THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH
TECHNICAL ADVISORY COMMITTEE AND CGIAR SECRETARIAT

REPORT OF THE FIRST EXTERNAL PROGRAM AND MANAGEMENT REVIEW

OF THE

INTERNATIONAL NETWORK FOR THE IMPROVEMENT OF BANANA AND PLANTAIN

(INIBAP)

CGIAR SECRETARIAT

The World Bank

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(INIBAP)

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May 6, 1992

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Dear Alex and Alexander,

I am pleased to submit to you the report of the External Management and Program Review (EMPR) for the International Network for the Improvement of Banana and Plantain (INIBAP).

The Panel feels confident that we had ample opportunity to thoroughly evaluate the management and programs of the Network. Discussions with the institution's administration and staff were open and candid. Our visits to the regional networks were very informative. Our requests to INIBAP headquarters were for the most part responded to with speed and courtesy. Unfortunately, responses to our request for financial details and salary information from INIBAP were not timely and difficult to reconcile. This interfered with our analysis of the Network's financial picture, but we were able to address the key issues in our terms of reference. In spite of the financial reporting difficulties, we believe that our report does a thorough job of evaluating the achievements, current status and future plans of INIBAP.

The Panel approached the review with careful consideration to the terms of reference and the specific questions prepared vis-à-vis INIBAP. We also took care to note that INIBAP, as a new organizational structure for international agriculture, is itself an "experiment". To this point, the Panel came to recognize that there is some confusion regarding networks as an instrument, versus providing quality research services as a goal. Networking is not in and of itself the *raison d'être* for INIBAP. The Panel has the distinct feeling that the process has been confused with the purpose. We have made reference to this at several points in our report.

The importance of the distinction between the process of networking and the philosophy of research service should not be lost on the CGIAR system. If INIBAP is to be considered an experiment, these types of distinction are important in gaining a proper evaluation of how this mode of operation can be extended to other applications.

On balance, the Panel feels quite positive regarding the future potential of INIBAP, and sees opportunities for achievements of significant impact. Before the review, I was not aware of the importance of cooking banana and plaintain to subsistance agriculture in Africa. My country visits to Nigeria, Cameroon, and Burundi convinced me of the importance of INIBAP's mission.

The Panel is particularly grateful for the assistance and advice of Dr. Donald L. Plucknett and Mr. Shey Tata of the CGIAR Secretariat during portions of our initial phase, and for being accessible during the main phase of the review.

The EMPR Panel was composed of very capable people with broad experience and high professional standards. Each of them made many valuable contributions to the review process, and I take this opportunity to give each of them my thanks, and to pay them my respects. Dr. Selcuk Ozgediz of the CG Secretariat provided much helpful advice, historical background, concepts and suggestions that kept us focused on the right task and to meeting deadlines without sacrificing quality. Also, Ms. Kerri Wright Platais of the Secretariat was extremely valuable to the Panel's work, serving as an important resource person and participant.

I also want to personally thank you for the opportunity to serve the international agriculture research community in this important capacity.

Sincerely Yours,

David R. MacKenzie
Chairman
INIBAP/EMPR Panel

ACKNOWLEDGMENTS

The External Management and Program Review Panel wishes to express its sincere appreciation to the management and staff of INIBAP for the support they gave to the members of the Panel throughout the course of this review. The Panel is particularly grateful for the open and constructive spirit of the entire institution and for the generous time and help given to us whenever requested.

The Panel wishes to particularly thank Dr. Edmond De Langhe for his hospitality and for insuring that our task would be done under optimal conditions at all times. We also gratefully acknowledge the efforts of the INIBAP headquarters staff in making our stay in Montpellier, France so productive. We are also grateful to the INIBAP Regional Coordinators for their assistance, courtesy and hospitality during our country visits. The Panel found this phase of the review to be particularly informative and valuable to understanding the mission, goals and accomplishments of INIBAP.

In addition, the Panel wishes to thank Mr. Mehdi Abdelwahab of INIBAP headquarters for providing initial liaison and review planning, and Mr. Robert D. Huggan, INIBAP's Head, Information and Communications, for editorial assistance in the final stages of the EMPR report. The Panel also wishes to thank Ms. Ingrid Hagen, of the CGIAR Secretariat, for her invaluable assistance in the logistical coordination of the review. Finally, the Panel greatfully acknowledges the excellent services of Ms. Florence Malafosse, of the INIBAP headquarters staff, and Ms. Anne-Marie Seng-Sourinho, special project assistant, for their hard work in producing this document on time.

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LIST OF ACRONYMS

ACIAR	Australian Center for International Agricultural Research
ARCOBAT	Association pour la Cooperation des Recherches de Bananiers en Amèrique Tropicale
ASBANA	Associaciòn Bananera Nacional (Costa Rica)
ASPNET	Asia and Pacific Network
BBTV	Banana Bunchy Top Virus
CABI	Commonwealth Agricultural Bureau International
CATIE	Centro Nacional de Investigaciòn y Enseñanza
CENIAP	Centro Nacional de Investigaciònes Agropecuarias (Venezuela)
CGIAR	Consultative Group for International Agricultural Research
CGIS	Central Germplasm Information System
CIAT	Centro Internacional de Agricultura Tropical
CIRAD	Center de Coopèration Internationale de Recherche Agronomique por le Dèveloppement
CONAB	Consejo Nacionel del Banano (Panama)
CORBANA	Corporaciòn Bananera Nacional (Costa Rica)
CRBP	Center Règional Bananiers et Plantains (Cameroon)
CTA	Technical Center for Rural and Agricultural Cooperation
EANET	East Africa Network
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuària
EMPR	External Program and Management Review
FAO	Food and Agricultural Organization
FHIA	Fundaciòn Hondureña de Investigaciòn Agricola
IARC	International Agricultural Research Center
IARPBC	International Association for Research for Plantains and other Cooking Bananas
IBSRAM	International Board for Soils Research and Management
IBPGR	International Board for Plant Genetic Resources
ICA	Instituto Colombiano Agropecuario
ICIPE	International Center for Insect Physiology and Ecology
ICLARM	International Center for Living Aquatic Resources Management
ICW	International Centers Week
ICRAF	International Center for Research in Agroforestry
IDRC	International Development Research Center
IITA	International Institute for Tropical Agriculture
IMTP	International Musa Testing Program
INFO/DOC	Information and Documentation
INIBAP	International Network for Improvement in Banana and Plantain
IPGRI	International Plant Genetic Resources Institute
IPM	Integrated Pest Management
IRAZ	Institut de Recherche Agronomique et Zootechnique de la Communautè
IRFA	Institut de Recherche sur les Fruits et Agrumes
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Service
KUL	Katholieke Universiteit Leuven
LACNET	Latin American and the Caribbean Network
MGCN	Musa Germplasm Conservation Network
MGES	Musa Germplasm Exchange System
MOU	Memorandum of Understanding

NARS	National Agricultural Research System
PCARRD	Philippines Council for Agriculture, Forestry, and Resources Research and Development
QDPI	Queensland Department of Primary Industries
RAC	Regional Advisory Committee
RENIP	Regional Evaluation and National Integration Program
RFLP	Restriction Fragment Length Polymophysim
RTI	Royal Tropical Institute (The Netherlands)
RISBAP	Regional Information System for Banana and Plantain (ASPNET)
SPAAR	Special Program for African Agricultural Research
TAC	Technical Advisory Committee
TOR	Terms of Reference
UPEB	Uniòn de Paises Exportadores de Banano
UPLB	University of the Philippines, Los Baños
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WACNET	West and Central African Network
WARCOP	West African Regional Cooperation for Research on Plantain

SUMMARY

The origins of the International Network for the Improvement of Banana and Plantain (INIBAP) are grounded in the disease black Sigatoka. This looming global threat to banana and plantain production stimulated a few visionary institutional founders to establish a research-service institution to facilitate a reorientation of *Musa* breeding to address this important disease. Along the way, a few additional high priority constraints were added, but the target of INIBAP remains improved *Musa* cultivars (plantain and cooking bananas) for domestic consumption.

Among its notable achievements, INIBAP has been awarded membership in the CGIAR system.

The Network is considered to be an innovative institutional model established to facilitate *Musa* research activities, but not to engage in them directly. This network-based mode of operation was selected as more cost-efficient and more likely to provide effective linkages with national agriculture research systems (NARS) than through other modes.

The expectations for INIBAP are established in its mandate statement:

> "The general objective of INIBAP is to increase the productivity and stability of banana and plantain grown on smallholdings."

This global perspective and commodity orientation represents an important assignment for INIBAP, given the enormous importance of domestically consumed *Musa*, which is a staple food in much of Asia, Latin America, and particularly in Africa.

As a condition of CGIAR membership, an External Management and Program Review (EMPR) of INIBAP was to be completed in early 1992. The responsibility for commissioning the EMPR was assigned to the CGIAR Secretariat, and coordinated with TAC, to be conducted by a panel of specialists with experience and knowledge sufficient to provide judgments on the value of the achievements of the institution, and make recommendations of substance.

The EMPR Panel was given terms of reference, including a series of illustrative questions general to IARCs and specific to INIBAP. To conduct the review, Panel members, as a whole or in teams, visited components of the Network, including various sites in the four Regional Networks (Latin America and Caribbean; West and Central Africa; East Africa; and Asia and the Pacific). The Panel had access to numerous documents provided by INIBAP and from other sources. Two survey questionnaires were administered through the CG Secretariat; one to the INIBAP Board of Trustees, and a second to clients within the four INIBAP regions. These sources, along with direct personal interviews, provided the basis for the EMPR Panel's evaluations and recommendations provided in the review report.

In Chapter 2 the Panel defines a number of concepts necessary for understanding INIBAP's identity and operations. These include three alternative institutional models for carrying out research and research-related services: research service institution, research-based service insitution, and research center with in-house facilities. The role of networks and of research is examined in these three types of institutions. INIBAP is characterized as a research service institution.

Chapter 2 also provides an overview of the evolution of INIBAP and its strategy.

Program and Activities

The report provides in Chapter 3 a description of the numerous accomplishments of INIBAP which have been organized and presented as programs, services and training activities, and by the four Regional Networks.

Highlights of INIBAP's accomplishments include the establishment and improvement of programs to facilitate the exchange of healthy *Musa* germplasm through INIBAP's services. These include the Transit Center, the two Virus Indexing Centers, and a germplasm repository reputed to be the world's largest collection of *Musa* accessions, and associated documentation on the collection.

INIBAP has also launched an International *Musa* Testing Program (IMTP) to evaluate improved cultivars, and assess the potential stability of sources of resistance used to improve *Musa* hybrids.

Through a number of collaborative research projects, INIBAP is fostering fundamental, strategic and applied research in areas such as molecular biology, reorientation of *Musa* breeding objectives for smallholding banana and plantain produced for domestic consumption, and on aspects of crop protection. These Network activities are supplemented with research support and coordination services, and research planning and facilitation.

INIBAP's research services are reinforced with a global information and documentation (INFO/DOC) system. Other INIBAP programs have been established in collaboration with other organizations to provide easy access to *Musa* literature and publications through the INIBAP Communications Program.

INIBAP has no training coordination program, although training is one of its four strategic objectives.

INIBAP has also established four regional networks to service the needs of clients within the producing regions, and to represent the Network through regional presence. Although the establishment of the regional networks is a major achievement, much needs to be done to develop them into effective regional operations on *Musa* research and development. Detailed summaries of the operation each regional network are provided in this report, based on in-country visits by members of the EMPR Panel.

INIBAP's services through its regional networks cover a wide range of responsibilities and are thinly spread. This is in part because the Network's goals and priorities are unclear. Although all four Regional Coordinators are extremely busy, it is not clear if the services they are providing are high priority.

Organization and Management

The organization and management of INIBAP was studied in considerable detail by the Panel, and the findings are reported in Chapter 4. The legal status of the institution is still unsettled as the French Government has not awarded the Accord de Siège necessary for legally establishing the institution's headquarters. This places INIBAP in some jeopardy, and has fostered *ad hoc* solutions for employing some Network staff.

INIBAP's governance is through a Board of Trustees, organized into three sub-committees and led by an elected Chair. The Board survey questionnaire revealed interesting information of the Board's past performance, its expectations for INIBAP, and some insights on perceived problems and possible corrective actions.

The Panel also evaluated the present leadership of INIBAP, and given the Director's pending retirement, the Panel provided the INIBAP Board of Trustees with some points-to-consider on the management characteristics that would suit the future needs of the institution.

The finance, planning and organizational structure of INIBAP was evaluated by the Panel and specific recommendations are made by the Panel on these areas. The institution's financial shape is not good, but the situation is not so severe as to place the Network in immediate jeopardy. A summary of the institution's financial history is also provided.

Other sections of Chapter 4 deal with management of human resources, and INIBAP's institutional relationships which need to be strong, given the Network's mode of operation. The Panel's recommendations regarding human resources focus on the need for team-building and empowering professional staff, to encourage innovation and motivation. Institutional relationships for a network are an important consideration, as its achievements are mostly done through others. INIBAP's institutional relationships are evaluated by the Panel by category, with particular focus on strategic partners. Most institutional relationships were judged to be satisfactory.

The Future of INIBAP

In Chapter 5, the Panel offers a view to the future for INIBAP. The time-scale is partitioned into three segments: in the next twelve months, in the next five years and in the next ten years.

In the short-term (one year), the Panel is recommending that INIBAP work on providing institutional stability (i.e. financial, emotional, confidence, goal and role clarity, and job security). Other priorities note the need for the new Director to find opportunity to visit throughout, and come to understand, the Network. The Panel also calls for beginning the process of rigorous strategic analysis and planning for the Network.

In the medium-term (5 years), the Panel is proposing that the institution redirect itself through a strategic planning process. This process was prescribed for INIBAP as a condition of membership in the CGIAR. This effort is seen as a necessity for INIBAP to totally rethink how it should reorganize itself to address specific goals, clearly stated objectives and design corresponding programs and projects, all coupled to realistic budgets.

In the long-term (10 years), the Panel recommends that INIBAP strategically redirect its efforts to a broader vision of its global mandate for *Musa*. A number of strategic issues, not now clearly addressed by the Network, will need to become part of INIBAP's consideration. The Panel has proposed that this would best be done through a participatory strategic planning process that would ask the right strategic questions, analyze the strategic issues and develop a strategic plan that would best meet the expectations of the institution - with the perspective of the clients, the users and the donor community. The breadth of strategic issues considered should go beyond the present product focus (improved *Musa* cultivars with disease resistance) to include a more holistic view of the *Musa* production and marketing systems. The absence of these perspectives from INIBAP' strategy was noted by the Panel. How INIBAP chooses to broaden its strategic view has been left to the Network's strategic planning process.

INIBAP and the CGIAR

In the final chapter, the Panel examines INIBAP's relationship with the CGIAR system, and provides suggestions on how the CGIAR might evaluate the success of this innovative mode of operation. Described by some as an "experiment", INIBAP provides the CGIAR system with a unique opportunity to test the concept that networking is more cost-effective and is better able to link with NARS than are research centers. But the Panel has concluded that the experiment, as it is being implemented, is not an adequate test, as INIBAP is currently underfunded for the tasks it has undertaken. There is need for the CGIAR to clearify its expectations from INIBAP and employ a practical means of assessing INIBAP's progress.

LIST OF RECOMMENDATIONS

Throughout the report, the Panel has made numerous suggestions to address specific issues identified during the review. Some of these carry greater importance for the institution and these have been identified as listed below.

With respect to INIBAP's programs and activities, the Panel recommends that:

1. INIBAP conduct a thorough, formal study of its procedures for handling germplasm requests with a view to expediting the process.

2. The Crop Protection Research Coordination program adopt a more holistic view of approaches to crop protection.

3. INIBAP examine its training-related policies, priorities and activities, with the intent of establishing a Training Coordination Program.

4. As part of its strategic reorientation, INIBAP clarify the role, identity and mission of regional networks. It further recommends that each regional network be encouraged to develop its own strategic plan, within the broad parameters provided by the updated INIBAP strategy.

In the area of INIBAP's organization and management, the Panel recommends that:

5. The Board establish a Finance and Administration Committee, with an Audit Subcommittee, to oversee the management of INIBAP.

6. The Board commission an external audit of INIBAP's financial controls and of Thornton International, with immediate effect (i.e. without waiting until the next annual audit).

7. The Board explore both formal and informal ways of monitoring INIBAP's human resource management practices, so that its staff work as a team, are motivated, and feel that they are valued by the organization.

8. The Board review recent salary and benefits decisions to verify if they are consistent with INIBAP policies and procedures, and the guidelines issued by the Board.

9. The Board develop a formal policy to address various conflict-of-interest

situations.

With regard to INIBAP's future, the Panel recommends that:

10. The Board place greater focus on strategic concerns facing the institution.

11. INIBAP initiate a rigorous analysis of its strategic directions, taking into account institutional expectations consistent with its membership in the CGIAR system, donor perspectives and client needs.

12. INIBAP consider employing a participatory approach to identifying its strategic directions.

Finally, with regard to CGIAR and donor actions on INIBAP, the Panel recommends that:

13. The donor community strengthen funding for the Fundación Hondureña de Investigación Agrícola (FHIA) in Honduras *Musa* breeding program.

14. The CGIAR clarify its expectations from INIBAP for the removal of the "sunset clause" that is attached to INIBAP's membership in the CGIAR.

It is the consensus of the Panel that INIBAP offers an exciting opportunity to facilitate significant researchable problems related to *Musa* production and consumption. The Panel's enthusiasm for the opportunities to assist these needed research activities through services, support and training represent an opportunity consistent with the CGIAR's purposes. The prospects for the Network are positive but need rethinking, replanning and renewed support.

CHAPTER 1. INTRODUCTION AND CONTEXT

1.1 The Expansion of the CGIAR and Extension of its Mandate

During the 1988 mid-term meeting of the CGIAR, the Group agreed to review 10 non-associated international research centers for possible entry into the System. The list included the International Network for the Improvement of Banana and Plantain (INIBAP). In assessing the global importance of banana and plantain research and making its recommendations to the CGIAR on the possible role of INIBAP, TAC relied upon a desk study prepared by the TAC Secretariat on the subject, the report of a TAC Fact Finding Mission to INIBAP (1989) and the recommendations of a TAC panel on Banana and Plantain.

In its 1985 review of CGIAR priorities and strategies, TAC had identified banana and plantain as meeting the main criteria for CGIAR support (TAC/CGIAR, 1987). TAC recommended the main priorities requiring international strategic research to be: the exploitation of genetic resources; a better understanding of indigenous banana and plantain production systems to keep genetic improvement programs aligned with producers' needs; and research on the major diseases of banana and plantain to ensure development of disease-resistant cultivars.

Within the CGIAR, the International Institute for Tropical Agriculture (IITA) had established a program on plantains as early as 1973 and had been assigned the mandate for plantain improvement in 1987. This was primarily for work in Sub-Saharan Africa. Given the IITA experience in plantain research, the TAC Study on the expansion of the CGIAR considered several institutional options in the desire to take maximum advantage of IITA's experience. These included the following:

> "**Option 1**: IITA to assume primary responsibility for banana and plantain research and establish a distinct program. INIBAP would be given the option of becoming an integral part of IITA.
>
> **Option 2**: IITA to assume primary responsibility for banana and plantain with particular focus for sub-Saharan Africa. It would maintain the base collections for banana and plantain germplasm and play a leadership role in germplasm enhancement. CIAT and IRRI to add banana and plantain to their mandates and cater to the needs of Latin America and Asia respectively. The relationship between IITA, CIAT and IRRI would be similar to the existing arrangements for rice research. INIBAP would have no specific role in the CGIAR.
>
> **Option 3**: INIBAP to have primary responsibility for banana and plantain. IITA would transfer its plantain breeding activities to INIBAP.
>
> **Option 4**: Present arrangements with CGIAR funding for INIBAP through IITA and/or IBPGR. INIBAP would remain outside the CGIAR.
>
> **Option 5**: Maintain present arrangements but incorporate INIBAP into the CGIAR."

After considering the institutional options outlined, TAC decided that a modification of Option 1 was preferred. TAC recommended "... that IITA assume primary responsibility for banana and plantain research in the CGIAR and include INIBAP under a wider mandate. The identity of INIBAP should be maintained and the network component of the program should be run from the Montpellier site for reasons of superior communication and continued fruitful contacts with CIRAD/IRFA."

During the 1990 International Centers Week (ICW) the TAC recommendations were considered by the CGIAR. After much discussion the Group decided to invite INIBAP to join the CGIAR as a separate institution. This decision was based on recognition of the importance of international research on bananas and plantains and that INIBAP, operating through its networking structure, presented a highly innovative model for the CGIAR. This decision came at a time when the donors perceived a need to explore new institutional models for future CGIAR activities.

The invitation to join the CGIAR was for an initial trial period, as the International Service for National Agricultural Research (ISNAR) had undergone during its first five years. The CGIAR also asked INIBAP and IITA to work with TAC to agree upon a division of labor and mode of collaboration between the two institutions that would to best further the CGIAR's objectives in banana and plantain research. A proposed process and timetable was prepared by the CGIAR Secretariat. This included presentation of the INIBAP strategy to TAC in 1991 and a CGIAR External Program and Management Review of INIBAP in early 1992. This review is scheduled for discussion by TAC in June 1992 and the CGIAR at ICW 1992. INIBAP would have an opportunity to modify its strategy to take into account feedback provided by the external review. It would prepare a five-year Medium Term Plan (MTP) for discussion by TAC and the CGIAR in 1993 with implementation starting January 1, 1994. The next external review of INIBAP in 1998 would assess the institution's progress and make recommendations to TAC and the CGIAR about the continuation of INIBAP's status within the CGIAR.

1.2 Banana and Plantain and INIBAP's Focus

Bananas and plantains are grown in 115 countries. Seventy million tons are produced annually, with only 10 percent exported to developed countries. The remaining portion provides a significant source of nutrition to nearly 400 million people in the poor regions of the tropical world. World banana and plantain production is estimated by FAO at more than 68 million metric tons, of which about 24 million are grown in Africa, 26 million in Latin America and the Caribbean, and 17 million in Asia. In East Africa, 80 percent of the daily carbohydrate intake in rural areas is from banana and plantain.

M U S A

The word *Musa* is derived from Arabic, meaning banana. Taxonomically, *Musa* is the genus that contains between 30 and 40 banana-related species. The evolutionary origins of *Musa* are in South-East Asia.

All edible bananas and plantains are derived from two species: *Musa acuminata* and/or *Musa balbisiana*.

The terminology used to describe the various types of banana and plantain is often confusing, and complicated by subtle uses in different languages. Also, genetic makeup, cooking characteristics and consumption practices further confuse the common terminology.

One way to avoid the imprecision of common names is to simply refer to the entire group as *Musa*, thus avoiding arguments over the confusing terminology.

BOX 1

Bananas and plantains are of important nutritional value. They provide a rich source of the carbohydrates needed for energy, vitamins C, B and A, and some minerals, notably phosphorus, calcium and potassium, needed for bone development. In North America and Western Europe it is estimated that banana consumption averages no more than 30 grams per person per day, or about one banana a week. In contrast, in African countries where banana is a major staple, consumption may exceed one-half kilogram per day.

As the world export trade in bananas is estimated at only 7 million tons, it is clear that the primary importance of the crop is as a local consumption food. Most of the global banana and plantain production is consumed by the small farmers who grow the plants, or is sold in local markets. Bananas and plantains are attractive to small farmers. Their perennial nature reduces production costs and does not deplete the soil of needed nutrients. Farmers use the residue of the plant as mulch and the plant's canopy cover provides protection for other crops, such as beans, groundnuts and coffee, that are often grown with banana. It has been estimated that half a hectare of bananas will feed an entire family.

Genetics of Banana & Plantain

Nearly all edible bananas and plantains are derived from two diploid species: *Musa acuminata* (AA genome) and/or *Musa balbisiana* (BB genome). Neither of these species are truly edible types, but assortments of the genomes provide what is commonly known as banana and plantain.

The exported dessert-type bananas are triploid (genome AAA). This ploidy level contributes to the sterility of the fruit (i.e., no seeds) and thus the extreme difficulty in breeding improved varieties. Most of the world's export dessert bananas are Cavandish. (see Box 2)

Plantains and cooking bananas are also triploids, but their genomic makeup is a mixture of chromosomes from both *Musa acuminata* and *Musa balbisiana*, yielding either AAB or ABB genomes, perhaps also BBB.

Recently, Musa breeding programs have been reoriented to emphasize Third World staple - food type bananas and plantain. The strategy is to use conventional genetics to intercross AAB and ABB genomes with improved diploid parents to produce tetraploid hybrids (AAAB). This reassortment allows specific traits of interest, such as resistance to disease, to be incorporated into superior cultivars.

BOX 2

Types of bananas differ widely. For example, a large group of banana varieties, that have no cunterparts in any other region of the world, exist in the highlands of eastern Africa. A few are used as dessert bananas, but the majority are either starchy cooking types or astringent varieties used in making fermented beverages. For commercial dessert bananas, however, the banana-exporting countries focus almost exclusively on the Cavendish variety.

In addition to the variety of banana and plantain cultivars available, there is also a multiplicity of local names. Common names differ from area to area or from one ethnic group to another. There is also no clear internationally accepted classification for banana and plantain varieties. This creates difficult circumstances for communication between scientists working on similar varieties in different parts of the world. In addition, there are no universally accepted standards for the scientific names of banana and plantain species, although one system was established by British taxonomists nearly 40 years ago. Currently, the use of molecular classification procedures have not yet been applied to the genus *Musa*.

In light of the growing importance of the crop and its diverse nature and uses, INIBAP was established in 1984 to coordinate an international research effort on behalf of banana and plantain grown on smallholdings. It was created after a series of meetings with key donors, scientists and representatives of most major banana and plantain producing countries, who met to explore a means of addressing the deficiency in banana research for the benefit of developing countries. These meetings were held in Ottawa (1982), Washington D.C. (1983), and Rome and Washington, D.C. (1984).

Since most previous banana research had focused on export dessert bananas, it was stressed during the formation of INIBAP that the primary objective of the network should be that of increasing the production and the stability of production of bananas and plantains grown for domestic consumption within producing countries (Nestel, 1984). The network was conceptualized as having a primarily regional structure, with regional activities linked through

a team of regional coordinators. It was recommended that the network use the resources of existing breeding programs, especially the long-established one in Honduras which had recently released their previously private material into the public domain. INIBAP was set up with some aspects analogous to those of the CGIAR Centers, but ***was not intended to have a central research facility of its own***. At the time of its inclusion into the CGIAR three of the now four regional networks were in place.

1.3 The External Review

The full terms of reference (TOR) for this external review is included in Annex 2. As in other external reviews, the list of general questions in the standard TOR for External Reviews of CGIAR Centers was supplemented with a set of additional questions reflecting specific concerns expressed about INIBAP. Both sets of questions are included in Annex 2.

Although INIBAP is a small institution, the complexity of its mandate and operations requires as much data collection and analysis as in the reviews of larger centers. This is reflected by the diversity of the illustrative questions appended to the TOR.

Different Musa Commodities

It is very easy to think of *Musa* fruit as a single commodity; yet it is readily possible to recognize six principal types among the three (or perhaps four) botanical groups of triploids. Definitions and geographic areas of greater importance are:

1. Sweet dessert bananas (AAA): Gros Michel and Cavendish types grown very largely for export; New World, West Africa, Asia, Australia.
2. Semi-sweet, sub-acid dessert bananas (AAB): for domestic use and internal markets; Brazil, India.
3. Cooking bananas (AAA): palatability variable when ripe but habitually cooked, usually unripe; East Africa, New Guinea.
4. Plantains and similar types (AAB): fruit remains firm-textured and starchy when ripe, then needing to be cooked to be palatable; often fried or roasted; West and Central Africa, Colombia, South India.
5. Bluggoes, Awak and Sabas (ABB/BBB): also more-or-less starchy when ripe and normally cooked ripe before eating; New Guinea, the Philippines, Thailand and more generally.
6. Beer bananas (AAA): often morphologically close to type 3 but astringent; fermented product may be sold in bulk; East Africa.

There has never been any breeding interest in type 6, nor is there current interest in type 1, except that hybrid products may serve two purposes, in types 1 and 3. Current breeding programs are targeted on types 2, 3, 4 and 5, each of which makes substantial dietary contributions in many Third World countries.

BOX 3

Despite the complexity of the review, TAC and the CGIAR Secretariat kept the panel size deliberately small (four persons, including the chairman). This might possibly be the smallest external review panel in the CGIAR's history.

The review required gaining first-hand impressions of the global and regional activities of INIBAP. To gain such an understanding, the Panel, as a whole or in sub-groups, visited the INIBAP Transit Center at KUL in Leuven, Belgium, the headquarters at Montpellier, France and the bases of the four regional networks in Latin America, Africa and Asia. In addition, the Panel interacted with the INIBAP Board of Trustees during International Centers Week in Washington, D. C. in 1991, attended an INIBAP-organized biotechnology workshop in Costa Rica, and interacted with the representatives of the French Foreign Ministry and CIRAD. The report was prepared during a 16 day period in April-May, 1992. The list of institutions visited and persons met by panel members is included in Annex 3.

The review report is designed to first give the reader a broad view of the design of INIBAP as an institution. This overview is presented in Chapter 2 and provides a context and perspective for analysis of issues in subsequent chapters.

Chapter 3 then examines how INIBAP was able to implement the design described in chapter 2 in programmatic terms. The focus here is on INIBAP's activities and accomplishments to date and the strengths and weaknesses of its program.

Chapter 4 focuses on INIBAP's organization and management and the manner in which the original institutional design has been put into operation. As in Chapter 3, an assessment is made at the end of Chapter 4--this one oriented towards INIBAP's organizational strengths and weaknesses.

Chapter 5 identifies INIBAP's future opportunities, as the Panel sees them, and offers some specific recommendations to utilize them effectively. The purpose of this Chapter is to provide INIBAP's Board and management and the CGIAR audience with views on strategic issues of importance to the CGIAR and to INIBAP. This is followed by a chapter which draws conclusions from the Panel's analysis and highlights issues that the CGIAR might consider.

CHAPTER 2. THE INIBAP CONCEPT

From its inception in 1984 INIBAP has been viewed as a unique international agricultural research effort whose objectives were to be achieved through a networking strategy, and thus avoid the heavy human and physical capital investment associated with research centers. Although there was a recognized need for an international approach to *Musa* germplasm improvement, the nature of existing research was fragmented, and a network, it was and is assumed, would better accommodate the location specificity of problems and cultural requirements. In terms of governance, however, INIBAP operates on the same mode as other Institute of Agricultural Research (IARCs), with a Donor Support Group, a Board of Trustees, and a Director.

2.1 Key Concepts

INIBAP was invited to join the CGIAR, in part, in order for the CGIAR System to be able to better understand its "innovative institutional mode." Gaining such understanding requires identifying the distinguishing characteristics of this "innovative mode" and comparing these to the characteristics of institutions with which the CGIAR System is more familiar, i.e., international centers such as IRRI, CIAT, IITA, etc.

Understanding INIBAP's operations requires first a clarification of its role in the conduct of research. It is also essential to clarify what a network is and the role that networks can play in the conduct of research. This section starts with an explanation of these two concepts (research and network). It then follows with a description of what the Panel considers to be three distinct institutional models for carrying out international research and research-related activities, with special emphasis on the role played by research and networking in each model:

- research center with in-house facilities ("research center" for short);
- research service; and
- research-based service.

Networks and networking play an important part in each of the three types of institutional models. Drawing distinctions among these models was helpful to the Panel in appreciating the nature of INIBAP's outputs and their actual or potential impact on its target or client audiences.

2.1.1 Research

The Panel uses the term "research" in the same sense as TAC: "discovery and/or development of new knowledge or technology" (TAC 1992, p. 13). In the Panel's view, the new knowledge generated by each research activity could relate to understanding relationships among phenomena or to a new way of conducting research (i.e., to methodology). Similarly, new technology could vary from a material object (a plant variety or equipment) to a new system of application (a planting technique).

In the CGIAR, for purposes of simplicity, a distinction is often made among four types of research: basic, strategic, applied and adaptive. Broadly speaking, basic research is geared towards generating new understanding, with no application in mind. Strategic research is also geared towards generating new understanding, but for the solution of specific research problems. Applied research uses basic and strategic research findings to generate new technology. Adaptive research is concerned with adjusting technology to the circumstances of

a specific location. Most research institutions within the CGIAR are involved primarily with strategic or applied research.

The term "research institution" is typically used to refer to institutions whose principal preoccupation is the **conduct** of basic, strategic, applied or adaptive research. In other words, the primary outputs of such an institution are new knowledge or technology. The institution can claim full or partial credit (i.e., have a sense of ownership or co-ownership) for the generation of the new knowledge or technology.

2.1.2 Networks

A network is a relatively new organizational mode for carrying out research or research-related activities. Plucknett, Smith and Ozgediz define a network as "an association of independent individuals or institutions with a shared purpose or goal, whose members contribute resources and participate in two-way exchanges or communication" (1990, p.1). Faris defines it as "a cluster of institutions linked together by a common interest in working interdependently on an identified common problem or problems," (1991, abstract).

Building on a typology developed for the Special Program for African Agricultural Research (SPAAR), Plucknett, Smith and Ozgediz define four types of networks:

- **Information exchange networks** usually involve the gathering and dissemination/sharing of information on a specific subject by the members of the network.

- **Material exchange networks** are usually geared towards testing selected plant varieties or machinery at the sites of the participants.

- **Scientific consultation networks** bring together scientists working on common or related problems autonomously for exchanging ideas and experiences.

- **Collaborative research networks** enable a group of researchers to pool their resources and talents in the definition and solution of a research problem.

These types reflect the dominant characteristics of a network and are not mutually exclusive. A network may start as an information or research consultation network and evolve over time into a collaborative research network. It can still maintain information network, material exchange network and scientific consultation network dimensions as well. But the main purpose of a collaborative research network is to conduct research on a common problem through a research team made up of participants from several institutions. Such a network is geared towards discovery or development of new knowledge or technology.

Conducting research on a common problem to jointly generate new knowledge or technology is not the main purpose of the other three types of networks. The primary outputs of information exchange networks are information, those of material exchange networks are plant varieties or equipment. In the case of scientific consultation networks, the collective activity of the network is "consultation," which usually helps enhance the research capacity of the participating institutions or individuals, but the network - as a network - does not produce "research."

However, a material exchange network can have a research dimension, even though its main purpose is to facilitate the exchange of materials. Findings resulting from the exchange (such as through a germplasm-testing network) can be analyzed and shared with the members of the network and the global research community. To the extent that such studies involve discovery or development of new knowledge, research becomes the secondary purpose of a material exchange network. New varieties (or technology) resulting from the exchange would be the outputs of the institutions carrying out the testing and developing the technology, not that of the organization facilitating the exchange.

The attractiveness of a network (particularly for donor agencies funding it) is that a network uses the existing facilities and staff of the participating institutions. Another perceived advantage is the participation, in decision making or research, of institutions and individuals who would later play a role in implementing the results of these decisions or research.

The international centers within the CGIAR have played a major role in the formation and coordination of networks of all types. Institutions like INIBAP, ICRAF and IBSRAM have opened a new chapter in international agricultural research because of their extensive use of networks to achieve their goals.

2.1.3 Institutional Models

The first two of the three institutional models described below (research center and research service) are different in terms of the nature of their **primary** outputs. In the third (research-based service), the primary output of the institution is service (not necessarily research service), but the service provided is partly dependent on some in-house research competence.

Research Center. The first group of international agricultural research centers were established with the philosophy that to tackle a global problem which research might help solve (such as finding ways of increasing rice yields in developing countries), one needs:

- an interdisciplinary team made up of the best scientists from around the world,
- laboratories, experimental fields and other equipment they would need to conduct their research, and
- a supportive environment conducive to innovation and creativity.

Most of the CGIAR centers were founded with these basic principles in mind. Centers of this type were established both because of the **international** nature of the problems being addressed through research, and because it was felt that it would be more cost effective to have the research done through this mode rather than any other.

Having a team of scientists work in one facility (or several well-integrated facilities) allows interdisciplinary interaction and communication among the team members on a daily basis on a range of related projects. Interaction of this type is physically impossible in a collaborative research network (although new information technologies are quickly breaking the geographic barriers). The research center model also facilitates the integration of the efforts of individual scientists or project teams toward the goals of one institution. The participants in a collaborative research network, on the other hand, have to keep in mind the goals of their own institutions simultaneously with the objectives of the research activity being carried out through the network.

Research is not the only goal of the research centers. Many of the research centers in the CGIAR are engaged in research-related activities of a research service or institution-building nature. In most cases, their competence in research gives them a comparative advantage in providing research services in their areas of competence (such as training, information and consultancy). In other words, their services are dependent on their extensive competence and experience in research.

Research centers employ networks in a number of ways. First, they coordinate or participate in collaborative research networks which further their research aims. Second, they utilize information, material exchange or research consultation networks for providing services to their clients (usually, national programs in developing countries) and for strengthening their research capacities. Third, they use networking as a means of disseminating the results of their research activities.

Research Service. The CGIAR makes a clear distiction between research and research-related activities of the institutions it supports. The latter group of activities include those designed to enhance the effectiveness of research, training in research methods, collaboration with other research institutions, and assistance in planning, organizing and developing research systems (TAC, 1992, p. 14). The term "research-related" often refers to non-research activities of institutions whose primary preoccupation is research.

By "research service" the Panel is referring to services provided by an institution to other institutions in order to facilitate the conduct or enhance the effectiveness of their research. The service provided can be in the form of information, training, materials (such as germplasm), advice, a forum for exchange of views, funding, etc. and can be geared towards basic, strategic, applied or adaptive research.

Research service institutions are primarily engaged in service provision. This is their principal "business." But they can and often do have a research arm as well. The nature of the research they conduct depends on their institutional goals and competence. Because they play a catalytic role in the conduct of research by others, they have frequent opportunities to participate in some collaborative research activities.

An opportunistic, proactive research service institution would conduct **research on research needs** related to its mandate to understand where its activities could have the greatest impact. Similarly, it would have a clear sense of which institutions or individuals are carrying out (or have the potential to carry out) the type of research that is needed. It would then catalyze the matching of research needs and suppliers, sometimes forging previously unrealized linkages among institutions or individuals. Much of this type of activity requires good assessment skills and imaginative thinking.

Research service institutions empower others to do research. Critical input provided by a research service institution can enable a research institution to generate outputs which would otherwise not have been possible. This critical input can be in the form of a new plant variety, information about a new plant protection procedure, a consultant, and facilitation of a linkage between two otherwise unrelated institutions.

Networking offers a particular advantage to research service institutions because networks can be instrumental in **both** the assessment of needs and the delivery of services. Information, material exchange and scientific consultation networks are particularly geared towards service delivery. Collaborative research networks can enable a research service institution to help fill

a vacuum in the global research agenda. The service institution need not be a participant in such collaborative research networks.

Some research service institutions operate much like a "holding company of networks," i.e., the institution provides an umbrella framework for a number of independent or semi-independent networks (of various types). These are sometimes called "network organizations," which creates some confusion because this term does not reveal the principal outputs of the organization.

Among the CGIAR institutions, International Board for Plant Genetic Resources (IBPGR), soon to be renamed the International Plant Genetic Resources Institute (IPGRI), comes closest to a research service institution.

Research-Based Service. This is a variant of a service institution (not necessarily "research service") where the service provided is based on some in-house research capacity. The main mission of the institution is to provide a service, but it can do this best by further developing its service competence through hands-on research. Such institutions have a critical mass of staff engaged in research. But, because service is the main occupation of the institution, the research conducted is dictated by the needs of the service arm.

Among the CGIAR institutions, perhaps ISNAR comes closest to a research-based service institution. The services provided by ISNAR are geared specifically towards strengthening the organization and management of national agricultural research systems in developing countries.

2.1.4 Implications for INIBAP

INIBAP is not a research center, in the sense that its principal preoccupation is not the generation or development of new knowledge or technology. It does not itself have a research capacity, beyond the limited time its staff can devote to research after carrying out their other responsibilities.

INIBAP's characteristics best fit the definition of a research service institution. Its activities are geared towards facilitating the conduct of research by others. It does this through networking and other means. INIBAP resembles a "holding company of networks." Individual networks in the holding company help identify research needs and mobilize action toward meeting these needs. Each network addresses needs in one geographic area or subject matter. The actions by all the networks, taken together, represent the catalytic outputs of INIBAP.

INIBAP's current characteristics do not fit that of a research-based service institution. The research service it provides depends on the research capacities of others, not its own.

INIBAP employs networking as a principal means of providing research service to the institutions it believes would have an impact on local producers and consumers of banana and plantain. It employs both global and regional information networks, coordinates material exchange networks (for germplasm and testing varieties), and coordinates four regional scientific consultation networks. It is involved in only a few collaborative research network activities.

The results of INIBAP's efforts will demonstrate the appropriateness of a research service mode of operation for meeting its goal of increasing the productivity and stability of banana and plantain grown in smallholdings. INIBAP should constantly ask itself if another mode will provide

a more cost-effective means of reaching this goal. Should it gear the activities of its networks from a research service orientation to collaborative research? Should its regional networks spin-off sub-networks in areas of regional importance? Should it move toward a research-based service? Or does it make sense to contemplate a research center model at some date, either on its own or by joining forces with others?

While it is difficult to answer these questions with much clarity at this time, the Panel has attempted to provide some answers later in the report, in Chapter 5. What follows below is an account of the origins and evolution of this exciting new entity in international agricultural research.

2.2 Origins of INIBAP and Assumptions Made

In July 1981, when the International Association for Research for Plantains and other Cooking Bananas (IARPCB) met at a conference at IITA in Ibadan, Nigeria, the seed was planted that eventually became INIBAP. That meeting was preoccupied with the rapid spread of black Sigatoka and recommended the multiplication of resistant cultivars and, more importantly, the stepping up of breeding efforts. Exactly one year later, International Development Research Centre (IDRC) convened a meeting of selected specialists at its Headquarters in Ottawa, Canada to implement IARPCB's recommendations and plan the creation of INIBAP. The experts agreed that the most appropriate strategy was to create an "informal international network". IDRC was accordingly tasked with taking the lead and, in November 1983, brought together interested donors in Washington, D.C. Following a recommendation of that meeting, Dr. Barry Nestel was engaged as a consultant to prepare a report which was formally presented to donors in May 1984 in Rome (Nestel, 1984). Before the end of that year, a steering committee of the donor group met in Washington, D.C. and IDRC was appointed as the executing agency to create INIBAP.

Black Sigatoka

Two species of the fungal genus *Mycosphaerella* cause the distinctly different *Musa* diseases yellow Sigatoka and black Sigatoka. Both diseases can cause significant yield losses in susceptible cultivars. Genetic variation in the pathogen contributes to differential disease reactions in some cultivars, and this can severely threaten host plant resistance.

The damage done to susceptible plants is primarily manifested in a loss of leaf area and, consequently, photosynthetic capacity. Under some conditions, total foliar death may occur before the fruit is ready for harvest.

Black Sigatoka (caused by *Mycosphaerella fijiensis*) has a wider host range than does yellow Sigatoka (caused by *Mycosphaerella musicola*). Black Sigatoka is considered to be far more destructive. Experimental evidence on the damage caused by black Sigatoka in plantains shows losses of 35 percent (IITA verbal information) to 40 percent (CORBANA, verbal information).

The principal mode of crop protection for commercial banana production has been by fungicide (chemical control).

BOX 4

The Nestel report of 1984 represents the original blueprint for the creation of INIBAP. In that report, the major effort for breeding banana and plantain for food needs of smallholders was confirmed. *Musa* breeding was also identified as the priority effort at international level, with husbandry, socio-economics, post-harvest research, and so on, as suitable for location-specific attention in the various regions.

The Nestel blueprint proposed that INIBAP take aim at the following specific objectives:

- "Select and develop plantain and banana material resistant to the major diseases and pests of the crops;
- Subject this material to a program of regional trials prior to disseminating promising cultivars to the interested countries; and
- Establish a global network which would link and strengthen national and international plantain/banana improvement programs." (pp.14-15)

Another original goal was to develop at least one major *Musa* breeding center in each of the regions.

Persley (1984) also recognized the need, as an international effort, for breeding centers to generate and distribute new germplasm. In addition, capacity was needed to index clonal material for Bunchy Top disease for germplasm provided from countries where the virus existed.

Persley (1984) gives a summary of those objectives, cited more often in the early life of INIBAP:

- "Helping national and regional programs to establish and implement research priorities;
- Strengthening breeding programs and facilitating the interchange of improved, pathogen-tested germplasm;
- Assisting in the establishment and analysis of regional and global trials of new and improved cultivars;
- Supporting studies on banana-based farming systems and socio-economics which were associated with the breeding program;
- Promoting the interchange of documentation and information relating to bananas;
- Providing appropriate training for staff of national programs; and,
- Identifying donors and assisting countries in the development of proposals for donor support." (p.3)

INIBAP today, however, has evolved into a somewhat different model from the originally envisaged "informal international network", and has a more explicit mandate to carry out some research, albeit at a much reduced scale in comparison to other CGIAR centers.

2.3 Need for an International Effort

It is the view of TAC that, in comparison with other crops of similar significance, banana and plantain are under-researched.

Banana and plantain are difficult crops to breed and very few national agricultural reseach system (NARS) are capable of marshalling the human and capital resources necessary to achieve impact. The threat of black Sigatoka (*Mycosphaerella fijiensis*) in most producing

regions gives the disease global importance. The chemical control of this disease is not an affordable option for most smallholders. Other pests and diseases of significance are present in the producing areas and their control is also of global interest. There is therefore a recognized need for an international effort to upgrade breeding and research activities. This requires the exchange of germplasm and knowledge, as well as other forms of information, data, methods, and techniques.

2.4 INIBAP Strategy

In its Strategy Paper, "Looking Ahead, The Strategy of Choice", INIBAP's mandate statement reads as follows:

> "The general objective of INIBAP is to increase the productivity and stability of banana and plantain grown on smallholdings."[1] (p. 7)

The four specific objectives are:

- "to initiate, encourage, support, conduct, and coordinate research aimed at improving the productivity of banana and plantain;
- to strengthen national and regional programs and facilitate the interchange of improved and disease-free genetic material through assisting in the establishment and analysis of regional and global trials of new and improved cultivars;
- to coordinate and support the collection and exchange of documentation and information related to banana and plantain;
- to coordinate and support training for researchers and technicians from developing countries." (p.7)

In the strategy statement INIBAP goes further to set its intermediate operational goals:

- "to strengthen the ability of NARS to conduct research in relation to banana and plantain and thus to develop their own solutions to production problems and to promoting the development of banana and plantain;
- to develop, through INIBAP's own research and that of other organizations, improved germplasm for increasing banana and plantain productivity and the contribution of these crops to sustainable agricultural production and income;
- to contribute to the improvement of scientific knowledge of value in the solution of problems to banana and plantain production (particularly in the management of diseases and pests); such knowledge may relate to an understanding of production constraints and opportunities, or to research methods and techniques." (p.37)

INIBAP's strategy recognizes the magnitude of task that needs to be done with minimal resources and has narrowed its operational strategy. The strategy is stated thus:

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[1] No definition of "smallholdings" is provided in the strategy statement.

"Recognizing that INIBAP has limited financial resources and that the factors affecting banana and plantain crops around the world are numerous and complex, the network's strategy over the next five years is to focus on two thematic activities most likely to benefit artisanal producers, namely germplasm improvement and pathology." (p.32)

INIBAP, prior to this strategy statement, had already designed and modeled itself into two major categories of activities: global and regional. This design is still in effect. Global activities are twofold: thematic and information and documentation. No formal pattern exists for regional activities.

It is important to note TAC's critical examination of INIBAP's mission and priorities as it joined the CGIAR in 1990. In its report entitled "A possible expansion of the CGIAR", TAC reaffirmed the "exploitation of genetic resources" as the main international effort.

While endorsing the notion of a network, TAC, in a July 1991 memorandum to INIBAP, made the following statement:

"TAC would like to see a clearer exposition for how INIBAP Headquarter staff would maintain their disciplinary excellence whilst concentrating on their main activities of guiding and monitoring research activities and providing technical backstopping for the regional networks.

... INIBAP should clearly indicate its approach during the coming quinquennium to those research areas that are not currently of its top priority.

The network proposals for regional activities, especially those relating to catalytic support, research assistance to weaker NARS, and adaptive research, should be made more explicit in terms of both funding mechanisms and administration.

...The operational mode of INIBAP requires close collaboration with other CGIAR institutions, especially IITA and IBPGR."

2.5 Program Structure

2.5.1 Global Activities

Following a research service strategy, INIBAP attempts to provide an international forum for discussing research problems, priorities and needs, identifying who is best suited to carrying out the research, and then facilitating their needs mainly in terms of research support, training and financing. Within this broad framework INIBAP has established six central program activities:

- *Musa* Germplasm Exchange System (MGES): this umbrella program coordinates the collection, indexing, inventory, and shipment of *Musa* accessions.

- International *Musa* Testing Program (IMTP): the IMTP is a global multiple locational trial designed specifically to evaluate hybrids for their resistance to black Sigatoka and hybrid performance.

- Central Germplasm Information System (CGIS): the CGIS generates, collates, records and distributes information on germplasm.

- Crop Protection Research Coordination: this program addresses the priority diseases (black Sigatoka, Banana Bunchy Top, *Fusarium* wilt, and others), and priority pests (nematodes and weevils).

- Collaborative Research Program: under this program are the collaborative research projects with other institutions.

- Information/Documentation System (INFO/DOC): this program is concerned with the identification and provision of information and documentation to satisfy the needs of scientists and institutions concerned with *Musa*.

INIBAP coordinates a number of research activities in collaboration with other institutions. Notable are the links with the Katholieke Universiteit Leuven (KUL) which, in addition to hosting the Transit Center for global distribution of *in vitro* material, is also contracted by INIBAP to undertake research on cell and protoplast culture and somatic embryogenesis.

INIBAP also has relations with other IARCs, of which IITA and IBPGR are probably the most important (See Section 4.9).

2.5.2 The Regional Networks

The establishment of regional networks started with the Latin American and Caribbean Network (LACNET) in 1988, followed by the West and Central Africa Network (WACNET) in the same year, then the East Africa Network (EANET) in 1989, and finally the Asia and Pacific Network (ASPNET) in 1991. Regional networks were foreseen as major tools to help strengthen national and regional programs, help identify regional needs and carry out collaborative research, in addition to their implementation of global activities controlled from Headquarters. Establishing networks in Latin America and in Asia was relatively easier than in West Africa and East Africa. This is mainly because the NARS in the former regions are more advanced, and communication is better.

Regional networks have allowed INIBAP to establish relations with a number of regional and national institutions. LACNET is currently based at Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), a regional center based in Costa Rica. CORBANA, Costa Rica's

***Fusarium* wilt**

Fusarium wilt disease (caused by *Fusarium oxysporum f.sp. cubense*) is notorious for its destruction of the export cultivar Gros Michel. Production of this cultivar became impossible in Central America in the late 1960s and was replaced with the "race 1"-resistant, Cavendish-type clones.

The damage done to the infected plant is primarily blockage at the water transport system, resulting in wilting.

New races of *Fusarium* have now been identified, including a "race 4" which attacks Cavendish in subtropical conditions (Canary Islands, South Africa, Taiwan and Australia).

Since the spores of the pathogen remain viable in the soil for very long periods of time, production practices include extended crop rotation when resistance fails. The implications for this practice in subsistence agriculture are obvious. Fortunately, levels of resistance to *Fusarium* wilt in plantain are reported to be significant.

BOX 5

national research institution, is also in part host to LACNET. The WACNET Regional Coordinator has very recently moved from IITA's Onne station to Centre Régional Bananiers et Plantains (CRBP) in Cameroon. EANET is based at the Institut de Recherche Agronomique et Zootechnique (IRAZ), a regional research institute based in Burundi. ASPNET is based at Philippines Council for Agriculture, Forestry and Resources Research and Development (PCARRD), Los Baños, the Philippines. INIBAP has established relations with leading national research institutions within producing regions, notably Fundación Hondureña de Investigación Agrícola (FHIA) in Honduras and the Australian Center for International Agricultural Research (ACIAR).

Chapter 3 discusses the regional networks in detail, covering their origins and evolution, as well as their goals, activities and achievements. In many ways the regional networks are supposed to be of strategic importance for research service and problem solving - a key difference between INIBAP from other commodity-oriented CGIAR centers.

A number of other diseases and pests also need to be addressed and their significance varies from region to region. In addition, each region has its own priority research issues. These differ by region but generally fall into the categories of crop management, post-harvest technology and socio-economic factors.

Banana Bunchy Top Disease

First reported more than 100 years ago, Banana Bunchy Top disease may occur in as many as 30 countries (confirmed and unconfirmed reports). The virus symptoms include reduced vigor, stunted plants and virtually no yield. The disease is largely confined to the Asia-Pacific region and to a few countries in Africa.

The etiology of the disease is still being carried out. Recently, strong evidence has been given that there are two viruses involved, which are transmitted by aphids. Sophisticated molecular probes, recently developed in Australia, can be used to index plant material for the presence of the virus(es). This is particularly important for the INIBAP Virus Indexing Centers, as no method has been demonstrated for eliminating the virus(es) in plant tissue. Consequently, indexing for the absence of virus(es) is critically important for the international exchange of germplasm, particularly in tissue culture.

BOX 6

In the Latin American and Caribbean (LAC) region, black Sigatoka poses the greatest threat. The LACNET region has the strongest breeding programs on banana and plantain and these are located in Brazil, Guadeloupe, Honduras and Costa Rica. Although the Honduran Foundation for Agricultural Research (FHIA) has the lead in developing black Sigatoka-resistant cultivars, there has been minimal interchange of germplasm across national boundaries. Yellow Sigatoka (*Mycosphaerella musicola*), Moko disease (*Pseudomonas solanacearum*) and *Fusarium* wilt (*Fusarium oxysporum* f. sp. *cubense*) are the other diseases of importance in the LAC region. nematodes (*Radopholus similis* and *Helicotylenchus multicinctus*), borer weevil (*Cosmopolites sordidus*) are the most significant pests.

In the West and Central Africa (WAC) region, black Sigatoka is also the most important disease. Nematodes and borer weevils are reported as causing serious losses for smallholder producers although the extent of this threat has not been conclusively studied. Post-harvest losses and marketing problems are also reported but need substantiation.

In the East Africa region, black Sigatoka once again is the greatest threat. In addition, *Fusarium* wilt is an increasingly important problem. Banana Bunchy Top Virus (BBTV) disease

is present in the region and is reported to be spreading slowly. Nematodes (*Radopholus similis* and *Pratylenchus goodeyi*) and the borer weevil are the important pests. Land-population densities are generally high in the region and, because of continuous cultivation, declining soil fertility has become a serious constraint to productivity. The socio-economics of beer bananas (production, household utilization and marketing) appear to be an area requiring investigation.

The Asia and Pacific region is the center of diversity of the genus *Musa*. Most of the popular and successful cultivars, as well as pests and diseases, are therefore indigenous to this region. The national research programs in countries such as the Philippines, India, Taiwan and Australia are also fairly advanced when it comes to *Musa* research. Although black Sigatoka is also a risk in this region, *Fusarium* wilt is considered a greater cause of losses in the larger producing countries. BBTV poses the greatest risk in moving germplasm from this region to other regions. Moko disease and yellow Sigatoka are also important diseases in the region. Nematodes (*R. similis* and perhaps others) are reported as important pests.

2.6 Intended Outputs

In its strategy statement, INIBAP foresees the following outputs from its activities:

- "establishing an international germplasm exchange and evaluation program involving, say, up to 20 countries and 500 (*sic* 1,000) accessions;
- obtaining international acceptance (in conjunction with IBPGR) of a set of descriptors for *Musa* cultivars;
- identifying cultivars and hybrids (*sic* cultivars) that are resistant or tolerant to major pests and diseases in various major production areas and at the same time maintain their productivity;
- characterizing the races of black Sigatoka and developing methods of early screening of germplasm for resistance to this disease;
- making appropriate indexing methods for Bunchy Top Disease available to producing countries through INIBAP or INIBAP-supported research;
- establishing an appropriate training program for banana and plantain researchers and extension workers." (p.41)

As an institution INIBAP has two types of outputs. In the first category are the research outputs, in particular the results of research conducted by INIBAP and with immediate benefits for researchers and/or farmers in producing countries. These may include new knowledge or technologies. In the second category are research-related service outputs, in particular institution building outputs which enhance the NARS capacity to achieve the former. These include outputs enhancing the research effectiveness of NARS, collaboration with other research institutions, training and assistance with planning, organizing and managing research systems. At the moment a great majority of INIBAP's outputs are in the form of research services.

Global and thematic activities of INIBAP fall into what the CGIAR categorizes as "core activities". These activities are assessed, therefore, in terms of their international character and to confirm that INIBAP has comparative advantage in carrying out and/or facilitating these activities.

2.7 Measures of Success

INIBAP should be evaluated in terms of the extent to which it has obtained or is likely to achieve its stated outputs, given its overall strategy and resource base. In this regard, and because of the explicit networking strategy, the EMPR evaluation focused on INIBAP's two components: global and regional activities. In doing so, measures of success were examined for both research and research-related outputs, to the extent that available information permitted such an assessment.

Measures of research outputs considered include:

- numbers of productive and resistant cultivars;
- accessions with particular characteristics, and so on, that have been distributed to producing network members; and
- any specific scientific breakthroughs, technology, new knowledge, methods, and techniques.

Measures of research-related service and institution-building outputs include:

- number of end-users receiving quality information;
- number of action-oriented workshops and meetings, and effectiveness of follow-up;
- expert meetings and follow-up;
- number of consultation and back-stopping missions to NARS;
- number of NARS staff trained at various levels;
- number of different training courses and follow-up for effectiveness;
- quantity and quality of any activities enhancing effectiveness of research by NARS.

Finally, financial and managerial efficiency of INIBAP in generating these outputs is assessed throughout the next two chapters.

CHAPTER 3. EVOLUTION AND ACHIEVEMENTS OF INIBAP

3.1 Introduction

The purpose of this chapter is to examine how successful INIBAP was in putting into operation and implementing the concept and strategy described in Chapter 2. The emphasis is on documenting INIBAP's achievements to date in the areas where it has initiated activities.

The chapter is structured along the lines of the INIBAP program outlined in Section 2.5. Section 3.2 focuses on INIBAP's germplasm and crop protection activities. This discussion covers INIBAP's global (or thematic) activities in *Musa* germplasm exchange, testing, information system development, and related crop protection activities. It also includes a summary of collaborative and contract research related to germplasm and crop protection, carried out under INIBAP auspices or with its support.

Section 3.3 covers an assessment of INIBAP's global activities in the area of information and communications. This is followed in Section 3.4 by a brief discussion of how INIBAP has addressed training issues in its programs.

The longest section in the chapter (3.5) is devoted to analysis of INIBAP's four regional networks. Each regional network is studied in terms of its evolution, organization, goals and activities, and administration. The activities of the networks are examined from two perspectives: first as a bridge to INIBAP's global programs and, second, as activities carried out to address region-specific concerns. There is also an assessment of the achievements and performance of each network, as well as a comparative analysis of issues common to all four networks.

The last section of the chapter summarizes the Panel's overall assessment of INIBAP's program performance as a synthesis of the assessments made in the earlier sections.

3.2 Germplasm and Crop Protection Activities

INIBAP is engaged in five program activities that cover specific thematic activities. The purpose of these programs is to facilitate *Musa* research and to address the intent of the Network's mandate. Primary among these are activities that 1) provide access to healthy germplasm and associated documentation, 2) evaluate advanced hybrids and 3) foster research to determine the extent of pathogen variation that may threaten resistance to priority diseases.

INIBAP is firmly aligned with a fundamental strategic reorientation of *Musa* breeding, which occurred in the 1980s and is continuing. The previous work in this field was primarily to seek resistant substitutes for the sweet dessert banana cultivars of the export trade. Although banana exports are a major income source, both for exporting countries and their inhabitants, these cultivars constitute only a small portion of the world production. They amount to perhaps 10 percent, plus a minimal contribution to domestic consumption in Third World countries. At the same time, these countries are the producers of the other 90 percent, grown as a food crop which is often the principal staple food in family diets.

In the new orientation, the methods are the old ones, of crossing triploids with diploids to produce tetraploids (see Annex 4). The difference is that the triploids are the key. They are representative of the other 90 percent of *Musa* food crop production. Improved traits can be

introduced from the improved diploids now available. The primary breeding programs using this approach are located at the IITA sub-station in Onne (Nigeria), the FHIA program in La Lima (Honduras) and the Empresa Brasiliera de Pesquisa Agropecuaria (EMBRAPA) program in Brazil. This reoriented approach to breeding *Musa* has produced some extremely interesting hybrids that are now undergoing international testing (described later in section 3.2.2 - International *Musa* Testing Program). The deployment of these hybrids to subsistence agriculture in much of the tropics represents both an exciting opportunity and an enormous challenge: to help the disadvantaged and those in need.

The new breeding approaches have provided renewed interest in public sector research in *Musa*. The question INIBAP has asked is how to best develop and transfer technology to the smallholders that predominate the subsistence production systems for much of tropical Africa, Asia and Latin America. Can this be done through forming networks of research partners and provision of research services?

The role of pesticides in future *Musa* production systems brings the question of sustainable agricultural production systems to the forefront. Commercial export bananas have come to rely on repeated applications of fungicides (up to 40 per year) for control of the black Sigatoka disease. But these costs are prohibitive and the technology is inappropriate to smallholders, particularly those engaged in subsistence agriculture.

The Panel gave close attention to INIBAP's program activities and achievements, and the Network's prospects for success. For instance, the Panel evaluated how INIBAP is positioned for exploiting the new breeding strategies through the Network's services. The question regarding pesticide dependency vis-à-vis smallholders is related to the Network's crop protection program, and this was evaluated as well.

INIBAP is also facilitating non-conventional research approaches to *Musa* improvement through its research services. These approaches include: chemically induced tetraploidy (IRFA, Guadeloupe); somaclonal variation (Taiwan); and genetic engineering methods (several programs, including IRFA, Guadeloupe and KUL).

The research services provided by INIBAP (described later) were mostly not in existence before INIBAP, and they represent globally significant efforts to assist in the development of improved cultivars of banana and plantain.

The strategy of the INIBAP germplasm programs is to: assemble *Musa* germplasm from wild species and already existing cultivars, and from improved hybrids produced from breeding programs; provide a check on quality (virus-free status and genetic stability); inventory the material (including documentation); and then share this material with the global research community through the INIBAP testing program. This is discussed in section 3.2.2.

In its evaluation of INIBAP's program activities, the Panel asked the questions: What needs to be done? What is INIBAP's comparative advantage? What can they afford to do? What can best be done through partnerships? And, if INIBAP did not exist, who would accomplish the task, or what would be lost?

3.2.1 *Musa* Germplasm Exchange System (MGES)

The *Musa* Germplasm Exchange System, established in 1987, is an umbrella program that coordinates the collection, indexing, inventory and shipment of *Musa* accessions through several

participating institutions and through activities managed from INIBAP headquarters. MGES receives requests for materials which are then transferred to the Transit Center at KUL for processing. The MGES program also coordinates interinstitutional collaboration and some aspects of training (see section 3.4).

The MGES has been quite active in providing germplasm accessions on a global scale. The Panel looked at the flow of requests to determine the efficiency of operations and responsiveness to requests. Based on information provided by the MGES Coordinator, the Panel was satisfied with the quality of materials but not with the speed of services being provided by this activity.

MGES coordinates two Virus Indexing Centers to screen accessions in the Transit Center collection, prior to general distribution. Virus indexing is a time-consuming and costly activity, and efforts are under way to accelerate the process. Primary among these is the use of recently developed molecular probes to screen for the Banana Bunchy Top Virus (see Box 6).

Given the incomplete etiology of this disease, the indexing protocol is supplemented by growing each accession in a greenhouse for symptom observation. This practice is consistent with the recommendations of the FAO/IBPGR *Technical Guidelines for the Safe Movement of Musa Germplasm*, but contributes to a slow process of clearing accessions for distribution. The two Virus Indexing Centers (France and Australia) forecast that they will be able to handle only 115 accessions collectively per year when fully operational. Plans are under way to initiate a third Virus Indexing Center in the Philippines. The Panel views this additional capacity as important inasmuch as the FAO/IBPGR indexing protocols are to be followed. Expanding the capacity of the Virus Indexing Centers to better meet the needs of the *Musa* research community seems a reasonable choice.

The Panel suggests reconsideration of the policies used to determine which material is to be indexed before distribution. Present practices assume that material from Central America is virus-free. This has proven to be false for at least one accession in the first IMTP which, based on symptoms, is thought to be infected with the Cucumber Mosaic Virus. Whether or not this virus is a significant threat needs to be determined, and appropriate action taken to assure the phytosanitary status of the material from the Transit Center.

The Panel also noted that the flow of requests for germplasm from the regions, to headquarters and eventually to the Transit Center, is a time-consuming and bureacratic process. For increased efficiency, a more simplified chain of requests should be considered to allow for faster response.

The INIBAP Transit Center at KUL, Belgium supports four INIBAP programs: the *Musa* Germplasm Exchange System, the International *Musa* Testing Program (see section 3.2.2), the Central Germplasm Information System (see section 3.2.3), and the *Musa* Germplasm Conservation Network (an activity of the Transit Center).

The primary purpose of the Transit Center is to store and distribute *Musa* germplasm maintained in a tissue culture repository. Over 1,000 accessions are held in culture under ambient conditions suitable for prolonged storage. This collection is reputed to be the largest *Musa* collection in the world and annually provides tissue culture material through a number of active *Musa* programs. The 1991 annual report of the Transit Center lists recipients by category of activity and destination. Inspection of the report indicates considerable activity and thus interest in the research services provided by INIBAP to the global research community.

The Panel had the opportunity to visit the KUL Transit Center, view the facilities and talk with the program leader, professional staff and graduate students. The Panel also talked with a number of recipients and inquired about material coming from the Transit Center to determine their satisfaction with the Transit Center's services. The Panel was very impressed with the operation's management and programs.

3.2.2 International *Musa* Testing Program (IMTP)

The International *Musa* Testing Program is specifically designed to evaluate *Musa* hybrids for their resistance to black Sigatoka disease (see Box 4) and for hybrid performance in multiple locations. The first test, now being conducted at six locations, is evaluating seven FHIA hybrids under intense black Sigatoka selection pressure. In addition to the seven hybrids, the trial includes nine check entries intended to differentiate pathogen variation patterns.

The vegetative material entered in the first IMTP was provided through the Transit Center at KUL. Results from the first test are now being received and preliminary reports indicate very good performance of some of the FHIA entries, including resistance to black Sigatoka and satisfactory fruit production.

Plans are under way for the second IMTP for black Sigatoka and another IMTP focusing on *Fusarium* wilt disease (see Box 5). However, the *Fusarium* wilt trial will be preceded by a project to evaluate the extent of pathogen variation and to explore potential sites suitable for testing resistance. This preparatory project, funded by the Australian government, is now under way. The results should be very helpful to INIBAP in planning the experiment.

The Panel questions the need for the complexity of the first IMTP design. The inclusion of nine check entries and the placement of many susceptible plants around each row requires considerable land area, and incurs significant additional costs. This is particularly questionable for an aerial pathogen known for its capacity to spread long distances. Moreover, the experimental protocol for collecting epidemiological information was reported to the Panel as excessive. The Panel also noted the confusing terminology that is associated with the IMTP; one name to describe trials for different diseases. This confusion seems needless as more precise terminology would better communicate the intentions of particular tests.

The Panel suggests that INIBAP carry out a critical review of the experimental design, protocols and methods of the IMTP with assistance from outside experts. Consideration should be given to reconfiguring the physical layout for more efficient use of space and resources. Also, some thought should be given to what other types of trials could serve the needs of the Program. Would the objectives of IMTP be better met with a series of trials built on models identified for other crops, with each focused on a specific evaluation? These options should be evaluated by INIBAP through a peer review, which would allow for drawing on the experiences of others.

3.2.3 Central Germplasm Information System (CGIS)

The objective of the CGIS is to generate, collate and record relevant information on *Musa* germplasm, and to make this information available to interested users. Considerable *Musa* information is known to exist in various locations, but it is not readily accessible.

INIBAP's CGIS is organizing computerized files to describe *Musa* accessions. The intention is to primarily support the *Musa* germplasm collection held in storage at the Transit Center in Leuven. Once completed, the database will be made available free of charge to interested *Musa*

researchers. Plans call for the inclusion of passport data, information on conservation and multiplication, virus indexing results, taxonomic description, agronomic description, classification and evaluations recorded for specific traits.

The CGIS database is presently under design, and progress was reported to the Panel. The apparent need for a *Musa* documentation system is noted and the Panel encourages INIBAP to continue the program's development.

3.2.4 Coordination of Crop Protection Activities

Although there are a number of pests and diseases of *Musa* species, INIBAP has focused its attention on black Sigatoka (caused by *Mycosphaerella fijiensis*) (see Box 4), *Fusarium* wilt (caused by *Fusarium oxysporum, f. sp. cubense*) (see Box 5), and the Banana Bunchy Top disease (caused by Banana Bunchy Top Virus) (see Box 6). Other pest problems receiving INIBAP's attention at the regional level include plant parasitic nematodes (e.g., *Radopholus similis*) and the banana weevil (*Cosmopolites sordidus*).

INIBAP's pathology program has, in many respects, only recently been initiated. In late 1991, the Crop Protection Program Coordinator was recruited and reported to Headquarters in February 1992. He is presently designing the program. Based on his brief report to the INIBAP Board of Trustees outlining his program plans, the Panel has drawn the following assessment.

The Panel's view of the presently proposed crop protection activities is that they are too limited in approach and do not consider an Integrated Pest Management perspective. Little consideration has been given to environmentally friendly methods such as biological control, cultural practices, or pest and disease forecasting (to reduce chemical pesticide dependency).

3.2.5 Collaborative and Contract Research

INIBAP reports a number of collaborative and contract research projects with partner institutions in areas of mutual interest. Some of these are directly related to developing technology to enable better germplasm exchange services, or may serve as a prelude to *Musa* genetic engineering. Other collaborative research projects are in various stages of formation as INIBAP reaches out to its network collaborators in a variety of institutions and centers. The Panel found it difficult to determine the boundaries of what constituted research collaboration with INIBAP, as some associations appeared to have occured merely because of mutual interest, or were only informational in nature.

Three collaborative projects with KUL are developing methods for *Musa* suspension cell and protoplast cultures, somatic embryogenesis and cryopreservation. Each of these collaborative projects hold promise for INIBAP's various program interests.

Another INIBAP collaborative project with CIRAD is looking to create an RFLP map for *Musa*. The Panel was not able to evaluate the progress of this effort.

Other collaborative research projects operate through regional networks with support from INIBAP headquarters. For instance, the Panel noted the interdependence of INIBAP and the breeding programs at IITA and FHIA (see Section 4.9 Institutional Relationships).

It was difficult for the Panel to evaluate these collaborative projects as the output was not predetermined, goals were not described clearly and thus expectations were difficult to determine.

Moreover, the work is mostly fundamental and methodological which is characteristically hard to predict.

3.2.6 Assessment

The Panel notes the successful establishment of INIBAP's research services that facilitate the international exchange of healthy germplasm. By assuring the phytosanitary status of *Musa* germplasm and by assembling documentation for its *Musa* germplasm collection, INIBAP is making important contributions to the *Musa* scientific community through research services.

The Panel feels these services are quite valuable and should be continued. However, an analysis of the budget indicates that the germplasm and genetics program of INIBAP account for 40 percent of its senior staff years and 48 percent of the core budget proposal for 1992. After administrative expenses, this leaves little room for other activities. INIBAP should keep the balance across activities under constant review in order that budget allocations can reinforce the institution's strategic priorities.

To date INIBAP has taken the position of other CGIAR centers on intellectual property rights (IPR) in that its management of *Musa* germplasm includes the maintenance and enhancement of material held *in trust* for the world community. This position ensures accessions remain freely available to all. However, the Panel notes further thinking regarding agreements with advanced laboratories and/or private sector companies must be considered to ensure that INIBAP's genetic materials remain in the public domain and are available to its partners. Given the history of *Musa* production and its strong ties to private companies, specific consideration should be given to germplasm stored for or exchanged with the private sector, or with advanced laboratories intending to protect their germplasm with patents.

The Crop Protection Research Coordination program needs to be expanded for a more holistic view of the approaches that could be used or developed through new technologies. This is particularly true for the components of integrated pest management that could be used as alternatives to pesticides. These environmentally friendly technologies are particularly well suited to subsistence agriculture because of safety and suitability for production systems more likely to include labor-intensive methods.

The Panel recommends that the Crop Protection Research Coordination program adopt a more holistic view of approaches to crop protection.

The Panel's assessment is that INIBAP is too narrowly focused on cultivar improvement and addresses only some portions of crop protection (those related to host plant resistance). Other elements of crop protection (such as biological control, cultural practices, chemical protection) are not yet part of INIBAP's agenda. The Panel suggests that the Crop Protection Program Coordinator work more closely with INIBAP's host, CIRAD, which describes a well-rounded international Integrated Pest Management (IPM) program for *Musa*, coordinated from Montpellier, France (CIRAD: Images of Research, 1989). CIRAD's IPM research focuses on disease forecasting, control practices and cultural methods for disease management in *Musa*.

The Panel found no mention in INIBAP's documentation or program descriptions of a major interest in facilitating research in post-harvest technology, although one of the Regional Coordinators has expressed interest in the topic. Moreover, the Panel could not detect any INIBAP interest in facilitating research in production technology or farming systems research, although IITA is presently doing this research at its Onne sub-station. Morover, the Panel met

with CRBP scientists in Cameroon who are doing considerable research activity in this area, but INIBAP appears unaware of this research.

The Panel was particularly disappointed to discover no mention of INIBAP facilitating research in sustainable agriculture. Furthermore, there is no evidence of INIBAP's interest in facilitating research in economics, marketing, technology adoption or social impact.

The germplasm documentation efforts of INIBAP should be accelerated towards implementation. This might be done through expanded collaborative efforts, and more use of consultations to derive a consensus on what needs to be included in a usable system. There is need for an expanded germplasm documentation system and INIBAP should explore options for financing.

The perception (real or otherwise) is that INIBAP has created an overly bureaucratic process for handling requests for germplasm. This should be addressed through a formal study of the most efficient methods for speedily handling incoming requests. Alternatives might include delegation of responsibility to the Transit Center for direct responses, or removing the network coordinators from the loop, and otherwise expediting the services offered.

The Panel recommends that INIBAP conduct a thorough, formal study of its procedures for handling germplasm requests with a view to expediting the process.

3.3 Information and Communication Activities

In a network organization that provides research service, Information and Communication activities play the vital role of linking and coordinating different parts of the network. Information and Communication also offer opportunities for different parts of the network to learn from each other. Based on its importance, Information and Communication should probably have the status of a thematic activity, but INIBAP has preferred to treat it as a program.

Organizations such as Association pour la Coopération des Recherches de Bananiers en Amérique Tropicale (ACORBAT), Unión de Países Exportadores de Banano (UPEB) and IRFA had identified the need for ready access to up-to-date information and documentation on all aspects of *Musa* research. UPEB attempted to address this issue by developing a database with more than 11,000 references to provide regional producers with access to relevant research information. Since 1986, IRFA has published a monthly journal on banana and plantain abstracts in French, which was machine-translated into English and Spanish.

A workshop organized by INIBAP, Technical Centre for Rural and Agricultural Co-operation (CTA) and IDRC in 1987 was attended by 41 scientists and information specialists who reviewed the status of *Musa* documentation. Representatives from major organizations such as Commonwealth Agricultural Bureau International (CABI), FAO, UPEB, IRFA and Netherlands Royal Tropical Institute (RTI) who participated in the workshop reached an agreement on what INIBAP's role should be. The participative environment fostered involvement, which in turn generated commitment of an elite group of information specialists.

3.3.1 Evolution of Information and Communication

Following this workshop, IDRC agreed to provide special project funding over the first three years for the setting up of the Info/Doc system. CTA also offered support by partly funding the trilingual newsletter *MUSARAMA*, which succeeded IRFA's bibliographic publication. UPEB

accepted the responsibility for translating, printing and distributing the Spanish edition of the newsletter. The newsletter has been published twice a year and is distributed to more than 1200 recipients.

In an entrepreneurial service area such as Information and Communcation, there is a strong temptation to do everything with centralized controls. INIBAP service did not succumb to the temptation and used the supportive group of information specialists to come up with a clear definition of its role:

- "To identify the information requirements of concerned institutions and scientists.
- To meet regional needs for information on bananas and plantains.
- To collaborate with existing information sources and services".

As the above role definition suggests, this service was clear about who its clients were. It wanted to meet the research information needs of scientists and researchers in both developed and developing countries, as well as the needs of information users at the regional level in developing countries.

INIBAP accepted the recommendations made by its informal advisory group, namely the participants in the workshop. The initial program for **Information/Documentation (INFO/DOC)** constituted a clear and credible vision and the recommended initial components were:

- Current research-in-progress by region.
- Thesaurus, terminology, taxonomy and databanks, with terminology based on the UPEB thesaurus, which is being expanded to three languages. INIBAP agreed to establish a committee to look at the taxonomy and classification of *Musaceae*. IBPGR agreed to develop a database on bananas and plantains.
- Collection of documents at INIBAP's headquarters.
- Communications, services and training.

INFO/DOC did not attempt to do everything. Rather it entered into interdependent relationships with UPEB and IBPGR and jointly created a set of shared goals. Later, it offered three regional workshops in collaboration with Institut de Recherche Agronomique et Zootechnique de la Communauté Economique des Pays des Grands Lacs (IRAZ) and UPEB.

Information and Communication has a second program called **Communications** to generate and disseminate research knowledge to specialists and institutions involved in banana and plantain research. This would include:

- *MUSARAMA*, a trilingual periodical of abstracts, news and comments on *Musa* research.
- Proceedings of thematic and regional workshops.
- Selected research monographs.
- Reviews of research literature.

- Manuals and codes of practice.

- Directories of research projects, research workers and research institutions.

Information and Communcatioin is also planning to offer training programs in information/documentation handling, retrieval and dissemination.

3.3.2. Achievernents and Quality Consciousness

INIBAP information program charted for itself a long-range plan, broken further into medium-term programs and annual milestones. It reviewed its performance each year and, based on the review, it developed the annual plan for the following year. In addition to these annual reviews, it prepared a review of the INFO/DOC project during the period November 1, 1987 to March 31, 1991.

INFO/DOC attempted to learn from its experiences and its reviews highlighted both successes, and "gaps" which were identified and decreased. Information and Ccommunication's philosophy of learning to learn and improve is consistent with *kaizen* (Japanese word which means the art of continuous improvement). Instead of being satisfied with the creation of a microcomputer-based database, INFO/DOC has developed a proposal in collaboration with IRFA/CIRAD to offer a CD-ROM based database that represents the leading edge of technology.

3.3.3 Assessment

This area comes under the category of a core program that receives restricted funding. Although it had a long-term plan, its funding had to be renewed annually after a review. INFO/DOC has also taken extraordinary steps to keep in touch with its stakeholders by participating in professional meetings and its reports include an impressive list of professionals from its donor and client systems contacted during the professional meetings.

Information and Communication's performance receives a high rating from the Panel and it hopes that the following 11 steps practiced by the program will be considered by other parts of INIBAP for possible adoption.

- Creating a participative network.

- Defining role/s clearly.

- Practicing client-orientation.

- Forming an advisory group.

- Developing a challenging, yet feasible vision.

- Fostering interdependent relationships with other organizations, and having shared common goals.

- Offering an integrated package of products and services.

- Adopting an integrated planning approach in which long-, medium-, and short-term plans dovetail into each other.

- Adopting planned reviews.

- Demonstrating a willingness to learn from both successes and failures.

- Taking proactive measures to minimize financial uncertainties.

It is interesting to note that while parts of INIBAP adopted a centralized approach to managing their projects, Information and Communication chose a decentralized and participative approach and had regional and global partners. The program should be encouraged to continue its progress along the decentralized path it chose and its activities merit more recognition and support within INIBAP.

The Panel also offers two suggestions to INIBAP management regarding the program's future direction:

- In addition to continuing current Info/Doc activities, it should start working on an **analysis** of the database to identify patterns, such as similarities and differences in experiences with a new technique in different regions, and likely reasons for differences in productivity across regions.

- Explore new ways to utilize the information and communication resources to develop and implement a fund development plan.

3.4 Training Activities

3.4.1 Evolution and Policy

Coordinating and supporting training for researchers and technicians from developing countries is one of INIBAP's four specific mandate objectives. INIBAP, however, has no training program. In fairness to INIBAP, this is acknowledged as lacking. Priority is currently placed on *ad hoc facilitation of* individual training as well as on short courses for staff in national programs.

3.4.2 Activities and Impact

Training activities to date have been largely restricted to short courses organized or facilitated by Regional Coordinators. There is no training coordination or activity led by the Headquarters. Section 3.5, discusses training within Regional Networks in greater detail. In general, regional training activities started with individual requests for technical and research-oriented training on tissue culture techniques. The placement of Regional Coordinators in the late 1980s allowed INIBAP to offer a few short courses on germplasm exchange and quarantine regulations, and information and documentation. In addition, INIBAP has facilitated the attendance of nationals at IITA's annual course on Plantain Research and Technology Transfer since 1989.

Training for NARS staff is the single most frequent request placed with Regional Coordinators, and INIBAP suffers from a chronic inability to assist or facilitate. To exacerbate this, INIBAP has apparently an unwritten policy to assist only those nationals who work on INIBAP-sponsored or INIBAP-supported projects. Top priority is given to training that is related to INIBAP's core activities such as germplasm exchange.

3.4.3 Assessment

Human resources will ultimately be the decisive factor in any collaborative research activity - be it national, regional or international. Training is fundamental if the Regional Networks are going to assist NARS in developing sustainable institutional capacity for research on *Musa*. For NARS to develop that capacity, the panel believes that three criteria must be met:

1. Training is done or facilitated at all levels: technical, managerial and professional;

2. Both short- and long-term training needs are met; and

3. Universities and research institutions in the region and abroad are deliberately involved by INIBAP in training and *Musa* research, as well as in developing a capacity to offer advanced degrees on *Musa*.

Once collaborative research activities start in the Regional Networks, every opportunity should be taken to link this research with training in local and overseas universities, as well as regional and international research centers.

INIBAP staff at headquarters and Regional Coordinators have to develop a new awareness of the importance of training and the existing needs. If Regional Coordinators were assigned the responsibility for assessing regional needs, Headquarters staff could assess global trends as well as identify institutions and individuals who could offer some of the training. This process should assist INIBAP in determining the areas in which they have (or ought to have) a capacity to train.

The Panel recommends that INIBAP examine its training-related policies, priorities and activities, with the intent of establishing a Training Coordination Program.

This recommendation does not imply that INIBAP should immediately hire a Training Coordinator. A network-based organization like INIBAP could benefit from existing capacities in partner organization for training coordination. It is also possible to add training coordination, for the time being, under the responsibility of the Information and Communication program.

3.5 Regional Networks

What follows is a description and assessment of INIBAP's four regional networks. The discussion starts with the network with the longest history (Latin America and Caribbean) and proceeds towards the newest (Asia and Pacific). The last part of the Section (3.5.5) summarizes the Panel's main conclusions on INIBAP's regional networks.

3.5.1 Latin America and Caribbean Network (LACNET)

Evolution and Organization. The first of the INIBAP regional Networks, LACNET, was established to serve countries with a long history in *Musa* research and communication. A great deal of the earliest research in the region was carried out or commissioned by fruit companies and other organizations interested in bananas for export.

Some important regional institutions were already in existence prior to 1985, notably CATIE in Costa Rica and UPEB in Panama, the latter a regional pioneer in information and documentation on *Musa*. Another important partner for INIBAP in the region was the Fundación Hondureña de Investigación Agrícola in Honduras. Although founded in May 1984, FHIA had

acquired as a gift the former *Musa* breeding program of the United Fruit/United Brands Companies, complete with staff and ample facilities.

The concentration of strong breeding programs is a feature unique to LACNET. Although the Jamaican program had fallen to a low activity level in the 1970s, there were three additional centers for genetic research in *Musa* in the region: Honduras, Brazil and Guadeloupe.

Finally, in the field of communications there was ACORBAT which had several times reunited regional scientists since the 1960s, to present new research data and to further mutual contacts.

At a meeting of national delegates at CATIE in May 1986, a then member of the INIBAP interim Board of Trustees and secretary of ACORBAT, Dr. Ramiro Jaramillo, was asked to formulate a proposal for an INIBAP regional network. Dr. Jaramillo was appointed the first Regional Coordinator beginning in July 1987, following an additional meeting of delegates at CATIE. The approving committee comprised 15 persons from 11 countries. They were: Brazil, Colombia, Costa Rica, Ecuador, France (IRFA), Panama, Puerto Rico, Venezuela, the Windward Islands, Canada (IDRC) and the USA (United States Agency for International Development USAID and United States Department of Agriculture USDA).

The Regional Advisory Committee (RAC), previously called the steering committee, met first in 1987 and again in 1989. Their next meeting is planned for 1992. To maintain contact with actual and potential clients and to keep an effective INIBAP presence in the region, the Regional Coordinator has had to maintain a demanding travel schedule.

Goals and Objectives. The 1987 RAC meeting suggested five priorities for the regional network: facilitate germplasm collection and exchange; facilitate exchange of information; assist national programs in establishing their priorities and seeking donor support; and provide funding support for small-scale research projects. What follows is a description of LACNET's activities and achievements in two categories: those serving as a bridge for global INIBAP activities, and those that are region specific.

A. Bridge to Global Activities

Germplasm Conservation and Exchange. Under MGES there has been a substantial amount of material exchanged. The most significant export was of the first seven FHIA hybrids to the INIBAP Transit Center at KUL, for IMTP sites in the two African INIBAP regions. Beneficiaries of imports from outside the region have been Colombia, Costa Rica (CATIE), St Lucia and Venezuela. Other requests in the process of multiplication at KUL are from Argentina, Bolivia, Cuba and Honduras.

There have been some instances of germplasm exchange within the LACNET region since 1989. CATIE in particular has sent accessions to Barbados and Venezuela and received them from Brazil, Colombia, Dominican Republic and Honduras. FHIA has given hybrids, not only to CATIE but also to Brazil, Cuba and St. Lucia.

An INIBAP proposal exists whereby CATIE would conserve a proportion of the INIBAP/KUL *in vitro* germplasm bank (MGCN), but funding has not yet been secured. The purpose would be duplication from a security viewpoint, not to provide material for the region.

In relation to CGIS, evaluations in Colombia (Instituto Colombiano Agropecuario - ICA), Guadeloupe (IRFA), Honduras (FHIA) and Venezuela (Centro Nacional de Investigaciones - CENIAP) are expected to contribute to the database.

Germplasm Testing. Three standard IMTP sites have been planted in the LACNET region, with the same seven FHIA hybrids previously mentioned, together with nine diploid black Sigatoka standard hosts. Sites and planting dates were: Guapiles (Costa Rica - CORBANA) April 1991, La Lima (Honduras - FHIA) September 1991 and Zabaletas (Colombia - ICA) October 1991. During country visits, the Panel members observed that the trials are well advanced and showing valuable results, despite the infection of at least one entry with the Cucumber Mosaic Virus (see section 3.2). The Regional Coordinator has made repeated visits to these sites and is also monitoring tests at FHIA of later hybrids, many of which should enter future phases of the IMTP for black Sigatoka resistance.

The hybrid clones received at CATIE from EMBRAPA in Brazil have been treated as being under the general framework of the IMTP, although the tripartite agreement allows for the inclusion of diploids with no commercial intentions. This project is a general service to EMBRAPA, to confirm genetic resistance sources and guide future action in its breeding program, since the disease has not yet reached Brazil. A further set of genotypes was in the course of being transplanted from the tissue culture laboratory to a greenhouse at the time of the Panel's field visit.

Research. Global INIBAP research activities other than the above have scarcely been in evidence, except that the Germplasm Research Coordinator from headquarters and J.P. Horry from IRFA/Guadeloupe assisted in a reclassification and replanting of FHIA's germplasm collection in January 1992.

Information. This INIBAP activity is well advanced in LACNET. This is partially due to some regional activity already in existince, especially in the case of UPEB. Much of UPEB's publication output was devoted to bananas as an export product, but technical matters and abstracts were also treated, notably in the monthly *Informe* (newsletter) with a wide international circulation. A fairly comprehensive bibliographic database had been assembled, plus a thesaurus of banana terms and a directory of *Musa* researchers and areas of study.

This accumulated information was made available to INIBAP and now forms a part of the headquarters stock. An INIBAP training course used the system as training material so that it is now installed (or about to be) in seven countries; Brazil, Costa Rica, Colombia, Cuba, Honduras, Panama and Venezuela, with Mexico and the Andean regional group Insituto Interamericano de Ciencias Agrícolas (IICA) expected to participate in the near future. The INIBAP newsletter *MUSARAMA* has provided a frequent update on new references, and the very new publication *INFOMUSA* is also regarded as informative. The Spanish translations of these newsletters are made and distributed by UPEB. Another publication, published in Spanish, was released from Colombia on plantain cultivation in the tropics, with the Regional Coordinator's assistance.

B. Region-specific Activities

Needs Assessment and Planning. The May 1987 LACNET RAC meeting resulted in the submission of research proposals from national programs in Brazil (EMBRAPA), Colombia (ICA), Costa Rica (Asociación Bananera Nacional Costa Rica ASBANA, now Corporación Bananera Nacional de Costa Rica CORBANA), Jamaica (Banana Board) and Panama (Consejo Nacional del Banano - CONAB), also from the regional entities CATIE and UPEB, the last in respect of

the INFO/DOC center. All too little has been possible in response to these. To INIBAP's credit, a point has been made that it is difficult to identify common research needs for ecologically diverse subregions, where the chief cultivars may be different. The Regional Coordinator has not yet been able to develop an overall strategy or medium-term plan for the regional network.

Information. In addition to the regional activities carried out by UPEB (described above), the Regional Coordinator responds to numerous requests for information.

Consultation/Communication. While acting as Regional Coordinator, Dr. Jaramillo has continued to assist with the organization of ACORBAT meetings. The most recent, in Mexico, attracted 800 persons. Until recently the themes were concerned with Cavendish (export dessert-type) bananas almost entirely, but he has lately succeeded in introducing plantains as a separate area of communication. In Mexico, the Germplasm Research Coordinator from Headquarters presented a paper. In 1989, the Regional Coordinator was elected Vice-President of ACORBAT. He also collaborated with CATIE as the primary collaborator for the organization of the INIBAP biotechnology workshop in Costa Rica in January, 1992.

Regional reports reveal that the Regional Coordinator is often called upon as a consultant in the formulation or monitoring of non-INIBAP projects, by IICA, IDRC and USAID. He is regularly asked by CATIE to serve on examining bodies for MS theses on *Musa* themes.

Collaborative Research. Because of financial constraints, LAC region-specific collaborative research has been minimal. The one instance of a joint project between two or more national programs within the region has been the EMBRAPA-CATIE-INIBAP convention for germplasm testing. The only relevant INIBAP-supported initiatives in operation on a national scale refer to work on plantains in Colombia. This research tests high-altitude performance of different genotypes and studies high-density planting systems. Exceptionally high productivity has been achieved.

Institution Building. In general, it is clear that close links are maintained with key institutions in Central America, namely CATIE and CORBANA in Costa Rica, FHIA in Honduras and UPEB in Panama. The Regional Coordinator's linkages with national centers are currently maintained by frequent and extensive travel. While maintaining or enhancing INIBAP's presence and prestige through close personal contacts, the travel load is exhausting for him.

As already indicated, opportunities for strengthening national research programs scarcely exist. At all levels financial resources are lacking and the fund-raising capacity of the region seems low. The situation might at any time deteriorate where funds for national programs depend heavily on the sometimes precarious state of the market for export bananas.

Training has for the most part been for groups and on themes dictated by Headquarters. These are: INFO/DOC; quarantine and management of new germplasm and the management of selection sites under the IMTP program. The Regional Coordinator has assisted national programs in the training of individuals, notably in tissue culture methodology and in the identification and control of black Sigatoka. One CORBANA scientist has been funded to enter PhD studies in the USA.

Administration. Both CATIE at Turrialba and CORBANA in San Jose provide office facilities for the regional network and one of the two INIBAP secretaries. The arrangement works reasonably well. CORBANA also offers transport, when necessary, to supplement the Regional Coordinator's private car, as in the case of the Panel members' visit in March 1992. The Regional

Coordinator, when in Costa Rica, divides his time between the two centers which are perhaps 80 kilometers (50 miles) apart. External communications are not a problem.

The Regional Coordinator finds it difficult to cope with heavy and frequent travel, overseeing research in progress and devoting many extra hours to keeping up with paper work, including annual, quarterly and even monthly reports to headquarters. Like other Regional Coordinators in the Network, his imprest account has a low ceiling (US $5,000). He must account frequently for his disbursements to stay solvent. In addition to regional travel, he visits headquarters at least once per year.

Assessment. The establishment of LACNET has so far done much more to further INIBAP's global programs than to further stimulate research on strictly regional problems. In the former case, the region is a particularly important one in that much genetic improvement work has been or is being conducted within it. Nevertheless, such programs have been treated as donors to INIBAP's global aims rather than as beneficiaries of facilitated resources. INIBAP's access to improved *Musa* germplasm is in jeopardy bacause of FHIA's uncertain financial situation.

Some regional achievements can be attributed to INIBAP's global germplasm activities. The initial success of an African plantain variety at high altitudes in Colombia represents a preliminary impact. More may come from the black Sigatoka IMTP program. Although the disease has so far reached less than half of the area of *Musa* cultivation in the region, it is an acknowledged threat in the other part and new genotypes are a potential future impact.

A very positive regional achievement has been the rapid dissemination of the *Musa* bibliographic database.

Negative aspects of the regional network are the relative lack of attention given to region-specific training needs and the absence of social science considerations in the network's activities. The Panel also noted a lack of post-harvest technology, little or no information available on regional production systems, nutritional analysis and consumer acceptance.

Four responses were received to a CGIAR questionnaire sent or given to national and regional centers: Brazil, Colombia, Jamaica and Venezuela. As provisional conclusions, it seems that INIBAP is better regarded for its basic concepts than for its execution. This may be attributed to the lack of attention to national problems. The Regional Coordinator is, however, praised for both his accessibility and his personal capacities. The information service is also given high marks.

3.5.2. West and Central Africa Regional Network

Evolution and Organization. The West and Central African Network (WACNET) was in some ways a successor to the West African Regional Cooperative for Research on Plantains (WACORP). WACORP was created in 1981 (funded by IFAD) but was dissolved in 1984 following the creation of INIBAP. WACNET was established in July 1988 when the inaugural Regional Coordinator, Dr. Gerard Sery, was appointed. The Regional Coordinator, until April 1992, was located at IITA's Onne Station, but is now located at CRBP in Douala, Cameroon. He was a founding member of WARCORP, the predecessor to WACNET. The network members have therefore known and worked with him for some time.

The origins of WACNET can be traced back to a study commissioned by INIBAP and completed in 1987.[2] The report's main recommendation was that the proposed network should give priority to generating technologies for small-scale producers. The major components recommended for the program were: research, development and training. Proposed research was broken into three components:

- on-farm adaptive research in all countries;
- technology generating applied research in the stronger national programs; and
- basic research at some of the regional universities and at IITA, and closely associated with post-graduate training.

A key feature of WACNET is the Regional Advisory Committee (RAC), which is composed of representatives from Cameroon, Congo, Cote d'Ivoire, Ghana, Guinea, Nigeria and Zaire, with observers from IITA and CRBP. The countries represented on the RAC are the key members of the network in terms of the importance of banana and plantain in their member countries. In addition to these countries, Senegal and Gabon are also network members.

Goals and Activities

From the needs indicated by the RAC, the Panel infers that the goals of WACNET can be described as developing institutional capacity for research so as to improve the productivity of smallholder plantain producers.

WACNET has no formal program structure for its activities. For the purposes of this review only, however, the panel separated WACNET activities into two categories:

- those serving as a bridge for global INIBAP activities; and
- region-specific activities.

A. Bridge to Global Activities

Germplasm conservation and exchange. Germplasm exchange is taking place and it appears that network members are satisfied with the accessibility of germplasm from INIBAP. In 1991, for instance, more than 50 cultivars were exported from the Transit Center to IITA, CRBP and NARS. The absence of tissue culture facilities in most NARS, however, restricts germplasm exchange. No exchange of germplasm seems to occur among NARS in the region.

Germplasm testing. The main germplasm testing activity of WACNET is the IMTP trial being carried out in collaboration with IITA at Onne and CRBP at Njombe. The IMTP trial at Onne was planted in December of 1991 and, although well managed, it is too premature for any results. IITA staff have the direct responsibility for the trial. The IMTP trial at Njombe, although established earlier in May 1991, is also premature to judge for results.

[2] This report was entitled: Plantain in West Africa. Proposal for a Regional Research and Development Network. The study team was headed by G.F. Wilson.

Research. No INIBAP global research activities are being carried out within WACNET other than WACNET's participation in the IMTP.

Information. Information exchange in the region is mainly physically accomplished by the Regional Coordinator as he travels the region and distributes documents. The global INFO DOC is undergoing decentralization. There are plans to develop a WACNET information system which are discussed later in this section.

B. Region-specific activities

Needs assessments and planning. The RAC, which met in December 1991 in Abidjan, Cote d'Ivoire, has identified, in order of priority, the following as the current regional needs: training (group and individual); financial support; equipment; and resistant germplasm. The farmers' major problems appear to be borer weevils and marketing difficulties. No research, however, has been done to verify these, although the panel's field visit indicated these problems. The network, through the RAC, has identified the following research priorities: weevils and nematodes; post-harvest issues; the potential problem of Bunchy Top disease; and socio-economics and marketing.

Information exchange. In a move to decentralize the global INFO/DOC system, INFO/DOC organized a workshop which was held in Dakar, Senegal, 11-14 February 1992. The workshop recommended an Information/Documentation Center to be established at CRBP, Cameroon. It was hoped that this would lead to national centers being established. A Regional Information/Documentation Coordinator position was also recommended. INIBAP, however, is also examining IITA as the more appropriate INFO DOC center, given IITA's comparative advantage in this area.

Collaborative research. WACNET currently has no collaborative research program. Research priorities have, however, been identified by the RAC, as reported earlier.

Institution building. Training is a major need of the region and WACNET's training activities are restricted mainly to the support of INIBAP's global activities. Since 1989, IITA, in conjunction with INIBAP, has run an annual three-week workshop on Plantain Research and Technology Transfer. Participants have come from different sub-Saharan African countries. A total of 20 trainees were selected from about 50-60 applicants, the selection being done jointly by IITA and INIBAP. All the resource people, with the exception of the Regional Coordinator, were provided by IITA. The only other group training activity to date was the Banana and Plantain Germplasm Exchange and Quarantine Regulations Training Course, held in collaboration with IITA and IDRC, 19-23 March, 1990. In terms of individual training, one Nigerian is funded by INIBAP for a Ph D on post-harvest technology at the University of Ibadan.

Fund raising for NARS has become one of the Regional Coordinator's most onerous and least rewarding activities. To date, he has successfully assisted Ghana and Guinea in securing $10,000 each for greenhouses needed for multiplying germplasm material. Congo, Zaire and Cote d'Ivoire also submitted for the same and are awaiting a decision on funding. He also assisted six countries prepare and submit a joint proposal to IDRC for $600,000 towards the establishment of tissue culture labs and nurseries. Ghana, Guinea and Cote d'Ivoire have also made a joint submission to ADB for an agronomy and marketing study on plantain. This is a collaborative study of the three countries sharing borders.

It appears that the Regional Coordinator has limited opportunity to provide consultation services to national programs in the region. He has, however, visited the NARS in Guinea on a consulting mission. He has similarly visited extension and development agencies in Nigeria and Cote d'Ivoire. Institutional linkages are, however, fairly good with the RAC member countries. In terms of other regional and international institutions, the strongest linkages to date are with IITA and CRBP.

Institution building will remain a major activity of WACNET. Baseline research surveys are also considered critical to understanding, verifying, and prioritizing problems. One important planned activity the NARS eagerly await is the Regional Evaluation and National Integration Program (RENIP). Under this proposed activity, trials containing new cultivars will be carried out in member countries with the hope of imminent release of resistant material to farmers. There will be a considerable delay, however, because cultivars have to undergo the IMTP before entering RENIP.

Administrative and Financial Matters. The Regional Coordinator seems to be able to cope with the considerable constraints of a limited budget that is controlled from Headquarters. The budget has no meaningful discretionary component to allow initiative on his part. He has been allocated no field vehicle. Communications from Onne were difficult with neither telephone nor fax. INIBAP, on its own, or in conjunction with IITA, was unable to commission satellite linkage at Onne. It is also apparent that the relocation to CRBP may not have resolved these communication problems.

In terms of staffing, the Regional Coordinator has a secretary as the only other support to run the office.

Assessment. Priority needs of the region appear to focus on two areas:

- strengthening the capability of NARS to carry out *Musa* research and collaborative activities; and

- technological and policy solutions to production and farmer problems.

The NARS in WACNET are weak and their training, financial and equipment needs are considerable. Special effort is required to scientifically and holistically understand farmers' problems in producing bananas and plantain. For now, it appears WACNET has no strategy, much less resources, for addressing regional priorities such as borer weevil, post-harvest losses, or price and marketing problems. Research attention should be given to these topics if the network is to have a positive impact.

WACNET should play a key role in having the regional needs assessed. For example, tissue culture facilities might be needed by NARS to enhance the whole germplasm and collaborative research effort. Since it might be difficult to acquire funds for each and every NARS in the region, WACNET could identify priority programs and help establish a regional tissue culture facility for all its members.

WACNET could identify funds for awarding a few competitive small grants to scientists in NARS who are judged as competent to work on priority problems. These would help encourage indigenous research and strengthen the capacity of NARS to participate in collaborative research networks.

Training is fundamental if WACNET is to help develop a sustainable capacity for *Musa* research. Every opportunity must be taken to link research with training by collaborating with local and overseas universities, as well as regional and international research centers.

The RENIP proposal appears to be in the doldrums. This will last as long as the IMTP is the portal for the release of material following advanced testing.

In terms of information and documentation exchange, the Regional Coordinator is distributing mostly material from Headquarters with little, if any, derived from within the regional network. The development of a WACNET INFO DOC system needs acceleration.

Consultation and backstopping by the Regional Coordinator to NARS is one way to acquire respect and stronger links, but with current time constraints he may not be able to give much assistance in this area. Time permitting, he should be able to assist some NARS with special research problems, skills and the like. He has, however, maintained good links with host institutions and those NARS in WACNET. Links are also reasonably good with IITA and CRBP. Stronger links, however, need to be developed with local and overseas universities, other regional networks and Headquarters.

The Regional Coordinator's efforts in fund raising seem focused on needs for tissue culture facilities and collaborative research projects. He has a difficult task raising these funds. Funding priorities need to be reassessed to allow the regional network access to INIBAP core funds. Headquarters also need to assist his attempts to raise funds from donors.

Finance and management issues are of critical importance to the eventual success of the regional network. The current situation appears to be a low input – low output equilibrium. It appears unrealistic to expect WACNET to have impact given the limited budget, communication and support services. The future growth path and therefore organizational structure of the regional network coordinating office has to be planned as a matter of urgency. Support is needed for both program and administrative activities. The matter of relocating the Regional Coordinator may have to be carefully re-examined by the Headquarters and the Board of Trustees. It appears both have made important decisions on incomplete facts.

In a questionnaire survey of 13 WACNET members that was carried out for the review by the CGIAR Secretariat, five responses were received from (Cameroon, Gabon, Nigeria, IITA and CRBP). Comments made by these respondents somewhat confirmed the impressions that the panel had gained in the field. The respondents were generally satisfied with INIBAP's services but at the same time indicated deficiencies in collaborative processes. The limited availability of the Regional Coordinator to members was also indicated as were other problematic issues in relation to communications with headquarters, administrative and support services.

3.5.3. East Africa Regional Network

Evolution and Organization. EANET was established in April 1989 when the Regional Coordinator, Mr. Kabonyi Sebasigari was appointed. In July of the same year, a Memorandum of Understanding (MOU) was signed between INIBAP and IRAZ. At the time of his appointment the Regional Coordinator was an employee of IRAZ, and he remains located at IRAZ in Burundi.

In 1985, an INIBAP mission[3] visited East Africa to determine research needs and the possibility of establishing a network. The team visited Burundi, Zaire, Rwanda, Tanzania, Kenya, Somalia and Ethiopia.

INIBAP financed the training of IRAZ researchers at IITA in 1986, and in 1987 secured EEC funding to install a plant tissue laboratory at IRAZ with assistance from KUL. In 1987 INIBAP completed a banana disease and pest survey in East Africa and in the same year held a workshop on banana weevil and nematodes in the region.

Links between EANET and KUL were strengthened in 1988, when an IRAZ researcher was trained in tissue culture at KUL and the Transit Center gave about 100 banana clones to IRAZ. In the same year INIBAP financed Dr. Phil Rowe of FHIA to visit IRAZ and thereby established links between FHIA and IRAZ.

The RAC for East Africa is composed of representatives from Zaire, Rwanda, Burundi, Uganda, Kenya, Tanzania, Ethiopia, Malawi and two regional institutions including IRAZ.

The East African highland bananas fall into two main types: cooking and beer. Because eastern Zaire has these highland bananas, and because plantain dominates the western part, Zaire is the only country which is a member of both African networks. In addition to the countries already mentioned, INIBAP has established links with the following countries: Comoros Islands, Madagascar, Mauritius, Mozambique, Somalia, Zambia and Zimbabwe. Initial contacts have also been made with South Africa.

Goals and Activities. Judging from the RAC's expressed needs the panel infers that the major goals of EANET are the strengthening of the scientific capacity of NARS to carry out applied and collaborative research that is relevant to the farmers' needs.

EANET has no formal program structure for its activities. As in the case of the other three networks, the panel separated EANET activities into two categories:

- those serving as a bridge for global INIBAP activities; and
- region-specific activities.

A. Bridge to global activities

Germplasm conservation and control. Burundi, Ethiopia and Zimbabwe have received germplasm from the Transit Center. Material received by IRAZ in Burundi has also been distributed to Rwanda and Eastern Zaire. Lack of tissue culture facilities has hindered germplasm exchange. Rwanda, Malawi and Tanzania have submitted proposals to the Regional Coordinator for such facilities. A request from Uganda is expected before the four proposals are jointly submitted to potential donors.

Germplasm Testing. The IMTP trial at Mageyo, Burundi, is now well established and well managed. INIBAP is also interacting with Ethiopia in order to design a project on the screening of *Ensete* material. A trial organized through the Central Germplasm Information System has been established at Cibitoke, Burundi. It has about 30 standard banana clones. The RC also

[3] The mission produced a report entitled: Banana Research in Eastern Africa. Proposal for a Regional Research and Development Network. INIBAP. 1986.

intends to study Tanzania's national banana collection and collect germplasm from the Kilimanjaro region.

Research. There are no global research activities under way in EANET with the exception of the IMTP.

B. Region-specific activities

Needs Assessment and Planning. At its first meeting held in September 1991, the RAC identified the following research priorities for EANET: crop management, soil fertility and management; post-harvest technology; and socio-economics. The RAC has also identified the following priority needs for strengthening the national programs:

1. Training - particularly in plant pathology and tissue culture techniques.

2. Germplasm exchange - particularly black-Sigatoka-resistant material.

3. Establishment of tissue culture labs; currently only Burundi has one.

Information Exchange. INIBAP documents are regularly distributed to users in the region. In the initial step toward decentralizing the global INFO DOC, a regional workshop on Information and Documentation for bananas and plantains was held in Burundi, 18-23 June, 1990. Proposals were formulated for collection and dissemination of information through the creation of a regional information and documentation center under the Regional Coordinator. None of the recommendations have been implemented yet.

Collaborative Research. Although no regional collaborative research is under way yet, the RAC has identified priority areas of research, as noted earlier.

Institution Building. Training facilitated by EANET includes some individual as well as group training through the IITA/INIBAP course. Training needs are, however, enormous and fall into the following priority areas: plant improvement; plant protection; and *in vitro* culture techniques. There has not been a deliberate attempt to determine training needs at various levels throughout the region. Universities in the region are not actively involved in training on banana research.

Fund raising for NARS is crucial given that no regional research, training and information exchange activities are funded by core funds. The Regional Coordinator is expected to generate additional funds by incorporating an overhead on project funds facilitated by INIBAP. The priority fund-raising activity currently is said to be tissue culture facilities. The Regional Coordinator has established contacts with the Nairobi-based donors.

The Regional Coordinator is not active in providing consultation services to NARS due to lack of time. He has, however, participated in the rapid rural appraisal that was carried out in Uganda on banana farming systems.

The future impact of EANET is likely to be jeopardized if training and tissue culture facilities are not available to NARS. RENIP also holds promise for future improved cultivars for the region. Uganda, Tanzania, Malawi, and Rwanda have already indicated their readiness to participate in RENIP as soon as it is under way. The Panel suggests that RENIP's initiation be accelerated.

Administrative and Financial Matters. EANET is still in its infancy. Staff at the post are the Regional Coordinator and a secretary provided by IRAZ. The IRAZ headquarters in Gitega is about two hours away from the airport primarily used by the Regional Coordinator. Although capable, he seems overwhelmed by his workload and the numerous tasks. Office administration and correspondence consume time that otherwise could be used more effectively for networking activities. For instance, he estimated that it can take up to a month to catch up with administrative work if he goes on a 1-2 week field trip. Resources and funds therefore limit his ability to cope with the needed attention to global activities, routine office paper-work and regional activities. The panel observed that the absence of a vehicle compromises his efficiency. Valuable time and flexibility is lost using public transport.

Assessment. The situation with EANET is somewhat similar to that of WACNET. The needs are enormous and the resources inadequate. Once again, institution building needs to start before producing countries can expect some impact from INIBAP's global activities. Training, financial and equipment needs, particularly for tissue culture facilities and collaborative research, are considerable. Since the RAC has mapped out priority research areas, INIBAP needs to assist by funding and/or facilitating some of this work. This work includes a study of soil fertility problems, nematodes and borer weevil control, post-harvest losses, as well as with price and marketing problems.

Training is critically underfunded. The Regional Network must assist NARS to develop a sustainable capacity for research on *Musa* and every opportunity must be taken to link research with training by collaborating with local and overseas universities, as well as with IARCs and other research centers (e.g. International Center of Insect Physiology and Ecology ICIPE)

Implementation of RENIP has to be advanced. The current uncertainty surrounding the decentralization of the INFO/DOC program to EANET needs to be addressed alongside other regional needs. The Regional Coordinator has been successful in developing links with host institutions and the NARS in EANET. INIBAP Headquarters and the Board of Trustees need to address the issues of planning, financing and management of EANET, consistent with the importance it carries as a central part of INIBAP's strategy.

The advantages and disadvantages of the current location of the Regional Coordinator should be thoroughly evaluated. The same applies to the resource needs of the regional office and establishing the appropriate critical mass required for effective operation.

3.5.4 Asia and Pacific Network (ASPNET)

Evolution and Organization. ASPNET, which became operationally effective on January 1, 1991, is the latest of the INIBAP regional networks to be established. Dr. Ramon Valmayor, ASPNET's Regional Coordinator, played a leading role in establishing the network. Before joining INIBAP, Dr. Valmayor was Executive Director of the Philippine Council for Agriculture and Resources Research and Development (PCARRD) and a six-year member of INIBAP's Board of Trustees (where he served as the Chairman of the Program Committee).

Although the network was not formalized until 1991, a regional dialogue on banana and plantain research was initiated in 1988. INIBAP established a Southeast Asia Banana Task Force (under the chairmanship of Dr. Valmayor) to evaluate the status of banana and plantain in the region and explore the possibility of regional coordination on banana improvement. The Task Force generated comparative baseline information about the status of banana and plantain in the region and recommended the establishment of a regional network.

A second expert consultation meeting was held a year later in Manila on banana and plantain R&D networking, under the co-sponsorship of FAO and INIBAP. The participants were the leading scientists from the research and development institutions in the region. On this occasion, the definition of the "region" was broadened from Southeast Asia to all of Asia and the Pacific. The consultation urged INIBAP to proceed with the establishment of the network and accept the offer from the Philippines (one of the signatories to the International Agreement establishing INIBAP) to provide an initial base for the regional network. This led to INIBAP's decision to establish the network and ask Dr. Valmayor to set it up on a part-time consultancy basis during the second half of 1990.

ASPNET has a Regional Advisory Committee (RAC) made up of representatives of countries and institutions which signed a Memorandum of Agreement with INIBAP and participated actively in setting up the network. These include Australia, Indonesia, Thailand, Malaysia, Philippines, China, India, and the Taiwan Banana Research Institute (a non-profit private institution). Other countries or institutions in the region which are "willing and able" to contribute to the common interest in banana and plantain research and development can become "members" of the network. RAC has a Chairman, selected from among its members, and the ASPNET Regional Coordinator is, *ex-officio*, its Secretary.

Goals and Activities. As ASPNET is the last of the four regional networks to be established by INIBAP, the first three served as examples for ASPNET's activities. Yet, ASPNET developed a different character of its own, in part because of the nature of the problems of the region, the strength of many of the large national programs in the region, and the style of the Regional Coordinator.

The two most significant events of the first year of ASPNET's operation were a technical meeting on diseases affecting banana and plantain in the Asia and Pacific region and the inaugural meeting of the Regional Advisory Committee.

The regional technical meeting on banana diseases was held in Brisbane, Australia, in April 1991, in close consultation with the Queensland Department of Primary Industries (QDPI). The meeting identified *Fusarium* wilt as the most important disease and Sigatoka as the second most important disease affecting bananas in the region. The participants agreed to develop an IMTP protocol against *Fusarium*, and recommended the expansion of the United Nations Development Program (UNDP)-supported IMTP against Sigatoka diseases to include the Asia and the Pacific region.

The inaugural RAC meeting was held in Indonesia in August 1991. The Committee established guidelines for membership in ASPNET, elected its Chairman, and reviewed the ongoing and planned activities of the network.

As in other regional networks, ASPNET's activities fall into two broad categories:

- those serving as a bridge FOR global (or thematic) INIBAP activities,
- region-specific activities. The following is a summary of ongoing and planned ASPNET activities within these broad categories.

A. Bridge to Global Activities

Germplasm conservation and exchange. The Virus Indexing Center at QDPI (Brisbane) became operational in 1991. The Center at the University of Philippines at Los Banos (UPLB) is expected to begin serving INIBAP at a later date. The Regional Coordinator has developed a proposal for a "mega" project on *Musa* germplasm collection, characterization and maintenance. The collection would focus on unexplored areas of Indonesia, Philippines, China and Vietnam. The proposal is under review at INIBAP HQ.

Germplasm Testing. ASPNET was instrumental in advocating the initiation of an INIBAP IMTP against *Fusarium*. It also facilitated transfer of samples to QDPI as the first step in the initiation of the *Fusarium* IMTP program.

Research. There were no global INIBAP research projects to which ASPNET contributed.

Information. ASPNET is planning to develop its own regional information system (see below).

B. Region-specific Activities

Needs Assessment and Planning. ASPNET was instrumental in facilitating dialogue among the banana scientists from the region concerning regional needs. The 1988 Task Force, the 1989 regional consultation on networking, the 1991 technical meeting on diseases, and the first RAC meeting were all aimed towards identifying needs within the region and in individual countries. However, this has not yet been carried to the next step of developing a "regional network strategy" and an implementation plan.

Information Exchange.: ASPNET publications summarizing the proceedings of the three regional meetings noted above are among the significant INIBAP publications to date. Also, ASPNET co-sponsors publication of important manuscripts by its members. ASPNET is planning to strengthen information exchange within the region by establishing a Regional Information System for Banana and Plantain--Asia and the Pacific (RISBAP). A proposal has been drawn up which aims to replicate (with some modifications) at the regional level the national research information system in use at PCARRD. The proposed effort is quite ambitious in scope and has the following components:

- a database including principal characteristics of all ongoing and completed R&D projects on banana and plantain;
- a database of literature and publications for banana and plantain in the region;
- Asia and Pacific *Musa* Germplasm Information System;
- a database of all researchers/scientists and institutions involved in banana and plantain R&D;
- an information system on technologies on banana and plantain in various levels of development; and,
- an Asia and Pacific Pests and Diseases Information System.

Research Consultation. In addition to its information network characteristics, ASPNET serves primarily as a research consultation network. Participation of Australia and the Taiwan Banana Research Institute in the network's activities (and those of its advisory committee) is likely to introduce advanced research institution and private sector perspectives to the dialogue among the network members.

Collaborative Research. No collaborative research activities have yet been undertaken by the network. Need for research in a number of areas (such as diseases, production systems and post-harvest-technology) have been identified as high priority, but no collaborative research projects have been initiated in these areas.

Institution Building. Many of the members of ASPNET have relatively advanced research programs. The Regional Coordinator serves an important research consultancy role within the region. He also tries to generate funds for research projects developed by scientists from the region and for participation of regional scientists in training programs offered within the region.

Administrative and Financial Matters. ASPNET is housed within the PCARRD complex in Los Banos, which also houses CIP, IIMI, FAO/UNDP and CIRAD. It has a one-room, partitioned office, shared by the RC and his secretary/assistant. Because the Regional Coordinator was formerly Executive Director of PCARRD, when he started his INIBAP job he merely changed offices within the same building. The office and its furnishings are provided to INIBAP free of charge.

The Regional Coordinator has access to some IRRI facilities. Because of the proximity of PCCARD to IRRI, he is often sent electronic mail or other messages through IRRI.

He has expressed a strong need for a second professional staff member (Assistant Regional Coordinator). The overall staffing of this and the other regional networks needs to be seen in the context of INIBAP's (and each region's) future strategic directions and program of work, and the funding outlook.

The Regional Coordinator visits the headquarters once a year (during the annual Board meeting) and, like all staff, prepares quarterly activity reports and plans. He has authority to spend up to $5,000 and maintains an INIBAP bank account in the Philippines. Accounting and control of his financial transactions are handled at the headquarters.

The budget and expenditures of this region in 1991 were about US$ 160,000, including salaries. About a fourth of this sum was allocated to activities of global nature by the headquarters (such as MGES, IMTP, CGIS). The approved 1992 budget allocates $488,000 to ASPNET. The increase from 1991 is due to the planned start of two IMTP programs (versus Sigatoka and *Fusarium* wilt) and the regional information system. Given the current overall budget situation of INIBAP, it is doubtful that these programs would be implemented as planned.

Assessment. Establishment of ASPNET has enabled INIBAP to globalize its efforts. ASPNET covers the largest land area and population among the four INIBAP regions and the greatest diversity in terms of the strength of national research institutions, number of banana and plantain varieties, ratio of exports to national production, and the cultural backgrounds of the region's people.

Most of this network's activities are region-specific, rather than serving as bridges with INIBAP's global activities. As a result, the network has a somewhat independent (from the headquarters) character, as compared with the other regional networks. An interesting indicator of this are MOU that ASPNET has signed with other institutions, reflecting its desire to maintain a separate identity.

Because most of the larger countries in the region have strong and mature banana research institutions, ASPNET has the potential to initiate collaborative strategic and applied research activities more quickly than some of the other regional networks. The Panel sees this as the next stage in this network's evolution. Thus, the Panel urges ASPNET to facilitate the formation of one or more collaborative research networks in the Asia and Pacific region. Several of these countries should be able to finance their own contributions to such collaborative research networks.

The most important achievement of ASPNET to date has been the bringing together of banana and plantain research and development institutions and scientists in the region. The consultations conducted to date have led to identification of issues requiring collective attention and to publications with relevance to scientists within and outside the region. So far no specific impact of the network can yet be identified in production, income or institution-building terms.

ASPNET's activities to date are generally appreciated by the network members. Five of the ASPNET members responded to the questionnaire survey of the regional network members conducted by the CGIAR Secretariat for this external review (India, Indonesia, Malaysia, Pakistan and Vietnam). Identification of the problems of the region for strategic research, facilitating coordination and cooperation among network members, and useful reports and proceedings were identified by these respondents among the particular strengths of ASPNET. Weaknesses mentioned include: insufficient contact with national problems; insufficient authority (of the Regional Coordinator) for program implementation; weakness of back-up facilities for network coordination; and delays in getting planned programs off the ground.

3.5.5 Conclusions on Regional Networks

In the Panel's view three major conclusions can be drawn regarding INIBAP's regional networks: their identity and goals; the "dumping ground" syndrome; and the budget problem.

Identity and Goals of Regional Networks. The Panel observed that the regional networks are all in their early stages of development. They have not yet developed an identity of their own that is separate from INIBAP's global activities. This observation is confirmed by the absence of clear mission or goal statements by the networks. At this stage, it is difficult to distinguish goals of regional networks from those of INIBAP. In fact, what the Panel deduced to be the current goals of the networks mainly reflects a collation of regional short-term needs identified by the RACs, and not the results of a systematic analysis of regional needs.

The Panel feels that each regional network has to acquire an independent and autonomous character before its members can function as a team. Without operating as a team it will be difficult to do effective needs assessments, set goals, plan strategically, mobilize needed resources, and effectively perform the enormous task of collaborating in the solution of regional and national problems.

The "Dumping Ground" Syndrome. The Panel has observed that the regional networks have become the catch-all entities for virtually all the *Musa* activities that are not covered under the umbrella of INIBAP's global activities. These include, *inter alia*, crop management, post-

harvest technology, pests, socio-economics, and training. Because these items represent some of the most pressing needs in the producing areas, the expectations are high but the funds are limited. Basically, no core funds are allocated to these activities.

The Budget Problem. The budget problem can simply be summarized by the observation that limited funds are allocated to the Regional Coordinators and that this portion of the budget is controlled from Headquarters. This not only contributes to the "lack of identity" problem, but also explains why there have been few innovative ideas emerging from the regions. An analysis of the budget over the years shows that the Headquarters and global activities have had a lion's share of INIBAP's budget and have steadily increased. The regional networks, on the other hand have received an average of approximately 27 percent of the budget between 1986 and 1992. In those seven years, the proportion of the budget for regional networks varied from approximately 20 per cent to 45 per cent, with four of seven years below 25 per cent. Moreover, the regional budgets also cover expenses of global activities such as IMTP, further reducing the proportion of the budget for regional activities. It appears that, during periods of austerity, regional network budgets are more likely to be cut than Headquarters or global program budgets.

The Panel recommends that, as part of its strategic reorientation, INIBAP clarify the role, identify and mission of the regional networks. It further recommends that each regional network be encouraged to develop its own strategic plan, within the broad parameters provided by the updated INIBAP strategy.

3.6 Overall Assessment of INIBAP's Activities

INIBAP's achievements in providing research services through its global program of activities are significant and worthwhile. INIBAP has successfully initiated programs to provide an exchange of valuable, healthy *Musa* germplasm, associated documentation and supporting programs coordinated through its system of regional networks. This focused approach to servicing the needs of *Musa* research appears to be an important initial strategy for INIBAP to get programs underway.

The Panel, however, feels that the regional research services through its regional networks have not really taken off. Regional networks are the "dumping ground" for a considerable number of other responsibilities such as institution building, and collaborative research on pests, post-harvest technology, crop improvement, and socio-economics.

3.6.1 Achievements

INIBAP's global program of activities are providing valuable and needed services to the international *Musa* research community. Through INIBAP, it is now possible to safely exchange genetic material without the previous uncertainty of transporting unwanted plant pathogens. This service takes on greater importance as *Musa* breeding turns its attention to domestically produced and consumed cooking bananas and plantain. Earlier banana breeding efforts focussed mostly for export dessert-type bananas. The international traffic in *Musa* germplasm was fairly contained. The prospects for an accelerated research effort in *Musa* improvement must be predicated on a safe germplasm exchange system. The Panel feels that INIBAP has done a commendable job in launching research services for the international *Musa* research community. The quality of the services, value of the technical information and the institutional commitment to documentation are clearly evident.

The creation of the four regional networks is a significant INIBAP achievement and has provided useful fora for *Musa* scientists. But this, in and of itself, is not enough. Regional networks have to develop in character, identity and resource base. Current expectations are high and related research, information and documentation, training, technical support, communications and the different needs that exist between regions must be addressed.

3.6.2 Lessons learned

Many of INIBAP's programs have been underway long enough to ask the question: What has been learned from the experience?

It is clearly evident to the Panel that the size of the demands placed on the INIBAP, particularly at the regional level, are much greater than originally envisioned. The expectations of national programs exceed the capacity of the Regional Coordinators to respond in ways they judge sufficient. The high expectations of the INIBAP "clientele" are placing considerable strain on the Network's human resources, finances and facilities.

Related to this concern is the emerging evidence of the relatively high cost of providing *Musa* research services. One underlying premises of the network concept is that it is a less expensive way of getting a job done. This may not be true. Many of the costs of the INIBAP research services are fixed, and the proportional gains from efficiency are not being realized. This has resulted in 48 percent of the 1992 core budget being allocated to germplasm and breeding, while only 6 percent of the core budget is allocated to strengthening national and regional programs.

Another lesson learned from the INIBAP experience is the difficulty in linking germplasm collections to virus indexing and documentation. What is needed is a system that can be easily distributed to NARS researchers. The absence of a standardized classification system for *Musa*, the difficulties of absolutely determining virus-free status, the incomplete documentation for many accessions in the *Musa* collection, and the difficulties for global communication (especially electronic) has slowed progress in some areas. Some of these constraining factors are either beyond INIBAP's control, or the solutions are too costly to consider.

The Panel asks if some of these constraining factors might be resolved by INIBAP involving itself in the research process, rather than attempting to accomplish their research via collaboration and networking. For instance, the development of descriptive information for the *Musa* germplasm collection might be a project INIBAP could incorporate into the CGIS. The distribution of a germplasm database might be executed directly by INIBAP using CD/ROM technology. Reading equipment could be provided to users, at least at the regional level.

The Panel was impressed with the varied approaches used by Regional Coordinators to solve similar problems. Some very inventive solutions have been created, but the Panel notes that the sharing of these successes within the Network has not become a formalized process. For Instance, Dr. Valmayor's facilitation of a the translation of an Indonesian publication on bananas into English for wider usage within the Asia Pacific Region is an example of how to get the job done with few resources. This goal-oriented approach to activity accomplishment is fundamental to networking. Success stories should be shared within the Network, so that others can learn and thus benefit from the insight and experience of others.

3.6.3 Conclusions

The Panel is satisfied with the growth of the Headquarters and the global programs and activities. Regional networks, however, need to grow considerably in order to achieve a balance in organizational growth.

In terms of research service outputs, global programs and activities are considered satisfactory. Because of the state of flax in the regional networks, attempts to measure research service outputs are at best confused. In terms of research, outputs of global activities are minimal and just beginning. There are no research outputs from regional networks. This overall situation of a mixed performance brings to the forefront a strategic question whether or not research should be a major INIBAP activity. This, in addition to the relevant question of the appropriate output mix for INIBAP is addressed in Chapter 5.

CHAPTER 4. INIBAP'S ORGANIZATION AND MANAGEMENT

In this chapter the Panel provides an assessment of INIBAP's effectiveness as an organization. The focus is on understanding how INIBAP functions as an institution and whether its organization and management practices are geared towards achievement of its goals.

An overview of INIBAP's legal status (Section 4.1) provides a backdrop for the rest of the chapter. This is followed by the panel's assessment of the way INIBAP's Board of Trustees functions (Section 4.2). The following section (4.3) is on leadership and is included here for both recognizing Dr. Edmond De Langhe's contributions to INIBAP and assisting the Board in its current exercise in selecting a new Director. Sections 4.4 through 4.8 summarize the Panel's understanding of how INIBAP functions, in terms of its organizational culture, structure, and management systems and processes. Particular attention is paid here to how INIBAP manages its human and financial resources and how it could overcome some of the difficulties it faces. The next section (4.9) addresses how successful INIBAP has been in forging and managing relationships with other organizations – an important characteristic for a network-type institution. The chapter ends with an overall assessment of INIBAP's strengths and weaknesses.

4.1 Legal Status

INIBAP has juridical personality as an international, intergovernmental organization. It attained this status on August 25, 1990 when the international agreement establishing INIBAP was ratified by France, following ratification by Canada and the Philippines. These three countries, plus Belgium, Colombia and Senegal, were signatories to the 1988 international agreement establishing INIBAP. To go into effect, the agreement needed ratification by at least three countries. Thus, ratification by France equipped INIBAP with the legal personality needed for operating as an international entity.

This was an important milestone in the life of INIBAP. Since 1984, INIBAP had been operating under the auspices of IDRC, which had been serving as the executing agency on behalf of the Donor Support Group financing INIBAP's activities.

The INIBAP convention provides the organization with the full legal status accorded to juridical persons by the laws of the countries which signed the agreement. It also stipulates that:

- the headquarters of the organization is to be in Montpellier, France;
- its working languages are to be English, French and Spanish (thus making INIBAP the only institution within the CGIAR with a trilingual requirement);
- it is to have a Support Group (this term is used instead of "donor support group" because some members of the support group are not donors to INIBAP), which is to meet at least once annually, endorse the organization's annual program of work and budget, appoint the members of the Board of Trustees (upon nomination from the Board), and, together with the Board, commission periodic external reviews of the organization.

4.1.1 The Status of the Headquarters Agreement

While the international agreement provides for INIBAP the legal umbrella to operate in France, it does not give the organization and its staff the privileges and immunities enjoyed by international centers in other countries. Obtaining a suitable headquarters agreement (*Accord de Siège*) in France has been a major preoccupation of INIBAP's Board and management, practically since the establishment of the organization. Much progress has been made in this regard (thanks to the efforts of the host country representative on the Board and the French officials concerned with CGIAR matters), but negotiations with the Government of France have not yet been brought to a satisfactory conclusion. The number of agencies involved in such negotiations and the slowness of the bureaucratic process have led to delays. The Panel is not aware of a situation within the CGIAR where obtaining a headquarters agreement at the start of a new institution has taken such a long time.

The Panel is in no position to predict if and when INIBAP will be able to obtain a satisfactory headquarters agreement in France. The current predictions are for this matter to be settled before the end of 1992, but, then again, similar predictions were made in previous years.

Although it does not yet have a headquarters agreement, INIBAP's operations have been facilitated greatly by CIRAD, which has been serving as the administrative host to INIBAP. In addition, Agropolis and the City of Montpellier have extended a warm welcome to INIBAP. The City has agreed to provide a suitable piece of land on which a headquarters building is to be constructed. Depending on the specific provisions of the headquarters agreement concerning immunity from taxation, and through the generosity of the Government of France, INIBAP would be able to operate out of suitable rent-free facilities.

One factor complicating matters at the moment is that, as of the beginning of 1992, IDRC relinquished the role it had been playing since 1984 as executing agency for INIBAP. IDRC still continues to assist in the employment of several INIBAP staff (usually as IDRC consultants seconded to INIBAP through CIRAD under a scientific exchange agreement between the Governments of Canada and France), but intends to relinquish this role at the end of 1992.

Having to operate without a headquarters agreement for so many years has forced INIBAP to resort to making *ad hoc* arrangements in employment, financial and other matters and has perpetuated a feeling of uncertainty among staff. The effects of this on the organization are discussed in greater detail in Sections 4.7 and 4.8, below.

4.1.2 Role of the Support Group

INIBAP's entry into the CGIAR has introduced a complication in its governance. Entry into the CGIAR for most formerly non-associated centers has led to dissolution of their Donor Support Groups, because the Groups' functions would now be carried out by the CGIAR. In INIBAP's case, however, having a Support Group is a requirement of the international agreement. Changing the agreement would require ratification by all six original signatories - a costly and time-consuming option.

If the INIBAP Support Group were to continue to exercise its authority as provided by the international agreement, INIBAP's program and budget proposals would need to be approved by both TAC/CGIAR and the Support Group. Similarly, Board members would need to be approved by the Support Group, even in the case of CGIAR nominees (when the INIBAP Board starts to utilize this process), and INIBAP's governance would maintain its two-tier character. In short, INIBAP would be subject to two chains of accountability: one to its Support Group, and the other

to the CGIAR.

Most members of the INIBAP Support Group have expressed a desire to have the functions of the Support Group performed by the CGIAR, with or without a change in the international agreement. The Panel supports this view and urges the members of the Support Group to eliminate a potentially conflicting dual accountability mechanism.

4.2 Governance

Institutional oversight of INIBAP is the responsibility of its 11-member Board of Trustees (the membership of the INIBAP Board throughout its history is shown in Table 4.1). Two members of the Board are *ex-officio:* the Director of INIBAP and a member designated by the host country (France). Of the nine other trustees, five are from banana and plantain producing countries and four are appointed on the basis of their scientific work and administrative expertise. As INIBAP is now a member of the CGIAR system, the Board plans to have some members of the Board of Trustees designated by the CGIAR - as is done in other centers in the system.

The Board is structured into three committees (program, nomination and executive). An elected Chair presides over the annual meeting and is empowered to act in certain capacities between meetings. Committee meetings can be called intermittently for special assignments to serve the needs of the institution, as directed by the Board Chair.

For purposes of the review, the Panel had access to multiple sources of information to evaluate the functions and effectiveness of the Board of Trustees. Primary among these was a survey questionnaire the Board members completed as part of the external review process. Rated on a scale of Excellent, Very Good, Good, Fair and Poor, the Board rated itself as Good on activities such as policy making, center guidance and the management of programs, resources and external relationships. These self-assessments by the Board members (9 responded) are somewhat low compared to similar assessments conducted by other IARC boards.

In general, Board members seem knowledgeable of their responsibilities in areas of institutional accountability. They rated themselves as fairly effective in planning, assessment and institutional guidance. However, the Board rated its performance as poor in program activities conducted at field locations (a.k.a. the regional networks). This suggests that the Board does not see itself as playing a particularly active role with respect to region-specific activities. Collectively, the Board scored itself quite high on its oversight of resource planning, management and control. Less satisfaction was reported in human resource planning. Notably, a few Board members listed INIBAP's overall effectiveness in this area as "poor".

In its relationship with the Network's management, the Board for the most part agreed that relationships are based on openness, respect and mutual trust. They reported that they are able to discuss, when necessary, sensitive and potentially controversial topics in adequate depth. Less agreement was reported on assessing administrative performance based on explicit and objective criteria.

In addition to the survey, the EMPR Panel Chair and a CG Secretariat representative interviewed one-on-one the members of the Board of Trustees in attendance at the November, 1991 meeting in Washington D.C. Comments from Board Members, recorded in confidence, noted strong support for INIBAP as an institution and for its mission. However, resource constraints were noted repeatedly and concern was expressed as to how this situation limits the Network's activities.

Table 4.1

INIBAP BOARD OF TRUSTEES AND THEIR TERMS OF OFFICE

1984 - 1992

Name	Nationality	85	86	87	88	89	90	91	92
ADETUNJI A.	Nigeria					x	30/5/90		
AYUK TAKEM J.	Cameroun							x	x
BEHNCKEN G.	Australia							15/3/91 P	x P
BERTRAND A.	U.S.A.				x	x	x	x N	x N
CHAMPION J.**	France	x	x	x	1/6/88				
DUBREUIL P.L.**	France				20/10/88	x	x	x	x
DE LANGHE E.*	Belgium	x	x	x	x	x	x	x	x
ECKEBIL J.P.	Cameroon	x	x	x	1/6/88				
GIACOMETI D.	Brazil	x	x	x	x	x	x	x	x
GOMEZ CUERVO P.L.	Colombia					x	x	x	x
JARAMILLO R.	Colombia	x	x	x	1/2/88				
KAFURERA J.	Burundi	x	x	x	x	x	x	x	x
NESTEL B.L.	England		x	x	x	x	x		
PERSLEY G.	Australia	x	x	x	x	x	x	28/2/91 P	
STOVER H.	Canada	x	x	26/5/87					
SUN P.M.H.	Chine							15/3/91	x
TER KUILE C.	Netherlands							x C, E	x C,.E
VALMAYOR R.	Philippines	x P	x P	x P	x P	x P	x P		
WORMER T.	Netherlands								x
ZANDSTRA H.G.	Canada	x c	x c	x c	x c	x c	x c	15/3/91 C, E	Appointed BOT Chair Emeritus
Number of members		10	11	11	12	11	11	11	11

* Director General, Ex- Officio
** Host Country, Ex-Officio
C Chairperson
P Chairperson, Program Committee
E Chairperson, Executive Committee
N Chairperson Nominating Committee

In spite of resource constraints, Board Members recommended additional activities including: the initiation of a training program; more and better use of the regional advisory committees; and more support for the Regional Coordinators.

Regarding their role as a Board of Trustees, some suggestions were made as to how to increase the Board's effectiveness. One member proposed rotating meetings to provide visits to the Network's regions. Another asked for distribution of written material more in advance of Board meetings. Another called for ending the process of "retranslation" of Board decisions by headquarters' management. Others looked at the EMPR to recommend strong revisional changes "in-house," both for institutional management and for the Board.

Other comments made by the members of the Board described their expectations for the new Director of the institution. Some felt the successful candidate should have a strong knowledge of the "community" and possess leadership ability. Although the new Director should not necessarily be a banana specialist, he or she should be, overall, a good research leader and manager capable of effectively mobilizing a small number of staff. The new Director should also be able to interact effectively with donors and Regional Coordinators. Finally, it was proposed that the new Director should make the regional networks the "front-line" of the institution, and handle their needs first.

4.2.1 Assessment

Based on the Panel's review of Board minutes, interaction with the Board Chair and Board members, and interviews with INIBAP staff, the Panel was pleased with the openness of the Board to listen to new ideas, its willingness to reach out, and its "people" orientation. These characteristics will be indispensible during INIBAP's leadership transition period.

The Panel noted some Board-related practices that may be limiting the Board's effectiveness. Pre-meeting documentation circulated to the Board members tends to be nonselective, thus overloading members and masking strategic concerns that should predominate Board meeting agendas. Other IARC boards are presented with agendas that identify topics and associated documentation as either informational, for discussion or for decision. This sorting of topics with careful selectivity enhances a board's effectiveness.

The Board's role on oversight of institutional agreements and activities should extend to all Memoranda of Understanding and financial audit of the institution. As presently practiced by INIBAP, MOUs are signed by the Director and even, as proposed in some cases, Regional Coordinators. Then the Board is informed. This suggests an area for careful consideration in the future.

The Panel determined that financial audits of INIBAP are commissioned by the Director and not by the Board of Trustees. This, in and of itself, is an unusual practice not consistent with generally accepted financial control standards.

The Panel was surprised to discover the extent of management's participation in Board meetings. The virtually open attendance at Board meetings is likely to weaken the Board's resolve in the decision-making process.

Very close relationships between two Regional Coordinators and members of the Board of Trustees has emerged through host institutions' associations. The Panel feels that this could result in awkward conflict-of-interest situations for the Regional Coordinators, and might jeopardize the regional perspective necessary for effective regional coordination.

The Panel recommends that the Board develop a formal policy to address various conflict-of-interest situations.

The Panel notes that the composition of the INIBAP Board of Trustees is not well balanced by disciplines, experience or gender when a broader need is considered. For instance, the present membership appears to lack a social science perspective. Another weakness is in finance and management experience that has been manifested in poor institutional performance in these areas. Also there are no women on the Board. Deficiencies such as these should be considered in searching candidates for the Board of Trustees.

4.2.2 Assessment

The INIBAP Board of Trustees must assume greater responsibility for strategic issues by practicing more rigorous selectivity in what it spends its time on and disregarding the more mundane topics that tend to clutter the agenda.

The Panel further suggests that the Board of Trustees assume full responsibility for financial auditing of the institution and undertake an active participation in budgeting and resource allocation decisions. These responsibilities could be greatly facilitated by selectively nominating members of the Board with management and finance perspectives.

The Panel suggests that alternatives to face-to-face meetings be considered to hold down the costs of Board meetings, which now represent a significant portion of INIBAP's budget. The Panel considered recommending a reduced-size board, but rejected this alternative as broad representation, institutional support, and oversight roles would be diminished with fewer members. Modified Delphi methods (mail-out questionnaire procedures) and electronic conferencing might supplement pre-Board meeting planning, and facilitate the conduct of board business between Board meetings.

The Panel recommends that the Board establish a Finance and Administration Committee, with an Audit Subcommittee, to oversee the management of INIBAP.

Finally, **the Panel recommends that the Board focus its efforts on strategic concerns facing the institution.** At present, many of the Board's decisions appear to be activity-driven, and such choices may not necessarily result in achieving specific objectives.

4.3 Leadership

INIBAP's first Director, Dr. Edmond De Langhe, provided a strong scientific leadership to the institution during its formative years. As a recognized authority on *Musa*, he was able to see the need for creating a global network of research services designed to facilitate *Musa* improvement through international exchange and through targeted programmatic activities.

Several other individuals played important roles in developing the concept and support for INIBAP, notably Dr. Hubert G. Zandstra, the first Chairman of the Board of Trustees, and Dr. Barry Nestel and Dr. Gabrielle Persley, members of the first Board of Trustees. These three individuals, along with others, worked hard to establish and sustain the Network's growth against

many odds. Through a collective effort, the Network has established its planned programs, initiated substantial bilateral and multilateral agreements, built partnerships in its four targeted regions, and gained entry into the CGIAR. INIBAP is thus well positioned to provide global leadership for banana and plantain research and training.

Dr. De Langhe is entering retirement, and INIBAP is now in the process of appointing a new Director. Careful decisions need to be made for the type of individual most likely to provide the necessary leadership for the institution's future. The Panel suggests that, in addition to the expected administrative skills for an institution such as INIBAP, the new Director should be committed to participatory strategic planning and be capable of managing the resources (human, technical, physical, financial and intangible) of a network-type institution. The Panel believes this consideration is important for the following reason. During an institution's formative years, a top-down, centralized approach to management is one option to quickly implement programs and execute decisions. But such an approach also has some drawbacks, in that it constrains the building of a team of professionals each of whom can bring unique gifts to the organization.

The search for a new Director was concurrent with the EMPR main phase. This provided opportunity for the INIBAP Board Chair to request the Panel's views on the traits of a new Director that would be most suitable for the institution's future. The following points to consider were transmitted to the Board chair:

1. **Leadership**

- Scientific competence and respect of the scientific community
- Visionary, strategic thinker
- Delegator, without abdication
- Capacity to redirect, toward institutional stability, with a humanistic perspective.

2. **Capabilities**

- Setting of clear objectives
- Creation of effective teams
- Translation of long-range plans into action
- Ability to influence network participants without interference.

3. **Capacities and Willingness**

- Passion for learning
- Willingness to seek out the clients' perspectives
- Comprehension of the potential and limits of a network organization.

4. **Interpersonal and Management Skills**

- Effective communication
- Strong people orientation
- Ability to attract, retain and motivate qualified people
- Effectiveness in mobilizing resources
- Understanding of financial information, especially budgets, and how to use them as management tools.

These desirable traits should be combined with a willingness to empower thematic program leaders and the Regional Coordinators so that they can effectively implement their programs. The

Director's responsibilities will then become exercised through consensus building, collective decision-making, and delegation of authority.

4.4 INIBAP's Culture

INIBAP is a network organization whose *culture* can be described in terms of the values, attitudes and beliefs shared by its members. Although some components of INIBAP's culture are explicitly stated in its policies, other cultural elements can be inferred only through practices that are encouraged or discouraged within the organization. This section is based on an analysis of data collected from interviews, internal documents and panel members' shared impressions.

4.4.1 Values

Client orientation should be an important value in any network organization. INIBAP's Strategy Paper and its program descriptions clearly suggest that INIBAP wants to be a client-oriented organization. Feedback from the regions also indicate that the Regional Coordinators work hard to maintain contacts with the client systems in their regions. However, the following shortcomings were observed in INIBAP **headquarters**' approach to practicing its espoused value of client orientation:

- Clients were often not involved in needs assessments, establishing goals/plans which involved them;
- Some clients received more attention and better service than others;
- Client feedback is not solicited on a regular and planned basis, and there are no formal mechanisms to ensure that client feedback is systematically incorporated into INIBAP's plans.

INIBAP should consider taking some steps to strengthen its client orientation.

In order to foster team spirit, a global network organization like INIBAP must also learn to work effectively with individual differences both within and outside the organization. INIBAP staff in the headquarters and the regions are diverse in terms of country of origin, age, educational background and work experience. INIBAP needs to ensure that its programs and activities meet the needs of both male and female clients. In addition, INIBAP needs to examine its recruitment practices to remove any barriers to hiring qualified women at the same professional level as men with similar qualifications. The Board has a special role to play in providing oversight of INIBAP practices in these gender-related areas.

A network organization like INIBAP wields tremendous influence as a role model among its affiliated organizations. Quality is recognized as important to its efforts, but predetermined quality standards have not been established in most of INIBAP's priority areas. For similar reasons, requiring each program to formally specify its quality standards will not only enhance INIBAP's reputation and effective use of its resources, but will also encourage its affiliates to improve their quality standards.

Fairness and equity in staff relations is important to foster and maintain staff commitment. We came across at least some situations where staff felt that they had not received a fair treatment, and their attempts to discuss the issues were unsuccessful. INIBAP should take concrete steps to improve its image as a fair and equitable organization.

4.4.2 Attitudes

Networks should function as learning organizations. They must be receptive to learning from their own and other organizations' experiences, as well as periodically examining their own assumptions and practices. Comparing research designs and reviewing of experiences across regions are specific ways in which learning opportunities can be pursued.

For similar reasons, INIBAP should examine whether it can learn from management practices in other network or agricultural research institutions. In this context, the statement, "Financial management uses all the techniques of a $10 billion Fortune 500 corporation," (INIBAP Management response to the EMPR Terms of Reference) is disturbing since it is neither factually correct, nor does it reflect an attitude of willingness to learn.

In order to generate commitment to common goals, a global network organization such as INIBAP must adopt a participative decision-making style both among its own management team and among its network partners. Centralized decision-making has been the norm, and INIBAP has only recently taken steps to implement the Board's request to increase decentralized decision-making by "greater delegation of authority in the framework of existing programs" and by "permitting RCs to commit funds or make payments within approved limits" (Staff Annual Report, 1991).

These efforts at increasing delegation must be backed by improved accountability through negotiated goals and measurable criteria. Currently, INIBAP functions more as an activity-driven or resource-driven organization, than as a goal-oriented organization. These issues are covered in greater detail in Section 4.5.

4.4.3 Beliefs

Shared beliefs among an organization's members both influence its culture and in turn get reinforced by the cultural norms. One belief area relates to what is considered to be **valuable** within INIBAP. Scientific field research to help the banana world is probably the most valued activity within INIBAP and should continue to be held in high esteem. Some other priority areas included in INIBAP's mandate, such as training and evaluation of societal impact of INIBAP's efforts, are not perceived as important and receive less attention than they deserve.

INIBAP is primarily a service organization and should practice a philosophy of service excellence. Although services rendered are monitored and reported in some areas, such as in germplasm collection and exchange and information services, the focus is more on the number of units of service rendered than on quality of service. Clearer understanding of INIBAP clients' needs and establishment of standards for quality of service will enable INIBAP to practice its service philosophy more effectively.

Ad hoc and reactive decision-making was observed in many areas, such as hiring practices (to overcome some procedural hurdles) and resource allocations for specific programs. Although some of these decisions required quick action, steps to prevent recurrence (e.g. developing policies to address these problems) were not adopted and *ad hoc* decision-making was continued. A shared belief of accepting this style of decision-making can, over time, lead to an atmosphere of complacency and increased risks. An alternative set of beliefs, such as doing it right the first time or learning from one's mistakes, can improve INIBAP's effectiveness and efficiency.

Although a statement prepared by INIBAP management in relation to the EMPR Terms of Reference correctly stressed the fact that INIBAP was a small, new and evolving organization, the practice of using a series of memos (more common in large, bureaucratic organizations) to attempt to resolve interpersonal problems or differences of opinion seemed a contradiction. Continuation of this practice could lead to a shared belief that bureaucracy is the norm within INIBAP.

4.4.4 Conclusion

INIBAP is conscious about the importance of its values in some areas. However, practiced values are different from espoused values in many areas. Given that INIBAP is a network organization that fosters inter-institutional collaboration at a global level, it must recognize the importance of being perceived as a value-driven organization with respect to principles that count most for such an organization. The Board of Trustees must periodically monitor and ensure that INIBAP's values-in-practice are consistent with its mandate.

4.5 Planning and Review Practices

4.5.1 INIBAP's Current Planning and Review Processes

INIBAP's first strategic document was a paper authored by Dr. Barry Nestel dated May 1984. Based on a discussion of Dr. Nestel's proposal at a meeting sponsored by IDRC and FAO, a report was prepared by Dr. G.J. Persley in June 1984, to describe the outcome of the meeting and its implications for further support by ACIAR for research on bananas. This was followed by a comprehensive strategic plan document entitled **Looking Ahead: A Strategy of Choice** and an updated **Strategy Paper**.

Looking Ahead: A Strategy of Choice (hereafter referred to as the strategic plan), recognized that due to financial limitations and INIBAP's complex environment, it should focus on the two thematic activities (germplasm improvement and pathology) most likely to benefit the target audience, namely, artisanal producers. The strategic plan document is visionary in nature and outlined specific steps needed to implement the plan.

Although the content of the strategic plan is commendable, the process by which it was developed had some limitations. It was solely the vision of INIBAP's founders, and it appears that a collaborative and participative process with a wider group of stakeholders was not used. An alternative approach, of involving INIBAP's stakeholders more directly in the formulation of INIBAP's strategy, could have led to a higher level of involvement and commitment by the network's formal members in its implementation.

INIBAP's program documents, such as **MGES-CGIS-IMTP**, are all based on the strategic plan. The operating budgets, in turn, were designed to dovetail into INIBAP's programs. As the following items suggest, these intended linkages have not materialized:

- It is difficult to directly identify the linkages between
  - the target audience, their needs and the strategic plan,
  - the strategic plan and the reasons for selecting specific thematic activities, and
  - specific thematic activities and annual budget allocations.

- Although the details of the strategic plan and programs were presented in the program documents, the panel did not come across a fund development plan to implement the programs.

- Goals for programs and budgets were not stated in measurable terms or in relation to the benefits for the target audience.

INIBAP's program structure appears to be the weakest element in the chain. In its earlier days, INIBAP could have managed with an informal process to link strategic plan, programs and budget. Given its current size and its global network, it is necessary to improve the planning and programming process.

Budget reviews are stifled by lack of measurable outputs. Budget reviews are therefore based either on a listing of activities completed or subjective judgment. This has resulted in a sub-optimal attention to quality, and lower staff morale. Each year, the managers have to cope with the uncertainties around the availability of funds. Given the ambiguity surrounding the availability of funds, the Board should consider examining whether the planned and budgeted activities are realistic. Components of the budget seem to reflect poor linkages with programs (e.g. one Regional Coordinator had pointed out during the 1991 annual meeting that, in his case, 50% of his travel money went toward planned trips to INIBAP headquarters.)

Quarterly reports from core managers is the major vehicle used by INIBAP's management to discuss performance against goals. These reports focus on activities, not goals or milestones. Further, intensive review discussions have been through one-on-one meetings with the Director, so that opportunities to learn across regions, and peer reviews to learn from past experiences have not been utilized. Discussions with Regional Coordinators are held during the week of the annual Board of Trustees Meeting, a busy and difficult time in which to conduct performance reviews of the Regional Coordinators.

Other reports used for planning and budget reviews are Monthly Technical and Financial Reports from Regional Coordinators, Staff Annual Report, and Executive Summaries and Support Documents for the Board's Program Committee. Since it is difficult to link these different reports, the bulk of the review efforts are directed toward an examination of activities undertaken, not progress against milestones and goals.

The Board of Trustees has to cope with an overload of information and a full agenda during their meetings, so that it has been able to play only a limited role in monitoring and reviewing programs, budgets and performance against budgets. The Board has recognized the need for simplifying INIBAP's financial information and, in its May 1992, meeting was planning to use illustrative charts to display financial performance trends. The Panel endorses the Board's decision to more closely monitor key financial indicators.

4.5.2 INIBAP's Planning/Implementation Cycle

A draft version of **Planning/Implementation Cycle (PIC) at INIBAP** is presented in INIBAP's Strategy Paper reproduced here as Figure 4-1. According to this schematic diagram, INIBAP attempts to involve its key stakeholders during the planning part of the cycle through regional workshops, regular consultations with NARS, expert workshops and periodic consultations with experts. Based on these inputs a work plan is submitted to the INIBAP Board for approval.

After Board approval, the implementation phase begins. During this phase INIBAP's budget is finalized and allocations for (a) contract research by affiliated laboratories and institutes, (b) INFO/DOC System, (c) core staff, and (d) advisory executive role for NARS, are made.

Although the PIC, as described in the plan, clearly demonstrates INIBAP's desire to encourage a participatory and collaborative planning and implementation process, it has the following flaws that must be remedied:

- The participatory planning process may unintentionally create some expectations among the participants for which resources may not be available.

- The Board gets involved in planning, but not in the actual resource allocation process. Although the Chairman of the Board is kept informed about major resource allocation decisions, we are not aware of any policies established by the Board to guide trade-off decisions among alternative programs.

- The budget resources drive the plan, not vice versa. This is likely to lead to a reactive and budget-constrained approach.

4.5.3 Assessment

The following suggestions may help overcome these problems.

- The Board has already decided to prepare a new strategic plan. The Panel endorses the Board decision and urges the Board to have the proposed strategic plan prepared in collaboration with network members, including donors. The strategic plan must identify specific programs to be undertaken during the next eight to ten years, resource requirements and specific, measurable milestones for each program. During this meeting, it may be desirable to form an advisory committee with representatives from each INIBAP stakeholder group.

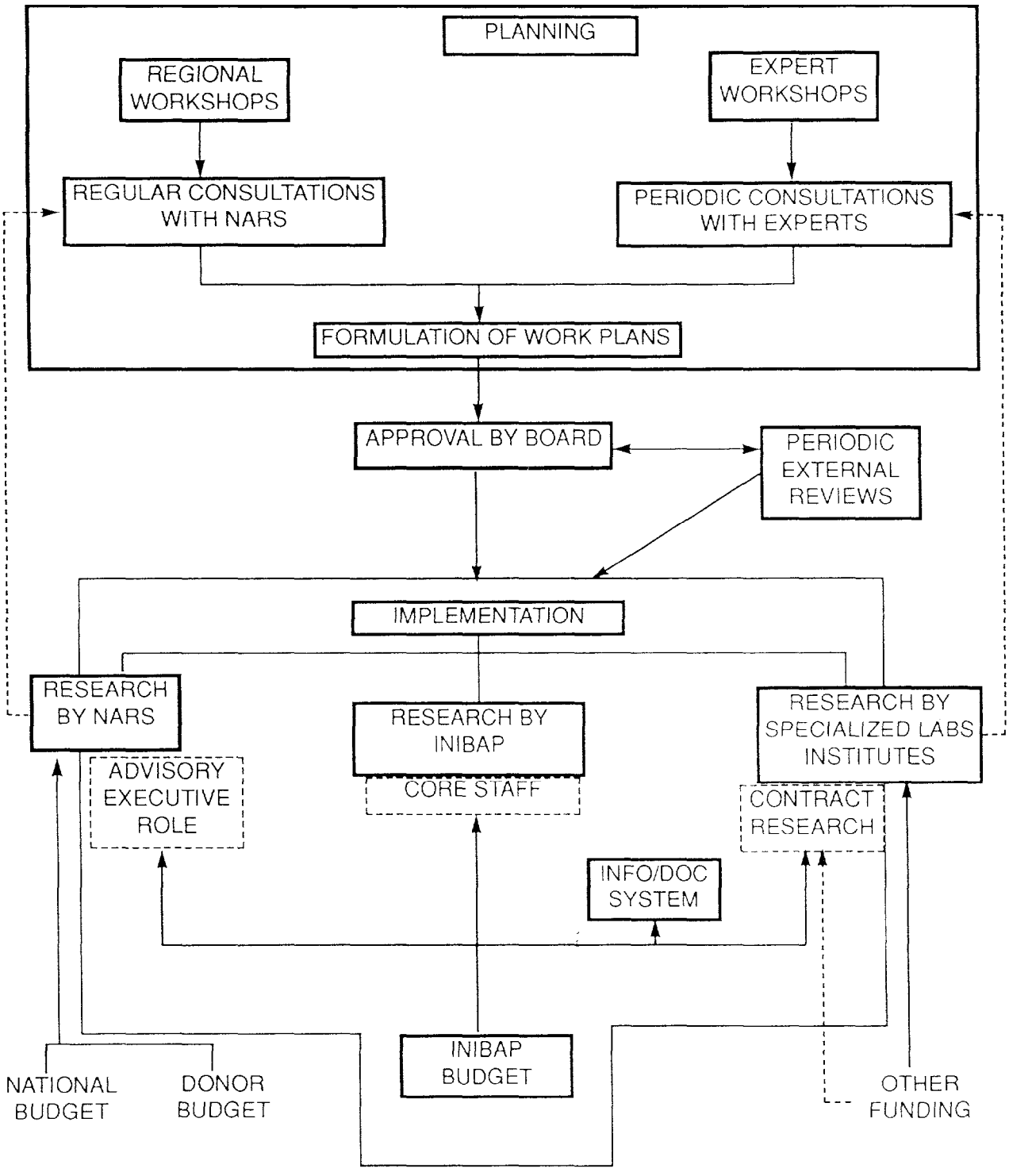
- Next, INIBAP should prepare a five-year program plan (referred to in the CGIAR as a Medium Term Plan) that identifies each program's annual milestones and financial requirements for the next five years. Core programs should preferably be funded through unrestricted funds.

- Current and potential donors of INIBAP should be constantly kept abreast of planning and programming efforts in order to increase their appreciation of INIBAP's funding needs. This could facilitate a more active fund-raising effort.

These suggestions are designed to give INIBAP management more opportunities for developing programs with a medium- to long-term perspective, and to avoid the painful annual process of wondering whether sufficient funds will be available for the following year. The budgetary process should be used annually to fine tune the next year's plan; resource allocations and detailed work plans with specific, measurable program outputs should be finalized in consultation with key stakeholders.

FIGURE 4-1

THE PLANNING/IMPLEMENTATION CYCLE AT INIBAP



By improving its planning and review processes, INIBAP will be in a better position to learn from its performance against milestones and outputs and, over a period of time, increase its effectiveness and efficiency.

4.6 Organizational Structure

4.6.1 INIBAP's Organizational Structure

INIBAP's organizational structure is displayed in Figure 4-2. Given that INIBAP is a small institution, its organizational structure reflects the need for interdependent, collegial and non-hierarchical relationships among INIBAP staff.

4.6.2 Desired versus actual fit among strategy, structure and leadership style

INIBAP's strategy calls for a collaborative and participative relationship with network members, as well as among INIBAP staff. Given his passion for *Musa* and his devotion to INIBAP, the Director chose a leadership style that enabled him to be personally involved in all major activities. Resource constraints impose the need for a simple and lean organization. INIBAP's organizational structure reflects its attempt to achieve a reconciliation among these conflicting demands. In the process of attempting to meet diverse needs, the organizational structure has created the following imbalances:

- Regional Coordinators have to wear many hats - ambassadors to affiliated organizations, facilitators of regional research, conduits for information and technology transfer from INIBAP to regional clients, experts in many technologies, regional fund-raisers and administrators of the regional headquarters of INIBAP. It is therefore not surprising that they report an overload.

- Unclear nature of the link between the headquarters professionals and regional coordinators (except through the Director).

- Unintended decrease in quality standards to accommodate the workload and resource constraints.

- Ambiguities in roles and reporting relationships (e.g. between headquarters and regional staff) that lead to experiencing frustration and job-related pressure.

- Mismatch between responsibility, authority and resource availability.

4.6.3 Assessment

In order to alleviate these imbalances, the Board needs to address INIBAP's structural concerns. In the Panel's view, any structural change should follow the completion of a strategic plan. Clarifying the mission, role and strategy of the organization would help INIBAP define its staffing needs and explore structural options which could combine headquarters and regional staff into a cohesive team working toward common goals.

4.7 Management of Human Resources

4.7.1 INIBAP's Human Resources

The organization chart presented in the previous section (Figure 4.2) identifies the human resources of INIBAP, which constitute its most valuable asset. It is important to nurture, develop and motivate the staff, so that they in turn adopt a similar approach during their interactions with their client systems.

Work overload, ambiguous roles and reporting relationships, or unclear goals were reported by a majority of staff interviewed by the panel. Although it is difficult to eliminate these problems completely, the INIBAP Board should periodically review the internal environment and ensure that the staff have the opportunity to work in an environment of trust, mutual respect and genuine concern for staff welfare. By creating such an environment in which each staff member feels that he or she is valued, INIBAP will be able to increase both, the quantity and quality of service.

Most staff interviewed by the panel stated that they are motivated by the opportunities for personal and professional growth offered by INIBAP's mandate. Some reported that their suggestions and ideas were not fully implemented. In summary, it appears that INIBAP is currently underutilizing its human resources and, as an organization facing resource constraints, it cannot afford to continue neglecting these genuine needs of its staff.

4.7.2 Modes of Employment

A striking feature of the INIBAP organization is that only one person, Dr. de Langhe, is directly employed by INIBAP. The modes of employment of other staff were as follows at the time of the review:

- One IDRC staff member through CIRAD,
- One CIRAD staff member,
- Seven staff members of Thornton International (a private French firm) through IDRC,
- Six IDRC consultants through CIRAD,
- One staff member through a Regional Coordinator, and
- One staff member through CATIE.

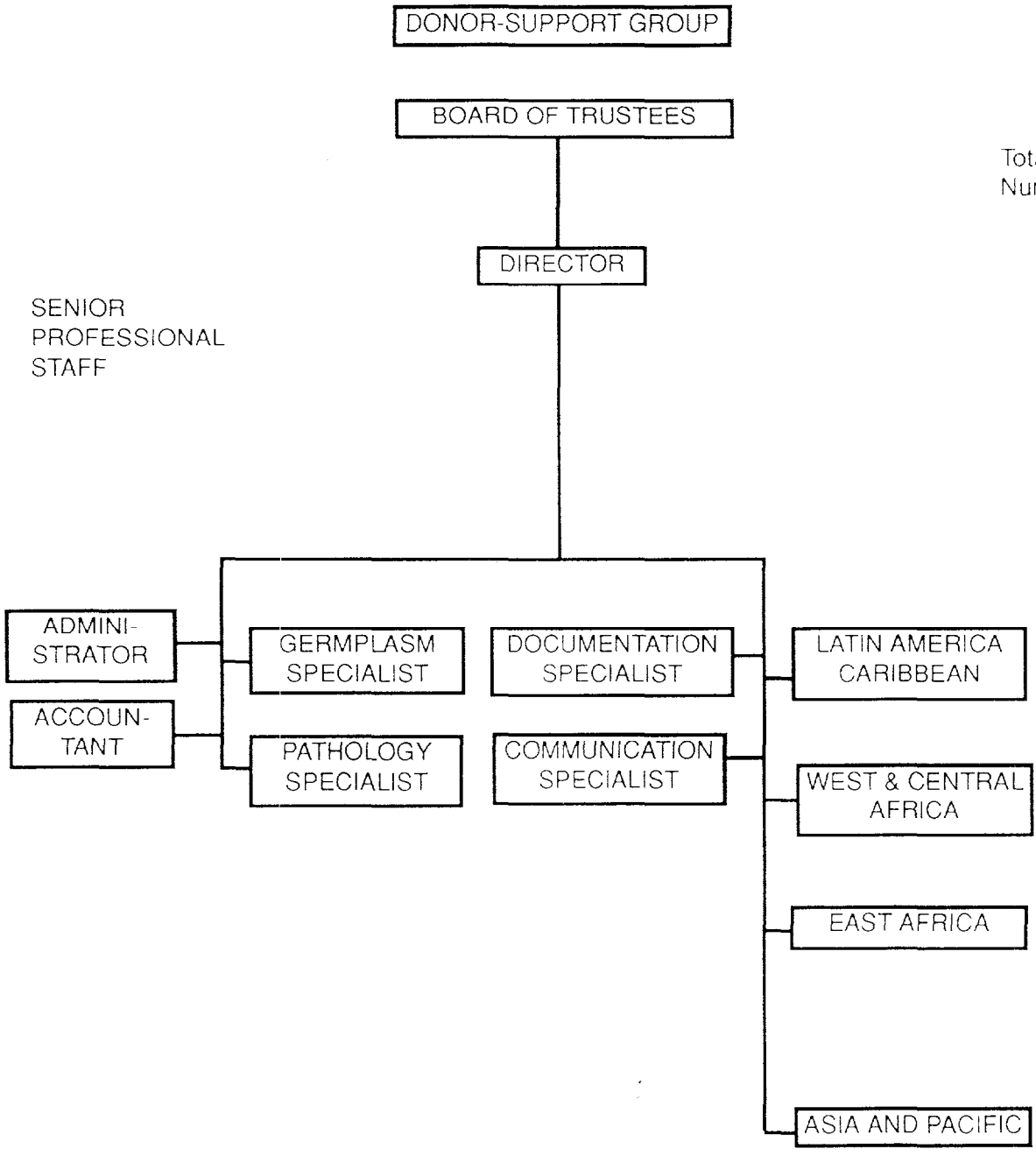
The practice of using a network of employers creates a loss of common identity and uncertainties about career paths. It is impossible to have uniform personnel policies, and differentials such as vacations or other benefits can lead to perceptions of unfair treatment. This problem would not arise if INIBAP had received its *Accord de Siège* from the French Government. In the Panel's view, there is an urgent need to find a solution to this problem.

4.7.3 Recruitment, Orientation and Development of Staff

Although INIBAP has a **Personnel Policies and Procedures Manual**, only a handful of the senior staff were hired through a customary, international recruitment process. Usually the first qualified candidate identified and available was hired. In some cases, where the staff member is paid by some other organization, INIBAP did not have an alternative. The quality of new people hired could have been enhanced by a more rigorous recruitment practice, which in turn would have reinforced a culture of quality consciousness.

FIGURE 4-2

INIBAP'S ORGANIZATION STRUCTURE



GROUP	Administration	Thematic	Information	Regional Coordinator	Total Number
SENIOR PROFESSIONAL STAFF					1
					10
JUNIOR PROFESSIONAL STAFF		2	2	4	8
SECRETARIAL STAFF	2	2	2	4	10
GROUP	Administration	Thematic	Information	Regional Coordinator	29

A network organization must adopt a formal process to expose new staff to INIBAP's basic values, attitudes and beliefs. INIBAP does not have a formal orientation process for new staff.

INIBAP staff belong to a variety of professions. INIBAP must recognize that these professionals will have dual loyalties - to INIBAP and to their respective professions. INIBAP must provide its staff with opportunities for personal and professional development. This need is partially met through attendance at seminars and professional workshops. Building greater overlap between staff and INIBAP's goals will enhance staff commitment to INIBAP.

4.7.4 Teambuilding

The panel did not find INIBAP staff to be functioning well as a team. Rather they worked as individuals or department members who were brought together occasionally through interdependent tasks. INIBAP cannot build an effective external network if it is not effectively networked internally. Building a cohesive team with shared goals should be a high priority area for INIBAP. By providing more opportunities to enable staff to understand each others' goals, priorities and work styles, INIBAP can increase the *esprit de corps* among staff.

4.7.5 Implementing Personnel Policies

During the final phase of the review the Panel was informed that, just prior to the Panel's arrival, a senior staff member, under contract through June 1992, was informed by the Director that he need not report to the office during the remainder of his contract. Although there may not have been a violation of law or procedures, the manner in which the whole matter was handled was, in the Panel's view, improper. The Panel is of the opinion that, in cases of conflict between management and staff, the staff member concerned should be treated with full dignity and respect.

Some staff felt that their performance planning and review process did not include a two-way communication process and requests for additional information on salary increase decisions were ignored. In these cases, the Panel felt, there may have been violations of INIBAP's personnel policies. The Panel suggests that the Board take steps to ensure that personnel practices are fair, equitable and in compliance with INIBAP policies.

4.7.6 Staff Compensation

In any organization, staff compensation decisions are complex. To ensure equity in compensation decisions, INIBAP should compare its compensation levels for specific levels of staff with those in organizations comparable to INIBAP. The Panel is aware of the unusually heterogenous nature of employment arrangements made for INIBAP's staff. However, when it comes to annual changes in the levels of compensation of individual staff, performance and merit criteria should be balanced with budgetary constraints and an equitable solution must be found.

Based on an analysis of changes in the salary and benefits of senior staff during the period January 1, 1991 to January 1, 1992, the Panel concluded that the percentage increases in salary were spread over a wide range (3.6% to 15.2% for salary increases effective January 1, 1991; 0% to 15.8% for salary increases effective January 1, 1992). Benefits of senior staff as a percentage of basic salary also showed wide variation (50% to 133% as a percentage of salary during 1991-92).

The Panel recommends that the Board review recent salary and benefits decisions to verify if they are consistent with INIBAP policies and procedures, and the guidelines issued by the Board to management.

4.7.7 Assessment

INIBAP has not demonstrated its sensitivity to the need for effective management of its human resources.

The Panel recommends that the INIBAP Board should explore both formal and informal ways of monitoring INIBAP's human resource management practices, so that its staff work as a team, are motivated, and feel that they are valued by the organization.

4.8 Financial Management and Administration

4.8.1 INIBAP: Funding & Expenditures, 1986-92

INIBAP's income comes from two primary sources - unrestricted grants and restricted grants. Unrestricted grants are funds received by INIBAP without conditions imposed which can be used as recommended by the Director in the Annual Budget approved by the Board of Trustees. These funds include both direct contributions by donors, as well as transfers to INIBAP from other organizations. Restricted grants represent funds received by INIBAP for a specific activity which has been mutually agreed upon by INIBAP and the donors. Figure 4-3 presents INIBAP's funding and expenditures during 1986-92.

The substantial deficit of $433,000 in 1991 and the budgeted deficit of $31,000 in 1992 (Figure 4-3) are in contrast with the excess of revenue over expenses during the period 1986-1990. Although INIBAP finances are not facing an emergency (the Finance Officer is now projecting a surplus in the amount of $115,000 for 1992), the Panel learned that the magnitude of the 1991 deficit was a surprise to the management. Better forecasting and monitoring of actuals against budgets are essential to avoid additional surprises in the future.

INIBAP's expenditures are grouped into three areas: regional activities, thematic activities and head office. Regional and thematic expenditures are more programmatic in nature while head office expenditures are those related to management, administration and governance. During the 1986-91 period, a positive trend emerged in INIBAP's expenditure pattern as the institute shifted spending from head office to its major activities, regional and thematic. By 1991, expenditures in the regional networks were 31% of the total spending, a 50% increase over 1990. Although the head office expenses have been shrinking as a percentage of total expenses (56% in 1986 to 32% in 1991), the absolute value of the increases during 1989-91 is substantial, from $445,000 to $765,000, which represents a 72% increase. The increase reflects recruitment of additional staff (Financial Officer in 1990 and a Secretary in 1991), and additional Board costs in 1991 in connection with INIBAP's admission to the CGIAR. Increases in head office costs must be monitored closely and kept under control.

The latest budget estimates for 1992 (the last column in Figure 4-3) show a dramatic decline in projected expenditure in regional activities and some decline in information and documentation. The latest figures are a cause for concern because they reflect a slowdown in decentralization to regional networks, if not a further centralization to headquarters activities. The Board should monitor these trends carefully.

Grant numbers in Figure 4-3 are estimates, not firm commitments from donors. According to the Financial Officer, restricted funds are used only for essential (now called "core") programs.

Financial management is a challenging activity in most not-for-profit organizations, since plans for expenses must be made well before actual receipt of funds from donors. Each year, INIBAP managers go through a process of patiently waiting for funds to be received before they start incurring expenses. One INIBAP manager referred to this frustrating process as the "Annual Russian Roulette".

INIBAP's total funding (unrestricted and restricted) has increased from about $0.3 million in 1986 to $1.8 million in 1991. The donor base has expanded from five donors in 1986 to 11 in 1991. INIBAP must attempt to continue expanding and strengthening its donor base and the total value of the grants.

Based on their audit, INIBAP's external auditors recommended a cash level equal to one year's equivalent of operating expenses (a recommended practice in France), as opposed to the current level of about two months. The Panel felt that INIBAP should, in conformity with CGIAR Guidelines, increase the working capital to at least 90 days' equivalent. The Board should monitor the cash balance and changes in donor grants from original projections.

4.8.2 Responsibility for Program and Financial Management

According to INIBAP's Finance and Accounting Manual, INIBAP's budget system prohibits any activity of a material and/or continuing nature to be undertaken until provisions for staff time and funding have been made in the Budget or in its additions/supplements.

In January of each year, the Director requests staff members who have responsibility for the operation of a unit or activity to submit their work plans and requirements by March 15. After consolidation of the requests, the Director discusses the budget with staff members and the revised budget is submitted to the Board's Executive Committee at its mid-year meeting. After incorporating the Executive Committee's suggestions, a revised work plan and budget is submitted to the Board of Trustees at the Annual Meeting. After approval by the Board, the final work plan and budget is presented to TAC in April (for discussion in June) and through TAC to the CGIAR in October. Thus, the budgetary process at INIBAP, as outlined in the Finance and Accounting Manual, is a bottom-up process which is based on inputs from staff, and the Board has the oversight responsibility for the budgetary process. The Panel found that interim budget reallocation decisions, as reflected in the "Latest Estimate" of the budget, are made in the light of changes in anticipated funds. It is unclear whether these changes are made in accordance with a prescribed process and in consultation with the Director and the Board. The Panel suggests that the Board should review the process by which interim budget reallocations are made during the year. The Panel further suggests that contingency plans should be developed to permit a prompt response to unforeseen events, such as a decrease in funding to be received from a donor. The Panel endorses the Board decision to use simple, clear charts containing financial information during its May 1992 Annual Meeting.

Figure 4-3
INIBAP: Funding and Expenditures, 1986-92

($000)

	1986	1987	1988	1989	1990	1991	1992 Bud CG	1992 Lat Est
Revenue:								
Unrestricted grants	183	548	896	852	1.056	1.024	1.495	1.793
Restricted grants	112	181	278	360	635	993	1.962	1.287
Other income	11	51	91	115	121	151	153	154
Total Revenue	**306**	**780**	**1,265**	**1,327**	**1,812**	**2,168**	**3,610**	**3,234**
Expenditures:								
Regional Activities								
East Africa	41	51	18	67	98	148	488	212
West Africa	0	10	33	82	75	113	223	166
LAC	56	70	74	121	123	346	469	335
Asia/Pacific	50	0	30	9	31	137	460	270
Sub-total	147	131	155	279	327	744	1.640	983
Thematic Activities:								
Info. Documentation	0	28	71	96	214	256	364	293
Info. Dissemination		0	13	5	41	51	108	98
Breeding & Germplasm	0	19	76	279	446	489	644	566
Pathology	0	0	51	42	24	21	100	257
Collaboration/Other	0	61	0	0	36	18	90	97
Sub-total	0	121	203	458	771	892	1,296	1,352
Head Office	187	327	417	445	573	965	705	784
Total Expenditures	**334**	**579**	**775**	**1,182**	**1,671**	**2,601**	**3,641**	**3,119**
Excess (deficit) of revenue over expenses	**-28**	**201**	**490**	**145**	**141**	**-433**	**-31**	**115**
Opening fund balance	**171**	**143**	**344**	**834**	**979**	**1,120**	**687**	**687**
Closing fund balance	**143**	**344**	**834**	**979**	**1,120**	**687**	**656**	**1,802**

Source: Financial Officer, INIBAP, May 1, 1992.

4.8.3 INIBAP's Financial Risks

A growing organization like INIBAP faces some predictable financial risks. Three types of financial risks are discussed in this section.

a) **Internal Controls**: INIBAP uses two types of internal controls to ensure that its assets are protected. First, it uses a set of procedures that are designed to prevent fraudulent activities. These procedures include an approved set of authorizations for each source document used for making accounting entries. Larger organizations use additional procedures, such as an internal audit department, and checks and balances within the accounting function, such as accounting entries being checked by a person other than the person who made them. These additional procedures are currently impractical for INIBAP, but may become relevant when it is a larger organization.

INIBAP's first external audit was initiated by the Director and the Financial Officer. This is rather unusual because, typically, actions initiated by the Director or Finance Officer should also be reviewed by the audit. Although our interviews with the external auditors did not identify any data to suggest that there had been a loss of internal controls, we suggest that future audits be initiated by the Board and the terms of reference of the external audit be specified by the Board or its recommended audit subcommittee (Section 4.2).

The chartered accountants who audited INIBAP's 1991 books of accounts advised the Panel that they planned to recommend an audit of internal controls as well as an audit of Thornton International during their next annual audit and that it would take two professionals approximately one week to do both. The Panel recommended earlier that the Board should form an Administration & Finance Subcommittee.

The Panel recommends that the Board commission on external audit of INIBAP's financial controls and of Thornton International, with immediate effect (i.e. without waiting until the next annual audit).

b) **Financing Deficits:** INIBAP's expenses were larger than its revenues in 1991, and 1992 was also originally budgeted to be a deficit year. Such deficits will decrease the pool of funds derived from past surpluses. INIBAP should obtain an audited overhead rate so that it can try to persuade the donors of restricted funds to recover fully the fair share of overhead costs.

c) **Cash Management:** Unpredictable cash inflows from donors can create the risk of running out of cash. To minimize this risk, mechanisms should be established to monitor both cash inflows and outflows and to negotiate with donors to adhere to a predetermined schedule for transfer of funds to INIBAP.

4.8.4 Conflict of Interest

As a network organization, INIBAP has a variety of stakeholders and it faces and will continue to face a variety of conflict-of-interest situations. INIBAP currently lacks a process to proactively manage conflicts of interest. The conflict-of-interest procedure described in the Financial and Accounting Manual is not adequate to deal with many conflict-of-interest situations. The Panel suggests that the Board should initiate the design of a process to permit an open discussion of conflict-of-interest situations, so that they can be rectified.

4.8.5 Assessment

It is clear to the Panel that the INIBAP Board needs to take immediate steps to upgrade INIBAP's financial management system. This can be done by improving the accuracy of forecasting revenues and expenditures, and by comparing budget revenue forecasts with actuals each month.

The Panel has recommended that the INIBAP Board establish an Administration and Finance Committee and an Audit Subcommittee and that this Subcommittee should initiate an audit of INIBAP's internal controls and Thornton International's books of accounts. The audit may be an appropriate time to develop an audited overhead rate to be used for computing costs of restricted projects.

The Panel would like to stress the importance of cash management for INIBAP. In the Panel's view, INIBAP should start monitoring its cash position on a weekly basis and maintain its working capital level at 90 days' equivalent or higher.

Finally, the Panel has suggested that the Board should develop a policy to better address different types of conflict-of-interest situations.

4.9 Institutional Relationships

As an institution organized as an international Network (rather than a research center), INIBAP assumes responsibility for maintaining good institutional relationships. In the following section, the Panel provides an assessment of critical partnerships in the INIBAP Network.

4.9.1 Host Country Relationships

INIBAP maintains good relationships with France, the host country. The Panel was able to confirm this through visits with the Director General of the Center de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), the Ministry of Foreign Affairs (both headquartered in Paris) and with representatives of the Institut de Recherche sur les Fruits et Agrumes (IRFA) in Montpellier (France). Although the Ministry of Foreign Affairs is the official host for INIBAP and the French agency providing core funding (the third largest INIBAP donor) to the Network, CIRAD also functions as a scientific partner with strong mutual interests, providing valuable supporting activities.

INIBAP operates one of its Virus Indexing Centers through CIRAD, and from them receives services (e.g., printing of publications) and financial assistance. Effective collaborative projects have evolved between scientists at INIBAP and IRFA (a division of CIRAD).

The Panel is concerned that, without a formalized Headquarters' Agreement, INIBAP's legal status in France will continue to be fundamentally flawed, leading to uncertainty and anxieties (see Section 4.1). The Panel was convinced, however, of strong support for executing the Headquarters' Agreement within both the Ministry of Foreign Affairs and CIRAD. The causes for the delay appear to reside elsewhere.

In the Panel's view, INIBAP should give more attention to targeting strategic partnerships in keeping with the Network's priorities. A thorough assessment of existing and future partnerships should become part of an institution-wide strategic planning process for INIBAP.

The role of the Regional Coordinators in promoting institutional relationships should be strengthened and should focus on national *Musa* programs consistent with the mission of INIBAP. To do this, regionally focused strategic planning, consistent with an institution-wide plan, should be used by the Regional Coordinators in targeting those institutions most suitable for meeting the objectives of research facilitation, germplasm and information exchange, and training.

The Panel suggests continuation of the dialogue with IITA on the existing MOU and its planned collaborative projects to ensure that all existing agreements are fully subscribed to, and that each institution be served by the best interests of a strong partnership.

A system of accountability for institutional relationships should become the responsibility of the INIBAP Board of Trustees. A system of monitoring institutional relationships, agreements and achievements could help the institution focus its activities, direct its resources and better meet its objectives. The basic elements of this system would be an assessment of the needs and benefits to be derived from individual agreements, and how they would contribute to fulfillment of institutional objectives.

4.9.2 Relations with IITA

IITA and INIBAP cooperate through a Memorandum of Understanding (MOU), executed in July 1991, that sets out areas of collaboration for research on plantain and banana in Sub-Saharan Africa.

Topics agreed to in the MOU set out individual institutional responsibilities (research, training, support services for IITA; coordination, seeking funding, germplasm introduction, information collection for INIBAP). Collaboration and cooperation items include agreements on consultation, germplasm collaboration (testing, evaluating, improving), pathology, training and information dissemination.

The development of the INIBAP/IITA MOU was not without its difficulties. Primary among these was the choice of terminology used to describe IITA's implementation of the IMPT trials in Africa under contractual arrangement with INIBAP. Early draft agreements, which stated that IITA would be the executing agency, were taken under reconsideration by INIBAP. The difference was settled with the participants described as equal partners in Sub-Saharan IMTP trials. However, it was alleged to the Panel that this point of agreement remains somewhat contentious. The Panel feels that any remaining problems will require good faith by the two institutions to resolve differences in expectations.

In addition, until recently, IITA hosted the West and Central African Regional Coordinator at its station in Onne (Nigeria), and provided general support (i.e., housing, vehicle, office space, clerical systems, etc.) of considerable value to INIBAP. Unfortunately, the Regional Coordinator found that communications to and from the Onne station were too difficult, and thus INIBAP authorized his relocation to Douala (Cameroon). The Panel sees this as an unfortunate decision inasmuch as it will quite likely diminish the once strong relationships between the two institutions.

IITA also serves as a site for the IMTP provided at no cost to INIBAP and managed by Onne station scientists (see Section 3.2).

The Panel is pleased to report very strong proactive support for the INIBAP partnership from the IITA Director General. This attitude has encouraged institutional cooperation with INIBAP at the scientist level. The Panel sees this as exemplary and takes special note of these positive efforts.

4.9.3 Relationships with IPGRI

The International Plant Genetic Resources Institute (formerly the International Board for Plant Genetic Resources), headquartered in Rome (Italy), reports "good" relationships with INIBAP. The EMPR Panel Chair met with the management and selected scientific staff of IPGRI in early April 1992, to verify institutional relationships and explore a series of questions on joint programs. Positive comments on the collaboration with INIBAP were received from IPGRI and positive reports were given on collaborative projects in *Musa* germplasm collection, joint publications and co-sponsorship of conferences. In most areas, the prospects for continued good relationships seem positive.

One area where concern was expressed in the management of INIBAP's germplasm program. The importance of *Musa* germplasm to the two institutions is mutual, and concern was expressed for attitudinal differences that might, in the future, create some difficulties for collaboration. This concern was also expressed to Panel members by IITA staff, which suggests this aspect of INIBAP's interinstitutional relationships should be monitored in the future to provide accountability and assurance.

4.9.4 Relationships with other international or regional institutions

With regard to other IARCs, INIBAP has had little opportunity to interact. This may change if INIBAP considers possible reconfiguration of its regional networks in ways that might better affiliate programs with established international centers.

FAO has direct relationships with INIBAP and recently the two institutions negotiated a Memorandum of Understanding on research relating to the identification of resistance to black Sigatoka. The nature of the MOU is to resolve a potential programmatic overlap in new methods to select for resistance to the disease. Of concern to FAO was INIBAP's request for funding to UNDP for the IMTP trials, and FAO's request to the Common Fund for very similar research. This common approach, it was felt, could give the appearance of duplicated research funded by sister UN agencies. In the MOU, INIBAP agreed not to engage in research that would use toxin preparations of the pathogen in a seedling screening protocol.

The Panel feels that the concern for overlap is somewhat spurious in that the Common Fund's research interests are primarily for export dessert-type bananas, whereas INIBAP is interested in cooking bananas and plantains. The potential effect of the agreement on research program development may be minimal but the Panel wonders if sufficient care and consideration is being given to the execution of MOUs. In this case, it would seem that a letter of explanation to the funding agencies could have been sufficient.

Relationships with the Fundación Hondureña de Investigación Agrícola (FHIA) in La Lima (Honduras) have recently become somewhat strained. This *Musa* breeding program is the primary source of improved hybrids for INIBAP's IMTP. In a letter dated March 30, 1992, FHIA's Director General wrote to INIBAP's Director, expressing his disappointment that INIBAP had not included funds in the UNDP project proposal to support FHIA's continued breeding of new *Musa* hybrids. The Panel was subsequently informed that UNDP determined that FHIA could not be included in the proposal by agency regulations, but would be eligible to apply through the regional level.

FHIA breeding program is currently funded from multiple sources which are considered by FHIA to be less than reliable. Continuity of FHIA's breeding effort is of crucial importance for the success of INIBAP's IMTP. *Because of this,*

The Panel recommends that the donor community strengthen funding for the Fundación Hondureña de Investigación Agrícola (FHIA) *Musa* breeding program.

Regarding relationships with ICIPE, INIBAP has approached this international center proposing joint efforts on identifying resistance to banana weevil. Little progress on these discussions was reported to the Panel.

INIBAP's relationships with regional centers are numerous and include institutions which host the Regional Coordinators. For instance, CATIE in Turrialba (Costa Rica) hosts the Latin American and Caribbean Regional Coordinator and the Panel judges the relationship to be quite good. IRAZ hosts the East African Regional Coordinator and the situation appears to be only functional, at best. A combination of constrained funding for the Regional Coordinator and the host institution has resulted in an extremely difficult situation for the regional Network, and constant tension in the Network's relationship with the host institution. For instance, the Regional Coordinator has no transportation other than that provided on a case-by-case request from IRAZ. Other IRAZ priorities often get in the way and the Regional Coordinator can get stranded waiting for transportation. This example is symptomatic and the situation is contributing to considerable strain, and significantly reducing the Regional Coordinator's effectiveness.

The Western and Central African Regional Coordinator recently moved to Douala (Cameroon) to be hosted by the Regional Center for Banana and Plantain (CRBP). This relationship is particularly complicated as the move was initiated without clear agreement on host support or responsibilities. The Regional Coordinator is located 80 kilometers from the CRBP headquarters and transportation seems to be a major problem inasmuch as INIBAP does not supply a vehicle to Regional Coordinators. The cost of purchasing one represents a considerable personal expense for the Regional Coordinator. The Panel recommends that INIBAP's administration move quickly to resolve the differences in expectations with its African host institutions, and then develop policies on how such agreements should be drawn up and executed in the future.

4.9.5 Relationships with national institutions

INIBAP has worked actively to establish strong linkages with national institutions which have a common interest in *Musa* research. A primary interface for this partnership-building effort has been through the Regional Coordinators. Here, personal contacts and work on conferences and workshops designed to establish and maintain institutional relationships and foster cooperation have been fairly successful.

A further INIBAP activity designed to build relationships with national institutions is the establishment of the four Regional Advisory Committees (RACs) which serve important mechanisms for communicating needs and priorities. The effectiveness of these RACs varies by region and the frequency of meetings is dictated by the availability of funds.

As an input to this review, the CGIAR Secretariat conducted a mail questionnaire survey of 51 institutions which represent INIBAP's client and collaborator population. The list was drawn up jointly with INIBAP management and included all major participants from developing countries in the four regional networks. The survey covered the respondents' views on INIBAP's goals,

priorities and global programs as well as the functions, activities and operations of the specific regional networks of which the respondent's were members. The survey also included a number of open-ended questions on INIBAP's as well as the regional networks' strengths and weaknesses. By the time this review was completed, 17 responses had been received, 13 from developing-country institutions[4] and four from collaborating regional or international institutions.

The following **direct quotes** from the responses received summarize the views expressed by this sample of institutions. They do not necessarily reflect the views of the Panel or INIBAP.

INIBAP's Strengths:

- On paper a well-established organization which, if properly and adequately funded, could achieve much toward the improvement of banana and plantains.
- Has developed into an international institute of repute...Provides a vehicle for the international community to take advantage of each other's strengths.
- Has a better research base for bananas and plantains than any other research organization of the CGIAR System.
- The network approach to solving problems helps in strengthening local capabilities.
- Sufficient coordinative effort; good control of germplasm material; sufficient reports and proceedings.
- Genetics and plant breeding programs; promotion of scientific know-how; information, workshops and meetings.

INIBAP's Weaknesses:

- Not achieving its aims and ideals.
- The INIBAP Headquarters and the coordinators would have been more effective if they were placed in best research institutes like IRRI or ICARDA.
- INIBAP should have a research institute of its own where basic and strategic research can be conducted.
- Not enough research exchange or contact with network members.
- Research program very biased towards production. Needs to improve on staff quality, diseases and pests research, agronomic trials, post-harvest activities, plant physiology, soils and fertilization, cultural practices.
- Insufficient effort for budget hunting; imbalanced program among regions and headquarters.
- Bureaucracy - thus resulting in slowdown of the implementation of the projects.

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[4] The responding national programs were from: Brazil, Cameroon, Colombia, Gabon, India, Indonesia, Jamaica, Malaysia, Nigeria, Pakistan, Venezuela, Vietnam, Rwanda.

This group of respondents saw INIBAP's germplasm exchange and testing activities, its publications and information services, and the workshops it has conducted as the major contributions of INIBAP to their countries. Areas of improvement suggested by the participants ranged widely, but followed the main lines of the weaknesses of INIBAP mentioned, which are summarized above.

4.9.6 Relations with advanced scientific institutions

Considerable attention has been paid by INIBAP to building strong relationships with advanced scientific institutions. This has been attempted as direct sponsorship of INIBAP programs (such as the Transit Center at KUL, Belgium) and as grants to scientists to undertake particular projects for the Network. As an example, and with Australian funding, INIBAP has organized an international project to clarify the extent of genetic variability in the fungus that causes *Fusarium* wilt (i.e., *Fusarium oxysporum f. cubense*). This INIBAP-sponsored activity is considered to be a prelude to an IMTP-*Fusarium* project that would target the identification of stable forms of resistance to this disease.

INIBAP has also attempted to foster scientific interest in *Musa* problems through international conferences, such as the one held recently (January 1992) in San Jose (Costa Rica) on the applications of biotechnology to *Musa* improvement. By inviting targeted scientists from key institutions to participate in the biotechnology conference, INIBAP hoped to foster the application of this technology to banana and plantain research. Exactly how successful this type of approach will prove to be is not clear to the Panel. Such conferences may offer opportunities for scientist-to-scientist contact that might lead to research collaboration. Although scientific exchange fostered through personal interaction is important, other mechanisms might prove more effective, for example consultations, pilot project grants and direct visitations. The Panel suggests that INIBAP carefully analyze the effectiveness of its use of conferences for promoting collaborative, interinstitutional, scientific interest in *Musa* research.

INIBAP operates its second Virus Indexing Center through QDPI in Queensland (Australia). Although the Panel had no direct opportunity to view this service, second-hand reports, documents and the flow of materials indicate an effective relationship.

4.9.7 Relations with donors and the CGIAR

The Panel notes good relationships between donor institutions and INIBAP. The Network has taken care to foster donor interests, both on the importance of cooking banana and plantain in producing countries and to the exciting possibilities for applying new technologies for the solution of *Musa* production constraints. Donor interest and support for the Network is said to have significantly contributed to the decision to admit INIBAP to the CGIAR system.

INIBAP's relationship with the CGIAR has at times been strained. Membership in the system has brought to INIBAP added demands for coordination and additional costs that are disproportionally reflected in its budget as a small institution. This "CG administrative overhead" should be closely monitored by both the Network and the CGIAR, especially during the early years of membership. Additionally, CGIAR may want to learn from the experiences of other relatively small centers in the system.

4.9.8 Assessment

In the Panel's view, INIBAP should give more attention to targeting strategic partnerships in keeping with the Network's priorities. A thorough assessment of existing and future partnerships should become part of an institution-wide strategic planning process for INIBAP.

The role of the Regional Coordinators in promoting institutional relationships should be strengthened and should focus on national *Musa* programs, consistent with the mission of INIBAP. To do this, regionally focused strategic planning, consistent with an institution-wide plan, should be used by the Regional Coordinators in targeting those institutions most suitable for meeting the objectives of research facilitation, germplasm and information exchange, and training.

The Panel suggests continuation of the dialogue with IITA on the existing MOU and its planned collaborative projects to ensure that all existing agreements are fully subscribed to and that each institution be served by the best interests of a strong partnership.

A system of accountability for institutional relationships should become the responsibility of the INIBAP Board of Trustees. A system of monitoring institutional relationships, agreements and achievements could help the institution focus its activities, direct its resources and better meet its objectives. The basic elements of this system would be an assessment of the needs and benefits to be derived from individual agreements, and how they would contribute to fulfillment of institutional objectives.

4.10 Overall Assessment of INIBAP's Organization and Management

INIBAP is a small international organization with 11 senior staff members and a total staff complement of 29 people. Its annual budget is about US$ 3 million. It is also a relatively new organization (founded 6 years ago) using a new and innovative institutional model for its operations.

New organizations usually experience some problems of growth. When such organizations employ a relatively untried approach to doing their business, their growe-related problems are compounded because of the scarcity of experiences by other organizations they can learn from.

INIBAP has faced (and is still facing) problems of growth which are further complicated by lack of knowledge and experience in solving problems associated with operating in a networking mode. It has a broad mandate and a strategy which introduces some clear priorities and conceptual suggestions for operating in a networking mode. But the priorities and networking concepts of the strategy are not based on extensive empirical evidence or a planned approach to chasing among priorities. They are "best guesses", albeit with considerable face validity.

INIBAP could perhaps have been able to overcome these difficulties if it had a stable institutional environment, funding levels adequate to implement a set of medium term programs intended in the strategy, and a nucleus of first rate team of staff on which to build the institution.

First, INIBAP has never experienced a stable institutional environment; organizationally or financially. The international agreement establishing INIBAP did not go into effect until 1990. More important, INIBAP never had (and still does not have) a headquarters agreement to enable it to operate as an international entity with the full privileges and immunities accorded to such organizations. Financially, the funding uncertainties led to a budgetary environment the staff began to call the "Annual Russian roulette."

Under these circumstances, INIBAP has resorted to various pragmatic ways of employing staff and managing its operations. While such arrangements can usually be tolerable by all concerned for a short, temporary period; if they extend to several years, they become a source of frustration and begin serving as a major barrier to performance.

This is the situation INIBAP now finds itself in. There are some administrative, personnel and financial policies, but the pervasive temporariness and uncertainty of the institution render most of these inapplicable. The leadership style of the Director also contributes significantly to the environment of uncertainty. As a result, there is little teamwork, low morale, and weak integration and orientation of the efforts of individual staff towards institutional goals.

Second, INIBAP seems to have experienced funding **problems** throughout its history. This is in part because the chosen strategy did not consider sufficiently the financial resources that would likely be available to implement it. Thus, programs were started on many fronts, with inadequate funding to do a good job in each. An unexpected funding shortfall led to cutbacks in already underfunded programs. More important, many vital financial decisions with consequences on the strategy and priorities of the institution were being taken by the financial officer, with little or no Board involvement. Thus, the set of priorities, as reflected by expenditure patterns, were driven more by financial considerations ("making ends meet") than the policy directives of the Board. INIBAP's financial information system does not link resurce allocations to goals or milestones, or program expenditures to achievement of programmatic goals.

As a result, goals and priorities are blurred and INIBAP's resources are spread thinly across many programs. And what is implemented within these programs, particularly in the case of the Regional Networks, is not what is intended in the INIBAP strategy. A new look is necessary to bring reality to INIBAP's strategic directions, both with the problems of its clients, as well as the resources that are available or can be marshalled.

Third, like the growth of its program, INIBAP's staffing has followed an opportunistic path. Staff have been added in a piecemeal manner as INIBAP has expanded its program. Hiring of senior staff has not always followed the international competitive selection principles used by other IARCs. Not having full legal status has also influenced INIBAP's hiring decisions.

As a result, INIBAP has an eclectic group of senior staff: some at or near the age or retirement, some with a strong allegiance to other organizations, some with insufficient skills to perform the required tasks, and others with good skills, but little experience in carrying out the tasks expected of them. They all have exhibited strong dedication to the mission of INIBAP, even if they are frustrated with the way INIBAP management does things. This dedication to INIBAP mission is an asset INIBAP should capitalize on.

In the Panel's view, INIBAP needs to examine its staffing patterns carefully as it moves towards the next stage in its evolution. There is much talent within the current INIBAP senior staff on which to build a future organization. There are also areas where staff turnover may be beneficial in the long-run. These questions should be addresed with objectivity and rigor, keeping the interests of the organization in mind.

For these reasons and more, the Panel's overall assessment of INIBAP's organization and management is, unfortunately, not positive. While the problems of growth, lack of experience and absence of role models may account for some of the failings of INIBAP in managing its operations, there is much that could and should have been anticipated by the Board and management to turn INIBAP into a healthy organization.

A major change is now taking place in leadership. Also, the Board seems to be eager to play an active role in guiding INIBAP's transformation. The staff are anxious to have their views heard about the future of the organization. Over time, INIBAP's admission to the CGIAR is likely to lead to greater financial stability. And there is renewed hope that it may not be too long before the long-awaited Accord de Siege is signed.

A new chapter in INIBAP's history will soon begin. The suggestions the Panel made in this chapter of the report are geared towards making INIBAP more successful.

CHAPTER 5. PANEL'S VIEW OF INIBAP'S FUTURE

The Panel took a collective view of INIBAP's current status and projected a view of INIBAP's future. The panel found that although INIBAP is, organizationally speaking, not resting on a stable foundation, it has the potential to not only achieve stability, but also move forward to assume a leadership role as a network organization engaged in research service. Unlike the earlier chapters founded on objective data, this chapter relies on both data from the present and the Panel's projections for the future. The chapter also suggests and recommends specific action plans for INIBAP in the short-, medium-, and long-term.

5.1 Current Scenario

INIBAP is currently in transition. By the end of 1992, INIBAP would have:

- Incurred the first deficit (excess of expenses over revenues) for the year ended December 31, 1991, as well as a projected budget deficit for 1992;
- Completed its second full year as a member of the CGIAR group of institutions;
- Appointed a new Director of INIBAP; and
- Had the new Chairman of the Board of Trustees for a little over one year.

INIBAP is also facing some uncertainties now. First, its *Accord de Siege* has not yet been signed by the French Government. It is therefore not functioning as a full fledged international organization. Second, some donors have made significant reductions in their financial contributions to INIBAP. As a result of these changes and uncertainties, INIBAP must take a hard look at itself and, after due deliberation make some difficult decisions. The next section reviews INIBAP's progress toward its mandate.

5.2 INIBAP's Accomplishments

INIBAP has indeed made much progress in the directions indicated by the mandate. Some of the major accomplishments of INIBAP and its partners include:

- Establishment and improvement of programs to facilitate interchange of improved and healthy germplasm;
- Establishment of four regional networks and a regional-level forum for consultation and communication;
- Facilitation of a variety of research projects, many of which involve two or more partners;
- Assistance in establishing and analyzing regional and global trials of new and improved cultivars; and
- Development of the Info/Doc program in collaboration with other organizations and publications through the Communications program.

It is difficult to evaluate and determine whether in the absence of INIBAP, these programs would have been implemented. And due to interdependencies, INIBAP's effectiveness and efficiency remain unclear. Despite these difficulties in measuring performance, it is clear that INIBAP has moved toward its goals in these areas.

5.3 Unanswered Questions

A complicating factor for INIBAP's view of the world appears to be found in the institution's present mandate. By focusing on the smallholder, little or no regard seems to be given to sectors beyond agriculture, such as the urban poor. An interesting point is made when INIBAP's mandate is compared to the CG mandate, which offers a broader target and thus a greater opportunity to set goals that contribute to positive achievements. A projection of INIBAP's science-based activities and its current configuration suggest a major focus on cultivar development and some aspects of crop protection. These present priorities are no doubt derived from the original black Sigatoka stimulus, but this may not represent the best focus of the Network's properly derived goals. Of the following research topics that are relevant for any crop, INIBAP has focused **only** on Cultivar Improvement and Crop Protection.

- Cultivar Improvement
- Crop Protection
- Crop Production
- Sustainability
- Farming Systems
- Post Harvest Technology
- Storage
- Processing
- Technology Adoption
- Economics
- Marketing
- Social Impacts.

Although INIBAP has progressed toward its goals, there are many unanswered questions to be reviewed to understand if there are gaps in INIBAP's progress toward its mandate. The next four sub-sections focus on each of four groups of unanswered questions: commodity differentiation, market segment, production system, and other unanswered questions.

5.3.1 Commodity Differentiation

In its present activities, INIBAP has given primary focus to developing improved cultivars of cooking banana and plantain, and resistance to black Sigatoka. As noted in Section 3.2, this research approach is predicated on a radically changed breeding strategy for improved *Musa* tetraploids. Prior to the 1980s, of the six commodity types of Musa (see Box 3), the focus of the *Musa* breeders was on export dessert-type bananas. Since then, the banana breeders have started working toward improving other commodity types of *Musa*. The new direction for banana breeding is aligned with INIBAP's mandate. However, there only are partial answers to the following questions:

- What are the variations among the different types of bananas?

- Why did big banana companies stop supporting breeding research and decide to rely on expensive chemical spraying techniques?

- If the non-export varieties of banana and plantain can be made disease resistant, will the consumers grow and/or purchase the new varieties? How will this be verified?

- Do we know what specific characteristics the consumers are looking for? To what extent can these traits be improved by breeding techniques?

- Can the effectiveness and efficiency of breeding techniques be improved? How?

- How will biotechnology techniques complement conventional breeding techniques?

5.3.2 *Musa* Production Systems

Although INIBAP's mandate calls for a focus on assisting farmers with smallholdings, the Panel did not come across adequate information on how bananas are produced in smallholdings. Classification of different types of production systems, and an understanding of their similarities and differences, is the kind of baseline data needed before alternative production methods can be explored. Additional unanswered questions related to production systems are:

- What are the costs and benefits of alternative types of cultivation in smallholdings?

- What are the economic and societal implications of an increase in banana productivity in smallholdings?

- What are the costs versus benefits of using Integrated Pest Management (IPM) techniques instead of only providing resistant cultivars used in smallholdings?

- Will the *Musa* cultivars to be used in smallholdings also be used in larger or mixed crop production systems?

- What do we know about consumer use, nutrition, income distribution, equity (e.g. gender, poverty), income protection, consumer satisfaction, markets, prices, food policies, social policies, and socio-economic impact?

As a member of the CGIAR group, INIBAP has the opportunity to learn from other CGIAR members (e.g. exploring food policy research questions with IFPRI and institutional development questions with ISNAR).

5.3.3 Consumer Preferences

Consumer acceptance of food is determined by a number of factors such as appearance, taste, texture, flavor, processing or preparation characteristics, labor requirements, costs, nutritional value, storage, and others. This is particularly true for staple foods, as slight differences can significantly alter preferences.

INIBAP's focus on smallholding producers of banana and plantain will require the consideration of food preferences as part of its strategy to deploy improved *Musa* hybrids. Failure to consider these factors in the process of research strategy planning would be a serious omission, as cultivar adoption will likely be derived from wide acceptance of suitable substitutes, when compared to current *Musa* cultivars.

Based on our interviews at the INIBAP headquarters and the Network's regions, the Panel concluded that INIBAP management does not have clear answers to some fundamental

questions, such as:

- What are the opportunities for adding value through alternative technologies, uses, food processing, or long-term storage alternatives, and enhanced food qualities?

- To what extent has INIBAP fostered collaborative research across different institutions?

INIBAP management must have answers to these questions so that many strategic decisions can be made with full understanding the major characteristics of the intended product, production system, and customer preferences. INIBAP must also be clear about both its current identity and alternatives. INIBAP has probably outgrown its current strategy.

5.4 Implications

INIBAP is pursuing one, or at most two choices - new cultivars with disease resistance. This narrow approach appears to be creating some knowledge gaps, some overlooked science-based opportunity, and a neglected humanistic perspective.

The point to be made is not that the present INIBAP choices are entirely wrong, only that many choices do not seem to have been thoroughly considered. The Panel also believes that by the end of ten years, INIBAP would have identified specific areas, and ways in which it will be adding value to the research activity it services. By then it would have stopped some services and would have become equal partners in activities where NARS and local organizations have accepted expanded responsibility.

In addition to making correct choices, INIBAP must restore stability and team spirit within the organization. The next three sections present the action plans for the short-term (next 12 months), medium-term (1-5 years), and long-term (6-10 years).

5.4.1 INIBAP in the short term (Next twelve months)

INIBAP Board has the important task of guiding its transition during the next few months before the new Director fully assumes his or her responsibilities. INIBAP's priorities during the next twelve months should be:

- Restore stability in various forms - (e.g. financial, emotional, confidence, goal and role clarity, and job security) by increased communication and more conservative financial management.

- Initiate strategic planning with written inputs from Regional Coordinators and full participation of headquarters staff with the following deadlines:

  By January 1993: Strategic Plan and Medium Term Plan (MTP)
  By March 1993: Refine MTP
  By January 1994: Begin implementing MTP

These proposed deadlines are consistent with the planning calendar jointly developed by INIBAP, TAC and CGIAR. It is important that the strategic planning process delivers not only important analysis, but also leads to improved relationships among senior staff. One approach to developing INIBAP's strategy is presented in Box 7 (Strategic Planning: Points that could be considered by INIBAP).

The Panel recommends that INIBAP consider employing a participatory approach to identifying its strategic directions.

During the next year, INIBAP must restore stability, confidence and goal clarity. The Panel suggests that during the next twelve months, INIBAP should:

- Conserve capital by postponing expenditures on projects which are not crucial.
- Avoid, as far as possible, adding staff or fixed operating expenditures, before the development of the strategic plan.
- Avoid political or other pressures to make strategically important decisions, such as relocation of INIBAP's headquaters. Until such time INIBAP is clear about its strategy, it should not attempt to make these decisions.
- Permit the new Director to get a feel for the network by freeing him or her to travel through most of the network during the initial months.
- Use a participative process that involves regions and their stakeholders during the strategic planning process (see Box 7).

Strategic Planning:
Points that could be considered by INIBAP

1. Strategic planning should be a participative process with inputs from headquarters staff, regional staff, affiliated organizations and other key stakeholders.
2. Strategic plan should clearly identify priorities among objectives derived from INIBAP's mandate.
3. The strategic plan should be implemented by breaking it into programs, each of which:
   - is a stand-alone piece, and together with other programs, it will contribute to implementation of the strategic plan,
   - has a strategically tangible and significant output,
   - is time bound (more than one year),
   - is managed by a clearly identified manager with resources specifically allocated for the program.
4. INIBAP should consider the following concepts/ideas while developing its future strategic plan and programs:
   - Network is the means, not the end (i.e. there may be alternative approaches to move toward the mandate);
   - INIBAP's focus is on applied (as opposed to basic) research;
   - INIBAP facilitates development and dissemination of knowledge on how to increase effective and efficient production of *Musa* grown on smallholdings;
   - Research facilitated by INIBAP will lead to cost-effective and financially self-sustaining solutions for Musa grown on smallholdings, and consumed domestically;
   - INIBAP continues to recognize the importance of bringing together people with specialized knowledge, to solve specific problems of common interest - through exchange programs, international project teams, etc.
   - INIBAP positions itself as a Learning Organization that helps various participants in *Musa* research and *Musa* production practice the art of continuous improvement.

BOX 7

Substantial amounts of baseline data are needed in order to begin the process of long-term strategic planning for INIBAP. This will require some research and assessment studies. Baseline data are needed on the biological and environmental factors presently determining *Musa* production systems worldwide. In addition to biotic constraints, abiotic considerations should be well described (Note: the Panel heard several references to soil fertility difficulties in regions of Africa, but heard no mention of the constraint as part of INIBAP's plans).

Other baseline data are needed in the socioeconomic and cultural systems that INIBAP plans to engage. All of these must be sorted into a clear perspective of the current types of *Musa* production systems, and those that INIBAP would hope to induce. The establishment of baseline data could then be followed by a strategic analysis using client input,

scientific perspectives, donor interest and user needs.

The Panel recommends that INIBAP initiate a rigorous analysis of its strategic directions, taking into account institutional expectations consistent with its membership in the CGIAR system, donor perspectives and client needs.

This strategic study should be conducted through a participatory process and consider the perspectives of science, society, environment and human needs as it relates to *Musa* production and utilization.

5.4.2 INIBAP in the Medium-Term

The Panel believes that in the medium term, five years from now, INIBAP would have strategically redirected itself and would be posturing itself to undertake some inter-institutional projects that involve interdisciplinary approaches.

By the end of this period, INIBAP network members would have acquired a better understanding of how INIBAP plans to operate and how they can contribute to the organization. The quality of INIBAP staff and the clarity of their roles and goals would have improved.

The establishment of measures of success through strategic planning will further communicate with the donor community, research partners and institutional clients as expected outcomes, often stated as milestones. Measures of success can then be linked to potential donors' goals, and goals common to INIBAP, and can be used for communicating financial needs to potential donors.

In the medium-term, INIBAP will also be engaged in "fitting" into an ideal organization form (research service with low or medium research component, research-based service, or research center). Clarity about INIBAP's strategy is a prerequisite for developing its organization structure. By the end of this period, INIBAP's regional centers would have acquired a critical mass of staff and the Panel also expects a significant improvement in INIBAP's financial information and control system, to monitor and track various research projects, and financial measures of success will be available for most mature projects. By the end of five years, INIBAP would have acquired a capability to establish measurable performance goals for projects of the research centers serviced by it.

5.4.3 INIBAP in the Long-Term

A consequence of INIBAP's narrowly focused thematic activities has an impact for the regional networks. With headquarters focusing primarily on germplasm exchange and testing, and information services, INIBAP defers its program gaps to the Regional Coordinators. This "dumping of responsibilities" combined with insufficient resources throughout the Network, seems to further contribute to frustrations at the regional level.

The Panel focused its analysis on the question - What will INIBAP be doing ten years from now? The Panel is optimistic about the future opportunities available to INIBAP if:

- It strategically redirects its efforts,
- Its staff work together as a team,

- Its networks link regional needs with INIBAP's mandate, and

- INIBAP's strategy is supported by a committed group of donors that participated in developing the strategic redirection.

The Panel's vision for INIBAP is that at the end of ten years it will be regarded as the research service organization *par excellence*. The Panel believes that INIBAP would have, by the end of ten years, initiated interdisciplinary research projects in the form of joint programs across different institutions. Innovative financing mechanisms, may become available to ensure that more unrestricted funds are available to INIBAP. It is also likely that INIBAP may encourage its network members to mutually support themselves (e.g. an organization interested in IMTP trials might be introduced by INIBAP to potential donors). INIBAP's partners may make their own contributions to collaborative research projects or pay for their share of expenses in a joint project. Obviously, the ten year picture assumes that INIBAP has successfully implemented its strategic redirection, and moves further along its chosen path.

CHAPTER 6. CONCLUSIONS: INIBAP AS AN INNOVATIVE MODEL

INIBAP's membership in the CGIAR represents a test of an innovative model for organizing research through networking, rather than through in-house research facilities and a sufficiently large interdisciplinary team of scientists. This approach to organization has a certain appeal, especially to the donor community. The donors expect timely responses to national needs, without incurring great costs and creating permanent structures. Thus, INIBAP represents an *experiment* within the CGIAR system, as an innovative mode of operation.

The Panel looked at this aspect of INIBAP's CGIAR membership as a test of the hypothesis: **A network-based institutional model is cost-effective in terms of achieving the CGIAR's objectives.**

From an experimental perspective, INIBAP, as it currently operates, would not allow an objective test of this hypothesis. The design is imperfect and some of the expectations, on both sides, may be unrealistic.

Leaving that aside, from a conceptual perspective, INIBAP is a research service organization, utilizing networking as a means of providing services to NARS and other clients. Is the concept being tested by the CGIAR the potential utility of addressing commodity research goals through a research service institution as an alternative to a research center (as defined in Chapter 2)? Is the test focussing instead on having the needs for international research in banana and plantain fulfilled through collaborative research networks? The Panel summarizes its views on these and similar CGIAR-related issues in this chapter. The aim of the chapter is to share some, admittedly tentative, views with a larger audience and stimulate discussion of some key strategic questions about this experiment. The **intention is not** to pre-judge the outcome of the strategic planning process recommended for INIBAP in the preceding chapter.

6.1 Lessons to be Learned

INIBAP has only few comparable institutions to learn from as a model. These include IBSRAM, ICRAF and ICLARM. However, the mandates of these institutions are radically different and they are each using networking in different ways.

There is also the experience of the research centers in networking. There are many networks coordinated or backstopped by the IARCs, but the experiences of these have not been fully studied by INIBAP.

The donor community's expectations of INIBAP appear to be unclear. Is INIBAP expected to be the answer to meeting, directly or indirectly, all international research and research-related needs for banana and plantain? If so, and given the narrowness of the science base for *Musa*, INIBAP has a major task to fill (or help fill) the knowledge gaps related to product types, production systems, market concerns and other strategic issues outlined in Chapter 5. In addition, INIBAP would be expected to play a major institution building role, given the weakness of national programs in several regions of the world. How will INIBAP work to close these gaps in research and meet the institution building needs, and can this be done through an institution not engaged directly with research?

Thus, a clearer statement of the hypothesis to be tested through the INIBAP "experiment" needs to be set out. As this hypothesis was originally set by the CGIAR, it seems that clarifying it should be the CGIAR's responsibility. The Panel came to this conclusion based on its observations of INIBAP trying to meet the expectations of membership in the CGIAR, but not knowing what achievements would bring it full membership and thus remove the sunset clause that it now carries.

The Panel recommends that the CGIAR clarify its expectations from INIBAP for the removal of the "sunset clause" that is attached to INIBAP's membership in the CGIAR.

6.2 Critical Issues

Three questions are frequently asked about networks and institutions operating in a network mode:

- How much research should the staff of a network-based institution be engaged in?
- What is the critical mass (in terms of senior staff) needed for a network to be successful?
- What are the hidden costs (or administrative overhead) of operating a network?

The Panel explored these questions and offers the following initial thoughts and observations:

6.2.1 Involvement of Staff with Research

The Panel is not entirely convinced that INIBAP could facilitate generation of knowledge and technology only through providing services via networks. Research on gaps in *Musa* research and how to conduct *Musa* research, analysis of information assembled by INIBAP, research on making networks more effective and several other research activities might best be done by INIBAP internally. INIBAP staff might be in the best position to conduct such research because of their global or regional perspectives and experience.

There is also the possibility for INIBAP staff to be engaged in collaborative research. If and when INIBAP helps form some collaborative research networks, INIBAP staff would be expected to contribute to the collective research effort of the network.

Involvement of staff in research activities of this type would keep the staff current. It would also assist staff in terms of pursuing their career development goals.

Thus, involvement with research should be encouraged in a research service institution. However, the institution must always keep in mind that its main purpose is providing service. Excessive involvement with research at the expense of service may limit the institution's overall effectiveness.

6.2.2 Critical Mass for Networks

In a very imprecise exercise, the Panel examined the desirable size of a regional network. To do this, some assumptions were made about the goals of the network and types of research services to be provided, such as in the areas of institution-building, technology adoption, information exchange, research support, and facilitated access to resources.

In a very general sense, the Panel views the staffing needs of such a regional network as consisting of four senior staff and a modest administrative and research support. This would permit a regional network coordinator to better target responsibilities, build some synergism and permit greater responsiveness without perpetuating the present state of overload.

Using some rough figures of what it costs to support a scientist per year, the Panel calculated the cost of operating a global network of four regional networks plus a coordinating headquarters. The assumptions on cost-per-scientist were taken as equivalent to other international centers. This was based on the Panel's observation that regional network staff would need more funds for travel, support and resources than what is provided at INIBAP.

Summing the numbers over the entire Network provides a figure much larger than the resources currently available to INIBAP. This "critical mass" analysis helped the Panel visualize the causes of frustration at the Regional Coordinator's level and why the expectations of the Network may be unrealistic.

This thought, when combined with the Panel's observation that the Regional Networks have become the "residual institutions" for activities not adopted in the global plan, points to the difficulties the Regional Coordinators are having.

The Panel then evaluated whether or not the INIBAP experiment, as an innovative model, is really a good test. The Panel concluded that it is not, as the available resources for INIBAP are too little, and INIBAP's range of activities too wide, to verify if the experiment worked.

6.2.3 Administrative Overhead (Or Unseen Costs of Participating in the CGIAR)

During the review, the Panel came to appreciate the proportional distortions that occur in a network of INIBAP's size. For instance, the expectations for maintaining good relationships with the donors, the CGIAR and with partner institutions place a heavy demand on the Director, supported by a very small staff. In some ways, the dimensions of the demand are comparable to those of a research center. But, in proportion to total resources available, the load on INIBAP, as described to the Panel, is "burdensome".

To address this demand by expanding the headquarters staff would, in some ways, defeat the advantages of being a Network (i.e., operating with a decentralized structure). Institutional overhead, as a proportion of the Network's budget, would increase and thus fewer resources would be available for research support activities.

Alternatives may need to be explored, such as linking INIBAP with other institutions, or developing styles more suitable to the network mode of operation. This might include foregoing attendance at inter-center meetings, providing less detailed reports to the CGIAR, truncating donor support meetings, having a small board - all extremely difficult choices. These issues, however, need to be kept in mind by the CGIAR and addressed explicitly by INIBAP during its strategic planning process.

6.3 Evolutionary Paths

During its deliberations, the Panel explored some likely outcomes of INIBAP's strategic planning process. This was done to develop a perspective of what can be anticipated as INIBAP evolves during the next decade. The Panel's intention was not to second-guess the results of INIBAP's strategic planning process, but to brainstorm about possible outcomes of that process.

The Panel foresees four alternative outcomes concerning the institutional identity and main preoccupations of INIBAP.

The first possible outcome is that INIBAP would strive to become a research service institution *par excellence*. For INIBAP, this would mean remaining a predominantly service-oriented institution, but doing it better. Staff would be involved with a limited amount of research, as noted above.

A second alternative is for INIBAP to gradually shift from a purely service institution to one that engages in considerable collaborative research. This could be through active involvement in collaborative research networks, or through other types of collaboration in the conduct of research. INIBAP would still maintain its identity as a research service institution, but its staff would have greater involvement with research activities than in the first alternative noted above. The increase in collaborative research activities could result from clearly targeted goals and specific objectives developed through strategic planning.

A third alternative might be a decision to transform the Network into a research-based service. That could be done in either of two ways. The Network could decide to create, a small internal research capacity to provide the minimum research activity necessary for meeting its service-related goals. Alternatively, INIBAP could link with an existing institution which has the needed scientific research base (such as IITA or possibly FHIA). The institution with the scientific research base could maintain its identity as a research organization separate from INIBAP, and INIBAP its own identity as a research service institution. Appropriate arrangements can be made for sharing of staff and facilities.

A fourth evolutionary outcome might be to transform INIBAP into a research center, thus creating a full fledged autonomous institution capable of conducting international research and providing research-related services on *Musa* though its own staff and facilities.

The probabilities associated with the likely occurrence of these possible outcomes vary. It is possible that some "hybrid" might emerge. But what is needed is for INIBAP to explore its alternative futures using a "zero-based strategic planning" approach (as outlined in Section 5.4.1), in consultation with its key stakeholders.

6.4 The Sunset Clause

INIBAP's membership in the CGIAR was conditional on a sunset clause, requiring an external review after five years of membership. This review would be used in determining whether INIBAP's membership in the CGIAR group of institutions would be continued.

The Panel feels that INIBAP's conditional membership needs to be reviewed from several perspectives. First and foremost, as recommended above, the CGIAR should make clear to INIBAP its expectations. Second, the CGIAR needs to clarify what type of a mechanism would be most appropriate for determining if the sunset clause should be removed. Third, the timing of the CGIAR decision on this matter should be examined.

Over the next 18 months TAC and the CGIAR will have several opportunities to interact with INIBAP: this external review will be discussed by TAC and the CGIAR; INIBAP's updated strategy will be presented to TAC (and possibly the CGIAR), and INIBAP's Medium Term Plan will be reviewed by both TAC and the CGIAR. These should provide TAC and the CGIAR with sufficient opportunity to get to know this institution and clarify what is expected from it in order for INIBAP to continue receiving support from the CGIAR.

Once the expectations are known, milestones can be established to monitor progress. Various means can be used to do this. INIBAP could commission an external review. TAC and the CGIAR Secretariat could commission an interim review. Or, the INIBAP Board can be asked to report periodically on progress. These and other means should be explored as possible ways of monitoring INIBAP's progress towards accomplishment of agreed objectives.

If these monitoring mechanisms suggest sufficient progress in the right direction, the CGIAR should not wait until the end of the "sunset clause" period to lift the condition. In this way, the sunset clause would become less of a "sword of Damocles" and more of a target for achievement.

6.5 Concluding Comment

Conducting an experiment requires careful attention to the conditions under which the test is being conducted. First and foremost, one must make sure that the experimental variable is present in the test. Otherwise, the results of the test will not show the effects of the experimental variable.

In INIBAP's case, if the CGIAR's intention is to test the usefulness of networking (or a network-based research service) mode of operation for meeting the CGIAR's goals in banana and plantain research, adequate funds must be allocated to it. Otherwise, the conditions of the test will be flawed. Thus, in considering INIBAP's new strategy and Medium Term Plan, TAC and the CGIAR should pay close attention to whether the INIBAP networks are likely to have the resources necessary to carry out the tasks expected of them and the strategic plan they developed.

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BIOGRAPHIES OF THE REVIEW TEAM MEMBERS

Panel Members:

David R. MacKenzie (Chairman)

CURRENT POSITION: National Program Director
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EDUCATION: PhD, Plant Pathology and Plant Breeding,
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EXPERIENCE: Dr. MacKenzie is presently Director of the USDA's National Biological Impact Assessment Program which has the mission to facilitate the safe application of biotechnology to agriculture and the environment. Prior to this appointment, Dr. MacKenzie served as Professor and Head of the Department of Plant Pathology and Crop Physiology at Louisiana statewide. Before that, he was for ten years Professor of Plant Pathology and director of the State of Pennsylvania's potato breeding program. His international experience includes employment with the Rockefeller Foundation immediately following his graduate studies; with assignments in CIMMYT's Wheat Program; rice multiple cropping research at IRRI: and then as the Head of the Vegetable Breeding Department at AVRDC. Other international experience includes consultancies with the World Bank, CGIAR, TAC, FAO and USAID. Additional collaborative projects include several in crop protection in Latin America, Asia and in two Republics of the former Soviet Union.

Mandivamba Rukuni

CURRENT POSITION: Senior Lecturer in agricultural economics and Dean of Agriculture at the University of Zimbabwe.

EDUCATION: Bsc. Agric Hons (Rhodesia) (1976), M.Sc (Reading) (1978) and Ph.D (Zimbabwe) (1984)

EXPERIENCE: Citizen of Zimbabwe, his professional career has been largely with the University of Zimbabwe having joined the institution in 1980. He has taught a number of courses including farm management, project appraisal and agricultural sector planning and analysis. His research has been largely in the area of food security policy analysis and smallholder irrigation in Africa. He is member of the editorial board of **Irrigation and Drainage Systems** and **Agricultural Economics** journals. Outside the University, he is current Chairman of the Agricultural Research Council of Zimbabwe and a board member of the Grain Marketing Board. Between 1986 and 1991 he was on the board of the Southern African Center for Cooperation in Agricultural Research. Between 1983 and 1992 he directed twenty training

workshops in collaboration with CIMMYT on-farm research, through which about 400 agricultural researchers have been trained from about 20 countries, mostly within east and southern Africa. He also has consulting experience in 15 countries in Africa, for various donors and international organizations.

Kenneth Shepherd

CURRENT POSITION: Advisor to EMBRAPA in Bahia State, Brazil, on germplasm and breeding of bananas.

EDUCATION: B. Sc with 1rst Class Honors in Agriculture Botany from Dunham University, UK (1947)

EXPERIENCE: Of British nationality, he has been in Brazil since December 1981, to install a banana germplasm collection and to set up the breeding program which he still assists. A current decision is to try to find a chromosomal basics, by cytological study, to link with somaclonal variations in bananas. Previously, from 1964 to 1980 he was Director of the Banana Breeding Research Scheme (a regional program) in Jamaica and, before that, worked as a cytogeneticist in the Banana Research Schemes of Trinidad and Jamaica from 1950 to 1964. In over 40 years with the same crop he has made contributions not only to cytogenetics and breedings but also to taxonomy, including co-authorship of the autovitative paper on cultivar classification. Up to 1949 he spent time with the Solanum germplasm collection then maintained at Cambridge in the UK.

Srinivasan Umapathy

CURRENT POSITION: Founder and President of Andover Consulting & Training Group (ACT) Andover, Massachusetts, USA.

EDUCATION: Bachelor of Technology - Mechanical Engineering (1970) degree in Mechanical Engineering from the Indian Institute of Technology, Madras, India, Doctorate in Business Administration (1980), Harvard Business School

EXPERIENCE: Specializes in assisting organizations proactively manage change and diversity by improving their integrated planning and resource allocation systems, clarifying goals and roles, and team building across functions and hierarchical levels, so that different parts of each organization work towards the same goals. He has consulted with research intensive organizations in Belgium, Canada, Greece, India, U.K, and U.S.A. Based on a study of planning and budgeting practices in 402 U.S. organizations, he has published a book, several articles and developed a proprietary diagnostic questionnaire called PROgram and Budgetary Effectiveness (PROBE). He is a member of the Board of Directors of the NTL Institute, U.S.A., which pioneered research and training in small group processes. Before he founded ACT, he worked with Tata Engineering and Locomotive Co.Ltd. (1972-76) and taught at British University School of Management (1980-89) and Boston College (1987-90), Boston, Massachusetts, USA.

CGIAR Secretariat:

Selcuk Ozgediz (Secretary)

CURRENT POSITION: Management Adviser, CGIAR Secretariat, World Bank

EDUCATION: B.Sc., Economics and Statistics (1966, Middle East Technical University, Ankara), M.S., Mathematical Statistics (1968, Michigan State University), M.A. and Ph.D., Political Science (1970 and 1976, Michigan State University)

EXPERIENCE: Has been serving as CGIAR's Management Adviser since 1983. Coordinates the CGIAR's external management review process and inter-center management development programs, monitors the effectiveness of the CGIAR's and the centers' management, and serves as management consultant to the CGIAR centers and their boards of trustees. Previously at the World Bank, served as member of the Core Team which prepared the World Development Report, 1983 (on management in development) and worked as Economist in the Policy Planning and Program Review Department (1979-83). Before his World Bank Career, taught public policy analysis and social science research methodology at Bosphorus University, Istanbul (1976-79); was independent management consultant in the U.S. (1974-76); served as Senior Research Manager of Systems Research Incorporated, Lansing, Michigan (1970-74) and as consultant economist at the U.S. Department of Agriculture (1967-70) and Organization for Economic Cooperation and Development (OECD, 1966).

Kerri Wright Platais

CURRENT POSITION: Scientific Associate, CGIAR Secretariat, World Bank.

EDUCATION: B.A. Social Sciences, emphasis in International Studies, Colorado State University (1985), M.Sc. Agronomy, Colorado State University (1989)

EXPERIENCE: Working with the Science Advisors in the CGIAR Secretariat for the past three years, Kerri Wright Platais specializes in broad coverage of both the biological and social sciences. Activities include work in the areas of Biotechnology and Intellectual Property Rights (IPR), Plant Genetic Resources, Training in the CGIAR System, and work with Non-Governmental Organizations (NGOs). Earlier work included the USAID funded International Plant Biotechnology Network (IPBNet), where she served as network coordinator from 1986-1989. International experience includes rice tissue culture research with Chulalongkorn University in Thailand (1985-86) and volunteer work in a farming systems research project in Haiti (1983).

TERMS OF REFERENCE FOR EXTERNAL REVIEWS OF CGIAR CENTERS

BACKGROUND

The Consultative Group on International Agricultural Research (CGIAR) has charged its Technical Advisory Committee (TAC) with the responsibility of conducting External Program Reviews (EPRs) of those International Agricultural Research Centers (Centers) that it supports financially. The CGIAR has assigned a similar responsibility to its Secretariat for External Management Reviews (EMRs).

TAC and the CGIAR Secretariat normally discharge these responsibilities by commissioning either separate panels or a joint panel to conduct the reviews. In commissioning panels, neither TAC nor the CGIAR Secretariat delegates its responsibility for reviews, but both use panels to facilitate the process. Panels submit their reports for consideration by TAC and CGIAR Secretariat before they are transmitted to the CGIAR. While the main recommendations made by panels are normally endorsed both by TAC and the recommendations made by panels are normally endorsed both by TAC and the CGIAR, such endorsement cannot be presumed by either the panels or the Center under review. Equally, as autonomous institutions, Centers are not obliged to implement the endorsed recommendations. In practice, however, they usually implement most, if not all of them.

PURPOSE

Through its support of International Centers, the CGIAR aims to contribute to increasing sustainable crop, livestock, fish and tree production in developing countries in ways that improve the nutritional level and general economic well-being of low-income people. The purpose of external reviews is to help to ensure that the Centers continue to implement strategies and programs that are relevant to these goals; that they maintain or enhance their record of achievement; and that they are efficiently managed. In these ways, external reviews reinforce mechanisms of accountability within the System.

EPRs and EMRs are also essential components of the CGIAR's integrated planning process. The context in which they are undertaken is to be found in the document "Review Processes in the CGIAR".

THE REVIEW

Against this background, the panel is requested to make a thorough and independent appraisal of the Center and all its activities, following the broad topics below, as well as the appended list of questions and guidelines. Panels are encouraged to set their findings in the broader context of the CGIAR System, where this is relevant to the activity or program under review.

A. Recent Evolution of the Center

Important changes affecting the Center since the previous external review.

B. Mandate

The continuing appropriateness of the Center's mandate in relation to the mission and goals of the CGIAR.

C. Strategy and Programs

The policies and strategies of the Center, their coherence with CGIAR strategies, and the mechanisms used for monitoring and revising them.

The extent to which the Center's strategy is reflected in its current programs; the rationale for any proposed changes by the Center and their implications for future activities.

The quality of current programs and activities.

D. Center Guidance, Values and Culture

The overall effectiveness of the Center's Board of Trustees in governing the Center, and the effectiveness of leadership throughout the Center.

The Center's guiding values and culture, and their influence on the Center's performance.

E. Program Organization and Management

The mechanisms in place at the Center to ensure the excellence of the programs and cost-effective used of resources.

The adequacy of the Center's organizational structure, and the mechanisms it uses to manage and coordinate its research programs and related activities.

F. Resources and Facilities, and their Management

The financial resources available to the Center in relation to its present and future programs.

The land, laboratories and services available for supporting the programs.

The Center's human resources.

The Center's information resources and facilities.

G. External Relationships

The Center's relationships with national research system[1] in developing countries.

Collaboration with advanced institutions in research and training, in both the public and

[1] National Research systems include all those institutions in the public and private sectors, including universities, that are potentially capable of contributing to research related to the development of agriculture, forestry and fisheries.

private sectors.

Collaboration with other CGIAR Centers and international agricultural research institutions, and undesirable overlap of activities.

The Center's relationships with the government of its host country or countries and with institutions therein.

H. Achievements and Impact

The Center's overall impact, its contribution to the achievement of the mission and goals of the CGIAR, and the methods used for making such assessments.

Recent achievements of the Center in research and other activities.

The potential of the Center's current and planned activities for future impact.

THE REPORT AND RECOMMENDATIONS

Panels are requested to prepare succinct reports in plain language (understandable to non-technical readers), in which factual material is kept to the minimum necessary to set the conclusions in context. Reports should include clear endorsements of the Center's activities where appropriate, as well as recommendations and suggestions for changes.

Recommendations should be justified by the analysis and approved by panel members. Recommendations for increases in staff or activities should be accompanied by analyses of their resource implications. Report should be formally transmitted to the Chairman of TAC and the Executive Secretary of the CGIAR by panel Chairs.

LIST OF QUESTIONS FOR EXTERNAL REVIEWS

These questions supplement the Terms of Reference and illustrate the types of questions the panel should consider in each category. They apply to most, but not necessarily to all CGIAR Centers. In addition, TAC and the CGIAR Secretariat usually compile a short list of questions that are specific to Center under review. In preparation for each review, the questions are circulated to the members of the CGIAR and the Center inviting them to comment and, if considered essential, to add supplementary questions. The panel is not required to answer all questions explicitly, but to take them into account in making its own assessment of the most important ones.

A. Recent Evolution of the Network

1. What important changes have taken place in the Network since the previous external review? What were the principal reasons for change? What are the likely effects of these changes on the future performance of the Network?

2. How responsive was the Network to the previous review?

B. Mandate

3. How appropriate are the Network's operational mandate and mission statement in relation to the changing mission goals of the CGIAR?

4. How well do the present and planned activities of the Network relate to the mandate and mission of the Network?

C. Strategy and Programs

5. Does the Network have an up-to-date and well-reasoned strategy statement? In particular, does it:

   (a) reflect a thorough understanding of the needs of the Network's principal clients and of the relevant activities of its partners and collaborators?

   (b) take into account the major changes expected to occur in the Network's external environment?

   (c) spell out the Network's aims and objectives in different program areas and provide a clear justification for them?

   (d) take into account the Network's internal strengths and weaknesses and the financial constraints likely to be faced?

   (e) provide a clear justification for the future scale of the Network's operations?

6. Are national authorities satisfied with the Network's strategy and did they have adequate opportunity to contribute to its formulation?

7. Does the Network's allocation of resources to its programs reflect the priorities

appropriately? Are the planned directions and priorities within programs appropriate?

8. Does the Network's strategy sufficiently take into account the determinants of sustainable food production, the alleviation of poverty, preservation of the quality of the environment, conservation of genetic resources and natural resource standardship?

9. Has the Network analyzed the operational implications of its future strategy and priorities in terms of finance, staff and other aspects?

10. How well is the Network's current strategy reflected in its programs and activities?

11. How successful has the Network been in reaching its major objectives in each major program area since the previous external review? Have the approaches adopted been the most appropriate for the problems to be solved? What has been the quality of the Network's work in each program area?

12. How effectively does the Network's training program meet the needs of national research systems?

13. How much attention has the Network paid to gender considerations in planning and implementing its program activities? Is this adequate?

14. Does the Network give appropriate attention to post-harvest technology?

15. Has the Network made adequate provisions from its core funds for work on genetic resources? How effectively is this work exploited for the benefit of developing countries?

D. Network Guidance Values and Culture

16. Is the Network's legal status appropriate for fulfilling its mission?

17. How effective has the Network's board been in determining policy and providing oversight? How effective has it been in managing its internal affairs (e.g. planning, internal board structure, member selection and development, managing meetings etc.)?

18. Are board-management relationships based on openness, respect for each other's roles, and mutual trust? Does the Board regularly assess and provide feedback on the performance of the Director on the basis of explicit and objective criteria?

19. How effectively has the Network been led by the director general and the management team since the previous external review? How well do senior managers work as a team?

20. What principal guiding philosophies appear to shape the action of the board management and staff? Are they conducive to high performance? (Among others, consider attitude towards creativity, accountability, efficiency and organizational change).

21. What are the main features of the Network's current organizational culture? Do aspects of this culture serve as barriers to performance? Is the Network's organizational culture in harmony with its strategy, structure and management practices?

E. Program Organization and Management

22. Has the Network developed an organizational structure suited to good program performance? What coordination mechanisms are in place? Are they effective? Are there alternative structures that could serve the Network better in the future in the light of the Network's strategy?

23. How effectively are the Network's decentralized activities linked with those at the headquarters? Do the staff outside the headquarters have adequate opportunities to contribute to overall planning and decision making?

24. How effective are the Network's strategic and operational (i.e. medium term and annual) planning processes? How well are they linked to budgeting? Do these processes ensure sufficient consideration of the views of the Network's clients and other key stakeholders?

25. Does the Network have an effective planning and management system for projects or activities?

26. How effective are the network's program monitoring and internal review systems and processes? Does the network have an effective peer review or a similar quality control process?

27. Do staff work effectively in teams? Do the structure and operating procedures of work-groups facilitate cooperation and teamwork?

28. Do the Network's program organization and management processes ensure efficiency and internal accountability? Are they conducive to innovation?

F. Resources and Facilities

29. How effective has the Network been in organizing, staffing and managing its human, financial, administrative and information resource?

Human Resources

30. Has the Network been able to attract and retain international and local staff of the highest calibre? Is the turnover rate one that ensures program continuity as well as healthy infusion of new staff into programs?

31. Does the Network have appropriate personnel policies for international and local staff stationed at the headquarters and outside it? Are they seen to be fair and consistent? (consider policies for staff recruitment, orientation, compensation, performance planning and assessment, career development, tenure, spouse employment, retirement, etc.).

32. Does the Network actively promote recruitment, retention and career development of women? Are there barriers to women's advancement in the Network?

33. How successful are managers and supervisors in managing people? In particular, how skillful are they in planning, coordinating and delegating work, communicating effectively, and motivating, developing and rewarding staff?

34. How satisfied are staff at all level with their jobs? How are morale, trust, communication and teamwork perceived among the staff?

Finance

35. How successful has the Network been in securing funds for its activities? How stable is the Network's funding? Does the Network have a fund-raising strategy, and how effectively is fund-raising managed?

36. Does the proportion of the Network's budget received as restricted funding distort the Network's strategy and the priorities accorded to its various activities?

37. How effective are the systems and processes used for financial management of headquarters and field operations? (Consider financial planning, analysis, reporting and control, accounting, budgeting, internal and external auditing, and cash and currency management).

38. How strongly is financial management linked with program management? How much financial responsibility do the staff have?

Administration

39. How successful has the network been in establishing an administrative infrastructure that meets the needs of staff in an efficient manner?

40. How cost-effective are the systems and policies used for managing the Network?

- property (e.g., maintenance, development, contruction, rental);
- general services (e.g., security, housing and dormitories, food services, transport, travel services);
- procurement operations (e.g., foreign and local purchasing, receiving, stores)?

Information

41. How successful is the Network in acquiring, generating and managing the information it needs for decision-making, communication and integration of activities?

42. How effectively are information services and technology managed? (consider computerization, telecommunications, records management, archives, library, and documentation).

G. External Relationships

43. How successful has the Network been in managing its relations with:

- clients in developing countries;
- institutions in the host country of its headquarters and of its substations in other countries;
- public and private sector institutions in developed and developing countries (including other CGIAR centers);
- donors, the CGIAR and TAC;
- and the media and the general public?

44. Is the Network strategy for collaboration with national research systems appropriate considering the size and stages of development of these systems? Are the priorities for collaborative work accorded to individual countries (in particular, the host countries) appropriate? Does the Network actively promote a strategy of collaboration in international research with national systems and regional research organizations?

H. Achievements and Impact

45. What mechanisms does the Network have in place to monitor its achievements and impact? Are these adequate?

46. How does the need to demonstrate impact influence the Network's priorities and strategies? Is there a tendency for long-term consideration to be sacrificed for short-term gains?

47. What have been the most notable achievements of the Network since the previous external review?

48. What benefits have developing countries derived from the Network's previous review? What contributions has the Network made to strengthening national research systems through training, institution building, collaborative research and technical assistance?

49. What is the network's potential for further impact, given its planned activities? Do these justify continued donor support for the Network? Is there a case for increasing the funding level? Could funding be reduced without seriously affecting the network's potential for further impact?

LIST OF SPECIFIC QUESTIONS

50. Has INIBAP set appropriate priorities regarding plant protection? Farming Systems? Multiple Cropping?

51. Have the main yield limiting factors been determined in different growing regions?

52. Has INIBAP contributed to coordination between institutes with interest in developing

appropriate biological control strategies, in order to avoid overlap?

53. What is INIBAP's policy with respect to intellectual property rights and its relationship to the private sector?

54. Is the division of responsibility between INIBAP and IITA efficient from a CGIAR perspective?

55. What support is provided by Headquarters to the Regional Coordinators? Is it adequate? What of the Regional Advisory Committees?

56. What role does biotechnology play at INIBAP (at the Transit Center and the rest of the network?).

57. What proportion of INIBAP's direct outputs are research? How much of INIBAP's work is in the form of facilitating research done by others?

58. What have been the specific research outputs of the various programs?

59. What are INIBAP's linkages to other collections of *Musa*?

60. What is the role of INIBAP vis-a-vis genetic resource conservation; how are activities linked to IBPGR and other Centers?

61. Does INIBAP need to modify its legal status following its membership in the CGIAR? What future role if any, would the Donor Support Group play?

62. Is INIBAP's Headquarters location and arrangements with the host country suitable for INIBAP's mission?

63. To what extent does the administrative superstructure of INIBAP (the Board and headquarters staff) facilitate or hinder efficient functioning of individual networks? What role should the Board's program committee play in this process?

64. What role does INIBAP play in information exchange among scientists and institutions conducting research on banana and plantain?

65. What input have NARS had in developing INIBAP's strategy? How well is the Network linked to NARS for research training, technical assistance, funding and germplasm testing?

66. How effective have INIBAP's research, workshops and conferences been?

67. What are the expectations for the INIBAP Regional Programs as components of the Network and its strategy. How will this interact with the thematic programs? Is there adequate planning and communications among Network components?

68. Is the Network a facilitator or a generator of germplasm and information and how should this be measured?

69. If a research base is essential for maintaining scientific excellence and a Network

has, by definition no substantial research base of its own, how will INIBAP maintain its quality of science? Is the network approach to international agriculture development valid?

70. Is INIBAP's thematic approach valid and compatible with the distributed regional coordination approach? Is INIBAP reaching the right audience with this strategy?

71. What are the impact expectations for INIBAP for the next 5 years (sunset period), and beyond?

Annex 3

List of Institutions Visited and Persons met by Panel Members

EAST AFRICA REGION

BURUNDI:

IRAZ:
Dr. Joseph Kafurera, Director of Research

INIBAP Regional Office:
Mr. Kabonyi Sebasigari, Regional Coordinator

WEST AFRICA REGION

CAMEROON:

IRA:
Dr. Ayuk-Takem, Director

CRBP:
Dr. Lassoudiere, Director
Dr. Jenny, Genetic Improvement Program
Dr. Noupadja, Agronomist
Mr. Kwa, Physiologist
Dr. Foure, Phytopathologist
Dr. Mouliom Pefoura, Phytopathologist
Dr. Fogain, Entomologist
Dr. Price, Nematologist
Dr. Auborion, Phytopathologist
Mr. Genettais, Agronomist
Mr. Temple, Agriculture Economist
Mr. Achard, Agronomist

NIGERIA:

IITA: (Ibadan)
Dr. Jaques Eckebil, Deputy Director General, Finance and Administration
Dr. Heinz Gasser, Director of Training
Dr. James Gulley, Group Training Coordinator
Dr. Rainer Zachmann, Training Materials Coordinator

Dr. S.K. Hahn, Director Emeritus
Dr. Kenton Dashiell, Leader, Grain Legume Improvement Program
Dr. Hans Herren, Director

IITA: (Onne)

Dr. Dirk Vuylsteke, Program Leader Plantain and Banana Improvement
Dr. Rodomiro Ortiz, Plant Breeder
Dr. F. Gauhl, Plant Pathologist
Dr. C. Pasberg-Gauhl, Plant Pathologist
Dr. C. Gold, Entomologist
Dr. P. Speijer, Nematologist
Dr. S. Ferris, Postharvest Reserach
Mr. G. Harry, Research Fellow
Mr. K. Mohambo, Research Fellow
Mr. B. Ruhigwa, Research Fellow

INIBAP Regional Office:

Dr. Gerard Sery, Regional Coordinator

ASIA AND THE PACIFIC REGION

THE PHILIPPINES

IRRI:

Dr. Kenneth Fischer, Deputy Director General, IRRI

INIBAP Regional Office:

Dr. Ramon Valmayor, Regional Coordinator

LATIN AMERICA AND THE CARIBBEAN REGION

COSTA RICA

CATIE:

Dr. Ruben Guevara, Director General
Dr. J.V. Escalant, Biotechnology Specialist (IRFA/CIRAD)
Dr. Jose Galindo, Plant Pathologist

CORBANA:

Mr. Juan Lang, Vice Manager
Dr. Ronald Vargas, Director of Research
Dr. Douglas Marin, Pathologist
Dr. Luis Ching, Agronomist

INIBAP Regional Office:
Dr. Ramiro Jaramillo, Regional Coordinator

HONDURAS

FHIA:
Dr. Fernando Fernandez de Cordova, Director General
Dr. Adolofo Martinez, Deputy Director
Dr. Eugene Ostmark, Director Of Research
Dr. Philip Rowe, Banana Breeder
Dr. Franklin Rosales, Banana Breeder
Mr. Alexis Matute Vargas, Communication Specialist

PANAMA

UPEB:
Dr. J. Enrique Betancourt, Director
Mr. Nitzia Barrantes, Information Documentalist

EUROPE

BELGIUM

KUL Transit Center:
Dr. Ronny Swennen, Director
Ir.Christine Peters
Ir. B. Pannis
Ir. D. Djailo
Ir. K. De Smet
Ir. I. Van den Houwe
R. Bogaerts
E. Kempanaers
L. Cnaepelinckx
S. Voets
W. Dillemans
J. Staf

KUL Faculty:
Dr. B. Cammue
Dr. F. Vanderleyden

FRANCE

CIRAD (Headquarters):
Dr. Henri Carsalade, Director General
Dr. Marie de Lattre, Director for International Organizations

CIRAD (Montpellier):

Dr. Jacky Ganry, Head of Research on Bananas

INIBAP Headquarters:

Dr. Edmond De Langhe, Director
Mr. Mehdi Abdelwahab, Assistant Director
Mr. Thomas Thornton, Financial Officer
Dr. Hugues Tezenas du Montcel, Germplasm Coordinator
Mr. Robert Huggan, Information and Communication Coordinator
Ms. Claudine Picq, Information Officer
Dr. David Jones, Crop Protection Coordinator
Ms. Susan Faure, Executive Secretary

Ministry of Foreign Affairs:

Ms. Chedeville Murray, Project Officer

Cabinet Claude Cazes (Price Waterhouse Affiliate):
- External Auditors -

Mr. Jean Ducup de Saint-Paul, External Auditor
Mr. Christophe Coddyn, Assistant

History and Methods of Banana Breeding

Kenneth Shepherd*

Early interest in banana breeding was undoubtedly triggered by *Fusarium* wilt. Although this was first recorded at the beginning of the century it did not make immediate catastrophic inroads into the large-scale growing for export of the Gros Michel cultivar in Central America and Jamaica. This banana type is now known to be not the most susceptible to the original pathogen. But, before many years had passed, the economic severity of the disease was to be felt all the more because of the very large scale of planting. Added to this, it was soon clear that the pathogen could survive for long periods in infected soil. Banana cultivation became a shifting one.

First thoughts of breeding go back to the late 1920s and early 1930s and arose in three centers: with the United Fruit Company in Honduras, with the newly inaugurated and UK-funded Imperial College of Tropical Agriculture (ICTA) in Trinidad, and with the Department of Agriculture in Jamaica.

The commercial company was sufficiently alarmed to form a germplasm collection which included some introductions from Asia. Thereafter, United Fruit's concern soon weakened and died, for reasons not on the public record.

At ICTA and in Jamaica, centers which collaborated practically from the start, work continued in pursuit of a "Gros Michel resistant to *Fusarium*". Both programs formed collections and shared more interesting acquisitions, such as (Pisang) 'Lilin' (also known as 'Lidi') which came to ICTA in 1932. Various former post-graduate students, scattered throughout the tropics, and national Departments of Agriculture contributed germplasm, via intermediate quarantine at the Royal Botanic Gardens, Kew, where this service was available into the 1960s.

There were some cytological studies in Jamaica in the initial phase, but it was ICTA that adopted the taxonomy, cytology and cytogenetics of *Musa* spp. and cultivars as a major research area. Critical findings were that the relevant basic haploid chromosome number is 11, and that 'Gros Michel' and many other cultivars are triploids with 33, while some other cultivars and the nearest wild relatives are diploids with 22. A vital discovery, first published in the 1930s, was that when a diploid's pollen (11 chromosomes) was used in crosses on female flowers of 'Gros Michel', the result was a low or very low incidence of seeds that could yield tetraploid hybrids, with 44 chromosomes. The morphology of these made it clear that the hybrids each possessed the whole chromosome and gene complement of the triploid and could inherit *Fusarium* resistance through the extra chromosomes of the pollen. A pathway was opened for breeding, but not for all triploids. Clones of the Cavendish sweet banana type were almost invariably seedless, although one hybrid has now been achieved in Honduras.

Few tetraploid hybrids of 'Gros Michel' were ever generated at ICTA, for want of land space, and this function became Jamaica's, while ICTA persevered with more strategic studies. The division of labor was incorporated in 1947 in a Banana Research Scheme, sponsored by the UK but also supported by the then British Cameroons and by the Jamaican All-Island Banana Growers' Association (AIBGA). Additionally, ICTA started to seek the genetic improvement of

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diploids, by crossing and selection, on the now universal and logical principle that, with a genetically fixed female parental contribution, the success of hybrids must depend totally on the positive genetic qualities transmitted by the pollen.

The diploids on hand were of limited appeal, mainly related wild forms, but germplasm exploration had been delayed by war and by the unsettled political situation of postwar Asia. Trips were made to East Africa in 1948 and, finally, to the Pacific area and Southeast Asia in 1954–55. The stocks that reached Trinidad were not great in quantity but, at the end of the 1950s, a few very useful diploids had entered into the process of achieving improvement of pollen parents. At that time also, resistance to yellow Sigatoka was becoming a second major objective, while Jamaica was already making the change from 'Gros Michel' to *Fusarium*-resistant forms of Cavendish bananas, albeit with nostalgia. Happily, the breeding program was still regarded as an insurance for the future.

By 1960, advantages had been seen in the union of all breeding and allied research in Jamaica, where a Banana Board had come into being with a small but effective research department. The newly named Banana Breeding Research Scheme soon gained autonomy within the Banana Board, partly because of its international funding. The Cameroon participation ceased but new partners entered, so that the scheme was funded by the UK, Jamaica and Trinidad governments, by the AIBGA and by the Windward Islands Banana Growers' Association (WINBAN). The island group was only then developing banana exports.

The effect of better diploids made an almost immediate impact, in the conversion of the fixed female parent from 'Gros Michel' to its semi-dwarf mutant 'Highgate' and in more promising hybrids. However, the Scheme in Jamaica was short-lived on a banana breeding time scale. In early 1973, WINBAN was obliged to withdraw because of economic stresses and a change in UK policy replaced core budget financing with project aid. Hybrid production virtually ceased but remaining resources allowed the continued evaluation of already existing ones, with the aid of three British scientists on projects. As a sort of swan song, one of the best products of the program was among the last seeds recovered from 'Highgate'.

A new program was mounted by United Fruit in Honduras at the end of the 1950s with a massive collecting effort in Asia, the major contribution to the germplasm now in place there. As a novelty, the offshore island of Utila was used as an intermediate quarantine site. The motivation for this change of Company policy can be at least guessed at, that fresh land for 'Gros Michel' or its mutants was running out. If this was the reason, then the time left for breeding a resistant cultivar was already too short. The conversion to Cavendish occurred in the middle 1960s.

The scientific community can be thankful that the company was then forward-looking enough to maintain the program when many other *Musa* research projects were closed. With the switch of varieties there was a lack of intense pressure to produce commercial hybrids so that, for 20 years and more, the breeders, or chiefly one, concentrated on diploid improvement, the results of which are now spectacularly apparent.

Other major events in the history of this program were the appearance and rapid spread of black Sigatoka in Central America, the takeover of United Fruit by United Brands, the latter's withdrawal from banana growing in Honduras and the Company's remarkable generosity in donating all the program's land, facilities and accumulated plant material to the recently founded Fundación Hondureña de Investigación Agrícola (FHIA). With an additional breeder and a revived incentive to produce disease-resistant tetraploid hybrids of plantains and various other banana types, the prestige of FHIA has been enhanced by the quality of the first products. Using the

advanced diploids available, some of them have striking resistance to black Sigatoka.

Apart from efforts on a minute scale, in India if not elsewhere, the programs described so far were the only two up to 1980. Brazil launched a program in 1982 when a collection of effective germplasm began to be assembled. After early exploratory crosses, this work has settled down to a primary task of producing tetraploid hybrids from 'Pome' ('Prata') forms, since these are very much the most planted bananas in the country today. The breeding philosophy has followed that which evolved in Jamaica, of using tetraploids as a measure of advances in diploid parents and accumulating progressive gains in the former. 'Prata' itself has poor agronomic traits so that these gains should come easily. The immediate resistance objectives are to yellow Sigatoka and to *Fusarium* wilt, with black Sigatoka testing on the scale that an EMBRAPA/CATIE/INIBAP convention permits. This disease is not yet recorded in Brazil.

Even more recently, CIRAD/IRFA has started banana genetic research in Guadeloupe, and now apparently Cameroon, based both on traditional and biotechnological methods.

IITA planted its first tetraploid hybrids of plantains and other cooking types at Onne, Nigeria, in 1989, but the IITA diploid parents available do not offer great hopes for the quality of these first products.

To conclude on conventional breeding methods, it should be conceded that there has been a difference of opinion over the strategy of how to use primary tetraploids. Should breeders test them directly as potential cultivars or use them chiefly as parents in tetraploid x diploid combinations in the production of "secondary" triploids?

The main arguments against tetraploids as potential cultivars are of weak leaf petioles, which is not usually a conspicuous defect, and of a theoretical possibility of spontaneous seed setting not possible in triploids; but this too does not seem to occur in practice, or at least when no male-fertile diploid is near.

The case for primary tetraploid production is that a small-to-moderate scale of pollination can give sufficient progeny for useful selection, permitting a relatively cost-effective breeding program. Also, the similarity of the hybrids to their already popular triploid parents could facilitate acceptance by farmers and consumers. A good secondary triploid, by contrast, would be a totally novel combination.

In any case, for now and for the immediate future, the very great majority of hybrid candidates, for global testing and possible adoption as cultivars, will likely be primary tetraploids.

Many years of raising and evaluating tetraploid hybrids of 'Gros Michel' and its mutants did not yield a single new cultivar in commercial production. This has been a cause of criticism of the method but there are unusual reasons for this failure. Bananas for export require special physiological characteristics: of remaining firm and green during ocean transit, at reduced temperatures, and of easily controlled ripening speed on arrival. When ripened, the fruit must not break away easily from its stalk. It was in these requirements that the best-looking hybrids failed, not in their agronomic performance, nor in the disease resistances for which they were selected.

From this evidence, the new tetraploid hybrids now being produced have every chance of succeeding where they may be replacing cultivars of similar type and usage. The best future situation will call for not only a diversity of cultivar types among the hybrids but also genetic variability within types, as a cushion against new or variant pathogens.