutes such as IFPRI, IBPGR and ISNAR becoming involved in forestry and centres such as IITA, ILCA and CIAT in agroforestry.)

2. Totally in favor of an unmodified Option B -- Nil
Some (e.g., Leakey, de Camino, Krugman, Palmer, Persson) argued strongly against ICRAF being asked to take on forestry. By contrast, Hulse, Kio and Pereira argue for direct integration of international forestry and agroforestry located on the ICRAF site. Others (McGaughey, Wadsworth, Poore, Seip, McFadden, Brooks, Bentley, Myers and Kemp) specifically argue for closer coordination between forestry and agroforestry and other areas of CG-supported research, which need not necessarily require a direct institutional link with ICRAF.

3. Totally in favor of an unmodified Option C -- Nil

However 26 respondents were in favor of a modification of C, that would enable hands on research to commence simultaneously in several regions/agroecological zones instead of one and build on existing national or regional institutional capability (Persson, Gordon, McGaughey, de Camino, Wadsworth, Ganguli, Youngs, Brady, Kemp, Krugman, Holmes, Dommergues, Turnbull, Hunziker, Fugalli, Herdt, Salleh Nor, Hodges, Bentley, Brooks, Webb, Payne, Pereira, Nair, Wood and Kio)

D. NETWORKING

1. CGIAR should strongly support national/regional networks -- 14 (de Camino, Persson, Palmer, Ganguli, Hawtin, Webb, Kemp, Brady, Souvannavong, Turnbull, Hunziker, Pereira, Lanly and Payne)

2. Webb, Hawtin, Vanderryn and Ganguli argue that a CGIAR Forestry Research Entity located in the Asia region should absorb the ongoing F/FRED, IDRC tree breeding and improvement networks.

3. McGaughey and Wencelius both argue that CGIAR should be cautious about trying to get too heavily involved in providing technical assistance for building national

research capability. That should be done by a separate organization (s). (See also paras. 10.1 and 10.2 of Chapter 1 of this TAC III Paper.)

E. ROLES OF IBPGR, IFPRI AND OTHER IARCS

1. IBPGR should be beefed up to play a positive leadership role in genetics and tree breeding. -- 5 (Brady, Kemp, de Camino, Turnbull and Krugman)

2. IFPRI should be beefed up to carry out policy research. -- 6 (Brady, Kemp, Arnold, Fugalli, de Camino, Hulse)

3. Some IARCs that are already involved in agroforestry should be encouraged to move further in that direction. -- 4 (Krugman, Palmer, Brady, Bentley) ICRAF can play a role by working collaboratively with the IARCs (McGaughey).

G. OTHER KEY POINTS

1. Mobilize the private sector. -- 3 (McGaughey, Krugman, Salleh Nor). The CAMCORE model is a promising way to go.

2. Give stronger emphasis to training. -- 4 (EL Lakany, Wencelius, Gordon, Hulse)

3. Discuss how the impact of this proposed forestry research program will be monitored. (Ryan)

TAC FORESTRY III: RESPONSES TO PROCESS PAPER

Summary of Main Comments Received as of January 25th. (50 responses to date)

Arnold (Forest Economist and Policy Research Specialist, Oxford Forestry Institute)

1. Emphasizes the need to sharpen the section on forest policy to make clear what such research contributes and the advantages of centralization. (Whilst Bellagio II identified reduction in deforestation as a priority, there is a need to make it clear that what we mean is policy reform to encourage sound management of forest and land resources in order to avoid that part of deforestation that is undesirable.)

2. Suggests a section on potential gains will be stronger if made more explicit. The advantages of analysis based on results from a wide range of situations in identifying more accurately the relationships that might need to be then researched at the national level. Development of research methods and tools and research in international dimensions such as trade flows are instances that might be cited.

3. In the area of utilization of non-timber products, he questions the emphasis on food on page 6 of the main document. The main contribution of non-timber forest products to household security is through income (ie., saleable and processable products).

4. Concerning institutional options, he comments that none of the options includes provision for use of international centers outside the CG system which have established capability. There's a need to emphasize this in order to remove or reduce gaps in Option A and reduce the magnitude of what would need to be created under Option C.

Bass (Rockefeller Foundation)

1. Argues against a commodity approach for forestry. Would wish to see a broader focus on forest land ecology and management.

2. Supports the notion of centralization of clonal and seed propagation, basic tree botany and taxonomy, soil microbiology and mycorrhizal research.

3. Concerned about the idea of only starting CGIAR research in one agroecological region (Option C).

Bentley (WINROCK)

1. Argues for a vigorous and parallel effort to this forestry initiative to deal with agroforestry research.

2. Argues strongly for choice of CGIAR forestry topics to be related to agroecological factors and a broader ecosystems approach to research compare with traditional CGIAR agricultural research (See same point made by John Gordon from Yale).

3. Argues strongly for emphasis on sociological factors and diagnostic research.

4. Suggests silviculture (including growth and yield) policy, ecology, regeneration, integrated pest management, economics and social science research elements will have the highest payoffs and should have the highest priority.

5. In relation to institutional options, Option A makes good sense and is already occurring in some areas.

6. In terms of Option B, sees the sense of linking forestry and agroforestry in Africa but sees the need for a separate arrangement such as CATIE in Latin America and a third as yet unidentified for Asia.

7. In relation to Option C, to effectively combine a commodity focus with an ecosystem focus would require at least three to four centers (given regional market differences, one can envisage a need for up to ten centers or sub-centers in the tropics worldwide).

Bowen (Head of the Soil Fertility, Irrigation and Crop Production Section, International Atomic Energy Agency, IAEA)

1. It makes abundant good sense to start in one agroecological area.

2. Agrees the institute should carry out hands-on research. Is decidedly cold on the ICRAF/CG center model since ICRAF has no track record in hands-on research.

3. Concerned about proposal B because of the possibility that forestry will be dominated by ICRAF, whose staff, good though they are, are mainly experienced in the extension/information dissemination network area and not in penetrating scientific research.

4. In assessing in which agroecological zone for initial focus, agrees with the matrix approach but adds the need for a human factor consideration to focus on research in ecological areas in which the greatest absolute gain will be made. A lesser absolute productivity in some areas, e.g., some semi-arid zones, could have a much greater socioeconomic impact than major increases in absolute gain in a country relatively high on the socioeconomic scale.

5. In the area of pathology, argues that we don't know the extent of root disease on reducing productivity and would wish to see more focus in that area.

6. In relation to the decision to defer entry into new biotechnology, agrees in principle that this should be done in collaboration with existing institutes. The issue is, will it? Fears that agricultural interests might dominate those of forestry in a larger biotech organization.

7. In terms of the institutional options, supports C but with considerable interaction with existing relevant CG institutes. Most of the ongoing CG forestry activity is agroforestry. He sees the CG "Forestry" Institute as doing research which goes deeper and interacts with the agronomic, silvicultural activity of regional CG institutes.

8. Likes the focus on "Trees-as-a-Commodity" approach. Argues for a focus on how to make a good species into an excellent one by genetic methods or by a deeper insight into mycorrhizal or N fixation management. Argues for a specialized group working essentially on tree research incorporating genetics, mycorrhizal, N fixation, tissue culture, etc.

Brady (ex-Director of Science and Technology, USAID)

1. Supports the case for centralization involving some hands-on research work that is applicable globally or at least at the regional level.

2. Suggests an Option D that would simultaneously initiate hands-on research in at least three regions by creating what he terms Technology Generating Centers (TGCs). These would build on existing national research institutions (rather than the alternative of a stand alone forestry research initiative as envisaged under Option C). Within each region, he would see the need for two to three such Technology Generation Centers that could take on for example:

   - Genetic enhancement and tree breeding.

- Utilization of market research.

- Silviculture and associated biological/mycorrhizal research (these are illustrative ideas only).

These Technology Generation Centers would be complemented by non-CG financed Technology Evaluation Centers (TECS) that would plan and implement a number of specific, high-priority research networks. These Technology Evaluation Centers will be financed by the donor system.

3. IBPGR should be beefed up to take more of a lead role in forestry genetics and tree breeding.

4. IFPRI should be beefed up to take a lead role in forest policy research.

5. Suggests that the costs of the above approach would be very appreciably lower than an Option C which envisages a new forestry research center (less necessary investment in bricks and mortar, etc.). Also argues that it would be possible to move ahead more quickly in all regions and achieve early tangible results.

Brooks (Professor of Natural Resources and Watershed Management, University of Minnesota)

1. Strongly argues for combining forestry and agroforestry.

2. Argues that a focus on fast-growing multipurpose trees, genetics, germplasm propagation, etc., is not sufficient to solve problems of deforestation, watershed degradation and fuelwood shortage. Research must include land use practices and management sides of the issue such as agroforestry practices, reforestation methods and systems, and particularly how different systems and species combinations can be developed to achieve production and protection goals.

3. In relation to institutional options, rather than separating centers of research on the basis of agroecological zones, sees merit in considering regional centers on a geographical basis (the arguments in favor of this regional approach are 1) Commonalities would be greater than if we pursue separate agroecological zone models, 2) Many research and other collaborative networks already exist in the main regions, 3) The logistics, travel to research sites, cost of meetings, workshop training sessions, etc., favor a regional rather than a global/agroecological arrangement.

4. Argues that the regional centers would need a cadre of research scientists covering various disciplines such as forest management, silviculture, genetics, ecology, soils, agroforestry, forest economics, social science, watershed management and hydrology. Each center would focus on the major research needs in the respective region and agroecological zone.

5. Strongly supports the training and educational function.

6. Argues for more emphasis on the quantitative relationships of various land use practices in upland watersheds, particularly how these effects translate into measurable impacts on upland and downstream productivity and such issues as biodiversity and the health and welfare of people.

de Camino (ex-CATIE and former member of Bellagio II Task Force)

1. Concerned about how to maintain linkages between forestry and agroforestry research.

2. Strongly supports the notions that we need a CG-supported entity that involves itself in hands-on research.

3. Concerned about the implications of Option C only starting in one region. Wishes to see simultaneous initiatives in other regions working through existing national or regional centers (eg., FRIM (Malaysia), FRIN (Nigeria), ICRAF, CATIE etc.)

4. Supports the notion that IBPGR should provide scientific leadership for genetics, tree breeding and IFPRI for forest policy research.

5. Strongly supports the need to incorporate centralized research on sustainable natural forest management (but gives no specific suggestions as to how to go about it).

6. Strongly supports the notion of a CGIAR Forestry Research Initiative supporting both research contracting and enabling networks.

7. Wishes to see silvicultural research incorporated into the CG system.

8. Of the three options doubts that Option A (building all forestry research into existing IARCs) could be effective. Doesn't like Option B (merging forestry and agroforestry under one roof in ICRAF). Considers the two should be separate with strong linkage mechanisms (undefined). Likes

Option C, but concerned about too slow an impact if we only start in one region.

Dommergues (Soil microbiologist with CIRAD/CTFT, France)

1. We can't expect effectively to deal with the range of tropical forest tree problem from only one center. He favors the "start with one center (in the humid tropics) then build up similar capability in other regions" model.

2. Microbiological research should not be developed independently from plant biotechnology (to maximize exploitation of the plant/tree/micro-organism interaction).

3. High priorities for microbiology research include: inoculation of non-promiscuous species, interaction with mineral fertilization, clonal selection for nitrogen-fixing trees and stress resistance and high growth yield characteristics.

El Lakany (Professor of Forestry, Desert Development Centre, Cairo and former member of the Bellagio II Task Force)

1. Expresses reservations about Option B (building on ICRAF); would spread ICRAF too thin, etc.

2. Advocates close coordination between CGIAR and IUFRO.

3. Wants to see more emphasis given to a CGIAR training function in forestry.

4. Research on N-fixation should emphasize the efficiency of symbiosis under difficult site conditions (salinity, drought, etc.).

5. Strongly supports the need for some emphasis on silvicultural research.

Fugalli (Coordinator of IUFRO/SPDC)

1. Queries the oversimplification of dividing the entire developing world into only three agroecological zones.

2. Emphasizes that clonal propagation needs to be preceded by provenance selection to ensure that it is concentrated on trees with potential for high productivity.

3. Agrees with the idea of deferring a separate forestry biotechnology entity.

4. In relation to pathology and entomology, argues that physiology is a key element of such research and would wish to see a tree physiologist as part of an integral, regional research team.

Ganguli (Chief Forester for the Asian Development Bank)

1. Has supported IUFRO/SPDC and the FORSPA initiative in Asia as the way to go in the past.

2. If a CGIAR forestry research entity is created in Asia, it should absorb the IUFRO/SPDC initiative (consistent with what the TAC process paper argues).

3. Parallel to that, some areas of forestry research can be dealt with by broadening the mandate of existing IARCs (no specific suggestions).

Gordon (Dean of Faculty of Forestry, Yale)

1. Concerned that the prioritization of topics for CG support in the TAC Panel Paper was too much influenced by the CGIAR agricultural experience. He queries the "choose species/improve yields/transmit to practice" model. Argues in favor of application of ecosystem methodology, integrated land use/ecosystem reclamation and management of biodiversity research.

2. Like Wadsworth, argues for more centralized study on second growth forests.

3. Wants more emphasis on wildlife, herbs and shrubs.

4. Also concerned about separation of forestry and agroforestry.

5. Questions how far one can go in centralizing seed and germ plasm banks. Need for regional centers.

6. Basic research on propagation mechanisms can be centralized.

7. Suggests fourth institutional option, ie. to augment activities simultaneously at several existing locations outside the IARC system at leading developing world universities, each with a specific and adaptive research role.

8. Strongly supports the need for CGIAR to support training and strengthening of national institutions.

Herdt (Rockefeller Foundation)

1. Finds both Options A and B untenable.

2. Favours Option C but recognizes that we will need more than one regional center.

Hodges (Leading Mycorrhizal Researcher, USFS)

1. Argues strongly for a discrete, CGIAR supported forestry research entity but one won't suffice. Argues for several regional centers.

2. Strongly favors a focus on mycorrhizal (endotrophic forms) research and Frankia type N. Fixation. Cites Casuarinas as a vastly underutilized genus. (see also ACIAR's work).

3. Woody germplasm conservation needs careful selection of appropriate species. Cites the CAMCORE program as a promising approach.

Holmes (Chairman of the Bellagio Task Force)

Verbal reactions, telephone discussion of 9 January.

1. Was not surprised at the lack of endorsement for Options A and B.

2. Believes that what is emerging as the so-called "Brady Option" (Option D1) goes a good way towards what he feels is needed, but questions whether that option can work without a central coordinating body such as advocated by the Bellagio II Task Force (and also by IUFRO/SPDC)

Hulse (former member of the Bellagio II Task Force)

1. In relation to clonal propagation and biotechnology, questions whether 1) clonal and tissue culture should be assigned highest priority, 2) to what extent can experience from industrial tree species, most in temperate environments, can be spread to tropical zones? Media composition has been arrived at empirically and in many instances is specific to a genus or species. Much that has been discovered about macro-propagation could be more widely adapted. CP and TC should be pursued where macro techniques are less than satisfactory. The advantages of genetic heterogeneity as occurs in the natural forest are stressed.

At the same time, the beneficial experience with TC in bamboo, bananas and other food crops is recognized.

2. Biological control of pests and pathogens requires exceptional skills in taxonomy, particularly biochemical taxonomy, in order reliably to determine pest host plant relations to identify propagate and safely release effective natural and exotic enemies. Taxonomy is a neglected discipline.

3. In relation to lignocellulytic degradation, argues that since lingocellulose is synthesized enzymatically, a rational research strategy would seek to identify in the LC fungi enzymes with specific functions and thereby to degrade LC systematically into useful derivatives. Since on the world market the price of microcellulose is two to three times that of refined starch, and the range of utility of lignin derivatives is far from fully explored, this would seem a potential profitable venture.

4. Agrees that IBPGR is the agency best equipped to carry out conservation of woody germplasm.

5. In relation to policy research, without any intended derogation of IFPRI, whose record is splendid, the targets for policy research need to be carefully and precisely defined. PR is often more descriptive than pragmatically prescriptive or destined to evoke beneficial change.

6. In relation to utilization, the rationale for centralization of food and fodder from forests is not obvious. Centralization strongly tends to technology push, since market identification and assessment are of essence decentralized activities, food tastes, preferences and concepts being specific to localized communities and cultures. Both food and feed research call for scientific specializations not usually encountered in forest research organizations. (This comment relates to the TAC Panel II proposal that more effort be put into investigating the food and other potential uses for underutilized forest based plants (and animal species).

7. Complementarity of centralized and site specific research. Sees the need for a very strong emphasis on training of forestry research workers.

8. Under research goals, wishes to see stronger emphasis on silvicultural research. Argues that CG farming systems research has been at least as beneficial as plant breeding. Are there not opportunities for silvicultural <u>systems</u> research?

9. In relation to the three options, has a strong preference for Option B. At the outset, the new program could benefit from ICRAF's established physical, technical and administrative facilities. It could build upon and diversify ICRAF's diagnostic and development networks and training program.

10. Comments on the time horizon for bringing a CGIAR forestry research entity into being. Past IDRC experience as the executing agency for ICARDA, ILCA, and ICRAF suggests that at least two years will be required to establish a new international center to formulate the constitution; to identify a suitable location; to negotiate conditions of residence and modus operandi with the host government; to select a board, search for, appoint and put in place a director and staff; and acquire property, equipment and other essential facilities. (Argues that if the collaboration with ICRAF route is favored, many of these are already in place and could be expanded and diversified.)

Hunziker (Senior Forestry Adviser, Swiss Overseas Development Aid Agency)

1. Is concerned at the selectivity of the TAC Phase II report and the fact that it omits many of the key areas identified by Bellagio II.

2. Concerned at the proposal to overcentralize research.

3. Argues for a decentralized approach building on the capacity of existing institutions and development of networks (the IUFRO/SPDC model).

4. Strongly supports the need for mention in the TAC III paper of complementary initiatives to ensure full coverage of research needs identified by Bellagio II.

5. Feels that more emphasis should be given to silvicultural research for organizing and back stopping pilot centers in representative tropical forest ecosystems.

6. Argues for separation of socioeconomic and forest policy research.

7. Supports the notion that both ISNAR and IFPRI should become involved in a CGIAR supported initiative.

Kemp (Deputy Chief, Natural Resources Adviser to the ODA)

1. Emphasizes the need for close integration of forestry in overall land use and development policies.

2. Welcomes the increased emphasis on the importance of strengthening the national forestry research capabilities.

3. Agrees that new biotechnology should be developed in association with existing centers rather than in a separate forestry facility.

4. Argues for incorporation of policy research related to forestry within other existing centers of appropriate expertise (eg. IFPRI) to ensure close integration with economic development and land use policy research.

5. Supports the notion that some emphasis should be given to silvicultural research and endorses the argument that the CG can provide long-term continuity for same.

6. Concerning institutional options, has reservations about the capability of a single center adequately to meet global research needs.

   Instead supports the promotion of intensified forestry research through existing CG Centers together with strengthening of other national and international (EG. ICRAF) centers outside the centers outside the system.

Keogh (Head of the Overseas Development Unit, Irish Forestry Board)

1. Strongly supports the notion of CG involvement in forestry, particularly from the perspective of assuring long range finance as required for meaningful forestry research results.

2. Emphasizes the need for involvement in silvicultural research and production of guidelines for improved natural forest and plantation management.

3. Argues strongly for intermediate research as a link between the researcher and the end user to indicate what type of research is most likely to result in the highest payoff.

Kerr (Commonwealth Secretariat, U.K.)

1. Outlines the main functions of the Commonwealth Secretariat which is so far not become heavily involved in forestry. However, in the light of the rising interest in global forestry problems expressed by Mrs. Thatcher's government, it is possible that the Commonwealth Secretariat may be asked to take on a greater role in forestry. We should keep the Secretariat informed of developments.

Kio (Director of Forestry Research, Forestry Research Institute of Nigeria)

1. Despite the reservations expressed by many on the incorporation of new biotechnology, regrets its exclusion from the proposed mandate of the IFRC since the forestry initiative may lose a long-term advantage of being abreast of the latest techniques of genetic engineering and potential for developing special tree clones to meet the needs of forest industry and agriculture.

2. In relation to institutional functions, wishes to see more elaboration on intended relationships between the international center and non-research forestry organizations, e.g., private farmers, small farming communities and cooperatives.[1]

3. In the area of genetics and tree-breeding, regrets the omission of industrial forestry crops. Forest industrial trees have potentials which an international center could help to develop.

4. In relation to the three options, ruled out A (building on existing IARCs).

5. Finds B a viable alternative. In his opinion agroforestry is an aspect of forestry which does not warrant a separate institution in the present circumstances. Argues that the earlier emphasis by the international community, though welcome, was misplaced and that ICRAF has suffered from crisis of identity since its inception. All attempts to portray agroforestry as a new science distinct from agriculture or forestry have failed.

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[1] We acknowledge that the TAC Process Paper did not give enough emphasis to the need for basic socioeconomic research to determine farmer communities' perceptions of the role of trees in rural economies.

6. Regards Option C as excellent but would like to see three or four regional research centers from the outset. Recognizes difficulty of the high cost of that option.

7. If a one center option is to be used as a start-up initiative, it is desirable to stress the need for strong collaboration with existing regional centers in other regions. In that respect, would see prospects for collaboration between an IFRC and, for example, IITA in West Africa, ICRISAT in the South Asia region, CIAT in Amazonia, ICARDA in the Middle East.

Krugman (Director of the Timber Management/Forestry Research Division, USFS)

1. Supports the arguments for regional CGIAR-supported forestry research centers with strong and direct linkages to national research organizations (where they exist).

2. Supports the research areas identified as lending themselves to a centralized approach, but wonders whether we've given enough thought to restoration forestry (ecology) as a more direct approach to reforestation (check).

3. Supports the notion that CGIAR forestry centers should have a Research/Development/Application function.

4. Supports the notion to keep forestry and agroforestry research separate. Has strong reservations about ICRAF as a research mover. Wishes to see more hands-on agroforestry research carried out by existing IARCs.

5. Agrees that a separate biotechnology center for forestry research makes no sense at this point in time. Link it with an existing agricultural/industrial biotechnology center.

6. Wants to see more thought given to how to mobilize private sector support.

Lanly (Director, Forest Resources Division, FAO Forest Department)

1. Expresses concern that earlier comments by FAO on areas with potential for international centralization are not fully reflected in the TAC Forestry II document. In particular, reiterates the following:

    - topics like entomology, phytopathology, forest maturation and remote sensing are not the best candidates for centralized research.

- there is a need clearly to differentiate between policy research on one side and socioeconomic on the other.

- a more appropriate treatment of the topics of clonal propagation and new biotechnologies is needed.

- in addition, considers that among additional research topics requiring a centralized approach should be added germplasm and breeding in captivity of animal genetic resources.

2. On agroecological siting of research centers, argues that if there are eventually to be three, they should be located respectively, in the humid, dry (sub-tropical/sub-temperate) and mountain regions.

3. Argues that if the humid tropics are to be given priority in terms of location of the center, the Amazon river basin should be the first choice since it comprises 56% of the world's tropical moist forests.

4. Three of the eight members of the Amazon Cooperation Treaty have prepared proposals for the establishment of research centers in the Amazon (Colombia, Guyana, Venezuela).

5. In relation to identification of priority research topics:

   - clonal propagation cannot be seen in isolation and must be based on a sound, solid tree improvement program;

   - seriously questions the proposal to encourage IBPGR to undertake woody germplasm conservation. Argues that IBPGR only has expertise in crop germplasm conservation.

   - argues that ex situ conservation of tree seeds is of limited and dubious value in long-lived tree species. Thus the regeneration of the seed materials stored would pose almost insurmountable problems.

   - on sampling techniques, assessment of variation patterns and collection techniques, claims that IBPGR does not have experience in these fields in forestry species which differ fundamentally from strategies and methodologies in agriculture and mainly annual frequently in breeding or inbred crops. Argues that this work cannot be done without the involvement of national institutes and will require a time scale which is very different from that which IBPGR is used to.

6. Re pathology and entomology, questions the justification for centralization. Expresses strong concern at the possibilities of replication if the psyllid problem in Lucina which arose because of a narrowly based gene pool being widely distributed without documentation and used in a totally unscientific manner.

7. In relation to examples of successful ongoing forestry research networks, cites those coordinated by CTFT in Africa.

8. In relation to institutional options, in Option A rejects the idea of IBPGR playing a major role in germplasm. Argues that Option A has serious shortcomings in that no existing CG center can be charged with research on silviculture and forest utilization.

9. Argues that the drawback of Option B is that you could deal with research on trees and not on forests.

10. Clearly favors Option C because it singles out forestry research in a visible manner and doesn't dilute it in a large number of research entities.

Leakey (Principal Scientist, Institute of Terrestrial Ecology, Scotland)

1. Strongly favors the case for centralized soil microbiological research, with special reference to reclamation of degraded and eroded lands.

2. Wants to see more emphasis on role of soil microbes (isolation, identification of micro flora in tropical soils).

3. Some areas of entomological research are pan-tropical, e.g., hysipyla, shoot borers attacks of Meliacae species.

4. Strongly supports the notion of centralized research on clonal propagation which can overcome many of the biological problems that have constrained reforestation with indigenous trees (grafting can help to improve yield and quality).

5. Recognizes that clonal propagation must be strongly linked to tree improvement programs. Suggests as a major theme for CG-supported research domestication of under-utilized tree species for the production of an increased range of forest products.

6. Of the three options, does not favor A.

7. B is limited because of ICRAF's location.

8. Likes Option C and argues for its initial location in West Africa.

9. Argues that if we are to use the matrix approach to selection of a site for a first center the matrix analysis should take into account macro climatic factors (e.g., the influence of the West African region tropical rainforest on rainfall and agricultural productivity further north in the Sahel.

10. Research needs to focus on systems of land use that mimic the natural forests and the role they play in the hydrological cycle (e.g., development of forestry/agroforestry systems incorporating a considerable number of integrated tree crop species).

McFadden (Leading Entomologist, USFS)

1. Welcomes the elimination of biotechnology as a stand alone forestry initiative.

2. Strongly opposes any notion of segregating forestry and agroforestry.

3. Believes that we should give more emphasis to social forestry and to socioeconomic research.

4. Argues strongly for eventual full ecological representation (the limitation of our model C is that it will confine itself to the humid tropics for a considerable first phase period).

McGaughey (IDB)

1. Regrets the separation of forestry from agroforestry. Suggests that agroforestry research could be farmed out to many of the existing centers with some guidance from ICRAF (but makes no suggestions as to how linkages between forestry and agroforestry research should be maintained).

2. Concerned about the notion contained in Option C of starting research only in one region (which, using the matrix approach suggested in the Process Paper, will probably lead to the conclusion that a CGIAR-supported forestry research initiative would be located in Asia--not Latin America).

3. Concerned about how far CGIAR can realistically go in pursuing hands-on research at the national level (clarify). He cites current problems with the CIMMYT maize research in Africa (discuss with Mike Collinson).

4. Believes more emphasis should be given to a combination of public and private sector research (the CAMCORE Model?).

5. Believes that in the area of policy research, its important that the local/national specific content be emphasized from the start. Implies that eg. IFPRI and WRI research has sometimes been too much of a top-down effort.

6. Favors the notion of addressing silvicultural research aimed at increasing natural forest and plantations.

7. Favors an institutional option that would simultaneously begin to develop research networks in all three regions and do sustainable research on high-priority topics with a small lead technical secretariat providing overall guidance and monitoring of research quality.

Myers (Ecologist and environmental writer)

1. Wants to see more emphasis on linkages between forestry and other sectors, particularly upstream/downstream relationships in water catchment planning.

2. Policy research aimed at conservation of tropical forests needs to encompass the roles of agricultural marketing prospects, credit, rural infrastructure, land tenure, agrarian reform, in addition to production oriented research of the traditional CGIAR mode.

3. Emphasizes the need for intensified policy research in the area of shifting cultivation as a major cause of deforestation.

4. Queries the emphasis in the CGIAR approach on intensive input farming systems; argues that for millions of third world people, low input subsistence farming will be the reality for the coming decade.

5. Queries whether CGIAR increased productivity oriented research will make any significant contribution to the macro problem of how to slow down deforestation.

6. Emphasizes need for strong emphasis on policy and socioeconomic research to understand people's perceptions of sustainable farming/forest management system options.

Palmer (Deputy Coordinator of IUFRO/SPDC)

1. The TAC III Process Paper does not:

(a.) Sufficiently emphasize the location specific (genotype specific) nature of the great majority of forestry research.

(B.) It overestimates the advantages of centralization in some areas of research.

(c.) It overlooks the fact that Option A (build forestry into existing IARCs) would leave international forestry research without a coordinating body, and that many key areas of forestry research would be neglected.

(d.) It ignores the difficulties experienced by ICRAF in fulfilling its mandate. He argues strongly against trying to graft forestry onto ICRAF.

(e.) He suggests that Option C is an impossibly large mandate for a single research center which in no way could meet global tropical forestry research needs. (This misinterprets the TAC Forestry Panel III Paper which stated that we would need at least three regional centers eventually to deal with forestry research needs.)

(f.) He criticizes the TAC III Process Paper for prematurely discounting the IUFRO/SPDC option.

The main thrust of the Palmer argument is that none of the options A - C is valid. Instead, he suggests we need to stick to the strengthening of national research institutions focused on site specific regional research. He sees the need to create a centralized CGIAR forestry research coordinating entity that would restrict itself to provision of services (improved flows of raw data, knowledge, information and development of information systems and databases a la IUFRO/SPDC model and Bellagio II recommendation).

Payne (USDA FS International Forestry Staff and Senior Representative of IUFRO)

1. Does not disagree with the notion that we need centralized and national research, but continues to emphasize the theme that local research is the highest priority and that it needs to be done where it benefits local people and where flexibility exists to address the inherently local problems so important in forestry. High quality research performed

at one or two locations without building national capability on site would be a real error.

2. Is concerned at Option C and the focus on only one institute. Believes the whole point of getting forestry in to the CG system is to move forestry research forward to an effective level and argues that that can only be done by simultaneously building a series of regional forestry research centers.

3. In relation to the identification of topics that could benefit from centralization, observes that the list of topics is biased in favor of forestry regeneration by intensive means. Is concerned about the need to intensify research in the vast remaining areas of natural forest and of growing secondary forest.

4. Broadly agrees with the proposed functions of a CG institution in forestry.

5. On the institutional options, is negative on Option A, integrating all forestry research into agricultural research centres will be an uphill battle. Despite their commonalities, agriculture and forestry have substantial differences.

6. Has the same feelings about the second option of combining forestry and agroforestry in ICRAF.

7. Option C will clearly be the favorite if centralization and hands-on research are the key to entry of forestry into the CG system, and would argue for simultaneous development in several regions. However still argues strongly that the "broker only" role for forestry (as per IUFRO/SPDC) would be a far less expensive solution.

Pereira (Formerly principal scientist of U.K., Director of Regional Agricultural Research (Zimbabwe)/Land use consultant to World Bank and former member of TAC)

1. Concludes that the Panel II report makes a convincing case for a CGIAR role in forestry research.

2. Agrees that "new" biotechnology research should be left to existing strong specialized laboratories.

3. Regards as a serious omission a study of watershed management policy and the monitoring of forestry stewardship of stream source areas.

4. Regarding the three main options, would completely dismiss Option A. Argues that the existing system has not even succeeded in undertaking adequate studies in soil and water management, although these are basic components of agricultural production.

5. In relation to Option B, argues that ICRAF is not yet strong enough to carry critically important responsibilities for forestry.

6. In relation to Option C, finds this the most plausible option but points out that this new center could not fail to overlap with ICRAF in many areas particularly, e.g., in relation to production of fuelwood and fodder in relation to the forest/farm interface.

7. Notwithstanding the 'fireworks' that will greet the proposal, believes that ICRAF should be subsumed into a new CG Forestry/Agroforestry centre, with useful access to implementation of practical research in the semi-arid and cool, high altitude ecologies.

8. Still believes that a separate main center will be needed in more humid tropical forests.

9. Argues strongly for well-established provenance and species trials at the national level and for strengthening of training in silvicultural experimentation.

10. Argues that strong CG support for networking operations must be built into the plan for the new centre.

11. Argues that IUFRO has insufficient administrative strength to undertake this task and it has too narrow a specialization in forestry.

Persson (SIDA)

1. Concerned about lack of emphasis on land use and on natural forest management potential.

2. Supports the need to strengthen national institutions through networking. Believes another option (than A-C) would be to build on existing national research institutes (see also Brady and McGaughey).

3. Doesn't like the idea of adding forestry to ICRAF.

4. Some areas of research could be handled by existing IARCs (not specific).

Poore (IIED)

1. Concerned about the Bellagio III emphasis on the advantages of forestry following CGIAR agricultural research experience and focusing on increasing productivity.

2. Advocates instead reprioritization to focus on improved understanding of four main ecosystems:

   (a.) Natural forests (untouched)
   (b.) Natural forest management for timber and other products
   (c.) Polycultures (including agroforestry)
   (d.) Monocultures

3. Policy research would focus on the optimum combination of the above.

4. Concerned that the Bellagio II (and TAC Forestry paper) overemphasized wood production, and monocultural systems. They neglect the sustainable management of natural forest ecosystems.

5. Wants to see more emphasis in the discussion of research institution functions on producing valid models and generalizations with scope for replication elsewhere (ie., in contradiction to management trials). Supports the need for a focus on databases, gene banks, dissemination of knowledge.

Nair (Professor of Agroforestry, University of Florida, former staff member of ICRAF)

1. Feels that the CG initiative should be of a catalytic nature to stimulate national research capability. The focus of CG should be on technology thrust areas which will make use of the rapidly developing array of new technology tools and advancements for research.

2. In relations to the options, his concern at the proposal in Option C for an initial focus on a single agroecological zone, delineation of the whole developing world into humid, arid and temperate zones is too broad an approach. Humid tropics in country/continent X could have problems quite different from those in country/continent Y. Moreover, narrowing down this focus will also depend on institutional options. Feels that the focus should be on research topics that are widely applicable, ie, zone neutral, and favors a regional rather than agroecological approach.

3. Institutional functions of a CG initiative. Broadly agrees with the listing of functions in the TAC II Paper, feels it important sharply to focus the CG centers work so as to avoid duplication of functions that are being carried out by existing national institutions.

4. In relation to the options, feels that perhaps the best option would be a combination of A and C for forestry research and A and B for agroforestry research.

5. Argues that C alone will not produce the desired results. By simple analogy it would be like one center in the world trying to address all agricultural research. Link forestry research to the mandate of existing CG centers (to the extent possible) and create a new center for dealing with items that cannot effectively be handled by existing CG centers would be a more desirable strategy. (cost permitting)

Ryan (Deputy Director, ACIAR)

1. Suggests stronger emphasis on the need for in situ seed conservation as a component of the proposed activities involved in the conservation of woody germplasm. Argues that taking this into account will have a bearing on questions of the location of a forestry research entity.

2. Understands the reasons why soil microbiology has been included as a candidate for research, however suggests that experience with biological nitrogen-fixation research in the international centers and in ACIAR's programs with the developing countries is that the probability of a profitable response to improvements in inoculation rhizobia, etc., is somewhat low. The cost of setting up new microbiology programs is quite substantial. An argument for integrating with an existing facility.)

3. Would wish to see more clarity in the relative emphasis to be given to plantation forestry, natural forests, farm woodlots, fuelwood production, etc. This relative emphasis will also influence institutional structure and locations.

4. In reviewing the list of functions which the new forestry institution would be responsible for, comments that nowhere in this document is there an explicit description of how the impact of the initiative ought to be assessed in the future. Important to spell out the proposed scientific or intermediate outputs that the forestry initiative would be expected to generate, and the final or economic outputs that would occur.

5. Would like to see more explicit reference to ACIAR's forestry activities.

6. Not clear precisely how ISNAR could be involved in forestry and seeks more clarification on that point.

Salleh Nor (Director, Forestry Research Institute of Malaysia)

1. Doesn't like Option A (It smacks of selling out forestry to agriculturalists.)

2. Wants to see stronger emphasis on strengthening of national institutions. Favors a "collaborative" networking approach.

3. Feels that a central CGIAR-supported IFRC is essential (Option C) but argues that we will need at least 3 (one in each major region).

4. Argues that SPDC activities should be absorbed by the CG System and SPDC as an entity could then be discontinued.

5. Doesn't like Option B.

6. Strongly supports the need to include silvicultural research.

7. Give more emphasis to the private sector.

Seip (Former Forestry Adviser, NORAD)

1. Strongly favors close integration between forestry and ICRAF and for that reason is inclined towards Option B.

2. Is concerned that global environmental concerns (such as the alleged decline in rainfall as a consequence of deforestation in West Africa, forestry and the greenhouse effect, etc.) should have been included in the discussion.

Souvannavong (Tree breeding scientist with CIRAD/CTFT)

1. There are major limitations to a high degree of centralization of forestry research.

2. Supports the notion of centralized research on some selected high priority areas as identified by the TAC II panel. IN particular he strongly supports the notion of clonal propagation and soil microbiology (which imply the need for controlled research conditions in laboratories or nurseries,

reproductive physiology and flowering induction studies, conservation of woody germplasm).

3. Centralized silvicultural research can only be related to methodological tools. In general silvicultural research must be highly site specific.

4. For centralized research in the Sahel region, favors Dakar as possessing well-established, existing facilities.

5. Believes that tree breeding and improvement must be done largely through networking and in situ conservation.

Turnbull (ACIAR Forestry Program Coordinator, Australia)

1. In general supports the selection of topics identified in TAC Panel II as having potential to benefit from centralized international research.

2. Supports the concepts of twinning (collaborative research on a scientist to scientist basis) as is being strongly supported in the ACIAR Forestry Research Network in the Asia region.

3. Queries the oversimplification in TAC Forestry II of agroecological zoning (which identified three major zones: humid, arid and temperate). Sees the need to refine this analysis.

4. Emphasizes the point that clonal propagation including tissue culture cannot logically be divorced from tree breeding research. There needs to be a networking arrangement between clonal propagation and country specific networking programs.

5. Supports the notion of a close link between microbiological and tree breeding research.

6. Supports the notion that IBPGR should play a lead role in supporting international seed collections of tree species that have major significance.

7. Suggests that the CSIRO Australian Tree Seed Center, which has collected a wide range of species could play a greater role internationally.

8. Agrees with the range of functions suggested for Option C in the TAC II Panel Report.

9. Suggest as essential that the center should have the ability to fund complementary research through contracts and grants.

10. In relation to networking, suggests that we build on the ACIAR experience, the key features of which are 1) Research on high priority problems with a high probability of success, 2) Twinning of scientists in each project, 3) The maximization of spill-over of results. This network is concentrated on increasing the availability and productivity of multipurpose trees and shrubs, principally of Australian origin through species introduction, provenance testing, tree breeding, symbiotic micro-organisms, and utilization.

11. Agrees that the panel should look in greater detail at the three options suggested in the Process Paper. However advocates a fourth option which might be to locate CG-funded units specializing on forestry research topics at key forestry institutions in various agroclimatic zones (the Brady Model).

12. For example, forest products/forest silviculture could be attached to FRIM in Malaysia and/or FRIN in Nigeria; germplasm/tree breeding to the ASEAN Tree Seed Center in Thailand or CSIRO Tree Seed Center. This decentralized approach would allow integration with CG centers with, for example, forest policy research being attached to IFPRI.

Vanderryn (Director of Forestry and Natural Resources, USAID)

1. Concerned at the inadequate mention in the TAC II Paper of natural forest management.

2. Argues for stronger emphasis in the report on information dissemination and application. Cites the F/FRED experience of establishment of a data base and its work on both biological science as well as socioeconomic aspects. Both go hand in hand.

3. In the organizational options, fails to understand why we didn't make specific mention of an option that would combine networking coupled with strengthening of national centers together with establishment of a regional centralized CG center. Argues that the networking discussion should not be dealt with as a separate issue but as an integral part of whatever option is selected. (Our model C does in fact envisage a combination of the two activities.)

Wadsworth (Director of ITF Puerto Rico)

1. Strongly in favor of a hands-on research initiative (arms length subcontractual research won't work).

2. Concerned about the separation of forestry and agroforestry (but no specific ideas about how to achieve an effective linkage).

3. Concerned to ensure participation of developing country researchers in formulating CGIAR research programs.

4. Wants to see more emphasis on protection and management of natural forests, with special attention to secondary forest growth which covers fifty percent of the tropics and which may be a better alternative in some situations that investment in plantations.

5. He has views on the ranking of Bellagio II priorities and would suggest an alternative as under:

    1.1 Agroforestry research
    Fuelwood production on farms using multipurpose trees.

    1.3 Dry zone woodland management research
    Low cost technologies for the production of fuelwood.

    2.4 Management for sustained yield and production
    Maintenance of forest quality with production

    3.2 Improvement of fast-growers
    Centralized work on well-known producers

    3.3 Tree and stand establishment
    Reforestation technologies

    4.2 Adaptation of existing technologies

    5.2 Potentials for increasing government rent capture

    5.5 Small scale industry

Webb (IDRC and also chairman of the SPAAR Forestry Group)

1. Agrees with the areas suggested for centralized research focus, but feels that argument for centralization of silvicultural research to be the weakest. Suggest that the examples of ITF's contributions to centralized silvicultural research are overstated.

2. Strongly supports centralization of policy research (with emphasis on socioeconomics).

3. Supports the concept of a CGIAR research initiative absorbing promising ongoing networks such as those sponsored by IDRC on bamboo and rattan in Asia. (A separate letter from Geoffrey Hawtin of IDRC makes the same point and includes more specific ideas.)

4. Of the three option he rejects both A and B and strongly supports Option C, wishes to see more emphasis on backstopping of regional networks and NARS.

5. Supports the notion of prioritization of topics and the need to resist the notion that CG should try to do everything for everybody.

6. Concerned that utilization does not feature in the list of topics discussed (supports the C model starting in one agroecological zone but rapidly moving to others [considers neither A nor B to be adequate responses to Bellagio decision]).

7. Wants to see more emphasis on network characteristics, one essential of which is sharing of research tasks.

Wencelius (A French forestry research expert working in the Africa Technical Division of the World Bank)

1. Agrees with the emphasis on genetic improvement, soil, microbiology and policy research. Advocates more emphasis on utilization research, particularly into non-wood products.

2. Believes that silvicultural research should remain responsibility of national institutions.

3. Agrees with suggested functions of the CGIAR Forestry Research Initiative, but would wish to see more emphasis on national networking for dissemination of research results (suggests this work should not be done directly by the CG centers).

4. Advocates hands-on forestry research and training in existing IARCs (so as to make it possible to start simultaneously in several ecological zones and to take advantage of the scientific expertise already existing in IARCs). Sees the need for a small separate CG forestry research center providing overall guidance and monitoring of research quality.

Williams (former Director, IBPGR)

1. Strongly supports the notion that IBPGR could provide advice and jointly operate some specific projects, particularly where R & D on clonal propagation interfaces with germplasm conservation and management.

2. Feels that the paper neglects the interest of the donor community in underexploited woody species. Argues that a specific item should be included to deal with that aspect (same point made by Roger Leakey of ITE).

3. In relation to developing collaborative linkages between the CGIAR and other institutions working in the same area, mentions the emerging IFAR program for conservation of woody germplasm of tree crops of both perennial agriculture and more traditional forest tree species.

Wood (Senior Forestry Research Scientist, Oxford Forestry Institute)

1. Agrees with the concept of centralization of clonal propagation, tissue culture, and related biotechnology research, also with the arrangement proposed for pathology and entomology.

2. Not convinced that centralizing a data base on tropical forestry in one place is practical. Believes several linked data bases on related subjects would be better.

3. Wants to see sharper definition of the role of multi-purpose trees for agroforestry (socioeconomic research to determine the genotypes most likely to find favor with farmers and local communities as per the F/FRED network activities).

4. In relation to CGIAR support in forestry for lower income groups, sees the need for strong emphasis on policy research dealing with land tenure, traditional customs, caste and class inequities, etc.

5. Wants to see more emphasis on sustainable rangeland management, sustainable agroforestry farming systems in a regional agroecological context.

6. Concerned about the high degree of emphasis on genetics of trees. Argues that for lower income groups other factors are more important, e.g., management of natural forests, and on-farm trees.

ANNEX III

EVALUATION OF INSTITUTIONAL OPTIONS FOR FORESTRY IN THE CG SYSTEM

	OPTION A	OPTION B	OPTION C	OPTION D	OPTION E
MINIMUM COST REQUIREMENTS[a] (US$ millions)					
* likely minimum initial investment cost	b	c	60	25	10
* likely minimum ann. operating cost to make the option effective;	20	18	21	18	13
EVALUATION CRITERIA (effectiveness in terms of):	(Scale of 0 (not effective) to 5 (highly effective))				
1 rapidly achieving and maintaining a high standard of scientific excellence;	4	4	5	3	2
2 involving hands-on research with the CG system;	5	5	5	4	0
3 covering key researchable forestry problems in major agroecological zones, as defined in the TAC Forestry Panel II paper;	4	4	3	4	4
4 achieving early research results that will affect a large number of dev. country people;	2	2	4	4	3
5 making a positive contribution to containing deforestation and to sustainable land use and ecosystem management;	5	5	2	3	3
6 providing a clear identity and central focus for CG forestry activity;	4	2	3	5	4
7 integrating forestry and agroforestry;	5	4	2	3	3
8 involvement with existing IARC's;	4	4	3	3	2
9 involvement with other national or regional research institutions;	4	4	4	5	5
10 developing and managing networks;	4	3	4	4	3
11 providing international data base management services;	5	4	5	5	4
12 training researchers;	4	4	5	5	3
13 providing flexibility in relation to evolving CG structure;	3	3	2	4	5
SUM (unweighted)	(53)	(48)	(47)	(52)	(41)

(Notes on next page)

7. Believes that in the area of wasteland reclamation forestry has to collaborate closely with rangeland managers.

8. In relation to institutional options, is concerned that the Option C focus is on only one center. Argues that forestry needs several centers as a long term goal. Strongly supports networking with national research institutions.

Youngs (Formerly Director of Forest Products Research, Madison)

1. Supports the need for hands-on forestry research centers.

2. Considers transfer of appropriate technology as critical as new research in many areas.

3. Wants to see much more emphasis on utilization research, particularly for small scale forest-based processing industries.

4. Emphasis in policy research, give special attention to economic and policy incentives to encourage more effective use of existing resources.

5. More emphasis on market research.

6. Of the options; would favor a combination of A and C, ie. build on existing IARCs for some areas of research but also establish a separate forestry research center for topics that can't be covered by IARCs. This approach will enable a simultaneous start in several regions.

Note:
Additional helpful comments were received after the date of completion of above from:

Messrs: Plucknett (Science Adviser, CGIAR)
De Pommier (ex-ICRAF Staff)
Huillet (OECD)
Brewbaker (NFTA)
Rowe (World Bank)

a. The assumptions used in developing cost estimates are as follows.

For all options:

* an average of $250,000 per year salary and operating cost for a scientists and/or administrators, including technical and office support staff, travel, etc.
* a world class stand-alone1 research centre (IFRC) would cost a minimum of US $25 million, including facilities, equipment, and staff housing, etc.
* an ICFR (which does not have hands-on research) would cost about $10 million;
* capital costs could be reduced somewhat for all options if existing centres or facilities are used;
* funding for work by IFPRI, IBPGR and ISNAR would initially run about $2.5 million per year;
* estimated funding levels are those that would obtain at full operation; gestation periods for options will vary;

Option A:

* initially, six RARC's with forestry programs; as noted in footnotes b and c, the initial investment costs are difficult to estimate at this time; operations would involve a minimum of 10 forestry related scientists per centre; 60 scientists @ US$ 250,000 is $15 million, or $2.5 million per centre on average. Some would likely have fewer scientists, others more. Cost has not been added in for shared scientists – e.g., possibilities include soils experts, entomologist, pathologists, statistictians and computer specialists.

* the ICFR would cost about $10 million initial investment; there would be 8 people @ $250,000 or $2 million per year operating costs; this would be in addition to the allocation of capital costs to forestry from the overall RARC investment;

Option B:

* same as for A except there would be no ICFR, i.e., $10 million less investment cost and $2.0 million per year less in operating costs;

Option C:

* this option would involve a minimum investment cost of $20 million per centre, times three centers, or some $60 million in investment cost;

* each centre would have at a minimum, a scientific and administrative staff of some 25 (3 plant physiologists, one seed biologist, 2 geneticists, one ecologist, two silviculturalists, one nursery/seed orchard expert, two soils experts (microbiologist and other), two statisticians/computer specialists, one (early stage/nursery) pathologist, one entomologist, two administrators, one economist/social scientist, one information/publicity expert, plus five more. Total yearly cost: $19 million.

Option D:

* investment cost for the IFRC would be $25 million.

* professional staff would be 30 @ $250,000/yr or $7.5 million/yr. In addition to the professionals mentioned for Option D, there would be need for an additional 5 fairly high level professionals to handle administration, selection and quality control on grants and contract work.

* contracts and grants would amount to another $7.5 million per year.

Option E:

* One ICFR would involve an initial investment of some $15 million.

* the ICFR would have 8 professional staff and administrators @ $250,000, or $2.0 million per year operating costs.

* grant and contract funding might amount to some $7.5 million per year.

b. investment costs will depend on other agroecological research considerations within the centres and whether existing facilities/centres will be used. Thus, it is difficult to develop estimates for forestry alone. Further, there likely will be significant joint costs involved.

c. same as b