



Innovations in Coffee: Patents Reveal in Indonesia

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Abstract

This paper aims to reveal coffee-related innovations based on the number of registered patents in Indonesia. This paper used a desk study with a literature review and a descriptive analysis method. A literature study to identify existing innovations from registered documents through patent mining, sourced from Indonesian and WIPO patent databases. **Findings.** The results from the Directorate General of Intellectual Property Rights of Indonesia's patent search, the registered patent on coffee is 202 patents. From the invention technology, the innovations group into coffee processing as beverage (53%), coffee processing equipment (27%), extraction process (5%), and coffee breeding or plantation process (3%), and other (11%). Also, 75% of patent owners are not from Indonesia but dominate Switzerland, America, and other countries.

1. Introduction

Nowadays, the growth of coffee plantations gives us many perceptions of entering demand and production strength in the marketplace. This circumstance brings us to market opportunities to fulfil customer's requirements by improving the productivity of harvesting coffee through innovation capabilities. Increasing trend coffee production impacts turning national economic value through high economic farmer incomes. The high level of sensitivity and some of the environmental conditions growing coffee plants are the most influential to the productivity of coffee crops is the high place will relate to coffee flavour and type of rainfall. It is a necessary condition to produce the highest quality coffee standard. The meaning of coffee to the people of this town and the importance of income security for the townies, especially crop (coffee) growers, maximizing the available resources, and understanding the value chain are the goal to improve the quality of life and incomes for the people in this community (Vechgama et al., 2020). Coffee is one of the most important tropical commodities and provides economic benefits at each step of the global value chain that links growers to consumers. The coffee industry contributes to the economies of both exporting and importing countries. As a beverage, it brings joy to a growing number of consumers worldwide. At origin, coffee production provides a livelihood for up to 25 million farmers and their families. Actors along the global value chain accrue additional economic benefits: traders, roasters, retailers, and their workforce or other stakeholders (ICO, 2019a).

In world consumption, coffee becomes most important as complementary usage consumed drinks globally and is also the second most traded raw material by volume on the stock market, second only to oil (Sutil-Martín & Ricardo-Ruíz, 2018). Currently, more than 70 countries produce coffee, and global production for 2018-19 estimate at 170.937 million 60kg bags (ICO, 2019b). The distribution among coffee producers in 2018 shows Latin America accounts for 60 percent of global output, followed by Asia (24 percent) and Africa (16 percent). More than half of global coffee output is accounted for by the three dominant producers: Brazil (33 percent), Colombia (10 percent), and Vietnam (10 percent). However, some other African and Latin American countries are heavily dependent on their exports of coffee, despite their low share in global output (Baffes et al., 2005). Nowadays, coffee commercials produce in more than 50 countries. The world drinks over 3 billion cups a day, alone, with families, friends, or colleagues, while sitting, standing, or walking, at home or in coffee shops, and even in outer space. Coffee is a growth market. Consumers continue to rise globally, and consumption steadily grows at a healthy annual rate of 2.2% (ICO, 2019a). On the other side, coffee has a value chain cycle regarding risks, income, resources and price volatility, and climate change, especially in measuring the development of the world's coffee industry. The coffee industry's sustainability is still vulnerable if we linkage with cover necessary production costs at current price levels, especially considering increases in inputs and logistics. However, there is a positive impact in the coffee industry regarding increasing economic value through sustainability production availability.

As a consumable product with high demand by the people of Indonesia, coffee has become the third most-consumed drink in the world after water and tea. Drinking coffee is not just a taste, but it has become part of their lifestyle for some urban communities. Many coffee shops spread throughout Indonesia; some are local coffee shops, while others sell branded coffee. The emergence has known the habits of consuming coffee in Indonesia of local coffee shops in each region of the local coffee products. The expansion of local cafes that provide coffee in shopping malls and public places has existed in Indonesia. Indonesia has a coffee plantation area of 1.24 Ha (in 2018), with coffee production growth from 2019-2023 is expected to continue rising by 1.43% per year (Agricultural Data and Information System Center - Ministry of Agriculture, 2019).

The increasing number of coffee productions reflects the seriousness of Indonesian coffee farmers, increasing their production and meet market needs. Indonesia has become the fourth world's coffee producer after Brazil, Vietnam, and Colombia. Besides, the selling price of coffee in Indonesia also experienced an average increase of 4.98% per year. Increased production, selling price, and export amount based on the high coffee production indicate that coffee is one of Indonesia's natural wealth and has excellent potential for the availability of raw materials products. The increasing trend of coffee consumption in Indonesian society shows an excellent opportunity to develop a business based on coffee raw materials such as coffee drinks or other products. This potential is exciting for inventors to make breakthroughs and continuous innovations in processing and marketing coffee. Most of Indonesia's current coffee production develop for generations, so only a tiny part follows innovation development. Also, the type of coffee exported abroad in mud (green bean) is necessary to certify processed coffee products. Based on the previous study, the Indonesian industry of coffee, significantly increasing quality, needs to be updated by biotechnology (Santoso et al., 2013).

The protection of Intellectual Property Rights (IPRs) was an asset and is a tool of trade competition to manifest its existence in the international market. A 10% increase from all approved patents or grants can increase economic growth by 1.67%. It shows that IPRs, especially patents, is a legal tool that can protect the work of inventors and as a tool in business strategy. It shows the innovation of coffee processing into another alternative utilization with higher economic value

than green bean as the competitiveness of products that can be sold in the free market primarily characterized by coffee plants typical of Indonesia. The development of innovations in coffee has long been developed in science, including variations of processed coffee as a beverage (Setiawan & Wikandari, 2016), making tools to process coffee, coffee plant breeding techniques, making processed coffee into other products, and others. However, patent-based innovation technology is still little discussed. It can be used as a new reference to formulate the development of coffee processing technology innovation to increase the coffee industry in Indonesia.

In this paper, innovation in coffee related to the patent reveal aims to describe the general development of coffee needs trends related to registered patents relating to technological innovations already conducted. Through patent analyses, information databases, and patents' utilization of patents is an attempt to emphasize competitiveness to open up market access to both national and international markets. The analogy to a patent application can infer that analyzing patents is most worthwhile to manage the complexities of searching and inter-relating patent information (Bonino et al., 2010). A patent search is a general term covering different search processes such as technology survey, prior art search, freedom to operate, validity, and patent portfolio search. These search processes differ in terms of the searcher's information need, the corpora, and the output of the search (Kumar et al., 2016). Fundamental science and technology trends should be monitored regularly because of the need to react quickly to technological changes and make strategic decisions on time (Mikova & Sokolova, 2014). Moreover, look at trajectories in advantageous positions when technology becomes a solution to enhance the national economic scale. In the end, this paper can be a reference for decision-makers in finding the growth of the innovative coffee technology that requires value information benchmarking.

The increase in the economic value of coffee is determined mainly by the post-harvest handling process. Coffee that does not treat has explicitly a relatively low value. In contrast to coffee that gets special treatment, the added value will be different economically. The treatment and processing in question determine by technological innovations controlled by coffee farmers and entrepreneurs. Technological innovation will produce a different taste and quality. Several factors that affect the quality and taste of coffee are variety, geographical environment, climate, and post-harvest processing methods. Natural factors such as variety and geographical environment are not dominant factors, but the method is also key to creating superior coffee taste and quality. Therefore, technological innovation in coffee processing is one of the keys to producing quality and competitive coffee. This technological innovation can obtain through patent document information. Through proper analysis, business actors in the coffee processing industry will increase their knowledge and master new techniques better than existing ones, such as coffee fermentation technology, coffee drying technology, and others. Even though analyzing patent documents in coffee technology innovation, it is possible to continue developing existing technological innovations (Salengke et al., 2019).

In the trade and business of agricultural commodities, global partnerships based on international NGOs' standards are needed to achieve social, economic, and environmental sustainability (Fadillah et al., 2019). Innovation word comes when there is something that needs to repair or develop. It happens when a condition needs to improve capabilities, especially in enhancing productivity. Advanced technology becomes a solution in providing a new dimension of output according to customer requirements. Innovation is a crucial factor in national progress. Applying advanced technology and entrepreneurship and innovation approaches in creating goods and services translates scientific and technological advances into productive economic activity (Raghupathi & Raghupathi, 2017). It includes technologically new products and processes and logistics, distribution, and marketing (Fagerberg et al., 2018). Innovation that sources from rituals

measures some (but not all) resources and is used for developing new products or processes, while patents count (patentable) inventions that were coming out of that process. The capabilities to introduce new technologies in developing economies in industrialization and modernization. Significant efforts to introduce new products and processes by adopting new capital equipment and production technologies, new goods, and services are still ongoing with emerging economies. After the users have explored enough, the next step will raise the competition and get stricter conditions in which industry stakeholders can open their markets to each other. They propose a typology of four trajectories linking innovation and development that may coexist in different industries of emerging countries. The empirical documentation offered by innovation surveys may further articulate the variety of the innovative patterns associated with the development process (Bogliacino et al., 2012). Those four trajectories link innovation and development in figure 1.

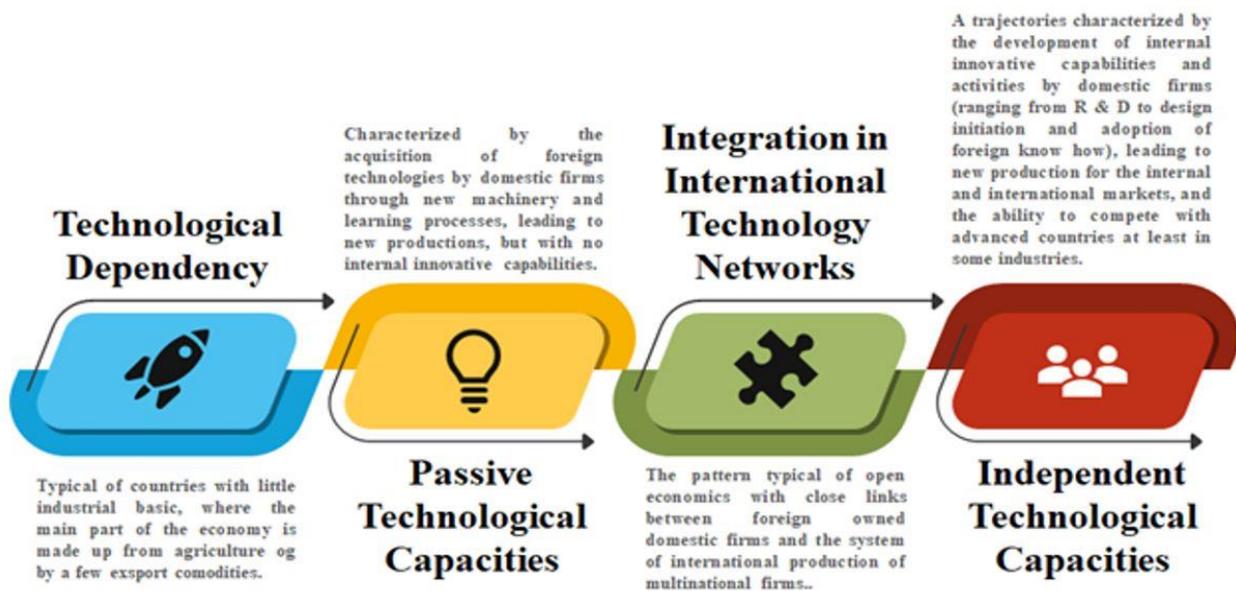


Figure 1. A trajectory linking with innovation and development

The high level of business productivity in industries today results in many opportunities leading to the industrial process. One of them in the coffee industry is excellence in meeting the community's needs. This condition becomes mainstream if we look at development coffee from the supply chain until we move to a value chain perspective in the product. Those kinds of stuff need a derivative step to elaborate many process diversification (roasted coffee, instant coffee, coffee mix, decaffeinated coffee, soluble coffee, coffee beer, ice coffee, and another kind of product) becomes a commodity with high competitiveness in the market. As one of the valuable agricultural commodities in the world market, the coffee trade is one of the most widely consumed beverages and part of a significant share of the world population's daily routines. A high economic value in trade and coffee as agricultural products is widely traded and provides foreign trade in global markets. Poverty problems that occur in rural areas overcome through increased production and added value of coffee commodities also impact millions of lives along the Global Value Chains (GVC).

The innovation of coffee from a social aspect can deliver a product to the consumer more efficiently, with higher quality, or in a unique form than the value chains in competing countries. Increasing the firm's competitiveness is only helpful at sustainably creating wealth and alleviating poverty when interventions similarly raise the industry's competitiveness at all levels of the value chain. At the same time, most economists and individuals disagree about the significance of the environment concerning economic activity. It includes specific facts regarding the depletion and

extraction of natural resources (Nguyen & Vo, 2021). The value chain analysis is based on four significant dimensions and is also related to economic growth (Samper & Quiñones-Ruiz, 2017). These dimensions are the institutional framework through which the value chain activities process, geographical coverage, governance structure, and input-output structure. All these determinants have a relation with the sustainable economic growth of any industry of a country.

The development of coffee arises when meet innovation, starting from plantation until harvesting times, and follow by distribution process by the users becomes blending and defines results as typing many kinds of coffee aromas. The analytical framework of a global value chain supports the development of coffee industries cross-linked with the positioning process from upstream to downstream. GVC Initiative seeks to develop an industry-centric view of economic globalization that highlights the linkages between economic actors and across geographic space (www.globalvaluechains.org). GVC analysis provides a valuable framework for understanding how and why economic change benefits some countries and regions, not others. It also provides advantages and disadvantages to specific actors within the chain (Jeff Neilson & Pritchard, 2009). The world population on coffee production in 2020 (Table 1) shows the top 5 coffee production by production that have a significant process from upstream to downstream with kinds of treatment. Those circulations remain on high-value chain productivity among other countries in the world.

Table 1. Data of top 5 Sustainable Coffee Production in The World
Coffee Summary Thousand 60-Kilogram Bags

No.	Country	2018/2019	June 2019/2020	December 2019/2020
1	Brazil	64.800	59.300	58.000
2	Vietnam	30.400	30.500	32.225
3	Columbia	13.870	14.300	14.300
4	Indonesia	10.600	10.700	10.700
5	Ethiopia	7.250	7.350	7.350

Source: (United States Department of Agriculture, 2019)

Those linkages on coffee production in Indonesia deliver many untold stories, whereas many efforts were taken to increase production volumes over a specified period. As a tropical country and significant coffee producer, many potential developments in diversification products through innovative business conduct concerning excellence in industrial competitiveness. As an overview shows, in 2019/20, coffee production is forecast to reach 10.7 million bags, increasing 100,000 bags from 2018/19. Farmers in the central Robusta production area of Southern Sumatera have reported no severe weather issues during the flowering and bean development stage. As a result, improved yields are expected during the first harvest, which will peak in May-June (Global Agricultural Information Network, 2019).

Heavy rainfall has delayed Arabica harvesting in West Java. Despite Java's small Arabica production compared with Northern Sumatera, the region has seen steady production increases. More farmers replace vegetables with coffee, and area expands in government forestry lands. Much of the West Java Arabica production sell domestically to meet increased consumer demand for coffee. However, some volumes are exported directly or shipped to Medan in North Sumatera for blending with other Arabica beans. Table 2 shows that Indonesia coffee production (million 60-kg) production for 2018/19 is lowered 300,000 bags to 9.4 million bags based on lower than expected output of Robusta beans. Higher yields in Southern Sumatra regions, such as Pagaralam, were insufficient to offset lower Robusta yields in highland areas resulting from heavy rain and high winds during cherry development (Global Agricultural Information Network, 2019).

Table 2. Indonesia Coffee Production (Million 60-Kg Bags)

Variety	2015/16	2016/17	2017/18	2018/19	2019/20
Arabica	1.5	1.3	1.0	1.2	1.25
Robusta	10.6	9.3	9.4	9.4	9.45
Total	12.1	10.6	10.4	10.6	10.7

Source: (United States Department of Agriculture, 2019)

Sustainable coffee production in Indonesia remains several achievements regarding the roadmap of the supply chain. These include innovation on farming management and integrated system, processing in harvesting and post-harvest, marketing, and policy.

The history of coffee development in Indonesia comes from a Dutchman introducing Arabic Mocca (Prastowo et al., 2010). Robusta coffee (an estimated 85% of coffee in Indonesia) is Indonesia's most widely grown coffee due to resistance to disease and more comfortable planting conditions than Arabica coffee. Smallholders cultivate growing coffee in Indonesia by 95%. Most coffee plants are spread all over Indonesia, namely in Sumatera, Java, East Nusa Tenggara, and Sulawesi. This coffee is then processed by local farmers and then sold domestically or exported abroad. As shown in figure 2, Arabica coffee spread centralized in the northern part of Sumatra and Robusta coffee in the southern part of Sumatra.



Source: (Ministry of Agriculture, 2019)

Figure 2. The spread of robusta coffee and arabica coffee in Indonesia

Indonesia is the largest coffee producer after Vietnam in ASEAN. The existing coffee processors in each region have their headquarters in their management. In Indonesia, many coffee businesses include several registered brands, 1788, registered copyright 107, industrial design 101, and Geographical Indication (GI) 27. Based on the spread of coffee in Indonesia, there are types of coffee that can live and survive with certain regional conditions, given IPRs protection to protect geographical indication. This type of protected coffee has specifications that characterize the coffee plant species' specificity from geographic criteria, coffee varieties, flavours, and other distinctive identifications. The objective of a GI is to capture the economic benefits of place-related quality attributes within the locality of production. However, non-economic benefits may include protecting environmental and cultural values and strengthening social institutions (Jeffrey Neilson et al., 2018). The coffee is spread throughout Indonesia with geographical conditions of each region, has had protection through geographical indications including the famous Arabica Coffee Kintamani Bali, Gayo Arabica Coffee, Arabica Coffee Flores Bajawa, Arabica Coffee Kalosi

Enrekang, and Arabica Coffee Java Ijen-Raung. This coffee distribution export by countries with the most significant destinations of America, Japan, and Europe in green beans. Also, the most significant consumption of coffee processing is roasting to presented in the form of beverages.

2. Research Method

This research used a desk study using a literature review and descriptive analysis method. A literature study is defined to identify existing types of innovations from registered documents through patent information. The source of literature obtained from patent utilization R & D database on documents with data information related to the topic of study. The utilization of R & D refers to the inventor registering their invention with many know-hows that perform on the patent database. By focusing on seeking the answers to the problems, the study mainly on the prospecting development of coffee to enhance the development of market demand. Analysis was performed using data mining techniques applied on patent documents (Nemet et al., 2020). Based on method or process, a collection of detailed data that transforms into patent information. Data information approach refers to two approaches, namely: (1) Literature Study: Browsing information related to the topics and issues from various sources, such as books, journals, articles, or papers of other scholars; (2) Patent Benchmark: Data of patent database through the document on innovations in coffee: patents reveal in Indonesia, using an online database in the Directorate General of Intellectual Property Rights of Indonesia and other WIPO databases with the same keyword "kopi."

This paper aimed to reference and recommend the information for coffee innovations through patents revealed in Indonesia, which tailor to R & D results from differences innovation development for commercial in market needs. The study focuses on the answers to the problems, mainly on innovations in coffee-related online patent information revealed in Indonesia and benchmarking on technology through the WIPO database. Furthermore, try to inform stakeholders how coffee industries contributed to economic development by using patent information and networking associate. Moreover, expected to become the input for potential users of technology and valuable information in the development of science and technology. The nature of the modification process is the implementation and reverse engineering of technical information sourced from the patent.

3. Results and Discussions

3.1 Identification of Coffee-related Patents

Derivative technology from R & D results can be a solution in industrial acceleration through patent information. The patent application was a part of the R & D result registered by the patentee for protection against infringement. Its means an effort to understand the role of intellectual property rights (IPRs) tend as a "cost center" and not as an "asset center" (McDonald, 2013). Innovation with novelty, invasive steps can be applied in the industrial world worthy of being a registered patent. It also applies to coffee-based innovations as well as processing elements. Based on the patent document search from the Indonesian Intellectual Property Directorate (DJKI), coffee-related innovation found 202 patent applications. On the main page of patent information, we shall obtain the abstract, date of registration, patent status, the origin of invention, and inventor. Furthermore, we can get the complete version of the invention on patent documents.

The invention of coffee firstly entered in 1991, originating from Switzerland. The invention is entitled "Process for Improving Robusta Coffee Quality," which has expired innovation protection. There is also Patent Cooperation Treaty (PCT), a registered patent globally in many countries, one of which is registered in Indonesia. Indonesia ratified PCT in 1997 through a presidential decree, which we can see as the PCT patent of coffee registered in 1998. The invention entitled "Extraction-Beverage Bags Equipped with Holding Elements" from Japan. The patent whose inventors come from Indonesia originated in 2001, produced by Lhokseumawe State Polytechnic to invent coffee bean processing equipment. The invention was about the peeling machine designed by a specific axis with 2-3 kg/minute capacity. The number of patents whose invention comes from Indonesia is only 28% of the total registered patents. Rights of the patent holder of the coffee invention, dominated by the ownership of government research institutes, especially the research institute of a plantation.

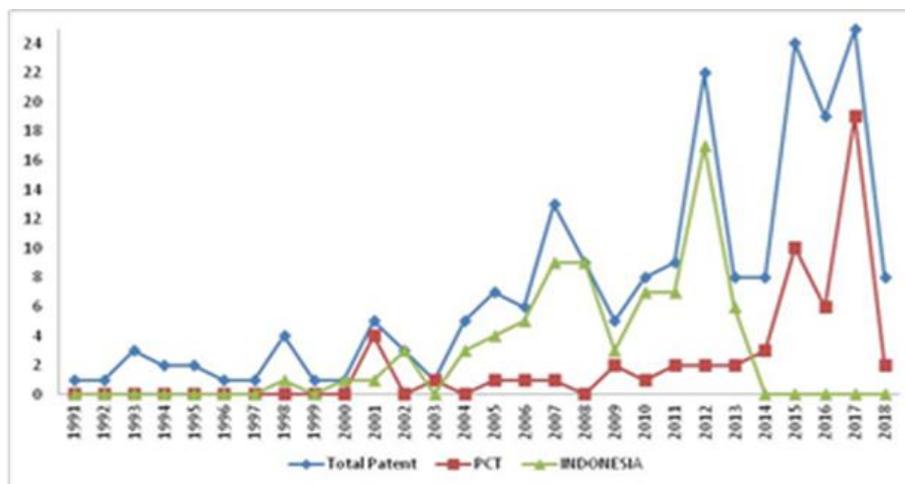


Figure 3. Patents of Coffee

The number of registered patents in Indonesia continues to show an upward trend reflecting that coffee innovation continues to increase (figure 3). It was also growing with the number of coffee products and the development of coffee shops that entered Indonesia. Based on the type of registered patent status, 48% of patents are under review, and 17% have to declare granted (figure. 4). The patents, cancelled by law, and erased can be due to a request by the inventor or not qualify patents by formative and substantive. Patent examination application in Indonesia takes at least five years since it has registered until a given certificate.

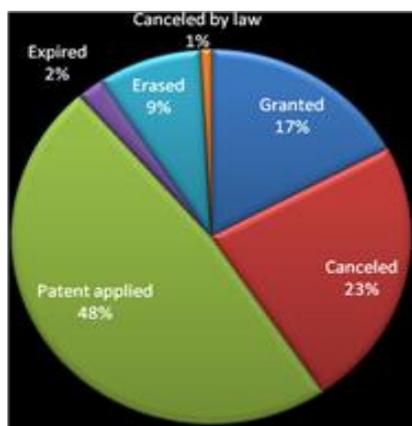


Figure 4. Patent's status

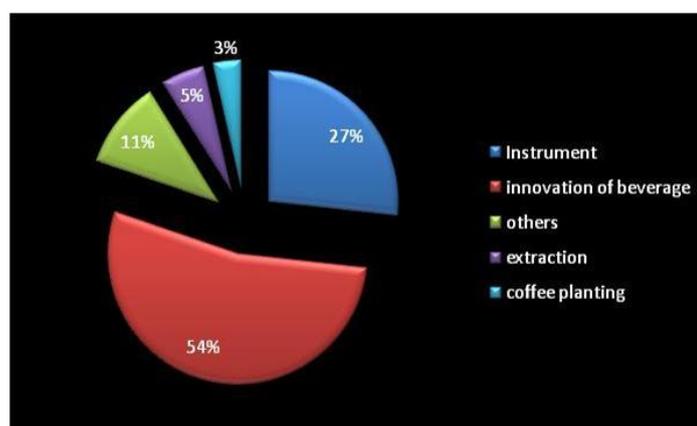


Figure 5. Technology of patents

Processing of coffee to be a drink such as seasoning innovations on coffee drinks, coffee powder composition, fermentation of coffee beans, coffee products with the presentation of ready-made brew. From the invention technology, the innovations group into coffee processing as beverage (53%), coffee processing equipment (27%), extraction process (5%), and coffee breeding or plantation process (3%), and other (11%) (Figure 5). It means that the utilization of coffee dominates by high consumer needs in the processing of coffee into beverages.

Innovations related to coffee bean processing equipment also become helpful information for industry players in manufacturing. The type of innovative tools in the patent document is a tool grinder coffee beans, coffee bean picker, sorter, packaging equipment, coffee makers, and others. Other coffee is a mixture of a product such as cream for wounds on soft tissue, cosmetic raw materials, cancer detection, animal feed. It shows that the substances in coffee can develop coffee into a new product with a value-adding strategy.

3.2 Challenges and Opportunities

Patent document collections are an immense source of knowledge for research and innovation communities worldwide. The rapid growth of the number of patent documents poses an enormous challenge for retrieving and analyzing information from this source in an effective manner (Krestel et al., 2021). Patents are representatives of the technological innovations of a country or an organization. Indeed an agreement between the inventor of the patent and the government or any agency designated by the government. Summarize text-mining and visualization-based approaches used for patent analysis. Patent collections are rich in structured and unstructured text content, which requires intelligent tools to accomplish efficient patent analysis (Abbas et al., 2014). Patents are representatives of the technological innovations of a country or an organization. Indeed an agreement between the inventor of the patent and the government or any agency designated by the government. Besides technological competitiveness, using IP information also helps estimate the developments of a particular firm in a specific time interval (Ernst, 2003).

Patent analysis is beneficial for organizations in determining the novelty of their inventions, as well as identifying the Intellectual Property (IP) and technological competitiveness (strengths and weaknesses) of the competitors (Abraham & Moitra, 2001). With Know-How (skills) in which defined as any information, data, or knowledge engineering results from experience or skills that can use in practice, particularly in industry, and allows the results of the research which have been patented for the applied and carried out the production process (Hendrix et al., 2018). A patent pool can help create a critical mass of intellectual property, necessary for an innovative idea to attract the private sector. If marketed properly, every relevant industry player could be made aware of the research centres that generated the IP, which would help catalyze links with the industry (European Commission, 2007). The patent document also provides information on the origin of the invention, as seen in Figure 6.

Patents registered in Indonesia are from Switzerland, followed by Indonesia, America, Japan, and the Netherlands. As many as 72% of patents in Indonesia have patented whose invention comes from outside Indonesia. Such information may show a competitor of coffee innovation in Indonesia quasi by inventors from Switzerland. In contrast to the world, patent search results from WIPO, where many coffee patents come from America, UK, and Europe. The results indicate an opportunity for other countries to enter Indonesia as a competitor in business coffee development. Based on the patent document search in Indonesia, the invention originating from Switzerland is dominated by inventions related to coffee management as a beverage, particularly the composition

of coffee drinks and coffee extraction to strengthen the aroma. In contrast, the invention derived from Indonesia type in the form of simple coffee processing equipment, the composition of coffee drinks with a mixture of other ingredients, processing of coffee into other products. On the other hand, the invention of more complex coffee processing tools dominates by patents from Netherland and China.

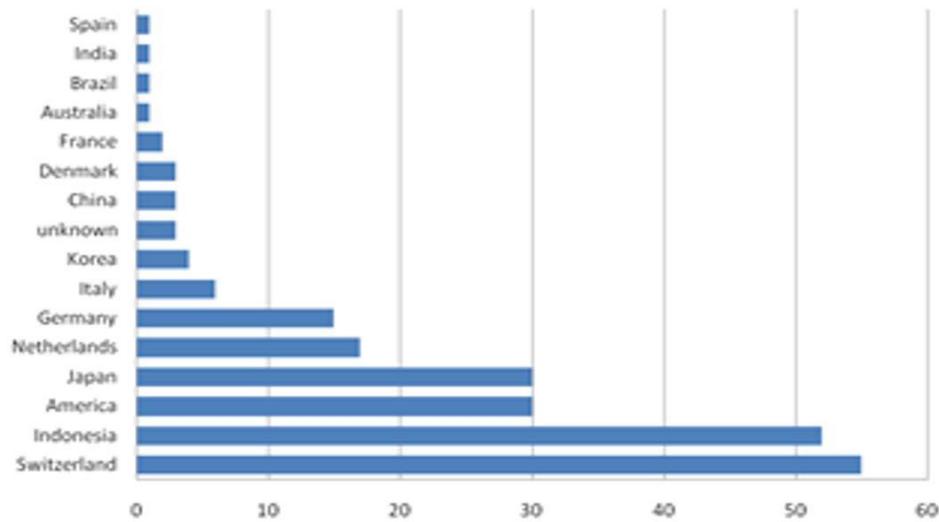


Figure 6. Origin information of patents

Open-ended patent documents allow researchers or business actors to reverse technology by using patent documents, especially expired documents. Based on 202 registered patents in Indonesia, there are three patents from Switzerland whose status is expired. The patents are a coffee extraction process and robusta coffee processing. Patents that have expired will become public domain, or in other words, can be reverse technology in the framework of commercialization. The patent's validity period is usually 20 years, while the single patent is ten years since the patent is registered. The protection of patents by specific region, but protection in other countries is banned due to novelty.

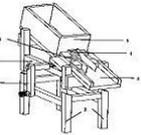
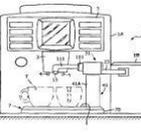
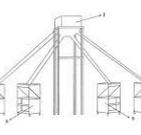
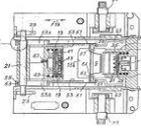
INDONESIA		NETHERLAND	
	ROASTING MACHINERY		COFFEE MACHINERY
	PEELER MACHINERY		COFFEE MACHINE WITH A COLD CONTAINER
	SORTING MACHINERY		INFUSION PART FOR COFFEE MACHINES AND ITS SUPPLIES

Figure 7. Comparison of technology

Ownership of the Indonesian patent region comes from the outside country, dominated by the company and the university. Switzerland dominates the invention of coffee. Its patents owned

by the world's largest NESTEC S. A company or consulting firm of NESTLE products. Supported by patent document search results using WIPO patent data search, that invention related to coffee innovation dominates by NESTEC, as many as 1199 registered documents. The type of innovation produced by the company in beverage composition. Besides, NESTEC is the most abundant food and beverage company globally, with more than 2,000 brands.

The invention of the Netherland country dominates by KONINKLIJKE company PHILIPS N.V. whose invention dominated by invention relating to a coffee-processing apparatus (Figure 7). On the other hand, Indonesian patents consist of a simple machine dominated by coffee's preliminary process. Japanese coffee innovation is dominated by Suntory Beverage & Food Limited, with innovations related to the composition of coffee drinks. It shows that many patents source from large corporations, suggesting that invention protection is essential in the business world.

The invention originates from Indonesia, owned mainly by R & D institutions or individuals. The challenge for Indonesian entrepreneurs, especially coffee entrepreneurs, is to conduct business development or cooperation with R & D institutions for joint ownership in commercialization. Also, support the development of SMEs in Indonesia, where coffee management in Indonesia is still done centrally by each local farmer. Moreover, patent protection fees are accessible in 5 years for government agencies. It can be advantageous for Indonesia to evolve since it still lags far behind its comparative competitiveness and export position with Brazil, Colombia, and Vietnam (Suprayogi et al., 2017).

3.3 Managerial and Theoretical Implications

This paper aims to find information technology related to innovation coffee through patent reveal in Indonesia. Prospecting innovation coffee through patent reveal will provide readers with the latest research on patent information. The target was to find the potential market and users that already applied for commercial interest and know the trends of technology and the current research progress of coffee development in Indonesia. This paper expects to become the input for potential technology users and a valuable source of information in the development of science and technology, especially in coffee.

Moreover, it has a solid commitment to showing enrichment of the actual condition related to Indonesian development in coffee harvesting and contribution information about patent reveal innovation regarding technology processed. Try to invite policy stakeholders to utilize registered patents with high commercial value-using an online search, the data contained in WIPO, and other places for free. Also, familiarize with utilizing patents that have expired and can be applied.

The connectivity between management coffee in ICO and patent information and literature studies still enrich the maturity of the development coffee industry. Coffee is a critical tradable crop for 25 million smallholders in 60 tropical countries. The sustainability of how such commodities are produced, traded, and consumed is at a critical juncture, with the outcome likely to be decided within the coming decades (Gardner et al., 2019). Patent applications are an essential tool for promoting innovation and technology. The patent system creates a framework that supports an incentive for the R & D result, fostering innovation, technology transfer, and economic growth. When developing a new product, technical information may determine the success or failure of its product itself. Patent documents represent a rich source of technical, legal, and business information that is generally standardized and often not reproduced anywhere else (Hendrix, 2020). Supply chains involve the interplay of actors in three principal sectors: the market, the state, and civil society (Newton et al., 2013). The interactions between actors in these

sectors have changed markedly with ongoing globalization processes and the increased prominence of sustainability agendas (Mol, 2015). Two significant developments of globalization have played a vital role in shaping efforts to improve the sustainability of commodity supply chains: an increase in the number, reach, and complexity of transnational connections and the relatively limited role of state authorities (Bush et al., 2015).

4. Conclusions

This study regarding Indonesia is a coffee-producing country with increased productivity every year. The potential of coffee innovation in Indonesia based on patent information is still shallow than Switzerland, the US, Netherland, and Japan. In Indonesia, coffee innovation needs to be supported by the cooperation between SMEs and coffee processing companies with R & D institutions or universities to obtain optimal results.

That compilation of patent analysis found the search related to technological on coffee registered in Indonesia dominated government research institutes, especially the research institute of a plantation. Based on 202 registered patents in Indonesia, the invention comes from Indonesia, only 28% and 72% from outside Indonesia. Furthermore, spread in fields of coffee processing as beverage (53%), coffee processing equipment (27%), extraction process (5%), and coffee breeding or plantation process (3%), and other (11%). Also, the used remaining in the processing of coffee seasoning innovations from coffee drinks, coffee powder composition, fermentation of coffee beans, until coffee products with the presentation of ready-made brew. Information related to patent products can be used as a reference for new technologies for the processing of coffee products.

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