

Seed Banking 1979-1994

In the early twentieth century, scientists and agriculturalists collected plants in greenhouses, botanical gardens, and fields. Seed collection efforts in the twentieth century coincided with the professionalization of plant breeding. When scientists became concerned over the loss of plant genetic diversity due to the expansion of a few agricultural crops around mid-century, countries and organizations created seed banks for long-term seed storage. Around 1979, environmental groups began to object to what they perceived as limited access to seed banks, and they questioned the ownership of the intellectual property of living organisms. Controversy also ensued over the uneven flow of genetic resources because many of the seed banks were located in the global North, yet plants were collected largely from countries in the global South. The environmental groups' campaigns, which some called the seed wars, and the movement for biodiversity conservation intersected in ways that shaped debates about plant genetic material and seed banking. Several significant shifts in governance occurred in 1994 that led to the creation of the International Plant Genetic Resources Institute in Italy, and to changes in the governance of several international seed banks.

Many scientists often use the terms seed bank, gene bank, and germplasm collection interchangeably, although there are different techniques associated with storage of different plants and types of storage. Plant germplasm is the genetic material, mainly seeds, but including clones, or cuttings, that plants need to reproduce. Scholars Robin Pistorius and Jeroen van Wijk assert that, in the 1980s, scientists began conceptualizing plant genetic diversity in terms of individual genes rather than in terms of particular plants.

Seed banking allows long-term storage of plant germplasm for scientists and farmers to use at a later time. To preserve germplasm, the storage environments of the seed banks consist of low temperatures and low moisture, which keeps the seeds dry and stops samples from growing quickly. For long-term storage, airtight vials store the seeds in temperatures around -20 degrees Celsius, and around 0 to -5 degrees Celsius for medium-term storage. Thousands of seeds are stored for each plant variety. Samples can degrade over time, and especially in developing countries, the facilities may not be equipped for long-term storage. Most plants are stored as seeds, but asexual or polyploidy crops such as potato, cassava, and banana require different techniques for reproduction and storage. In the 1980s, seed banks experimented with techniques for storing asexual or polyploidy plants as tissue cultures, called artificial seeds. These varieties can also be propagated in test tubes for shorter-term storage. Cryopreservation, freezing seed in liquid nitrogen at extremely low temperatures, is another technique for long-term storage of plant material, but is not as widely used as it is in animal breeding and conservation.

The International Board for Plant Genetic Resources (IBPGR), headquartered in Rome, Italy, and established in 1974, oversaw many, but not all, seed banks around the world during this time period. Through the efforts of the IBPGR and of different nations, the collection of plant germplasm surged in the 1970s and 1980s. By 1993, the IBPGR had conducted more than 400 collecting missions in greater than 100 countries. Seed banks also proliferated during this time. In 1979 twenty-five seed banks for long-term storage existed in the world, but by 1995, 129 countries held a total of 1061 germplasm collections.

A 1979 book by North American writer Pat Roy Mooney, *Seeds of the Earth: Private or Public Resource?*, helped trigger a protest movement against seed banking. Beginning at a 1979 Food and Agriculture Organization (FAO) conference, representatives from developing countries expressed discontent with the seed banking regime, citing Mooney's arguments that genes discovered in the global South would be patented in the North, and consequently, that the plant genetic material

would no longer be available to farmers in the South. Mooney and others distinguished between those countries they called gene rich in the global South and those they called gene poor in the global North, which nonetheless had more resources for seed collection and storage. Erna Bennett, employed by the FAO, also headquartered in Rome, and who helped establish its Unit of Crop Ecology and Genetic Resources, acknowledged these concerns and advocated for farmers to have access to germplasm. As a proposed solution, Bennett spearheaded a campaign that the FAO, rather than the IBPGR, gain jurisdiction of the global seed banks to ensure control over the germplasm by the United Nations, headquartered in New York, New York. Bennett resigned from the FAO in 1983 because of the increased relationship between FAO and corporate interests.

By 1981 the issue of seed banking, and the connection between intellectual property rights and conservation, garnered further international attention. Developing countries, such as Mexico and Pakistan, feared that germplasm collected in their countries would be stored in developed countries, such as the US, and that they would be denied access to the genetic material, prompting the creation of the phrase germplasm embargo. These developing countries called for the principle of free exchange of plant germplasm.

Throughout the 1980s and 1990s, activist groups such as Canadian Rural Advancement Foundation International (RAFI, later called the ETC Group) and Spanish Genetic Resources Action International (GRAIN) criticized seed banks. M.S. Swaminathan, a plant geneticist from India and an advocate of farmers' rights, chaired the Keystone International Dialogue Series on Plant Genetic Resources in 1988, 1990, and 1991, a series that brought together different interest groups and attempted to reach a consensus between on-farm conservation and seed banks, and farmers' rights and plant breeders' rights.

In 1983 the FAO held a meeting that established the International Undertaking on Plant Genetic Resources, a voluntary, non-binding agreement, as well as an FAO Commission on Plant Genetic Resources. The International Undertaking established standards for the international collection and storage of plant genetic resources. Amendments to the International Undertaking in 1989 and 1991 attempted to clarify the legal rights surrounding plant genetic resources, but the International Undertaking was ultimately unsuccessful at its goals.

The FAO argued that it and other publicly accountable intergovernmental organizations should have jurisdiction of international seed banks. The FAO was accountable to the United Nations, but the IBPGR and their institutional host, the Consultative Group for International Agricultural Research (CGIAR), were accountable to their donors, including the World Bank. Notably, CGIAR was housed in the World Bank's headquarters in Washington, DC. The collaboration between the CGIAR and FAO, which had been initiated by the FAO in 1971 with the idea of integrating conservation of plant genetic resources into their existing agenda of international agricultural research, revealed tensions between the two organizations' missions and relationships with corporate influences. Tensions between the FAO and IBPGR, both located in Rome, Italy, continued into the early 1990s. In 1991, the IBPGR became the International Plant Genetic Resources Institute (IPGRI). It was officially ratified by the Italian government in 1994, and became part of the CGIAR network. Jurisdiction over the global system of seed banks was still disputed until the United Nations Convention for Biological Diversity in 1992 in Rio de Janeiro, Brazil. In 1994, authority of the CGIAR's twelve gene banks transferred to the FAO.

The decisions of the UN Convention on Biological Diversity (CBD) in 1992 had consequences for plant genetic resource conservation. The CBD framework secured legal rights over natural resources to their countries of origin. The CBD did not extend to existing seed banks, which were at the time under the auspices of the CGIAR network, but it set a precedent for international governance of genetic material, and it left unclear who governed seed banks. The Trade-Related Aspects of Intellectual Property Rights (TRIPs), negotiated by the World Trade Organization among its members in 1994, further established international standards for trade of plant genetic materials. Over the next decade, the FAO developed an International Treaty for Plant Genetic Resources for Food and Agriculture, widely adopted by United Nations members in 2002.

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