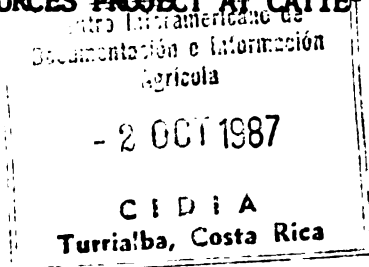


## THE PLANT GENETIC RESOURCES PROJECT AT CATIE, TURRIALBA, COSTA RICA



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### BRIEF HISTORY

During a Conference of experts in Genetic Resources, held in 1972 at Beltsville, Maryland, USA, it was recommended that a genebank for Central America and the Caribbean region be established. In 1973, a group of specialists of the region and FAO, recommended the establishment of this genebank at CATIE, Turrialba. CATIE requested the cooperation of the Federal Republic of Germany through the Ministry of Economic Cooperation (BMZ). The German government entrusted the German Agency for Technical Cooperation (GTZ) as the executioner of this project, which began work on July 1, 1976.

### OBJECTIVES

The main objectives are the following:

- To collect, conserve, evaluate, document and distribute the genetic resources of native important crops, including their weedy and wild relatives;
- To promote and strengthen national programmes of the region in genetic resources through technical advice, training and the exchange of materials and information;
- To participate in the efforts of genetic conservation with other na-

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tional and international institutions;

- To supply breeding, evaluation and development programmes with new germplasm of traditional and new crops.

The following activities are linked with the above mentioned responsibilities:

- Exploration of species diversity in natural habitats in order to decide necessary measures to be taken;
- Collection of material in danger of extinction;
- Long-term conservation of collected material in the form of seeds or by maintenance of living collections;
- Characterization of material in order to predetermine its potential usefulness for breeding programmes or direct utilization by farmers;
- Exchange of material with other institutions.

## ORGANIZATION

Figure 1 shows the organization of the project, with 35 people working on different sections.

## LIVING COLLECTIONS

In Turrialba, the project conserves different miscellaneous collections of tropical crops. These collections are constantly being expanded to accommodate new material gathered in the Central American countries, Mexico and Panama.

At present the existing collections occupy some 40 hectares and, in

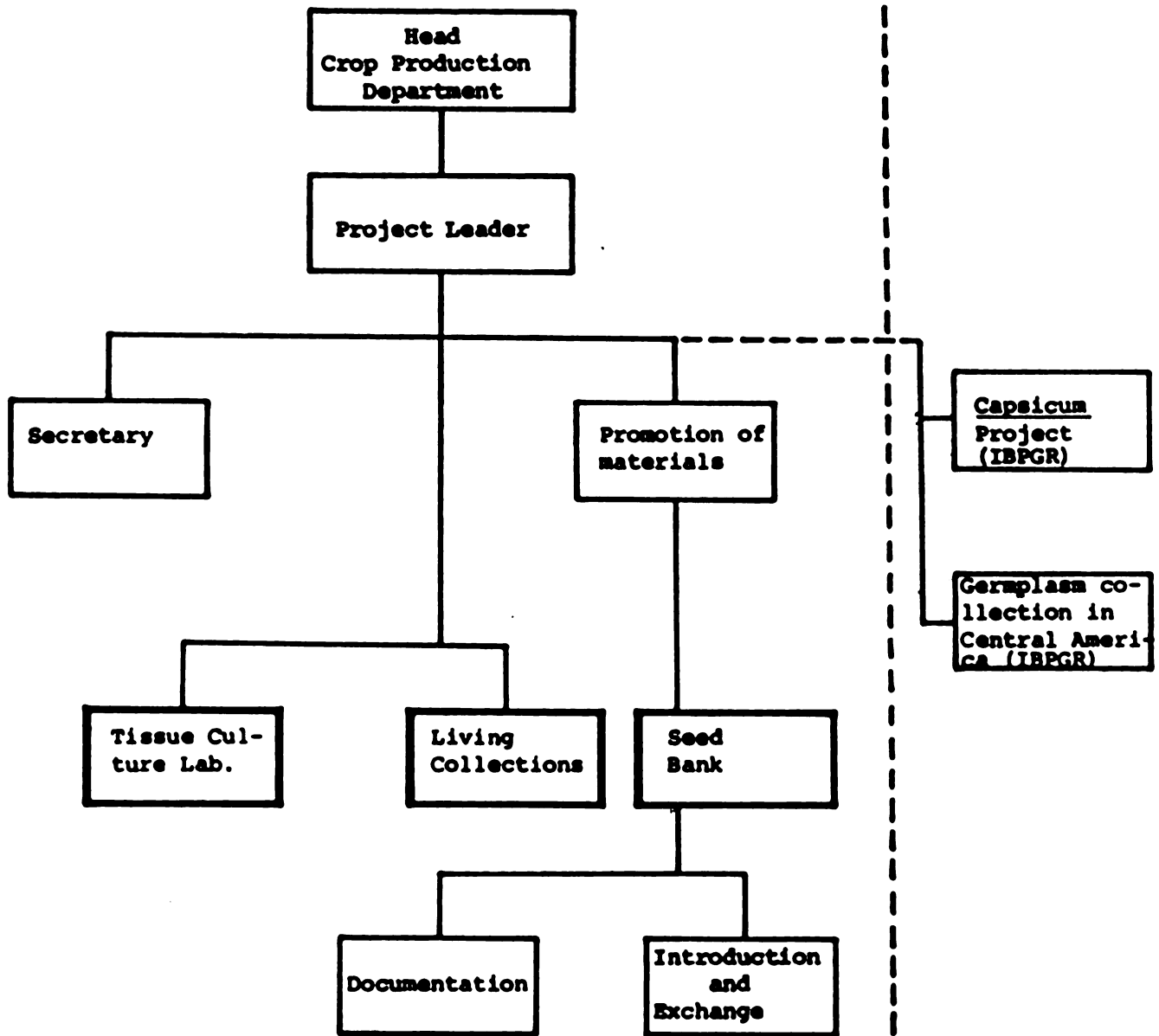


Figure 1. Organization of the Plant Genetic Resources Project.

all, there are 335 species. Some of these species are represented by only one or two individuals. Just 21 species are being characterized and evaluated at this time. The rest of the species are utilized only for conservation but possible, in the future, will be studied more intently.

The main purpose of this characterization is to select materials with promising economic value and to promote its usefulness to farmers.

Table 1 shows the species which are being studied in this section of the Project.

Table 1. Species from the living collection of the project, with potential economic value, which are being studied.

| Botanical name                | Common name   |
|-------------------------------|---------------|
| <i>Annona muricata</i>        |               |
| <i>Annona reticulata</i>      |               |
| <i>Averrhoa carambola</i>     | Star fruit    |
| <i>Bactris gasipaes</i>       | Peach palm    |
| <i>Bixa orellana</i>          | Annatto       |
| <i>Chrysophyllum caimito</i>  |               |
| <i>Chrysophyllum cainito</i>  |               |
| <i>Coffea</i> spp. *          | Coffee        |
| <i>Dioscorea</i> spp.         | Yam           |
| <i>Ipomoea batatas</i>        | Sweet potato  |
| <i>Macadamia integrifolia</i> | Macadamia nut |
| <i>Macadamia tetraphylla</i>  | Macadamia nut |
| <i>Manihot esculenta</i>      | Cassava       |
| <i>Musa</i> sp.               | Plantain      |
| <i>Passiflora edulis</i>      | Passion fruit |
| <i>Piper nigrum</i>           | Black pepper  |
| <i>Pouteria sapota</i>        |               |
| <i>Pouteria campechiana</i>   |               |

| <u>Botanical name</u> | <u>Common name</u> |
|-----------------------|--------------------|
| Theobroma cacao*      | Cocoa              |
| Vainilla planifolia   | Vanilla            |
| Xanthosoma spp.       | Coco yam           |

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\* Entrusted to special programmes of CATIE.

### IN VITRO COLLECTIONS

The project has a tissue culture Laboratory to preserve the variability of different tropical crops and exchange materials with other national or international institutions. Tissue culture conservation is the best and most economic method to maintain some species that produce recalcitrant seeds or are very expensive to preserve in living collections.

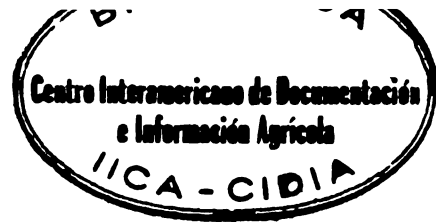
This section of the Project works mainly with species shown on Table 2.

Table 2. Species of interest which are conserved in the Tissue Culture Laboratory

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| <u>Botanical name</u>  | <u>Common name</u> |
|------------------------|--------------------|
| 1. Colocasia esculenta | Taro               |
| 2. Dioscorea spp.      | Yam                |
| 3. Ipomoea batatas     | Sweet potato       |
| 4. Manihot esculenta   | Cassava            |
| 5. Musa spp.           | Plantain           |
| 6. Vainilla planifolia | Vanilla bean       |
| 7. Xanthosoma spp.     | Coco yam           |

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Recently, the project started working with Bactris gasipaes (peach palm), looking for a more efficient and economic methodology for conservation and multiplication of this species.

### DOCUMENTATION

This is a very important section which maintains complete records on all aspects of the germplasm utilized by the project. Through this section information on germplasm conservation is supplied promptly to those who request it, in any country of the world.

In Turrialba data are stored on a IBM 4331 computer model. In this way print-out lists can be supplied to requestees rapidly.

### INTRODUCTION AND EXCHANGE

Introduction and exchange of materials are important activities. Constantly, the project is introducing new materials of interest, in particular from the Central American and Mexican region, for increasing the variability and value of existing collections. At the same time, it is exchanging materials with other institutions or sending germplasm samples to interested persons.

### SEED BANK

This section of the project started february 1977. Its main objectives are considered:

- To establish the necessary infrastructure for short and long term seed storage, considering also the requeriments of a regional cooperation for the future,

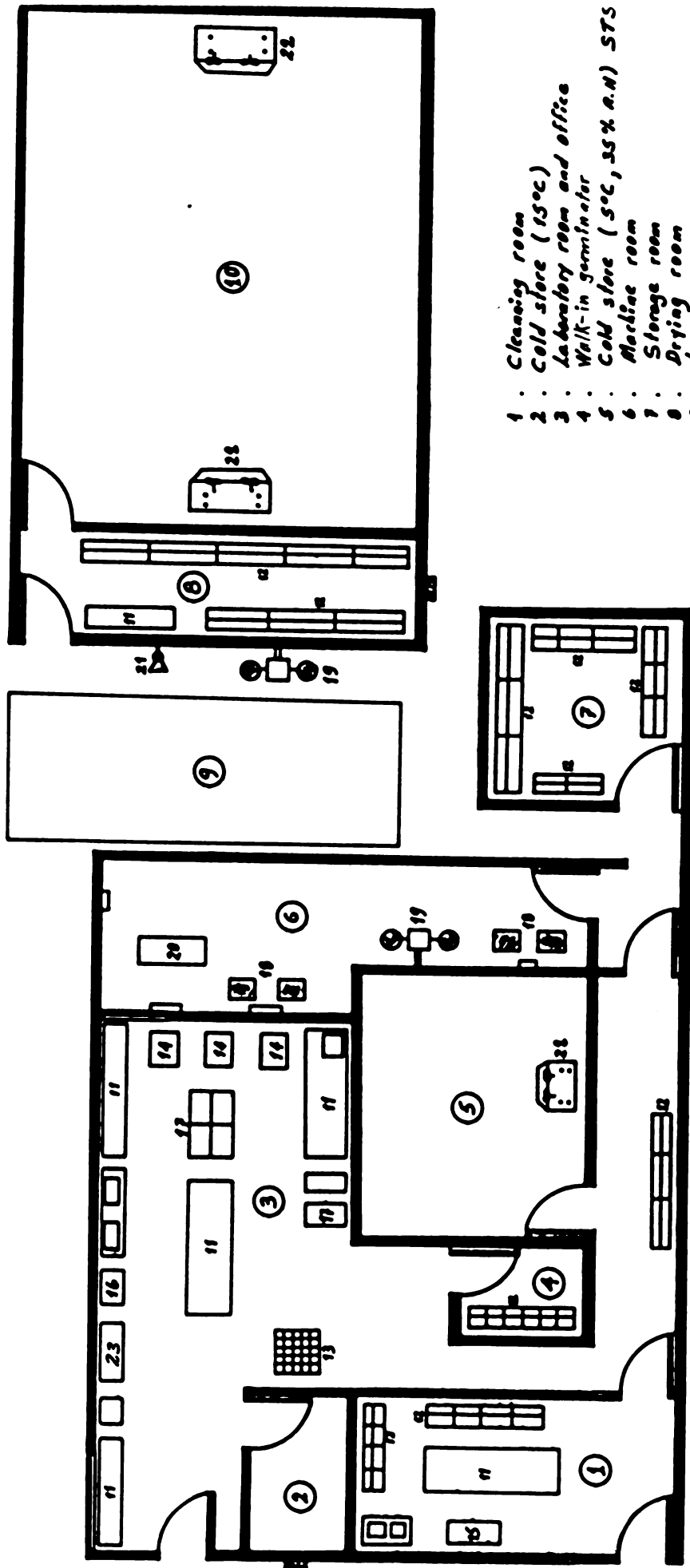
- To organize the maintenance of the seed collections in a way, that the danger of mistakes and losses is minimized,
- To establish laboratory facilities and to carry out experiments to investigate the requirements for seed storage and germination of some tropical species on which information is lacking,
- To train auxiliary personnel as well as technical personnel of the region,
- To exchange seed samples with interested national and international institutions.

#### FACILITIES

Facilities available in Turrialba for seed storage include:

- A cleaning room where seed is inspected and cleaned,
- A cold store of 55 m<sup>3</sup> capacity maintained at 5°C ± 1°C and 30-40% relative humidity (rh), for short term storage,
- A cold store of 23 m<sup>3</sup> capacity maintained at 15°C ± 2°C and 60-70% rh used for short term storage of seeds such as coffee, Bactris gasipaes and others,
- A cold store of 110 m<sup>3</sup> maintained at -17°C for long term storage,
- A drying room kept at 15-20% rh where the moisture content of the seed can be adjusted to any desired level and where seed is divided and packed for long term storage,
- A laboratory room for testing seeds.

Figure 2 shows the distribution of the seed bank.



1. Cleaning room
2. Cold store (15°C)
3. Laboratory room and office
4. Walk-in refrigerator
5. Cold store (5°C, 35% a.h.) STS
6. Machine room
7. Storage room
8. Drying room
9. Lawn
10. Cold store (-11°C) LTS
11. Tables
12. Shelves
13. Two-way thermogradiat plate
14. Incubators
15. Blower
16. Water still
17. Geminolon cabinets
18. Compressors
19. Air-dehumidifiers
20. Electric plant
21. Alarm bell
22. Fans
23. Seed herbarium

Fig. 2. Diagram plan of the seed bank at CARIK, Torrialba

(Approximate scale 1 m)



## ORGANIZATION OF STORAGE

All receipts and releases of germplasm are recorded on computer. Additionally, seed samples of each accession are conserved in small glasses for teaching and identification purposes (seed herbarium).

For short term storage, small quantities of seeds are deposited into paper bags, plastic bags or glasses at 5°C and 30-40% rh. These seed lots should be used for multiplication within a few years.

For long term storage, seeds are dried down to a moisture content of 5 to 6% (according to the species). Later, samples are divided into sub-samples of about 100 to 400 seeds each, and sealed hermetically in laminated foil bags. Before storing the seed in the cold store, germination, seed moisture content and sample identify are checked. The respective data are stored in the computer.

Every 5 or 6 years the viability of the stored seeds have to be checked. Depending on the experience gained throughout the ongoing years, extension of these intervals should be considered. When the viability is considered low (less than 80%), the respective seed lot has to be rejuvenated in the field or in greenhouses.

## LABORATORY FACILITIES

Better seed laboratory facilities were made available on january 1979. The equipment includes:

- 4 small Jacobsen germinators
- an experimental germinator
- 3 incubators
- an oven with forced air ventilation
- an analytical balance
- a precision balance
- a refrigerator
- equipment for seed cleaning

- a heat sealer for laminated foil bags
- a two-way thermogradient plate
- 2 blowers
- a distilled water equipment
- desiccators
- a walk-in germinator for the germination of larger seeds that have to be germinated in sand (for instance, coffee, cocoa, Bactris gasipaes, Annona sp. and others).

The laboratory has an electric power plant which provides the whole system with electric current for use during power shortages. A control unit switches the plant on automatically when the power fails or if the voltage varies by more than 10%.

A room for seed preparation, and a laboratory for routine seed testing as well as for experimental work, are located close to the storage units.

#### ORGANIZATION OF THE WORK FOR SEED STORAGE

Figure 3 shows the sequence followed for seed storage at CATIE, Turrialba.

When seeds are received from collection trips from recent introductions, they are cleaned, pre-dried and registered. As they normally come in small quantities insufficient for long term storage, they are kept in the short term store until they can be multiplied. However, a sample of a few seeds from each accession is preserved in a seed herbarium for identification purposes.

#### SPECIES CONSERVED IN COLD STORES AS SEED COLLECTIONS

Table 3 shows the species which are conserved as seed collections in both, short and long term storage.

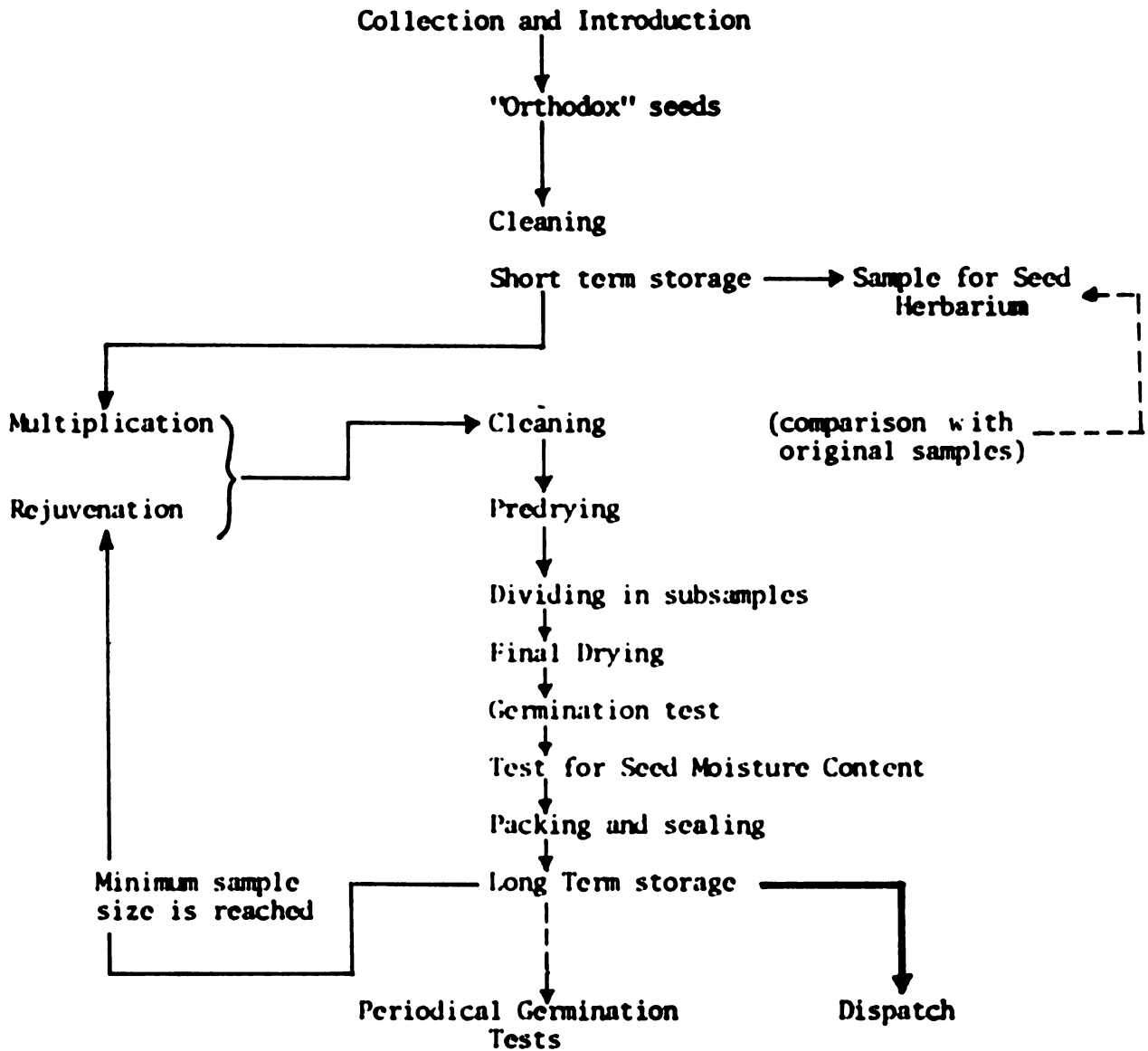


Figure 3. Activities involved in the maintenance of seed collections at CATIE.

Table 3. Species conserved as seed collections in the seedbank, CATIE.

| Species           | Number of accessions |
|-------------------|----------------------|
| Cucurbita spp.    | 2032                 |
| Capsicum spp.     | 908                  |
| Phaseolus spp.    | 1054                 |
| Amaranthus spp.   | 240                  |
| Vigna spp.        | 77                   |
| Lycopersicon spp. | 290                  |
| Solanum spp.      | 56                   |
| Zea mays          | 93                   |
| Other species     | 48                   |

The majority of these accessions were collected in central american countries, with some of them coming from south american countries.

#### FUTURE PLANS

The main emphasis will be oriented to characterization and preliminary evaluation of material with promising economic value the objective being to select the best representatives. The selected material will be used for distribution to interested research programmes and farmers. Activities will be developed to study more intently tropical fruit trees, root crops, agroforestry trees, plantains and spices. Additionally, new methods for tropical seed conservation, on which information is still lacking will be developed. At present, new methods to better conserve guava (Psidium guajava) and annatto (Bixa orellana) are being studied.

## QUARANTINE REQUIREMENTS IN COSTA RICA

The Costa Rican authorities require a phytosanitary certificate for introducing any kind of material from all the countries of the world. An official Quarantine Service is in operation for inspecting material that arrives from other countries. When pests and diseases are detected, samples are destroyed promptly. When mailing germplasm or any other material outside of Costa Rica, it is necessary to obtain an export permit and a phytosanitary certificate from the respective authorities.

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