

## Policies Impacting Access to Plant Genetic Resources in Last Four Decades

Pratibha Brahmī<sup>1\*</sup>, Vandana Tyagi<sup>1</sup>, Pragma<sup>1</sup> and Anuradha Agrawal<sup>2</sup>

<sup>1</sup>ICAR-National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi-110012, India

<sup>2</sup>Indian Council of Agricultural Research, Krishi Anusandhan Bhavan II, New Delhi-110012, India

A paradigm shift occurred in the international policy environment with respect to biological diversity from “heritage of mankind” to “sovereign rights of a nation”, primarily triggered by the Convention on Biological Diversity (CBD) in 1992. To address the issue of food security, in terms of access to plant genetic resources for food and agriculture (PGRFA) as well as for realization of farmer’s rights, the International Treaty for Plant Genetic Resources (ITPGRFA) was adopted 2001. In 2010 a Nagoya Protocol on Access and Benefit Sharing (NP-ABS) was developed under CBD to facilitate exchange of biological resources bilaterally between countries, on mutually agreed terms. Both the Treaty and CBD offer regulatory mechanisms for exchange of germplasm and fair and equitable share of benefits and are implemented through national policies in mutually supportive manner. However, practically they have impacted germplasm flow. In the world of plant breeding and crop improvement, these regulations are seen to bring a slow-down in the international exchange of germplasm hampering scientific progress.

### Introduction

Agro-biodiversity is crucial for food and nutritional security of the world. This component of biodiversity is dependent on the availability of basic raw material in the form of germplasm for improvement of crops, livestock, and other components used as food fibre and feed. Agro-biodiversity needs to be sustained by humans for current and future generations, as opposed to biodiversity existing in natural ecosystems, which is self-sustained. The germplasm and varieties of various crops used for food and animal feed have been developed over centuries mainly through human interventions. Most of the cultivated or domesticated species are not found in the wild habitats as such. The use of plant genetic resources for food agriculture (PGRFA) is essential for crop improvement programs and the interdependence for these resources among countries requires facilitated exchange. Therefore, it is important to develop mechanisms for facilitated access among countries.

The germplasm exchange mechanisms have rapidly changed during the last four decades, due to the trends of globalization and privatization. A major paradigm shift was witnessed in the international policy environment from “heritage of mankind” to “sovereign rights of a nation”, primarily triggered by the Convention of Biological Diversity (CBD), which came into force

in 1993, adopted during the Rio Earth Summit of the United Nations. It was the first legally binding institutional mechanism, providing for conservation and sustainable use of all biological diversity and with provisions of equitable sharing of benefits arising out of the use of biodiversity. The CBD reaffirmed national sovereignty over genetic resources and stressed that the authority to determine access to genetic resources rests with the national governments and is subject to national legislations (<http://www.biodiv.org/doc/legal/cbd-en.pdf> full text of the Convention). It provides for a bilateral approach to access/exchange between countries on prior informed consent (PIC) and mutually agreed terms (MAT).

The CBD was meant to put in place regulations regarding access to germplasm, and raised the required level of negotiations. The Convention provided a framework of regulations for access to genetic resources and transfer of relevant technologies. However, it does not offer special treatment to PGRFA which are of different nature and crucial for food security and sustainable agriculture. The Food and Agriculture Organization of the United Nation (FAO) simultaneously adopted a resolution for revision of non-binding International Undertaking on Plant Genetic Resources (IUPGR) on PGRFA which aimed at systematic PGR management, international co-operation and PGR exchange. The

\*Author for Correspondence: Email-Pratibha.brahmi@icar.gov.in

Commission on Genetic Resources for Food and Agriculture (CGRFA) addressed the outstanding issues of access to PGRFA and realization of farmer's rights and adopted the International Treaty for Plant Genetic Resources (ITPGRFA) in the 31<sup>st</sup> Conference of the FAO in November 2001. The ITPGRFA entered into force in 2004 (<http://www.fao.org/ag/cgrfa/itpgr.htm>).

During the negotiations of the Treaty, it was realized that not only plant breeders but also farmers must have rights over their landraces and varieties (Paroda, 2013). The Treaty thus provided for facilitated access to PGRFA and established the Multilateral System (MLS) of Access and Benefit Sharing (ABS). The objectives of the Treaty and CBD are identical, though the access and benefit sharing mechanisms are dealt differently. The Treaty has created a MLS of ABS while CBD and Nagoya Protocol on Access and Benefit Sharing (NP-ABS) creates mechanism for bilateral arrangements (Halewood, 2015). Both the Treaty and CBD are however meant to be implemented through national policies in mutually supportive manner. With the advent of CBD continued free exchange of germplasm was the main concern but more importantly, the most critical issue is how the farmers who are the true discoverers, conservers, producers and breeders of these invaluable resources can be benefitted from these resources. The Treaty and the NP-ABS though ratified by many countries, has halted the use of genetic resources to a great extent (Paroda, 2018).

### PGR Governance Status

Global recognition of the policy significance of interdependence on PGRFA arguably reached its zenith in 2001 when 'interdependence' was explicitly included in Article 11 of the ITPGRFA as one of two criteria - the other being relevance for food security- for including crops or forages in the MLS. Through the MLS, ITPGRFA parties have agreed to create a global, virtual pool of genetic resources for 64 crops (these are listed in the Treaty's Annex 1). In addition to conservation, this germplasm is intended to be utilized for the purposes of training, breeding and research for food and agriculture. Member states agree to provide facilitated access to one another (including natural and legal persons within their borders) on the understanding that monetary benefits will be shared if the recipients incorporate materials in new, commercialized PGRFA products that are not available to others for research,

training or breeding (Dua *et al.*, 2004). Issues were raised on the ownership of PGR and benefit sharing, as the vast collections of germplasm conserved in various gene banks in CGIAR system were collected from gene rich/economically developing nations and stored away from the place of collection (Evenson 1999, Hamilton *et al.*, 2005).

India is signatory to legally binding instruments like CBD, ITPGRFA, World Trade Organization's agreement on Trade Related aspects of Intellectual Property Rights (WTO-TRIPS), and it has also endorsed the Global Plan of Action (1996). TRIPS and CBD compliant legislation/ acts/ policies have been enacted in the country during the past 20 years in terms of providing access to PGR within the country and sharing of benefits arising out of their use. These include the Patents (Amendment) Act 2005, 'Biological Diversity Act 2002', 'Protection of Plant Varieties and Farmers' Rights Act, 2001' and Geographical Indications of Goods (Registration and Protection) Act 1999. The access mechanisms of germplasm under these regimes are depicted in Fig 1.

For complying with the provisions of CBD, Government of India enacted the legislation called Biological Diversity Act (BDA), 2002 and also notified the Biological Diversity Rules, 2004 (<http://www.nbaindia.org>). The objectives of the BDA are to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising out of the use of biological resources, knowledge and for related matters, giving effect to the CBD. For the purpose of the Act, a National Biodiversity Authority has been established and which regulates conservation and access to biological diversity for sustainable utilization and equitable sharing of benefits arising out of the utilization of biological resources. India being signatory to the legally binding Treaty has an obligation as a Contracting Party, however as per BDA prior approval of NBA is required for accessing biological resources. Thus for harmonizing provisions of BDA and ITPGRFA, Government of India issued a Gazette Notification in 2014 for implementation of ITPGRFA and provided exemption under Section 40 of BDA, 2002 (to exempt certain biological resources normally traded as commodities) for facilitating export of germplasm through ICAR-NBPGR for Annex 1 crops of Treaty.

India has also ratified Nagoya Protocol (NP) on ABS and is one of the countries already having domestic

measures in place on ABS. NP recalls and recognises the MLS and ABS established under the ITPGRFA in the context of poverty alleviation and climate change and acknowledges the fundamental role of Treaty and FAO CGRFA in harmony with the Convention. The protocol provides for a strong basis for greater legal certainty and transparency for both providers and users of genetic resources. Gazette notification to this effect was issued in 2014 and guidelines notified.

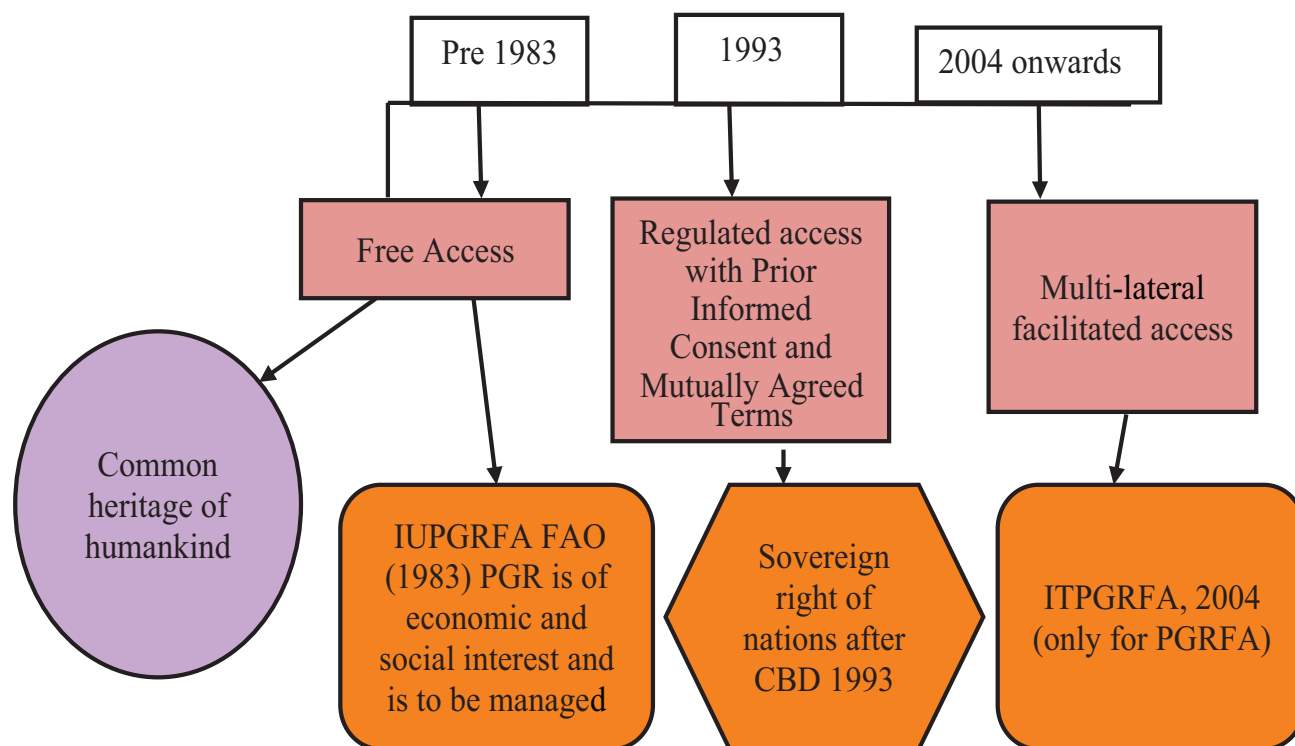
**Access to Indian Biological Resources by Nationals of Other Countries**

As per the BDA, 2002, no person from outside India or a body corporate, association, organization incorporated or registered in India having non-Indian participation in its share capital or management, can access any biological resources or knowledge associated, for research, commercial utilization, bio-prospecting or bio-utilization, without proper approval of NBA. Also, no person can apply for any intellectual property right in or outside India for any invention based on any research or information on a biological resource obtained from India, without obtaining approval from NBA. Collaborative research projects involving transfer or exchange of biological resources or information

between Governments sponsored institutions of India, and such institutions in other countries, are however exempted, if they conform to the policy guidelines approved by the Central Government (Box 1). The role of national research organizations mandated with agricultural research in development of new varieties is well-established. In addition, there are number of State Agricultural Universities and private sector seed companies engaged in crop improvement and varietal development programs. The public and private sectors are, therefore, supplementary to each other to fulfil the demand of the Indian farmers in terms of new crop varieties/hybrids, quality seed production and their distribution. At national level, access to biological resources from India is regulated by BDA

**Box 1. Exemption Provided Under the Biological Diversity Act, 2002**

Section 40	Annex 1 crops of ITPGRFA
Section 5	Collaborative research projects conforming to policy guidelines issued by Central Government and approved by Central Government
Section 7	Local people and communities of the area, growers and cultivators of biodiversity, and vaidis and hakims practicing indigenous medicine
Section 40	NTCs (Normally traded commodities) (for material used only as commodity by traders)



**Fig. 1. Access to Genetic Resources under different Policy Regimes**

## Impact of CBD and Treaty on Germplasm Flow in India

Under the free access before CBD, need-based import and export of research material was facilitated by NBPGR with delegation of the responsibility to Director, ICAR-NBPGR by the Department of Agricultural Research and Education (DARE), Ministry of Agriculture. During that period, India benefitted with introduction of many new crops (e.g. sunflower, soybean, kiwi, dragon fruit, cashew etc.). A detailed account of introduction of fruit crops in and from India has been published recently (Ranjan *et al.*, 2022). However, during the implementation of the BDA 2002 and subsequent notifications to implement the provisions of the Act, many stakeholders expressed their concerns hindering the “business as usual” with respect to genetic resources use.

To address this concern, Tyagi *et al.* (2006) analysed the number of germplasm accessions introduced from CGIAR Centres and NGBs during pre-CBD period (1988-1992) and post-CBD (1997-2001) period. There was an overall decline of 14.5% in introduction the post-CBD era. The results showed that requests for germplasm import from other countries for public-funded research were drastically reduced from 80-90% to only 20-22%. This decline was confined to supplies from NGBs of various countries, indicating cautious approach adopted by different countries in sharing their germplasm, post-CBD. Interestingly, 81% of germplasm introduced from NGBs did not originate or they were not the centres of diversity for that particular biological resource (Tyagi

Category	Pre regulations (1985-1994)	Post regulations (2010-19)	% increase/decrease
ICAR	55	20	35↓
CG Centers	10.9	10.8	0.1↓
Private	4.5	60.8	56.3↑
Universities	17	7	10↓
Others	12.6	1.4	11.2↓

Fig. 2. Share of plant germplasm accessions imported in India, by categories of users

*et al.*, 2006). It indicates that these importing countries might have realized the importance of PGR much earlier and assembled vast collections. Similarly export of germplasm is also reduced to a great extent.

Another analysis for the period 1985-1994 before and 2010-2019 after regulations entered into force has been done by the authors to study the impact on the volume of exchange of germplasm. The years 1995-2009 are not taken into account as this period was considered as transition phase. The results showed that the number of germplasm accessions imported from CG Centres more or less remain unaffected. However, a 35% reduction from NGBs in other countries occurred in germplasm requested by ICAR Institutes. In total, a decline of 56.3% was seen in total imports if, private seed companies are not taken into account (Fig. 2). Private seed companies import mainly from their counterparts/ sister companies. With reference to export of PGR, a sharp decline was observed in number of samples exported, slight increase is observed in year 2018 as the export was undertaken under a collaborative project on ‘Stress tolerant orphan

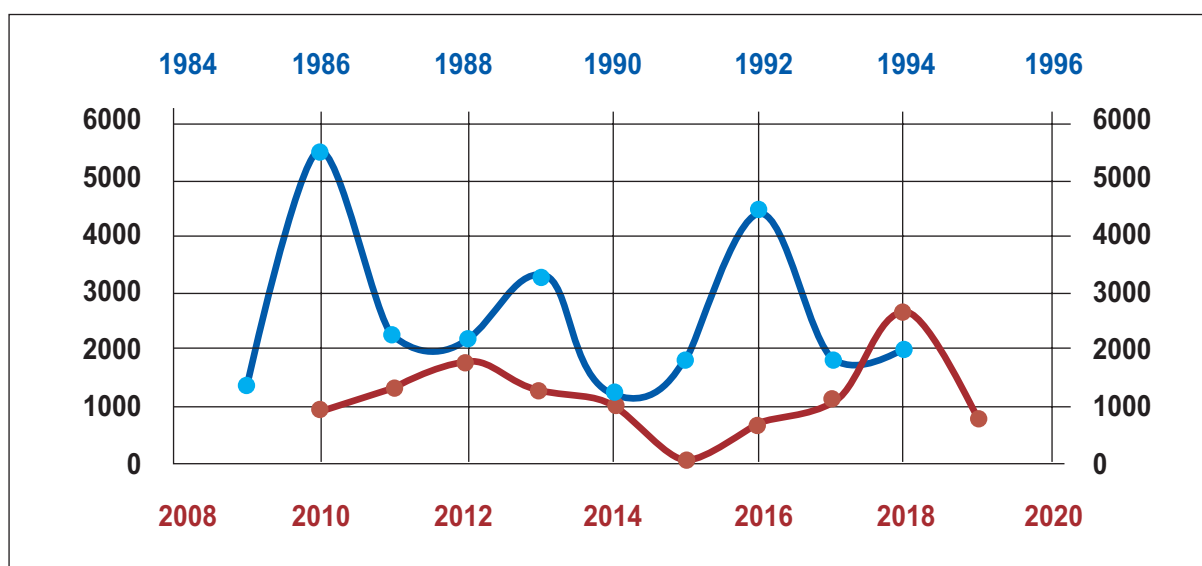


Fig. 3. Number of samples exported

legumes across Sub-Saharan Africa and India' (Fig 3.). This decline in number of import of germplasm is likely to have a long-term effect on breeding in public sector organization especially in crops like pulses, vegetables and other potential crops.

For exchange of components of agrobiodiversity, there is a need for closer look at the provisions of the BDA 2002, with respect to regulation for access to germplasm for research (including crop improvement), as well as some definitions. It is necessary to underline the intent and context of these provisions especially with reference to food and agriculture. For exchange of Genetic Resources for Food and Agriculture (GRFA) including plants, animal, fish, microbes and insects, ICAR had designated its five bureaux dealing with GRFA as 'single window' system for import and export of these components as per extant legislation and international regulations (Office order F. No. 8 (2) / 2011/ Cord. (Tech.) dated 19.10. 2012). Section 16 of BDA, 2002 provides for delegation of power and functions of the Act by National Biodiversity Authority (NBA). Under these special powers of NBA, DARE may be delegated to deal with agrobiodiversity issues including sharing of components of agrobiodiversity including their commercial utilization through its National Agricultural Research System (NARS). India's Biological Diversity Act 2002 is under revision and above suggestions have been provided by the PGR community on the proposed amendments.

### Way Forward

The challenge in the coming decades will be for countries to ensure the access, sustainable use and transfer of PGRFA for food/livelihood security and conservation, while ensuring the fair and equitable sharing of benefits from their use with the providers and knowledge holders. Many countries continue to evolve their institutional arrangements in response to changing circumstances, new information and experience. A survey of ABS country measures accommodating the distinctive features of PGRFA was undertaken by the CGRFA which found that there are significant gaps in research about the positive or negative effects of the regulatory measures in practice on various stakeholders and the conservation and sustainable use of PGRFA.

Thus, policy change must be aimed to enhance efficient flow of germplasm around the world. Since the national policy affect germplasm exchange for

PGRFA and owing to the special features of these resources, they needs to be dealt separately from policies governing access to non-food and non-feed biological resources. The overall objectives of the CBD being conservation of total biodiversity, the use of cultivated agrobiodiversity has little impact on the environment and naturally occurring biodiversity which is self-sustaining. Although, anthropogenic pressures are affecting our climate and environment, cultivated diversity is generated continuously and it can be conserved only through utilization. Thus the regulations for general biodiversity need not apply to components of agrobiodiversity.

### Acknowledgement

Dr RS Paroda, a global leader in the area of plant genetic resources mangement has been closely associated with the changes in the policy domain with respect to PGR exchange and ABS mentioned in this article. The authors thank him for his continued guidance and congratulate him on his 80<sup>th</sup> birthday (August 28, 2022), wishing him many more years of productive and happy life ahead.

### References

- Dua RP, P Brahma and BS Dhillon (2004) International Treaty on Plant Genetic Resources for Food and Agriculture: An assessment. *Indian J. Plant. Genet. Resour.* **17**: 48-32.
- Evenson RE (1999) Intellectual property rights, access to plant germplasm, and crop production scenarios in 2020. *Crop Sci.* 1630-1635
- Halewood M, P Brahma, PN Mathur and KC Bansal (eds) (2013) *A Road Map for Implementing the Multilateral System of Access and Benefit Sharing in India*. Bioversity International, Rome, ICAR and NBPGR, New Delhi, 126 p.
- Hamilton S, Ruraidh and E Javier (2005) Intellectual property rights and germplasm exchange: the new rules in planning rice breeding programmes for IMPACT.
- Paroda RS (2013) Implementing the International Treaty to address current concerns about managing our plant genetic resources. In M Halewood, P Brahma P, PN Mathur and KC Bansal KC (eds) *A Road Map for Implementing the Multilateral System of Access and Benefit Sharing in India*. Bioversity International, Rome, ICAR and NBPGR, New Delhi, pp 4-9.
- Paroda RS (2018) Agrobiodiversity: dynamic change management. In: *Reorienting Indian Agriculture: Challenges and Opportunities*. CAB International, Wallingford UK, pp. 157-164.
- Ranjan P, Brahma P and Tyagi V *et al.* (2022) Global interdependence for fruit genetic resources: status and challenges in India. *Food Sec.* <https://doi.org/10.1007/s12571-021-01249-6>
- Tyagi V, Singh AK, Chand D, N Verma, Singh RV and Dhillon BS (2006) Plant Introduction in India during Pre- and Post-CBD periods – An analysis *Indian J. Plant Genet. Resour.* **19**(3): 436-441.