

Trade Related Intellectual Property Rights in Fisheries: The Indian Context

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Introduction

At the end of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) in 1994, the Trade Related Intellectual Property Rights (TRIPS) agreement was implemented to regulate standards of Intellectual Property (IP) regulations in WTO member countries. The Uruguay Round introduced IP rights into the multilateral trading system for the first time through a set of comprehensive disciplines. Being a member of the WTO and a signatory to the TRIPS agreement, it is compulsory for India to formulate its IP regulations to comply with the TRIPS agreement. The TRIPS Agreement is subject to WTO dispute settlement mechanism, which is contained in the Dispute Settlement Understanding ("Understanding on Rules and Procedures Governing the Settlement of Disputes", TRIPS) (Grain, 1998).

TRIPS constituted Annexure 1C of the Marrakesh Agreement (Marrakesh Agreement was the final act of the Uruguay Round of GATT negotiations concluded in Marrakesh, Morocco and was effective since 1st January 1995), which established the WTO. TRIPS is intended to maximize the contribution of IP systems to economic growth through accelerating trade and investment.

TRIPS agreement covers five broad issues:

- How basic principles of the trading system and other international IP agreements should be applied to improve trade?
- How to give adequate protection to IP rights?
- How countries should enforce those rights adequately in their own territories?
- How to settle disputes on IP between members of the WTO?
- Special transitional arrangements during the period when the new system is being introduced.

TRIPS and Intellectual Property Rights (IPRs) with Special Reference to Fisheries

The main objective of the TRIPS agreement is explained under Article 7 as ".....to provide protection and enforcement of IP rights, which should contribute to the promotion of technological innovation and to the transfer and dissemination of technology to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare and a balance of rights and obligations". According to Article 65, WTO members (including India) must ensure their laws meet the

minimum standards laid down in the TRIPS agreement. IP Rights (IPRs) at a multilateral level have their genesis in the Paris Convention for the Protection of Industrial Property in 1883, which protected industrial property i.e. Patents and trademarks. Through the TRIPS, the WTO makes it mandatory for all its member countries to follow basic minimum standards of IPR provided for under TRIPS and bring about a degree of harmonization of domestic laws in this field. The TRIPS agreement represents the existing global state of IPR standards and legally binds all its member countries. It is the only agreement amongst several multilateral agreements under WTO which have significant impacts on global trade (Maskus, 2000). TRIPS has a direct impact on agricultural and fisheries trade and development, particularly on biotechnology aspects (WIPO, 2009), and its impact on trade is comparatively more important for developing countries as fisheries is a significant stakeholder in India's GDP. The key element of the TRIPS agreement for the agricultural and fisheries sector is the requirement for WTO members to make patents available for any inventions in the sector. The most important article in the agreement when considering the agricultural (fisheries subject is included under agriculture) sector is Article 27, which reads as follows:

Article 27: Patentable Subject Matter

- 1) Patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application. Patents shall be available and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced.
- 2) Members may exclude from patentability inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect ..., including to protect human, animal or plant life or health or to avoid serious prejudice to the environment, provided that such exclusion is not made merely because the exploitation is prohibited by their law.
- 3) Members may also exclude from patentability:
 - Diagnostic, therapeutic and surgical methods for the treatment of humans or animals;
 - Plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof.

According to the TRIPS agreement India had to provide legal protection to farmers traditional knowledge (including that of fisheries) via patents or by an effective *sui generis* system or by both, by 2006. However, the agreement provides for each country to determine and adopt a suitable procedure to implement the provisions of the agreement within its legal system and practices. Developed countries like US and UK have adopted well-built IP regimes using strong patent systems in fisheries and agriculture sector, in general. The main reason for developed countries to choose patents for protection is due to their technological capabilities and the immense financial benefits that a patent system is expected to generate (Holger, 2001). Whereas, developing countries like India has weak regimes due to lack of financial and technical support. Most of the developing countries have faced several difficulties in protecting inventions related to fisheries which mainly attribute to lack of strong rules and regulations. Biological resources including that from fisheries sector have not been registered or documented in most developing countries and with the globalization process, bio-diversity and the traditional knowledge, skills and technologies

possessed by local farmers in developing these varieties are at stake. Global Multi-National Companies (MNCs) have engaged in bio-piracy of vital genetic resources and associated traditional knowledge found in developing countries to get patent rights for their own countries. In this process, the developing countries are continuously denied the benefits, which legitimately belong to them. The industrial property systems were set up centuries ago for inanimate objects and that too in formal systems of innovation. The time has come to revisit them. The emerging challenge is to look at the systems that will deal with animate objects (such as fishes).

ICAR Policies with Respect to TRIPS and Fisheries

With respect to the biological material (e.g., fish) used in various invention/s specific attention need to be given to the source or geographical origin of biological material used in the invention and the same need to be disclosed in the patent application will be mentioned in the specification. The reference samples deposited at the Genetic Resources Bureaus of ICAR will be helpful for internal reference (ICAR, 2006). However, in case of any litigation it is likely that the evidence in the form of such duly characterized and documented referral sample can be held valid at the discretion of a Court of Law. As referred in the ICAR Guidelines for Intellectual Property Management and Technology Transfer/Commercialization, all ICAR institutions must take individual initiative of depositing a referral sample at the respective National Bureaus (e.g., fish genetic resources) before filing a patent for any invention based on biological material. Traditional knowledge in fisheries also comprises an important share of IP as outlined under the TRIPS Agreement. Accordingly, ICAR shall also disclose the traditional knowledge related to the innovations made in its set up in all its patent/ IPR applications to the best of its knowledge and information.

In this context it requires to be mentioned that isolation of indigenous genes from fish or marine organisms and their application for specific target traits will have special significance and prospects. Therefore, ICAR genetic resources bureau for fish will make efforts to register document and index these knowledge items in public domain. This is to discourage any patenting of the public domain traditional knowledge.

Improved breeds/ strains of fish cannot be protected in India as patents or variety protection. However, these resources constitute valuable assets in ICAR and India. The ICAR has a system in place for plant germplasm registration and documentation at its National Bureau of Plant Genetic Resources (NBPGR) for long. However for elite fish genetic material in the public domain, there is no IPR enabling provision under the existing Indian laws nor is there any provision for the registration and documentation of the breeds and strains of fish developed by ICAR. To check their misuse or exploitation, "ICAR will develop a system of their registration and documentation, at the respective National Bureaus of Animal and Fish Genetic Resources for quickly placing them through disclosure in the public domain thereby forestalling any unforeseen patenting in other countriesand to establish a system of their registration and documentation. It will suitably extend the existing system to register and document the elite and new breeds/strains of fish developed in ICAR, at the National Bureau of Fish Genetic Resources (NBFGR)" (ICAR, 2006).

Need for Registration of Aquatic Diversity

As per Section 3j of Indian Patents Act, no living organism as a whole obtained from nature can be patented. As per Indian Patent Act, Section 3(j), plants & animals in whole or any part thereof other than GMO and essentially biological processes for production or propagation of plants and animals are not patentable in India. However, IPA allows for

patenting whole organisms like transgenics, with human intervention. There is no national mechanism for documenting information about fish germplasm exists to bring it in public domain. NBFGR has been identified as a nodal institute to develop a system to register and document valuable fish genetic resources by ICAR. The registration system will bring elite germplasm into public domain to promote its use in research. To pre-empt any unforeseen grant of patents on fish, including the improved breeds/strains, there is a need to establish a system of their registration and documentation to suitably register and document the elite and new breeds/strains of fish developed in ICAR at National Bureau of Fish Genetic Resources (NBFGR).

Intellectual Property Rights in Fisheries Sector

Patent statistics revealed that 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 insignificant number of patent protection in India and licensing of patented technologies is also reflected in the index of patent rights, which is 1.48 in 1990 (Ginarte and Walter, 1997; WIPO, 2011). Japan has the largest share of foreign patent grants by the USPTO (40 per cent, as recorded up to early 2010). The EU is second, with a 27 per cent share. The Asia-8 group was in third place with 20 per cent; its share nearly doubled from 2000 to 2010, largely because of rapid growth by South Korea and Taiwan. Chinese patenting activities in the U.S. remained insubstantial, as did those of Brazil, Russia, and India, in contrast to much higher activity of Chinese and other national patent offices. However, as compared to China the patents granted for favour of India remained insignificant (93706 patents by China as compared to 18230 by India during the year 2008).

In recent times among the Indian organizations, CSIR along with other private industries are the major patent applicants in India and US, the rest of patent applicants are foreign individuals. There is also lack in continuity in patenting activity for the last four decades from 1920-1950 in the field of aquaculture. However, in recent years (after 1996) there are incremental trend in patent filing in ICAR institutes including fisheries. Among fisheries, a maximum of 55 per cent of patents have been granted in the field of processing technology followed by 24.5 per cent in fishing technology and about 21 per cent in aquaculture. Among fish processing technology, about 43 per cent of the patents granted to the foreign nationals, and about 15 per cent to CSIR in the subject area of extraction and isolation of polysaccharides and protein from marine organisms, fish oil originated fat liquors, alkaloid from sponge etc. In post WTO era (1996-2000), the average number of patents granted in fisheries discipline is six in a year. Increasing awareness for patent search engines/sites, access to patent information, and the comparatively easier administrative procedures in the amended patent laws are among various reasons for increased patenting activity. In aquaculture too, the majority of patents (45 per cent) granted in India are to the foreign nationals (Ninan et al., 2005). Since the innovations in processing technology can be varied easily in the process patent application area, and are easily imitable towards various directions, there appeared to be greater trend to incline for processing technology in fisheries subject. Importance of processing technologies with respect to export and trade in and outside India also are the reasons that hold the edge towards patent application in India as compared to other subjects in fisheries like aquaculture, machinery or fishing technology. 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, polyunsaturated fatty acids, bioactive compounds, alkaloids and other bioprocessed products.

In recent times seaweeds and marine plants have been identified as valuable resources to isolate bioactive molecules for use against different diseases. However, this area is vastly unexploited and after implementation of the product patent regime in 2005, research and patenting activity in this sector could rise. CMFRI has taken the lead to develop a nutraceutical supplement with concentrated anti-inflammatory principles as Cadalmin™ Green Algal extract from seaweeds for use against joint pain and arthritis (Indian Patent Appl. No. 2064/CHE/2010). Around 46 per cent of the total patents granted in fisheries sector during the post WTO era (1996-2002) are in processing technology. A total of 27.93 per cent of patents applications 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 per cent of patent applications relate to aquaculture, and about 12 per cent patent applications relate to fishing technology.

Protection of Technologies in Fisheries with Special Glimpse of the Technologies Developed By Marine Fisheries in India

Technologies in the fisheries can receive protection by patents, trademarks, geographic indications, and copyright, and design. These technologies receive protection by one or a combination of different IPRs depending upon the nature of technology (Ravishankar and Archak, 2000). Given the vast and unexplored potential of utilization of aquatic resources, the increasing trend in biotechnological patents in the developed countries, patenting of aquatic genetic resources will have an increasing trend in times to come. The use of aquatic resources has a significant potential in pharmaceuticals, nutraceuticals, high value compounds/chemicals, cosmetics and food.

For example, technologies have been developed in marine fisheries in India for land-based culture of pearls, fish strains, packages of improved marine finfish and shellfish husbandry practices, natural resource management technologies, improved tools including cage culture technology for open sea fish farming, technologies for making nutraceuticals and value added products, computer software and data sets, and several other processes and products related to fisheries sector, some of which have been safeguarded by patents. Central Marine Fisheries Research Institute is the pioneering ICAR institute to conduct marine fisheries research in India, and endowed with the potential to benefit the fish farmers and related entrepreneurs with her technologies. CMFRI pioneered in shaping a number of IP protected technologies, which are of direct or indirect benefits to the society and mankind. Design, development and propagation of open sea cage device for cultivating marine fishes along the coastline of India (Indian Patent Appl. No. 31/CHE/2010), cutting edge mariculture technologies of food fishes such as cobia (*Rachycentron canadum*), silver pompano (*Trachinotus blochii*) and *Etroplus* sp are some of the success stories of marine fisheries and CMFRI. The mariculture in open sea cage device will expand a new mariculture space in future. The breakthrough of cobia and pompano breeding is considered as a milestone towards the development of foodfish mariculture in the country. CMFRI achieved the rare feat of joining the elite group of countries (US and Australia) engaged in satellite tracking of yellowfin tuna (*Thunnus albacares*) with pop up satellite tagging of this species in oceanic waters. CMFRI showed the way of land-based culturing of pearl oyster in marine body (Indian Patent Appl. No. 1543/CHE/2009), open sea green mussel and oyster farming, hatchery technology for production of ornamental fish (Indian Patent Appl. No. 3455/DEL/05), edible clams, sea horse, mass scale spat production of green mussel, artemia selective breeding to impart high value traits for use in mariculture (Indian Patent Appl. No. 2063/CHE/2010), biotechnological interventions to control fish diseases and maintain fish health, probiotics, bioprospecting beneficial microorganisms for aquaculture grade antibioitic substitute, biocatalysts from beneficial bacterial flora (Indian Patent Appl. No. 203/CHE/2008), PCR kits to manage various fish diseases, gene mining technologies for

various important traits, phytoplankton culture and algal biotechnology, production process for sea cucumber *Holothuria scabra* and *Holothuria spinifera* seeds or fingerlings, resource management of the Indian sacred chank, *Xancus pyrum* (= *Turbinella pyrum*) by breeding, nursery rearing and sea ranching, propagation of soft coral *Sinularia kavarattiensis*, fish aggregating devices (FAD), capture based aquaculture of mullets and red snapper, lobster farming in floating sea cages, mud spiny lobsters (*Panulirus polyphagus* fattening in sea cages), image pearl production, cost effective and rapid duplex PCR kit for early detection of white spot syndrome virus of shrimp, Cadalmin™ Varna (Indian Patent Appl. No. 32/CHE/2010) and Cadalmin™ Silo fish feed, which are of direct use of the fish farming communities. Marine organisms too have various potential applications in the area of human health. This has more to do with the relative infancy of marine bioprospecting. In the process of harnessing high value bioactive molecules from marine organisms, CMFRI could able to successfully develop a number of products for use as nutraceuticals for human health. A patent protected product Cadalmin™ Green Mussel extract (Cadalmin™ GMe) containing anti-inflammatory principles from *Perna viridis* to combat joint pain, arthritis/inflammatory diseases developed by CMFRI as an effective green alternative to the synthetic drugs available in the market (Indian Patent Appl. No. 2065-2066/CHE/2010). Cadalmin™ Green Algal extract (Cadalmin™ GAe) is another addition to the pipeline of the nutraceuticals developed by CMFRI (Indian Patent Appl. No. 2064/CHE/2010). Cadalmin™ GAe contains 100 per cent natural and a vegetarian marine bioactive anti-inflammatory ingredient extracted from a blend of marine macro algae with an ecofriendly “green” technology, and is a natural remedy to chronic joint pain and arthritis. The institute has taken a leading role on frontier areas of research such as stock assessment of marine fisheries, mariculture, biotechnology, marine bioprospecting, development of nutraceuticals and valuable bioactive molecules from sea, bioinformatics, remote sensing, and climate change. Most importantly, CMFRI is mandated with natural resource management technologies. Several techniques, protocols, and technologies developed by CMFRI cannot be transferred to the end users. However, these are the vital links to ecosystem, and can be used for human welfare. Some of these natural resource management technologies developed in the area of marine fisheries are trawl ban, fish watch – spot information system of Indian marine fisheries, national marine fisheries data centre, database on socio- economic evaluation and technology, extension modules, multi-stage stratified random sampling for estimation of marine fish landings in the country and information system, mangrove restoration, conservation of shark and marine mammals, m-KRISHI® fisheries mobile service, documentation of seaweeds, seagrasses, hard corals and shallow water sponges of Indian coastline, among many.

Bioactive Compounds from Marine Organisms: A Potential Source of IP in Marine Sector

Ocean is a potential source of bioactive compounds, which does not have a significant history of use in traditional medicine as in the case of terrestrial plants (Kamboj, 1999). Previously, the research was focused mainly on terrestrial plants because of their easier availability. The isolation of biologically unique molecules from marine organisms that are not found in terrestrial sources leads to a remarkable progress in marine bio prospecting. The boom of marine bio-prospecting began in recent years and 18000 plus natural compounds from marine organisms have been isolated as compared to 155000 terrestrial products (Blunt, 2004; Mayer et al., 2007). Between 1969 and 1995, 63 marine substances were patented as antitumor agents, accounting for half the marine molecules patented for pharmaceutical purposes (MartínezPrat, 2002). There are a significant (and growing) number of marine-derived compounds with pharmaceutical potential in the pipeline. The accompanying table (modified from one included in Kijjoa and Sawangong 2004) presents the marine-derived potential therapeutic compounds used for drug

discovery efforts. Many of these are still undergoing preclinical evaluation, but several others are currently being administered to patients as part of clinical trials.

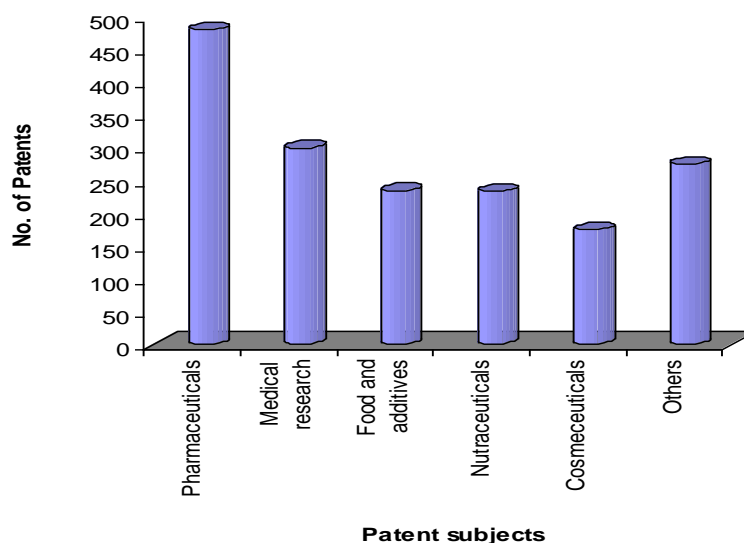


Figure 14.1 Distribution between patent subjects and its number

CMFRI is one of the pioneering institutes to isolate and characterize bioactive compounds with antioxidant, antibacterial, and anti-inflammatory properties from marine flora and fauna, some of them have been protected by patents (Appl. No. 2064/CHE/2010, 2065/CHE/2010, 2066/CHE/2010). A sampling of some of the most exciting marine based IP protected drug discoveries currently undergoing clinical evaluation are briefly summarized below.

Table 14.1 Marine based IP protected drug discoveries

Diseases	Biomolecules/bioactive compd	Marine source orga
HIV	Cyclodidemniserinol trisulfate	Tunicate
	Lamellarin α -20-sulfate	Tunicate
Pain	Conotoxins	Gastropods
Cancer	Bryostatin	Bryozoan
	Didemnin-B	Tunicate
	Dolastatin 10	Sea hare
	Halichondrin B	Sponge
	Ecteinascidin 743	Tunicate
	Kahalaide F	Gastropod
	Aplidine	Tunicate
Asthma	Contignasterol	Sponge

(Modified after Kijjoa and Sawangwong 2004)

IP in Marine Sector

A novel process to produce a product or by-product out of marine resource, or product itself is patentable. Also the pharmaceutical or other properties of bioactive compound(s) that is (are) unknown from marine resource is patentable. Marine organisms have various

biotechnological applications in the area of health, environment and mariculture. As compared to terrestrial ecosystem very meager is known and explored from marine environment probably because of the difficulty in reaching the depths.

The areas of patenting in fisheries sector includes Technologies and methodologies in fishing processing, and aquaculture/mariculture (with intervention) , Pharmaceuticals ,Food and feed, Nutraceuticals, Cosmetics , and Bioactive compounds .The percentage contribution of patented technologies under the three major divisions of fisheries sector include 21 per cent on aquaculture,25 per cent on fishing, and 54 per cent on fish processing (Ninan et al, 2005). An increasing trend of filing patents after the Indian Patent Act, 1970, and further increase in post WTO era is also noteworthy.

Fish Genetic Resources: Consultative Group on International Agricultural Research (CGIAR) Policy Framework

Cultures of the marine coastal populations are directly linked to marine biodiversity. Many of them have developed management systems that, while ensuring the conservation of marine biodiversity, they used several traditional practices using marine resources. For example, coastal peoples of northwestern America use marine algae for wound healing and health care purposes. Traditional healing practices in the Maldives rely both on terrestrial plant species and many marine species of fish, coral and seaweed. In Brazil, traditional zotherapy knowledge of the artisanal fishing community is well known for using marine organisms for use as folk medicine (Medeiros Costa-Neto, 2000). Marine diversity is increasingly feeding a myriad of industries. On the one hand, many industries are turning to the sea, expecting that its huge genetic, biochemical and physiologic diversity will contain useful substances.

The expectations on long-term productivity increases derived from the use of fish genetic resources have also resulted in the extension of property rights over them—in a process that parallels that of plant genetic resources for agriculture. As a member of the CGIAR, ICLARM has endorsed the CGIAR's IPR policy. The CGIAR is promoting the transfer of intensified production systems for the benefit of the poor. However, its IPR policy is highly controversial. On the one hand, it is designed to prevent others from obtaining IPRs on genetic resources as collected and provided by gene banks. On the other hand, it allows for the “defensive patenting” of in-house developed technologies and products. No matter whether this “defensive patenting” intends to ensure that the CGIAR inventions will not be slightly modified and patented by somebody else, or seeks providing the group with bargaining chips to negotiate the transfer of technologies from the private sector, it legitimates the patenting of genetic resources. The trend towards the patenting of fish genetic resources, and even the patenting of new breeds of fish, is accelerating as the aquaculture industry applies biotechnology shortcuts—including hybridization, sex manipulation, polyploidy and genetic engineering—which are more amenable to patenting than selective breeding (Correa, 1998).

Summary of Key Messages

The coastline of about 8118 km of Peninsular India with about 20 lakh square km of exclusive economic zone for fishing around coastline (Ayyappan et al., 2011). High priority is being offered to fisheries development with the support for production, marketing, canning the fishes as well as offering suitable training for fishery industry. The fish production has increased compared to other agricultural products (1.1 per cent of the total GDP and 5.3 per cent of the agricultural GDP in India). During 2010-11, the production of marine fishes was estimated to be about 3.07 million tons as compared to a meager 0.534

million tons during 1950-51. Marine fishery registered an annual growth rate of 3.2 per cent with a total fish production of about 3.07 million tons during 2010-11. The total quantities marine fish and products exported during 2010-11 was recorded to be 813091 tons as compared to 678436 tons in the previous year (2009-10). Marine fish has retained its position as the principal export item in quantity terms and the second largest export item in value terms, accounted for a share of about 38.42 per cent in quantity and 20.42 per cent in US\$ earnings. Indian coastline and EEZ is gifted with an enormous resources of valuables hidden into the depths of sea, and can be explored to develop products with valuable patent protected nutraceutical, pharmaceutical and biomedical products for human health and well being. In doing so, our country can be the leader in this area if we efficiently harness the valuables for marine ecosystem and deliver efficient technologies from the sea, and to avoid other countries to intrude into our rich resources that happened earlier with turmeric, neem, and basmati rice. An inventor can be deprived of his rightful share of recognition for his invention if malicious persons get hold of his product and promote it as their own. IP system comes to the rescue of the inventor in this situation. This will provide the true inventors with the due recognition to the ownership of an inventor over his/her innovative idea. The ultimate goals of any intellectual property system are safeguarding the rights of an inventor in his invention/ intellectual richness while benefiting the end users and society as a whole.

The IP system operates, as TRIPS agreement states, towards securing its objectives as follows: “.....protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.” This will encourage scientific research, new technology and industrial progress. The patent protection system must be worked out towards the benefit all stakeholders- patentee, society, and the nation.

Patents therefore play an important role as far as the commercial aspects of the products are concerned. The purpose of an invention is to protect and encourage fair competition in the field of technology so as to transform inventions or creations into real and productive forces at the earliest. A nation’s market economy is dependant on the successful working of its patent system (*Industrial Gases v Kamsup Industrial Gases PTC (Supp.) (2) 358. 368*). The Patent Act contains general principles applicable to the working of all patented inventions. It is provided that “...in exercising powers concerning grant of compulsory licences, regard should *inter alia* be had to encourage innovations and to secure that inventions are worked in India on a commercial scale, and to the fullest extent reasonably practicable without undue delay, but to see that patent rights contribute to technological innovation, and to transfer and to disseminate technology for the mutual advantage of producers and users of technological knowledge in a manner conducive to social and economic welfare and to ensure that the benefit of the patented invention is available at a reasonably affordable prices to the public and for grant of compulsory licences in respect of patents for the reasonable requirements of the public.....”. It is therefore, obligatory for the patent holder/s or assignee/s to work out the patented invention towards commercialization for ensuring economic and social growth by providing an impetus to the advancement of science and technology towards the benefit of society and mankind.
