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Cultural Factors and Crop Genetic Diversity

Over time, humankind has used more than 7,000 edible plant species. However, only 150 crops are now commercialized at a significant global scale. Only three crops (maize, wheat, and rice) currently meet 50% of global protein and calorie requirements. As a result, the base of global security has been narrowed. This limits livelihood options for the rural poor, particularly in marginal areas. To address both the needs and the problems associated with global environmental change (growing climatic instability, soil depletion and scarcity of water resources), the focus of research and development must broaden to include a wider range of crop species and varieties.

Crop science and biotechnology have dramatically increased our ability to use plant genetic resources to increase productivity and value of crops. They do not, however, account for vast amounts of genetic diversity in crops upon which global food security and future crop development depends.

Cultural factors are important in maintaining rich genetic resources and associated knowledge of crops that have been neglected by formal crop improvement efforts and by commerce. Food preferences customs on plant use are deeply embedded in culture. For example, glutinous and starchy varieties of grains, roots and tubers, and vegetables arise out of differences in tastes. Migrating people often take crop germplasm (the genetic material for plant reproduction, including seeds, tubers and other plant organs) into new ecosystems or niches. Similarly, they introduce genetic resources into new cultures where the plants are used in different ways.

Management practices of local farmers enable them to develop and maintain the variation (phenotypes) required to meet their needs. Genetic diversity may be maintained in order to obtain crucial but diverse traits like frost or drought tolerance, or disease resistance in highly stressed agricultural environments. The set of ethnobotanical indicators described below can help us to better understand the mechanisms by which farmers manage genetic resources in order to obtain both the crop traits they need and the qualities they prefer.

Food Culture, Folk Taxonomy and Associated Folklore

Food culture, folk taxonomy and associated folklore are important indicators of diversity relating to how crop populations or ecotypes within a species may be treated differently. For example, a certain variety may have ritual value and uses that cause it to be maintained, despite changes in market forces, and perhaps assigned a special place within the cropping system. By developing many names for crop types farmers are

effectively segregating populations and often treating then differently. Over time, this segregation can engender botanically significant distinctions between varieties. Cultural knowledge about a crop variety helps to transmit plant knowledge both widely in a community and specialized knowledge within sub-sectors of the community. Common examples of this cultural knowledge are recipes and knowledge of associated pests and pathogens.

Multiple Use of a Crop Species

Multiple use of a crop species is a characteristic of cultures with a long history of co-evolution with a given crop species, resulting in a rich and complex body of associated knowledge about that crop. Identifying multiple use species does not mean merely noting those of economic importance. In Southeast Asia, local communities have developed uses of rice to fit almost all known categories of ingested food, drink, processed snack or medicine; even rice stalks and husks have many important uses. It is in these latter cases of diverse and multiple uses of a crop, where we can expect to find a rich body of ethnobotanical knowledge on plant genetic diversity.

Planting a Crop in Diverse Niches and Environments

Planting a crop in diverse niches and environments is another ethnobotanical indicator of diversity. By working with genotype-environment interactions (developing and matching varieties to the niches where they are best adapted), human communities are maximizing both the use of ecological niches in their farming systems and the varietal diversity

existing within a crop species. The continuing evolution and adaptation of crop varieties to new and diverse environments is a process that contributes to plant genetic diversity and is often managed by farmers growing crops under traditional cultural practices commonly in marginal areas such as mountains, desert margins, tidal areas or those subject to periodic flooding.

Practices and Traditions for Managing Germplasm

Practices and traditions for managing germplasm (seeds and planting material) can also be ethnobotanical indicators. Such practices concern the selection of seed and planting materials and the ways to store and exchange seed. They also include the traditions and rules that decide who selects and maintains germplasm. Women farmers often have the most developed criteria for selection of crop varieties; criteria that are not limited to yield, but related to competition with weeds, storability, cooking quality, taste and other desired qualities.

We have presented the indicators in a checklist (see box on next page) that can be used to compile ethnobotanical information on diversity within crops as they are managed by local peoples. The indicators can also be used to identify ways to support, and offer incentives to, farmers continuing to manage crops and trees in ways that both meet food security needs and maintain cultural and biological diversity.

Ethnobotanical indicators of diversity within crops

Species with an important role in the local food culture

- several names for varieties of the same species
- folkore associated with species
- ceremonial and ritual uses of species
- knowledge about a species is well distributed across different sectors of the community and transmitted across generations

Multiple uses of the same species

- for example, it is used as a staple, vegetable, condiment, medicine, beverage, non-food uses
- different cultivars of the species preferred for distinct uses
- different parts of the plant used for distinctive foods and non-food uses

Planting of the same species in diverse environments and micro-environments

- within an ecozone, farmers plant it under different conditions, microenvironments (e.g., field, paddy, swidden, terrace, field margin, along watercourses, home garden, inter-cropped fields, orchards)
- the species is found across a wide range of ecozones and in marginal areas, even in places where one would not expect it
- the species can occupy both major and secondary roles within local farming systems

Existence of local germplasm systems and germplasm exchange within and between communities

- diverse cultural communities maintain the species within their local taxonomic and germplasm systems
- germplasm exchange across cultural communities and across growing environments
- farmers have distinct criteria for selecting planting material from their own harvest or from outside their farm or community.

The better understanding of the distribution and use of genetic diversity in crops is a major innovation in plant genetic resources conservation. By focusing on the ways that local cultures classify, manage and use plants, genetic resources programs are locating new and more valuable uses of these resources. A growing number of countries is taking steps to meet the obligations of the Convention on Biological Diversity to recognize and promote the role of local people in the maintenance of agricultural biodiversity.

Effective use of ethnobotanical approaches is dependent upon participatory approaches and protocols that:

- establish equal partnerships;
- protect the rights of local communities to use plant genetic resources; and
- maintain the distinctive cultural practices that help shape the genetic diversity of their crops.

Likewise, ethnobotanical methods allow better understanding of the maintenance of diversity-rich pockets, and microenvironments created and managed by people. These microenvironments can serve as points of introduction for new diversity for crop varieties or wild species that are under threat from commercialization or land use change.

Oases in North Africa are examples of microenvironments that depend upon the traditional management practices of local communities. In agriculturally marginal areas such as mountains and desert margins, the role of traditional human communities has been shown to be beneficial to the diversity and stability of ecosystems.

Increasingly, genetic resources scientists use advanced techniques, including molecular genetics, to measure genetic diversity as it is managed and used by farmers. The growing partnerships between farming communities, ethnobotanists, and genetic resources scientists may help ensure that the next advances in agriculture will help maintain the diversity of plant genetic resources under farmer management. Thus, essential biological assets of communities living traditional lifestyles, often in marginal environments or centers of biodiversity, are enriched.

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