

Plant Breeders Legislation in India and Pakistan: A Comparative Analysis

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The main focus in this paper was to look at the Plant Breeders Legislations in India and Pakistan in the context of plant Breeders rights and to examine them in the light of Trade Related Aspects of Intellectual Property Rights Agreement. For this purpose, the available literature was reviewed through hand search method and made a comparative analysis. Our findings indicated that the existing legislative endeavors are a good step towards regulations in order to safeguard the agreement of intellectual property rights. The comparative analysis of the PPV&FR Act of India and PBR Act of Pakistan provides the opportunity to understand effectiveness of this law in these countries and their compatibility with International legal framework. The foremost determination of these laws are the improvement of seed industry by ensuring the interest of the breeders, producers, seed organizations and farmers by giving an effective system for protection of plant varieties and rights of farmers.

Keywords: Plant Breeders Rights Act 2016, protection of plant varieties and farmers Rights Act, legislation, TRIPS agreement, International Treaties,

In this study an attempt has been made to look at and review Plant Breeders Legislations in India and Pakistan in the context of plant Breeders rights in line with Trade Related Aspects of Intellectual Property Rights Agreement. Formerly, the Indian Government had passed the Protection of Plant Varieties and Farmers' Rights (PPV&FR Act, 2001) and later Pakistan had passed the Plant Breeders' Rights (PBR Act, 2016). Subsequently both countries India and Pakistan progressed toward becoming signatory to the TRIPS agreement and now they are member. The agreement's article 27.3(b) indicate that the signatory countries should give protection of seed or plant varieties in the form of compelling sui generis framework or by patent or by using the both methods at the same time (Brahmi, Saxena & Dhillon, 2004). With the passage of time, they ratified different treaties which led them to the legal arrangement for plant variety protection in the form of pertinent laws for the protection of plant or seed varieties, farmers and breeders rights by leaving some of the issues even still remained unsettled. Furthermore, both countries went for legislation in the light of TRIPS Agreement, which gives the clue of plant variety protection and the Biodiversity Convention and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) (Cullet & Koluru, 2017). The primary concern of both countries is the advancement of seed sector by securing the reward of the breeders, seed organizations and agriculturists by giving a powerful system or protection the rights of farmers and plant varieties. The PPV&FR Act is a lengthy document and it discussed the breeders, researchers specifically the farmer's rights in detail while PBR Act is short document and it provides these rights in different manner. The study endeavors to break down most parts of the enactments while carrying out the comparative studies for judging its utility in the relevant countries.

Method

A literature review method of hand search was carried out to review/view the available literature/articles on Plant Breeders Legislations in India and Pakistan and to critically examine in line with TRIPS Agreement as mentioned elsewhere earlier. Cited research articles were explored and after thorough analytical reading, main themes were discovered or extracted for the purpose of this study.

India and Pakistan have passed laws for the development and the protection of plant varieties. These laws are compliance with the International legal framework. The common ratified treaties include Biodiversity

Convention, ITPGRFA Treaty, World Trade Organization and TRIPS Agreement etc. (Cullet & Koluru, 2003). Both countries have ratified nearly the similar international treaties concerning the plant variety protection and management.

India has confirmed the Biodiversity Convention which gives essential system to the protection and the utilization of biological assets. It asserts India's sovereignty over its biological assets and qualifies India's power with the presentation of regular thought which suggests that the protection of biodiversity in India is not conforming to the need of his own country but also with the norms of the international community at large (Cullet & Koluru, 2003; Rukh, 2012). Pakistan marked this treaty in 1992 and was subsequently, approved by the cabinet in 1994. Later on in 2002 a biodiversity conference was arranged with the assistance of International Union for Conservation of Nature (IUCN) 2012. Pakistan presents its national execution answer to Convention on Biological Diversity (CBD) after each 3 or four years (Rukh, 2012) to safeguard the traditional knowledge and lineaments in order to form only a couple of settlements which offers a particular explanation in relation between the administration of natural assets and intellectual property rights. Article 16 of CBD obviously shows that an intellectual property right does not undermine the working of the Convention (Cullet & Koluru, 2003).

India and Pakistan have ratified the ITPGRFA Treaty which has almost similar objectives as CBD. This treaty has close link with CBD, it provides the three unified goals like sustainable use, conservation and benefit sharing. It's "principle aim is to facilitate the exchange of seeds and other germ-plasm to be used for research, breeding and crop development" (Helfar, 2004; Wikipedia, 2017). Besides this the PGRFA Treaty offers acknowledgment to farmer's role to conserving and enhancing plant genetic resources for agriculture and food. Contrary to this, the treaty does not provide or discuss the farmers' rights over their landraces (Cullet & Koluru, 2003).

The agreement provides a joint system for access facility to plant genetic resources for food, agriculture, and sharing in a fair way and usage of arising benefits from these resources on complementary and mutual basis. Pakistan as a member of ITPGRF, the Institute of Agricultural Biotechnology and Genetic Resources (IABGR) of Pakistan Agriculture Research Council (PARC) is the national institution answerable for collection, conservation, evaluation and distribution of PGRFA (Food and Agriculture Organization, 2013). It is also necessary to mention here that article 27 of TRIPs protects the plants varieties in wider sense while article 27.3.b of this agreement may confine the membership holding countries to rule out from patentability as indicated below;

(b) Animals and plants other than micro-organisms, and necessary biological processes for the production of plants or animals other than non-biological and microbiological process. However, Members shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof.

The above sub clause of the article provides that member countries opted for saving plant variety by means of patent or by effective "sui-generis system" or using both the methods. It also gives a reasonable flexibility for rising nations to choose the best option to protect their plant and biological processes and urges the countries to develop and make suitable protection system for their plants according to their own policies, goals and objectives.

Furthermore, Article 27.3.b provides multiple options of Patent or Sui-generis system or any mixture thereof to member countries. These options have been divided among the developing and developed countries in two blocks such as ;many developed countries have granted patent protection to plant, whereas the developing countries being known as economically reliant on agriculture are focusing on making their own kind of PVP mechanism. In case of developing countries such as India, Pakistan, Thailand, Philippines and some other Southeast Asian countries have prepared different PVP system at their own (Kanniah & Antons, 2012) and are still working hard to constitute effective sui-generis system in accordance with TRIPs and CBD requirement.

Historically, the Headquarter of UPOV is located in Switzerland (Geneva), that Convention was held in Paris in 1961 for the first time and had been continuously summoned in 1972, 1978 and 1991. This was the start

of breeding business reproducing which assisted the possibility of PBRs and campaigned for improvement in the trade of seeds' quality. (International Union for the Protection of New Varieties of Plants, 1994; 2011). In the meanwhile in 1961, the national confirmation plans for giving breeders' rights were coordinated into UPOV, with the particular target of empowering private sector business breeding (Sing, Manchikanti &Chawla, 2011).The UPOV Convention, for example, tried to advance value between reproducers, creators and innovators by keeping in mind the end goal to improve seed trade (Ranjan,2009).To date, the UPOV holds its unique feature as a tool of the breeders. The consequent modifications of the Conventions in 1978 and later in 1991 expanded the extent of breeders' rights (Koluru & Cullet,2003). Forty seven UPOV's favoritism position towards breeders has, however, resulted in developing countries' wariness not in favor of using the form as the choice of sui-generis framework (Ragavan&O'Shield,2007). Nevertheless, lack of acknowledgment of farmers 'rights was the main defect of UPOV Concerning the farmers' rights has, therefore, raised the following two main issues; Firstly, it was related to traditional rights of farmers, as the right to re-sow, relevant to new varieties. Secondly, the rights of farmers, provided source (Koluru & Cullet,2003). Both issues were not entirely managed by the UPOV and a substitute designed for reproducers' rights and along these lines treats privileges of different players in rural exchange as exemptions to the breeders' rights (Ott, 2004).

Due to considerable following reasons, India and Pakistan are not the members of UPOV, as such they have prepared their own sui generis system instead of joining UPOV:-

- a) It does not recognize indigenous people's inherent right to biodiversity and TK, as recognized under CBD and ITPGRFA.
- b) The UPOV's focus is only to protect Breeders MNCs rights and pay no attention to rights of the indigenous peoples and farmers entirety.
- c) It curtails farmers' rights to freely save seed for cultivation due to which farmers have to buy seed every season and it does not say about benefit sharing.
- d) In contrast to CBD and ITPGRFA, UPOV does not recognize, states sovereign right on genetic resources, exist in their territory. (Erum, 2015)

Legislation on Plants or Seeds in India and Pakistan

Being a member of WTO, from 1995 India has prepared its domestic legal framework in compliance "with intellectual property law in the seed sector," in 1990s.India amended the Patent Act1970, the act permit for the patenting of seeds develop by non-biological method like advance biotechnology. The significant work was introduced in the form "of Protection of Plant varieties and farmers rights Act (PPV&FR) Act, 2001, to bring India's seed sector in conformity with the WTO and TRIPS' requirements" (Singh, 2016). India is the first country in the world that has approved IP rights lawmaking at the same time granting rights to both farmers and breeders. India adopted some features of laws from the other countries and modified them within its Act (Ramanna, 2003).

The Seed Act, 1976 and rules created under the Act give the structure to the operation of Pakistan's seed sector. The Seed Act's goal is calculating and managing the nature of seeds of different varieties of agriculture sector and for matters associated therewith, applies to the whole of Pakistan (Pakdoc, 2012). The most salient feature of this Act is to give the systems of varieties enlistment and seed affirmation. Pakistan has also approved the Plant Breeder Rights Act, 2016(PBR Act, 2016) in compliance with a balanced sui-generis method for the safety of plant varieties and in conformity with the WTO and TRIPs Agreement. It particularly does not fulfill the requirements of farmers and modern times. The existing legal system of the country requires further improvement.

Comparison of PPVFR Act (India) and Plant Breeders' Rights Act (Pakistan)

The Indian Government cleared the PPV&FR Act 2001. After becoming the party to the TRIPs agreement India has formulated a law in 1994 (Brahmi, Saxena&Dhillon, 2004).The signatory countries will save the plant varieties by an effective sui generis system or by patent or by mixing both under the article 27.3(b) (Ranjan, 2009).

Likewise, Pakistan introduced the Plant Breeders Rights Act 2016 after long debate in public and parliament. Here, the concern is to generally analyze both the legal documents of PPV&FR and PBR Act. (i) The prime concern of the PBR Act is to support the seed organizations and plant breeders in private and public sectors to spend in research and plant breeding;(ii) The Act facilitates in access to protect foreign varieties, new technologies and development of superior varieties;(iii) It's another important objective is to encourage and build healthy competition among the public and private sector organizations for variety development (PBR Act 2016, objectives).

The PPV&FR Act provides three types of rights;(i) Breeders' Rights which give special rights to sell, produce, market, distribute, export or import seed of the protected variety;(ii) Researchers have right to use the variety as basic source for the objective of development of a developed variety;(iii) Act recognizes the rights of farmers as breeders' rights.

On the other hand, section 22 of PBR Act provides the rights of the plant breeders in respect of owner's protected variety has exclusive rights:"(a) selling or offering for sell or developed variety or the protected variety in Pakistan;(b) exporting of the generative or vegetative propagating material of the saved variety into Pakistan or importing it from Pakistan etc" (PBR Act, 2016). Section 25(d) provides that the farmers have right to use, save, exchange, sow, re-sow, share or sell his farm production seeds, provided that under this Act on the commercial bases the farmer is not entitled to sell seed of a variety protected (PBR Act 2016, s25) without the conditions of Seed Act, 1976 (XXIX of 1976) (PakDoc, 2012), and regulation made therein. Thus to recap the PBR Act provides limited rights to farmers as compare to the Indian Act.

Analysis and discussion

A significant feature of the PPV&FR Act is that it includes the farmer's rights as positive rights that go away from the general description of farmer's rights in the international treaties (Ranjan, 2009).

International organizations like the FAO resolution 5/89(FAO Conference,1989) and the ITPGR treaty, despite the fact that perceive the worries identified with business misuse of the germplasm by the plant reproducers where no advantage is given to agriculturists(Anderson,2012).Some International legal instruments define the farmer's rights for example, rights emerging role of farmers in conservation, enhancing and making accessible PGR, specifically those in centers of origin or diversity. Article 9.3 of the ITPGR consider the national laws of the country where farmers have the rights to save, exchange the farm saved seeds. This is pertinent to consider here that the Treaty permits member countries to build up their own types of securing agriculturist's rights. The rights of farmers may define as the rights provided from their past contribution like rights to use, save, exchange or sell farm saved seeds.(Food and Agriculture Organization, 2009).Secondly, "the right to be compensated for providing the PGR used by the commercial breeder in developing new varieties"(Convention on Biological Diversity, 1992) and right to save and register their varieties(Ranjan, 2009).

The PPV&FR Act 2001 recognizes the farmer's rights to benefit sharing and the positive right of ownership of a farmer over the PGR. The Act provides the opportunity to produce and register the new seed varieties to the farmers while it also requires that the variety complete the other requirements for registration (PPV&FR Act 2001,s 39.1).The PPV&FR Act's definition of breeder explicitly includes farmers (PPV&FR Act 2001,s 2(c)).PPV&FR Act gives the chance to enlist their varieties under the surviving assortments. It is a different novel element of the PPV&FR Act that enables enrollment to farmers of officially accessible assortments (PPV&FR Act 2001,s 8).Extent variety is farmer's variety which is obtainable in India or variety mentioned under the s.5 of the Seed Act, 1966 or a variety about there is common knowledge (Seed Act1966). Thus, farmer's variety can be enrolled under the extant varieties (Ranjan, 2009).

On the other hand, the PBR Act states that a farmer to be permitted to use, save, exchange, sow, re-sow, sell or share his farm produce variety. However, farmer shall not be allowed to sell seed of a variety protected under this Act on a commercial basis without complying the requirements of Seed Act, 1976and regulations developed under the Act (Seed Act,1976).Thus, provided farmer rights in PBR Act are limited in comparison with PPV&FR Act. Rights of farmers are necessary for the purpose of conservation and surviving

genetic variability and for the generation of new ones. The function of farmers' rights has great importance in countries like India and Pakistan due to the high wealth of varieties present in our ecosystem and the agriculture nature of the national economy.

The criterion of new seed variety registration is very difficult and lengthy in the PPV&FR Act and PBR Act. The truth is that "only commercial plant breeders and public research institution" can register their variety in easy way. The reason is that commercial plant breeders and public research institution have the facility to manage modern scientific breeding to fulfill the NDUS or DUS criterions for enrolment new variety (Brahmi, Saxena & Dhillon, 2004). As an outcome, a small number of farmers' have access register their new seed varieties under the current registration method provided in the both Acts.

The PPV&FR Act and PBR Act chapter VII provides novel basis under which plant variety registration can be challenged. Section 47 of PPV&FR Act provides that the authority can allow compulsory license, if there is an occurrence of any grievances regarding the accessibility of the seeds of any enrolled new seed variety at a reasonable cost. After the expiry of time of three years, "the registration can be allowed to any individual person to take up such exercise from the date of issue of certificate of registration to undertake sale and distribution of the seed or other relevant material of the variety" (PPV&FR Act 2001, s 47). The PBR Act Section 33 provides the power to Registrar to issue compulsory license in the following circumstances:

- (a) For public interest particular in the matters
- (b) in case the owner of the certificate become the case of exploitation
- (c) when the seeds are not accessible to the people or farmers at a low price.
- (d) the owner of the certificate denied to give a license to a third party on reasonable commercial terms and conditions.
- (e) the Registrar has right to issue "compulsory license after the expiry of three years from the date of grant of a certificate" (PBR Act 2016, s 33).

Section 50 of PPV&FR Act is related to the time of compulsory license which states that the Authority should decide the length of the obligatory permit and such time may shift from case to case basis by considering the growth time frames and other pertinent considers (PPV&FR Act 2001, s 50). However, in any case it should not surpass the aggregate outstanding period. Section 34 of PBR Act discusses about the duration of compulsory license period, this section is similar with Section 50 of PPV&FR but it further adds that the period of compulsory license shall not surpass five years from the date of its issuance. Section 52 of PPV&FR Act and Section 35 of PBR Act provides the same reasons under which a Compulsory license can be revoked. The Authority or Registrar can revoke the license "on an application made in the prescribed manner from an aggrieved person". Here, it is necessary to satisfy that the licensee is not fulfilling the terms and conditions of the license, further in the public interest it is not suitable to continue such license. (PPV&FR Act 2001, s 53).

The both Acts have inserted the Sections for modification of Compulsory license and the Authority or Registrar has the right to modify the license in case of public interest.

Section 64, 65 of PPV&FR Act and Section 38 of PBR Act deal with the infringement and suit for infringement as in matter of infringement, both the acts are different while in matter of suit for infringement they are the same. The PPV&FR Act states that "any person who is not actual breeder of a variety registered and sells, exports or produce such variety" that person is committing infringement. Section 38 of PBR Act provides that any action in violation of the granted rights to breeder under section 22 shall be considered as infringement. The infringement suit shall be brought in any lower Court of District Judge having jurisdiction contained by the local limit of whose jurisdiction the cause of action originate.

S.66 of PPV&FR and s.39 of PBR Act provides same relief to the aggrieved party in infringement matter. The alleviation which a court may give in any suit for infringement may incorporate an order at the alternative of the offended party, either damages or a share of the benefits. (B) Time limitation on an infringement suit:

According to Section 40 of PBR Act, an aggrieved party may file suit within three years time duration. Before actual or constructive notice damages will not be assessed against the defendant in case infringement is

committed by defendant provided that the variety is a protected plant variety. On the other hand, PPV&FR Act of India does not provide the time limitation on an infringement suit. But provides penalties for applying false information, it provides that; The person shall be punishable with imprisonment for term which shall not be less than three month which can be extended to two years, or with fine which shall not be less than fifty thousand rupees but which can be extend to half million rupees, or with both provided that if any person applies any false denomination to a variety or show the false name of a country or place a false name and address of the breeder of a variety registered under this Act in the course of trading such variety (PPV&FR Act2001, s 70). In comparison with PPV&FR Act, the PBR Act does not provide any provision of penalty for applying false denomination. Section 41 of PBR Act provides that penalties for contravention of this Act or rules shall be framed in the light of this act. Chapter VIII of PPV&FR Act deals with the Plant Variety Protection Appellate Tribunal and with its composition, appeal, order and procedure. The tribunal will be set up through an official notification by the Government to use jurisdiction, power given on it under this Act. The PVPAT will comprise of legal as well as technical member. In comparison with PBR Act, it does not allow to establish appellate tribunal, although, any aggrieved party has the right to appeal in High Court after the decision of District Court, within sixty days of the decision(PBR Act2016,s 46).

The PPV&FR Act allows the storing of reference samples. It takes enough and proper storage infrastructure. The Authority creates suitable set up for furnishing storage services at particular places in the state. The National Gene Bank at National Bureau of Plant Genetic Resources provides facilities and technical expertise.(Brahmi, Saxena&Dhillon, 2004) whereas on this matter PBR Act is silent.

Section19 of the Act states that a breeder to present an amount of seed incorporating with parental lines as indicated and determined by the regulations. Moreover, the saved seeds are to be monitored and regenerated if important for DUS testing for support. Some extra fee may be charged for protection and regeneration, other than testing expenses. For the purpose of financial autonomy of the authority the fee for registration and other processes as well as annual fee should be reasonably determined (PPV&FR Act2001,s 19).Respectively, Section 47of PBR Act states that the Federal Government may by notification in the official Gazette, set down a schedule of fee and charges for services rendered to the applicants and the public under this Act and any fee or amount collected shall be deposited in the manner as may be prescribed.

The Act bound the applicant when once submit his/her application, it must be sure that the genetic material was acquired by proper legal way and the genetic or parental material was used for breeding. This sort of affirmation would be difficult in situations where the basic information identifying with the material has not been recorded. Besides, it is difficult for a breeder to get information relating to the contribution of former, town group, and so on. Since such data may not be dependable, therefore, in this type of situation when the information is not accessible, the matter might be left to the expert to choose who may welcome claims later through media etc (PPV&FR Act2016,s 18).

On the other hand, Section 15 of PBR Act states that “the application for protection shall be with relevant to a new plant variety”. The application should include true denomination assigned to such variety by the candidate. In case of genetically modified plant variety, it requires approval from the National Bio-safety Committee constituted by the Federal Government to this impact genetically modified plant varieties may have no unfriendly impact on the earth, human or vegetation and on human health.

The PPV&FR Act and PBR Act provide a new regime in the seed sector in India and Pakistan. This law can be utilized for the security of its hybrid breed seeds. The seed sector expects that plant assortment security administration will bring another strategy that gives the more prominent access to public germplasm. It is also interesting that the initial stage on the PPVFR bill, the seed sector in India was not content with those arrangements of the PPV&FR charge that offered rights to agriculturists to offer seeds contending that this will undermine the very reason for having an enactment on plant assortment protection (Ranjan, 2009).

“However, the seeds industry, later on, softened its stand on farmer’s rights provisions in a process of accommodation and compromise where industry understood that the concept of farmer’s rights as an

alternative means of intellectual property protection reinforced their position on IPR enabling them to gain PBR rights in India”(Ranjan,2009).

Enforceability of the PPVFR Act and PBR Act is also considerable issue in India and Pakistan. The majority of the farmers are illiterate and poor in both the countries. They are not well aware from their rights due to this reason, enforceability of the legislation will be difficult in India. Alternate issues identified with the enforceability may run from choosing fitting locales for NDUS testing, creating regulatory systems to direct profit sharing and guaranteeing that there are no encroachments of the rights that spill out of the assurance of plant variety. The Protection of Plant Variety and Farmer’s Rights Authority of India has been set up for the effective implementation of the PPVFR Act. The effective enforcement of the Act will take some time.

Conclusion

The comparative analysis of the PPV&FR Act of India and PBR Act of Pakistan provides the opportunity to understand how these laws are effective in the respective countries, how they are different from each other and how much they are complying with International legal framework. The common purpose for both laws are the improvement of seed industry by ensuring the interest of the breeders, producers, seed organizations and farmers by giving an effective system for protection of plant varieties and rights of farmers. Both the Asian countries - India and Pakistan have signed the same International treaties like TRIPS Agreement, ITPGRF, and Convention on Biological diversity for the protection of plants varieties. India is one of the country in the world which has passed legislation including the rights of breeders and farmers under the Protection of Plant Varieties and Farmers’ Rights Act, 2001.India’s PPV&FR Act is considerable both in the domestic and international perspective. The both countries’ Acts allow following characteristics of new variety should be registered for securing the interest of innovator: Extant variety, New Variety, Essentially Derived Variety and Farmers Variety. The PPV&FR Act has discussed the farmer’s rights in detail as compare to PBR Act. Both of the laws provide that in case of infringement of rights, the aggrieved party has the right to bring a suit in District Court while in matter of appeal the legal instruments have different channels such as Tribunals and High Courts.

References

- Anderson,R.(2012).Plant genetic diversity in agriculture andfarmers’ rights in Norway.FNI Report.,Fridtjof Nansen Institute .Norwegian.
- Brahmi, P., Saxena, S., & Dhillon, B. S. (2004).The Protection of Plant Varieties and Farmers Rights Act of India.*Current Science*,86(3), 392-398.
- Convention on Biological Diversity.(1988).*International Treaty and Article 8 (j) of the Convention on Biological Diversity*.Retreived from: <https://www.cbd.int/convention/wg8j.shtml>
- Cullet, P., & Kolluru, R. (2003).Plant Variety Protection and Farmers' Rights-Towards a Broader Understanding. *Delhi Law Review*, 2, 41-59.
- Erum, N. (2015). A critical analysis of plant breeders’ rights Bill –A Neo Imperialism; Counterbalancing the Sui Generis Regime of Intellectual Property and Plant Variety Protection between the corporate sector and Indigenous farming community of Pakistan. *An LLM thesis*, University of International Islamic University, Islamabad,p.58.
- Food and Agriculture Organization (2009).*International Treaty on Plant GeneticResources for Food and Agriculture*. Rome, Italy.
- Food and Agriculture Organization. (2013). Enhancing Understanding and Implementation of the International Agriculture in Asia:*FinalReport*,Bankok, Thailand. Retrieved from: <http://www.planttreaty.org/sites/default/files/gb5re.pdf>.
- Food and Agriculture Organization of United Nations.(1989). Commission on Genetic Resources for Food and Agriculture,Resolution 5/89.Retreived from:<http://www.fao.org/nr/cgrfa/cgrfa-about/cgrfa-history/en/>.
- Helfer, L. R. (2004). *Intellectual property rights in plant varieties: International legal regimes and policy options for national governments* (No. 31). Food & Agriculture Org.
- International Treaty on Plant Genetic Resources on Food and Agriculture.(2001). Retrieved March 15,2017 from:<http://www.fao.org/3/a-i0510e.pdf>.

- International Union for the Protection of New Varieties of Plants.(1994). Nature and Rationale for the Protection of Plant Varieties. Seminar presented at the meeting of International Union for the Protection of New Varieties of Plants. *A Report*, Geneva, Switzerland.
- International Union for the Protection of New Varieties of Plants.(2011). *Introduction to UPOV*. Retrieved from: <http://www.upov.int/portal/index.html.en>
- International Union for Conservation of Nature (2012). *What is IUCN?* Retrieved on March 16, 2017 from: <https://www.iucn.org/about>
- Kanniah, R., & Antons, C. (2012). Plant variety protection and traditional agricultural knowledge in Southeast Asia. *Australian Journal of Asian Law*, 13(1), 1-23
- Ott, R. (2004). Protection of Plant Varieties and The Farmer's Rights Act. *Oklahoma Journal of Law And Technology*, 1-14. Retrieved from: <https://www.law.ou.edu/sites/default/files/files/FACULTY/2004okjoltrev14.pdf>
- PakDocs. (2012). *Seed Act 1976: The main Objective of Seed Act 1976 (Pakistan)*. Retrieved from: <http://www.pakdocs.com/seed-act-1976/>
- Ragavan, S. & O'Shields, J., M. (2007). Has India Addressed Its Farmers' Woes? A Story of Plant Protection Issues. *The Georgetown International Environmental Law Review*, 20, 9-104
- Protection of Plant Varieties and Farmers Rights Act 2001. India
- Plant Breeders Rights Act 2016. Pakistan
- Ramanna, A. (2003). India's Plant variety and Farmers' rights legislation: Potential impact on stakeholders access to genetic resources. *EPTD Discussion Paper No.96, p.3*. International Food Policy Research Institute (IFPRI).
- Ranjan, P. (2009). Recent Developments in India's Plant Variety Protection, Seed Regulation and Linkages with UPOV's Proposed Membership. *The Journal of World Intellectual Property*, 12(3), 219-243.
- Rukh, H. (December 24, 2012). *Convention on Biodiversity and Pakistan*. Retrieved from: <http://envirocivil.com/environment/convention-on-biodiversity-and-pakistan/>
- Singh, K. (2016). Intellectual Property Rights in Agricultural Biotechnology and Access to Technology: A Critical Appraisal. *Asian Biotechnology and Development Review*, 18(3), 3-33.
- The Seed Act 1976. Pakistan
- Wikipedia (April 2, 2017). *Germplasma*. Retrieved from: <https://en.wikipedia.org/wiki/Germplasm>.

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