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Germplasm exploration and collection

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Introduction

The improvement of crops by breeding is determined by the amount of genetic variability available. While breeding needs will vary according to objective, the emphasis is usually on wider adaptability rather than local adaptations. Locally adapted genotypes currently risk being replaced by high yielding cultivars (HYC) being introduced to combat the ever-increasing demand for food and other crop based needs. At the present stage in time it may not be possible to predict the breeding requirements for the future and therefore there is need for conserving as much genetic variability as possible for use in the forseeable and unforseeable future. The only safe approach that might ensure the availability of diversity in the future despite the mounting pressures lies in collecting and the maintenance of the entire genetic diversity of the cultivated species and their wild relatives. The initial step in achieving this objective is through efficient exploration and collection of the germplasm of crops and their wild relatives and its conservation.

Exploration and collection

Exploration is the purposeful collection of wild and cultivated plants in search of both primitive and advanced genetic materials that may be used to improve cultivated crops as well as in studing genetic variability for futher understanding of the crops. Depending on needs and objectives the exploration mission can be either specific, i.e. collecting the variability of a particular crop or broad-based with the aim of capturing maximum diversity of different crops occurring in the same region and maturing at the same time.

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Aims of Exploration/Collection Missions

The objectives of any germplasm collecting mission is to capture maximum variability of the crops and their wild relatives from a wide agro-ecological coverage. The purposes of capturing this variability in germplam may either be to meet the needs of the breeder trying to solve some specific problems or for conservation for some unspecified future needs. In both cases the germplasm procured must be viable and remain so through proper handling.

Planning for an Exploration/Collecting Mission

Depending on the priorities, the missions undertaken can be either broad-based or specific. However, both types of missions have a common item in that there is need for meticulous planning to ensure being at the right place at the right time to collect mature germplasm. These missions are costly to implement and any error in timing may mean a complete failure in meeting the objectives.

Before a mission is launched, a thorough prior knowledge of the crop/species is important. Some of the points regarding the crop that need consideration are its:

- Agro-ecological zone of occurrence
- Diversity
- Distribution
- Maturity time
- Edaphic conditions, etc.

A study of the relevant herbarium material is necessary especially where dealing with wild relatives so as to be conversant with the species and develop a visual impression and also relate where to expect the species in the various ecological zones. The explorer/collector has then to synthesize all the available information before making a decision regarding:

- Route and collecting site
- Strategy and sampling methods to be used in collecting
- Team composition
- Other logistics e.g. transport, equipment and contingencies needed

Team Composition

A collecting mission should be headed by a team leader with adequate knowledge of the crop/species to be collected. A small team of 2-3 persons is recommended. The

inclusion of a local scientist who is conversant with the target crop/species and also the area to be covered is highly recommended, both as a source of local information and to help create a good relationship/confidence between the team and the local community to be interacted with. Efforts spent on composing the team are justified. A poorly composed team may mean complete failure in meeting the objectives.

Collecting Strategy and Sampling Methods

When implementing the actual collecting, there s need to apply a sampling method which will ensure that the genetic diversity of the species/crop is represented in the samples collected. There is therefore need to take into consideration the various variance in (1) soils, (2) topography, (3) elevation, (4) areas that pose some physiological stress. Ensure that all these sites are sampled. Note that areas that are not easily accessible have a higher potential for diversity than those easily accessible. More landraces are likely to be found in marginal areas where agriculture is based on multicrop subsistence. Ethnic diversity might also mean higher diversity in crops.

To ensure efficient handling and at the same time obtain maximum variability of the germplasm collected, only a limited number of samples can be collected. There is therefore need to ensure unbiased germplasm sampling which is not influenced by the germplasm qualities or the preferences of the collector. A random sampling technique is recommended. In sampling from a genepool, the sample size where the seeds are collected may vary between 4 000 for homogeneous to 8 000 for heterogeneous populations.

Passport Data

In addition to collecting, the collector has the responsibility to ensure that all the accessions collected are accompanied by adequate passport data. This information is recorded on the site of collection and is the most significant data available to the curator for subsequent use in all phases of the genetic resources work regarding the specific accession. Passport data is also useful to the curator to guide in designating core collection, identification of duplicates and for planning re-collection, if there is need. To the end-user, be it a breeder or a researcher, the passport data is of great importance as a guiding tool for all forms of utilization. Some of the information that comprises the passport data include: date of collection, exact location, identification, characteristics, ecological conditions of collection site, accession numbers allocated to accession by collector, collector's number/institution and any other relevant information.

Potential for Collection in Namibia

Namibia's semi-arid and arid conditions make it a valuable source of both pasture/forage and other crop germplasm that is highly adapted to dry zones. This germplasm is suitable for use both locally and elsewhere in the rangelands of the world. Namibia is still a young country with fairly low population at present but an increase in population should be anticipated which will mean more pressure on the land. This pressure will most likely be relieved through intensified utilization of the marginal areas as is happening elsewhere in other countries. These areas which have been protected for a long time are probably having climax vegetation with maximum diversity, they are also some of the areas where there is a high risk of loss of genetic diversity. Other areas at risk are those areas likely to be ear-marked for development projects. There is therefore need to pinpoint the areas of high genetic diversity that are at risk and initiate germplasm collection without delay.

Vegetation surveys have shown that in addition to highly adapted local food crops, there is a large wealth of other species that are fairly drought tolerant. Some of the species recorded include: *Eragrostis, Aristida, Stipagrostis, Brachiaria, Indigofera, Kaokochloa, Citrullus, Acanthosicyos, Sporobolus, Acacia, Melinis, Chloris, Enneapogon, Triraphis, Cynodon, Monelytrum, Panicum, Cenchrus, Echinochloa.*

As a part of its wider programme in the SADCC countries, the IBPGR undertook a collecting mission in 1990 and also a training/collecting mission early this year. The first mission which was collaborative with the National Programme collected a total of 42 grass accessions and 30 forage legumes. The second mission collected 21 accessions of millets and 3 of sorghum in addition to having 14 participants on on-hands training on germplasm collecting techniques. The training was jointly conducted with ILCA.

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