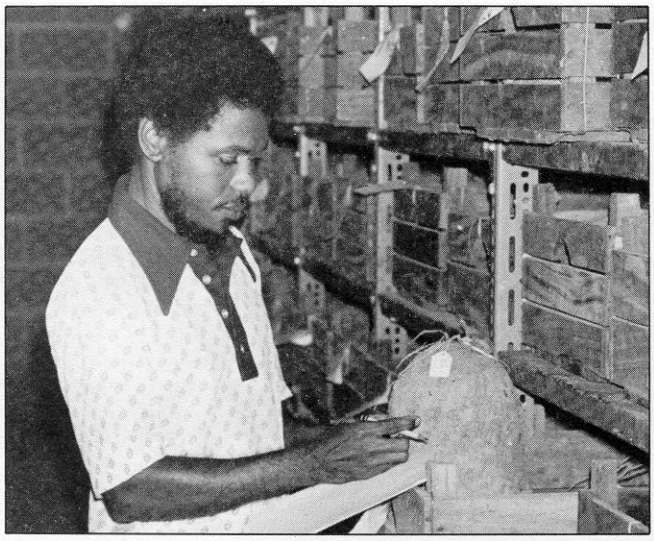
Roots and tubers (right) are bulky material that need to be planted every year. The Tissue Culture Lab at IITA has developed a safe storage in vitro of roots and tubers, by means of the meristem-tip culture method. (Far right) About 400 clones of sweet potato grow slowly in their test tubes and require less space and time than reproduction in the field.

Photos: IITA



BANKING SEEDS

GUN LUNDBORG

It was some 60 years ago that Russian geneticist N.I. Vavilov revealed the existence of "reservoirs of genetic variability" in different parts of the world. One was identified in Ethiopia, another was later discovered in West Africa by other geneticists: 12 centres, all in the tropics, were identified.

Once the world was a vast reservoir of genetic variation. In centuries past, indigenous African crops were confronted by new ones arriving through the caravan routes and from over the sea: sugarcane, bananas, chickpeas, cassava, maize, sweet potatoes and groundnuts. The best plants were selected by farmers year after year and their seeds stored until the next season. Natural crosses with wild relatives made the varieties more adaptable.

But today's mechanized farming, herbicides and chemical fertilizers are based on a narrow range of cultivars, intensive land clearing, and re-seeding of over-grazed pastures — all of which are leaving behind a wasteland of genetic erosion.

It was to save Africa's fast-diminishing genetic resources of crop species that the International Institute of Tropical Agriculture (IITA), based in Ibadan, Nigeria, established its Genetic Resources Unit (GRU) in 1975. Its main aims are to collect, conserve and study food legumes, rice, roots and tubers and their wild relatives that have been growing south of the Sahara for the past 3000 or 4000 years.

Many important food crops, such as cowpeas and yams, probably originated in Africa. Although at least six species of rice are considered indigenous to the continent, the African rice *par excellence* is *Oryza glaberrima*, an annual plant with red grains, still grown in some areas. According to Dr Quat Ng, the head of the GRU, this variety is in danger of extinction: Because of low yields and storage difficulties, many farmers have stopped cultivating it. Dr W.M. Steele, who has documented much of the genetic material at the GRU, notes that one of every 10 known species of wild plants is either extinct or in danger of extinction.

The GRU's West African location was not only an ideal starting point for the 38 exploratory missions to 18 African countries it has undertaken since 1976, but also a convenient place to bank the 20 000 specimens or "accessions" accumulated by its geneticists. These include cowpeas, rice, maize, groundnuts, lima beans, African yambeans, cassava, yams and sweet potatoes.

The GRU genetic bank preserves seeds in an operation that depends on perfect storage. First, seeds are cleaned, fumigated, and dried to a humidity content of 6 percent. They are then classified, assessed and documented.

Every year about 10 000 plants are grown at the GRU, the most important being rice and cowpeas. Seeds earmarked for long-term storage — 50 years of more — are called the "base" collection. They have to be sealed in aluminum tins and kept in a room at -20°C at a relative humidity of 60 percent (Temperature and humidity are the two main factors influencing the rate at which seeds age.). The "active collection" is in short-term storage at 5°C and 40 percent humidity. Here the seed will remain viable for at least 10 years.

Because lifespans vary not only among seeds of different species but among seeds of the same species, the GRU therefore periodically tests its seeds. Whenever the germination rate drops to 85 percent, it is time for rejuvenation, that is, seeds are grown into plants to provide fresh new seeds.

Harder to store than seeds are the GRU's roots and tuber plants. Because cassava seeds do not reproduce the characteristics of the mother plant, stems have to be planted every year. Yams, which do not flower regularly or easily, are also reproduced vegetatively by means of their tubers rather than from true seed.

The Tissue Culture Laboratory at IITA uses a technique for safe storage and maintenance of such plants that involves keeping plant materials in an artificial environment at a temperature range lower than normal for tissue culture. The growth of the plantlets is therefore very slow; in fact, some have been stored up to 28 months this way. Growth becomes normal once the plants are put into a new medium.

After its field trips to the "reservoirs of genetic variability", the GRU distributed samples to its agricultural research organizations. Samples have also been sent out regularly to research stations and breeders around the world. There is thus a continuous flow of germplasm from Ibadan. Unfortunately for the GRU, no new material is coming in, because for two years there have been no funds available for collection missions.

And though distribution is free and the only condition of loan is that the borrower provide some feedback, this commitment is seldom respected. It is a dangerous sign. The world community must contribute to the preservation of genetic resources now, and not realize their value the hard way — after they are gone. □

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