



## Impact of Intellectual Property Rights protection for plant varieties on rice varietal development and biodiversity in India

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### Abstract

Intellectual Property Rights (IPR) protection for crop varieties have implications on both research and food security, as development of new varieties depends on access to existing varieties/biological material or access to their genetic information. In this situation, India under its obligation under Trade-Related Aspects of Intellectual Property Rights (TRIPS), opted for a “sui generis” system and enacted “Protection of Plant Varieties and Farmers’ Rights Act” (PPV&FRA) in 2001. Through some specific provisions in this act, a balance between incentive to innovate (through limited period exclusive rights) and access to protected varieties during protection period for furthering innovations is attempted. India enacted another IPR act following sui-generis system viz., Geographical Indications of Goods (Registration and Protection) Act-1999 (GI act). Under this act some special types of agricultural crops are protected. In this backdrop, this study attempted to examine the status of IPR protection to rice varieties and impact of the two types of IPRs viz., PPV&FRA and GI on varietal development and biodiversity in the case of rice in India. The study utilized secondary data from relevant IPR authorities and ICAR-Indian Institute of Rice Research (ICAR-IIRR) database. It is observed that (i) there is increase in rice varietal development following enactment of PPV&FRA and GI acts in India; (ii) there is increase in private sector participation in hybrid rice research following enactment of PPV&FRA; and (iii) both PPV&FRA and GI acts individually and also together are playing a key role in rice biodiversity management.

**Keywords:** Geographical Indications, IPR.

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## 1. Introduction

Intellectual Property Rights (IPR) protection is a type of incentive offered to an innovator in the form of innovator’s exclusive “monopoly control” over the innovation for a “limited period of time”. It is anticipated that during the protection period the innovator will recover his investment by appropriating rents from exploiting the innovation commercially. It is expected that IPR protection will spur innovation by competition in an economy. Another argument in favour of IPR protection is to incentivise

private sector participation in research, a knowledge creation activity by addressing market failure due to ‘public good’ nature of knowledge. Compared to IPR protection to other innovations, IPR protection for crop varieties have important implications for research and food security as varietal development is a cumulative/ sequential process i.e. development of new varieties depends on access to existing varieties/biological material and/or their genetic information (Gavrilova, 2020). Thus,



there is continuous debate regarding IPR protection to plant varieties. But under TRIPs agreement it became mandatory for member countries to introduce IPR protection to plant varieties. In this situation, India opted for a “sui-generis” system and enacted “Protection of Plant Varieties and Farmers’ Rights Act” (PPV&FRA) in 2001. Through some specific provisions in this Act, a balance between incentive to innovate (through limited period exclusive rights) and access to protected varieties during protection period for furthering innovations is attempted. In this backdrop, this study is an attempt to examine the status of IPR protection to rice varieties and impact of PPV&FRA on rice varietal development research in India.

There is another kind of IPR system in the world including India i.e. Geographical Indications (GI) which also covers plant types/varieties from output (product) side. GI is distinctive signs that associate products of quality and reputation with their place or area of production and thereby help to identify and distinguish such products in the market. In addition, for qualifying and benefitting as geographical indications, the qualities, characteristics or reputation of the product should be essentially linked to the place of origin. India enacted Geographical Indications of Goods (Registration and Protection) Act-1999 (GI act). The Indian GI act came into effect from 15<sup>th</sup> September 2003. Under this act some special types of agricultural crops including rice are protected.

The impact and implications of these two IPR protection i.e. PPV&FR and GI acts on biodiversity of rice, an important staple crop in India, constituting 22 per cent of total cultivated area is examined in this research work. Further it is documented in literature that private sector participation both in marketing and research is high in the case of high value and low volume kind of seeds and cross pollinated crops (Jaffee and Srivatsava, 1994; Singh *et al.*, 2016; Nhemachena and Muchara, 2020). Against this, rice being a self pollinated crop with low value and high volume seed type, offers an interesting case study for clearly identifying role of IPR in determining participation of private sector in plant breeding industry.

## **2. Review of literature**

In the context of prevalence of different types of IPRs like Plant Variety Rights (PVR), plant patent, utility patent and trade secret, Lence *et al.* (2016) observed that different types of IPRs are suitable for providing incentives in

different types of research (in terms of period, extent of risk in research and nature of genetic material used in research etc.) in plant varietal development. Positive effect of plant variety rights protection on cultivar development was reported by Tsvakirai (2017) in the case of peaches and Nectarines, and by Nhemachena *et al.* (2019) in the case of wheat in South Africa. Vander Wouw *et al.* (2013) and Mariani (2020) reported positive effect of variety protection on development of new varieties in lettuce and cereals like wheat, maize and barley etc. in European Union Countries. In the context of India, higher decadal growth in the number of varieties for the majority of crops in the post-PPV&FRA period was reported by Venkatesh and Pal (2014). Their study focused on varietal development up to the year 2010. The present attempt is based on data of registration with PPV&FR authority up to the year 2019 and varietal notification up to August, 2020 and confined to in depth study of single crop namely rice.

Plant types registered under GI act, as they are linked to specific geographic regions, are more convergent with the objectives of conservation and sustainable utilization of biodiversity of crops (Lalitha and Soumya, 2017). This is because GI registration is governed by codes of practice that define the sustainable “production and management practices” relevant to the conservation of biodiversity and also production cannot be “delocalized” (Dagne, 2015; Lalitha and Soumya, 2017). GI is a hybrid between a public quality standard and a specific IPR to protect a heritage based reputation (Bienabe and Marie-Vivien, 2017). GIs serve as a factor of mobilization of local communities for achieving sustainable management of local resources and in turn biodiversity (Dagne, 2015). GIs can be used to protect Traditional Knowledge (Kumar and Sharma, 2018). Hence, in the present study an attempt is also made to analyse impact of GI-IPR mechanism on rice varietal innovation and biodiversity management.

## **3. Data and Methodology**

The study is based on secondary data collected from PPV&FR Authority’s month wise “Plant Variety Journal of India, registered varieties data base from [http://www.plantauthority.gov.in/List\\_of\\_Certificates.htm](http://www.plantauthority.gov.in/List_of_Certificates.htm), and the Indian Seednet portal of Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Government of India (<http://seednet.gov.in>). Some data from ICAR-IIRR “Rice



hybrids” database was also utilized in the study. Database on Geographical Indications registered was collected from website [http://www.ipindia.nic.in/writereaddata/Portal/Images/pdf/GI\\_Application\\_Register\\_10-09-2019.pdf](http://www.ipindia.nic.in/writereaddata/Portal/Images/pdf/GI_Application_Register_10-09-2019.pdf). Simple descriptive analytical approach has been used in analysing the data for drawing inferences.

## 4. Results and Discussion

### 4.1 Impact on varietal development

In India PPV&FR authority created for enforcing varietal protection under PPVFR act, started receiving applications from the year 2007 and started registering varieties for IPR protection from the year 2009. By the beginning of year 2020, 161 crop species were notified for protection under this act. Under PPV&FRA, four kinds of varieties can be registered, *viz.*, (i) extant variety (ii) new variety (iii) farmers variety (it is subset of extant varieties) and (iv) Essentially Derived Variety (EDV). Under extant variety category, two types of varieties are eligible for registration *viz.* extant varieties notified under the seeds act-1966 and extant variety

about which there is a common knowledge (VCK). Under PPV&FRA, there are provisions of breeder’s exemption and farmers’ rights, thereby trying to balance between incentive to innovator and access of protected plant varieties to farmers and other innovators. Under PPV&FRA protection period for annual crops is 15 years. According to index of intellectual property protection to plant varieties constructed by Campi and Nuvolari (2020), India’s index value stands at 2.11 against maximum possible value of index being 5 (indicating stronger intensity of IP protection).

At the time of this study, totally 3914 plant varieties were registered with PPV&FR authority, out of which 1910 were rice varieties constituting 49 per cent of total plant varieties registered (Table. 1). On an average 356 plant varieties were registered per annum out of which 174 were rice varieties. Out of the 1910 rice varieties, only 92 were registered as new varieties indicating that IPR protection for these varieties were sought even before commercialization or within one year of commercialization. Out of the 1910 rice varieties, only 76 were hybrids.

**Table 1.** Progress of plant varieties registration under PPV&FR Act

| Year    | Total number of plant varieties registered | Number of rice varieties registered | Share of rice varieties in total plant varieties registered (%) | Number of new rice varieties registered | Number of rice hybrids registered |
|---------|--|-------------------------------------|---|---|-----------------------------------|
| 2009    | 168  | 6                                   | 4   |   |                                   |
| 2010    | 49   | 5                                   | 10  |   |                                   |
| 2011    | 116  | 11                                  | 9   |   | 1                                 |
| 2012    | 212  | 40                                  | 19  | 1                                       | 4                                 |
| 2013    | 304  | 122                                 | 40  | 20                                      | 10                                |
| 2014    | 833  | 531                                 | 64  | 26                                      | 19                                |
| 2015    | 385  | 231                                 | 60  | 14                                      | 16                                |
| 2016    | 605  | 349                                 | 58  | 21                                      | 16                                |
| 2017    | 371  | 230                                 | 62  | 5                                       | 4                                 |
| 2018    | 477  | 314                                 | 66  | 2                                       | 4                                 |
| 2019    | 394  | 71                                  | 18  | 3                                       | 2                                 |
| Total   | 3914                                       | 1910                                | 49  | 92                                      | 76                                |
| Average | 356  | 174                                 |   | 8                                       | 7                                 |

Data source: [http://www.plantauthority.gov.in/List\\_of\\_Certificates.htm](http://www.plantauthority.gov.in/List_of_Certificates.htm), Plant Variety Journal of India (various issues)



**Table 2.** Distribution of ownership of rice varieties registered under PPV&FR Act (Number)

| Year               | Farmers | Private industry | Public sector | Total |
|--------------------|---------|------------------|---------------|-------|
| 2009               | 3       | 1                | 2             | 6     |
| 2010               |         |                  | 5             | 5     |
| 2011               |         | 1                | 10            | 11    |
| 2012               | 1       | 3                | 36            | 40    |
| 2013               | 46      | 31               | 45            | 122   |
| 2014               | 456     | 34               | 41            | 531   |
| 2015               | 191     | 28               | 12            | 231   |
| 2016               | 318     | 20               | 11            | 349   |
| 2017               | 219     | 6                | 5             | 230   |
| 2018               | 289     | 9                | 16            | 314   |
| 2019               | 33      | 7                | 31            | 71    |
| Total              | 1556    | 140              | 214           | 1910  |
| Average            | 141     | 13               | 19            | 174   |
| Share in total (%) | 81      | 7                | 11            | 100   |

Data source: [http://www.plantauthority.gov.in/List\\_of\\_Certificates.htm](http://www.plantauthority.gov.in/List_of_Certificates.htm), Plant Variety Journal of India (various issues)

Out of 1910 rice varieties registered with PPV&FR authority, 81 per cent varieties were Farmers' varieties (FV) and 11 per cent varieties were public sector varieties (Table. 2), the rest were private sector varieties. On average 141 varieties from farmers were registered per annum against 13 varieties from private industry and 19 varieties from public sector. Hybrids constituted only 6 per cent of the public sector rice varieties portfolio (Table. 3). In contrast, in the case of private industry rice varieties portfolio, share of hybrids stood at 46 per cent (43 and 48 per cent in case of new and extant varieties, respectively). Share of private sector in total rice hybrids registered for Plant Variety Protection (PVP) stood at 84 percent, and was 97 per cent in the case of new hybrids. In the case of typical new varieties, private sector share was higher (74%). This indicates early protection seeking behaviour of private sector. Only in the case of extant typical varieties, private industry share was lower (15%). On average, 1 hybrid and 18 typical varieties per annum was registered with PPVFR authority from public sector. On the other hand, 6 hybrids (3 new and 3 extant) and 7 typical varieties per annum were registered by private sector under PPV&FR act. These results indicate that private sector

portfolio is nearly equally distributed between hybrids and typical varieties. But in the case of public sector, portfolio is skewed towards typical varieties. On the whole, share of hybrids in total rice varieties registered by both public sector and private (excluding farmers' varieties) with PPV&FR authority stood at 21 per cent.

In the case of total rice varieties registered from public sector, share of new varieties (both hybrids and typical put together) was only 7 per cent. On the contrary, in the case of private industry, share of new varieties (both hybrids and typical put together) was 54 per cent. Thus as of now only 26 per cent of PVPs issued to public and private sector together in rice crop (excluding farmer's varieties) were for new varieties. Time limit for registering extant varieties and farmers varieties of rice is 27<sup>th</sup> October 2020 and 1<sup>st</sup> July 2024, respectively. After that only new varieties will be registered. As of now registration with PPV&FR authority is voluntary. Further some applications may be pending or in pipeline for getting registration with PPVFR authority. Hence, results of the analysis of rice varieties registered with PPVFR gives only a partial picture of impact of IPR on varietal development.



**Table 3.** Public sector and private industry portfolio of rice varieties registered with PPV&FR authority

|  | Public | Private | Total | Share of private sector (%) |
|--|--------|---------|-------|-----------------------------|
| <b>Rice hybrids (number)</b>                     |        |         |       |                             |
| New  | 1      | 33      | 34    | 97                          |
| Extant   | 11     | 31      | 42    | 74                          |
| All  | 12     | 64      | 76    | 84                          |
| Average/year                                     | 1      | 6       | 7     |                             |
| Share of new (%)                                 | 8      | 52      | 45    |                             |
| <b>Rice typical/ pureline varieties (number)</b> |        |         |       |                             |
| New  | 15     | 43      | 58    | 74                          |
| Extant   | 187    | 33      | 220   | 15                          |
| All  | 202    | 76      | 278   | 27                          |
| Average/year                                     | 18     | 7       | 25    |                             |
| Share of new (%)                                 | 7      | 57      | 21    |                             |
| <b>Total rice varieties (number)</b>             |        |         |       |                             |
| New  | 16     | 76      | 92    | 83                          |
| Extant   | 198    | 64      | 262   | 24                          |
| All  | 214    | 140     | 354   | 40                          |
| Average/year                                     | 19     | 13      | 32    |                             |
| Share of new (%)                                 | 7      | 54      | 26    |                             |
| <b>Share of hybrids (%)</b>                      |        |         |       |                             |
| New  | 6      | 43      | 37    |                             |
| Extant   | 6      | 48      | 16    |                             |
| All  | 6      | 46      | 21    |                             |

Data source: [http://www.plantauthority.gov.in/List\\_of\\_Certificates.htm](http://www.plantauthority.gov.in/List_of_Certificates.htm), Plant Variety Journal of India (various issues)

Another source to analyse the impact of IPR on research is data on notified varieties available in the Indian Seednet portal of Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Government of India. The details of rice seed varieties notification progress in last three decades is presented in the table 4. During the first decade under focus, totally 204 varieties were notified including 6 hybrids. In the next decade the total number of varieties increased by 1.5 times. In the recent decade comprising of period from the year 2011 to 2020, the number of notified varieties increased by 2.1 times compared to the first

decade under focus. It is worth noting that during period 2011-2020 number of typical varieties notified increased by 1.8 times and number of hybrids notified increased by 5.8 times (compared to 1991-2000 decade). Consequently the share of hybrids in total notified rice varieties increased from 6 percent in the first decade to 10 percent and 18 percent in second and third decades respectively. Overall 44 percent of typical varieties and 64 percent of hybrids notified in last three decades was concentrated in the last decade (2011 to 2020) i.e period after registration process for IPR protection under PPV&FRA started (in the year 2009).



**Table 4.** Progress of rice varieties notified in the last three decades

|                                  | Time period |           |           | Total |
|----------------------------------|-------------|-----------|-----------|-------|
|                                  | 1991-2000   | 2001-2010 | 2011-2020 |       |
| <b>Number of rice varieties</b>  |             |           |           |       |
| Typical                          | 191         | 272       | 352       | 815   |
| Hybrids                          | 13          | 29        | 75        | 117   |
| All                              | 204         | 301       | 427       | 932   |
| <b>Share of hybrids (%)</b>      |             |           |           |       |
|                                  | 6           | 10        | 18        | 13    |
| <b>Spread across decades (%)</b> |             |           |           |       |
| Typical                          | 23          | 33        | 44        | 100   |
| Hybrids                          | 11          | 25        | 64        | 100   |
| All                              | 22          | 32        | 46        | 100   |

Data source: <https://seednet.gov.in/Reports.aspx>

**Table 5.** Details of distribution of notified rice hybrids across public and private sectors

|  | Time period |           |           | Total |
|--|-------------|-----------|-----------|-------|
|  | 1991-2000   | 2001-2010 | 2011-2020 |       |
| <b>Number of rice hybrids</b>              |             |           |           |       |
| Public sector                              | 12          | 16        | 9         | 37    |
| Private sector                             | 1           | 13        | 66        | 80    |
| All  | 13          | 29        | 75        | 117   |
| <b>Share of different sectors (%)</b>      |             |           |           |       |
| Public sector                              | 92          | 55        | 12        | 32    |
| Private sector                             | 8           | 45        | 88        | 68    |
| All  | 100         | 100       | 100       | 100   |
| <b>Spread across different decades (%)</b> |             |           |           |       |
| Public sector                              | 32          | 43        | 24        | 100   |
| Private sector                             | 1           | 16        | 83        | 100   |
| All  | 11          | 25        | 64        | 100   |

Data source: <https://seednet.gov.in/Reports.aspx>

A look into ownership of notified hybrids (Table. 5) indicates that share of private hybrids in total hybrids increased over the decades from 8 per cent to 88 per cent. Further 83 per cent of private hybrids were notified in the last decade only i.e. during the period 2011-2020.

On the other hand in the case of public sector, maximum share of hybrids (43%) were notified during the decade 2001-2010. Dominance of private sector in notified hybrids is in alignment with the insights from analysis of data of protected varieties under PPV&FRA.





**Table 6.** Distribution of private companies registering their rice varieties with PPV&FR authority as on 31-12-2019

| Nature of rice variety   | Number of companies | Number of PVPS | Average Number of PVPs |
|--------------------------|---------------------|----------------|------------------------|
| All varieties            | 27                  | 140            | 5                      |
| Hybrids                  | 21                  | 64             | 3                      |
| Typical                  | 18                  | 76             | 4                      |
| Exclusively Typical      | 6                   | 7              | 1                      |
| Exclusively Hybrids      | 9                   | 27             | 3                      |
| Both typical and hybrids | 12                  | 106            | 9                      |

Data source: [http://www.plantauthority.gov.in/List\\_of\\_Certificates.htm](http://www.plantauthority.gov.in/List_of_Certificates.htm) Plant Variety Journal of India (various issues)

Though hybrids offer the potential of biological appropriation mechanism (as hybrid seeds need to be purchased by farmers every year to realize the potential of hybrid vigour), legal IPR was sought after for strengthening appropriability of returns from market and also for protecting parental lines. Accordingly PPV&FRA enactment increased participation of private sector in hybrid rice research. By the end of the year 2019, 27 companies registered their rice varieties with PPVFR authority and 21 companies registered their hybrids. Nine companies exclusively registered their hybrids. On the other hand, 6 companies exclusively registered their typical varieties. Twelve companies registered both their typical varieties and hybrids (Table. 6). A look into notified hybrids database indicates that, so far 25 private companies notified their rice hybrids under seeds act. Only 16 companies are common in both notified hybrids database and PPV&FRA database (with respect to rice hybrids), and obtained PVP certificates for 93% of their notified hybrids. Thus, the results clearly indicate that private sector participation in hybrid rice research increased over the last three decades and is corroborating with the observations of Maria (2002). Besides the policy of introducing IPR to plant varieties, India's FDI policy in seed sector, large potential domestic market, higher export potential of hybrid rice seeds, and availability of diverse agro-climatic regions may be the other contributing factors for increased private sector participation in hybrid rice research in India. Some evidences regarding concentration in rice hybrids ownership among limited private companies and correlated concentration in downstream seed sector were documented in recent literature (Prasanna *et al.*, 2018; GD, 2019).

There is further scope to strengthen IPR on hybrids by an innovator by following the practice of sequential

registration of hybrid, parental line one and parental line two. To check this kind of practice, it has been made mandatory under PPV&FRA that a hybrid variety will be registered as a compound registration by including parental lines as well. Only single cross hybrids are eligible for registration under PPV&FR act. Further, according to the act, in case of a new hybrid with one parent in public domain, the hybrid and parental line in public domain will not be eligible for protection (PPV&FRA, 1-11-2019). This provision besides curbing the process of prolonged period of protection by sequential application for registration, will also encourage exploring new lines for hybrid development and in-turn enhance biodiversity. In 2018, share of hybrids in total rice area was 8 per cent (GD, 2019) Currently, around 30 hybrids are under cultivation covering an area of around 3 million hectares.

As of now registration of varieties with PPV& FRA is based on DUS testing relying on morphological characteristics. Such testing is not only time and cost consuming but also focuses on limited number of traits (Jamali *et al.*, 2019). To overcome these limitations in cost effective way, some studies suggest use of DNA based testing (Jamali *et al.*, 2019) and "speed DUS testing" (Jamli *et al.*, 2020) in plant variety registration. Recently in Indian context, Delhi High Court *via* its judgement on first July, 2019 allowed DNA fingerprinting results in dispute settlement in varietal registration (Indiakanon, 2019).

#### 4.2 Impact of IPR on biodiversity

As indicated in previous paragraphs 1556 rice varieties spread across different states/agro climatic zones were registered as Farmer's varieties (FV) under PPV&FRA in India. Maximum number of varieties were from Odisha state (Table 7).



**Table 7.** State level distribution of Farmers Varieties (FV) registered under PPV&FR Act

| State                      | Number |
|----------------------------|--------|
| Odisha                     | 761    |
| Chhattisgarh               | 342    |
| West Bengal                | 240    |
| Jharkhand                  | 104    |
| Madhya Pradesh             | 47     |
| Kerala                     | 21     |
| Manipur                    | 8      |
| Tamil Nadu                 | 6      |
| Uttar Pradesh              | 6      |
| Andaman and Nicobar Island | 5      |
| Uttarakhand                | 5      |
| Bihar                      | 4      |
| Assam                      | 2      |
| Others                     | 2      |
| Haryana                    | 1      |
| Himachal Pradesh           | 1      |
| Maharashtra                | 1      |
| Total                      | 1556   |

Data source: [http://www.plantauthority.gov.in/List\\_of\\_Certificates.htm](http://www.plantauthority.gov.in/List_of_Certificates.htm), Plant Variety Journal of India

**Table 8.** Rice types registered under GI act in India

| State  | Number of rice types registered under GI | Rice types   |
|--|--|--|
| Assam  | 3  | Joha rice, Boka Chaul, and Chokuwa   |
| Bihar  | 1  | Katarni  |
| Chhattisgarh   | 1  | Jeera Phool  |
| Kerala   | 6  | Navara, Palakkadan Matta, Pokkali, Wayanad jeerakasala, Wayanad Gandakasala, and Kaipad. |
| Maharashtra  | 2  | Ajara Ghansal Rice and Ambemohar Rice  |
| Manipur  | 1  | Chak-Hao (Black rice)  |
| Punjab, Haryana, Delhi, Himachal Pradesh, Uttarakhand and parts of Western U.P and J&K | 1  | Basmati  |
| Uttar Pradesh  | 1  | Kalanamak Rice   |
| West Bengal  | 2  | Gobindobhog Rice and Tulaipanji Rice   |
| Total  | 18                                       |  |

Source: [http://www.ipindia.nic.in/writereaddata/Portal/Images/pdf/GI\\_Application\\_Register\\_10-09-2019.pdf](http://www.ipindia.nic.in/writereaddata/Portal/Images/pdf/GI_Application_Register_10-09-2019.pdf)

Several farmers' varieties are having special features like resistance to biotic and abiotic stress and also locally adapted and serve as excellent source of these traits (Singh and Agarwal, 2020). Individual farmers or community of farmers had applied for protection of these varieties. Integrating these varieties in formal seed systems by means of Quality Declared Seed (QDS) system can aid

in improving efficiency of seed system and biodiversity conservation (Singh *et al.*, 2018; Singh and Agarwal, 2018). Creation of national level register of farmers varieties with detailed description of varieties not only Distinct, Uniform and Stability i.e. DUS characteristics but also other values, traits etc. as reported by Noreiga, (2016) in the case of Peru will serve not only defensive purpose but also publicity





purpose, creating demand for these varieties (both from breeders and other farmers) and thus aid in both varietal development and biodiversity management.

In PPV&FRA, provisions of researcher's exemption and farmers' rights also aid in biodiversity management by ensuring access to biological material for research. Disclosure and benefit sharing provisions in the PPV&FRA act are expected to incentivize farmers in biodiversity conservation. But under PPV&FRA as per existing provision farmers get benefit only when their varieties are incorporated into new commercial varieties. It is being opined that farmers should get benefit in all instances where indigenous/heterogeneous seeds are used by the formal sector and not just in cases where they are used in hybrid breeding programs or where the downstream results are protected by IP (Mrunalini *et al.*, 2019). Accordingly there is suggestion for modification of benefit sharing provision in PPV&FRA and use of block chain technology in enforcing benefit sharing mechanism (Mrunalini *et al.*, 2019). In states like Kerala, there is some shift in view of some community organization, and are preferring ensuring benefit share of farmers under National Biodiversity Act through Peoples Biodiversity Registers (PBR) than through registration under PPV&FRA (Blakeney *et al.*, 2020).

Under GI- IPR system, so far at global level, 137 rice types were registered (OriGI website accessed on 22-09-2020) spread across 18 countries. China is the topper with 61 rice types (45%) followed by India with 18 rice types (13%). These 18 rice types are spread across different states of India (Table. 8) and are registered under Geographical Indications of Goods (Registration and Protection) act-1999. Maximum number of rice types registered under GI in India are from the state of Kerala (33 %) followed by Assam (17%). These rice types are cultivated in specific parts of the respective states. As indicated earlier, production of rice types registered under GI act cannot be "delocalized", and also "must be produced following specific practices" to ensure quality and command premium price in the market. Premium price in the case of GI protected rice types in India as well at international level are well documented (Yadav *et al.*, Khan, 2020, Roy, 2019; Giraud *et al.*, 2018; Ravindra *et al.*, 2018). This premium price reinforces the incentive

to produce GI tagged rice and helps in biodiversity management in rice crop.

In September 1997, an American company, Rice Tech was granted with U.S. Patent on "basmati rice lines and grains". It was officially challenged by the Indian government in the year 2000 and most patent claims (15 out of 20) were overturned in the US (Mukherjee, 2008). While India accounts for 65 per cent of international trade in basmati, Pakistan contributed the rest 35 per cent. After failing to jointly register for a GI tag for basmati rice, India and Pakistan decided to make registrations individually within the GI laws of their own countries before approaching the international market. Subsequently, India obtained GI tag for basmati under Indian GI act. India had applied for GI tag for basmati in European Union (EU) in 2018 and it was published in Official Journal of the European Union in September, 2020. Pakistan Government has filed an application against India's bid to obtain GI tag for basmati in EU.

#### *4.3 Overlap of PPV&FRA and GI IPR systems*

It is pertinent to note here that there is scope for some overlap between the two IPR systems *viz.*, PPV&FRA and GI. As indicated earlier in India basmati type rice is registered under GI Act. So far 32 basmati rice varieties were notified under Indian Seed Act 1966. Some basmati rice varieties are registered under PPV&FRA act. This kind of situation is arising because registration under GI is based on product quality standards and unique characteristics attributable to a given geographic region. On the other hand registration under PPV&FRA is variety specific and subject to a variety passing the DUS test. PPV&FRA is more related to rice seed value chain and GI is closely related to rice grain (product) value chain. But only in case of rice hybrids, seed value chain and grain value chain are completely distinct. In case of typical rice varieties some overlap between seed and grain value chains occurs. GI tag serves as a signal of quality of product thereby addressing "information asymmetry" and helps in value chain building with premium price and protecting interest of all stakeholders in value chain. On the other hand, under PPV&FRA only limited stakeholders namely plant breeders and farmers rights are protected against unauthorised use of seed material.

It is pertinent to note that applicant for basmati rice registration under GI was Agricultural and Processed Food



Products Export Development Authority (APEDA) and basmati rice varieties registered under PPV&FRA were mostly by public sector research institutes. Protection period of rice varieties under PPV&FRA is maximum for 15 years and non-renewable. Under GI act, protection is for 10 years and renewable. Hence, longer term protection for basmati rice under GI act and shorter term protection for specific basmati rice varieties under PPV&FRA are compatible and advantageous. As of now under GI act basmati rice protection is valid upto 25-11-2028. Even if it is not renewed under GI act, a specific variety of basmati rice can be protected under PPV&FRA for 15 years from the date of notification under seed act, 1966. This possibility acts as incentive for development of more varieties in basmati rice i.e creation of more biodiversity. On the other hand, even if a basmati variety's protection period of 15 years under PPV&FR is over, it can get protection under GI act, provided GI registration is renewed.

Simultaneous protection under two types of IPR regimes viz., PPV&FRA and GI act besides providing protection to plant material, also provides marketing advantage through signalling quality (Nagarajan, 2007). Besides basmati registration under both GI act and PPV&FR act, some more attempt for registering some other GI tagged rice varieties with PPV&FR authority are noticed recently. In case of Kalanamak rice, four varieties were developed (Yadav *et al.*, 2019) and one variety is registered under PPV&FRA. Jeeragasala and Ghandakasala rice from Kerala are registered both under PPV&FRA and under GI act. In the case of Navara rice. some controversy is documented in literature (Blakeney *et al.*, 2020). This is because under GI, Navara rice is registered for collective right but under PPV&FRA an individual farmer applied for registration. Thus, as long as owners claiming protection under both PPV&FRA and GI act are same, there are no issues. Hence, some farmer's varieties registered by community of farmers with PPV&FRA, if they are unique with some characteristics attributable for given geographic region, can get registered under GI act. This will facilitate value chain building by using signalling mechanism of GI. Efforts are on for developing improved varieties of other GI registered rice types also. In the case of Kaipad rice of Kerala (which belongs to organic rice group grown in saline environment), two improved varieties were

developed i.e. Ezhome - 1 and Ezhome-2. Similarly, in the case of Pokkali rice of Kerala, seven improved cultivars were developed. In case of Katarni rice of Bihar, efforts are on for developing improved varieties (Kumar *et al.*, 2019). Hence, GI protection is encouraging innovation and also conservation of biodiversity in rice varieties.

Other factors influencing role of GI in biodiversity improvement is extent of geographic area delineated under the IPR act for a given plant type or variety and size of product market. In case of basmati rice, geographic area coverage under GI act spreads across 7 states and hence so far 32 varieties are notified under seed act. Besides this, basmati rice has huge export potential. But in the case of other GI protected rice types in India, delineated area is only specific areas in specific states. This may not provide adequate incentive for biodiversity conservation and development unless some niche market is there for these GI tagged rice types. India's policy on export of non-basmati rice also had its implication in creating market for the 'non-basmati' type GI tagged scented rice varieties. Besides this, higher the share of benefits to farmers from GI tagged rice value chain, higher will be the incentive effect. In the case of "Pokkali" rice in Kerala, intermediaries' higher share in profits was reported to act as disincentive and discourage farmers (Anson and Pavithran, 2014). Subsequently under Rashtriya Krishi Vikas Yojana (RKVY) a scheme was implemented to motivate farmers to cultivate Pokkali rice with a incentive of Rs 10000 per ha (DOA, Thiruvananthapuram). In case of Tulaipanji rice of West Bengal also marketing problems was reported (Mondal and Dutta, 2014; Dipak, 2019).

## 5. Conclusions and Way forward

Results in the current study indicates that (i) there is increase in rice varietal development following enactment of PPV&FRA and GI act in India; (ii) there is increase in private sector participation in hybrid rice research following enactment of PPV&FRA; (iii) both PPV&FRA and GI act are playing their role in rice biodiversity management. Hence, it can be concluded that the nature of "specific provisions" in the two IPR acts in India, together with other policies in rice sector are encouraging varietal development. However, it is observed that marketing issues is some GI rice types and conflicts regarding ownership under the two IPR acts are cropping up. Some deficiencies in scope and implementation of "benefit



sharing” provision are noticed. Addressing these issues will strengthen role of these IPR acts in rice varietal innovation and biodiversity management.

### **Conflict of Interest**

Authors declare that they have no conflict of interest.

### **Ethical Compliance Statement**

NA

### **Author Contribution**

Conceptualization: PALP, LVSR, ASH; Initial Draft: AW, SNM; Critical review and finalization: BN, AKS and DPS

### **References**

1. Anson CJ and KB Pavithran. 2014. Pokkali Rice Production under Geographical Indication Protection: the attitude of farmers. *Journal of Intellectual Property Rights* 19(1):49-53.
2. Bienabe Estelle and Delphine Marie-Viven. 2017. Institutionalizing Geographical Indications in Southern Countries: Lessons Learned from Basmati and Rooibos. *World Development* 98:58-67
3. Blakeney Michael, Jayasree Krishnankutty, Rajesh K Raju and Kadambot HM Siddique. 2020. Agricultural Innovation and the protection of Traditional Rice Varieties: Kerala a case study. *Frontiers in sustainable food systems*. 3:116. doi: 10.3389/fsufs.2019.00116
4. Campi Mercede and Alessandro Nuvolari. 2020. Intellectual property rights and agricultural development: evidence from a worldwide index of IPRs in agriculture (1961-2018). *The Journal of Development Studies* DOI: 10.1080/00220388.2020.1817395
5. Dagne Tesh W. 2015. Beyond Economic Considerations:(Re) Conceptualizing Geographical Indications for protecting Traditional Agricultural Products. *International Review of Intellectual Property and Competition Law*. 46:682-706
6. Dipak Barman. 2019. Indigenous Aromatic Tulaipanji rice cultivation in Uttar Dinajpur district. *Research Review Journals*. 4(11):65-68
7. DOA. 2013. Agricultural Department-Rashtriya Krishi Vikas Yojana scheme on “Rice Development-Pokkali Rice Cultivation-2013-14” GO(MS) No.279/12/AD dated 27-09-2013. Directorate of Agriculture, Thiruvananthapuram.
8. Gavrilova Olga. 2020. Breeder’s and Farmers’ exceptions: how valuable are they for the World and are they a necessity for the BRICS countries? *BRICS law Journal* 7(3):4-28
9. GD. 2019. Early generation seed system case study- India Rice. Global Development. [https://www.agrilinks.org/sites/default/files/india\\_rice\\_egs\\_case\\_study\\_0.pdf](https://www.agrilinks.org/sites/default/files/india_rice_egs_case_study_0.pdf)
10. Giraud Georges, Julie Le Gallo and Hippolyte Boucher. 2018. Is Geographical Indication Acting on Rice Export Price? *International Journal on Food System Dynamics*. <https://doi.org/10.18461/pfsd.2018.1809>
11. GI.2019.[http://www.ipindia.nic.in/writereaddata/Portal/Images/pdf/GI\\_Application\\_Register\\_10-09-2019.pdf](http://www.ipindia.nic.in/writereaddata/Portal/Images/pdf/GI_Application_Register_10-09-2019.pdf)
12. GI <http://ipindiaservices.gov.in/GIRPublic/Application/ViewDocument>
13. Indiankanoon. 2019. <https://indiankanoon.org/doc/83741552/>
14. Jaffee Steven and Jitendra Srivatsava. 1994. The roles of the private and public sectors in enhancing the performance of seed systems. *The World Bank Research Observer* 9(1):97-117
15. Jamali Seyed Hossein, James Cockram and T Hickey Lee. 2019. Insights into deployment of DNA markers in plant variety protection and registration. *Theoretical and Applied Genetics* 132:1911-1929
16. Jamali Seyed Hossein, James Cockram and T Hickey Lee. 2020. Is plant variety registration keeping pace with speed breeding techniques? *Euphytica* 216, Article number:131. <https://www.x-mol.com/paperRedirect/1287827050928455680>
17. Kumar Pankaj and Sharma Ameeta. 2018. Review on IPR aspects for use of plant based bio-resources and the associated traditional knowledge. *Journal of Phytology Research* 31(1&2):71-83.
18. Kumar Vaibhav, Satyendra, Anand Kumar, Suresh Prasad Singh and Mankesh Kumar. 2019. Morphological characterization of Katarni rice (*Oryza Sativa*. L) derived backcross population for yield and its contributing traits. *Oryza* 56(4):368-374
19. Khan Madeeha. 2020. Kalanamak rice ready for International market. <https://mavericktimes.in/>



- news/national-news/kala-namak-rice-ready-for-international-market/7556/
20. Lalitha N. and Soumya Vinayan. 2017. GIs for protecting Agro-biodiversity and promoting rural livelihoods: status, strategies and way forward. Gujarat Institute of Development Research Working paper No. 240
  21. Lence, SH, DJ Hayes, J Alston and J Stephen, C Smith. 2016. Intellectual Property in plant breeding: comparing different levels and forms of protection. *European Review of Agricultural Economics* 43(1): 1- 29
  22. Maria Carmen Fernandez Diez .2002. The impact of plant varieties rights on research: the case of Spain. *Food Policy* 27(2):171-183
  23. Mariani S. 2020. Innovation and plant variety protection in the European Union : The case of cereal varieties, an empirical legal study. Thesis, University of Macerata, Italy.
  24. Mondal Goutam and Jayanta Dutta. 2014. Tulaipanji- a precious scented rice land race of North Bengal, India. *Ecology, Environment and Conservation* 20(2):529-534
  25. Mrunalini Kochupillai, Gregory Radick, Prabhakar Rao, Natalie Kopytko, Julia Koninger and Jasper Matthiessen. 2019. Incentivizing and promoting sustainable seed Innovations in India: A three-pronged Approach. Position paper for the Government of India, compiled with research support provided by the UK Global Challenge Research Funds.
  26. Mukherjee, Utsav. 2008. A Study of the Basmati Case (India-US Basmati Rice Dispute): The Geographical Indication Perspective. Available at SSRN: <https://ssrn.com/abstract=1143209> or <http://dx.doi.org/10.2139/ssrn.1143209>
  27. Nagarajan S. 2007. Geographical indications and agriculture-related intellectual property rights issues. *Current Science* 92(2):167-171
  28. Nhemachena Charity Ruranai, Johann F. Kirsten and Binganidzo Muchara. 2019. The effects of plant breeder's rights on wheat productivity and varietal improvement in South African Agriculture. Sustainability. 11,3378; doi:10.3390/su11123378
  29. Nhemachena Charity R and Muchara Binganidzo. 2020. Structure of the sunflower plant breeders' rights landscape in South Africa. *South African Journal of Science*. 116(9/10). <https://doi.org/10.17159/sajs.2020/7966>
  30. Noriega Isabel Lopez. 2016. Defensive protection of farmer's varieties. In: Farmer's crop varieties and farmer's rights, challenges in taxonomy and law. Halewood Michael (eds), Routledge pp: 212-248
  31. OriGIIn [https://www.origin-gi.com/i-gi-origin-worldwide-gi-compilation-uk.html?filter=RICE&filter\\_29=Rice&cc=p](https://www.origin-gi.com/i-gi-origin-worldwide-gi-compilation-uk.html?filter=RICE&filter_29=Rice&cc=p)
  32. PPVFRA. 2019. <http://www.plantauthority.gov.in/public-notice/PublicNotice-24of2019.pdf>
  33. PPVFRA. 2020. [http://www.plantauthority.gov.in/List\\_of\\_Certificates.htm](http://www.plantauthority.gov.in/List_of_Certificates.htm)
  34. PPVFRA. Plant variety Journal of India. various issues.
  35. Prasanna Lakshmi PA, LV Subba Rao, AS Hari Prasad, Amtul Waris, Shaik N Meera, B Nirmala, S Arun Kumar and Divya P Syamaladevi. 2018. Intellectual Property Rights protection for rice varieties-status-emerging issues and challenges-new initiatives" *Oryza* 55(3): 383-395
  36. Ravindra Tigga, Abhay Kumar, Shika markam and DP Kerketta. 2018. Doubling Income through value addition of organic scented jeeraphool rice by tribal farmers. *International Journal of current Microbiology and Applied Sciences*. Special Issue-7: 2637-2642
  37. Roy Shobha. 2019. Demand turns premium' Gobindobhog' rice pricey. September 06,2019. <https://www.thehindubusinessline.com/economy/agri-business/>
  38. Seednet. 2020. <https://seednet.gov.in/Reports.aspx>
  39. Singh RP and RC Agarwal. 2020. Farmers' varieties and ecosystem services with reference to Eastern India. In: Ecological and Practical Applications for sustainable Agriculture. Kuldeep Baudhdh, Sanjeev Kumar, Rana Pratap Singh and John Korstad (eds). pp:421-443
  40. Singh Dinesh K, Ankit Panchbhaiya and Shashank S. Sing. 2016. Role of vegetable seed industry and



- impact of plant variety protection (PVP) on seed industry in India. *Seed Times* July-Dec:29-37
41. Singh R.P, Agarwal RC. 2018. Improving efficiency of seed system by appropriating farmer's rights in India through adoption and implementation of policy of quality declared seed schemes in parallel. *MOJ ecology and Environmental Sciences* **3(6)**:387-391
42. Singh RP, Supriya Singh and Sandeep Kumar Lal. 2018. Channelizing protected farmer's varieties through semi-formal seed systems for effective utilization and conservation of Agro-biodiversity: an overview. *Seed Research* **46(2)**:87-97
43. Tsvakirai C. 2017. The role of plant breeder's rights in an evolving peach and nectarine fresh fruit sector, *South African Journal of Science*. **113(7/8)**. Art. 2016-0339. <http://dx.doi.org/10.17159/sajs.2017/20160339>
44. Van der Wouw M, Van Treuren R, Van Hintum T. 2013. A historical analysis of diversity trends in French and Dutch lettuce cultivars. *Euphytica* **190**:229-239.
45. Venkatesh P and Suresh Pal. 2014. Impact of Plant Variety Protection on Indian Seed Industry. *Agricultural Economics Research Review* **27(1)**: 91-102
46. Yadav SK, RC Chaudhary, Sunil Kumar and SB Mishra. 2019. Breakthrough in Improving Farmer's Income sustainably by producing Kalanamak Rice. *Journal of Agrisearch* **6(1)**:1-5

