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Managing Intellectual Property in Collaborative Way to Meet the Agricultural Challenges in India

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Research and development in all the fields of technology, including agriculture are taking place at an impressive pace today. In parallel, the number of intellectual property rights being applied proliferate in order to compensate innovators for these efforts and investments and to foster further innovation. Innovations are also being rewarded by temporarily restricting competition in the production of the resulting goods and services. Patent thicket or "patent floods" is surely making its impact in country like India by hindering the development and commercialization of technology. This can grow into a larger problem in near future with many more challenges to come. The concept of patent pools and clearing houses can be a likely solution to deal with this impediment. This paper hasattempted to explain the concept of patent pool and clearing house and also a basic suggestive model for Indian National agricultural research system to facilitate the access to best technology options available with less risk of stalking licenses and much less R&D cost.

Keywords: PIPRA, NARS, patent pools, patent thicket, clearing house, open source, patent assertion entity, private public partnership

Intellectual property (IP) rights are gaining awareness in the country now.However, earlier majority of the concepts of IP were restricted to developed countries. In recent years, there is considerable growth in the number of IP rights issued in developing countries as well. India too did not lag behind in generating patents. The graph represented in Fig. 1 clearly dissipates the increase in the number of patents applied. There are reports which show worldwide royalty and license revenues increase of 80 billion US dollars in 2000 from around 10 billion US dollars in 1983.[1] This trend also indicates that, now the revenues from royalty and license will be much more than what it was in 2000.

In context of patents, the numbers of patents being applied and granted are broad indicators of growth in innovative activities, which are a key driver of economic growth. These innovations have led to significant growth in the information technology and communications (ICT), biotechnology, medical, and pharmaceutical (BMP) sectors in many countries.[3] On the other hand, an ownershipgrants may result in a 'patent thicket'. Patent thicket is nothing but an overlapping set of patent rights that a firm should acquire for a product commercialization. This can increase costs for downstream activities such as cumulative innovation and the development of new products that combine multiple existing innovations.[4] For example, development of a new genetic diagnostic test typically requires licenses to a number of patents on gene sequences and related technologies.[5]

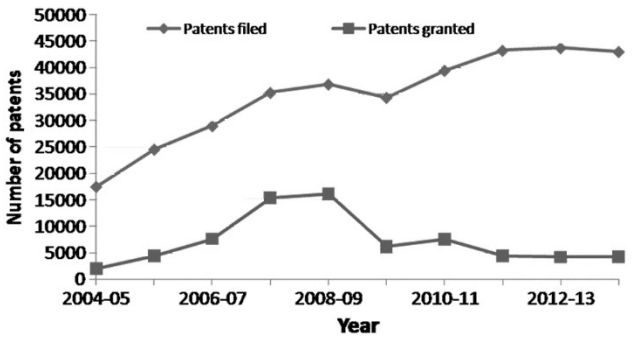

Fig. 1 — Trends in patent application filed during last ten years in India[2]

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The greater the number of licenses required, the higher is the cost of developing the new test. There is some evidence that markets for technology do not function as efficiently as desired by the participant.[6] As reported, among organizations involved in significant licensing activities, 43 per cent of licensing negotiations terminated unsuccessfully. Failure was reported to occur because there were either too many parties to the negotiation or because a useful bundle of IP could not be assembled in, 9% of failed out-licensing negotiations and 12% of failed in-licensing negotiations.[6] Thus making sustainable solutions to be worked out. In India, agriculture biotechnology sector, which sets a good platform for more investment by the industries[7] may need to take note of such trends and look out for appropriate solutions.

Collaborative IP Management Solutions

Collaborative patent licensing models are being considered as a tool to facilitate access to large numbers of inventions. The idea of collaborative patent licensing models, such as pools and clearinghouses, are gaining importance in all the countries as an alternative to single-firm production or cross-licensing. These models could be useful in a position where many related inventions are patented by many different organizations and where access to these inventions is essential for the development of a new innovation/product.

Patent Pools

A patent pool is an arrangement between two or more patent holders in which the relevant patents are licensed jointly as a package.[8] The licensees may be the patent holders themselves, other users of the technology, or both. Patent pools are often based around a specific technology or standard. Obtaining a single license from the pool means that the licensee has access to all of the IP covered by the patents in the pool and standardized licenses are typically offered to anyone who wants one.[8]

A patent pool is two-sided and thereby embodies two major licensing techniques. On the one side, the multiparty agreement between two or more patent owners by which their patents are licensed as a package to one another and form a pool. On the other side, the package is licensed out to third parties on a bilateral basis either directly by one of the partners of the pool or indirectly through an independent licensing authority.[9]

Patent pool is also called the 'one-stop license'. Licensees apply for a single license at the patent pool licensing entity and are authorized to use the bundle of essential patentedinventions. Figure. 2 depicts the situation with the absence and presence of a patent pool.P1– P4 represents the patent holders. L1–L4 represents the licensees. In the absence of a patent pool, licensees have to enter into negotiations with all the patent holders, which is a time consuming and expensive process. By contrast, in the presence of a patent pool licensee's turn to the patent pool for acquiring the rights as one package, which results in simplification and a significant reduction of transaction costs agreements with third parties can be accomplished directly, between patentees and licensees, or indirectly, through the establishment of a body specifically set up to administer the pool.

The concept of patent pool is no new; USPTO in the year 2000 has clearly recognized the importance of patent pool in shaping the industry and law in

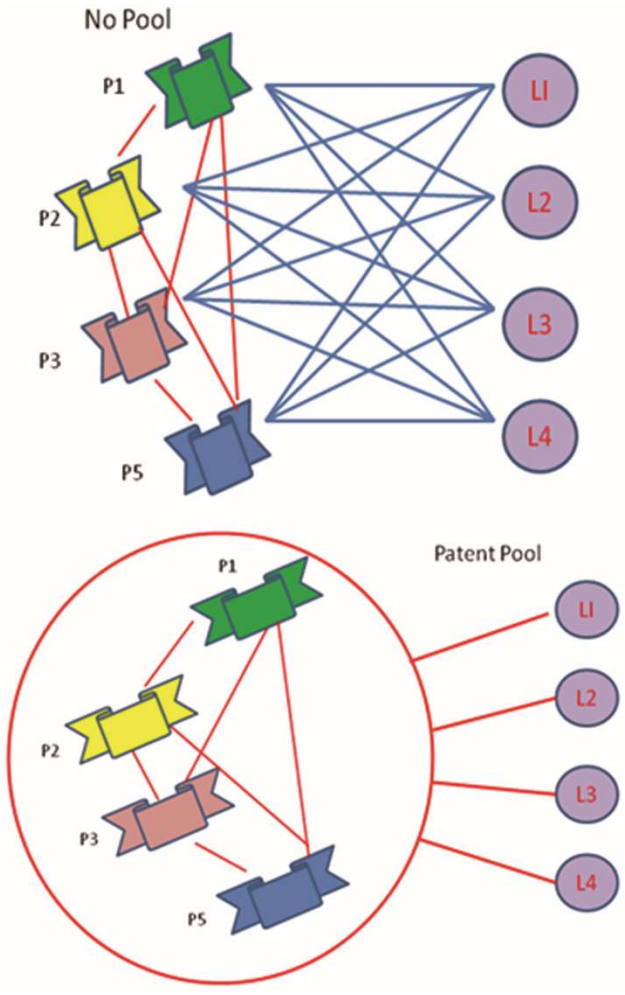

Fig. 2 — Comparative illustrations of the different licenses needed in the absence and a patent pool. [Adapted form[10],[11]]

United States for more than 150 years.[12] Survey of more than 35 patent pools organized or proposed from 1856 to present acrossa number of industry indicate that each of the patent pool was organized in response to a particular set of common objectives, and there is "no single reason to create a patent pool and no single way to manage a patent pool".[12] There are two basic types of patent pools—an open pool and a closed pool. The closed pool consists of several patent owners, one of whom is designated to license the pooled patents on behalf of all of them to third parties. Philips Corporation was the licensing agent for a pool that included Philips's patents directed to the recordable CD standard. A closed pool does not add new patent owners to the pool. An open pool invites additional patent owners to join the pool if their patents meet established criteria, for example, that the patents are essential to the relevant technical standard. Open patent pools are usually outsourced to professional management companies, such as a joint venture, set up specifically to administer the patent pool. For example, Sisvel manages the patent pools for RFID and MPEG, and MPEG-LA manages the patent pools for MPEG-2, MPEG-4, ATSC, and others.[13]

Serafino (2007)[12] classified the patent pool into following categories:

1) **Early pools associated with monopolies and cartels:**The Sewing Machine Combination (1856), National Harrow Company (1890), Motion Picture Patent Company (1908), etc.
2) **Pools created in response to US Government policy objectives**: Manufacturers Aircraft Association (1917) and Radio Corporation of America (1919), etc.
3) **More recent pools that address standardization**: MPEG-2 Patent Portfolio (1997), MPEG-4 portfolio (1998), DVD 6C (1999), etc.

Krattiger and Kowalski (2007)[14] classified the patent pool into following categories

1) **Internal, company specific:** DuPont combing technologies through internal development, critical challenge is to keep the internal innovation ongoing and tightly managed.
2) **Portfolio pooling:** Internal technologies supplemented with third party technologies.
3) **Cooperative pooling:** Companies agreeing to combine their technologies and allowing them to be managed by a separate entity, mainly for standard setting purpose.
4) **Third party aggregations**: Here companies in a pool purchase patent in technologies which they use or develop to avoid infringement claims.
5) **Forced Pooling:** This is very rare. For example, pooling forced by the US government as an order in the aircraft industry. Here the US government necessarily intervened to alleviate a patent hold-up among private aircraft manufacturers.

Some of the very successful patent pools include sewing machine combination (1856)wasformed as a result of the Albany Agreement by Singer company along with Wheeler and Wilson, Grover and Baker, and Elias Hove. The most important component of the sewing machine was the lock stitch for which Howe was granted a patent. He charged a hefty license fee for this. In addition to this, there were number of other components which were important to build a sewing machine and different parties held the patent right. There was considerable litigation between the parties, giving rise to "Sewing Machine Wars" of 19th century which threatened to stop the production and sales.[15] The patent pool, formed to resolve this litigation and bring down license fees, combined 9 complimentary patents that are needed to build a functional sewing machine. This pool was in existence till the duration of all these 9 patents expired. The Medicines Patent Pool (MPP) is another patent pool working till date to increase access to HIV, viral hepatitis C and tuberculosis treatments in low- and middle-income countries. Recent time's patent pools were created in response to the need of standard setting to promote new standards.[4] An example is MPEG-2 patent pool which combined 27 patents held by 9 patent holders necessary to meet MPEG-2 standard (video storage compression standard used in connection with Digital Versatile Disc (DVD) technology.

Benefits and Risks

Patent pool can have multiple benefits like, elimination of stacking licenses, reduction of licensing transaction costs through the introduction of a system of 'one-stop licensing' for non-member licensees which provides an alternative to having to negotiate and acquire separate licenses directly from each of the patent owners.[6] Patent pools also constitute an interesting instrument for government policy: It is better to encourage companies to establish patent pools than to force compulsory licensing.[9] Further it has also been pointed out that the patent pool would help companies to earn steady income,

recover their investments and reduce risk which could spur them to further research and innovation.[16]

Despite these advantages, patent pools also possess few risks. The initial cost of setting up and negotiating a pool agreement will often be high also there is a possibility of invalid patents in the pool. Moreover patent pools frequently operate on the borderline between "allowed monopolies and antitrust violation as stated by Professor Resnik (2003).

Patent Thicket and Pools in Biotechnology

In the field of biotechnology, access to existing as well as upcoming knowledge became a matter of concern in the 1990s when several companies started developing and patenting technology knowledge sequence such as DNA sequence. These resulted in a significant change in the ways of using patents. While the traditional patents were used to protect against imitation by competitor, the research tool companies sought broader patent for methods and data. According to OCED, 2004, then the companies started entering into contractual agreement for their eventual accords to produce end products. To cite an example, development of a genetic test for hereditary colon cancer could lead to considerable licensing problem. About a dozen genes are believed to be responsible for hereditary colon cancer and each of these could be associated with many variations and mutated alleles.Each such allele could code for different types of RNA and proteins. If it is supposed that over two dozen of companies own patent for different parts, it would be better to create a pool for a developer to use this test.[12]

Most of the technologies and the tools of the biotechnology have been developed by the developed nations. Such patents are held by few companies and universities. Commercial application of such technologies is largely restricted to developed nations.[17] Development of appropriate biotech technologies and their application in developing countries is held up by the array of existing patents apart from regulatory hindrance. Even though the exemption can be made for research purpose, when the new technology is ready for commercial useit will lead to chocking which would require the negotiation with several patents and multiple owners.

In the Golden Rice case, for example, Potrykus succeeded in genetically enriching rice grains with β-carotene, the precursor to vitamin A.He wanted to transfer the Golden rice materials to developing countries for further breeding, and to introduce the trait into the local varieties consumed in developing countries. However, a freedom-to-operate survey initially uncovered 70 patents, belonging to 32 different companies and universities, embedded in Golden rice.[18] Monsanto had the largest number of patents. After approaching six key-patent holders, an agreement was reached that allowed Potrykus to grant licenses, free of charge, to developing countries, with the right to sub-license.[19] A humanitarian board (HunBo) was established as a voluntary association to assist in the associated governance and decision making. This effort has helped to grant licences in developing countries. The Golden Rice case is an example of how private and public organizations, in a combined effort, dealt with the patent thicket by creating a non-profit, humanitarian and therefore, probably atypical patent pool in the form of a single licensing authority.[20, 21]

The case of RNAi interference provides another typical example of patent pool.There have been several clashes with respect to owing the exclusive right over the basic patent. Sirna and Alnylam pharmaceutical are the dominant players in this field. Alnylam alone owns more than 150 patents those are fundamental and necessary for therapeutic use of the technology.[22] Though the problems posed by patent thicket are well recognized, very few efforts have been taken to solve these issues.[23] Most of the patent pool in the field of biotechnology was in health sector.

Even though there are few examples of patent pools in biotech industry, there are several obstacles to the implementation of a patent pool in this industry.[16] First, the costs of initially forming and subsequently maintaining a patent pool are very high. Companies in the video encoding and consumer electronics industries worked together to finance their pools in anticipation of the profits of mass-produced consumer devices. It does not seem plausible that gene patent holders will be quite as willing to invest such money into a pool that does not have as wide a consumer base as the other industries.Furthermore, patent pools are often prone to antitrust issues. As the patent pool works on behalf of its member patent holders, it is easy for patent holders to collude to fix prices. Finally, a single patent pool is only effective as long as all of the patents within it are complementary to each other and none are substitutes.[16] If substitutes are present in the pool, it would no longer be efficiency enhancing, as pool members would try to increase profits at the expense of patent users. Since

most gene patent claims are on methods[24] it seems likely that substitute technologies will be patented. This could lead to the formation of multiple biotechnology patent pools to avoid substitute technologies within a single pool. Multiple patent pools would cause fragmentation rather than centralization of biotechnology, leading to further confusion instead of transparency for potential licensees. Although a biotechnology patent pool has some appeal, it does not appear to be the most promising solution.[25]

Clearing House

Clearing house is another important mechanism made for management of patent monopoly and control. The idea of an IP clearing house has been discussed by a number of authors to address the economic inefficiencies emanating from a proliferation of IP rights. A clearing house is like a middleman in the market for technology that facilitates exchanges between IP owners and IP users. The term "clearing house" is derived from banking institutions and refers to the mechanism by which cheques and bills are exchanged among member banks in order to transfer only the net balances in cash.[26] A clearing house refers to a mechanism whereby providers and users of goods, services and information or patents so you wish - are matched almost similar to patent pools.[27]

Its scope is broader than a patent pool and it may have independent objectives. Clearing houses have equally been suggested in the field of agricultural biotechnology as an adequate model to cut through a tangled mass of patents.[23] For example, a biotechnology clearing house could provide a database of biotechnology patents and allow searching and identification of IP owners. The clearinghouse could also facilitate licensing and handle the collection of royalties and monitoring of uses on behalf of the patent holders. In principle, the clearing house could raise revenues from both IP owners and IP users for its services.[2]

The three essential functions of an IP clearinghouse[23] are (i) the identification of all relevant IP claims over a technology and indication of the extent of availability for licensing; (ii) matching buyers with sellers, with standardized yet flexible prices and terms of contract; and (iii) monitoring and enforcement of contracts.

Classification of Clearing House

Depending on the functions performed, five different types of clearing house are distinguished.[28] These range from an 'informational' clearing house that merely facilitates access to information about IP, through a 'royalty collection' clearinghouse that provides information, as well as standardized licenses plus royalty monitoring and collection functions. The first clearinghouse model includes basic data, technical information, or complex information included in patents covering these technologies (information clearinghouse). The second clearinghouse provides lists of technologies available via the clearinghouse through licensing. Thereby, it offers a platform for technology owners and users to enter into bilateral negotiations (technology exchange clearinghouse). The remaining three are more advanced models aimed at providing both access to and use of the (patented) inventions. Access and use can be offered by a clearing house on a royalty-free open-access basis (open access clearinghouse), or *via* standard licenses (standard licenses clearinghouse and royalty collection clearinghouse). In addition, a royalty collection clearinghouse offers royalty collection and disbursement, monitoring and enforcement of 'license-conform' behaviour and an independent dispute resolution mechanism. *Open access* clearing house does not only foster free access to (information about) inventions, as its name may suggest, but also standardize *free* use of inventions.[29]It has also been classified based on ownership of the clearing house (Table 1).[2] Overall it is classified into four broad groups (Table 2).

An example of a third-party IP clearing house is BirchBob, which facilitates exchanges between the technology transfer offices of universities and other research institutions with firms that would like to use and license new technologies. It is a type I clearinghouse and provides an online searchable database of IP. Another example is Google patent

Table — 1 Classification of clearing house based on ownership

Ownership	Objective	Entry of IP	Function
Third party	Profit/revenue maximization	Open	Information only
Collective	Cost Recovery/other	Restricted	Information and Licensing

Table — 2 Broad classification of clearing house

Ownership	3rd Party	I	II
	Collective	III	IV
Informational Clearing house Information only Function	Licensing clearing house Information and Licensing		

search. The Google patent search allows online searching of the full text of the more than 7 million patents issued by the USPTO since the 1790s, using specialized text search technology developed by Google. Google does not charge users for searching its database nor patent holders for being listed, but instead earns revenues indirectly through advertising on its website.

A major example of a type I clearing house (even though it is non profit) in the area of agricultural biotechnology, is The Public Intellectual Property Resource for Agriculture (PIPRA).PIPRA was established, taking into consideration that IPR related to agriculture and biotechnologies are held by multiple owners, there are fragmentation and a restricted freedom to operate. PIPRA was set up as a collective regime to help in overcoming the 'fragmentation of public sector and re-establish the necessary freedom to operate (FTO) in agricultural biotechnology for public good while improving the private sector interaction by efficiently identifying collective commercial licensing opportunities.[30] PIPRA's primary strategies to improve access to patented technologies are to: i) provide a one-stop IP information clearing house for access to public sector patented technologies, ii) provide a resource for the analysis of patented technologies for implementation of specific projects, iii) develop gene transfer and gene-based trait technologies that have maximum legal "freedom to operate", iv) act as a technology transfer clearinghouse by clustering public sector technologies ready for transfer and v) support the development of IP management best practices and capacity enhancement in developing countries.[30]

Copyright collectives are examples of collective licensing clearinghouses (type IV). These collectives, such as ASCAP, Broadcast Music Incorporated (BMI), and the Japan Society for Rights of Authors, Composers and Publishers (JASRAC), are similar to patent pools in that they provide licenses to packages of IP. Aside from the fact that they apply to copyrights rather than patents, the main feature that distinguishes copyright collectives from patent pools is their scope. A license from a copyright collective typically permits the use of a wide range of copyrighted material, whereas patent pools are limited to a particular technology or standard.[2]

Open Source

A license is open source if it allows anyone, anywhere, for any purpose, to copy, modify and distribute the software (where distribution takes place either for free or for a fee) without having to pay royalties to the copyright owner.[33]

An example for Open source in agriculture sector is the Biological Open Source (BiOS) License from the Centre for Applications of Molecular Biology in International Agriculture (CAMBIA), a private non-profit research institute located in Canberra. It was founded by molecular biologist Richard Jefferson about fifteen years ago; CAMBIA pioneered, and subsequently patented the GUS and TransBacter technology serving as a prominent research tool in agricultural biotechnology.[33] The BiOS initiative was launched in 2004 and is intended to make these biological research tools widely available.[34] Improvementsbeing madeunder these enabling tools are to be shared under the BiOS open source license regime, but the products or materials made, created, or obtained by using them, do not fall under this provision and can be commercialized on a competitive and proprietary market under non-open source conditions. Indeed, the BiOS initiators are not averse to users of these tools filing patents on products made by use of the tools, the intention is to preserve public access to the initial tools and later improvements and modifications.[35]

Patent Trolling

Apatent troll, also called as patent assertion entity (PAE), is known to be person or company who enforces patent rights against accused infringers in an attempt to collect licensing fees. Patent trolls operate by protecting and forcefully exploiting a patent portfolio targeting additional money from existing uses and not from seeking out new applications for the technology. They monitor the market for possibly infringing technologies by watching popular products, news coverage and analysis. This issue of patent trolling was highlighted in United States stating causing enormous loss to the country's economy. The Then U.S. President *Barrack Obama* ensured for bringing up new policy and recommendation to address this issue. As a result, United State Patent and Trademark Office (USPTO) were advised to take measures to help the surge in patent-infringement lawsuits. In comparison to other countries, patent trolling was quite prevalent in India in the information technology and communications sector prior to the enactment of the amendment in 2005, and then steeply declined after the amendment.One of the most notable cases is that of Spice Mobiles and *Samsung*

India v *Somasundaram Ram Kumar*, wherein he was granted a patent for mobile phones that could incorporate multiple sim cards.

Agriculture Research System and Policy Regime in India

India, after becoming a member of the WTO, amended the 1970 Patent Amendment Act in 1999 so as to incorporate benefits for applications from industries such as drugs and agro-chemicals and provisioning of exclusive marketing rights therein. In India, public sector is giving more focus than the private sector for any new innovation. Agricultural biotechnology is an important deliberation for the developing world mainly because of its importance as a contributor for food security, climate change and economic security. Indian National Agriculture Research System (NARS) is one of the largest systems in the world.This system has contributed largely to the rapid growth of agriculture after green revolution The system consists of two main streams; ICAR(Indian Council of Agricultural Research)at national level and state agricultural universities (SAUs) at state level. Besides this there are several organizations like general universities, scientific organizations, various ministries, departments, private players and also voluntary organizations. All these organizations participate in research and development either directly or indirectly. ICAR is the apex body which is directly involved in undertaking research at national level. Over the years ICAR has established many national institutes, national bureaus, central research institutes, project directorates, national research centres and several national research projects to meet the agriculture research need of the country. ICAR was very successful till date to meet the research needs of the country. But now given the new challenges of global warming, water and agricultural soil health crisis, other indicators of climate change, etc, the apex research organization must prioritize out of the box research approaches and programmes. Biotechnology has been accepted as one of the major sector to potentially solve the above problems. Indian biotech industries are showing a steady increase in size, with a significant number of patents but still the number is very low compared to other countries. Patent administration, criteria, compulsory licence and patent validity are few challenges the Indian companies are facing with. The concept of patent thicket is new to Indian biotechnology sector. Based on a survey, In India the approach is to work on a product where the patent has expired. The research also indicates that, Indian companies are not even inclined towards licensing their patents to generate incomes. The general trend is that the companies retain their monopoly and exclude others from accessing to affordable products by the poor in developing countries is dependent largely on favourable patent regime.[36]

This situation in India has changed as the effect of newly introduced producer regime in India through the patents (amendment act), 2005. According to TERI's study, the potentiality of patent pooling in the biotechnology sector in India is high. Since biotechnology is a developing field of study in the country it has the potential for wide range of applications, particularly in critical sectors like pharmaceuticals and agriculture.[37] As stated earlier, there is growing number of patent applications over the years. In the years 2013-2014, there were significant number of patents filing from Scientific Research and Development Organizations. ICAR has filed 71 patents during the year 2013-2014. The list of top 10 scientific bodies applicants for patent during the year 2013-14 is given below (Table 3).

The Patents Act paved the path for product patent regime in India in 2005. The critics apprehend that it would "sound the death knell" of India's biogenetics industry. Increased patent protection would lead to higher drug price.[38] Even though there is a flexibility of compulsory licensing in worst case, there is considerable concern that these will not be adequate to increase the access to patentable knowledge and more importantly to promote innovation in developing countries.[39] In such a context people have

Table — 3 Top ten Indian applicants for patents from scientific research organizations during 2013-14[2]

S. no.	Organization	Applications filed
1	Council of Scientific and Industrial Research (CSIR)	267
2	Defence Research and Development Organization (DRDO)	116
3	Indian Council of Agricultural Research (ICAR)	71
4	Department of Biotechnology, Government of India	34
5	Jubilant Life Sciences Limited	29
6	GHR Labs and Research Center	26
7	Hetero Research Foundation	17
8	Center for Development of Advanced Computing	17
9	Indian Council of Medical Research	14
10	Indian Space Research Organization	12

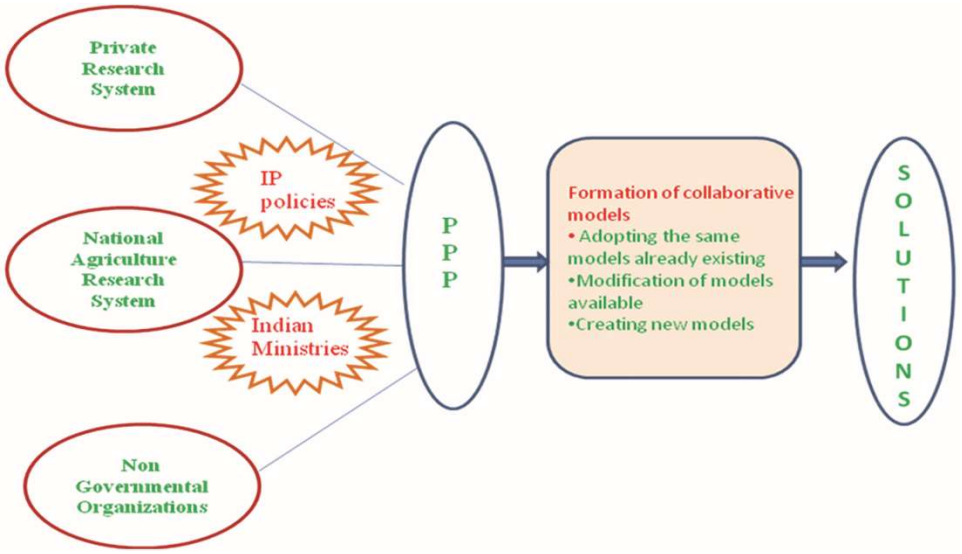

Fig. 3 — Suggestive collaborative licensing model for Indian agriculture

argued that a patent pool is a better alternative to traditional solution like compulsory licensing.[40] Also Section 102 of Indian Patents Act may be interrupted for facilitating the set up of government administered and managed patent pool.[41] Hence Indian legal policy is not likely to create any obstacle with respect to the set up.

India to safeguard the future expected challenges of food security, global climate change and the emerging scenario of post 2005, needs to access the patented knowledge to sustain the growth.In today's changing agriculture scenario the farming sector in India will require large-scale biotechnological innovations. Even though in India, we have many technologies developed by leading private companies and research institutes, its application restricts only to research purpose. When it comes for commercial spread it often gets chocked.A situation wherein technology developer need to license from several parties to develop a product the price shoots up and the research comes to a complete halt.Public and private sector working together will be an effective way to face the challenges ahead.A workable model could be thought of for improving operational efficiency.

Suggestive Model

The collaborative licensing model in many sense help India. The growing interest towards Private Public Partnership (PPP) in India will be highly advantageous for this. To facilitate access to and use of a twisted mass of patents in agricultural biotechnology, governmental and non-governmental institutions including private bodies need to set up collaborative licensing structures by funding the formation costs or by taking the lead as co-founders of such mechanisms as patent pools, clearinghouses or open source in the field of agricultural biotechnology. Including some humanitarian clauses in the licensing practices can add up to the model too. Even though these mechanism are not prominent in agriculture and biotechnology sector, in future it has enormous scope to find and maintain a healthy, dynamic balance between public and private forces, and grow along a more efficient, safe, and beneficial trajectory. A suggestive model which could be explored further is given below (Figure 3).

Conclusion

Patent pools and clearing houses are still rare phenomenon in India. Fragmented patent rights are real challenge as it leads to high transaction cost (identification, negotiation and enforcement), legal uncertainty (patent trolls) high royalty etc. Patent pools and clearing houses are appropriate opportunities to this problem to address the current and future expected challenges. These models create an opportunity for open innovativeness leading to better access to technology, reduced R&D cost, better relationship with strategic partners, prevention of stalking licences, and improved access to new business and capital. India has a better option of intriguing this concept for the advancing field of biotechnology. However, the techniques and market for genetic invention are amenable for pool is still questionable. Including the public and private partners together as suggested may be a good option while

availing the benefits of open innovation. India could think of these platforms in making further advancement in scientific opportunities.

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