



www.elsevier.com/locate/worlddev

doi:10.1016/j.worlddev.2010.06.006

The Perceived Impact of the In-Trust Agreements on CGIAR Germplasm Availability: An Assessment of Bioversity International's Institutional Activities

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Summary. — This study assesses the generation and consequences of the In-Trust Agreements (ITAs) that established the legal status of the CGIAR germplasm as freely available for the benefit of humanity under the auspices of FAO. The analysis looks at the history of the ITAs and focuses on the role of Bioversity International in research and other activities in influencing, facilitating and enabling the ITA negotiations. Results confirm the central role of Bioversity and policy research in the negotiations process. Concepts developed during the ITA negotiations contributed toward subsequent multilateral negotiations that eventually culminated in the International Treaty on Plant Genetic Resources.

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Key words — global coverage, plant genetic resources, multilateral exchange, CGIAR

1. INTRODUCTION

This study documents the policy-oriented research and activities conducted by Bioversity International¹ (hereafter Bioversity) that contributed to the establishment of the In-Trust Agreements (ITAs) between the Food and Agriculture Organization (FAO) of the United Nations and the Consultative Group on International Agricultural Research (CGIAR) Centers in 1994 that formalized the legal status of *ex situ* germplasm collections held by the CGIAR genebanks. Through the analysis of qualitative data, we assess the impacts of these agreements on germplasm flows and exchange and investigate what might have happened if the ITAs had not been signed. We also analyze Bioversity's role in collaboration with other partners—notably the CGIAR Centers and FAO—in the policy-making process and in institutionalizing open access to germplasm from CGIAR under the auspices of the ITAs.

2. CGIAR STEWARDSHIP OF PLANT GENETIC RESOURCES AND THE NEED FOR INTERNATIONAL AGREEMENT

An important part of the mission of the Consultative Group on International Agricultural Research (CGIAR) was to conserve genetic material of major staple crops in order to make it freely available for plant breeding. The first international agricultural centers dealing with *ex situ* conservation of staple crops² began in 1971, with the support of the Ford and

Rockefeller Foundations and their partners, to operate as the CGIAR (Frankel & Bennet, 1970; Frankel & Hawkes, 1975; Holden & Williams, 1984). In 1974, in response to widespread concern that many developing countries would lose their genetic resources and agricultural diversity because of genetic erosion, the CGIAR decided to establish a research center specifically focused on plant genetic resources: the International Board for Plant Genetic Resources (IBPGR), later the International Plant Genetic Resources Institute (IPGRI) and now, Bioversity International.

Over time, the CGIAR objectives were broadened to include making germplasm available for research and plant improvement to address the problems of food security and productivity. In this context, the significance of the CGIAR collections is potentially enormous. The centers hold approximately 700,000 accessions, which represent more than 10% of the six million accessions stored in over 1,300 genebanks around the world (FAO, 1998). The collections cover 2,768 species belonging to 753 different genera. The collections also contain

* The authors wish to thank Jan Engels, Michael Halewood, and Isabel Lopez Noriega for their help in developing the historical background and legal framework upon which the study is based; Mauricio Bellon, Chittur Srinivasan, and Garth Holloway for their useful comments on data analysis and interpretation; the CGIAR Standing Panel on Impact Assessment (SPIA) for funding this study; Rob Paarlberg, Jim Ryan, Bruce Gardner, Carol Weiss Tim Kelley, and Tom Walker for helpful comments on a previous draft. The authors alone, and not Bioversity, SPIA, or any of the individuals mentioned, are responsible for the contents of this study. Final revision accepted: March 21, 2010.

Table 1. CGIAR accessions by genus and species. Source: SINGER database.

Common name	Genus	Species	Accessions	% of total
Rice	<i>Oryza</i>	<i>sativa</i>	116,316	16.87
Common Wheat	<i>Triticum</i>	<i>aestivum</i>	81,464	11.82
Common Barley	<i>Hordeum</i>	<i>vulgare</i>	37,898	5.50
Sorghum	<i>Sorghum</i>	<i>bicolor</i>	36,711	5.32
Durum Wheat	<i>Triticum</i>	<i>turgidum</i>	31,512	4.57
Common Bean	<i>Phaseolus</i>	<i>vulgaris</i>	30,616	4.44
Chickpea	<i>Cicer</i>	<i>arietinum</i>	29,620	4.30
Maize	<i>Zea</i>	<i>mays</i>	25,827	3.75
Pearl Millet	<i>Pennisetum</i>	<i>glaucum</i>	20,879	3.03
Cowpea	<i>Vigna</i>	<i>unguiculata</i>	18,254	2.65

a large amount of intra-species diversity. The top ten crops, which account for 62% of the accessions, have an average of 42,910 accessions per species (Table 1). Because of this intra-specific diversity, the collections represent a potentially rich resource base for future crop breeding.

In practice, CGIAR Centers have never attempted to exercise exclusive control over the genetic stocks in CGIAR genebanks. Rather, they supply genetic resource materials upon request to scientists, breeders, national institutes, and others.

However, questions pertaining to the ownership and control of CGIAR collections became a topic of central debate beginning with the negotiations of the 1983 International Undertaking on Plant Genetic Resources for Food and Agriculture (PGRFA). The International Undertaking was the first comprehensive international agreement dealing with PGRFA that confirmed plant genetic resources as a heritage of humanity that should be available without restriction to anyone. This international policy was consistent with the CGIAR Centers' common practice and stated internal policies. However, the principle of national sovereignty over plant genetic resource arose in an interpretive resolution to the International Undertaking and then was further strengthened by the Convention on Biological Diversity (CBD) [Article 15] that explicitly recognized the rights of sovereign states over their natural resources, including plant genetic resources.

With the entry into force of the CBD in 1992 (Nairobi Final Act), countries could begin to exercise their national sovereignty by increasing restrictions on access to plant genetic resources. The CBD, in fact, established a system governing all biodiversity, including *ex situ* collections of germplasm that most countries formally ratified, but it did not specifically address the CGIAR collections, thus leaving their status in doubt. The conflict between the well-established CGIAR practice and internal policy of making germplasm freely available and the emerging international policy framework establishing biodiversity as a sovereign resource raised questions about the legal status of the CGIAR collections. At the same time, biotechnologies were being developed that raised the possibility as never before of plant genetic resources being developed and managed as private rather than public goods.

3. POLICY-ORIENTED RESEARCH AND POLICY CHANGES

In order to respond to and inform the debate on the emerging issues related to plant genetic resources and the status of the CGIAR collections, Bioversity, acting in its capacity within the CGIAR to advance the conservation and use of plant genetic resources for the benefit of humanity, initiated three types of action:

1. Commissioning of research to examine the issue of control and ownership of the CGIAR collections, including a paper, published in 1992, that proposed that the concept of "trusteeship" be applied to the CGIAR collections.
2. Dissemination of technical papers and sponsorship of seminars to inform interested parties and reduce the sense of uncertainty created by the CBD.
3. Facilitation of dialogue among a range of institutions and partners who otherwise would not have been in contact with each other but who were essential to the success of any policy solution. These included CGIAR Centers, governments of countries hosting CGIAR genebanks, FAO and its constituencies, farmers' rights advocacy groups, and other stakeholders.

Following upon this work, several important decisions were taken at the CGIAR Mid-Term Meeting in May 1994 in New Delhi, India. A study commissioned by the CGIAR on the System's genetic resources presented at this meeting strongly endorsed the development of a system-wide program on genetic resources to formalize the legal status of the CGIAR collections. Specifically, the CGIAR endorsed the proposal that an "in-trust" status be applied to the CGIAR collections with the understanding that the collections would be placed under the umbrella of an international agreement. The CGIAR Secretariat also decided that the centers would receive funding specifically for genetic resources conservation that could not be used for their other activities. The Inter-Center Working Group on Genetic Resources (ICWG-GR) was established to guide CGIAR policy and management of genetic resources. The centers expressed their commitment to enhanced integration of germplasm management by establishing the System-wide Information Network for Genetic Resources (SINGER). The CGIAR Centers endorsed the representational role of Bioversity on behalf of the CGIAR System at various important policy fora (e.g., the FAO Commission on PGRFA).

Bioversity was selected as the lead center on genetic resources, and was asked to provide a small secretariat for the ICWG-GR. Bioversity's Director General was made director of the System-wide Genetic Resources Program (SGRP). Given this official mandate, Bioversity prepared and presented a proposal to FAO and the Commission³ with the objective of placing the international germplasm collections of the centers under the auspices of FAO as part of an international network of *ex situ* collections. At its Fifth Session, the Commission accepted, in principle, the role of the centers as trustees of the germplasm collections, and requested the FAO Director General to conclude agreements with the individual centers with the objective of ensuring unrestricted availability of CGIAR-held germplasm. On 26 October 1994, FAO signed agreements with each individual CGIAR Center, thus bringing the CGIAR germplasm collections formally under the auspices of FAO and establishing them as being held "in-trust."

These agreements established CGIAR Centers not as owners, but rather as trustees for these *ex situ* collections. The material, managed by the CGIAR on behalf of the beneficiaries, in particular developing countries had to be conserved to the highest technical standards, duplicated for safety reasons, and made available without restrictions. No intellectual property rights over the germplasm could be sought. To ensure that a third party could not attempt to claim intellectual property over materials derived from the in-trust collections, the ITAs stipulated that CGIAR Centers must ensure that the recipients of transferred germplasm and its related information could neither claim ownership nor seek any intellectual

property rights over that germplasm or information related to it. Thus the ITAs formally established an internationally accepted legal status for the CGIAR collections and, therefore, established a stable policy environment that could help ensure continued flows of germplasm both to and from the CGIAR Centers.

Furthermore, the ITAs were an important initial step towards developing the concept of a multilateral global system of germplasm conservation and use by applying it in a practical way to the CGIAR germplasm. The concept was further developed during follow-on negotiations for the International Treaty for Plant Genetic Resources for Food and Agriculture (hereafter International Treaty or Treaty) and later became a fundamental part of the Treaty. The International Treaty also confirmed the in-trust status of the collections (Fowler, 2003). Once the Treaty was ratified, the CGIAR Centers would be expected to sign new agreements with the Treaty's governing body, which would replace the ITAs and bring the legal status of the CGIAR collections under the auspices of the Treaty. The formalization of the status of the CGIAR collections through the ITAs led to the recognition in the International Treaty of the collections as an important part of the multilateral global system for conservation and use of genetic resources for food and agriculture.

4. ASSESSMENT APPROACH AND METHODS

Fig. 1 presents a framework for the policy change process that established the ITAs and the role of Bioversity and others in that process.

The framework links inputs by Bioversity and other actors to outputs and eventual outcomes and impacts. The impact pathway serves as a framework first to predict and articulate the processes and factors expected to contribute to outcomes, in this case the policy change that was sought. The policy change was, in turn, necessary for securing access to and continued exchange of CGIAR germplasm. The framework then served as the basis for the assessment of inputs, outputs, out-

comes, and impacts and the associated roles and contextual factors. Such models, often called "logic models" or "impact pathways," are used extensively in the evaluations of government, non-profit organizations, and research programs (Rogers, Petrosino, Huebner, & Hacs, 2000).

The assessment relied heavily on qualitative data. In this study, qualitative data came from interviews, documents, and archival records. The information derived from the interviews is "phenomenological" in that it clarifies the perceptions and experiences that people give to events (Bamberger, Rugh, & Mabry, 2006).

A type of purposeful sampling as compared to random sampling was used in selecting people to interview. A relatively small group of "key informants" was identified based upon their in-depth knowledge of the technical and policy issues arising throughout the complex negotiations that preceded the enactment of the ITAs. A key informant approach is not a sample taken at random from a large population with the aim of generalizing with confidence from the sample to the larger population. Rather, key informants are a limited population of individuals with significant breadth and depth of knowledge to speak informatively in detail about what happened and why (Jimenez, 1985; USAID, 1996).

In order to give further structure to the key informant approach, a methodology was adopted from Arts and Verschuren (1999) that compares the perspectives from three different categories of informant: the ego perspective (in this case Bioversity staff), the alter perspective (people from other organizations involved in the ITA negotiations), and the researcher's own perspective gained through review of archival records and documents. The alter perspective included two types of respondent external to Bioversity who were knowledgeable about the events associated with the development of the ITAs: (1) organizations actively involved in the policy-making process at the time of the negotiations and (2) organizations with no official and direct role in the negotiations, but with a good overall knowledge of events associated with the negotiations and subsequent debates on plant genetic resource conservation. The initial interviews identified individ-

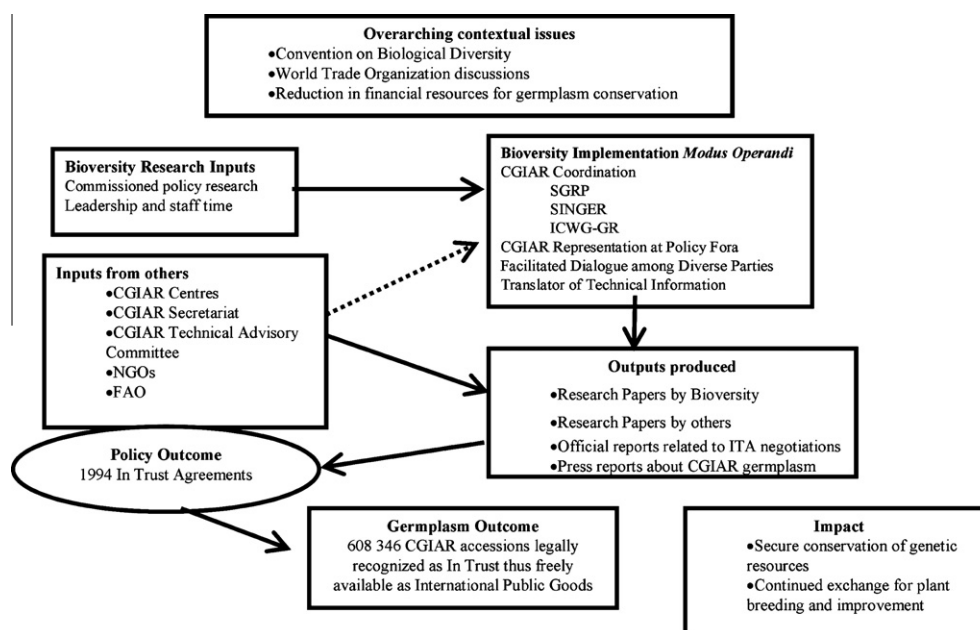


Figure 1. Bioversity international conceptual framework.

uals who were actively involved in the debates and negotiations and the main types of organizations involved in the negotiation process. Several people were selected to represent each perspective and then informants were asked to suggest other people to interview. An early reviewer of the paper also suggested additional informants.

A total of 16 key informants were interviewed, several on more than one occasion, as shown in Table 2.

The topics explored in the interviews were established initially during the research planning stage and these were used to develop an interview protocol. However, as is appropriate in a semi-structured interview, probing elicited further elaboration or verification, and new lines of inquiry were followed as they emerged. The initial topics included:

- The importance of the ITAs to germplasm conservation and use;
- the role of Bioversity and others in the debate on plant genetic resources;
- the exploration of what might have happened to plant genetic resource without the ITAs or Bioversity's involvement in the negotiations; and
- the extent to which the ITAs may have influenced other plant genetic resource policies.

Informants were assured that they would not be quoted by name to help ensure candid responses.

The information from the interviews was then cross-checked or "triangulated" with evidence from documents and archival records to test the consistency of findings. Another important source of information was SINGER, which is the information exchange network and database of CGIAR germplasm collections. The types of data and the specific sources of information are shown in Table 3.

5. THE ROLE OF BIOVERSITY IN ESTABLISHING THE ITAs

Bioversity's involvement in establishing a new legal foundation for the CGIAR collections was integral to its organiza-

tional mandate. Thus, unlike a project-oriented approach, there was no precise starting or ending date to the work or a specific budget allocation for its work related to the international plant genetic resource agreements. Also unlike a project, its contribution was made thanks to the efforts of personnel from across the organization, including the Director General and other high-level staff.

Two consultants, John Barton and Wolfgang Siebeck, both experts in international law related to genetic resources, were contracted in 1991 to carry out policy research to complement the work of Bioversity staff. Several papers on the topic were written by Barton and Siebeck under direct contract with Bioversity. Building upon this research, other papers were written by Barton and/or Siebeck, alone, together, in collaboration with Bioversity staff and in collaboration with others. At the request of FAO, Barton and Siebeck were again contracted by Bioversity in 1995 to research options for the multilateral system as input into the International Treaty negotiations process. Additional research and analysis related to Barton and Siebeck's 1991 and 1995 research was conducted by Bioversity later in the Treaty process. The complete list of research publications produced by Bioversity related to the two negotiations is shown in Table 3.

In addition to carrying out policy research to inform the negotiations, Bioversity played a number of complementary roles. It provided or interpreted technical information for negotiators in the plant genetic resources debate based on its own work over many years as well as a synthesis of work of other CGIAR Centers and other institutions working in plant genetic resources. An informant stated

"Bioversity has lessened the tensions along a polarized North-South axis resulting from the CBD process by informing the debate with factual information and thus defusing speculation."

Bioversity also took an active role in facilitating inter-institutional and inter-sectoral dialogue and linkages. According to its external review, Bioversity gained widespread respect and acceptance, even with NGOs highly critical of the CGIAR, through its involvement in the Keystone International Dialogue series on plant genetic resources in the years

Table 2. Key informant interview sample

Group	Organization	Role in 1994
"Ego" Perspective	Bioversity International	IPGRI Scientist IPGRI Director General IPGRI Deputy Director General
"Alter" Perspective	Civil Society Organization	Rural Advancement Foundation International (RAFI) Director
	Civil Society Organization	GRAIN Director (n/a)
	CGIAR	Scientist International Development Research Center Research Manager (n/a)
		CIAT Scientist Chair of CGIAR
	FAO	Consultant on genetic resources with IPBGR-IPGRI and FAO Officer of CGRFA Secretary of CGRFA FAO Legal Counsellor
	USDA	USDA Genebank Director Malaysia Delegate Portugal Delegate
	University	Professor Stanford University Law School
	University	Professor University of Minnesota Department of Applied Economics
	University	Professor Swedish University of Agricultural Sciences (n/a)
	Private Sector	International Seed Federation Secretary General
	Private sector	ICI Seeds Intellectual Property Manager

n/a indicates that an interview was not possible.

Table 3. *Major information sources**Bioversity-associated research papers*

- Siebeck, W.E., & Barton, J.H. (1991). The legal status of CGIR germplasm collections and related issues. IBPGR Internal Report 93/71. December 31
- Siebeck, W.E., & Barton, J. (1992). The implications of applying the legal concept of trust to germplasm collections at CGIAR research centers. *Diversity* 8(3), 29–35
- Barton, J.H., & Siebeck, W.E. (1992). Intellectual property issues for the international agricultural research centers. *Issues in Agriculture* No. 4, April, CGIAR. Washington, DC
- Barton, J.H., & Siebeck, W.E. (1994). Material transfer agreements in genetic resources exchange – the case of the international agricultural research centers. *Issues in Genetic Resources* No. 1, IPGRI, Rome, Italy
- Cooper, D., Engles, J., & Frison, E. (1994). A multilateral system for plant genetic resources: imperatives, achievements and challenges. *Issues in Genetic Resources* No. 2, IPGRI, Rome Italy
- Crucible Group (1994). *People, Plants and Patents: the impact of intellectual property on biodiversity, conservation, trade, and rural society*. IDRC, Ottawa, Canada
- Engels, J., & Siebeck, W. (1994). Plant genetic resources issues in international agricultural research. *Intellectual Property Rights. Agricultural Biotechnology for Sustainable productivity (ABSP) Workshop Series 1114 July*. USAID, Washington, DC, United States of America
- IPGRI (1996). *Access to Genetic Resources and the Equitable Sharing of Benefits: a contribution to the debate on systems for the exchange of germplasm*. *Issues in Genetic Resources* No. 4, IPGRI, Rome, Italy.
- Fowler, C., Smalle, M., & Griji, S. (2000). *Germplasm Flows between Developing Countries and the CGIAR: An Initial Assessment*. Global Forum on Agricultural Research (GFAR). GFAR Secretariat/FAO in Rome, Italy
- Fowler, C., Moor, G., & Hawtin, G.C. (2003). *The International Treaty on Plant Genetic Resources for Food and Agriculture: A Primer for the Future Harvest Centres of the CGIAR*. IPGRI, Rome, Italy

Other research

- Fowler, C. (2000). Establishing the scope of a multilateral system for plant genetic resources for food and agriculture: implications for crop exclusions. *Biopolicy Journal* 3, 1
- Fowler, C. (2003). *The Status of Public and Proprietary Germplasm and Information: An assessment of Recent Developments at FAO*. *IP Strategy Today*, 2003, 7
- Esquinas-Alcazar, J. (2005). Protecting crop genetic diversity for food security: political, ethical and technical challenges. *Nature Reviews Genetics* 6(12), 946–953

Official reports or records

- CGIAR Technical Advisory Committee TAC (1988). *CGIAR Policy on Plant Genetic Resources*. TAC Doc. AGR/TAC:IAR/88/4, February 1988
- CGIAR Technical Advisory Committee TAC (1993). *Stripe Study of Genetic Resources in the CGIAR* Doc. AGR/TAC:IAR/94/2.1. FAO
- CGIAR Technical Advisory Committee TAC (2003). *Report of the Fourth External Programme and Management Review (EPMR) of the International Plant Genetic Resources Institute*. TAC Secretariat and FAO. FAO Corporate Document Repository
- FAO (1994). *Report on the Commission of Plant Genetic Resources First Extraordinary Session Rome, 7–11 November 1994*. CPGR-EX1/94/REP
- FAO (1993). *Report on the Commission of Plant Genetic Resources Fifth Session Rome, 19–23 April, 1993* CPGR/93/5 FAO, 1993
- FAO (1996). *Ste of the World Report on Plant Genetic Resources for Food and Agriculture (CPRFA) 1996*. FAO, Rome, Italy
- *Bioversity Letters of Agreement 93/71 and 95/064*
- Selected Bioversity staff e-mails relating to the ITA negotiations
- Press reports and newsletter articles
- *Financial Times* (1994). *World Bank accused of attempting raid on gene reserves*. 21 June
- *Financial Times* (1994). *Free access to plant genetic resources assured* 5 July
- *North South Development Monitor*. 1994. *Third World Network* June 21, *South's Germplasm A World Bank Asset*
- Mooney, P.R. (1994). *The World Bank Transforms a Bio-Conventional Proposal for Intergovernmental Oversight into a Bio-Adversity Battle over Governance of the CGIAR*. *Diversity* Vol. 10, No. 2
- Serageldin, I. (1994). *Genetic Resources Conservation in the CGIAR: Protecting an Irreplaceable Resource for Future Generations*. *Diversity* 10 (2)
- Grain. *Towards a World Genebank*. Seedling July 2004. Newsletter published by Grain

Datasets

- SINGER

leading up to the ITA discussions (1988–91). Later in 1993, Bioversity was actively involved in helping to organize the Crucible Group⁴ meetings. Bioversity was a partner in the group and the Director General a member of its Management Committee. Bioversity remained fully involved in the second phase of the Crucible Group and participated in the discussions and report-writing.

Bioversity was present at most of the debates, having been mandated by the CGIAR to represent it on issues associated with genetic resources policy by virtue of its role as the convening center for the SGRP and the Genetic Resources Policy Committee (GRPC). This enabled Bioversity to play the lead-

ing role in terms of representing the CGIAR in the policy dialogue and also in terms of developing understanding and commitment among CGIAR Centers.

“Bioversity was definitely there in the thick of all the debates and they did bring rationality, expert knowledge and excellent negotiating skills to the tasks at hand. I would say that they had a large influence in hammering out an agreement that all the centers—those who held the actual germplasm—could live with and actively support.”

Many organizations and individuals made important contributions to the policy-making process, and it is difficult to isolate the contributions of Bioversity from those of others. The ITAs

may well have been agreed upon in some form without Bioversity's participation because the need was widely recognized and leadership could have emerged from other quarters. However, Bioversity may have helped to speed up the negotiations because it had spent years establishing trust with different parties through the various activities described above. Bioversity was described as an honest broker that was trusted by the diverse group of participants in what was otherwise a highly polarized debate. Some respondents linked the trust that Bioversity has enjoyed with its long-standing technical role in coordinating plant genetic resources regional and crop networks.

Bioversity's coordination of SINGER also contributed to trustful relations. All centers participating in SINGER made information about the flows of germplasm into and out of CGIAR genebanks publicly and freely available. Using this data, Bioversity was able to explain effectively concepts such as interdependence of plant genetic resources. The fact that the information was freely available on the internet also helped create an overall greater transparency about CGIAR accessions and distribution, thus defusing speculation.

6. THE PERCEIVED INFLUENCE OF THE IN-TRUST AGREEMENTS

As described earlier, the legal status of the CGIAR genebanks came into question as a result of the CBD and other policy decisions. Although these decisions were largely outside of the realm of genetic resources and agricultural research, they had—or could have had—serious implications for agricultural resources used in research related to plant improvement and agricultural productivity. Because the CBD implied that germplasm would be considered a sovereign property of countries and made no provisions for germplasm held by international organizations such as the CGIAR, the very legal foundation upon which CGIAR germplasm rested was called into question. As described by those concerned, the situation was characterized by discord and political positioning related to CGIAR germplasm collections. One respondent put it this way:

“... there was a real possibility of acrimonious international demands for return of some collections, an increased effort by private companies to take out patents and claim rights over varieties and other forms of entanglements which could have been nightmarish.”

Fear about privatization of germplasm was not unfounded. In 1985, the United States extended patent protection to plants (Heisey, Srinivasan, & Thirtle, 2002) and most countries had adopted plant variety protection legislation by 1990. As shown in the table below and discussed by Falcon and Fowler (2002), data from the United States Patent and Trademark Office showed a sharp increase in patent applications and grants for genetic resources leading up to the CBD, a trend that continues today (Table 4). The ITAs were needed in order to guard against the privatization of the CGIAR germplasm and to help ensure that it remained a public good.

Table 4. United States patents related to rice, wheat, corn genetic resources.^a Source: <http://www.uspto.gov>, accessed October 29, 2009

Time period	Rice	Wheat	Corn
1981–85	61	69	127
1986–90	123	148	217
1991–95	412	497	814
1996–2001	3,168	3,412	5,254
2002–October 2009	16,464	14,077	27,197

^a Applications containing the terms rice, wheat, or corn, plus gene.

In the 1994 CGIAR Mid-Term Meeting in New Delhi, the World Bank, which was a founding member of the CGIAR, announced that it would forgive existing CGIAR debts, increase its grant to the CGIAR to US\$40 million, and offer to match new funds from other donors up to a total of US\$60 million. There was speculation that this decision to provide increased financial support to the CGIAR Centers to avert a funding crisis was actually a maneuver to gain control over the collections. Concerns were heightened when the World Bank established a steering committee with itself as Chair and announced the intention to consult the WTO about the intellectual property provisions in General Agreement on Tariffs and Trade (GATT) and the disposal of CGIAR-held germplasm. Whereas views of the seriousness of this threat differ among those interviewed, the concerns were serious enough to have been published in various media around the world including the *Financial Times* (quoted below), and to have generated a rebuttal by the Chair of the CGIAR published in the genetic resources newsletter *Diversity*.

“The NGOs want the second session of the Intergovernmental Committee of the Convention on Biological Diversity to ensure that control over these germplasm collections stays with an intergovernmental body run on a one-country one-vote system and that recognizes farmers' rights (Financial Times, June 1994).”

Without a clear legal status, participants in the plant genetic resource discussions contemplated several possible scenarios. One scenario had countries that had contributed germplasm to CGIAR collections demanding its return. Countries might also stipulate that CGIAR Centers holding the germplasm originating from their country restrict its further distribution and use. Some participants also thought that countries hosting CGIAR Center genebanks might consider germplasm held in those genebanks as their sovereign property, since the material was physically located within their borders.

There was a concern that the consequence would be a “drying up” of exchange of germplasm both into and out of the CGIAR Centers, and thus less germplasm available for critical research and plant breeding. This was reinforced by several interview respondents and in several policy documents and meeting reports arguing that an internationally accepted legal status was needed for the CGIAR collections in order to facilitate continued acquisition and distribution. Some (quoted below) were concerned that the “illegality” of the collections would jeopardize the CGIAR itself.

“... possibly germplasm exchanges would have come to an end, because the IARCs could hardly operate outside the international law.”

“Many governments around the world were arguing that the CGIAR collections were illegal and regarded it as a failure of the CBD that it did not govern the CGIAR collections. If illegal, they would have to be closed. If the CGIAR fought to retain them despite being illegal, even the CGIAR itself might have to end.”

Even if it did not result in the outright collapse of the CGIAR, such uncertainty about the CGIAR's core business could have led to a reduction in donor confidence, and funding support to the CGIAR collections.

“... one could think about a chaotic situation: no exchanges of germplasm and the germplasm collections perhaps not fully dismantled, but surely not funded anymore.”

Since the ITA was established, the CGIAR genebank system did not collapse, rather the CGIAR genebanks have continued to carry out their mandate to distribute germplasm widely and freely. More than 1.6 million samples of seeds and plant materials from the in-trust collections have been distributed to researchers and plant breeders since 1994. Table 5 shows the

Table 5. *Distribution of CGIAR In-Trust Accessions 1994–2008. Source: SINGER database*

Accessions In-Trust distributed to	In-Trust samples	%
CGIAR centers	690,721	42.4
National Agricultural Research Systems	499,492	30.6
Universities	304,586	18.7
Genebanks	31,222	1.9
Germplasm network	28,607	1.8
Commercial company	27,183	1.7
Unknown	14,599	0.9
Other	11,235	0.7
Regional organization	9,699	0.6
Non-governmental organization	6,371	0.4
Farmers	4,372	0.3
Individuals	1,958	0.1
Other categories	107	0.0
Total	1,630,152	100.0

major recipients of these accessions, 49% of which were distributed to national agricultural research systems and universities for research purposes. The majority of these have gone to developing countries (Fowler, Smale, & Gaiji, 2000).

In addition to direct contributions to the conservation and use of the CGIAR germplasm, the ITAs also helped establish the legal basis for the International Treaty adopted in 2001 and ratified in 2004. Article 15.1 of the Treaty called for the CGIAR Centers to sign agreements with the Treaty's governing body to bring the in-trust collections under the auspices of the Treaty. Thus the ITAs established a legal framework for the CGIAR collections (by elaborating the concept of "in-trust") that was adopted in the Treaty. The ITAs also demonstrated the possibilities of putting into operation the concept of a multilateral system of germplasm conservation and use, which was another hotly debated concept during the Treaty negotiations. The multilateral system is a fundamental principle upon which the final Treaty is based:

"I didn't really appreciate the importance of the In-Trust Agreements at the time. It must, however, have paved the way for the more recent International Agreement on PGRFA, without which we would be reduced to bilateral agreements for germplasm exchange. . . I have great hopes for the International Treaty, and it could have been very difficult to achieve it without the In-Trust Agreement."

The value of the ITAs is ultimately related to the economic value derived from the use of accessions in plant improvement and the non-use values associated with conservation. Direct evidence of the economic value of an accession is very difficult to account for (Pearce & Moran, 1994). Furthermore, analytical approaches employing market-derived variables are intrinsically ineffective in capturing non-market value. An accession's marginal value can be estimated given enough resources (Pardey *et al.*, 1999) but even then, the method generally underestimates the total value because accessions are often used more than once in subsequent breeding efforts at different times and in different places (Rubenstein, Heisey, Shoemaker, Sullivan, & Frisvold,

2005). An evaluation of the role of IRRI in improving rice cultivars estimated IRRI global economic impact to be in the order of US\$1.9 billion over a 20-year period (Evenson & Gollin, 1997). According to the same study, the present value of a single accession incorporated into a modern variety is estimated to be nearly US\$50 million, and an estimated 1,000 cataloged accessions valued at around US\$325 million. Thus, having contributed to maintaining the CGIAR collections as public goods, the ITAs undoubtedly helped to conserve a resource of significant value.

7. CONCLUSIONS

This study analyzed the impact of the In-Trust Agreements and the role of Bioversity International in the negotiations to establish these agreements. The In-Trust Agreements, signed in 1994 between FAO and 12 CGIAR Centers, were the result of a lengthy negotiations process that aimed to provide a new legal framework (in the context of the uncertainty created by the CBD) for CGIAR germplasm conservation, acquisition, and distribution. Bioversity played a central role in these negotiations. In addition to conducting research to inform the policy-making process, Bioversity played a broader role that included the facilitation of dialogue among diverse interests and stakeholders and analysis to translate complex scientific information for policy makers. Bioversity's inputs into the policy-making process were not constrained by strict project-delimited timeframes and budgets. Rather, participation in the agreement negotiation process was a core activity of the organization that developed over many years as the policy debate evolved, engaged many different staff members as needs and opportunities arose (including the most senior management), and even continues today as new plant genetic resource policy issues emerge.

The ITAs operationalized the concept of a multilateral system of germplasm exchange, and thus facilitated the adoption of this concept by the International Treaty. The Treaty established a higher-level legal framework to govern multilateral exchange of plant genetic resources for the CGIAR and participating countries and confirmed the in-trust status of the CGIAR collections. In the views of several participants in both the ITA and the Treaty negotiations, this was perhaps the most important impact of the ITA.⁵

In the present-day policy environment, food security continues to be of concern. New challenges such as climate change, political instability and security, food prices, and others have emerged in the contemporary policy environment. Thus the value of the CGIAR collections, presumed even in the mid-1990's to be very high, is likely to be even greater today. The authors would encourage additional investments in further research into the value of the CGIAR collections and in policy research that informs decisions about how the policy environment can be further developed to promote sustained conservation and enhanced use of these resources.

NOTES

1. For convenience, 'Bioversity International' is used in the text even though the activities to which we refer may have occurred during the time of one of its predecessor organizations: International Board for Plant Genetic Resources (IBPGR), 1974–91; and International Plant Genetic Resources Institute (IPGRI) 1991–2006. Since December 2006, IPGRI and INIBAP have operated under the name Bioversity International.

2. CIAT, based in Colombia and established in 1967, focused on tropical agriculture; CIMMYT, based in Mexico and established in 1966, focused on maize and wheat; IITA based in Nigeria and established in 1967, focused on tropical agriculture; and IRRI, established in 1960 and based in the Philippines, focused on rice. Other centers joined later and by 2009 the CGIAR included 15 Centers.

3. In 1995 the mandate of the FAO Commission on Plant Genetic Resources was broadened (Resolution 3/5) to cover all components of agro-biodiversity of relevance to food and agriculture. It was then renamed the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA).
4. The Crucible Group was comprised of 28 individuals, including representatives of grassroots organizations, agricultural researchers, intellectual property specialists, trade negotiators, and agricultural policy analysts from South and North. They met to discuss the issue of the intellectual property protection of plant genetic resources. The Group

aimed to bring together individuals with widely differing views to produce a report in which consensus views were expressed when possible, but on issues where the participants did not agree, could provide an opportunity for each "side" in the debate to put forward their best arguments sharpened as a result of the discussions with a view to letting the readers of the report decide for themselves.

5. Bioversity's influence on the International Treaty negotiations is documented in Sauvè & Watts (2003).

REFERENCES

- Arts, B., & Verschuren, P. (1999). Assessing political influence in complex decision-making: An instrument based on triangulation. *International Political Science Review*, 20(4), 411–424.
- Bamberger, M., Rugh, J., & Mabry, L. (2006). *Real world evaluation*. London, UK: Sage Publications.
- Evenson, R., & Gollin, D. (1997). Genetic resources, international organizations, and improvement in rice varieties. *Economic Development and Cultural Change*, 45(3), 471–500.
- Falcon, W. P., & Fowler, C. (2002). Carving up the commons. Emergence of a new international regime for germplasm development and transfer. *Food Policy*, 27(2002), 197–222.
- FAO (1998). *The State of the World's Plant Genetic Resources for Food and Agriculture*. Rome.
- Fowler, C. (2003). The status of public and proprietary germplasm and information: an assessment of recent developments at FAO. *IP Strategy Today*, 2003(7), 2003.
- Fowler, C., Smale, M., & Gaiji, S. (2000). Germplasm Flows between Developing Countries and the Cgiar: An Initial Assessment. Global Forum on Agricultural Research (GFAR). GFAR Secretariat/FAO in Rome, Italy.
- Frankel, O. H., & Bennet, E. (1970). *Genetic resources in plants-their exploration and conservation*. Oxford, UK: Blackwell Scientific.
- Frankel, O. H., & Hawkes, J. G. (1975). *Crop genetic resources for today and tomorrow*. Oxford, UK: Cambridge University Press.
- Heisey, P., Srinivasan, C., & Thirtle, C. (2002). Privatization of plant breeding in industrialized countries: Causes, consequences and public sector responses. In D. Byerlee, & R. Echeverria (Eds.), *Agriculture research policy in an era of privatization*. UK: CAB International.
- Holden, J. H. W., & Williams, J. T. (1984). *Crop genetic resources: Conservation and evaluation*. London, UK: Allen & Unwin.
- Jimenez, P. R. (1985). Participant observation. In M. L. Bautista, & S. P. Go (Eds.), *Introduction to qualitative research methods* (pp. 144–156). Manila, Philippines: De La Salle University Research Center.
- Pardey, P. G., Koo, B., Wright, B. D., Eric Van Dusen, M. E., Skovmand, B., & Taba, S. (1999). *Costing the ex situ conservation of genetic resources: Maize and wheat at CIMMYT*. EPTD Discussion Paper No. 52, IFPRI, Washington DC, USA/CIMMYT, Mexico.
- Pearce, D., & Moran, D. (1994). *The economic value of biodiversity*. London, UK: IUCN.
- Rogers, P., Petrosino, A., Huebner, T., & Hacsí, T. (2000). Program theory evaluation: Practice, promise and problems. In P. Rogers, T. Hacsí, A. Petrosino, & T. Huebner (Eds.), *Program theory in evaluation: Challenges and opportunities*. New Directions for Evaluation, No. 87. San Francisco, CA, USA: Jossey-Bass.
- Rubenstein, K. D., Heisey, P., Shoemaker, R., Sullivan, J., & Frisvold, G. (2005). Crop genetic resources: An economic appraisal. USDA Economic Information Bulletin No. 2, 41 pp.
- Sauvè, R., & Watts, J. (2003). An analysis of IPGRI's influence on the International Treaty on Plant Genetic Resources for Food and Agriculture. *Agricultural Systems*, 78(2), 307–327.
- USAID (1996). *Conducting key informant interviews*. USAID Performance Monitoring and Evaluation TIPS, Number 2.

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