Observations about the distribution of cassava germplasm from an international collection.

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Introduction

The distribution of superior germplasm across the tropics is often the most powerful way to improve agricultural productivity. Plant quarantine regulations for cassava made clear in the 1980s that only in vitro plants would be accepted for distribution worldwide, and technical guidelines for the safe movement of cassava germplasm were produced (Frison & Feliu 1991). Over the last years, the *in vitro* technique has thus been used to distribute selected germplasm from CIAT to national programs, but also to introduce into CIAT large numbers of new germplasm collected in the crop's major centers of variability (Figure 1).

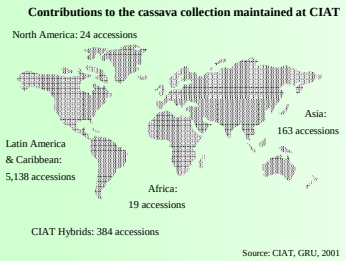


Figure 1. Status of the cassava germplasm collection conserved at GRU-CIAT.

Methodology for movement (introduction and distribution) of cassava germplasm

The field gene bank maintained at CIAT was converted into an *in vitro* gene bank (presently with 5,728 clones designated to FAO). Sterile cultures in artificial media have been established from disease-free mother plants produced by means of thermotherapy and meristem-tip culture and tested for cassava viruses.

The transfer process comprise the following steps:

- ❑ Receipt and handling of institutional requests.
- ❑ Multiplication of disease-free clones.
- ❑ Evaluation, packing and shipment of cultures.
- ❑ Handling of cultures at the receiving end.
- ❑ Release of materials (Figure 2)

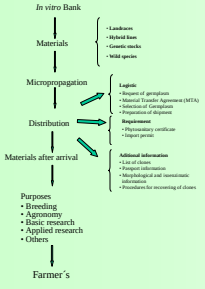


Figure 2. Flow diagram showing utilization of cassava meristem culture for the exhange of germpalsm in clonal form.

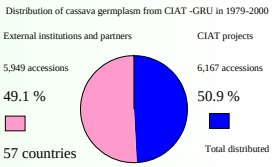
The cultures for shipment consist of well-rooted plantlets in an agar medium, contained in properly capped 16 x 125-mm test tubes and labeled with the clone's name (Roca et al. 1989). The test tubes are packed in a bag with: a) printed MTA (Material Transfer Agreement), b) phytosanitary certificate, issued by the Colombian authorities, c) a list of the material, d) instructions on how to handle the cultures after arrival, e) passport information, f) morphological and biochemical evaluation, and g) import permit (Figure 3).

Figure 3. Transfer of cassava germplasm in vitro.

Results

From 1979 to 2000, CIAT has shipped *in vitro* plantlets to 57 countries, with a total of 12,116 cassava accessions distributed, out of which 4,315 are different accessions. The principal recipient were CIAT Projects, who received 50.9 % of distributed accessions, while external institutions and partners received 49,1 % (Figure 4a). As compared to the other collections (9.6 times for the bean collection and 4.7 times for the forage collection), CIAT GRU has distributed twice the size of the cassava collection; this lower rate can be explained by the highly specialized type of distribution. In order to make the distribution successful, CIAT GRU has trained 53 Professionals and participated into 16 short courses.

Latin America and the Caribbean which have contributed 89% of the clonal collection have received 73% of the external shipments. The top five recipients (with 57% of total distributed outside) were Brazil, Colombia, Cuba, Peru and USA (Figure 4b). Although external institutions could still make wider use of the cassava collection, these figures indicate a relatively high rate of utilization. Three shipments of cassava towards Peru, Paraguay, and Ecuador were done as part of our efforts to restore germplasm to countries.



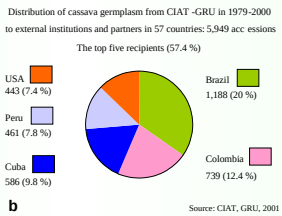
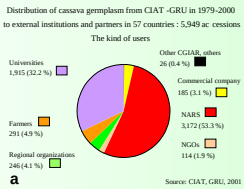


Figure 4a-b. Distribution of germplasm during the period 1979-2000.

External users are mainly national institutions of agricultural research (55.2%), universities (35.1%), regional organizations (4.4%), commercial companies (3.3%), NGOs (1.5%), other CGIAR centers and other institutions (e.g. Epcot Center) (0.4%)(Figure 5a).

The main purposes of external germplasm requests were: i) plant breeding to introduce genes into new hybrids, ii) evaluation of clones in other countries (agronomy), iii) applied research (pathology, entomology, etc), iv) basic research (cryopreservation, embryogenesis, general biochemistry, etc), and v) training (Figure 5b).



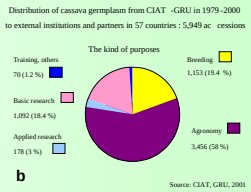


Figure 5a-b. Institutions and purposes of distribution of in vitro cassava germplasm.

CIAT projects have used the cassava collection for breeding (81.8%), basic research (10.3%) (for instance the cassava gene mapping project), applied research (5.9%), and for training and other purposes (e.g. exhibitions) (less than 1% each) (Figure 6). The material distributed was diverse, since the top five clones (three bred lines and two landraces) were distributed less than 140 times each on average. These five clones were released by the national programs as commercial materials (Figure 7).

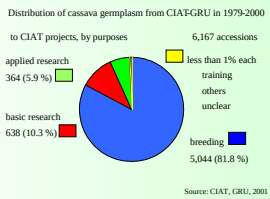


Figure 6. Distribution of in vitro cassava germplasm in CIAT.

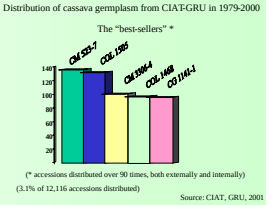


Figure 7. Clonal accessions most distributed by CIAT GRU.

Acknowledgements

These distribution and related research activities have been supported by grants of CIAT core budget, the International Board for Plant Genetic Resources, the Systemwide Programme on Information for Plant Genetic Resources, and the Ministerio de Agricultura y Desarrollo Rural of Colombia.

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Póster presented at the CBN-V, Saint Louis, Missouri, USA, 4-9 November 2001.