The effect of the Korea–US free trade agreement on governance of the aquaculture value chain

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Abstract
We present a value chain analysis of seafood exports from South Korea to major consumer markets in the United States, outlining the global value chain of oyster products from South Korea and its governance structure. A major issue faced by consumers is the lack of ability to determine where and how the seafood products are produced and processed. This can be addressed through standards set by the importing firm or country. In this article, we show that Korea–USA free trade agreement has led to development of high-capacity US-approved farms and processing facilities, and stricter standards have created a more efficient production and processing sector for exporting seafood products from Korea to the United States.

Keywords: aquaculture, global value chain, free trade agreement, South Korea, governance

Introduction
While the benefits of meeting public and private demand for consumer products include access to high-value markets, higher income consumers and better technology, there is also a growing public policy debate addressing current and future product specifications (Swinnen 2007). As delivering seafood to consumers is as important as producing it, it is necessary to evaluate all aspects of the procedure, which can be characterized by a systematic approach referred to as the value chain.

The cultured seafood supply chain is dominated by the Asian Pacific Region with major markets in the European Union (EU), Japan and the United States (Kelling & Young 2010). In recent decades, removal of trade barriers, decreasing costs and developing technologies in seafood transportation and preservation have encouraged Asian countries to increase trade flow, and led to the development of trade between Asia and regions of Africa and South America.

For many developing countries, fishery products have become a highly important source of foreign exchange, and preferential tariff regimes have an important role in facilitating trade for many developing nations. Flow from developing countries to developed countries increased with the reduction in tariffs on many products; however, this trade is subject to standards set by developed countries for imported products. These monitoring methods often impact the product value chains and help to improve product quality in developing countries. It is important to note that provisions affecting fishery products vary among trade agreements.

Since it has been only 4 years since implementation of the Korean–USA FTA, its long-term effects on Korean seafood exports are not known. The main objective of this study was to investigate the Korea–USA FTA with respect to the value chain governance system in South Korea and to determine how the associated seafood safety standards have affected Korean seafood exports, through analysis of Korean oyster production and export to United States over the period 2011–2014. The benefits of trade, such as economic growth and employment, can be counteracted by factors including tariffs and trade restrictions (Yu, Kam & Leung 2008). However, participation in a global value chain system can be beneficial through certification schemes such as hazard analysis and critical control points (HACCP).

It is difficult to distinguish between value chain and supply chain, as these two concepts have some overlap. The term supply chain refers to a network
of enterprises through which goods move from production to consumption. In supply chains, producers of goods aim to increase logistic efficiency using upstream and downstream businesses. The main objectives of supply chain management are to maximize profit by reducing linking costs [Food and Agriculture Organization (FAO), 2014].

The value chain is the concept of moving beyond simply linking producers to consumers by creating a mutually beneficial environment for all stakeholders (FAO, 2014). The main objective of value chain is to maximize profit, but methods employed differ from those of the supply chain concept. In a value chain concept, profit maximization is pursued by adding incremental value to the product via value addition or value creation (FAO, 2014).

The concept of the value chain was expanded by Gereffi and Korzeniewics (1994) who popularized the idea of the global commodity chain, first introduced in the mid-1980s (Bair 2009), by exploring how production, distribution and consumption of products are globally interconnected along value chains. In general, globalization has led to research and development, design, marketing and branding conducted by lead firms in developed countries with production relocated to developing countries (Kelling & Young 2010).

Material and methods

The global value chain

The global value chain (GVC) concept was developed to analyse globalization trends, in particular the increasing role of retailer and brand-name companies in creating and recognizing demand and expanding global production, distribution and marketing networks (Kaplinsky 2004). The importance of consumer-driven commodity chains was emphasized by Gereffi (1999). Governance of GVCs consists of organizing activities to attain functional divisions of labour and erect entry barriers along the chain, resulting in specific allocations of resources and distribution (Kelling & Young 2010). Governance consists of defining the terms of chain membership, adding or removing participants accordingly, and allocating to them value-adding activities not performed by lead agents (Ponte and Gibbon 2005).

In analysing the value chain, it is important to analyse all nodes in the chain, horizontal and vertical. While GVC governance was originally understood as the manifestation of the economic power of a lead firm, it was later expanded to include coordination of buyer-seller relations (Werth 2008). Global value chain analysis also considers the institutional framework within which chains operate and the external influences on chains that define the parameters of production processes (Humphrey & Memedovic 2006). Gereffi (1994) developed a framework for the study of global commodity chains (GCC). The description of commodity value chains allows macro and micro-analysis of processes contained within global, national and local units. Sturgeon (2002) studied contract manufacturing in electronics, defining value chains in industrial organization that are neither market based nor hierarchical, but described as networks. Gereffi, Humphrey and Sturgeon (2005) proposed the hypothesis of a governance structure between hierarchy and market. Studies of Gereffi et al. (2005) and Stevens (2001) described the positive effects of trade policies on value chains linking suppliers to the EU market. Ponte (2002) revealed a negative effect of an international coffee agreement on developing country exporters. Phyne and Mansilla (2003) analysed local power relationships in Chilean salmon farms, demonstrating how the expansion of salmon farming benefited domestic capital and labour.

In general, the GVC has become the mechanism through which developing countries engage in trade with developed countries (Keane 2008). Common political economic perspectives focus on capitalistic or general aspects of economic governance. In contrast, GVC analysis is useful in looking at governance from the viewpoint of the lead firms (Werth 2008). In South-East Asia, the rise of GVCs has altered trade patterns. From the 1990s to 2013, the intraregional trade flow in East and South-East Asia has increased from 33% to 43.8% (Choi & Kim 2014). East and South-East Asia show an increasing share of intraregional export of intermediate goods, while the United States and EU show an opposite trend.

Free trade agreements

In negotiations related to the Doha Development Agenda held by the World Trade Organization (WTO) in 2000, tariff reduction and the effect of tariffs on the trade of agricultural and non-agricultural products were discussed (Food and Agriculture Organization (FAO) 2008). Many studies have since analysed the impact of tariff reduction
on seafood trade (Locke, 2013). The Global Trade Analysis model developed by Hertel (1997) has been used to assess the effects of tariff reduction on world trade. The concept of tariff reduction and eagerness of countries to remove trade barriers led to creation of free trade agreements (FTA) among nations.

Free trade agreements are arrangements between two or more countries/trading blocs that primarily involve agreements to reduce or eliminate tariff and non-tariff barriers on substantial trade between them. The agreements normally cover trade in goods such as agricultural or industrial products, or in services such as banking, construction and services. As FTA procedures are time-consuming and costly, preliminary studies are carried out to predict their results. For example, Kiyota and Urata (2005) examined the impact of an FTA in East Asia and showed potential benefit to members. Park (2009) concluded that the Association of Southeast Asian Nations (ASEAN) FTA brings positive gains for all members.

Value chain of aquaculture products

The export of seafood products has become challenging for three reasons:

1. Seafood products have been under a spotlight due to the increasing importance of food standards. As countries expand markets, they must satisfy safety requirements of the importing country.
2. Production through aquaculture, which requires high investment and compliance with stringent regulations, is taking over capture fishing to meet global demand.
3. Global treaties have reduced or removed the tariffs on seafood products. Although this can confer advantages, it can result in environmental issues of overexploitation and overcapacity.

Seafood is the most commonly traded commodity among nations (Smith, Roheim, Crowder, Halpern, Turnipseed, Anderson & Selkoe 2010). Despite a sharp decline in capture production, the global trade of seafood continues to increase, thanks to aquaculture (Asche, Gudmundsson & Nielsen 2006). Nearly 40% of global seafood production is internationally traded (Wilén 2013). However, the scarcity of these products has increased global prices (FAO 2014). More than 50% of global seafood is exported from developing to developed countries (Smith et al. 2010).

The general structure of the global seafood trade comprises production (farming/capture), processing, exporting, distribution, retail and food service sectors. The structure of each supply chain varies depending on species, market and the processing stages. Asche et al. (2006) reported that, among agro-food industries, the primary producers of seafood products receive the lowest share of the retail value of the products. Gereffi and Lee (2009) showed that the structure of the seafood supply chain is primarily driven by the demands of the retail sector.

With the rapid expansion of trade globalization, analysing the value chain is important. With the growing demand for seafood products and growing diversity of exported products, competitiveness has become an important issue. Efficiency in seafood production must be considered within the context of sustainable development, and to compete in the global market, it is important to understand the dynamic factors within the value chain system.

The value chain framework has the ability to link seemingly disparate aspects of the seafood industry, from fishery management and economics to trade and processing. Currently, there is limited literature addressing the seafood trade from a global value chain perspective (Yu et al. 2008).

Results

Value chain system of Korean aquaculture products

Background

South Korea possesses territorial waters covering three times its land area of 90 000 km² as well as a coastline of about 2400 km. As a peninsula, three sides are bounded by the ocean that has historically made a significant contribution to the national economy. From the 1950s to the 1970s, the fishery sector played an important role in bringing in foreign currency by exporting seafood products. By the beginning of the 21st century, this trend had changed, and fishery imports exceeded exports (OECD, 2003). Over the past two decades, 5-year economic development plans have provided a framework for the Korean fishing industry (OECD, 2003). Fish catches increased from 470 000 t in 1962 to over 3 million t in 2012, while revenue from fishery exports jumped from 12.3 million USD to 2.1 billion USD (Ministry of Ocean and Fisheries (MOF), 2014). Fishing...
vessel tonnage rose from 161,000 t in 1961 to over 600,000 t in 2012 (Ministry of Ocean and Fisheries (MOF), 2014). The number of vessels increased from 45,000 to 90,000 in the 1990s and has since decreased to the current 75,000 (Ministry of Ocean and Fisheries (MOF), 2014). The South Korean economy has developed quickly, and overexploitation of the ocean resources within its territory has led to depletion of many fish stocks. The fishery sector accounted for nearly 0.2% of the Korean GDP in 2012 (Ministry of Ocean and Fisheries (MOF), 2014).

Despite diverse government policies employed for its management, the fishery resources in coastal and offshore seas are estimated to have been reduced to varying extents depending upon species. Direct and indirect causes of such reduction include destruction of habitat by contamination of the environment. Due to geographic characteristics of fishing grounds, joint management by South-East Asian nations has not been implemented (Lee 2004).

South Korea’s total aquaculture industry has shown continuous growth, attributed to the increase in seaweed production. Shellfish and finfish production has remained flat or been decreasing. Aquaculture production in 2013 was 1.515 million tons (Fig. 1). The value of aquaculture products in 2013 was 1.725 million KRW. In general, Korean aquaculture production has increased strongly in the past 20 years.

Aquaculture of marine finfish in Korea was traditionally conducted on a relatively small scale in pens located in naturally protected areas along the south coast. In recent decades, developing technology has enabled expansion of aquaculture along the coasts. The negative aspects of aquaculture have recently been realized, and a bias against aquaculture has emerged, considering it a main source of the increased pollution and decreasing aesthetic value of the coastline. In addition, extensive damage to aquaculture facilities results from seasonal typhoons on the southern coasts of the peninsula.

Efforts have been made to construct aquaculture facilities and develop technologies to foster aquaculture, but have not been sufficient to attain international competitiveness. The relative weakness of Korean aquaculture products in international markets is presumed due to high production costs and high mortality associated with stocking density beyond the capacity of facilities. Use of fishing grounds for aquaculture has a negative effect on the environment, and careful consideration should be given to commercial development of the grounds. It is argued that licences have been issued to promote a growing industry without considering environmental aspects. Overproduction of some cultured species has led to a sharp decline in commodity prices and increased pollution. Large-scale damage is expected to occur in the event of typhoons or red tides.

The Korean seafood industry from 1970 to 2010 can be divided into two eras. From the 1970s through the 1980s, Korean exporters preferred to export to Japan, as many of their relatives and friends emigrated from Korea to Japan following the Korean War. The second era (1990s to 2010) shifted Korean seafood traders to bigger markets, thanks to the experience gained from their partners in Japan, and can be considered the foundation of the Korean FTA with the United States and other western countries.

Korean seafood industry 1970 to 1980s: relational value chain

In 1961, at the start of South Korea’s modern economic development, the country had virtually no capital stock. Railroads, plants, dams and factories left by the Japanese had been destroyed during the Korean War. The majority of fertilizer plants,
electric power plants and mining operations were situated in North Korea, reflecting both natural resource distribution and Japanese investments. Industry in South Korea, in contrast, was focused on agriculture, fisheries and light manufacturing (Pyo 2002).

In the early 1970s, the seafood industry was well established, and the growing market demand made the industry more attractive to many Koreans. Japanese importers and Korean suppliers worked together to coordinate export of Korean seafood products to Japan. As many Koreans lived in Japanese cities, a relational value chain was created between Korean families in Korea and those in Japan.

**Korean seafood industry 1990s to 2010: from relational value chain to modular value chain**

From the 1980s onward, the supply chain shows the overlapping dynamics of the value chain system. Korean suppliers shifted from the relational value chain to modular value chain. Korean exporters gained experience and established a strong foothold in the export sector. This helped in developing export systems with countries such as China and the United States. During this period, the United States became a major importer of Korean frozen seafood, while Korean canned and live products were exported to Japan and China.

The economic boost to South Korea resulted in a more liberal credit policy, and dependence of Korean exporters on their associations with Japan was reduced.

**South Korea–USA free trade agreement**

The South Korea–USA Free Trade Agreement (KOR–US FTA) was implemented on 15 March 2012. It includes provisions to reduce and eliminate bilateral tariff and non-tariff barriers and enhance the rules and regulations governing the bilateral trade and investment relationship, including issues such as trade in manufactured goods, agricultural products and services; foreign investment; government procurement; and intellectual property and services (Williams, Manyin, Jurenas & Platzer 2014). In the short to medium term, the KOR–US FTA’s largest commercial effects are expected to be micro-economic in nature. The agreement may have a noticeable impact, even if its economy-wide effects are modest. As the implementation of the FTA, the trade scale of fishery products has increased annually. In the third year of the agreement, the trade in fishery products increased by 3.5%. The value of the seafood trade between the two countries in 2011 was 336 million USD and increased to 454 million USD in 2014.

The value of seafood export in the third year of the FTA showed a decline ($217 million, 0.2%) compared to the previous year. Exports increased for seasoned laver (5.4%), halibut (21.8%), squid (9.6%) and tuna (34.7%), but decreased for oysters (7.6%) and red snow crab (17.2%) (Fig. 2).

Seafood imports in the third year of FTA increased by 7.2% ($237 million) over the second year of FTA. The main increases were seen in salmon (293.7%), pollock (15.6%) and lobster (94.2%), chiefly due to the reduction in tariffs and increasing demand from the Korean domestic market (Fig. 3).

Using data from the reports provided by the Ministry of Ocean and Fisheries and the FAO, we analysed effects of 4 years of the FTA on the Korean seafood export value chain, using oyster aquaculture as a representative case.

**South Korea oyster production**

At the end of the nineteenth century, Japan introduced oyster culture to South Korea (Choi & Kim 2014). The Pacific oyster *Crassostrea gigas* is widely...
cultured along the southern coast where a number of small shallow bays are protected by islands (Choi & Kim 2014). According to the National Federation of Fishery Cooperatives of Korea, the first oyster culture licence was issued in 1907, and, in 1918, approximately 133 tons of oysters were produced on 1425 hectares. Culture techniques in the early twentieth century were primitive and limited to bottom culture in intertidal areas of bays using rocks or wooden poles as substrate for seed collection and subsequent growing. In the 1960s, modern suspended culture techniques using long-lines and rafts were introduced, and the culture area subsequently expanded from the intertidal area to deeper waters offshore. Owing to this technical innovation, an estimated 53,327 tons of oysters were harvested in 1963, approximately sevenfold the previous year’s harvest of 7036 tons (Choi & Kim 2014).

In 2014, South Korea had 232 oyster aquaculture facilities, covering approximately 585
hectares, producing 289,779 tons. Figure 4 shows South Korean oyster production from 1970 to 2014.

Oysters for local and global consumption may be sold live or processed into frozen, dried, canned and smoked products. Frozen oysters are mainly exported to Japan and the United States and amount to 80% of total export share.

Most of the oyster aquaculture of South Korea is located in the southern part of the country (Fig. 5). The farms, under FTA licences, are monitored regularly by both the Korean government and international licensing companies.

Korea’s annual oyster export volume rose from 14,574 tons in 1995 to 22,537 tons in 2001. In 2013, frozen oysters made up the largest segment, followed by canned. Fresh oysters are exported solely to Japan, with 85% of canned oysters exported to the United States. The total value of oyster exports to the United States was 15,255,005 USD in 2013.

The number of oyster culture licences and the area farmed remained stable from 2010 to 2013. In 2013, 1259 licences were current, and 8077 hectares were under culture with 70% allocated to hanging culture and 30% using bottom culture. On the west coast of South Korea, oysters are mostly farmed by the bottom method, due to shallow water and high tides (Fig. 5).

**Oyster value chain and FTA sanitary regulations**

To identify optimal oyster farm sites in southern Korea, geographical, environmental and sociocultural conditions were examined by the Korean government. The sites are annually inspected by committees selected by the US government.

Two systems connect the supplier market (Korean oyster farms) to the consumer market (the United States). In the first system, due to lack of processing facilities near oyster farms, the product is sold to Korean cooperative wholesalers, brokers or consignors. Most oysters are sold to Korean cooperative wholesalers and go directly to the processing facilities that usually owned by these cooperatives. The processed products transfer directly to wholesale market in the United States, at a tariff of less than 4%. The channels of distribution for oysters within Korea depend on the quality of the product and the location of the farm. The second system is direct marketing by the farms to US markets. In this case, a thorough understanding of US market is necessary.

As it is shown in Table 1, fishery cooperatives are based on region or fishing industry classification (e.g. trawling, purse seine fishing, seafood processing and aquaculture). As the distance of the farm and the time for transporting the product to exporting port or processing facility is important, setting the fishery cooperatives by regions can help this procedure to be faster and smoother. A major role of the cooperatives is to assist farmers and fishermen in marketing of their products. They provide their members with market information on production amounts, price and location. They operate cold storage plants to freeze and hold the fish until the market is favourable. They also operate the producer markets and city markets for selling the seafood to the market.

Fishery markets in Korean cities comprise the production centre, mostly operated by fisheries cooperatives, where the seafood is sold to wholesalers or exporters.

The seafood industry distribution system in Korea comprises physical and commercial distribution. Physical distribution includes transportation, storage, information distribution and activities such as collection and sorting. Commercial distribution includes trading, finance and insurance.

It is not easy to distinguish between import- and export-oriented fish trading companies, as they
may engage in both. The supply systems of fish and seafood in Korea include both the domestic supply, mainly through cooperatives and associations of fishermen and fish farmers in coastal and offshore fisheries, and imports through the trading companies.

The effect of FTA on the governance system of the Korean seafood value chain

Gereffi et al. (2005) developed a system of value chain governance classifications. We have used this to categorize each buyer and seller interaction within the Korea–USA FTA as market, modular, relational, captive or hierarchy (Table 2).

<table>
<thead>
<tr>
<th>City</th>
<th>Wholesale market in consuming city</th>
<th>Cooperative wholesale market in city</th>
<th>Cooperative wholesale market in port market</th>
<th>Busan cooperative fisheries market</th>
<th>Producer gate market</th>
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<td></td>
<td></td>
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<tr>
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<td>17</td>
<td>10</td>
<td>202</td>
<td>92</td>
</tr>
</tbody>
</table>

Source: Ministry of Ocean and Fisheries (MOF) 2014.

There are important differences in the governance structure of the Korean (farmers, brokers, collectors and wholesale cooperatives) and US systems (importers, wholesalers and retailers). Language barriers and informal relationships among farmers contribute to a complex governance system, while in the United States, monitoring food safety and working within these informal social networks compounds the complexity. According to the WTO, to ensure adherence to standards under non-tariff trade barriers, participating nations should subscribe to the Technical Barriers to Trade Agreement, and the Agreement on Sanitary and Phytosanitary Measures (Frohberg, Grote & Winter 2006). These two agreements allow the consumer country to participate in ensuring importation of high-quality products from supplier countries. In microlevel, the recognition of Korean seafood brands and trademarks by the consumers within the United States is a major issue faced by Korean exporters. In this case, FTA is a real success for Korean products because it recognizes Korean seafood and also gives easy access to Korean seafood products for US consumers. In other words, FTA helps consumers to distinguish Korean seafood products in US market by creating a producer–consumer trust.

To overcome the gap between US consumers’ expectations and what the Korean farmers are offering, Korean fisheries cooperatives help the farmers. The major role of FC is to assist the farmers and
fishermen in marketing of their products. The FC in Korea consist of two groups, based on regions and fishing industrial classification such as trawl fishery, purse seine fishery, aquaculture and fish processor’s cooperation. They advise their members who are fishermen or farmers with market information of production amount, price, etc. They also operate cold storage plants to freeze and hold the products freshness until the market is more favourable. Additionally they operate in Korean major ports to make arrangements to ship the products with best possible qualities to suitable markets.

Farmer-related governance structure is relational and captive (Table 2). The standards are set by the Korean government in accordance with desirable market such as the United States, and cooperatives offer financial assistance to farmers and processors, which represent a binding informal contract credit system.

In macrolevel, the FTA reduced the tariff on Korean seafood products imported into the United States to less than 4%. This potentially produces a higher flow of products into both the Korean and US markets. It is important for both countries to monitor the quality of traded food products. For this reason, the Korean Ministry of Oceans and Fisheries (MOF) was established to operate a sanitary management plan that aims to implement the Korea–USA Bivalve Sanitary Agreement (1972) and multiple Memoranda of Understanding regarding sanitary management of bivalves for export to the United States. According to the Ministry of Ocean and Fisheries (MOF) (2014), oyster production in Korea in 2011 was 281,022, nearly 30,000 tonnes of which were exported to the United States at a retail price of 700 USD per ton. However, shortly after implementation of the FTA, many Korean shellfish products were banned from entering the United States due to a sanitization issue, resulting in a sharp drop in export of oyster products in 2012.

The MOF has designated seven areas (Hansan, Gamak Bay, Sarang Island, Mireok Island, Narodo, Changseon, Gangjin Bay) covering approximately 34,435 hectares for rearing of bivalves for export. Inspection is conducted by the National Fisheries Research Institute, under the MOF and Animal and Plant Quarantine Agency.

Seeding is an important step in oyster production. Methods of seeding used in Korea include collection of juveniles and hatchery production. The techniques must conform to the life history of the oyster that remains attached to a substrate throughout its life.

Korean processing plants are capable of meeting standards such as those imposed by the HACCP. Through HACCP, exporters have direct control over the quality of the products they buy. Processing plants play the lead role in the production system. Unlike farmers, processors are capable of increasing their capacity to adapt to the standards set by the US government. In Korea, few oyster farms own their own processing facilities, which would lead to more effective hierarchical governance. Farmers have the least leverage in this process, as they have little capacity for upgrading their standards and technologies in accordance with the US market.

Discussion

A major issue faced by consumers is the lack of ability to determine where and how the seafood products were produced and processed. This can be addressed through understanding the value chain and the standards set by the importing country.

Global value chain is considered as the manifestation of the economic power of a lead country, and this can have both micro- and macro-impact on the total value chain and the supply chain. In the case of Korea and the United States, the relationship between Korean exporters and US importers is based on price and quality. Thus, in the microlevel, it is important for the US government to make sure the Korean seafood products comply with regulations and standards. On the other hand, compliance with the standards can improve the quality of Korean seafood products and generate increased profit for Korean farms, processors and exporters.

During the 1970s to late 1980s, importers in Japan effectively intervened downstream by supporting the Korean exports. Because many Korean families relocated to Japan during the Korea war, the relational value chain among these families and those remaining in Korea played an important role.

From the early 1990s, the relational value chain gave way to the modular value chain for reasons including the economic rise of South Korea, increasing seafood demand in new markets such as the United States, and sufficient experience gained from the previous decades. During this
period, the separation of pre-processing and post-processing centres led to more organization and regulation of the Korean seafood market.

Finally, the shift initiated by US-approved farms and processing facilities led to development of increased capacity, and the strict standards have created a more efficient production and processing sector for exporting seafood products to the United States.

In this article, we have showed that in microlevel, the FTA helps Korean brands to be recognized by US consumers and it helps Korean processing plans to reach to global standards to export. In general, the FTA helps all members of the value chain to improve in the certain level so that international standards for importing the products can be reached. In macrolevel, the FTA between Korea and the United States was the final step in removing tariff barriers to import and export of seafood products and created a platform for access of Korean oyster farmers and seafood processors to the US market by complying with the relevant standards. The FTA between Korea and United States has fostered expansion of the Korean aquaculture industry production of high-quality seafood products.

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