



PPV & FR Act 2001 and its Implications on Forest Genetic Resources

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Introduction

It is estimated that globally nearly 2.5 billion people rely heavily on wild and traditionally cultivated plant species to meet their daily needs including employment and livelihood. In turn rural and tribal folk, both women and men, are the true repositories of traditional knowledge systems dealing with the characteristics of these species. Since the acceptance of agriculture by human beings as their basic source of livelihood, there is a continuum for the informal crop improvement by farm families and farming communities. Although unaware of the modern principles of plant breeding, the community improvement of the crop, based on selection of superior types which are resilient to different fluctuations in the climatic conditions and suited to the requirements of the local masses, occurred generation after generation. This led to the localized improvement of varieties and coupled with indigenous conservation practices these varieties were saved year after year.

With the initiation of well drafted breeding programmes, based on sound genetic principles, the scientific plant breeding is drawing heavily upon planned hybridization among land races, locally adapted cultivars and wild relatives of crop plants. Such planned pyramiding of genes results in superior varieties combining high productivity with better quality traits, genetic resistance to diseases and pests and greater tolerance to stress environments, including drought, salinity, water-logging, extreme temperature regimes, etc. But these varieties

are based on the limited gene pool and are homogenous as well. Thus, adding to the most serious environmental problem faced by humankind that is irretrievable loss of biodiversity. The traditional varieties and landraces of most of our crops are disappearing from our fast changing agricultural landscape, from our farmlands and woodlands as high yielding varieties are making inroads into the islands of rural and tribal communities who till now conserved our genetic resources.

During last 40 years, due to the positive impacts of the Green Revolution in India, the production of foodgrains and other crops has increased enormously. But, in view of the major projections of climate change and estimated rise in global mean temperature by 1.4–5.8 °C, it is expected that there will be changes in rainfall pattern, unexpected floods and droughts and above all there will be requirement of climate resilient varieties to cope-up with these changes. Since early seventies, several national and international discussions are in progress to deal with such phenomenon. Some relevant ones being, Stockholm Declaration in June, 1972 at UN Conference on the Human Environment, Brundtland Commission Report on “Our Common Future” in 1987 and the First Earth Summit at Rio de Janeiro in 1992, which adopted several environmental conventions such as Biological Diversity (CBD), Climate Change, Ozone Depletion etc. In India, Environment Protection Act was enacted during 1986.



As a member of the World Trade Organization (WTO), India became signatory to the Trade Related Aspects of the Intellectual Property Systems (TRIPS), which provided under Article 27.3.b that the plant varieties are to be protected either by patents or by an effective sui generis system drawing its essence from UPOV. Based on these provisions, The Protection of Plant Varieties and Farmers' Rights Act, 2001 was enacted and the PPV&FR Rules were brought in force in 2003. Simultaneously, India being a party to Convention on Biological Diversity (1992), which recognizes the sovereign rights of States to use their own biological resources, and expects the Parties to facilitate access to genetic resources by other Parties subject to national legislation and on mutually agreed terms, it became necessary to enact Biological Diversity Act in 2002. Both these Acts aim to protect the biological wealth of India and to regulate the IPRs involved at any stage.

Some relevant concepts and definitions

Biological Diversity: means the variability among living organisms from all sources and ecological complexes of which they are part and includes diversity within species or between species and of eco-systems. This definition thus encompasses all available living things on earth. The Biological Diversity Act, 2002 under the provisions of section 8, established National Biodiversity Authority to act as the apex custodian of the Biological Diversity.

Biological Resources: means plants, animals and micro-organisms or parts thereof, their genetic material and by-products (excluding value added products) with actual or potential use or value, but does not include human genetic material. This definition as given in the BDA, 2002 indicates towards our commitment to conserve the biological resources to the extent where nothing is to be left out.

Variety: means a plant grouping except micro-

organism within a single botanical taxon of the lowest known rank, which can be-

- i. Defined by the expression of the characteristics resulting from a given genotype of that plant grouping;
- ii. Distinguished from any other plant grouping by expression of at least one of the said characteristics; and
- iii. Considered as a unit with regard to its suitability for being propagated which remains unchanged after such propagation, and includes propagating material of such variety, extant variety, transgenic variety, farmers' variety and essential derived variety.

Cultivar: means a variety of plant variety of plant that has originated and persisted under cultivation or was specially bred for the purpose of cultivation.

Folk variety: means a cultivated variety of plant that was developed, grown and exchanged informally among farmers.

Landrace: means primitive cultivar that was grown by ancient farmers and their successors.

Farmers' variety: means a variety which-

- i. has been traditionally cultivated and evolved by the farmers in their fields; or
- ii. is a wild relative or land race of a variety about which the farmers possess the common knowledge.

Extant Variety: means a variety available in India which is-

- i. notified under section 5 of the Seeds Act, 1966 (54 of 1966); or
- ii. farmers' variety; or
- iii. a variety about which there is common knowledge; or



- iv. any other variety which is in public domain.

Agro-biodiversity: Agro-biodiversity is a sub-system under biological diversity governed by CBD and Biological Diversity Act, 2002. The major constituents of agro-biodiversity are as below:

- a. The harvested crop varieties, progenitors of cultivated plants, livestock breeds and their non-domesticated species.
- b. Non-harvested species including micro-organisms, pollinators which support agro-sylvan-ecosystems.
- c. Non-harvested species in the environment, which support functioning of food production ecosystem.

Agro-biodiversity hotspots: Broadly, agro-biodiversity is that part of biodiversity which nurtures people and which is being nurtured by people. The major indicators of the hotspots of agro-biodiversity are the occurrence of rich genetic resources useful to humans and the varied ethnic cultures which conserve, select, adopt and domesticate wild relatives of cultivated plants. The areas rich in plant genetic resources, economic plant species, endemic species, progenitors of cultivated plants, their wild relatives, with vast array of variability in different ecosystems, i.e. farm lands, grasslands and woodlands, which have evolved under various environmental stresses and evolved or co-adapted through man's agro-pastoral interventions, can be designated as 'Agro-biodiversity Hotspots'.

Agro-biodiversity hotspots and provisions under PPV & FR Act and Rules

Section 70(2) of the Rules framed under section 45 of the PPV & FR Act states that "The Gene Fund shall be applied for meeting the following purposes in accordance with the priority made hereunder:

- (a) to support and reward farmers, community of farmers, particularly the tribal and rural communities engaged in conservation, improvement and preservation of genetic

resources of economic plants and their wild relatives, particularly in areas identified as agro-biodiversity hot spots;

- (b) for capacity building on *ex situ* conservation at the level of the local body, particularly in regions identified as agro-biodiversity hot spots and for supporting *in-situ* conservation."

The process of identification of agro-biodiversity hotspots of India

Based on the priority fixed under the Rule 70(2)(a), it became necessary to define and demarcate the areas which are to be identified as Agro-biodiversity hot-spots, before the support and rewards can be framed for farmers/ community of farmers. Thus, to identify the Agro-biodiversity hotspots a Task Force ['Task Force 6/2007' constituted vide office order No. PPV&FRA/6-22/07/1310-1312 dated 8th October, 2007] under the Chairmanship of Dr. M.P. Nayar, Former Director, Botanical Survey of India and Dr. K. Narayanan Nayar, Scientist E-1, National Botanical Research Institute, Lucknow with Dr. A.K. Singh, Principal Scientist and Head, Conservation Division, NBPGR, New Delhi as Member Secretary. The Task Force, after several rounds of discussions at different levels [including 02 National level Consultations held at NEH University, Shillong on 1-2 June, 2007 and at Annamalai University on 19-20 July, 2007], submitted its report which was published in the form of 02 Volume Book which have been widely distributed for creating awareness. The major recommendation of the Task Force was to identify 22 Agro-biodiversity hotspots distributed over 07 agro-geographical zones of India.

Some facts related to agro-biodiversity of India

- India is one of the 12 mega-diversity countries of the world and is considered as a major centre of domestication of crop plants.



The Agro-biodiversity hotspots of India

S. No.	Agro-Biodiversity Region	Districts
1.	Cold Desert	Western Himalyas covering Ladakh and Kargil. Upper reaches of Lahual-Spiti districts of Himachal Pradesh.
2.	Western Himalayan	The agrobiodiversity hotspot area covers the districts of Srinagar, Anantnag, Udhampur, Riasi, Kathu in Jammu & Kashmir, all the districts of Himachal Pradesh except the cold arid region and all the districts of Uttarkhand.
3.	Eastern Himalayan	The hotspot area includes all the districts of Arunachal Pradesh, Sikkim and Darjeeling district of West Bengal.
4.	Brahmaputra Valley	The hotspot area includes the following districts: Dhubri, Kokrajhar, Bongaigaon, Baretta, Nalbari, Goalpara, Kamrup, Golaghat, Darrang, Morigaon, Nagaon, Sonitpur, Jorhat, Lakhimpur, Sibsagar, Dibrugarh, Dhemaji and Tinsukia.
5.	Khasia-Jaintia-Garo Hills	The hotspot area includes all the seven districts, i.e. East Garo Hills, West Garo Hills, South Garo Hills, East Khasi Hills, West Khasi Hills, Jaintia Hills and Ri-Bhoi.
6.	North-Eastern Hills	The hotspot area includes all the districts of Manipur, Mizoram, Nagaland, Tripura and the adjoining Cachar and North Cachar districts of Asom.
7.	Arid Western	The hotspots are comprises of the following districts of Rajasthan: Sikar, Nagaur, Pali, Hanumangarh, Ganganagar, Jalore, Sirohi, Jodhpur, parts of Jaisalmer and Bikaner, Udaipur, Dungarpur, Churu, and Jhunjhunun.
8.	Malwa Plateau and Central Highlands	The hotspot area comprises the following districts of Shadol; Raisen, Bhopal, Sehore, Shajapur, Indore, Ujjain, Mandasaur, Rajgarh Hoshangabad, Narsinghpur, Jabalpur, Mandla, Umaria.
9.	Kathiawar	The hotspot are includes the following districts of Gujarat: Ahemdabad, Surendranagar, Jamnagar, Rajkot, Porbandar, Junagadh, Amreli, Bhavnagar, Bharuch, Surat, Navsari, Valsad, Banaskantha and Anand.
10.	Bundelkhand	The hotspot areas include the districts of Jhansi, Banda, Chitrakoot, Hamirpur, Jalaun and Lalitpur in Uttar Pradesh and Damoha, Datia, Panna, Sagar, Tikamagarh and Chattarpur in Madhya Pradesh.
11.	Upper Gangetic Plains	The hotspot area includes the districts of Hardoi, Sitapur, Barabanki, Lucknow, Unnao, Rae Bareilly, Kanpur, Kannuj of Central Uttar Pradesh and the districts of Maharajganj, Sidharatnagar, Kushinagar, Deoaria, Sant Kabir Nagar, Gorakhpur, Basti of North-Eastern Uttar Pradesh.
12.	Lower Gangetic Plains	The hotspot area includes the districts of Paschim Champaran, Purbi Champaran, Gopalganj, Siwan, Sitamarhi Muzaffarpur, Saran, Buxar, Bhojpur, Patna, Rohatas, Jahanabad, Vaishali, Samastipur, Darbangha, Madhubani, Sitamarhi, Sheohar in North Bihar.



13.	Gangetic Delta	The Gangetic delta agrobiodiversity region broadly includes the deltaic 24-Parganas districts, but also the districts of Hoogly, Howrah, Nadia, Bardhaman, Birbhum and Murshidabad which flank on both sides of the river Hoogly flowing into the Bay of Bengal. The hotspot area are the districts of south 24 Parganas, North 24 Parganas, Howrah, Hoogly, Nadia, Bardhaman, Birbhum and Murshidabad.
14.	Chotanagpur	The Chotanagpur region constitutes south and eastern plateau of Jharkhand and contiguous districts in Orissa. It is generally referred as Chotanagpur Plateau, which comprises all the districts of Jharkhand, Mayurbhanj and Sundargarh districts of Orissa. The hotspot areas are the districts of Singhbhum, Gumla, Ranchi, Lohardaga, Palamau and HazaribHag and Santhal Pargana in Jharkhand and Mayurbhanj district in Orissa.
15.	Bastar	The hotspot areas are the following districts: Bastar, Bilaspur, Durg, Jashpur, Kabirdham, Kanker, Kirba, Korla, Mahasamund, Kondaigaon, and Rajnangoan.
16.	Koraput	The Koraput agrobiodiversity region forms part of Northern Eastern Ghats in southwestern Orissa and northeastern districts of Andhra Pradesh (Vizagapatnam, Vijanagaram, Srikakulam). The hotspot area includes the districts of Malkangiri, Sonabeda, Jeypore, Koraput, Nabrangpur, Kalahandi, Bolngir, Rauagada and districts of north eastern Andhra Pradesh i.e. Srikakulam, Vijanagaram, Vizagapatnam.
17.	Southern Eastern Ghats	The hotspots are the districts of Chittoor, Ananthapur, Cuddapah, Kurnool in Andhra Pradesh and districts of Bellary, Raichur and Kolar in Karnataka.
18.	Kaveri	The hotspot area consists of the districts of Chengalput, South Arcot, North Arcot, Thiuvarnamalai, Tiruchirapalli, Pudukottai, Thiruarur, Vellore, Kanchipuram, Dharmapuri, Salem, Namakkal, Karur and Dindigal.
19.	Deccan	The hotspot are includes the districts of Jalna, Hingoli, Parbhani, Beed, Nanded, Latur, Osmanabad, Solapur, Sangli, Gondia, Gadchiroli in Maharashtra and the districts of Adilabad, Karimnagar, Warangal and Khamman in Andhra Pradesh and districts of Bidar and Gulbarga in Karnataka.
20.	Konkan	The hotspot area includes coastal districts of Thane, Raigad, Ratnagiri, Sindhudurg and part of Sahyadri districts of Pune, Satara and Kolhapur of Maharashtra, all the districts of Goa and uttar Kannda district of Karnataka.
21.	Malabar	The hotspot areas are the districts of Kasargod, Kannur, Wayanad, Kozikode, Malappuram, Palakkad, Thrissur, Idukki, Ernakulam, Alappuza, Kollam, Kottayam, Pathanamthitta & Thiruvananthpuram in Kerala, Udhagamandalam (Nilgiri) and Kanyakumari districts of Tamil Nadu and districts of Dakshin Kannada, Kodagu and Udipi in Karnataka.



- Through millennia, India is known for its civilizations and cultures and also for the confluence of human migrations attracted by the fertile Indo-gangetic plains. The ancient farming communities from time immemorial had grown and developed a rich cornucopia of crop plants through selection and adaptations.
- India has over 45000 species of plants and fungi, representing 11% of the world's flora.
- India is rich in endemic species representing 33% of its flora.
- There are three recognized hotspots of biodiversity in the Indian subcontinent, i.e. The Western Ghats & Sri Lanka, the Himalayas and Indo-Burma Region. There are 25 micro hotspots of flora.
- There are 16 forest types and 251 subtypes in India.
- At least 166 crop plants and about 320 species of wild relatives of cultivated plants originated in India. Within the spectrum of crop species and wild relatives, there are thousands of varieties, cultivars, landraces and ecotypes which occur in India.
- India is inhabited by about 550 tribal communities of 227 ethnic groups having 84.5 million people, which represent about 8% of the total population of the country.
- It is seen that large number of wild relatives of crop plants, primitive cultivars of cereals, millets, pseudo-millets, pulses and vegetables, which almost disappeared from their original habitat, are found near tribal villages or backyard farms of tribal settlements.

Implications of PPV&FR Act, 2001 on Forest Genetic Resources

The forests of India, which have been grouped

into 05 major categories and 16 groups according to biophysical criteria, are the rich source of agro-biodiversity per se. This agro-biodiversity is always under evolution due to natural selection pressures. With the impact of climate change ranging from warming temperatures, fluctuations in rainfall severity of weather conditions etc the forests tend to lose their ability to sustain the productivity and supply of products from the existing agro-biodiversity. The response of the genotypes in the changing climate may vary and several locked genes get suitable environment to express them. As the gene expression and its selection is limited to only some of the adaptable genotypes, the value attached with these genotypes is enormous. Once selected and tested, these varieties (or clones) can form the basis for reforestation in the degraded lands. The process of selection of new varieties in case of forest trees is generally long and time consuming. It involves a huge sum of resources in terms of land, money and time, which in turn increases the value of the selected material. Also, the success of reforestation depends on the meticulous selection criteria for the planting material and its large scale multiplication for supply of adequate quantity of planting materials. Thus, the existing agro-biodiversity, which is the only natural repository/ source of genes for the posterity needs urgent care for conservation.

The National Forest Policy, 1988 gives due emphasis on the conservation of biodiversity and the genetic resources with the help of both in situ and ex situ techniques. Since then, several conservation efforts and programmes were launched to protect the forest genetic resources. Now, with the opening of Indian economy to the global trade, these conserved genetic resources are becoming a commodity to be traded. The finalization of the ownership of the agro-biodiversity through registration under PPV&FR Act, 2001 will provide for the option of sharing the benefits accruing out of the use of the potentially best conserved genetic resources. The other implications of the PPV&FR Act, 2001 will be:



1. For reforestation of the degraded lands, the best material registered can be used on large scale. As the registration is for unique morphological characters, the planting material supplied for planting will be of uniform quality and easily identifiable in the field.
2. The import and export of planting materials will become easy because of the fact that the registered owners of the required varieties shall be known.
3. The quality of the planting material supplied will be better because under section 39(2) of the Act, expected performance under given conditions, is to be made known. If the propagating material fails to provide such performance under such given conditions, the compensation can be claimed by the users.
4. The trade of the planting materials of the registered varieties can be done without any fear of illegal use.
5. Once registered, the owners of the varieties can claim benefit shares out of the accrued benefits by the use of the variety under section 26 of the Act.