2 Genetic Resources: Status, Development, Losses, and Conservation Management

This chapter highlights the state and development of the world's genetic diversity centers, differentiated according to biodiversity in general and agrobiodiversity in particular. The extent and determinants of genetic extinction will be analyzed, and the differentiation between biodiversity and agrobiodiversity is discussed. In the last section, the methods for PGRFA conservation will be introduced.

2.1 State and Development of the World's Genetic Diversity Centers

There is a wide variation in the estimation of the overall amount of existing species or organisms: depending on different methodologies, the estimations lie between 5 million species (Stork, 1993) and more than 360 million species (André et al., 1994). This variation is determined by the limited knowledge about animals; especially as regards insects, the richest and most diverse group (Wilson, 1992), whereas the numbers of mammals and birds are fairly well known (Reid et al., 1993). The knowledge of the diversity of vascular plants is, however, relatively comprehensive, even though plants have not been inventoried as well as mammals or birds (Groombridge, 1992).

The inventoried plant species are not evenly distributed over the earth. According to OECD, (1996b) biodiversity - characterized as species richness - tends to be higher in: (1) warmer regions than in colder ones; (2) wetter regions than in drier zones; (3) less seasonal areas than in seasonal areas; and (4) areas with more varied topography and climate than more uniformed areas.

The differences in the distribution of plant biodiversity emphasize the importance of tropical and subtropical regions (especially tropical forests), and underline the significance of developing countries in terms of conservation and supply of plant genetic resources. Table 2.1 shows that regions dominated by developing countries, i.e., South America, Africa, and Asia, host high numbers of plants, whereas industrialized countries, e.g, European and North American countries, contain less than 5% of all documented plant species. South America, where nearly 30% of all higher plant species are to be found, is the most biodiverse region for higher plants, if biodiversity is defined simply by species richness.

D. Virchow, *Conservation of Genetic Resources*

Table 2.1. Distribution of higher plants by region

Region	Number of species[a]	Percentage of plants in a region to the overall amount of 300,000 documented plants
South America	85,000	28%
Asia	50,000	17%
Africa	45,000	15%
North America	17,000	6%
Australia	15,000	5%
Europe	12,500	4%

[a]: The number of species existing in the different regions has mostly been estimated provisionally, because of the lack of reliable surveys. This explains that the total of the given species' numbers does not even add up to the approximately 300,000 documented species, although the total should to be higher than 300,000 because of the double counting of species which are existent in two or more regions.
Source: compiled after data from Groombridge, 1992

In addition to the different regional distributions of species, significant plant diversity can be located in specific centers, which are differentiated according to the plant's affiliation to the group of plant genetic resources which are relevant to food and agriculture or to the group of not yet utilized plants. The regions with the main centers of general plant biodiversity and of diversity of domesticated plants (the so-called Vavilov's centers) will be characterized in the following section.

2.1.1 Centers for Plant Genetic Diversity

In order to locate areas of diversity, it is essential to define the criteria, which designate the quality of plant biodiversity in a given area. There are different approaches to present the state of biodiversity according to the objectives or the methodology chosen. Following the centers concept outlined in Davis et al. (1994), the criteria needed to define a center of plant diversity are (1) the biodiversity index, including species numbers and some biological population parameters; (2) the number of endemic species restricted to a given area; (3) the genetic separation between the species of a given area; (4) the grade of taxonomic scattering; and finally, (5) the current or potential economic value of the species. At present, all 5 criteria may be utilized in selective areas, where all information exists or can be obtained within a reasonable time frame. To define the centers of plant biodiversity on a global level, the operational use of the criteria is decreasing from the first to the fifth criterion.

After evaluating 1,400 floras, floristic studies, bio-geographical essays and vegetation studies, Barthlott et al. (1996) mapped out the species richness in ten "diversity zones", giving the numbers of species per 10,000 km^2. In comparison to a more simple map of Malyshev (1975), the map of Barthlott et al. is the first map