Protection of Plant Varieties and Farmers' Rights: A Review

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Intellectual Property Rights (IPR) and its application and expansion to agriculture has recently attracted global attention. Consequent upon the establishment of international agreements/institutional mechanisms such as the CBD and the WTO, and further, signing of ITPGRFA, the growing importance and the global scope of IPR in agriculture have been well realized and recognized. Most of the countries as members of World Trade Organization (WTO) are required to harmonize their related instruments with the TRIPS Agreement. It required that member countries enact/amend their domestic laws to provide for intellectual property rights (IPRs) in one form or the other in all fields of agricultural technology. Developing countries are currently attempting to fulfill the obligations of these international agreements by evolving new IPR regimes that simultaneously protect the rights of breeders and farmers. India's PPV & FR Act is significant both in the domestic and international context. The paper highlights various conventions/treaties/agreements affecting agricultural innovation systems and legal mechanisms adopted in developed and developing countries for such innovations. It also reviews the achievements / progress made in effective implementation of various provisions of the Indian legislation.

Key Words: Agro-biodiversity, Authority, Convention, Farmers' rights, Gene bank, Gene fund, Hotspots, Intellectual property, Plant variety, PPV & FR Act, Registration, Treaty

Introduction

Intellectual property, very broadly, means the legal rights which result from intellectual activity in the industrial, scientific, literary and artistic fields (WIPO). Two broad philosophical approaches underlie the decision to grant IPRs. The first approach to IPR protection predominates in many civil law / legal systems where the products of the human mind are stamped with the personality of their creator, inventor or author, thus endowing him or her with a moral as well as an economic claim to exploit those products to the exclusion of third parties. The second approach to IPR protection takes as its starting premise an instrumental view of IP. Legal protection for the products of human intellectual effort and ingenuity is granted not because of a moral commitment to compensating creators or innovators, but because the products they create enrich a society's culture and knowledge and thus increase its welfare. New plant varieties are afforded legal protection under this approach to encourage commercial plant breeders to invest the resources, labor and time needed to improve existing plant varieties by ensuring that breeders receive adequate remuneration when they market the propagating material of those improved varieties (Kannaiyan *et al.*, 2008).

IP protection is crucial for a sustainable contribution of plant breeding and seed supply. Breeding new varieties of plants, which are developed after contributing number of years to the selective inheritance of traits which provide improved yields, higher quality, and better resistance to such plant varieties, requires a substantial investment, in terms of skill, labor, material and economic resources. However, a new variety, once released, could in many cases be readily reproduced by others so as to deprive its breeder of the opportunity to benefit adequately from the investment made. Thus, an effective system of plant variety protection (PVP) is a key enabler for investment in breeding and the development of new varieties of plants or improving existing plant varieties, encourage importation of foreign varieties, promote exportation of plant varieties, provide access to information of the created products and the methodology of creation for the enhancement of social welfare and generally benefit the market place. An international system of IPR protection for plant varieties expands these benefits by facilitating access to new varieties created in other states.

Global Perspective

As early as the 1883 Paris Convention for the Protection of Industrial Property, agriculture was envisaged as an area of enterprise in respect of which property rights could be secured. Given the state of technology in 1883, the inclusion of these agricultural subjects within the Paris Convention, was probably in the context of the protection of trademarks and indications of source. During the next fifty years, different countries in Europe attempted to

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extend IP protection to the field of agriculture. The first attempt to recognize the intellectual property rights of a plant breeder was the enactment of the Plant Patent Act by USA in 1930 which aimed to protect asexually propagated plants by patents leading to a debate regarding the type of protection to be extended to the agriculture. There were two divergent views, either to extend patent protection to plants or to extend the *sui generis* protection, recognizing the plant breeder's rights. It was further debated that plants or animal varieties or essentially biological processes for the production of plants and animals are exception to patentable subject matter. Thus, by 1970s it was well established in the developed world that IP protection will be extended to agriculture. Extensions of IPR to agriculture lead to other issues such as protection of interests and rights of farmers and price rise due to monopoly in agricultural products. The first significant application of intellectual property to agriculture occurred with the evolution on the initiative of associations of horticulturalists and plant breeders of the UPOV Convention for the protection of plant breeder's rights for plant varieties. Secondly, traditional farmers and indigenous people around the world have been seeing their plant genetic resources (PGRs) and traditional knowledge (TK) monopolized by private enterprises under patents and plant breeders' rights and have not been receiving their equitable share of benefits for their contribution. These concerns led to the adoption of two United Nations binding international treaties, Convention of Biological Diversity (CBD), 1992 and The Food and Agriculture Organization (FAO) International Undertaking on Plant Genetic Resources, which was renegotiated and adopted as the International Treaty on Plant Genetic Resources for Food and Agriculture (also known as Seed Treaty) seeking to establish principles for facilitating access to plant genetic resources and establishing fair and equitable mechanisms of benefit sharing. To provide a strong basis for greater legal certainty and transparency for both providers and users of genetic resources Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity (2010) has been adopted. By 1995, with the establishment of WTO, the TRIPS Agreement provided that all member countries must implement a system of protecting IP in agriculture. This extended some kind of protection to agriculture by all the developed and developing WTO member countries. The provisions of *sui generis* protection provided the legitimacy to protect the rights of the farmers and balance the rights of the breeder and the farmer.

These international conventions /treaties /agreements /protocols have comprehensive provisions for conservation and sustainable use of, and access to genetic resources and for sharing of benefits derived from their use. Concurrently, new emerging regimes in protection mechanisms for innovations at the global levels are impacting the access, transfer, and use of biological and /genetic resources and/ or associated technologies for furthering the research and developmental activities in all fields of agriculture.

World Trade Organization (WTO)

As part of creating global universal standards for trade negotiations, the General Agreement on Tariffs and Trade (GATT) was initiated in 1946 and established in 1947. The initial objectives were to promote peace through an interdependent world by removing unnecessary barriers to trade and reduction of tariffs across borders. After several rounds of negotiations, the Uruguay round led to the signing of GATT agreement at Marrakesh in Monaco in April 1994, one of the key elements being the establishment of the WTO in January 1995 in Geneva. India is its founder member of WTO and also that of its predecessor, the GATT. The WTO's scope extended beyond matters of merchandise trade, to agriculture, textiles and clothing, investments, innovation, competition policies, safeguard measures, trade in services, anti-dumping, sanitary and phyto-sanitary measures etc. The WTO aims to help producers of goods and services, exporters, and importers conduct their business and create economic peace and stability in the world through a multilateral system based on consenting member countries (currently there are 153 members and 31 Observer governments) that have ratified the rules of the WTO in their individual countries as well (http://www.wto.org/english/thewto_e/whatis_e/whatis_e.htm).

Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS)

The TRIPS agreement is an international agreement administered by the WTO that sets down minimum standards for many forms of intellectual property (IP) regulation as applied to nationals of other WTO Members. It was negotiated at the end of the Uruguay Round of the GATT in 1994. The TRIPS agreement introduced intellectual property law into the international trading system for the first time and is quoted as one of the comprehensive international agreement on intellectual property to date.

Specifically, TRIPS contains requirements that

nations' laws must meet for copyright rights, including the rights of performers, producers of sound recordings and broadcasting organizations; geographical indication, including appellations of origin; industrial designs; integrated circuit layout-designs; patents; monopolies for the developers of new plant varieties; trademarks and undisclosed or confidential information. TRIPS also specify enforcement procedures, remedies, and dispute resolution procedures. Protection and enforcement of all intellectual property rights shall meet the objectives to contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations. Because ratification of TRIPS is a compulsory requirement of WTO membership, any country seeking to obtain easy access to the numerous international markets opened by the WTO must enact the strict intellectual property laws mandated by TRIPS.

The TRIPS Agreement includes three items related to agriculture: geographical indications (Arts. 22-24); patent protection of agricultural chemical products (Arts. 70.8 and 70.9); and plant variety protection (Art.27.3 (b)). Under TRIPS Article 27.3(b), member countries may exclude plants, animals other than microorganism and other biological processes from patentability but are obliged to provide intellectual property protection to plant varieties. According to these provisions, countries must provide for plant variety protection either by patents or a '*sui generis*' system or any combination thereof. '*Sui generis'* literally means 'of its own kind or unique'. While countries would have to follow detailed standards set out in the TRIPS agreement for providing patent rights to plant varieties, the only requirement to establish a *sui generis* system is that it should be effective. This gives countries the option of determining the scope and contents of the rights to be granted under a *sui generis* system (http://www.wto.org/english/tratop_e/trips_e/intel2_e.htm).

International Union for the Protection of New Plant Varieties (UPOV)

The International Union for the Protection of New Varieties of Plants (UPOV) is an intergovernmental organization which was established by the International Convention for the Protection of New Varieties of Plants by a Diplomatic Conference in Paris on December 2, 1961. The Convention entered into force on 10 August 1968. The purpose was to ensure that the member states party to the Convention acknowledges the achievements of breeders of new plant varieties by making available to them an exclusive property right, on the basis of a set of uniform and clearly, defined principles. UPOV mission is 'to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of the society'.

The Convention was revised in Geneva in 1972, 1978 and 1991. Both the 1978 and the 1991 Acts set out a minimum scope of protection and offer member States the possibility of taking national circumstances into account in their legislation. Under the 1978 Act, the minimum scope of the plant breeder's right requires that the holder's prior authorization is necessary for the production for the purposes of commercial marketing, the offering for sale and the marketing of propagating material of the protected variety. The 1991 Act contains more detailed provisions defining the acts concerning propagating material in relation to which the holder's authorization is required. As on August 08, 2011, 70 countries have become the members of the UPOV out of which 47 countries are party to the 1991 Act, 22 countries are party to 1978 Act and one country (Belgium) is party to the 1961/1972 Act of UPOV (http://www.upov.int/en/about/upov_convention.htm).

Convention on Biological Diversity (CBD)

The CBD was adopted at the Rio de Janeiro Earth Summit, in June 1992. Over 150 governments signed the documents at the Rio conference, and since then 193 countries have ratified the Convention. The Convention has three objectives, 'the conservation of biological diversity, the sustainable use of its components and fair and equitable sharing of the benefits arising out of the utilization of genetic resources. The CBD Preamble reaffirms that States have sovereign rights over their own biological resources, but, at the same time, are responsible for conserving their biological diversity and for using their biological resources in a sustainable manner. The most important parts of the Convention are Articles 15 and 8(j). Article 15 of the Convention recognizes the sovereign rights of States over their natural resources, their authority to determine access to genetic resources, and that access, where granted, shall be on mutually agreed terms or subject to prior informed consent of the provider country. Article 8(j) requires parties to respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional life styles relevant for the conservation and sustainable use of biological diversity

Table 1: Comparison of provisions in UPOV 1978, UPOV 1991 and TRIPS

Provision	UPOV 1978	UPOV 1991 Act	TRIPs compatible Patent Laws
Protection coverage	Varieties of species / genera as listed. Minimum of five on joining. 24 after 8 years	Minimum of fifteen on joining. 10 years later, must protect all plant genera and species	Inventions
Requirement	Novelty (variety must not have been commercialized)	Novelty (variety must not have been commercialized)	Novelty (invention must not have been published)
	Distinctness	Distinctness	Non-obviousness (Inventiveness)
	Sufficient uniformity having regard to the particular features of the variety's propagation	Sufficient uniformity having regard to the particular features of the variety's propagation	Industrial applicability (usefulness)
	Stability	Stability	
Protection term	Minimum 15 years (18 years for trees and vines)	Minimum 20 years (25 years for trees and vines)	Minimum 20 years (TRIPS)
Protection scope	Production for commercial purposes and offering for sale, marketing and repeated use for the commercial production of another variety	Commercial transactions with propagating material. Harvested material protected only if produced from propagating material without breeder's permission and if breeder had no reasonable chance to exploit his right over it.	Making the patented product, using the patented process or using, offering for sale, selling or importing for those purposes the patented product obtained by the patented process
Breeders' exemption	Mandatory. Breeders free to use protected variety to develop new variety	Permissive but Essentially Derived Varieties can only be marketed with the agreement of the breeder	No
Farmers' privilege	Minimum scope of protection allows farmers' privilege	Each member country can define a farmers' privilege suitable for its condition	No
	Any species eligible for PBR protection cannot be patented	This Act is silent on this question; countries may choose to exclude plant varieties from patent protection	Many countries exclude plant varieties as such from patent protection

Source: http://www.fao.org/docrep/007/y5714e/y5714e03.htm

and promote their wider application with the approval and involvement of the holders of such knowledge, innovation and practices and encourage the equitable sharing of the benefits arising from their utilization. It also promotes *in situ* and *ex situ* conservation of biological diversity. It signals wider international acceptance of both intellectual property rights (IPRs) over biological inventions and the need for multilateral assistance for crop genetic resources preservation (http://www.cbd.int /convention).

International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)

Internationally the concept of farmers' rights came up in 1980s as a response to the increased demand for plant breeders' rights, to draw attention to the unremunerated innovations of farmers. It was based on the fact that the farmers have been engaged in the informal breeding process besides conserving and preserving biological and genetic resources for time immemorial. Hence, they deserved to be recognized and rewarded like the contribution of breeders in development of the new varieties was recognized and rewarded through plant breeders' right. The first mention of farmers' rights was made in the meeting of the Working Group of the FAO Commission on PGR, 1986, in the context of the International Undertaking on Plant Genetic Resources (IUPGR) (Nagarajan and Singh, 2010). The 25th session of the FAO Conference of 1989 was a landmark in the history of recognition of farmers' right. The Conference endorsed the concept of farmers' right, and defined these as right arising from the past, present and future contributions of farmers in conserving, improving, and making available plant genetic resources, particularly those in the centers of origin/diversity. The negotiations at the 27th session of the FAO Conference culminated in the adoption of the ITPGRFA (also known as Seed Treaty), through Resolution 3/2001, in November 2001.

The ITPGRFA is a legally binding instrument that targets the conservation and sustainable use of plant genetic resources for food and agriculture and equitable benefit-sharing, in harmony with the 1992 CBD, for sustainable agriculture and food security. The Treaty was adopted in 2001 and, in accordance with its Article 28, came into force on 29 June, 2004, and currently has 127 parties. The preamble of the Treaty highlights the necessity of promoting farmers' rights at national and international levels. It recognized the enormous contribution that the

local and indigenous communities and farmers have made and will continue the efforts on conservation and development of plant genetic resources (Article 9.1). The main components of the farmers' rights highlighted in the Treaty are: (i) right to save, use, exchange and sell farm-saved seed and other propagating material (Article 9.3), (ii) right to fair and equitable sharing of benefits arising from the use of plant genetic resources for food and agriculture, (iii) right to participate in national decision-making process about plant genetic resources [entrusting national governments with the responsibility for implementing these rights in accordance with their needs and priorities subject to national legislation (Article 9.2)], and (iv) protection of traditional knowledge. The responsibility for implementing these provisions rests with the national governments who are free to choose the measures as they deem appropriate, according to their needs and priorities. The treaty also establishes an Multi Lateral System(MLS) for facilitated access to a specified list of PGRFA including 35 crop genera and 29 forage species essential for food security and interdependence, balanced by benefit-sharing in the areas of information exchange, technology transfer, capacity building and commercial development (http://www.planttreaty.org).

Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity

The Protocol was adopted at the tenth meeting of the Conference of the Parties on 29 October 2010, in Nagoya, Japan which significantly advances the Convention's third objective by providing greater legal certainty and transparency for both providers and users of genetic resources. Specific obligations to support compliance with domestic legislation or regulatory requirements of the Party providing genetic resources and contractual obligations reflected in mutually agreed terms are a significant innovation of the Nagoya Protocol. These compliance provisions as well as provisions establishing more predictable conditions for access to genetic resources will contribute to ensuring the sharing of benefits when genetic resources leave a Party providing genetic resources. In addition, the Protocol's provisions on access to traditional knowledge held by indigenous and local communities when it is associated with genetic resources will strengthen the ability of these communities to benefit from the use of their knowledge, innovations and practices. Benefits may be monetary or non-monetary such as royalties and the sharing of research results. The Protocol lists ten monetary benefits and seventeen forms of non-monetary benefits, but does not limit the scope of benefits and Parties are at liberty to apply any other form of benefit sharing (Earth Negotiation Bulletin, 2011).

Plant Variety Protection in Developed Countries

The general patentability requirements were similar at the basic level in most national patent acts which required inventions to be novel and industrially applicable. The non-obviousness or inventive step requirement was established later on initially by case law in the mid- nineteenth century and subsequently by codification.

i) United States of America

The United States is bound by the TRIPS Agreement and is also a UPOV member since February 22, 1999. The protection of plant varieties may obtain under one of three different systems (Grunberg, 2011). Patents can be obtained under the Plant Patent Act (1930) which applies to asexually reproduced plants (e.g. by tissue culture, cuttings etc. and not including edible tuber propagated plants) for a period of twenty years from the date of filing. The right granted excludes others from making, using, selling, offering for sale and importing the plant, or any of its parts. Plants and plant parts may be covered by Utility Patent where a class of varieties with a specific trait, plant parts and methods of producing or using plant varieties may be protected such as disease, insect or herbicide resistance, drought and salt tolerance, improvement of fruit and flower quality, etc. The term of protection is twenty years from the date of filing. Plant variety protection certificates (PVP) under the U.S. Plant Variety Protection Act (1970) implementing the UPOV Convention and applies only to sexually reproduced and tuber propagated plants which conform to Novelty, Distinctiveness, Uniformity and Stability (here in after referred as NDUS). The Plant Variety Protection Act is administered by the U.S. Department of Agriculture, which issues Plant Variety Protection Certificates (PVPC) for qualifying plant varieties. The term of protection is 20-25 years from the date of grant of protection. Protection cover excludes other from selling, offering for sale, multiplying, conditioning, importing, exporting and stocking the variety. PVP Act (1970) was further amended in 1994 extending statutory protection to F_1 hybrids and tuber propagated plants and generally brought the United States into compliance with the 1991 UPOV Convention.

The U.S. has in its national legislation only a limited farmer's exemption. In the case of farmers, protected seed may be "saved" for replanting on their own individual holdings provided that it is not sold to any third parties who use it for reproductive purposes.

ii) Australia

Australia is both a WTO and UPOV member and has signed the UPOV 1991 Convention in March 1, 1989 for complying with TRIPS. Australia's Plant Breeder's Rights (PBR) scheme is administered under the Plant Breeder's Rights Act 1994 and conforms to the UPOV 1991. Plant Breeder's Rights are a form of Intellectual Property (IP) which grant a limited commercial monopoly to breeders of new plant varieties. All new varieties of plant (including hybrid), fungal, algal species and transgenic plants which meets NDUS are potentially eligible for a PBR. PBR registration (also referred to as a grant or certificate of PBR) gives plant breeders specific and exclusive commercial rights to a new variety: producing or reproducing the material; conditioning the material for the purpose of propagation; offering the material for sale; selling the material; importing the material; exporting the material and stocking the material for any of the purposes described above. PBR allows a breeder the right to exclude others from a range of activities including producing and reproducing a protected variety. PBR also protects the registered name and synonym of the variety from use in relation to other similar plants.PBR is personal property and can be assigned, sold and transferred to other parties. PBRs are exhausted after sale of seed, except when the sold seed is multiplied for commercial purpose. The PBRs are allowed for 25 years in case of trees and vines and for 20 years for any other variety. The Act also allows farmers' privilege and compulsory licensing.

iii) European Union

All countries in Europe have legislation on PVP inspired by the UPOV convention. In addition, the European Union (EU) has created a PVP system which allows PVP over a plant variety in the whole territory of the European Union, through the so called Community Plant Variety Rights (CPVR) which is based on the 1991 UPOV Convention. This Community system withstands with the national PVP systems of the EU countries, which grant protection within the national territories only. Community plant variety rights shall have uniform effect within the territory of the Community and may not be granted, transferred or terminated otherwise than on uniform basis. There is no double protection system and only plant variety protection is granted. The CPVR confers protection to all varieties of all botanical genera and species, including inter alia, hybrids between genera and species provided that the varieties meet exactly the same requirements as outlined under the UPOV Convention and conform to NDUS parameters. The duration of protection for varieties of vine and tree species shall be 30 years and for rest 25 years from the year of grant of protection. There is no reference to farmers' rights in the EU regulation to safeguard agricultural production; farmers are authorized to plant, on their own holding, the product of the harvest obtained by planting a variety which is covered by a Community plant variety right. However this provision is applicable to some agricultural plant species. Researcher's exemptions for the acts done for experimental purposes and for acts done for experimental purpose and for acts done for the purpose of breeding or discovering and developing other varieties are not extended under the Act. Also there is no benefit sharing mechanism under the Community Plant Variety Regulation (http://www.cpvo.europa.eu/main/en/home/community-plant-variety-rights/legislation-in-force).

Plant Variety Protection in Developing Countries

As required under Article 27(3)(b) of TRIPS, countries had three options with reference to protecting plant varieties. UPOV could have been accepted as laying down general norms on a possible *sui generis* law but the liberal norms in the 1978 version of UPOV were revised in 1991 and the norms were tightened in favour of the breeders. Nevertheless, some kind (*sui generis*) of legislation was certainly needed for a variety of reasons, the most important of these reasons being WTO/TRIPS agreement. Developing countries were supposed to have such a system in place by 2000. Least developed countries were allowed a transition period until 2006, which has been extended until 2013 (Soam *et al.*, 2009 and Singh *et al.*, 2011d). A country is not required to be a member of UPOV to meet the TRIPS requirement for a *sui generis* system, but many developing countries have at least modeled their legislation on UPOV 1978 or 1991. A number of other countries are in the process of modifying their IP systems (Tripp *et al.*, 2007).

China: Regulations of the People's Republic of China on the Protection of New Varieties of Plants, issued on March 20, 1997 conform to the 1978 Act of the UPOV convention in principal. It is only a Regulation issued by the state council. Protection is provided through PVP

registration. Protection is extended to new, extant and essentially derived variety of the notified crop species. The criteria of protection are NDUS. The term of protection of variety rights is 20 years for vines, forest trees, fruit trees and woody ornamental plant and 15 years for other plants from the date of grant of certificate. There is no provision of farmers' rights in the legislation, however, use of protected variety for propagating purposes and use of harvest by farmers, on their own holdings shall not require authorization, or payment of royalties to the right holder. Provisions for compulsory/voluntary licensing have been kept but no mechanism on benefit sharing to farmers/communities has been defined under the Act (http://www.cnpvp.cn/en/index.html).

Indonesia: The Government of Indonesia approved the legislation entitled "Plant Variety Protection Law" (PVPL) in 1997. Procedural, administrative matters, such as implementation of the convention, finance and final provision are mostly adopted from the Patent Law. Its main features include that PVP shall be granted to all the varieties of all plant species, sexually or asexually propagated as new, extant, farmers' variety and essentially derived variety, which are new, unique, uniform, stable and has a denomination. The duration of protection is 20 years for crops and 25 years for forest trees (www.ppvt.setjen.deptan.go.id).

Kenya: Plant variety protection (plant breeder's rights) in Kenya is governed by the Seeds and Plant Varieties Act was enacted in 1972 which was further revised in 1991. This Act contains two major sections on seed certification and plant breeder's rights. In May 1999 Kenya acceded to the UPOV, 1978. The Act provides protection to new, extant, farmers' and essentially derived varieties in all crops which conforms to NDUS, except algae and bacteria. The duration of protection is 18 years for trees and vines and 15 years for other crops. Apart from breeder's rights, farmer who has bred or developed a new variety is entitled to registration and protection in similar manner to a registered breeder of a variety. Farmers are entitled for compensation in case of non-performance of a registered variety, recognition and reward, to save, use, sow re-sow, exchange, share but not sell the seeds as enshrined in the UPOV 1978 Act. Researcher exemption to use of protected variety for experimental purposes for breeding new varieties have also been provided under the Act. Benefit sharing mechanism is also established but under a different Act called the Environmental Management and Coordination Act, 1999 under which individuals and NGOs can claim for benefit sharing on behalf of any village or local community for a variety registered as essentially derived variety (www.kephis.org).

Malaysia: The Government of Malaysia opted *sui-generis* systems of plant variety protection and approved the Protection of New Plant Varieties Act, 2004 which came into force since 1st January 2007 and Protection of New Plant Varieties Regulations 2008 was enforced on 20th October 2008. All plants excluding microorganisms which fulfill the criteria of NDUS are eligible for protection The duration of protection of a registered variety which is new, distinct, uniform and stable is 20 years and for variety which is new, distinct and identifiable is 15 years. Apart from breeder's rights, farmers' rights, farmers' exemption (to farmers having less than a total area of 0.2 hectares) and compulsory licensing are also enforced (http://pvpbkkt.doa.gov.my/Authorized/PVPACT/index:htm).

Philippines: The Government opted *sui generis* system for protection of new plant varieties and enacted the Plant Variety Protection Act, 2002. Protection is given to new and essentially derived varieties which are new, distinct, uniform and stable through PVP registration. The duration of protection for trees and vines is 25 years and for other type of plants is 20 years from the date of grant of certificate. Apart from breeder's rights, traditional rights have been given to small farmers to save, use, exchange, share or sell their farm produce, sale and exchange of seed among small farmers, including sale and exchange of seeds among small farmers for reproduction and replanting in their own land and researcher exemption for use of protected variety for experimental and non commercial purposes and for breeding other varieties have also been provided under the Act (www.bpi.da.gov.ph).

Thailand: In compliance with TRIPS agreement, Thailand adopted the *sui-generis* system and enacted the Plant Varieties Protection Act, 1999 which was enforced in 2003. The Act is designed to encourage the breeders to breed new plant varieties, promote appropriate mechanism for the enforcement of the rights of local communities and breeders for access to biological resources and maintain genetic diversity in the field. The Act provides protection to new plant varieties, extant varieties, community's varieties and essentially derived varieties of the notified crop species which are novel distinct, uniform and stable. The certificate of registration of new plant variety shall be valid for 12 years for the plants which fruits within the period of not over two years, 17 years for the plants which are capable of giving fruits within the period of

over two years and 27 years for trees which fruits within the period of over two years from the date of grant of certificate. Apart from breeder's rights, farmer is entitled to registration and protection of a variety. A farmer or any person who is traditionally involved in conservation or development of the plant variety which is not registered as a new variety may register himself as a community under the Act. Farmers and researchers can also use the protected variety for experimenting or research for developing plant varieties, for cultivating or propagating a protected variety by him for non-commercial purposes which is declared as promoted plant variety in the quantity not exceeding three times the quantity obtained. Provision of benefit sharing in relation to the profits derived from the use of plants (domestic plant varieties and wild plant varieties) conserved by the community has been made through the PVP Fund created under the Act (www.doa.go.th).

Plant Variety Protection System of India

Agriculture provides for employment and key means of livelihood to two third of India's population and contributes 21% of India's GDP. The rural areas are still home to some 72 percent of the India's 1.21 billion people, a large number of whom are poor. More significantly, about 67 per cent of the total farming population in the country constitutes small and marginal farmers who depend on rain-fed agriculture and fragile forests for their livelihoods (Kochupillai, 2011). Agriculture being an integral component of the national economy and livelihood of millions of people, a balanced approach towards protecting the interests of the plant breeders in the formal sector and the traditional farming communities was required. It was in this background that a different form of protection was felt needed in India in addition to or instead of the existing international models. India took a significant step in this direction by adopting the *sui generis* system for protection of plant varieties and enacting a legislation that explicitly provides for farmers' rights in addition to PBRs. The Act is unique in the world in the sense that it has granted rights to both breeders and farmers simultaneously under one Act and has taken the farmers' rights concept a step forward and genuinely addresses the concerns of farmers as breeders, innovators, conservers, etc. It has tried to incorporate the features of UPOV, CBD and ITPGRFA along with certain distinctive features of its own as per requirement of farmers.

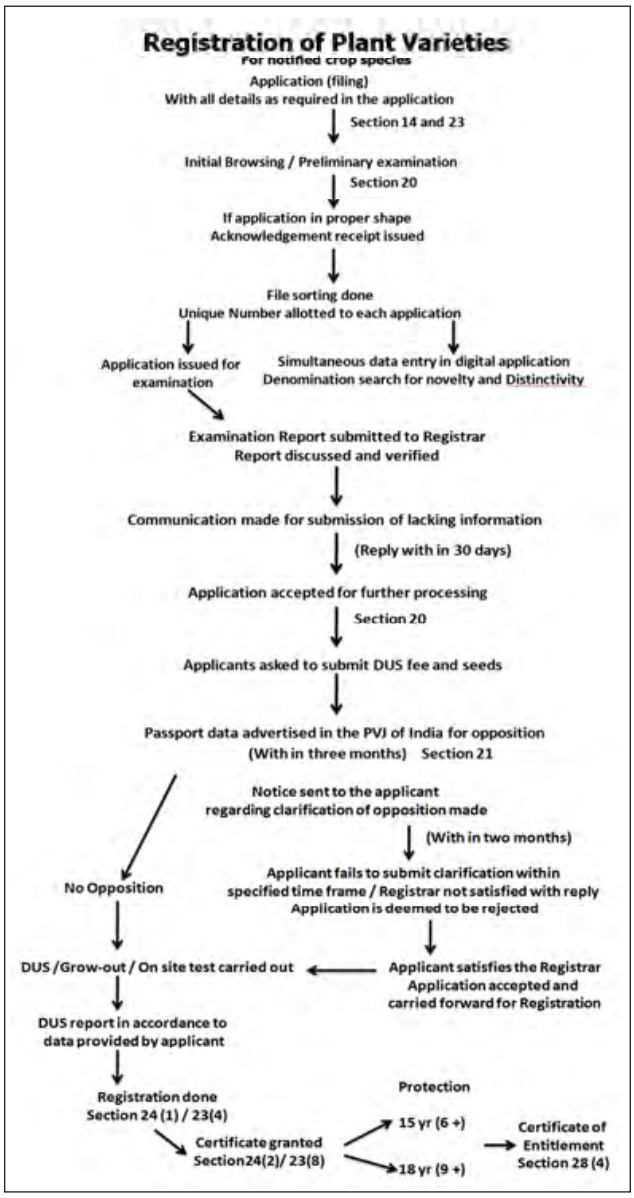
The Protection of Plant Varieties and Farmers' Rights Act, 2001

India as a member of WTO and signatory to the TRIPS enacted the "Protection of Plant Varieties and Farmers' Rights Act, 2001" (herein after referred as Act), for which Rules were notified in 2003 (The Gazette of India Extraordinary, 2001 and The Gazette of India, 2003). For the purpose of this Act, in exercise of the power conferred under sub-section (1) of the Section 3, the Central Government established the "Protection of Plant Varieties and Farmers' Rights Authority" (herein after referred as Authority) on 11th November, 2005 (The Gazette of India, 2005). The PPV&FR Authority is a body corporate under the Ministry of Agriculture with Chairperson as the Chief Executive. Besides the Chairperson, the Authority has 15 members, notified by the Government of India (GOI). The functioning of the Authority is based on the following major objectives of the Act:

a. To provide an effective system for protection of Plant varieties and rights of farmers and plant breeders.
b. To recognize and protect the rights of farmers in respect of the contribution made at any time in conserving, improving and making available plant genetic resources for the development of new plant varieties.
c. To accelerate agricultural development in the country, protect plant breeders' rights, stimulate investment for research and development in public/private sector for development of plant variety and
d. To facilitate the growth of seed industry to ensure the availability of high quality seeds and planting material to the farmers.

Specifically so as to promote the encouragement for the development of new varieties of plants and to protect the rights of the farmers and breeders the Authority shall provide for registration of new and extant plant varieties, develop, characterize and document the registered varieties, create compulsory cataloguing facility for all varieties of plants, ensure that seeds of varieties registered under the act are available to farmers and provide for compulsory license, collect statistics with regard to plant varieties, including the contribution of any person at any time in the evolution or development of any plant variety and maintain National Register of plant varieties (Singh *et al.*, 2011c).

To facilitate the registration of plant varieties, Authority has opened two branch offices of the Plant Varieties Registry, one at Birsa Agricultural University, Ranchi and other at Assam Agricultural University, Guwahati. These branch offices will function within its



Source: Gautam et al. (2011a)

territorial limits and will also keep a copy of National Register of plant varieties.

Registration of Plant Varieties

Under Section 29 (2) of the Act, the Central Government by notification in official Gazettes specifies the genera and species eligible for the purpose of registration of varieties. So far, Central Government has notified 54 crop species for the purpose of registration. PPV&FR Authority has developed crop specific "Guidelines for the Conduct of Test for Distinctiveness, Uniformity and Stability" which have been published in various issues of the Plant Variety Journal of India (PVJI) published by the Authority and can be downloaded from the website of the Authority. The purpose of these Guidelines is to provide detailed practical guidance for the harmonized examination of DUS of the candidate variety and, in particular, to identify appropriate characteristics for the examination of DUS.

Registration of plant varieties was started by the Authority with twelve crop species in 2007 which in due course has been extended to 54 crop species. The crop species notified for the purpose of registration and protection of plant varieties [The Gazette of India (2006a, 2007, 2009b, 2010a, 2010b and 2011b)] includes eight cereals (rice, wheat, maize, sorghum and pearl millet, durum wheat, dicoccum wheat and other *Triticum* species), seven grain legumes (chickpea, mungbean, urdbean, field pea, rajmash, lentil, pigeon pea), six fibre crop species [diploid cotton (two species), tetraploid cotton (two species) and jute (two species)], one sugar crop species (sugarcane), two tuber crop species (ginger and turmeric), eleven oilseed crop species (Indian mustard, karan rai, rapeseed, gobhi sarson, groundnut, soybean, sunflower, safflower, castor, sesame and linseed), two spices (black pepper and small cardamom), twelve horticultural crop species [including two flower species (rose and chrysanthemum), two fruit species (mango and coconut) and eight vegetable crop species (potato, brinjal / eggplant, tomato, okra /lady's finger, cauliflower, cabbage, onion and garlic)] and four medicinal & aromatic crop species (isabgol, brahmi, menthol mint, damask rose, periwinkle and brahmi). Further, DUS test guidelines for three species of orchid have been finalized and published in the PVJI.

The Authority is in process of developing and validating guidelines for DUS testing of more than 35 crop species at various institutions of Indian Council of Agricultural Research (ICAR), Indian Council of Forestry and Education Research (ICFRE), State Agricultural Universities (SAUs), etc. Some of the prioritized crops includes apple, pear, almond, walnut, cherry, apricot, citrus species, banana, litchi, guava, papaya, Indian gooseberry, pomegranate, Indian jujube, pineapple, bamboo, teak, shisham, tendu, sandal wood, deodar, chir, bottle gourd, bitter gourd, cucumber, pumpkin, pointed gourd, watermelon and muskmelon.

Once notified, applications may be filed for registration of varieties of the particular crop species under the categories of new plant varieties, Essentially Derived Varieties (EDV), extant varieties (notified under the Seeds Act, 1966), extant (Variety of Common Knowledge) and farmer's varieties. The overall process of registration of

Table 1. Year wise Applications received by the PPV & FR Authority

S. No.	Type of variety	Total number of applications received in different years						
		2007	2008	2009	2010	2011	2012 (31st January 2012)	Total
1.	New Variety	74	154	179	438	164	04	1013
2.	Extant Variety [including variety notified under section 5 of Seeds Act, 1966 and Extant Variety about which there is common knowledge (VCK)]	355	387	382	97	257	03	1481
3.	Farmers' variety	2	5	44	4	939	01	995
4.	Essentially Derived Varieties	--	--	--	01	01	--	02
	Total	431	546	605	540	1361	08	3491

Source: www.plantauthority.gov.in

plant varieties followed by the Plant Varieties Registry of the Authority is illustrated in the box. So far the Authority has received 3,491 (as on 31st January, 2012) applications for registration of plant varieties including open pollinated varieties, hybrids, parental lines and transgenic varieties from different stakeholders such as farmers, public and private sector including multinational seed companies. Table 02 indicates the number of applications received in 2007, 2008, 2009, 2010, 2011 and 2012 for crop species notified by the Authority under different categories

Application for registration of plant varieties should be accompanied with the fee of registration notified by the Authority [new and essentially derived variety (Individual-Rs. 5,000/-; Institutional-Rs. 7,000/-; Commercial-Rs. 10,000/-), extant variety notified under the Seeds Act, 1966-Rs. 1,000/- and variety about which there is a common knowledge (Individual-Rs. 2,000/-; Institutional-Rs. 3,000/-; Commercial-Rs. 5,000/-)] (The Gazette of India, 2008 and 2009e). No fee is to be paid by a farmer for registration of a farmers' variety.

Criteria for Registration of Different Types of Plant Varieties

i. New Variety

A new variety should conforms to the criteria of novelty [not been sold or otherwise disposed of in India, earlier than 1 year and outside India (in case of trees and vines earlier than six years, or, in any other case, earlier than four years)], distinctiveness (for at least one essential character from all varieties of common knowledge), uniformity (sufficiently uniform in its essential characteristics) and stability (if its essential characteristics remain unchanged after repeated propagation, on, in the case of a particular cycle of propagation, at the end of each cycle). After the candidate variety is accepted for DUS testing and the applicant deposits the prescribed DUS test fee (PVJI, 2007, 2008b, 2009b, 2011a and 2011b) and specified seed material (as specified in the crop specific DUS test guidelines) in the Authority along with a certified data on germination test made not more than one month prior to the date of submission from an accredited laboratory. Seed material is sent to the respective DUS test Centres (see website of the Authority for notified DUS test centres) for conducting DUS test trial consisting of new varieties in tests referred to as "candidate varieties" the characteristics of which are compared with the characteristics of varieties of common knowledge, referred to as "reference varieties" selected form the database [Indian Information System as per DUS Guidelines (IINDUS 08.1) and Notified and Released Varieties of India (NORV)] developed by the Authority (Gautam *et al.*, 2011a). The varieties are grown over two similar growing seasons in two test locations. DUS test is said to be confirmed if distinctness is established for at least one essential character.

ii. Essentially Derived Varieties (EDV)

In respect of a variety (the initial variety), shall be said to be essentially derived from such initial variety when it is predominantly derived from such initial variety, or from a variety that itself is predominantly derived from such initial variety, while retaining the expression of the essential characteristics that results from the genotype

Type of variety	Type of test	No. of locations	No. of seasons
New	DUS test	2	2
Variety of common Knowledge	DUS test	2	1
Farmers'	Grow out test	2	1
Essentially Derived Variety	Manner of testing EDV shall be decided by Authority on case to case basis		

or combination of genotypes of such initial variety; is clearly distinguishable from such initial variety; and conforms (except for the differences which result from the act of derivation) to such initial variety in the expression of the essential characteristics that result from the genotype or combination of genotype of such initial variety. The application for registration of an EDV shall be accompanied by the relevant documents, along with other details specified in section 18 of the Act.

Under Section 5 (1) of the PPV & FR Act, 2001, the Competent Authority constituted a six member Expert Committee which will act as an advisory body to the PPVFR Authority for evaluation and recommendation of application filed for registration under EDV and other related issues. Preliminary examination is carried out in the Registry. Once the Registrar is satisfied that all the requirements are complete, he will submit the application with all relevant documents to the Expert Committee. The Committee shall evaluate and may suggest the tests and procedures for establishing whether it is a variety derived from the initial variety by conducting such tests and following such procedures as may be prescribed. Once the Committee is satisfied with the reports, necessary directions will be issued to the Registrar for the registration. The rights of breeder of a variety or an EDV are same provided that the authorization by the breeder of the initial variety to the breeder of EDV may be subject to such terms and conditions as both the parties may mutually agree upon.

iii. Extant Varieties

a. Extant Varieties notified under the Seeds Act, 1966

Extant varieties which have been notified under the Seed Act, 1966 are registrable under this category. The Authority constituted a seven member Extant Variety Recommendation Committee (EVRC) to examine the suitability for registration of such varieties (The Gazette of India, 2006b). On the basis of the recommendations of the EVRC, extant varieties shall be registered as per the provisions of the section 28 of the PPV & FR Act, 2001 (Nagarajan *et al.*, 2010b). No field tests are conducted for evaluating DUS. The passport data of recommended plant varieties are published in the Plant Variety Journal of India of the Authority for calling objections if any, within a specified time frame. The varieties for which no objections are received are accepted for registration. The applicant are required to submit 2/10 quantity of seed material/ planting material specified for new varieties of same crop species before the issue of certificate of registration of plant varieties (PVJI, 2008a).

b. Farmers' Variety

A variety which has been traditionally cultivated and evolved by the farmers in their fields; or is a wild relative or land race or a variety about which the farmers possess the common knowledge are covered under this category. The criteria for distinctiveness, uniformity and stability for registration of a farmers' variety and variety about which there is a common knowledge has been notified by the Central Government (The Gazette of India, 2009c). Any person who applies for registration under clause (c) of Section 14 of the Act shall submit half of the quantity of seed material specified for a new variety in the respective crop species, divided into five equal numbers of packets for the purpose of field test and also for storing in the National Gene Bank and the seed supply procedures shall be such as may be specified in the Journal. Field test is conducted for confirming distinctiveness, uniformity and stability at the test Centres. The farmers' variety along with reference varieties and other similar variety are evaluated in the paired row test. The length of the row and plant population is kept such as specified in the Journal. A replicated trail is conducted for one season at two locations with limited purpose of confirming the distinctiveness, following the descriptors such as specified in the Journal. The uniformity levels for Farmers' variety for the respective species shall not exceed double the number of off-types such as specified in the Journal. If the variety meets the uniformity criteria, it is deemed to have met the stability criteria (Nagarajan *et al.*, 2008).

c. Variety of Common Knowledge (VCK)

A variety which is not released and notified under the Seeds Act, 1966 but is well documented through publications and is capable of satisfying the definition of 'variety', or have an entry in any official register of varieties or in the course of being made, or finds inclusion in a reference collection or is having a precise description in a publication, or has become a matter of common knowledge and the variety is under cultivation or marketing during the time of filing of application for registration (candidate variety should have been sold or otherwise disposed of in India one year prior to the date of filing of the application and it should not have been sold or otherwise disposed of 13 years prior to the date of filing of application and in case of trees and vines it should not have been sold or

otherwise disposed of 16 years prior to the date of filing of application) (PVJI, 2009a). The true representative seed of the variety should be available at the time of filing of application. The DUS shall be determined by conducting a field test for one season at two locations for the purpose of confirming the distinctiveness, uniformity and stability following the descriptors and plot size as may be specified in the Journal. Any person who applies for registration under clause (b) of Section 14 of the Act shall submit half the DUS test fee prescribed for new variety (PVJI, 2009b) and half the quantity of seed material specified for a new variety in the respective crop species, as divided into five equal numbers of packets for the purpose of field test and also for storing in the National Gene Bank and the seed supply procedures shall be such as may be specified in the journal.

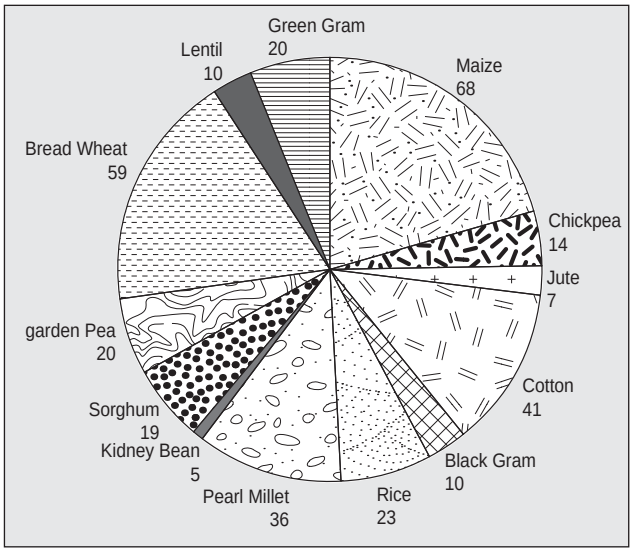
Since the criteria of distinctiveness, uniformity and stability for extant variety about which there is common knowledge and farmers' variety was notified on 29th June, 2009, the time limit for filing applications for registration of extant varieties (Common knowledge variety and farmers' variety) in case of twelve crop species notified on 1.11.2006 and six crop species notified on 31.12.2007 is extended for a period of three years from 30.6.2009 and the time limit for filing applications for registration of farmers' varieties in case of twelve crop species notified on 1.11.2006 and six crop species notified on 31.12.2007 is extended for a period of five years from 30.6.2009 (PVJI, 2011a).

iv. Trees and Vines

The DUS testing shall be field and multi-location based for at least two similar crop seasons and special tests will be laboratory based. Provided that in the case of trees and vines there shall be an option on the manner of the DUS testing that a panel of three experts shall visit the On-farm test sites for two similar crop seasons as may be specified [The Gazette of India, 2010c].

Special Tests

The Act provides for a mechanism of 'Special Tests' only when DUS testing fails to establish the requirement of distinctiveness. The DUS testing shall be field and multi-location based for at least two crop seasons and special tests be laboratory based. The Authority shall charge separate fees for conducting DUS test and special test on each variety. The tests are to be identified on certain set principles and will be notified crop species wise in due course and will be for characters for which breeding



work is going on and also these should have special significance in the trade of a particular variety. Broadly, these tests can be classified into five main groups: physical tests, biochemical tests, molecular tests, response tests and organo-leptic tests (Singh, 2011). To begin with the Authority has constituted a Task Force for identifying special tests for cotton, rice, oilseed, wheat, maize and medicinal & aromatic plants.

Certificate of Registration and Annual Fee

The Authority has so far issued 334 certificates of registration (241 of ICAR, 52 of SAUs, 38 of Private seed companies and 03 of farmers') in different crop species out of which 17 are for new varieties, 314 of extant varieties which are notified under Seeds Act, 1966 and 03 of farmers' varieties. The Authority has also opened a "National Register of Plant Varieties" having all details of the registered plant varieties and kept at the Head quarters of the Authority at New Delhi. This Register is an authentication of the plant breeders rights granted to the applicants. The certificate of registration shall be valid for nine years in case of trees and vines and six years in case of other crops. It may be reviewed and renewed for the remaining period as applicable for trees and vines and other crops on payment of renewal fees subject to the condition that total period of validity shall not exceed eighteen years in case of trees and vines from the date registration of the variety, fifteen years from the date of notification of variety under Seeds Act, 1966 and in other cases fifteen years from the date of registration of the variety. As a requirement under the Act, for the purpose of benefit sharing, the Authority shall also send a copy of

the certificate of registration to the National Biodiversity Authority and Indian Council of Agricultural Research (The Gazette of India, 2011a).

A breeder of the registered variety will have to pay annual fee which is determined on the basis of declaration given by him or his agent or licensee regarding the sales value of the seeds of the variety registered under the Act during the previous year and royalty, if any, received during the previous year from the sale proceed of seeds of the registered variety and verified by the Authority. The Authority with the prior approval of the Central Government has notified the Annual fee to be paid by the breeder, agent or licensee of the registered variety. Annual fee for a new variety shall be Rs. 2000/- plus 0.2 per cent of the sales value of the seeds of the registered variety during the previous year plus 1 percent of royalty, if any, received during the previous year from the sale proceed of seeds of a registered variety. For extant variety notified under Section 5 of the Seeds Act, 1966 (54 of 1966) the annual fee has been fixed for Rs. 2,000/- per year whereas for extant variety other than the extant variety notified under Section 5 of the Seeds Act, 1966 (54 of 1966) the annual fee shall be Rs. 2000/- plus 0.1 per cent of the sales value of the seeds of the registered variety during the previous year plus 0.5 percent of royalty, if any, received during the previous year from the sale proceed of seeds of a registered variety (The Gazette of India, 2009a).

National Gene Bank and Field Gene Bank

As per the Act it is mandatory to maintain the seed samples/ propagating material of registered plant varieties up to a period of protection provided to the candidate variety and also to address the issues for intellectual property of plant varieties including legal requirements such as infringement of plant breeder's rights, compulsory license, etc. Authority has established the National Gene Bank at Old Campus of National Bureau of Plant Genetic Resources (NBPGR), New Delhi for medium term storage of true samples of orthodox seed of all registered varieties for their entire period of protection. The seed samples kept in the National Gene Bank at low temperature (3-5^{o}C) so as to maintain genetic purity, viability and health during the period of protection beyond which the denomination and variety may go under public domain. After the expiry of protection period, seed material may be submitted to NBPGR/any public repository (Choudhury, 2010).

For perennial plants (fruit trees and plantation crops) such as mango, citrus, eucalyptus, polar, rubber, coffee, etc. which either produce 'recalcitrant (which are either short lived or do not withstand desiccation) seeds or no seeds at all, clonally propagated and have long regeneration cycles or sexually sterile, 'Field Gene Bank' is a practice worldwide as an effective '*ex-situ*' conservation strategy. Such field gene banks are developed in places mostly near to the place of origin/diversity of the species concerned, where suitable agro-climatic conditions like soil, water, area being relatively free from disease/pest infestation are available. For collection and maintenance of varieties released (referral collection) of perennial crop species collected from different niches so as to preserve sub species/intra-varietal variability at one place, Authority has established three Field Gene Banks at Dapoli (for Tropical and sub-tropical crops), Ranchi (Eastern ecosystem) and Mashobra (for temperate crops). Further, two Field Gene Banks are being planned in Tamil Nadu (for Coastal ecosystem) and Rajasthan (for Arid ecosystem). These facilities shall also be used for capacity building, documentation and training on the issues related to registration of plant varieties (Singh *et al.*, 2011a).

Plant Varieties Protection Appellate Tribunal

The Act provides for establishment of Plant Varieties Protection Appellate Tribunal (PVPAT). All orders or decisions of the Registrar or Authority relating to registration of variety/ registration as an agent or licensee can be appealed in the Tribunal. Further all orders or decisions of Authority relating to benefit sharing, revocation of compulsory license and payment of compensation can be appealed in the Tribunal. The Tribunal consists of one Judicial Member and one Technical Member. The form of appeal and period within which it must be preferred has been prescribed in PVPAT (Application and Appeals) Rules, 2010. There is a transitory provision by which it is provided that till the PVPAT is established the IPAB will exercise the jurisdiction of PVPAT. The decisions of the PVPAT can be challenged in High Court. The Tribunal shall dispose of the appeal within one year.

Convention Countries

The Act provides that any country which has acceded to an international convention for the protection of plant varieties to which India is also a party or where India has entered into an mutual agreement with a country for granting plant breeders' right to the citizens of both the countries will be treated as convention country. Special provision is also there where a person has made an application for granting of breeder's right to a variety in a convention country

and that person makes an application for registration of such variety in India within twelve months after the date on which the application was made in that convention country then such variety shall be registered in India with effect from the date on which it was applied in that convention country.

Infringement and Penalty

If a person infringes the rights of the registered breeder in respect of the registered variety or registered denomination without his permission breeder then it constitutes infringement. The remedy for infringement would be discovery of documents, preserving of infringing variety or attachment of property of the infringer. In case of farmers, a right established under the Act shall not be deemed to be infringed if the farmer proves that at the time of infringement he was not aware of the existence of such right. The Act also provides punishment in terms of imprisonment and fine for applying false denomination, for selling varieties to with a false denomination and for falsely representing an unregistered variety as registered.

Opposition and Revocation

Any person within three months from the date of advertisement of an application for registration may file an opposition based on the grounds provided in the Act. Both opponent and applicant file their pleading and evidence and the opposition is finally heard by the Registrar. If the opposition is allowed then the applicants cannot proceed further with the registration. In case, the opposition is rejected then the variety proceeds for registration. Revocation for registration is decided by the Authority on application filed by any interested person on the grounds provided in the Act. No revocation is done without offering an opportunity of hearing to the registered breeder. If revocation is allowed by the Authority then the certificate of registration becomes invalid. Any person aggrieved with the decision of the Authority or Registrar in an opposition or revocation proceeding may file an appeal to the Tribunal and subsequently to the Higher Court.

Rights Provided under the Act

Breeders' Rights

An exclusive right on the breeder or his successor, his agent or licensee, to produce, sell, market, distribute, import or export the variety registered under the Act. A breeder may authorize any person to produce, sell, market or otherwise deal with the variety registered under this Act. Breeder shall enjoy provisional protection of his variety against any abusive act committed by any third party during the period between filling of application for registration and decision taken by Authority. Enforcement of breeder right can be done by filing a suit for infringement in respect of registered variety and relief can be through discovery of documents, preserving infringement variety and document attachment of property of infringer. Breeders' rights would not apply in case when farmers save, exchange or use a part of the seed from the first crop of plants which they have grown for sowing on their own farms to produce a second and subsequent crops. Plant breeders would also not be able to exercise their rights in case where plants or propagating material of the protected varieties is used as initial sources of variation for the purposes of developing new plant varieties.

Researchers' Rights

A Researcher can use any of the variety registered under this Act for conducting experiment or research. The use of a variety by any person as an initial source variety for the purpose of creating other varieties comes under this provision. Authorization of the breeder of a registered variety is required where repeated use of such variety as parental line is done for commercial production of other new developed variety.

Farmers' Rights

The Act provides exhaustive and wide ranging rights to farmers in accordance with the FAO International Undertaking on Farmers' Rights and relevant CBD Articles on conservation and sharing biodiversity and benefit sharing (Gautam *et al.*, 2011b). It is one of the most important characteristics which distinguishes it from the UPOV which treats farmer's rights as a privilege and not a right in itself as compared to the rights granted to the breeders. The Act contains farmers' rights as positive rights, arising from the past, present and future contribution of farmers in conserving, improving and making available PGR, particularly those in centres of origin/diversity (Agarwal, 2011). The Act treats the farmer as plant breeder so far as the farmers' variety is concerned and they can register them under the Act without paying any fee. It protects farmers' interest by ensuring access to benefit sharing if their material is used for development of new varieties (Bala Ravi, 2004). In fact, a farmer is entitled to save, use, sow, re-sow, exchange, share or sell his farm produce including seed of a protected variety in the same manner as he was entitled before operation of the Act, provided that he shall not be entitled to sell branded seed

of a protected variety. Farmers have also been given a right to claim for compensation if the claimed characters under the given conditions are not realized. Farmers are entitled for recognition and reward from the Gene Fund provided that the material so selected and preserved (land races and wild relatives) has been used as donors of genes in varieties eligible for registration under the Act. In the event a farmer is unable to achieve the claimed performance of the variety which has been registered shall be entitled to compensation from registered breeder (Every breeder is required to provide full disclosure of the expected performance of the seeds or planting material of the registered variety). The compensation will be determined by the Authority. It has been kept mandatory for any breeder to secure consent of farmer(s) when a farmer's variety is used to develop an essentially derived variety (EDV). Also the innocent infringement clause insulates them against uncalled for long litigations. Farmers' have also been excluded from paying fee in any proceeding before the Authority or Registrar or Tribunal or the High Court. Farmers are also exempted from filing "affidavit sworn by the applicant that such variety does not contain any gene or gene sequence involving terminator technology". Moreover, feeling the lack of awareness among the farmers to protect their varieties, the Central Government has extended the time limit for registration of farmers' varieties from three to five years time period for applying and protecting their varieties (The Gazette of India, 2009d).

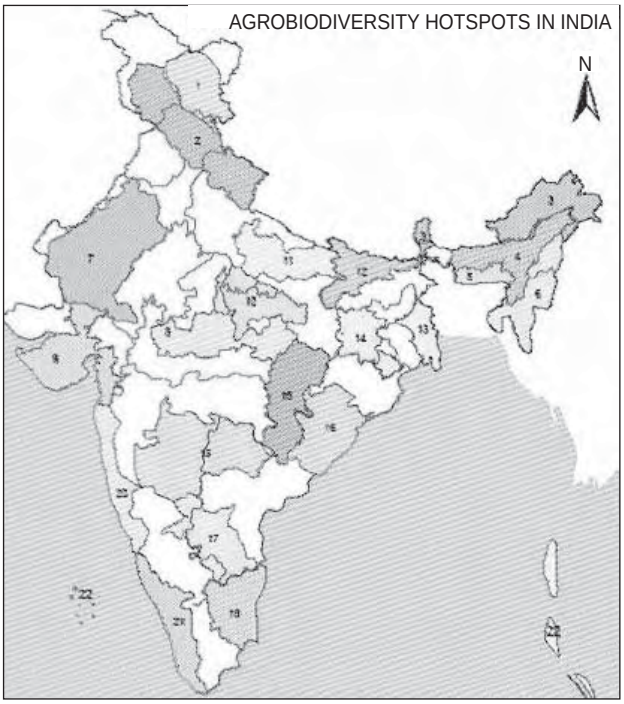
Rights of Communities

It is compensation to villagers or local communities for their significant contribution in the evolution of a variety which has been registered under the Act. Any person/ group of persons/governmental or non-governmental organization, on behalf of any village/local community in India, can file in any notified centre, claim for contribution in the evolution of any variety. After verification, if the Authority is satisfied, and after giving an opportunity to the breeder to file an objection and of being heard, subjected to the limit notified by the Central Government, it may by order grant such compensation to be paid to the claimant. Authority can direct breeder of a variety to deposit compensation (arrear of land revenue) to the Gene Fund.

Benefit Sharing and Compulsory Licensing

The Act provides for benefit sharing involving registered varieties in two circumstances. The first applies specifically to EDVs [Section 26]. In the second, any village local community can claim benefit for contributing to the development of a variety registered under the Act [Section 41]. For a variety registered as an EDV, any person or group of persons, being citizen(s) of India or firm or governmental or non-governmental organization formed or established in India, within a period of six months from the date of publication of the contents of the certificate of registration, can claim a share of benefits that may arise from its commercialization on behalf of any village or local community. The Authority shall establish the justification of the claims and determine the amount to be paid as benefit share on the basis of two criteria (a) the extent and nature of the use of genetic material of the claimant in the development of the variety for which benefit sharing has been claimed, and (b) the commercial utility and demand in the market for the variety. The amount of benefit sharing, if any, would have to be deposited in the National Gene Fund by the breeder of the variety. In the second circumstance, any person or group of persons, being citizen(s) of India or firm or governmental or non-governmental organization formed or established in India can make a claim on behalf of a village or local community for the contribution that they had made in the evolution of any variety registered under the Act (Applicant is required to provide the complete passport data of the parental lines from which a variety has been derived along with the geographical location in India from where the genetic material has been taken and all such information relating to the contribution, if any, of any farmer, village community, institution or organization in breeding, evolving or developing the variety). If, upon investigation, the claim was found justified, after the breeder was given an opportunity to file objection and to be heard, an amount of compensation as the Authority deems fit would be deposited by the breeder in the National Gene Fund (Singh, 2011e).

The Authority shall also ensure that the seeds of registered varieties are available to farmers and provide for compulsory license. Under Section 47 of the Act, after the expiry of 3 years from the date of issue of certificate of registration, any person can appeal on ground of inadequate seed supply, non availability of seed at reasonable price from the breeder and pray for the grant of compulsory license to undertake production, distribution and sale of seed or other propagating material of that variety. Authority will hear both parties and in public interest, may order breeder to grant a license to the third party on payment of a fee. Period of compulsory license may vary from case to



case maximum up to the period of protection. Authority can settle terms and conditions revoke or modify compulsory license.

Biodiversity and Agro-biodiversity Hot Spots

Biodiversity comprises the variety of all life on earth. It manifests at species, genetic and ecosystem levels. It is the outcome of over 3.5 billion years of evolutionary development, shaped by nature and human beings. Conserving biodiversity is basic to survival and well-being of human kind. Biodiversity is not distributed evenly across the globe. Certain countries, lying mostly in the tropics, are characterized by high species richness and more number of endemic species. Globally nearly 2.5 billion people rely heavily on wild and traditionally cultivated plant species for daily needs including employment and livelihood.

India is a mega-diverse country with only 2.5% of the land area, accounts for 7.8% of the recorded species of the world spread over 45,968 (11.18% of world) species of plants and 91,212 species of animals (7.43 % of the world) that have been documented in its ten bio-geographic regions (Gautam *et al.*, 2010). In India thousands of locally-adapted crop varieties are grown traditionally since ancient times and nearly 140 native breeds of farm livestock continue to thrive in its diversified farming systems. The country is recognized as one of the eight Vavilovian Centres of Origin and Diversity of Crop Plants, having about 375 wild ancestors and close relatives of cultivated plants.

Agro-biodiversity is that part of biodiversity which nurtures people and which is being nurtured by people. It includes variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries. Most of the country's agro biodiversity is in the custody of farming and tribal communities who followed age-old farming systems including shifting cultivation, made conscious and unconscious selections and inherited and perpetuated their seed over many generations (*in situ* on-farm conservation). Rich genetic resources useful to humans are the major indicators of the hotspots of agro-biodiversity. 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 can be designated as 'Agro-biodiversity Hotspots' (Singh *et al.*, 2011b).

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, Authority constituted a Task Force which after several rounds of discussions at different levels submitted its report which was published in two Volumes Book which have been widely distributed for creating awareness. The major recommendation of the Task Force was identification of 22 Agro-biodiversity hotspots (indicated in the map of India) distributed over 07 agro-geographical zones of India (Nayar *et al.*, 2009).

National Gene Fund

The Central Government has constitute a Fund called the National Gene Fund which would be enriched through the benefit sharing received in the prescribed manner from the breeder of a variety or an essentially derived variety registered under the Act, or propagating material of such variety or essentially derived variety; the annual fee payable to the Authority by way of royalty by the breeders of the registered variety; the compensation deposited in the Gene Fund under sub-section (4) of section 41; the contribution from any national and international organization and other sources. The Gene Fund shall, in the prescribed manner, be applied for meeting any amount to be paid by way of benefit sharing under sub-section (5) of section 26; the compensation payable under sub-section (3) of section

41; the expenditure for supporting the conservation and sustainable use of genetic resources including *in-situ* and *ex-situ* collections and for strengthening the capability of the Panchayat in carrying out such conservation and sustainable use and the expenditure of the scheme relating to benefit sharing framed under section 46 of the Act.

To fulfill the purposes of section 41 and section 45 of the Act, the Central Government shall frame one or more schemes to provide for all or any of the following: all matters connected with registration of the claims; processing of such claims for securing their enforcement and matters connected therewith; maintenance of records and registers in respect of such claims; utilization, by way of disbursal (including apportionment) or otherwise, of any amounts received in satisfaction of such claims; procedure for disbursal or apportionment by the Authority in the event of dispute regarding such claims; utilization of benefit sharing for the purposes relating to breeding, discovery or development of varieties and maintenance and audit of accounts with respect to the amounts received for claims in respect of registration of plant varieties.

To support and reward farmers, community of farmers particularly the tribal, 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. The Authority, as a mark of recognition for the selfless conservation of genetic resources by farmers/ farming communities, has awarded "*Plant Genome Savior Community Recognition*" certificate to the five farmers/ communities in 2007-08 and four farmers/communities in 2008-09 (Annual Reports, 2006 and 2008).

Following this, the Authority in consultation with Govt. of India has started "***Plant Genome Savior Community Award***". The award consists of Rs 10 lakhs in cash, a citation and a memento and will be given annually with a maximum of five awards per year. The award is open to all Indian farming/tribal/rural communities engaged in conservation, improvement and preservation of genetic resources of economic plants and their wild relatives. Gram Panchyats, State Agricultural University(s), Krishi Vigyan Kendra(s), Indian Council Agricultural Research centres, reputed Research institutes, Non-Governmental Organisation(s), community based organization and Farmer's Associations can sponsor applications. The applicant is required to submit information in support of their claims & a brief proposal for the utilization of award money towards community welfare measures/ development schemes including establishment of local seed/grain bank, water conservation facilities, facilities for grain/seed threshing/post harvest processing, farm schools or other such activities (Annual Report, 2009).

For 2009-10, awards were granted to Kopatgiri Nandiveerimath Seva Foundation, Karnataka for their work towards conservation and documentation of rare and endangered medicinal plant species in Kopatgiri hills, Gadag, Karnataka and Panchabati Gramya Unayana Samiti , Jeypore, Odisha towards their contribution in conservation of traditional land races of rice in Koraput region of Odisha (Extension Bulletin, 2011).

Other Related National Legislations

The international treaties/agreements/conventions led India to put in place the commensurate and compliant mechanisms and instruments. Some of the legal instruments passed by the Indian Government in response to international obligations includes the Seeds Act, 1966, the Patents Act, 1970 and its Amendment Acts:1999, 2002 and 2005, the Geographical Indications of Goods (Registration & Protection) Act, 1999 and the Biological Diversity Act, 2002.

Seeds Act, 1966

Until 1966, there was no Central Legislation on Seeds. With the arrival of high-yielding varieties in food grain crops in 1960s, India realized the need for a seed law which could create a climate for making available of good quality seeds to the cultivators. This led to the enactment of the legislation of the Seed Act, 1966. The Act was passed by the Indian parliament in 1966 Seed Rules under the Act were framed and notified in September 1968 and the Act was implemented in its entirety in October 1969. The Seed Rules were notified in 1968. The Seed Act and Rules were amended in 1972, 1973, 1974 and 1981. Even though the concept of Seed certification was known in India, the enforcement of provisions of Seeds Act in the year 1969, gave beginning to the systematic arrangements for large scale seed certification. Seed Certification Agencies function in accordance with the Seeds Act 1966.

Seeds Act, 1966 and Seeds Rules, 1968 provide certification and minimum quality standards of notified kinds/varieties. It authorizes formation of advisory bodies like Central Seed Committee to oversee the setting of seed standards, release, and certification and implementation of other provisions of the Act assisted by the Central Seed Certification Board and the Central Variety Release Committee. At state level the provisions of the Act are

implemented by State Seed Certification Agency and the State Variety Release Committee. The Act also provides for constitution of Seed Certification Agencies, Seed Testing Laboratories, Appellate Authorities, etc. Seed quality control is achieved through pre-and post-marketing control, voluntary certification and compulsory labelling of notified kind/varieties. The Seeds (Control) Order 1983, issued under the Essential Commodities Act 1955, established a regulatory framework for controlling the distribution and supply of seeds in the market. In 1988, a New Policy on Seed Development was developed with the objective of making available to Indian farmers the best planting material from anywhere in the world and to encourage the export of seeds. Another National Seed Policy was announced in 2001.

The notification of the varieties is done under Section 5 of the Seeds Act in consultation with the Central Seed Committee. Minimum limits for germination, physical and genetic purity of varieties/hybrids have been prescribed and notified for labelling the seeds of notified kind/varieties under Section 6(a) of the Seeds Act. Size, colour and content of the label are also notified under Section 6(b) of Seeds Act. The validity period for the commercialization of NVs is 15 years with the option of revalidation. Second category is "truthfully labeled" variety (TLV) constituting seeds that are neither evaluated under the said multi-location trials nor notified but which truthfully conform to the standards labeled on the seed (http://www.icar.org.in/files/Agril-Legislation.pdf).

Patents Act, 1970

The British implemented the first patent statute in India in 1856, based on the British Patent Law of 1852, "On Protections of Inventions", and provided certain exclusive privileges to inventors of new manufactures for a 14-year term. The 1856 Act was modified in 1859 and renamed the "Act for granting exclusive privileges to inventors". Enactment of the Indian Patents and Designs Act, 1911 by the British created for the first time a system of patent administration in India under the direction of a Controller of Patents. The 1911 Act remained in effect, with various amendments, until an independent India enacted its first indigenous patent law the Patents Act, 1970 more than 50 years later which came into force on April 20, 1972 (Muller, 2007).

As India became the member of WTO, it was obligatory to amend its domestic intellectual property laws in order to come into compliance with the WTO's TRIPS Agreement. The three amendments to the Indian Patents Act, 1970 have introduced a TRIPS consistent patent regime in the country which was brought about in the backdrop of intense debates that were focused on the need to establish a balance between the rights of the patent holders and the interests of the public at large. The first amendment of the Patents Act 1970 the Patents (Amendment) Act, 1999, formally implemented the mailbox procedure for patent applications claiming pharmaceutical and agro chemical products and made it retroactive to January 1, 1995.173 The 1999 Act also formally implemented EMRs. Second, the Principal Act was amended by the Patents (Amendment) Act, 2002, so as to provide the TRIPS-required twenty-year patent term, reversal of the burden of proof for process patent infringement, and modifications to compulsory licensing requirements. A third amendment was introduced in January 1, 2005 (Patents (Amendments) Act 2005) to introduce product patent regime in areas, including pharmaceuticals that were hitherto covered by process patents.

India's new Patents Act excludes "plants and animals in whole or any part thereof other than micro-organisms but including seeds, varieties and species and essentially biological processes for production or propagation of plants and animals" from patentability. This provision was added to the Act via the 2002 amendments. The patent law also excludes from patentability all inventions arising out of the use of traditional knowledge (Yadav, 2011).

To encourage and to provide a legal framework for commercial exploitation of incremental innovation (minor improvements in technology using local resources in a sustainable manner), India is on the verge of enacting Utility Model Bill which will extends protection only to mechanical devices. The Bill has provisions for publication, public inspection, opposition and a national register of utility model. Only one form of protection either patent or utility model would be granted at a time. However, transmutability from patent to utility model is provided during the application stage.

Geographical Indication of Goods (Registration & Protection) Act, 1999

Under Articles 1 (2) and 10 of the Paris Convention for the Protection of Industrial Property, geographical indications are covered as an element of IPRs. They are also covered under Articles 22 to 24 of the Trade Related Aspects of

Intellectual Property Rights (TRIPS) Agreement, which was part of the Agreements concluding the Uruguay Round of GATT negotiations. India, as a member of the World Trade Organization (WTO), enacted the Geographical Indications of Goods (Registration & Protection) Act, 1999 has come into force with effect from 15th September 2003. The Act seeks to provide for the registration and better protection of geographical indications relating to goods in India. The Act is administered by the Controller General of Patents, Designs and Trade Marks- who is the Registrar of Geographical Indications. Geographical indication in relation to goods, means an indication which identifies such goods as agricultural goods, natural goods or manufactured goods as originating, or manufactured in the territory of a country, or a region or locality in that territory, where a given quality, reputation or other characteristics of such goods is essentially attributable to its geographical origin and in case where such goods are manufactured goods one of the activities of either the production or of processing or preparation of the goods concerned takes place in such territory, region or locality (The Gazette of India (E), 1999). To facilitate the registration of geographical indications a Geographical Indications Registry is being established. The head office of the Registry also maintains a Register of geographical indications having details of all registered GIs in India. Duration of protection of a GI is for ten years which can be renewed for next 10 years before the expiry of the initial protection period. The registered GIs related to agri-horticultural crops in India have been indicated in the Table 3.

The Biological Diversity Act, 2002

India being a Party to the CBD, to realize the objectives enshrined in the Convention, the Government of India enacted the 'Biological Diversity Act, 2002' (Kannaiyan, 2007). The Act primarily aims at giving effect to the provisions of the CBD, including regulating access to biological resources and associated traditional knowledge so as to ensure equitable sharing of benefits arising out of their use (Gautam *et al.*, 2010). The salient features of the Act are to regulate access to biological resources of the country with the purpose of securing equitable share in benefits arising out of the use of biological resources and associated knowledge relating to biological resources; to conserve and sustainably use biological diversity; to respect and protect knowledge of local communities related to biodiversity; to secure sharing of benefits with local people as conservers of biological resources and holders of knowledge and information relating to the use of biological resources; conservation and development of areas of importance from the standpoint of biological diversity by declaring them as biological diversity heritage sites; protection and rehabilitation of threatened species and involvement of institutions of state governments in the broad scheme of the implementation of the Biological Diversity Act through constitution of committees. To implement the provisions of the Act, National Biodiversity Authority was established on October, 2003 and its Rules were notified in 2004. Since stakeholders in biological diversity include the Central Government, State Governments, institutions of local self-governmental

Table 3. Registered Geographical Indications of India in Agriculture and Horticulture

S. No.	Geographical Indications	State	S. No.	Geographical Indications	State
1.	Darjeeling Tea (word & logo)	West Bengal	18.	Khirsapati (Himsagar) Mango	West Bengal
2.	Kangra Tea	Himachal Pradesh	19.	Fazli Mango grown in the district of Malda	West Bengal
3.	Coorg Orange	Karnataka	20.	Naga Mircha	Nagaland
4.	Mysore Betel leaf	Karnataka	21.	Virupakshi Hill Banana	Tamil Nadu
5.	Nanjanagud Banana	Karnataka	22.	Sirumalai Hill Banana	Tamil Nadu
6.	Mysore Jasmine	Karnataka	23.	Mango Malihabadi Dusseheri	Uttar Pradesh
7.	Udupi Jasmine	Karnataka	24.	Vazhakulam Pineapple	Kerala
8.	Hadagali Jasmine	Karnataka	25.	Devanahalli Pomello	Karnataka
9.	Navara Rice	Kerala	26.	Appemidi Mango	Karnataka
10.	Palakkadan Matta Rice	Kerala	27.	Kamalapur Red Banana	Karnataka
11.	Malabar Pepper	Kerala	28.	Guntur Sannam Chilli	Andhra Pradesh
12.	Monsooned Malabar Arabica Coffee	Karnataka	29.	Mahabaleshwar Strawberry	Maharashtra
13.	Monsooned Malabar Robusta Coffee	Karnataka	30.	Wayanad Jeerakasala Rice	Kerala
14.	Spices – Alleppey Green Cardamom	Kerala	31.	Wayanad Gandhakasala Rice	Kerala
15.	Coorg Green Cardamom	Karnataka	32.	Nashik Grapes	Maharashtra
16.	Eathomozhy Tall Coconut	Tamil Nadu	33.	Byadagi Chilli	Karnataka
17.	Pokkali Rice	Kerala	34.	Laxman Bhog Mango	West Bengal

Source: http://ipindia.nic.in/girindia/images/RegGis.gif

organizations, industry, etc., a three tiered structure at the national, state and local level is envisaged including National Biodiversity Authority to deal all matters relating to requests for access by foreign individuals, institutions or companies and all matters relating to transfer of results of research to any foreigner), State Biodiversity Boards to deal all matters relating to access by Indians for commercial purposes, and Biodiversity Management Committees to carry out conservation, sustainable use, documentation of biodiversity and chronicling of knowledge relating to biodiversity (The Gazette of India (E), 2003).

Documentation of Biological Diversity

Protection and preservation of traditional knowledge have been a matter of concern to the developing countries in general and India in particular. To promote sustainable use and equitable benefit sharing while conserving the biological diversity several agencies in India have independently initiated registration of biodiversity knowledge foster sustainable development and to protect the local interests against the global interests (Shastry, 2007). Traditional Knowledge Digital Library (TKDL) of Council of Scientific & Industrial Research (CSIR) is an international library on traditional knowledge has a rich database of information of the traditional knowledge available in public domain in a common language. People's Biodiversity Registers which record the status, uses and management of living resources and Community Biodiversity Register which provides spaces for the rights to communities about their biological and cultural heritage are some efforts for documenting biological resources and associated traditional knowledge in the country.

Conclusion

Intellectual Property Rights has been recognized as universal and its importance has been acknowledged by both developed and developing world. The drive towards stronger worldwide IP protection has intensified as a result of changes that have taken place in the global technology system. To provide an international frame work for the protection of IPRs, WTO introduced TRIPS Agreement which gave a strong impetus for the globalization of PVP regimes. Plant variety protection has become established as an instrument of protection of plant variety innovations in developed countries over the decades. Developing countries, with their diversity of farmers and seed systems, present special challenges for designing a supportive IPR system. The goal is to provide incentives for seed sector development while not creating unnecessary or unrealistic limitations on the practices and livelihoods of smallholder farmers. This needs to have a balanced approach towards protecting the interests of the plant breeders in the formal sector and the traditional farming communities. After initial reluctance, many developing countries have accepted the TRIPS Agreement and have already revised or are in process of revisiting their IPR laws considering their specific conditions and needs. India has opted for a *sui generis* system of protection of plant varieties and has provided rights to farmers, breeders, researchers and equity concerns in the PPV & FR Act. All these provisions make it a unique Act, when compared to similar legislations in other countries. In a very short span of time the Authority has effectively progressed in implementing most of the provisions made under the Act for framing criteria of testing and registration of different types of plant varieties. It has also opened branch offices, national gene bank and field gene banks, identified agro-biodiversity hotspots and recognized and rewarded farming communities for their contributions in conserving genetic resources.

The Indian PVPFR Act is an effective *sui generis* system providing a balance between plant breeders' rights along with farmers' rights and researchers' rights. Its implementation will catalyze the availability of quality seeds of registered varieties and thereby contributing to the enhanced agricultural production and lead to the national food and nutritional security. At the same time, provisions for social recognition and economic reward made under the Act will support and promote the farm families to continue conservation, nurturing and enhancing agro-biodiversity of the country.

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