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Current Status of Access and Availability of Plant Genetic Resources

Four messages stand out relative to the current status of access and availability of plant genetic resources. First, the United States continues to manage the world's largest national germplasm collection that is freely available to scientists the world over. Second, the new international treaties governing biodiversity are failing to facilitate access despite the clauses designed to ensure access. Third, intellectual property rights issues are entangled with access and utilization problems, and often present collectors with difficult or unacceptable choices. Fourth, there are valid reasons to encourage countries to provide broad access to their genetic resources. Such reasons include saving their collections, improving their agricultural economy, and promoting conservation.

For obvious reasons, improved crop performance has been important to farmers for millennia. Farmers started with traditional selection schemes in which they would take the best plants from one crop year and use those plants' seeds to sow their crop the subsequent year.[1] Using this method, farmers were able to achieve the most desirable plant type, maturity, and quality.[2] It was not until about the time of Mendel, in the late 1800's, that agricultural education institutions began crop improvement programs to understand the genetic mechanisms of crop improvement.[3]

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1 M.R. Bellon et al., *Genetic Conservation: A Role for Rice Farmers*, *in* PLANT GENETIC CONSERVATION – THE IN SITU APPROACH 265-66 (N. Maxted et al. eds., 1997).

2 HERBERT KENDALL HAYES & FORREST RHINEHART IMMER, METHODS OF PLANT BREEDING 74-75 (McGraw-Hill Book Company, Inc. 1955).

3 Donald N. Duvick, *The Current State of Plant Breeding: How Did We Get Here?*, *in* SUMMIT PROCEEDINGS SEEDS AND BREEDS FOR THE 21ST CENTURY AGRICULTURE 71-93 (M. Sligh & L. Lauffer, eds.), *available at* http://www.rafiusa.org/Pubs/Seeds%20and%20Breeds.pdf (last visited Feb. 16, 2005).

Beginning in the late 1800's, the academic world became an important force in introducing the "professional" plant breeder into crop improvement.[4] Breeders thus became an important factor in raising crop performance in the United States and other countries. They approached the role academically with the support of pathologists, entomologists, biochemists, and other specialists.[5] The agricultural experiment stations that the breeders worked helped develop farmers' crop improvement associations to distribute the new varieties.[6]

In the pioneering days, as the United States developed its farming and pushed its frontier westward, the need for adapted crop varieties was a priority for the new government in Washington. Diplomats were urged to bring back varieties from other countries, while immigrants were encouraged to bring along seeds from their native countries.[7] Washington arranged for the seed increases and distributions to farmers at no cost, both directly and through extension agents. Interestingly, the Patent Office was the first to develop the program.[8] After the United States Department of Agriculture (USDA) was formed in 1862 under President Lincoln, it took over the responsibility of acquiring and distributing seeds. In 1898, the USDA started its program for plant exploration and introduction, which continues today.[9] Now that program is part of the USDA's National Plant Germplasm System (NPGS) managed by the Agricultural Research Service (ARS). Many of the early materials were not kept because of lack of adaptation or the lack of good storage conditions.[10] Today the program tries to maintain all the introduced materials but not all of them make it through the first growout and increase.

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4 NATIONAL PLANT GENETIC RESOURCES BOARD, U.S. DEP'T OF AGRIC., PLANT GERMPLASM: CONSERVATION AND USE (1984).

5 HAYES & IMMER, *supra* note 2, at 332.

6 A. RICHARD CRABB, THE HYBRID CORNMAKERS 210-11. (Rutgers Univ. Press 1947).

7 *See* CARY FOWLER, UNNATURAL SELECTION: TECHNOLOGY, POLITICS, AND PLANT EVOLUTION 18-19 (Gordon & Breach 1994).

8 BD. ON AGRIC., NAT'L RESEARCH COUNCIL, MANAGING GLOBAL GENETIC RESOURCES: THE U.S. NATIONAL PLANT GERMPLASM SYSTEM (1991); *see also* FOWLER, *supra* note 7, at 16-17.

9 George A. White et al., *History and Operation of the National Plant Germplasm System*, 7 PLANT BREEDING REV. 5, 9 (1989).

10 COUNCIL FOR AGRIC. SCI. AND TECH. REP. 106, PLANT GERMPLASM PRESERVATION AND UTILIZATION IN U.S. AGRICULTURE 5, 6 (1985).

The NPGS has always made the materials in the program freely available to requestors for research and crop improvement. With some 90 percent of the materials acquired freely from abroad, the U.S. policy is to be a good steward and distribute plant materials to scientists in other countries who wish to use the materials for research and development.[11] The NPGS does not carry Utility Patent materials, and it is not a registered patent repository under the Budapest Treaty.[12] It does, however, have some materials under the U.S. Plant Patent Act and designates those materials in the database.[13] Under the Plant Variety Protection Act (PVPA),[14] where all materials are available from the owner for research purposes, the NPGS will distribute materials by owner's consent if it is separately placed in the NPGS by the owners.[15] After the genetic materials that have PVPA Certificates are off protection, they are turned over to the NPGS and become freely available for distribution.[16]

Today the NPGS has more than 1600 genera and over 10,000 species.[17] The NPGS is the world's largest national collection and has grown to more than 462,000 accessions.[18] It has distributed millions of samples to scientists worldwide in over 150 countries worldwide.[19] Approximately 30 percent go overseas, 25 percent go to ARS's researchers, 28 percent go to state experiment stations' researchers, 14 percent go to the private sector, and the rest go to unclassified individuals and institutions.[20]

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11 Food Agriculture, Conservation, and Trade Act of 1990, 7 U.S.C.A. § 5841 (2004).

12 Sidney B. Williams Jr. & Kenneth A. Weber, *Intellectual Property Protection and Plants*, *in* INTELLECTUAL PROPERTY RIGHTS ASSOCIATED WITH PLANTS 91, 98 (J.H. Barton et al. eds. 1989).

13 *See* NAT'L PLANT GERMPLASM SYSTEM, *at* http://www.ars-grin.gov/npgs/ (last visited Feb. 17, 2005).

14 7 U.S.C.A. §§ 2321-2583.

15 *See* Storage Information Form, USDA-ARS, National Plant Germplasm System, *at* http://www.ars-grin.gov/ncgrp/forms/storage.doc (last visited Feb. 17, 2005).

16 U.S. DEP'T OF AG., PLANT VARIETY PROTECTION OFFICE, *Frequently Asked Questions*, *available at* http://www.ams.usda.gov/science/pvpo/FAQ/seedsamples. htm (last visited Mar. 16, 2005).

17 Summary of the holdings of the NPGS, *at* http://www.ars-grin. gov/npgs/stats/summary.stats (last visited Feb. 17, 2005).

18 Accession Area Queries, *at* http://www.ars-grin.gov/npgs/acc/acc_queries.html (last visited Feb. 17, 2005) (searchable database of Accessions).

19 U.S. DEP'T OF AG., Ag. Research Service, NPGS, GRIN, Database Management Unit (2004) [hereinafter Table 1]. *See* Appendix A.

20 Convention on Biological Diversity, June 5, 1992, 1760 U.N.T.S. 76, *available at* http://www.biodiv.org/doc/legal/cbd-en.pdf (last visited Feb. 6, 2005) (entered into force on Dec. 23, 1993); Henry L. Shands & Allan K. Stoner, *Agricultural Germplasm and*

Distributions from the NPGS have decreased slightly since the Convention on Biological Diversity (CBD) went into force in December of 1993.[21] The USDA was, and continues to be, the world's largest supplier of crop germplasm diversity of crops to researchers. The Consultative Group on International Agricultural Research (CGIAR) research centers, such as the International Rice Research Institute (IRRI), distribute large quantities of their special crops' germplasm for testing.

Since the CBD went into force, the materials received by the NPGS have decreased, and the countries supplying them have changed. For several reasons, it is no longer possible to receive materials from some countries, even though the treaties promulgate facilitated access. One possible explanation is that some countries may have chosen to wait out the negotiations at the Food and Agriculture Organization of the United Nations (FAO) before making any policy for distribution. Other excuses for not being able to send material are: (1) legislation is underway, is not complete, or it has not been implemented; (2) the bureaucracy has not been established; (3) the policy on the requested material is yet to be established; or (4) the quid pro quo of the proposed exchange is not seen to be equitable.

The United States signed the CBD in 1993 but has not ratified it. The CBD established the rights of countries to own and control the biological diversity within their borders, and it challenges them to establish legal terms for facilitated access and utilization.[22] It defers most agricultural genetic resources to the FAO's headquarters in Rome, Italy.[23] The FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) was completed in November 2001, and was put into force on June 29, 2004.[24]

Global Contributions, *in* GLOBAL GENETIC RESOURCES 348 (K. Elaine Hoagland & Amy Y. Rossman eds., 1997) [hereinafter CBD].

21 *See* Table 1, *infra* App. A.

22 *See generally* CBD, *supra* note 20.

23 Nairobi Final Act of the Conference for the Adoption of the Agreed Text of the Convention on Biological Diversity, *available at* http://www.biodiv.org/doc/handbook/cbd-hb-09-en.pdf (last visited Feb. 17, 2005).

24 International Treaty on Plant Genetic Resources for Food and Agriculture, Nov. 3, 2001, *available at* ftp://ext-ftp.fao.org/ag/cgrfa/it/ITPGRe.pdf (last visited Feb. 17, 2005) [hereinafter ITPGR]; *see also* http://www.fao.org/Legal/TREATIES/ 033s-e.htm (last visited Feb. 17, 2005) (noting that ITPGR was put into force on June 29, 2004).

The United States signed the ITPGR in 2002 but has not ratified it.[25] The United States does want to be part of the Governing Body at FAO as it establishes the ITPGR's Multilateral System.[26] The Governing Body will make decisions through consensus. One of the first issues it will address is the establishment of a universal material transfer agreement (MTA) for facilitated exchange of the genetic resources, which are listed as crops and crop groups in Annex 1 of the ITPGR.[27] Crops that are not on the access list will mostly default to the CBD's bilateral terms that govern access.[28] Some of the crops in that category are vegetables, soybeans, peanuts, small fruits, tree fruits, and nut crops.

It is not clear how rigid countries will be in insisting for access payments to germplasm or for royalties upon commercialization. Before the treaties, collectors were sometimes unable to get permission to collect plant germplasm because of their unwillingness to sign specific document terms that obligated how the material would eventually be used. Collectors rarely know at the time of collection how any material will be used over time. Under that system, USDA-sponsored collectors could not obligate the government in any manner.

Another issue for several countries is patenting derivatives of distributed material that cannot be patented on their own. ITPGR article 12.3(d) states that "[r]ecipients shall not claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, or their genetic parts or components, in the form received from the Multilateral System."[29] Most countries reserve the right to use intellectual property right protection on derivatives from the original material.[30]

Overall, the United States supports the ITPGR for its many positive elements. The private sector participated in the U.S. effort to

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25 *See* U.S. Mission to the UN Agencies in Rome, *U.S. Signs the International Treaty on Plant Genetic Resources for Food and Agriculture* (Nov. 2002), *at* http://usunrome.usembassy.it/files/Statements/A2111209.htm (last visited Feb. 17, 2005) (discussing ITPGR).

26 *Id*.

27 KERRY TEN KATE & SARAH A. LAIRD, THE COMMERCIAL USE OF BIODIVERSITY 120 (1999). *See* FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS 2004 Commission on Genetic Resources for Food and Agriculture; ITPGR, *supra* note 24, at Annex 1.

28 CBD, *supra* note 20, at art. 15.

29 ITPGR, *supra* note 24, at art. 12.3(d).

30 See KATE & LAIRD, *supra* note 27, at 17.

help shape the ITPGR and seems to be able to live with it. One of the most troubling aspects for the international community is the strong national legislation that some countries enacted in response to the CBD and which now encumbers the ITPGR.[31] Additionally, a number of countries have separated the crop wild progenitors (controlled by the Ministries of Environment) from the domesticated species/forms that are controlled by the Ministries of Agriculture. Since the ITPGR Multilateral System will not be a reciprocity system, exchanges may be a one-way street for some time, if not forever with some countries. The United States, with its NPGS, will likely continue to be a major player for a long time in distributing agricultural genetic resources for research and crop improvement.

Shands and Smith noted that countries failing to make materials available for use not only fail to adhere to the international treaty that they have signed, but fail humanity, science, and their own genetic resources community.[32] One bad outcome might be that country administrators—seeing no or limited distributions—abandon support for their genebanks and cut the genebank funding either partially or totally. Public sector funding is a major problem in all countries but particularly in developing countries. Shands and Smith concluded that the best national system provides an investment climate that encourages the private sector to invest, and to develop crops of interest and need for the country.[33] Additionally, they believe a good national system would provide incentives to the private sector to work on crops where there is presently little work going on.[34] Shands and Smith believe that countries should make genetic resources available freely, and broadly in scope, as part of that incentive.[35] Only by making the genetic materials available will there be interest and support for conservation.

31 *See id.*

32 Henry L. Shands & Stephen Smith, Will the FAO International Undertaking Treaty Engender Effective Support for Conservation? (Nov. 2000) (Presentation at the Annual Meeting of Crop Science Society of America, November 2000) (on file with author).

33 *Id.*

34 *Id.*

35 *Id.*

Appendix A

U.S. Department of Agriculture--Agricultural Research Service
National Plant Germplasm System
Pre and Post-CBD Distribution

Pre- and Post-Convention on Biological Diversity Summary of Germplasm Distributions from NPGS Seed and Clonal Repositories, 1990-2003.

Year	UARS	UFED	STA	UCOM	UPRU	UIND	UAID	INT	FGEN	FCOM	FPRU	FIND	Total	Domestic	Foreign	For.Pct.
Pre-Convention on Biological Diversity																
1990	21,419	625	42,140	27,287	899	5,389	320	1,883	2,283	3,634	27,727	438	134,044	97,759	36,285	27.1
1991	33,121	305	37,728	23,754	1,036	5,805	533	6,276	8,791	1,282	29,587	462	148,680	101,749	46,931	31.6
1992	22,763	1,013	31,294	15,235	2,108	4,857	2,296	3,490	10,307	4,507	26,731	737	125,338	77,270	48,068	38.4
1993	18,613	400	33,387	13,748	1,188	3,901	201	3,976	3,697	2,139	24,891	956	107,097	71,237	35,860	33.5
4YrAv.	**23,979**	**586**	**36,137**	**20,006**	**1,308**	**4,988**	**838**	**3,906**	**6,270**	**2,891**	**27,234**	**648**	**128,790**	**87,004**	**41,786**	**32.4**
Post-Convention on Biological Diversity																
1994	42,570	688	30,405	12,573	2,873	3,228	265	399	6,667	4,713	23,303	1,431	129,115	92,337	36,778	28.5
1995	27,390	245	33,079	19,099	1,444	3,425	0	1,563	3,583	4,259	23,537	216	117,840	84,682	33,158	28.1
1996	23,004	181	47,126	13,186	1,189	2,829	10	139	3,933	2,899	28,722	349	123,567	87,515	36,052	29.2
1997	20,723	418	32,410	18,037	4,089	3,140	7	576	1,224	3,142	24,815	174	108,755	78,817	29,938	27.5
1998	23,843	151	33,063	16,566	2,485	4,743	0	98	4,115	2,637	20,372	386	108,459	80,851	27,608	25.5
1999	28,366	261	40,053	10,108	4,019	5,541	0	1,098	2,641	3,048	36,715	726	132,576	88,348	44,228	33.4
2000	47,459	118	39,039	37,970	2,092	5,876	77	542	4,434	3,669	32,887	408	174,571	132,554	42,017	24.1
2001	28,400	402	30,452	11,025	1,406	5,448	151	867	6,133	4,125	29,202	2,254	119,865	77,133	42,732	35.7
2002	29,519	505	26,285	20,938	3,272	8,811	0	350	5,100	7,116	14,981	1,180	118,057	89,330	28,727	24.3
2003	47,064	369	40,156	14,460	3,285	6,031	19	5	4,052	4,562	33,127	1,055	154,185	111,365	42,820	27.8
10 YrAv	**31,834**	**334**	**35,207**	**17,396**	**2,615**	**4,907**	**56**	**564**	**4,188**	**4,017**	**26,766**	**818**	**128,699**	**92,293**	**36,406**	**28.3**
14YrAv.	**29,590**	**406**	**35,473**	**18,142**	**2,242**	**4,930**	**298**	**1,519**	**4,783**	**3,695**	**26,900**	**769**	**128,725**	**90,782**	**37,943**	**30**
14YR%	**23.0%**	**0.3%**	**27.6%**	**14.1%**	**1.7%**	**3.8%**	**0.2%**	**1.2%**	**3.7%**	**2.9%**	**20.9%**	**0.6%**		**70.5%**	**29.5%**	
14YrTot	**414,254**	**5,681**	**496,617**	**253,986**	**31,385**	**69,024**	**3,879**	**21,262**	**66,960**	**51,732**	**376,597**	**10,772**	**1,802,149**	**1,270,947**	**531,202**	**29.5**
Change	33%	-43%	-3%	-13%	100%	-2%	-93%	-86%	-33%	39%	-2%	26%	0%	6%	-13%	-13%

Column Codes and Percent of Distributions:

Code	14Yr Ave.	Code	14Yr Ave.
UARS=USDA's Agricultural Research Service	23.0%	UAID=U.S. Agency for Intl Development	0.2%
UFED=U.S. Federal agency, not ARS, not AID	0.3%	INT=CGIAR Intl Agricultural Research Center	1.2%
STA=U.S. State agencies and all universities	27.6%	FGEN=Foreign Genetic Resources Unit	3.7%
UCOM=U.S. commercial company	14.1%	FCOM=Foreign Commercial Company	2.9%
UPRU=non-commercial organization	1.7%	FPRU=Foreign non-commercial organization	20.9%
UIND=U.S. Individual, no affiliation noted	3.8%	FIND=Foreign Individual, no affiliation noted	0.6%

Data provided by the Germplasm Resources Information Network (GRIN) database management unit

Henry L. Shands 8/19/2004