

Technical Note 1.

THE USE OF PATENT STATISTICS FOR INTERNATIONAL COMPARISONS AND ANALYSIS OF DEVELOPMENTS IN FISHERIES AND AQUACULTURE TECHNOLOGIES

Key points

- The number of fisheries and aquaculture-related patents grew by an average of 5% per year from the 1990s to 2013.
- Recent patents have mainly to do with harvesting technologies and new products and markets.
- While more than two-thirds of all patents in fisheries and aquaculture originate from the United States, Korea, the European Union and Japan, inventors from Japan, Iceland and Denmark have frequently sought protection in multiple patent jurisdictions. This may be related to high-value inventions and may reflect the commercial strategy and market expectations of the applicant.

What's the issue?

Patents are considered by some to involve a trade-off between incentives to innovate and competition in the market along with diffusion of technology (OECD, 2004). Patents allow inventors to profit from their inventions and so are important enablers of innovation. Nevertheless, this protection may also hamper innovation by limiting competition and technology diffusion (OECD, 2009).

Patents can serve as a measure of innovation output, albeit an imperfect one. As a measure of inventive activities it has restrictions because not all inventions are patentable, not all patentable inventions are patented and the economic value of inventions can vary tremendously. Furthermore, the weak enforcement of patent rights and impediments like procedural complexities in some countries can also imply a lower propensity to patent innovations (Ninan, 2005). Here, the number of patents can still provide indication of the intensity and areas of emphasis of research. Patent documents identify among other things the applicant, inventor, technology category, claims, and cover a broad range of technologies on which there are sometimes few other sources of data. The patent indicators proposed here use this information to inform policy makers on the patterns of development of new fisheries and aquaculture technologies¹.

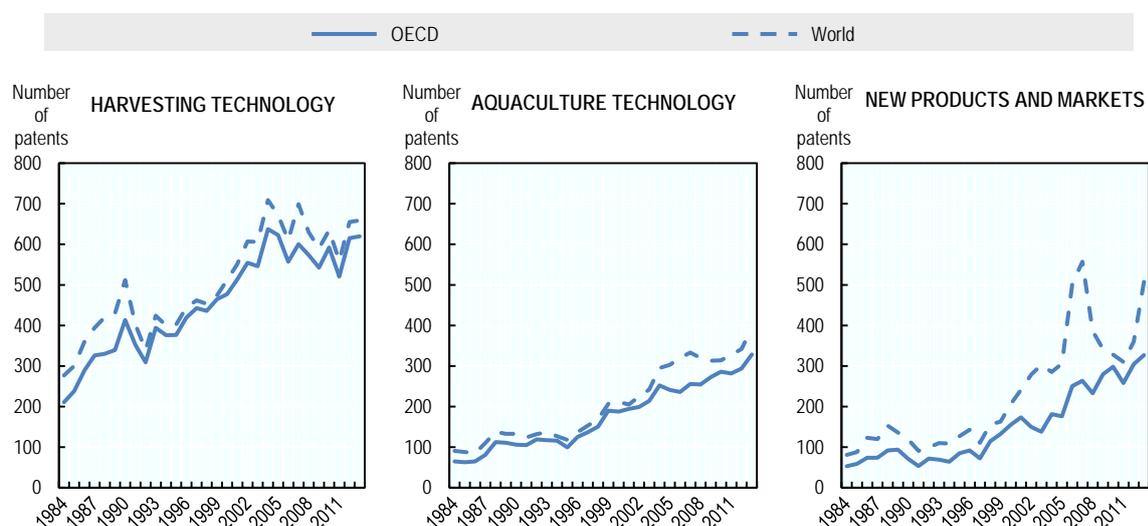
Using patents as an indicator shows that between 2009 and 2013, within OECD countries, most technology developments in fisheries and aquaculture sectors occurred in Korea (41.4%), United States (26.4%), the European Union (16.3%) and Japan (8.1%). Patent's applications declined after the 2008 financial crisis, mostly due to the declined of Republic of China and United States patents, and then almost rebounded in 2013 to 2008 level (Figure 1)². Some gaps exist in the available patent database on which the analysis relies with respect to country coverage, especially in developing countries, which complicates any assessment of patenting trends in the world (OECD, 2009)³. The number of all fisheries and aquaculture-related patents grew at an average annual growth rate of 3 % from 1990s to 2013.

¹ See methodology below for more information

² Patents' data are available until 2013 following the update in autumn 2016. For more information, please refer to [metadata](#) and [OECD.stat](#)

³ Notably for Japan, France (with missing coverage on the country of residence of inventors in some years), Chile (1980-2004 and 2009 are not covered at all, 2005 and 2008 only partly) and developing countries.

Figure 1: The number of fisheries and aquaculture-related patents in OECD countries and worldwide according to the residence of the inventor(s).



Source: OECD.Stat.

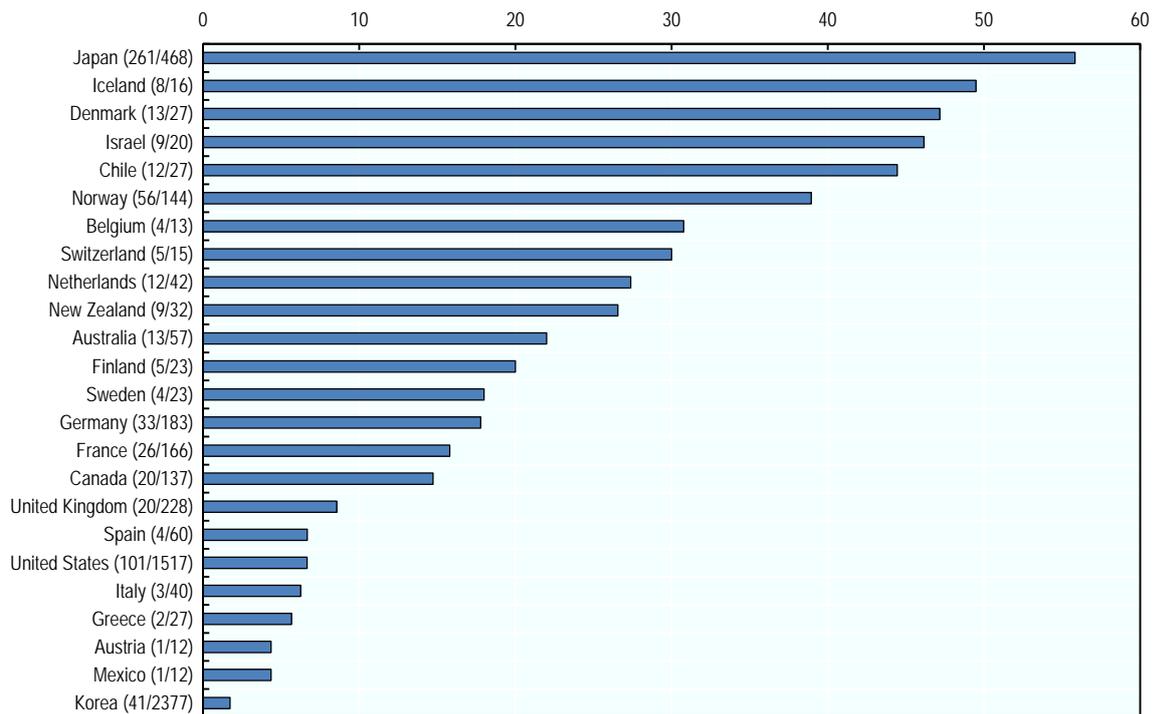
The data presented here concern all patents in fisheries and aquaculture (i.e. protected in at least one country). At the global level, between 2009 and 2013, for all patent domains related to fisheries and aquaculture Korea (36.3 %), the United States (23.2 %), the European Union (16.7%) and Japan (7.1%) account for the largest share.

The dominant position of Korea in the development of all patents in fisheries and aquaculture in recent years may reflect the growth in Korean R&D spending. As a share of GDP, this has reached 4.15% in 2013, compared to an OECD average of 2.4% (OECD, 2015b). Most of this research appears to be specialised for the domestic market, as the majority of the inventions have patent protection only in Korea (figure 2).

Considering only those inventions with broader international protection (patent protection in at least four countries), the trend in technology development changes. Japan, Iceland and Denmark are the countries with the highest percentage of such patents (Figure 2). The protected size of a patent family⁴ has been found to be correlated with the expected market value of the invention (Martinez, 2010; OECD, 2009; Squicciarini, 2013). Because it is expensive for holders to maintain patent protection in additional countries, it is theorised that only higher value inventions will be worth the cost of expanded international protection (Hašič 2015). In some cases, the IP office where the patent has been filed may be related to the presence of a multinational company headquartered in these countries, or other factors that would lead to an export focus based on foreign direct investment that would require broader technology protection. However, it can also be assumed that in some countries domestic market is separated from global trade that is why domestic firms seek protection in only one country.

⁴ The "family size" represents the number of countries where the patent application filed to protect a same invention. Family size "2 and greater" will count inventions that have sought patent protection in at least two countries, and so on. In Figure 2, data for the maximum family size measured "4 and greater" is shown.

Figure 2: Patent coverage “four and greater” for all domains in percentage of the country total patents (2009-2013)



Here only OECD countries with more than 10 patents in total are taken into account. The number of “four and greater” patents and the total number of patents for each country are indicated in the vertical axis in brackets.

Source: OECD.Stat.

Harvesting technologies

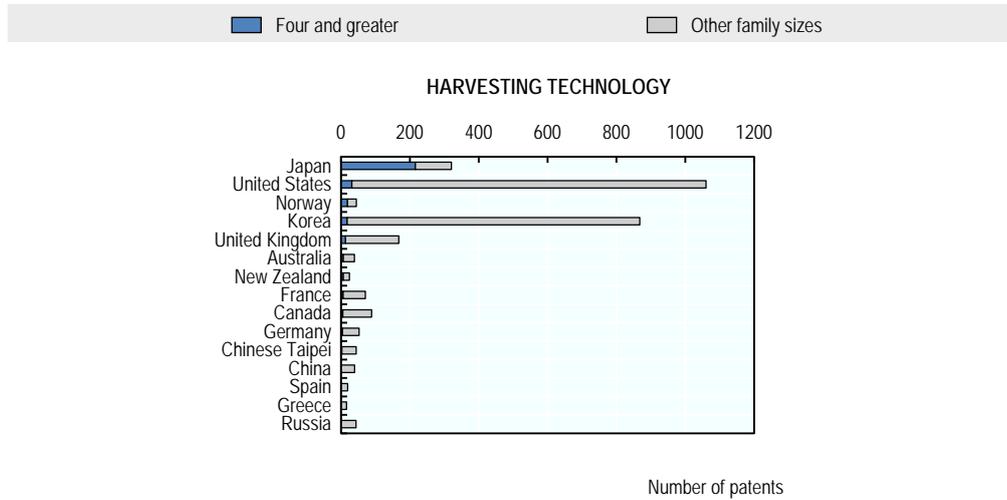
Patented innovation in the fisheries sector mainly focuses on the development of harvesting technologies (Figure 1). These inventions are associated with specific devices (such as artificial bait or pole and line) to make fishing operations more selective and productive. In the world, for harvesting technologies, the United States (34.2%), Korea (28 %) and Japan (10.3 %) account for most of the new patents between 2009 and 2013 in that domain (Figure 3). European Union member states (within the OECD) accounted for 13.9 % of patents of this type in the same period. There are differences in the pursuit of patent protection in multiple countries; for the United States and Korea, only 3 % and 2 % of their total patents respectively are protected in at least four countries, for Japan it is 67 %, 8.5% for France 7.7.% for the United Kingdom and 5.6% for Canada. It is important to note that focusing on fisheries patents only underestimate the level of innovation technologies related to harvesting since some are also adapted from outside of the fishing industry (e.g. vessels with higher capacity, sonar, powerful engine, etc.).

Aquaculture technologies

Patents in aquaculture technologies mostly involve the culture of fish or shellfish with technologies such as sex determination, floating fish-farms, incubators or hatching devices, feeding devices and receptacles for live fish. While Korea, the United States and Japan are leading technological developments in these fields, Germany and Norway have issued a large number of patents in this area representing 5% each of the world total patents (Figure 3)⁵. Germany (12.64 %) and Norway (37.4 %) have also protected a large number of their inventions in more than four countries.

⁵ German companies have specialised in the development of receptacles for live fish, e.g. aquaria technologies and Norway for the culture of fish, mussels, crayfish, lobsters, sponges, pearls or the like.

Figure 3: Inventor countries top ranking in patenting harvesting and aquaculture technologies, 2009-2013

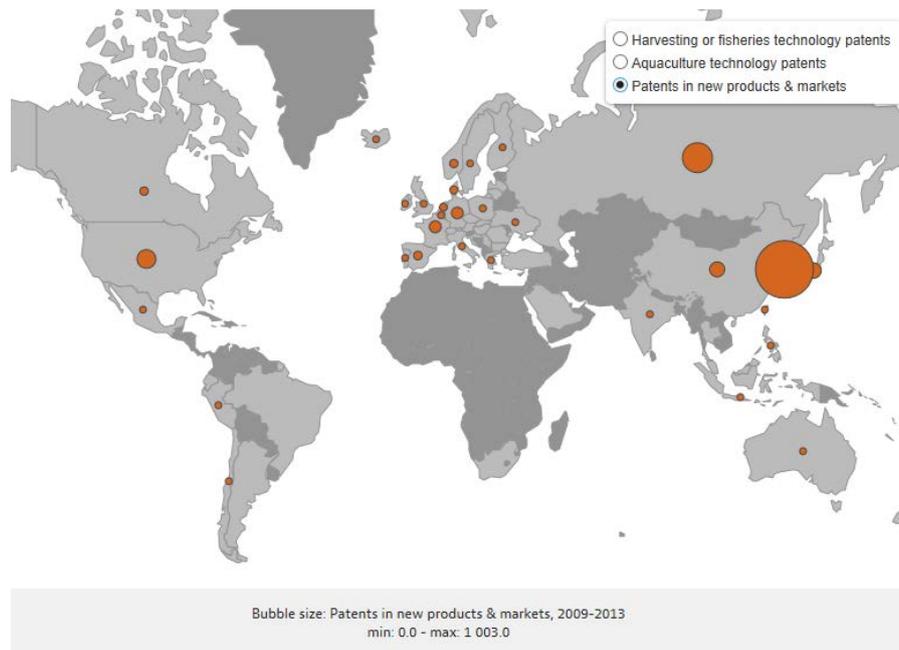


Source: OECD.Stat

New products and markets

New products and markets can add value and provide additional revenue sources, such as when fish products are processed and used in a way that finds new economic opportunities. The main patents observed in this category include technologies that help the production of food from the-sea products such as preparation or treatment of fish meal or powder; fish eggs substitutes, shell-fish, edible seaweed and the addition of, or treatment with, micro-organisms or enzymes. Russia has played a leading role these last years, representing 14.6 % of the total patented inventions developed in the world, behind Korea in that domain between 2009 and 2013 (figure 4). Very few of these types of inventions are protected in more than one country which can be a sign of a domestic market focus by firms

Figure 4: Patents in new products and markets 2009-2013 (one and greater) according to the residence of the inventor(s).



Source: OECD.Stat and [OECD fisheries and aquaculture innovation platform \(FAIP\)](#)

Method

To better understand the role of innovation in the fisheries and aquaculture sectors, the OECD Fisheries Committee has built a [Fisheries and Aquaculture Innovation Platform \(FAIP\)](#) to collect and share information. [Patent data](#), included as part of the FAIP, is an indicator that can help measure the role of innovation and provide an overview of developments over the past 30 years.

The patent statistics presented here used data from the Worldwide Patent Statistical Database (PATSTAT) of the European Patent Office (EPO) made available in the OECD STI Microdata lab, using algorithms developed by the OECD (Hašćic, 2015). Statistics were compiled according to the FISH approach described on the FAIP and are based on the priority filing date that is, the first filing date worldwide under the Paris Convention. This date is considered to be the closest to the actual date of invention. This dataset provides the number of inventions protected in at least one country and, as such, this category includes all patents for which data are available. In this context, the fractional count of priority applications provides an important index of technological development and reflects the entrepreneurial dynamism of the inventor's country.

Data are broken down by selected technology fields. Five categories of innovation are reflected in fisheries and aquaculture sectors, but only three are taken into account in this study: harvesting or fishing technologies⁶, aquaculture technologies⁷ and new products and markets⁸. Innovations that

6. Harvesting or fishing technologies are defined as more effective ways to find or harvest fish and which are typically associated with improvements in catch per unit of effort (for example: type/size of vessels and their methods of propulsion, search technologies, method of catching or harvesting fish and bringing them on board)
7. Aquaculture technologies are defined as methods to more effectively grow fish in captivity (innovation in feeds, improving the health of aquaculture animals, etc.)
8. New products & markets are defined as the development of new fish products and markets (food technologies/processing such as the development of surimi as a crabmeat substitute) and the improvement of market access (secure or enlarge markets for fish products) that provides important incentives for green growth (for example: eco-certification with fishers adopting by-catch saving technologies or modifying fishing practices and/or territorial user rights in fisheries.)

concern Institutions or conservation technology are not taken into account in this analysis. Institutional innovations do not lead to patenting, and conservation technology innovations that may apply to fisheries and aquaculture generally come from another sector. This analysis focuses on innovation that comes directly from inventors within the fisheries sector and thus does not account for the many technology innovations developed in other sectors that are then adapted and employed in the fisheries sector.

Further reading

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