Intellectual Property Rights in Fisheries Sector

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Patenting activity in fisheries sector in India was analysed at two levels, i.e., trends in growth of patenting activity during different time periods, 1913-1947, 1947-1970, 1971-1995 and 1996-2000. Patents were also examined to study the nature of technology. This study revealed that there is a steady increase in the average number of patents/year after independence (1947-1970). It was also found that there are on an average, three patents per year after introduction of Indian Patents Act, 1970, and in post WTO era (1996-2000) six patents per year. The analysis of patents documented since 1913 to 2000 revealed a steady increase in patenting activity in the field of fish processing technology (83 patents) and aquaculture (31 patents), whereas, patenting activity in fishing technology (37 patents) has steadily declined. These results indicate an aspect of less innovation in fisheries sector as reflected by patent statistics. However, there has been a shift towards increased patenting activity in post TRIPS era particularly by domestic applicants.

**Keywords:** Fisheries sector, patenting activity, fishing technology, processing technology, aquaculture

Scope for patenting in fisheries sector arises from the fact that, though any living form that has existed in nature does not qualify for a patent, anything created by human ingenuity and application of human intellect, if ‘new’ and ‘non obvious’, is in principle patentable. Different technologies in the livestock and fisheries enterprises can receive protection by breeder’s rights, patents, trademarks, geographic appellations, copyright and industrial design depending upon the nature of technology; they will receive protection by one or a combination of different IPRs. The patenting of living aquatic resources (or parts thereof) including genetic material in different forms may increase in future, given the vast and largely unexplored potential of utilization of such resources, and the expansive approach on biotechnological patents prevailing in the industrialized countries. The use of living aquatic resources has a significant potential in a number of fields such as pharmaceuticals, diagnostic and analytical reagents, cosmetics and food.

The objectives of the study are to document and analyse the patented technologies in three disciplines of fisheries sector, namely, processing technology, fishing technology and aquaculture. The study also interprets innovative activities in fisheries sector with regard to patent statistics.

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**Data and Methodology**

The patents in the fisheries sector were documented as per the Indian classification key, which is a compilation of 208 abridgement groups subdivided into different classes. The abridgement groups indexed as 82 XIV (4): Fish and Fishing and 83A3 XIV (5): Food preparation–meat, fish and eggs were found relevant for fisheries sector and patents were documented from these groups. From 1995 to 2000, the granted patents were documented from the Gazette of India, Part III, Section 2 for the respective years.

Patent applications relevant for fisheries sector were also collected for the period 1995-2000. Database at www.nrdecindia.com was searched to document patent applications filed in 2001 and 2002. It was found that out of 259 patents granted in India, 151 relate exclusively to fisheries sector. The remaining relate to ‘water’, ‘sea water’, ‘waste water’ and their purification / treatment methods.

The analysis of patenting activity was made at two levels. First, the data was examined with respect to the trends in the growth of patenting activity in India. Since the year wise output of patents during the period 1913-2000 was very small, the output was divided into four blocks, i.e., 1913-1947, 1947-1970, 1971-1995 and 1996-2000. The division is to facilitate comparison between the patenting activities before and after independence, before and after the
Indian Patents Act, 1970, and before and after WTO era.

The study also includes the profile of applicants who have been granted patents in India. Accordingly, the patents were grouped under three disciplines, namely, aquaculture, processing technology and fishing technology. The patents were further categorized under each discipline. The processing group includes four categories, namely, Process for making fishery products (subdivided into fishery products, fishery byproducts like fish meal, fish oil, fish protein concentrate, fish offal, meat analogues and miscellaneous products like carrageenan, chitin, phycocyanin, eicosapentaenoic acid, alkaloids and products of spirulina); Method and machine for processing/pre-processing of fish, shrimp and other byproducts; Process for preservation of food products and Method for sterilizing and packaging food products. The patents in the group fishing technology are categorized under four categories, namely, fish hooks, fishing rods, fishing reels, bait, power block, short guns, tapes used for fishing gear; Different types of nets and their improvements trawl otter boards for fishing; Machines for manufacture of nets and Improvements in boats, marine craft and apparatus for transferring fish. The patents under the group aquaculture were divided into eight categories, namely, Apparatus for transport of live fish, rearing fish; Process for producing pearls and their improvement; Hatcheries/incubators for culturing fish eggs; Process of preparation of compositions for controlling insects, pests, weeds in aquatic environment and farm management; Process of preparation of composition for feeding shrimp, fish and for use in aquaculture; Wastewater treatment apparatus using floating aquatic plant method for manufacture of soil improving agents from aquatic plants; Process for preparing a composition for treatment of fish and crustacean; Process for treating effluent water for culturing fish and gates to maintain water level.

**Technological Advances in Fisheries Sector**

India is the sixth largest producer of fish in the world and ranks second in the production of inland fish. Presently, the contribution of fisheries sector to the gross domestic product (GDP) and agricultural GDP has been estimated to be 1.2 and 4.2% respectively. Technological achievements in aquaculture, which led to enhanced fish production in inland waters, have revolutionized aquaculture practices in the country. Moreover, in 2002-2003, seafood exports were 4.6 lakh metric tonnes valued at Rs 6881 crores and share of seafood in India’s export of all commodities is 3.16%. Technologies have been developed for culture of pearls, running water fish culture systems, fish hatcheries, processes for making fish, fishery byproducts and efficient machines for the same, various types of nets and accessories for gears, some of which have been safeguarded by patents. Different technologies in the livestock and fisheries enterprises will receive protection by breeder’s rights, patents, trademarks, geographic appellations, copyright and industrial design, depending upon the nature of technology. Also, they will receive protection by either one or a combination of different IPRs.

**Analysis of Data**

A study on the patents granted in India collected from Research and Development Statistics 2000-01, Ministry of Science and Technology, Govt of India and www.indiastat.com over a period of 23 years (1976-1999) revealed that patenting activity has fluctuated erratically and showed no time trend in this period as total number of complete specifications notified as accepted in the year 1976-77 was 2,840 but showed a declining trend till 1983-84. Total number of patents dipped sharply during 1980-81 period and recorded a maximum during 1984-85. The total number of patents sealed from 1976-77 to 1998-99 is 43,731. Statistics indicated that there is a less competitive spirit in Indian firms or organizations. Though, the statistics has not been compared with other countries, it is seen that the patenting activity in India has been insignificant as compared to USA, Europe and Japan. The adoption of weaker level of patent protection in India is also reflected in the index of patent rights, which is 1.48 in 1990.

**Trend in Patenting Activity in Fisheries Sector in India**

Trends in patenting activity in processing, fishing technology and aquaculture in India analysed decade wise is presented in Fig 1. It can be seen that in fields of processing technology and aquaculture, there has been a steady increase in patenting activity during 1961-1970 whereas the patenting activity in fishing technology has steadily declined. Nine foreign corporations (for eleven patents) account for 18 of the total patents granted during the period. Indian organizations, CSIR and Hindustan Lever Limited,
Fig 1—Trend in patenting activity in fisheries sector in India (1913-2000)

Bombay, have also entered the arena during this period, the rest of patent applicants are foreign individuals. The significant role played by foreign firms in patenting activity in processing technology can also be an indicator for protection of export products by foreign corporations. There is also a lack in continuity in patenting activity for four decades from 1920-1950 in the field of aquaculture.

Discipline Wise Classification of Patents in Fisheries

Discipline wise analysis and classification of patents in fisheries sector as per the average number of patents granted per year in fisheries sector, categorized in three disciplines, namely, fishing technology, processing technology and aquaculture was also performed.

A maximum of 55% of patents have been granted in the field of processing technology followed by 24.5% in fishing technology and 20.53% in aquaculture. From this analysis, it can be inferred that there is a steady increase in average number of patents/year after independence (1947-1970), 1.65 numbers per year as compared to 0.56 in the pre independence era. It can also be observed that after introduction of Indian Patents Act, 1970, there are three patents per year. In post WTO era (1996-2000), the average number of patents is six per year. Probable reason for the growth may be the increased awareness of the public. The legal and administrative procedures implemented by the revised patent laws, which facilitate access to patent information, routing of patent applications and their grant can also be one of the reasons for increased patenting activity.

The applicant profile, number of patents, year-wise distribution of patent applications and provisional patent applicant profile in fisheries sector are given in Table 1.

Applicant Distribution of Patents in Fisheries Sector

Table 1, which gives the comparison between the patenting activity before and after introduction of the Indian Patents, Act 1970, reveals that 71.08% of patents recorded in processing technology are by foreign applicants while Indian applicants account for only 28.92% of total patenting activity. The majority of applicants are foreign corporations accounting for 43.37% of patents granted in processing technology. The major players are Astra nutrition Aktiebolag, Unilever Ltd, England and Friday Corporation, USA, and have two patents each. Nestle products Ltd has 4 patents. In India, CSIR, alone accounts for 14.46% of patents in processing technology. The technologies that have been patented by CSIR range from methods for protein extraction, extraction of carrageenan,
extracting fat liquors from marine oil, alkaloids from sponge, along with fish mincing machine and method for curing fish. It can be concluded from this data that developments in technology concentrate on bioprocessing. It is also clear that 54.84% of patents recorded in aquaculture are by foreign applicants while Indian applicants account for 45.16% of total patenting activity. The majority of applicants are foreign corporations account for 45.16% of total patents granted in India. The major players are Linde Aktiengesellschaft, German Co and the Lemna Corporation, USA which have two patents each. In India, majority of applicants are individuals accounting for 29.03% of total patents in aquaculture. The Taraporewala marine biological research station, Maharashtra also has 2 patents. The three technologies patented by CSIR are device for biocidal chemical release in aquatic system, an improved process for isolation of saponin from mahua and an improved process for preparation of pesticidal composition. It can also be inferred that 78.38% of patents in fishing technology are by foreign applicants while only 21.62% of patents are by Indians. Majority of applicants are foreign individuals accounting for 54.05% of total patents granted in India. Three individuals, namely, Carl Hansen, Denmark, Kolbjorn Bjorshol, Norway have two patents, Sir Charles Dennistonn Burney has 3 patents. Similarly among domestic applicants individuals account for 13.51% of patents granted in India. French company, Ateliers et Chantiers de La Manche and Indian company Garware Wall Ropes have 2 patents and are major players among corporations that have patented technologies in fishing technology.

It is also observed that in disciplines of processing and aquaculture, the major players are foreign applicants, which denote that the domestic market is perceived to be a potential market for promoting novel products by foreigners. It can also be concluded that involvement of domestic firms in R & D activity is small which account for the fewer number of patents by domestic firms or that domestic firms prefer trade secrets over patents. Continued dominance of foreigners in the total number of patent applications filed or patents sealed is in conformity with the situation in many developed countries where also, foreigners account for a large share than local firms, organizations and individuals.

In the field of fishing technology, individual citizens (foreign and Indian) dominate the patenting activity. Smaller role played by corporations could either be due to preference for trade secrets or due to lack of sufficient gains as a result of patenting their innovations. Significant participation of individuals has been explained to be (i) a sign of under development, and (ii) the individuals as small entrepreneurs, or (iii) the individual patenting of public funded research. This may be applicable in the present study also.

**Patented Technology in Fisheries Sector**

Technology constitutes a complicated, heterogeneous conglomerate of different fields of activity, characterized by many interrelated aspects. The systematic investigation of scientific developments in each field of technology and the network of field interrelations along with the overall structure of technology is an important element of R & D management studies. Patents, as measure of inventive activities, are generally restricted due to three reasons, namely, not all inventions are patentable, not all patentable inventions are patented and the economic significance of inventions varies enormously. Yet, the possibility that patent statistics would provide an output indicator of inventive activity is one of the strong motivating forces for research in this area.

**Patents in Processing Technology**

The maximum number of 83 patents (54.97%) was recorded in the processing technology. Most probable reasons for higher number of patents in processing technology are that, innovations in processing are easily imitable which include processes of manufacture and respective machinery. The propensity to patent these innovations could be because technological content needs to be safeguarded to attain a competitive advantage over competitors trading in substitute products. One of the reasons which hold importance is that trade in processing sector is better developed and export oriented, when compared to fishing technology, and therefore faces greater competition from domestic and foreign competitors. Thus patents serve as tool for preventing competitors from manufacturing products using same process.

A total of 31.33% (no.26) of innovations patented relate to process for making fishery by-products like fish oil, fish meal, fish protein concentrates, and fish analogues that account for majority of patents in the
processing sector. The development of byproducts plays a significant role in technological and business dynamics in fisheries sector. Though industries for fishery byproducts in India are few, foreign firms and individuals have utilized patents to expand their markets and are potential competitors for Indian firms. The processes for isolation of fish protein etc. have been patented maximum number of times, from which we can identify areas where technology is concentrated. This is also an example that demonstrates the fact that process patents provides stimulus for dynamic competition wherein the same product is manufactured by different processes.

The patents on method for obtaining carrageenan, chitin, phycocyanin, and products from spirulina, eicosapentaenoic acid, alkaloids (bioprocessed products) form 12.05% (no.26) of total products granted. Although these technologies are few in number, they are indicators of emerging technologies that are commercially important. Valuable biologicals, bulk chemicals, proteins, enzymes, lipids, essential fatty acids can be extracted from a variety of traditional and non-traditional species. New high value products based on seaweed polymers can also be developed including products for surgical dressings, packaging film and pigments. This area is vastly unexploited and after implementation of the product patent regime in 2005, research and patenting activity in this sector could rise.

**Patents in Fishing Technology**

There are a total of 37 patents in fishing technology and there are different categories under fishing technology, of which 20, maximum number (54.04%) is under the category fish hooks, fishing rods, fishing reels, baits, power block, short gun, tapes used for fishing gear. In fishing technology, the propensity to patent exists as the innovations are easy to duplicate due to their simple construction and design.

**Patents in Aquaculture**

The patents (no.31) granted in aquaculture have been further categorized so as to identify the technologies that have been patented. The maximum number of patents granted (22.58%) in aquaculture relate to apparatus for transport of live fish and rearing of fish, followed by 19.35% (no.6) for hatcheries or incubators for hatching fish eggs. As patents for mechanical inventions dominate in the case of fishing technology, it can be concluded that patents play an important role to safeguard inventions that involve simple technology which are easy to duplicate.

A total of 16.12% patents (no.5) also relate to process for manufacturing compositions used for controlling insects, pests, weeds in aquatic environment and farm management. The lower number of patents in aquaculture could be due to the fact that scope for patenting of aquaculture is restricted. For instance, the Indian Patents Act has defined innovations that cannot be patented, such as a method of agriculture. Also, majority of the farm innovations are developed through trials by farmers, which are known as the indigenous knowledge. Individual innovators have acquired a significant number of patents in aquaculture. The research institutes, which have played a major role in promoting aquaculture, until recently, placed lower importance for patenting. The majority of innovations that have been responsible for the progress in aquaculture fall under the non-patented group.

**Distribution of Patent Applications in India during 1995-2002 in Various Disciplines**

Distribution of patent applications in India among three disciplines from 1995-2002 is given in Table 2. The analysis reveals that maximum patenting activity in fisheries sector occurred in processing technology, i.e., 45.95%. A total of 27.93% of patents applications are recorded in ‘others’ group that refers to patents related to water treatment, waste water treatment, power and electricity generation from sea waves, river bank protection, manganese nodules, purification of microbes in water, etc. Whereas 14.41% of patent applications relate to aquaculture, 11.71% patent applications relate to fishing technology. Maximum number of applications filed are in the year 1996 followed by 2001 and 1995. 1997 recorded lowest of 4.5%. The study on growth of patent applications revealed that applications for patents filed in processing technology recorded growth of 6.5% per year while in fishing technology it exhibited a growth of 1.6 percentage per year and in aquaculture it exhibited growth of 2% per year. This is corroborated by previous results that in the field of processing technology the patents are maximum.

**Provisional Patent Applicant Profile 1995-2002**

The profile of applicants who have filed for patents is given in Table 3 which also enables comparison between the patenting activity of foreign and domestic
 applicants. Table 3 reveals that in all these areas of processing, aquaculture and fishing technology, Indians have dominated in filing for patent applications recording 69.13%, 58.82% and 87.5%, as compared to foreign applicants for fishing technology, processing technology and aquaculture respectively.

In processing technology, data revealed that number of patents (83) granted and number of patent applications (51) is greater when compared to other disciplines. The greater level of trade and industrial activity in processing technology could be one of the factors that stimulate enhanced patent activity with a view to attaining technological advantage and lead time over competitors to establish a larger market. Patents granted after implementation of the Indian Patents Act, 1970, indicate that legal enforcement and systematic procedures for obtaining patents are sufficient measures for enhanced patenting activity, a total of 56 granted in post-patent act period compared to 28 in pre-patent act period. The rise in patent applications in post TRIPS era also throws light on technological improvements in the discipline. The processing sector has great potential for enhanced patenting activity due to enforcement of the product patent regime in 2005.

### Conclusion

There is a relatively lesser number of patents in fisheries sector and relatively larger share of individuals in patenting activity, particularly, in fishing technology. The Indian firms account for lesser number of patents for their innovations when compared to their foreign counterparts. The reason is because the investment in R & D activity is small due to lack of capital for trials in innovating products and establishing product in market. Also, firms prefer other forms of intellectual property rights like trade secrets and trademarks. There exists lack of continuity in patenting activity, particularly, in the field of aquaculture. Moreover, on an average at least one patent a year has been granted over a period of 87 years. These data can be related with evaluations of persistence of R & D investments. The lower propensity to patent innovations in fisheries in India may be primarily due to the weak enforcement of patent rights and hindrances like procedural complexities. Thus, the results of the study indicate an aspect of less innovation in fisheries sector. However, there has been a shift towards increased patenting activity in post TRIPS era particularly by domestic applicants.

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References
1 Gazette of India, Part III, Section 2. Government of India
5 Ravishankar A and Archak Sunil, Intellectual property rights and agricultural technology, interplay and implications for India, Economic and Political Weekly, 35 (27) 2000, 2446-2452
8 Ginarte C J and Walter P G, Determinants of patent rights: A cross national study, Research Policy, 26 (3) 1997, 283-301
9 Kondo Masayuki, R & D dynamics of creating patents in the Japanese industry, Research Policy, 28 (6) 1999, 587-600
10 Engelsman E C and Raan A F J, A patent based cartography, Research Policy, 23 (1) 1994, 1-26
11 Ernst Holger, Patent applications and subsequent changes of performance: evidence from time series cross section analysis on the firm level, Research Policy, 30 (1) 2001, 143-157
12 Albuquerque E M, Domestic patents and developing countries: arguments for their study and data from Brazil (1980-1985), Research Policy, 29 (9) 2000, 1047-1060
15 Nogues Julio J, Social costs and benefits of introducing patent protection for pharmaceutical drugs in developing countries, The Developing Economies, 31 (1) 1993, 24-53
16 Kingston William, Innovation needs patents reform, Research Policy, 30 (3) 2001, 403-423
18 Bagachi A K and Bhattacharya U K, Indian patents as competitive instruments, dream and reality, Economic and Political Weekly, 30 (25) 1995, 1501-1511