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International Network for the Improvement of Banana and Plantain

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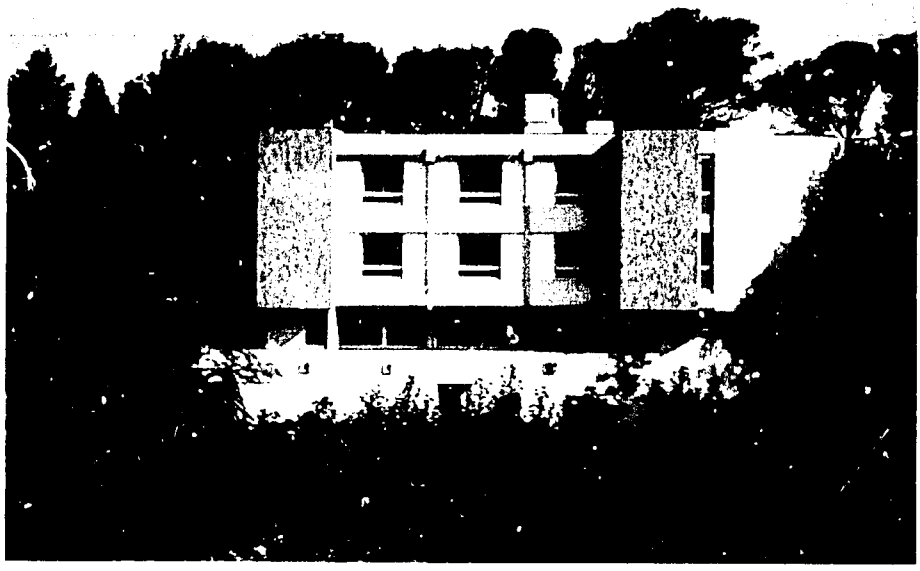
FOREWORD

The Board of Trustees and administration of INIBAP take pleasure in presenting this brief account of the institution's history, operation, and challenges. In reading this publication we hope that some of the excitement engendered in striving to confront and solve difficult problems comes across to you.

INIBAP is a young institution with no model to follow. It is breaking new ground. We therefore solicit your comments and suggestions as to how INIBAP can be more effective in working to improve the lives of the millions of poor families around the world who depend on bananas and plantains for their very existence.

Several individuals and institutions associated with INIBAP have provided illustrations for this booklet. We thank them for their assistance. We also wish to thank Mme. Isabelle Tezenas du Montcel, whose drawing used on the cover and title page is rapidly becoming the INIBAP trademark, along with the logo itself. We thank Mr. Alan M. Fletcher for writing the text and seeing the booklet through to completion. If there are errors or inadequacies in the text and presentation, however, we share the responsibility with Alan.

Edmond A. L. De Langhe
Director



INIBAP headquarters at CIRAD, Montpellier, France. CIRAD photo.

About INIBAP, Bananas, and Plantains

The International Network for the Improvement of Banana and Plantain (INIBAP) was established in November 1984 by a group of donor countries and organizations. Headquarters location is Montpellier, France. INIBAP's general mandate is the improvement of two closely related crops, bananas and plantains, both of which are classified in the botanical genus *Musa*. (Various varieties of bananas are eaten ripe and sweet as a fruit, or cooked green and eaten as a vegetable; plantains are starchy and are roasted, fried, or boiled before being eaten, much as potatoes are prepared.)

INIBAP's specific objectives are:

- to initiate, encourage, support, conduct, and coordinate research aimed at improving the production of bananas and plantains;
- to encourage the collection and exchange of documentation and information relating to bananas and plantains;
- to support training for researchers and technicians from developing countries.

A Little History

Bananas are afflicted by a number of diseases and pests. Few of them actually kill the plants, but they can have devastating effects on production.

One disease, commonly called "black sigatoka", first identified in the South Pacific island of Fiji as recently as 1964, has spread through much of Latin America and is spreading through several African countries. The widely grown varieties of bananas and plantains are susceptible to this destructive disease. As a result of concern over the rapid spread of this disease and the need to develop resistant cultivars as the most feasible control method for small farmers, the second International Conference of the International Association for Research on Plantain and Bananas, held at Ibadan, Nigeria in 1981, passed a resolution requesting that an international breeding program be established, and suggested that the existing banana breeding schemes that were having financial problems could be saved by international funding. The resolution also requested a modification of objectives to include improvement of plantains and cooking bananas.

As a result of this resolution, a committee presented a request to IDRC, which sponsored a meeting of banana breeders and selected scientists in Ottawa in 1982.

A banana grove devastated by black sigatoka disease. Photo by N. Mateo.

This meeting concluded that an international breeding program and a network to enhance and ensure its effectiveness was needed, and requested IDRC to seek support for the breeding programs and the network from the international donor community. This was done at a meeting of potential donor countries and organizations in Washington, D.C. in November 1983. They met in Rome during May 1984 and in Washington during November 1984.

The principal outgrowth of the 1983 meeting was the commissioning of a consultant to produce a report on the feasibility of establishing a banana and plantain research organization. The report made a convincing case for an institution devoted to working on the problems associated with bananas and plantains.

Consultations were held with banana researchers in Asia, East Africa, West Africa, Latin America, and the Caribbean. A steering committee was appointed to consider the consultant's report and recommend further action. On the recommendation of the steering committee, the donor group decided at the November 1984 meeting to proceed with the establishment of INIBAP, with the International Development Research Centre of Canada as the provisional executing agency. Doctor Edmond De Langhe, a professor at the Catholic University of Leuven (Belgium), was appointed first director of INIBAP.

Banana and plantain production is a subject of enormous complexity. Perhaps thousands of varieties are found over the world. Each region of the world has a range of problems and considerations unique to itself. Even within small locales, the range of problems can be large. Because of this great complexity, it was felt that INIBAP should not develop a large centralized research facility and program on the model of the international agricultural research centers that have been so successful with other crops of the developing world. It was decided instead that INIBAP should have a small headquarters organization, with a widely dispersed research network coordinated from headquarters and regional bases.

Worldwide Importance

Bananas and plantains are the staple food for many millions of poor people throughout the developing world. For millions more they comprise a significant portion of the total diet. The loss of bananas and plantains from the tropics would do incalculable harm to countless individuals living marginal lives.

Furthermore, improvements in production could help lift these people out of their marginal existence. Yet, to date, little research has been done on bananas and plantains, compared with other major crops.

Nutritional Value

Bananas and plantains are of great nutritional significance. The easy digestibility of bananas is widely recognized, and they are a rich source of the carbohydrates needed for energy in the human body. Bananas and plantains

Bananas and plantains are staple foods for millions of the world's poorest people. Photo by J. Dhingra.

are also rich in some minerals, notably phosphorus, needed for bone development, iron, and potassium. They are particularly rich in vitamin C and contain significant amounts of several other vitamins. It has been said that humans can live quite well on a diet of bananas and milk.

World Production and Consumption

World production of bananas and plantains is estimated at more than 62 million tons, of which about 19 million tons are grown in Africa. Sixteen million tons are produced in South America and nine million tons in Central America and the Caribbean. Since the world export trade in bananas is only about seven million tons, it is evident that the crop is overwhelmingly more important as a food crop for local consumption than it is as an export commodity. Most of the world banana and plantain production is consumed by the small farmers who grow the plants or is sold in local markets.

In North America and Western Europe, banana consumption averages no more than about 30 grams per person per day, or about one banana a week. In some African countries, however, where bananas are a staple, average per capita daily consumption may exceed one-half kilogram. Millions of people in the countries around the great lakes of eastern Africa consume about 250 kilograms per year. Even in countries with relatively low national consumption figures, millions of people in individual localities may consume bananas and plantains on a scale even larger than that of the great lakes countries.

Of particular relevance to poor people, the cost of producing plantains is lower than that of virtually any other staple crop grown in the humid tropics - lower than rice, maize, yams, or even cassava.

It is difficult to determine the cash value of the crop because little of banana and plantain production enters those parts of economies that are readily studied. But a recent survey of Latin American and Caribbean countries indicates that farm gate prices range from 10 to 20 U.S. cents per kilogram. If these prices are at all indicative of the world situation, the total farm value for world production must be in the range of 10 billion U.S. dollars per year. The importance of bananas and plantains in an individual country is illustrated by Colombia, where the cash value of the crop in 1983 exceeded that of rice and equalled half the value of the coffee crop.

Problems and Challenges

A Small-Farmer's Crop

The word "banana" calls up mental pictures of huge tropical plantations, transport on banana boats, banana republics, and yellow "hands" in the markets of temperate countries. But the well-known export bananas, almost always of the uniform Cavendish group, represent only about a tenth of the world production of bananas and plantains. For the most part bananas are a crop of the back-yard farmer.

Where bananas are grown on large plantations for export, knowledge of culture and production is excellent. Industrial research programs have supported the banana industry for many years. For crops grown in the back yard, however, little research has been done, and little of the plantation technology can be directly applied. The countless local varieties have specific problems, culture is likely to be specific to a relatively small locale, the degree of dependence on bananas and plantains varies with the local society, and small farmers can't afford costly pesticides. Location-specific and variety-specific research is needed, but little attention has been given to small-farm culture up until the present.

Diseases and Pests

Diseases have the potential to eventually exterminate bananas and plantains over vast areas. Most plant scientists know the nightmarish story of Panama disease, which all but eliminated the standard export banana Gros Michel early in the twentieth century. Fortunately, the Cavendish varieties were found to be resistant to the fungus organism that causes the disease. The banana industry was saved by Cavendish bananas. Panama disease continues to be a problem for other varieties, but even worse, a new strain of the fungus, called Race 4, has come on the scene at several places in the world. It attacks Cavendish and other varieties that are safe from the original form of the disease.

It has already been mentioned that alarm over the fungal disease black sigatoka led to the founding of INIBAP. That a devastating disease like

black sigatoka could spread from an isolated island in the South Pacific, to Latin America, and presently to several African countries within a period of twenty years is frightening to contemplate. It also emphasizes the need for safe methods of introducing banana and plantain varieties from one region to another. Research on this rapidly spreading disease is of the highest urgency.

Several other diseases are of major concern. Among them are bunchy top, a virus disease that causes gross distortion of the plant; Moko disease, which causes leaves to wilt; and yellow sigatoka, which causes leaf spotting and browning and ultimate market loss of the fruit crop.

A number of pests also destroy bananas and plantains. Burrowing nematode worms and the larvae of the banana weevil insect, for example, eat into the crowns of plants, drain away the plants' vitality, and sometimes cause mature plants to topple.

Entire books have been written about the diseases and pests of bananas and plantains, but little consideration has been given to how the small farmer can cope with them.

The banana borer weevil and its destructive larva (both much enlarged). Photo by IRFA/CIRAD.

Unexploited Germplasm

Countless varieties of bananas and plantains are known to exist over the world. Several hundred varieties are grown in villages throughout Southeast Asia alone. Many of these varieties are restricted to local zones, and if they have been put into scientific collections at all, they have never been systematically evaluated for their potential use in other parts of the world, or for their possible resistance to the major diseases and pests.

It is generally agreed that the practical solutions to the disease and pest problems of bananas and plantains are the selection of existing resistant varieties and the breeding of new varieties. These require intensive collection of varieties, screening them in different parts of the world, and integrating them into breeding programs.

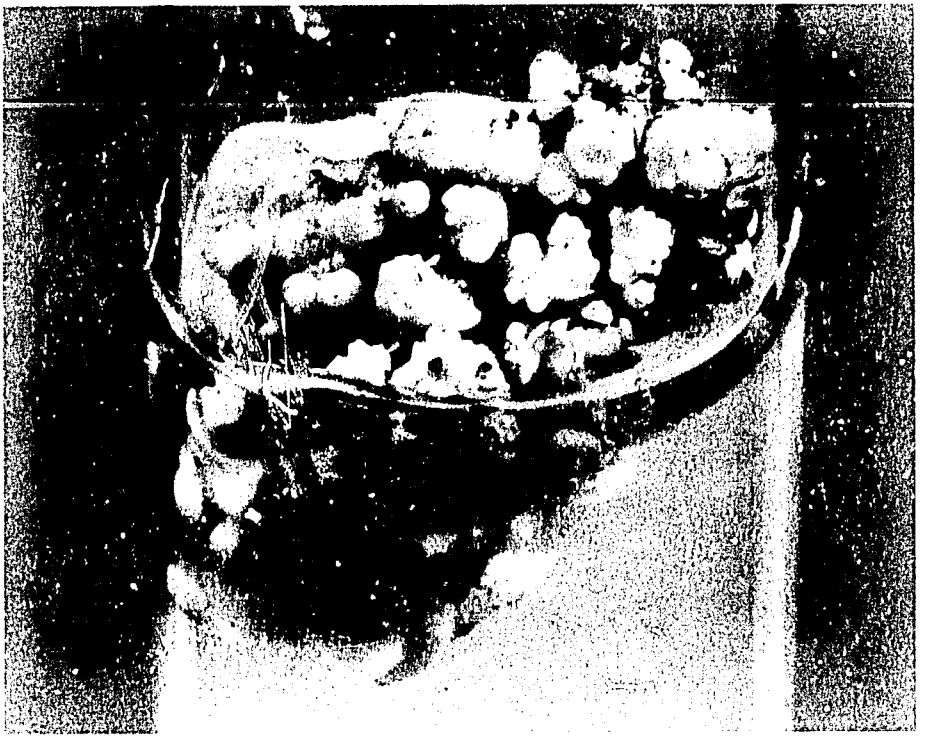
Important collections of natural varieties do exist, however. For example, collections in the Philippines, Jamaica, Brazil, Guadeloupe, and Honduras contain many sweet and starchy varieties with potential value. Further collection and evaluation of varieties, and incorporation of the potentially useful ones into breeding programs, requires organization and support on an international scale.

The Board of Trustees of INIBAP and the supporting donor group consider collection, evaluation, and transfer to be of high priority. Initial transfers of varieties are already under way. The main objectives for the present are: screening in Latin America, the Caribbean, and Africa of starchy bananas from Southeast Asia that are known to be resistant to black sigatoka disease; and introducing relevant varieties into existing breeding programs, for the genetic improvement of the popular starchy bananas and plantains.

In-Vitro Culture (test-tube culture)

Developing and improving *in vitro* methods for reproducing banana and plantain plants is regarded as essential to long-term efforts aimed at improving culture worldwide. For *in vitro* culture the very small growing tip (called a meristem) at the base of the plant stalk is cut off and placed in a test tube or flask partially filled with a gelatin medium containing a carefully formulated mixture of nutrients and plant hormones. Given the right light and temperature conditions, the plant tissue begins to grow as a formless mass. Eventually the mass develops numbers of tiny nodules over its surface. These nodules can be removed and placed in flasks containing a different combination of nutrients and hormones. Under these conditions, each nodule grows into a plantlet. With further chemical manipulation they can be induced to grow roots, and the rooted plantlets can be placed in soil, where they grow into mature plants.

Test-tube culture is useful in several ways. First, we have already mentioned the high risk of spreading disease when plants are carried around the world. Black sigatoka disease, for example, likely came to America and Africa via plants introduced from Southeast Asia. Except for the viral bunchy top disease, it is relatively easy to screen tissue or plantlets to be certain they are disease free. The living material is sent for a period of observation to a laboratory in a country where bananas are not grown. When it is certified



Cultured banana tissue, showing nodules, each of which can be removed and grown into a plantlet. Photo courtesy of Catholic University of Leuven.

disease free, the material is sent on to its final destination. An operation of this complexity requires detailed coordination by an institution like INIBAP. Transit laboratories organized and coordinated by INIBAP are in operation at the Catholic University of Leuven, Belgium, and at the CIRAD laboratories in Montpellier, France. Belgium and France are "neutral" countries, where bananas and plantains are not normally grown.

Second, test-tube cultured plantlets can be easily transported. Hundreds of plantlets can be air shipped in a small container to far-away places, where they can be planted and grown to maturity, for direct use or for use in local breeding programs.

Third, there are encouraging indications that it may be practical to produce new banana and plantain varieties in a test tube or flask by what is called somaclonal variation. Somaclonal variation takes advantage of the fact that plant tissues grown under certain conditions do show some variation from the parent plant. Of course, this phenomenon is a curse if you want to preserve a variety, but it may also give rise to genetic variations that could prove useful.

This developing technology deserves substantial support and central coor-

dination. A major new project, funded by IDRC of Canada, to be conducted and coordinated by CATIE, promises to shed highly significant new light on the potential of somaclonal variation in banana and plantain breeding.

Somatic embryogenesis may have greater potential, however. Biological engineering techniques--like haploid progeny, DNA recombination, and protoplast fusion-- at the cellular level can lead to profound genetic modifications of great value. Test-tube embryos can be grown from the cells so modified. This technique could have great potential for working with plants like bananas and plantains, which rarely produce seeds and usually have sterile male flowers. Somatic embryogenesis of bananas and plantains has been reported in laboratories in the U.S., Belgium, France, and Colombia, but much more research will be needed before the process can be used in massive, controlled breeding programs. Somatic embryogenesis of bananas and plantains can be a powerful tool in producing disease-resistant and improved varieties.

A Musa *genebank in a laboratory of the Catholic University of Leuven, Belgium.*

Breeding New Varieties

Breeding new banana and plantain varieties by classical plant-breeding methods is extremely difficult, because one of the banana's most appealing eating attributes is an obstacle to the plant breeder: bananas normally don't produce seeds; but the seed is the plant breeder's tool! Fortunately for the farmer, bananas and plantains are easily multiplied by removing and replanting the sprouts produced by mature plants; but sprouts are identical to the parent (they are called clones). They offer no hope for improved varieties.

There is an urgent need for strategic research that can lead to breeding new varieties of a plant that normally produces no seeds. One promising avenue of research is utilizing wild or other varieties that may not have good eating qualities but do produce viable pollen or seeds. If desirable characteristics—like disease resistance—can be combined in new plants, it should be possible to eventually cross these plants with standard varieties that have all of the desirable eating qualities.

Some success has been obtained with this procedure, but it requires a huge amount of effort and patience to get a small product: one "good" seed may be produced in 10,000 fruit!

A 1986 INIBAP-organized workshop established an overall breeding strategy for bananas and plantains.

A Babel of Names

One of the basic principles for all of science is orderliness. Without order science cannot function. Yet, disorder and confusion in names exist at all levels with bananas and plantains. Even the word plantain causes confusion because, in both French and English, common weeds (genus *Plantago*) are also called by that name, and in some Spanish-speaking countries the word "platano" is applied to all kinds of bananas, not just the starchy cooking varieties.

Confusion exists at three levels. First, at the local level, the common names for the same variety may be different from tribe to tribe or from one ethnic group to another. Second, there is no clear, internationally accepted classification for banana and plantain varieties, with the result that it is difficult for a scientist in one part of the world to be certain he or she is working with the same variety as a scientist in some other part. Third, there are no universally accepted standards for the scientific names of banana and plantain species. Yet, a useful system, with definitions, was established by British taxonomists nearly 50 years ago. The widely used biochemical classification procedures have not as yet been applied to the genus *Musa*.

INIBAP has a clear role in the clarification of the whole nomenclature problem. The International Board for Plant Genetic Resources (IBPGR) is actively working on the description of *Musa* species. Collaboration between INIBAP and IBPGR will be most beneficial. Several institutes active in information and documentation systems are interested in setting up a computerized databank system that would facilitate collecting and organizing

A promising diploid banana variety. Photo courtesy of Banana Board of Jamaica.

the myriad scientific and common names used. Among them, UPEB (Panama) is already well along in developing a *Musa* thesaurus.

In 1987 INIBAP organized a workshop on information and documentation. An outgrowth of this workshop was the formation of a committee, part of whose responsibility is to work toward a common terminology for these plants.

Highland Bananas

A large group of banana varieties exists in the highlands of eastern Africa that have no counterparts in any other region of the world. A few of them are dessert varieties, but most are either starchy cooking types or astringent varieties used in making a nutritious fermented beverage. Highland bananas are well adapted to altitudes ranging from 1000 to 2000 meters, where they are grown wherever there is sufficient rainfall.

Highland bananas have never been systematically studied, in particular for how they may grow in other parts of the tropical world. It is possible that they might produce well even in lowland conditions. Hence, they are believed to have a vast potential.

How highland bananas are affected by the major banana diseases and pests is unknown. But boring weevils are widespread in the region, and the local people are convinced that some varieties are tolerant to weevil infestation. Some varieties are also believed to be tolerant to nematodes. In addition to evaluating this important group for their suitability for other regions, they should be studied for their response to the well-known diseases and pests.

INIBAP has taken up the task of evaluating the highland bananas for various situations in all parts of the world. With the collaboration of IRAZ (Burundi), which functions as a regional base of INIBAP, a number of highland banana cultivars have been introduced at IITA Onne (Nigeria), to study them for their response to black sigatoka disease.

Ensete -- Ethiopia's Crop

Ethiopia is unique in having two staple food crops that are grown and consumed nowhere else in the world: a small-seeded grain called teff and a close relative of the banana called *ensete* or *enset*. INIBAP has made a commitment to work with ensete because more than eight million Ethiopians depend on it as a major source of carbohydrate.

The food from ensete is obtained from the starchy crown at the base of the plant and from the pseudostem. The starchy pulp, laboriously removed by scraping and beating, is fermented in pits dug into the ground, where it is stored for several years.

INIBAP is also investigating ways of introducing and encouraging banana and plantain cultivation in Ethiopia, because they are presently little grown in the country; national demand for bananas exceeds the national production.

The INIBAP Concept

The organization of INIBAP is unique. There was no model for it anywhere in the world. Because the challenges of banana and plantain research are so highly location specific, it was concluded from the outset that a large central research facility would be inadequate and inappropriate.

INIBAP has, and will continue to have, a small central administrative, scientific, and support cadre, with most of the actual work being done through regional networks. Wherever possible, existing institutions and facilities are utilized. The INIBAP concept also encompasses banana and plantain research in developing-country national programs and research conducted in the developed countries.

INIBAP has been designed to be a rather decentralized, or at least a highly deconcentrated, organization, for which the term "network" fits fairly well. It is a structured assembly of **regional networks,** in which **thematic research activities** (such as genetic improvement, tissue culture research, plant pathology research, and taxonomic studies) can progress in an orderly manner worldwide. While the regional networks form the operational core of INIBAP, care is taken to ensure efficient intraregional and interregional exchange of knowledge, material, and methodologies.

Mode of Operation

Each regional network has a steering committee composed of participants in national or regional programs, and a regional coordinator. The regional coordinator provides the services required for the functioning of the regional network.

Interregional coordination is carried out at the Montpellier headquarters. The director, assisted by a global coordinator for information/documentation and a senior technical advisor, is advised by technical committees composed wherever possible of leaders or representatives of the various programs over the world. Montpellier is a particularly good location for INIBAP because the important French research on banana and plantain is centered there, at CIRAD.

Most important in all of these efforts, the donors will be provided with an opportunity to oversee the three contributory channels through which they may be participating: their bilateral contributions to national research programs; their support of regional or worldwide programs; and their contribution to the core operation of INIBAP.

The Regional Networks

At the time of this writing, regional networks were being formed and put into operation. Each network is to have a regional coordinator, whose responsibilities are to:

1. help national and regional programs to establish and implement research priorities;

2. introduce, maintain, and classify genetic material in order to facilitate its exchange;
3. assist national programs and participate in the establishment and analysis of regional and global trials of new and improved cultivars;
4. support national programs and participate in banana-based farming systems and socioeconomic studies associated with the program;
5. promote the dissemination of documentation and information;
6. provide training courses for the staff of national programs;
7. identify donors and assist countries in the development of proposals for donor support.

Regional networks are considered to be both the recipients and the sources of new knowledge.

The link between the regional coordinator and the national research programs is to be assured by a steering committee representing the national programs.

Regional Network for Eastern Africa based at IRAZ in Burundi. This network is expected to be built up during 1987, with a steering committee formed and a regional coordinator functioning by the end of the year. Within this network, the International Centre of Insect Physiology and Ecology (ICIPE) in Nairobi is commencing studies on the biology of the banana weevil.

Tissue-cultured identical young plantain plants ready for planting in the field. Photo courtesy of IITA.

Regional Network for West and Central Africa. The International Fund for Agricultural Development (IFAD) is forming bilateral research agreements with individual national programs here, but IFAD considers that a strong regional effort is also required. The Onne station of the International Institute for Tropical Agriculture (IITA) in Nigeria has been participating in the germplasm activities of INIBAP, and IITA will likely become the operational base of this network. The results of a recent INIBAP mission in this region indicate that, with the anticipated participation of CIRAD, of France, there is an opportunity to build a program that will cover most of the research activities on plantain.

Regional Network for Latin America and the Caribbean. The regional banana researchers' organization ACORBAT, whose history goes back to 1964, has long recognized a need for strengthening and organization of regional activities. At a special meeting in June 1986, called by INIBAP, this need was confirmed, and the proposed networking principle, with a regional base at CATIE, was accepted. CATIE, with its historical emphasis on commercial banana production, has long recognized the need for internationalizing research and breeding. A steering committee was formed in 1987, and this network is presently well ahead of all other regional networks in its conception and organization.

Regional Network for Southeast Asia and the Pacific. This regional network is expected to be organized in 1987, with its base located at Davao, on the island of Mindanao in the Philippines, where substantial research on bananas is presently being conducted. Close cooperation with laboratories in Australia is anticipated.

Germplasm Exchange

Worldwide Activities. At the time of this writing substantial movement of banana and plantain germplasm was already under way. It serves to illustrate how INIBAP, with its regional networks, will become the focus of distributing the countless banana and plantain varieties around the world. For example, thirty varieties have been passed by Brazil through the transit center in Montpellier to Guadeloupe and Cameroon. About 40 cultivars from different African countries are in transit through Leuven for ultimate delivery to the Onne station of IITA. Exchange of 20 plantain cultivars between IITA and Nyombe has taken place through Leuven. Six highland cultivars from East Africa were passed through Leuven and are under observation at IITA Onne, and exchanges between Onne and CATIE have been initiated.

To minimize the likelihood of introducing diseases and pests along with germplasm, the actual transit operation takes place as follows. The *in vitro* material is sent to one of the transit laboratories, where it is multiplied and grown under greenhouse conditions. An alternative is to send suckers, from which *in vitro* material is taken and multiplied. If, after three to six months, no disease symptoms are observed, corresponding *in vitro* duplicates are sent to the regional base, where they are grown in the field, preferably under the supervision of the local plant quarantine service.

Rooted plantlets ready to be put in individual pots with soil. Photo courtesy of IRFA/CIRAD.

Information and Documentation

The technical literature on bananas and plantains is presently collected in at least six documentation services. However, there appear to be many gaps in the collection of the non-formal literature on these plants. There is a need for an international system that will make all of the literature on bananas and plantains available to all banana scientists in all parts of the world.

INIBAP organized and held a special workshop in June 1987 to work for a fluent system that will fit with the networking concept. The cosponsors of the workshop, CTA and IDRC, are both well known for their experience in this area. INIBAP is working on the information and documentation problem at both the regional and worldwide levels.

Information and documentation activities are considered to be perhaps the most important work of INIBAP, since these activities cut across all other aspects of INIBAP's program, influencing to a large extent how effectively everything else can be carried out.

An ornamental banana cousin, Musa coccinea.

One of the key responsibilities of the regional coordinator is to "promote the dissemination of documentation and information". Because the flow of information ranges from interchanges among local scientists to communication among national programs to contact with banana and plantain research in the developed countries, INIBAP must consider the best way to structure the flow of information and documentation so that responsibilities are appropriately divided between the regional programs and the directorate. IDRC will be the principal donor to INIBAP's information and documentation program.

Coordinating Research in Support of the Networks. INIBAP is taking the initiative to coordinate and strengthen research of worldwide relevance in these areas: genetic improvement of bananas and plantains, rapid indexing methods for bunchy-top disease, and chemotaxonomic identification of cultivars and of somaclonal variation (discussed earlier).

INIBAP's Donors

The ultimate vote of approval for an international development institution is in the support of its donors. The Board and Administration of INIBAP thank its donors, with whose generous support INIBAP has progressed in a brief period of time to become a significant force in the struggle to improve the nutritional status of the world's poor and hungry.

Our donors in 1987 were:

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Cooperation for Development in Africa (Canada)

Australian Development Assistance Bureau

Australian Centre for International Agricultural Research

U.S. Agency for International Development

European Economic Community (Cooperation for Technical Agriculture - CTA)

International Fund for Agricultural Development

Institut de Recherches sur les Fruits et Legumes (France)

Centre de Cooperation Internationale en Recherche Agronomique (France)

Institut pour la Recherche Agronomique et Zootechnique (Zaïre, Rwanda, Burundi)

International Institute for Tropical Agriculture

Centro Agronomico Tropical de Investigación y Enseñanza

ACRONYMS USED IN THIS BOOKLET

ACORBAT	Association pour la Coopération des Recherches Bananières aux Antilles et en Amerique Tropicale
CATIE	Centro Agronomico Tropical de Investigación y Enseñanza
CIRAD	Centre de Cooperation Internationale en Recherche Agronomique pour le Développement (France)
CTA	Technical Centre for Agricultural and Rural Cooperation (European Economic Community)
IBPGR	International Board for Plant Genetic Resources
ICIPE	International Centre of Insect Physiology and Ecology
IDRC	International Development Research Centre (Canada)
IFAD	International Fund for Agricultural Development
IITA	International Institute of Tropical Agriculture
INIBAP	International Network for the Improvement of Banana and Plantain
IRAZ	Institut pour la Recherche Agronomique et Zootechnique (Zaïre, Rwanda, Burundi)
UPEB	Unión de Países Exportadores de Bánano