

# How do the stakeholders perceive plant variety protection in Indian seed sector?

P. Venkatesh\*, I. Sekar, G. K. Jha, Premlata Singh, V. Sangeetha and Suresh Pal

*Creativity and innovation are important factors for sustainable agricultural growth. Intellectual property rights (IPR) is the key driver of innovation. However, many argue against this view, as it would benefit only a certain section in a country. The present study analyses the perception of stakeholders on Indian IPR system for plant varieties. A perception survey was conducted among various stakeholders of the seed industry across the country during 2011–12. Contrary to the view that IPR plays no role in innovation, this study finds a positive perception of majority of stakeholders on plant variety protection (PVP), while highlighting the hits and misses of Indian PVP.*

**Keywords:** Intellectual property rights, innovation, perception, plant varieties, stakeholder.

INDIAN seed industry has been introduced to intellectual property rights (IPRs) since the early 2000. Before the IPR era, public sector technologies and varieties were in public domain for access by all, and very scarcely patented or protected. The germplasm and other planting materials were exchanged freely among breeders in public sectors and public bred varieties were multiplied and sold by private companies, without having to pay any royalty to the source institute. In line with the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement of World Trade Organization (WTO), India enacted the Protection of Plant Varieties and Farmers Rights Act (PPVFRA) in 2001 (ref. 1). Subsequently, the PPVFR authority was established at New Delhi in 2005 and it started functioning since 2006. Commensurate with this development, the Indian Council of Agricultural Research (ICAR), the apex body for agricultural research and education in the country, set the guidelines for intellectual property generation, commercialization and transfer of agricultural technologies to enhance the work environment for higher innovativeness in public sector<sup>2</sup>. Opinion about IPRs and their impact on seed industry is diverse and contradictory. The proponents of IPRs argue that it would provide incentives for investment in technology development, particularly for private research and development (R&D), which in turn would contribute to the growth of seed industry providing more seed choices to farmers<sup>3–10</sup>. Further, in the absence of protection for innovation, high-yielding varieties and hybrids developed

in technologically advanced countries would not be accessible to developing countries, because any competitor might easily replicate and sell these varieties. Lack of accessibility to high yielding varieties would affect the opportunities of developing countries to gain crop productivity<sup>11,12</sup>. Despite IPRs incentive for innovation, some analysis raised concerns over lack of availability of local capacity and absorptive capability of developing countries to make use of innovation<sup>13–16</sup>. Some studies claimed the presence of a U-shaped relationship between IPRs and levels of economic development<sup>17</sup>. Further, IPRs may increase the price of protected varieties and may limit accessibility to those protected varieties, particularly for small and marginal farmers<sup>18,19</sup>. However, the effectiveness of any policy intervention depends on the awareness and attitude of its stakeholders. As these policy changes are intended to support the R&D activities of plant breeders of both public institutes and private seed companies, they are first to perceive the impacts and the farmers are the end recipients. This study was conducted to gain insights into stakeholder awareness and perceptions about various aspects of PPVFRA.

## Evolution of plant variety protection rights in India

Plant varieties were not part of IPR system in India before the PPVFR Act came into existence. Ever since seed companies entered the seed sector in 1988 through the National Seed Policy, the demand for plant breeder's rights rose<sup>20</sup>. In addition, being a founder member of the WTO and having ratified the TRIPS agreement, India had to enact a law for protection of plant varieties to comply with Article 27 in part II of TRIPS agreement. The bill on plant breeder rights faced severe opposition from different

P. Venkatesh\*, I. Sekar, G. K. Jha and Suresh Pal are in the Division of Agricultural Economics, ICAR–Indian Agricultural Research Institute, Pusa Campus, New Delhi 110 012, India; Premlata Singh and V. Sangeetha are in Division of Agricultural Extension, ICAR–Indian Agricultural Research Institute, Pusa Campus, New Delhi 110 012, India.

\*For correspondence. (e-mail: venkatesh1998@gmail.com)

corners like farmers' forum, Non-Governmental Organizations (NGO) and to some extent from public sector. This resistance was mainly based on the fact that private companies may control seed industry – for example they may take original resources or parental lines from farmers' field and/or public sector institutions, and develop a variety or hybrid to claim ownership without sharing any benefits to saviours or suppliers of plant genetic material. All these concerns were taken into account by policy makers, who effectively addressed the inequalities and enacted the PPVFR Act in 2001. This Act protects the interests of both plant breeders and farmers, and encourages development of new plant varieties of economic importance<sup>21</sup>.

The rights provided under the Act can be classified into three categories: breeders', researchers' and farmers' rights. Breeder's right grants proprietary ownership rights to plant breeders, for their varieties which confer exclusive rights to produce, sell, market, distribute, import or export the registered variety. Under researcher's rights, the Act exempts researchers to use registered variety for conducting experiment and use of variety as a source for creating other varieties. However, authorization by the breeder is necessary for repeated use of registered variety as a parental line for commercial production. Under farmers' rights, the Act recognizes a farmer as a 'breeder' who has developed a new variety in the same manner as a breeder of a variety; as a 'conservator', who has conserved the genetic resources of land races and wild relatives of economic plants, which have been used as donors of genes in varieties registered under this Act; and as a 'user' who is entitled to save, use, sow, re-sow, exchange and share or sell his farm produce, including seed of a variety protected under this Act, just as he was entitled before the enforcement of this Act, provided that the farmer shall not be entitled to sell branded seeds of a variety protected under this Act. Also, the Indian *sui-generis* system of plant variety protection is unique, because under this Act a variety can be registered under either of four categories: new variety, essentially derived varieties, extant variety and farmers' variety<sup>1</sup>, whereas under the International Union for the Protection of New Varieties of Plants (UPOV) member countries do not provide protection of varieties under the last two categories<sup>22</sup>.

## Methodology

The purpose of this study is to know the farmers' knowledge on plant variety protection, and the perception about impact of plant variety protection (PVP) on seed industry by various stakeholders such as breeders who work both in public research institutions and private seed companies. The survey was conducted for stakeholders' perception and farmers' awareness and the data were collected during the year 2011–12. The opinion survey

about impact of IPRs on the seed industry, was conducted among seedsmen from seed companies and scientists from public research institutes. For this purpose, three public research institutes dealing with major crops and a larger institution with the mandate of breeding number of crops were selected for the opinion survey. From the selected 4 ICAR institutes, 25 respondents from related disciplines were chosen for discussion. Hyderabad (India) was purposively selected for the private seed companies' survey, as it is one of the major seed producing regions of the country, and a large number of seed companies are located in and around the city. All 24 companies who responded to our request were surveyed through personal interviews using a structured questionnaire. Tamil Nadu state was purposively selected for farmers' survey, as it is one of the agriculturally important states and the crops which are more prominent in plant variety protection activities (rice, maize and cotton) are commonly grown in the state. Three districts were selected based on the area coverage of major crops. By adopting a three-stage random sampling technique (*taluk*, village and farmer) 60 farmers were selected from each district and thus a total of 180 farmers were selected for the study. Information regarding socio-economic characteristics, PVP awareness level and their sources of information were collected, through personal interviews.

## Stakeholder perceptions on PVP

The seed industry has a large number of stakeholders such as farmers, private seed companies, public research institutes, NGO, seed associations, government organizations, etc. However, breeders are the major stakeholders apart from farmers, as they are the first to see the impact of this policy change. Therefore, this study presents opinion of breeders including public and private research organizations (Table 1). The respondents were asked questions regarding PVP registration procedure and their impact on the Indian seed industry. As respondents had divergent views on each issue, their opinions were summarized into three categories – positive, negative and no impact – based on their majority (>50%).

The question regarding exchange of germplasm, including propagating material, resulted in negative responses from the public sector; however, their counterparts in the private sector did not feel any impact. The public sector plant breeder expressed that there was free exchange of genetic material between public research institutions and private seed companies earlier. In the post-PVP era, this exchange is somewhat restricted not only with private companies, but also among public research institutions. A similar view was reported by Leger<sup>23</sup>, for Mexico, where he noted that local breeders perceived positive impact, as flow would be accelerated, while public breeders opposed it, and multinational companies

**Table 1.** Perception of PPVFRA legislation and impacts on the Indian seed industry

Particulars	Public sector	Private sector
Facilitates access to germplasm/propagating material	–	0
Facilitates in marketing of new technology	+	+
Promotes PPP collaborative research agreements	0	0
Facilitates licensing agreements	+	+
Provides incentives for R&D and innovation	+	+
Facilitates commercialization of varieties	+	+
Controls seed prices	0	0
Effective protection system	+	–
Cumbersome procedures for obtaining protection	–	+
Length of testing the variety is very high	–	+

Opinion of the majority of respondents: + indicates positive impact/in favour, – indicates negative impact/against and 0 indicates no impact.

recorded no impact. It is evident from Table 1 that breeders from both sectors agreed that PPVFRA facilitates marketing of new technology, licensing agreement between and within these sectors, and commercialization of new varieties. PPVFRA has played a major role in commercialization of new varieties in the recent past<sup>10</sup>. It is worth to mention that both public and private sector breeders, agreed that PVP provides positive incentives for R&D and innovation, although their form of incentives is different. The study thus supports the argument of positive impact of IPR on innovation. Considering promotion of public–private partnership in collaborative research programmes, both of them expressed minimum or no influence of PVP. Similarly, respondents from both sectors felt that PPVFRA has no control on seed prices. This view is different from earlier reports<sup>18,19</sup>. With respect to effectiveness of PVP system, there was a stark contrast response between the public and private sectors. The public sector breeders opined it as an effective system as it addresses all their concerns, while views of the private sector were quite opposite. Some of the respondents charged that authorities commenced registration without a complete database of existing varieties. The same view along with many contentious issues, such as definition of different categories of varieties, duration and effect of registration etc., were raised by seedsmen from private companies in their report<sup>24</sup>. Some respondents suggested that the system be made more effective through introduction of DNA marker technology, to identify the originality of the variety. However, it may have a detrimental effect on small and marginal companies, as cost of protection would increase many-fold, and already small companies have voiced their concern about the existing cost structure<sup>10</sup>. The private sector respondents pointed out that registration procedure was cumbersome, as there were many legal and procedural formalities associated with the process, and the length of testing is relatively high in particular new varieties. However, the public sector respondents opined that procedure and time length for testing is justifiable and that initial phase of implementation of any

policy, may have to get accustomed to the new system with the passage of time.

### Constraints in PVP registration

The constraints faced by applicants for PVP registration have been studied. The questions regarding constraints in PVP have become irrelevant to public sector respondents, as it is mandatory for them to register all the eligible varieties under PPVFRA. Therefore, constraint analysis with respect to private sector only was done by using Garrett ranking technique (Table 2). The results show that cost of protection emerged as a major factor. Majority of the respondents expressed it as a serious concern, particularly for small size companies. Some of the respondents mentioned that it is difficult to protect all their varieties and parental lines with the existing cost structure and they have been forced to choose among their varieties to go for registration. Hence, they suggested a differential cost structure based on the size of the company. One of the respondents emphasized that small companies on the verge of extinction in the seed industry due to the first-come-first-serve approach of Indian PVP system, would lead to dominance of multinational companies in Indian seed industry, as they may take control of all the varieties through PVP. However, this view was contradicted by another respondent (from medium size company) who questioned the origin and development of varieties and hybrids within a short period of time (e.g. 5 years) and alleged them for illegal access of these varieties from other sources. It is worth mentioning that more than 40 litigation cases have been registered in PPVFRA till 2012, which demonstrates the beginning of variety ownership conflict in the seed industry.

Similarly, the private sector respondents felt that the cumbersome procedure, passport data requirement and longer time duration in registration, were the other important factors that discouraged them to apply for PVP. In India, the minimum time taken for registration of varieties under PPVFRA was 25 months, whereas in UPOV

**Table 2.** Constraints faced by private sector in PVP application

Constraints	Garret mean score	Rank
High cost of protection	84.6	I
Cumbersome procedure of filing and delay in processing application	82.7	II
Rapid change in technology limits filing protection	57.8	III
Inability to enforce protection	45.9	IV
Valuable information about the new variety may be leaked	43.8	V
Competitor may develop around new varieties or hybrid	37.8	VI
Lack of knowledge	32.5	VII
Maintaining protection is too expensive	27.2	VIII
Hybrids are natural patents, waste of time and money in filing protection	24.3	IX

countries it was 17 months<sup>19</sup>. Further, they stated that rapid change in technology or development of new varieties was the other significant factor which has discouraged them to go for registration. Because their marketing strategy revolves around frequent release of new varieties to attract farmers, PVP assumes less importance to them. Most significantly, the efficiency of PVP system and implementation of PVP rules were also major factors. The majority of respondents expressed concern over reliability of the PVP system in maintaining passport data and pointed out that submission of seed samples to the authority is the difficult part of protection. However, lack of knowledge and maintenance cost of protection, were not ranked as significant constraints. This implies that there is a fair amount of information about PVP and the maintenance cost of protection was reasonable. The survey also suggests that although hybrids were biologically protected, legal protection is important to avoid imitation of the products and false claim of the rights by the competitor.

### PVP and innovation

Many studies claimed that IPRs promote innovation and the opinion survey of breeders in this study also agreed with this reasoning. Thus, it is interesting to know the factors which stimulate innovation or research of breeders. It is to be mentioned here that private sector plant breeders were not keen in answering questions related to this section, as it is difficult for them to reveal their salary and innovation linked incentives. This analysis was thus confined only to public sector plant breeders. Garrett ranking analysis results show that personal scientific curiosity is the most important stimulant or innovation, followed by infrastructure creation (Table 3). The respondents rated PVP as the third most important factor in arousing research interest of breeders, which indicated that PVP also played a role in stimulation and it motivated breeders for innovation. The primary objective of this study is to understand the role of PVP in innovation and the results confirm the positive impact of PVP on innovation. The survey shows that respondents considered monetary benefits (royalty) accrued from innovation as

**Table 3.** Innovation stimulating factors in public sector

Stimulating factors	Garret score	Rank
Satisfy personal scientific curiosity	76.6	I
Research fund/infrastructure creation	71.4	II
Protection of new varieties	65.5	III
Economic motive	60.9	IV
Career opportunities	58.7	V
Social respect	48.5	VI
Licensing to others	37.9	VII

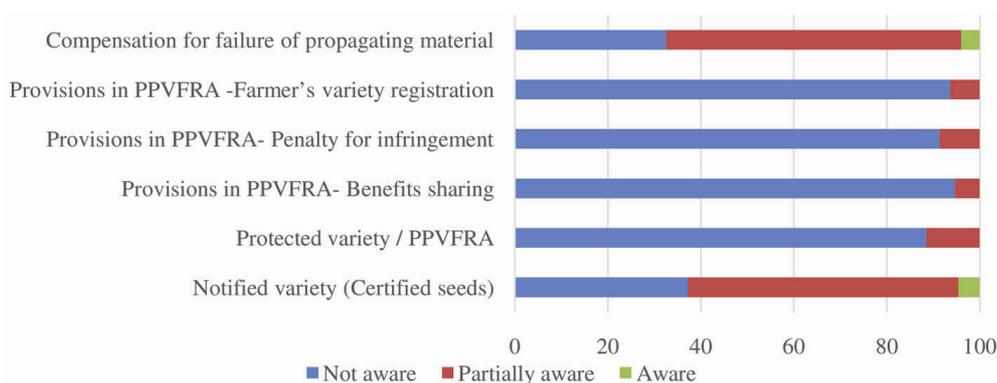
one of the factors and some of the respondents indicated that technical staff in the system were highly motivated as royalty was shared with them. As the innovation resulting in PVP or patent helped in career development and social (peer) recognition, the respondents rated these factors also as significant stimuli. Although licensing is part of economic motive, the respondents believed that *per se* it is not an important factor in research stimulation.

### Farmers' awareness on PVP

Socio-economic profile of the sample farmers reveals that they are diverse in age, education and economic background. The average age of sample farmers was 47.2 years and they had farming experience of over 25 years. Average family size of the respondents was found to be about five and a majority of the farmers (54.3%) could read and write. The sample farmers operated with an average operational land holding of 1.32 ha, a limited number of respondents (about 20%) had contact with the extension personnel and about 16% had social participation such as membership in farmers' club, cooperative society and farmers' welfare group. Farmers' awareness about PPVFRA and various provisions related to them are presented in Table 4. The farmers were asked a series of questions about PPVFRA in two rounds, and based on their replies, they were classified into three categories. Those who had not heard about PPVFRA were grouped as 'not aware' category, having a low level of knowledge were grouped as 'partially aware' and those with better understanding about provisions grouped as 'aware' category.

**Table 4.** Sources of information for the farmers regarding PPVFRA

Sources of Information	Garrett mean score	Rank
Electronic media (TV/radio)	72.1	I
Neighbours/fellow farmers/retailers	53.8	II
<i>KrishiMela</i> /trainings/meetings/campaign	47.3	III
Print media (newspaper/bulletin)	27.2	IV
Extension contact (state agriculture department, SAU, KVK)	21.6	V

**Figure 1.** Farmers' awareness on PPVFRA.

The first round survey results show that about 90% of the farmers were not aware of PVP, whilst nearly 60% of them have heard about the notified variety and some were even able to identify the tag colour of the certified or truthfully labelled seeds (Figure 1). However, only less than 5% have a better understanding of notified varieties and fall under 'aware' category. In the second round, questions regarding PPVFRA and its provisions were posed in a slightly different way as they may not be aware of the term, but may know the concept. For example, instead of asking about PPVFR Act directly, they were asked about the ownership rights of plant variety and major provisions in PPVFRA such as, punishment for infringement in case of branded sale of protected variety, registration of variety under the farmer's variety category and compensation for failure of performance of variety. It is interesting to note that some of provisions in the Act were heard by only 6% of the respondents. Surprisingly, there is a greater awareness level among farmers (63%) about compensation for failure of propagating material. It was due to the common practice of retailers in the study area. They replaced seeds in case of germination failure to maintain their trust and goodwill of the shop, also to avoid dispute with farmers which probably would have educated the farmers about compensation for poor quality seed. However, in general, results indicate that the farmer's awareness level about PPVFRA was relatively very low, as compared to the notified variety (certified seeds).

As the farmers' awareness survey produced a variety of responses, it is important to study their information sources. Garrett ranking technique was employed to rank

the information source of farmers. The respondents were asked to rank various information sources according to their importance. The analysis shows that electronic media such as TV, radio and mobile phone emerged as major sources of information on PVP. Neighbours, fellow farmers and retailers were the next important sources of information. Group contacts (meetings, trainings, campaign and *Krishi Mela*) also served as major sources of information, as some of the respondents mentioned that during meetings they came to know a few of the PVP provisions, like compensation for failure of crops. Print media and extensive official contacts were least ranked sources of information. Contrary to the popular notion, newspapers had a minimal role for providing PVP information to farmers. The survey clearly indicates that farmers, the end recipients of policy change, relatively have a low level of awareness about PPVFRA and therefore need to be provided with more information through various mass media campaigns, so that, they are aware of the benefits of conservation of genetic resources, of compensation claims when a variety fails its assured performance, ownership claim through registration of their varieties and avoiding sale of seeds of protected varieties under brand names.

## Conclusion

In general, the perception of breeders from both public and private, supports the hypothesis of positive impact of plant variety protection on Indian seed industry.

## GENERAL ARTICLES

How-ever, the private sector raised concern over issues like long testing period, registration fee particularly by small and marginally sized companies, and lack of complete database of existing varieties. And, the absence of a complete database of existing varieties may lead to false claims of ownership rights and conflicts in the seed industry. The attitude of small and marginal companies of avoiding legal battle with large companies due to high cost of litigation, exposed the other side of PPVFRA.

1. PPVFRA (Protection of Plant Varieties and Farmers' Rights Authority), 2012; available at <http://www.plantauthority.gov.in> (accessed on 31 January 2015).
2. ICAR, Guidelines for Intellectual Property Management and Technology Transfer/Commercialization. ICAR, New Delhi, 2006; <http://www.icar.org.in/files/reports/other-reports/icar-ipmttguide.pdf> (accessed on 31 January 2015).
3. Tripp, R., Niels Louwaars, N. and Eaton, D., Plant variety protection in developing countries. A report from the field. *Food Policy*, 2007, **32**, 354–371.
4. Glover, K., Intellectual property rights and international collaboration: A US perspective. *Curr. Sci.*, 1996, **70**(12), 1057–1059.
5. Gould, D. M. and Gruben, W. C., The role of intellectual property rights in economic growth. *J. Econ. Dev.*, 1996, **48**, 323–335.
6. Diez, M. C. F., The impact of plant varieties rights on research: The case of Spain. *Food Policy*, 2002, **27**(2), 171–183.
7. Kanwar, S. and Evenson, R. E., Does intellectual property protection spur technological change? *Oxf. Econ. Pap.*, 2003, **55**(2), 235–264.
8. Naseem, A., Oehmke, J. F. and Schimmelpfennig, D. E., Does plant variety intellectual property protection improve farm productivity? Evidence from cotton varieties. *AgBioForum*, 2005, **8**(2&3), 100–107.
9. Kolady, D. E. and Lesser, W., Does plant variety protection contribute to crop productivity? Lessons for developing countries from US wheat breeding. *J. World Intellect. Prop.*, 2009, **12**(2), 137–152.
10. Venkatesh, P. and Pal, S., Impact of plant variety protection on Indian Seed Industry. *Agric. Econ. Res. Rev.*, 2014, **27**(1), 91–102.
11. Wijk, J. V. How does stronger protection of intellectual property rights affect seed supply? Early evidence of impact. Natural Resources Perspectives, Number 13, Overseas Development Institute, 1996; <http://www.odi.org.uk/resources/specialist/natural-resource-perspectives/13-intellectualproperty-rights-seed-supply.pdf> (accessed on 25 August 2014).
12. Srinivasan, C. S., Plant variety protection, innovation, and transferability: some empirical evidence. *Rev. Agric. Econ.*, 2004, **26**(4), 445–471.
13. Grossman, G. M. and Helpman, E., *Innovation Growth Global Econ.*, MIT Press, Cambridge, 1991.
14. Leger, A., Intellectual property rights and innovation in developing countries: evidence from panel data. In Proceedings of the International Association of Agricultural Economists Conference, Gold Coast, Australia, 12–18 August 2006.
15. Drew, J., *An Economic Evaluation of the Roots and Fruits of Intellectual Property Rights for US Horticultural Plants*, Ph D dissertation, University of Minnesota, 2010; <http://purl.umn.edu/92005> (accessed on 25 August 2014).
16. Alston, J. M. and Venner, R. J., The effects of the US plant variety protection act on wheat genetic improvement. *Res. Pol.*, 2002, **31**, 527–542.
17. Chen, Y. and Puttitanun, T., Intellectual property rights and innovation in developing countries. *J. Dev. Econ.*, 2005, **78**, 474–493.
18. Lalitha, A., Diffusion of agricultural biotechnology and intellectual property rights: emerging issues in India. *Ecol. Econ.*, 2004, **49**, 187–198.
19. Venkatesh, P. and Pal, S., Determinants and valuation of plant variety protection in India. *J. Intellect. Prop. Rights*, 2013, **18**, 448–456.
20. Ramanna, A., *Farmers' Rights in India – A Case Study*, Background Study 4 from the Farmers' Rights Project, FNI Report 6/2006; <http://www.fni.no/doc&pdf/FNI-R0606.pdf> (accessed on 25 August 2014).
21. Brahmi, P., Saxena, S. and Dhillon, B. S., The Protection of plant varieties and Farmers' Rights Act of India. *Curr. Sci.*, 2004, **86**(3), 392–398.
22. International Union for the Protection of New Varieties of Plants (UPOV). 2011; [http://www.upov.int/edocs/expdocs/en/upov\\_exn\\_edv\\_1.pdf](http://www.upov.int/edocs/expdocs/en/upov_exn_edv_1.pdf)
23. Leger, A., Intellectual property rights in Mexico: do they play a role? *World Develop.*, 2005, **33**(11), 1865–1879.
24. Kumar, S., Khan, S. M., Hora, M., and Rao, M. P., Implementation of Indian PPV&FR act and rules: inadequacies leading to avoidable litigation. *J. Intellect. Property Rights*, 2011, **16**, 102–106.

ACKNOWLEDGEMENTS. This article is part of the Ph D thesis of the first author submitted to the IARI, New Delhi under the guidance of the last author. We thank IARI, New Delhi for financial support to the Ph D programme.

Received 1 June 2015; accepted 28 January 2016

doi: 10.18520/cs/v110/i12/2239-2244