



## **Fosterage of Kimchi Industry in Korea to Reaffirm its Sovereignty over Kimchi**

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### **ABSTRACT**

*Ministry of Agriculture, Food and Rural Affairs (MAFRA) plans to establish the status of Korea as the birthplace of kimchi by enhancing the competitiveness of domestically produced kimchi through several promotion strategies and fostering plans. The previous promotion strategies have included the following measures. First, the ministry will expand the base of kimchi and fostering related industries. MAFRA will industrialize pickled Chinese cabbage as a kimchi related industry and reinforce safety management of the kimchi. Second, MAFRA plans to strengthen the quality competitiveness of Korean kimchi. The ministry will standardize kimchi quality characteristics and introduce taste labeling (salty, spicy, sour), and pioneer new markets through developing new kimchi as a functional food. The ministry will also enhance the capacity of kimchi producers and related organizations and build governance for policy consultation. Lastly, MAFRA plans to counteract the expansion of kimchi imports and export expansion. The ministry will reinforce control of the imported kimchi by distribution stage and disseminate cost reduction technology of the domestically produced kimchi and pursue strategies for localizing exports. The ministry will examine the introduction of 'geographical indication on the country name' to prevent pirating trademarks of the domestically produced kimchi in foreign countries. The fostering plans in 2019 have inherited the main contents of the promotion strategies and the main focus is on countermeasures against the expansion of Chinese kimchi imports.*

Keywords: Ministry of Agriculture, Food and Rural Affairs (MAFRA), Kimchi, Chinese Cabbage, Fostering Plan

### **INTRODUCTION**

Kimchi is a traditional side-dish of Korea, made with fermented Chinese cabbage and radish. With its high nutrition, spicy and deeply flavored, it has been the most beloved food which is a staple in Korean cuisine over history (Lee, 1991). Despite its popularity, the size of the domestic kimchi market is estimated to be about US\$1.14 billion in 2018, a 4.2% decreased compared to the previous year. Among them, Korean kimchi sales are estimated to be US\$940.16 million, 5.9% down from the previous year while imported kimchi sales are estimated to rise 4.5% year-on-year to US\$256.5 million. Furthermore, the average unit price of imported kimchi is estimated to be about US\$0.7/kg, only 30% in comparison with the price of Korean kimchi, and the price ratio of imported kimchi against Korean kimchi is becoming larger every year. The decrease of the market size in 2018 is attributable to the fact that domestic kimchi producers decreased supply because they could not have procured raw materials at the right time and the price, while the kimchi production costs had increased due to the instability of supply and price of Chinese cabbage, and inflated prices of white radish and dried red pepper.

Table 1. Size of the Domestic Kimchi Market and Average Unit Price per its Country of Origin

Year	Sales (Wholesale, US\$ million)			Average Unit Price (US\$/kg)		Price Ratio (k/i)
	Korean	Imported	Sum	Korean(k)	Imported(i)	
2015	826.47	171.81	998.28	2.00	0.77	2.60
2016	885.36	189.03	1074.39	2.16	0.75	2.88
2017	990.10	195.12	1185.22	2.38	0.71	3.35
2018	932.13	239.20	1171.33	2.33	0.70	3.33

Note: All prices are converted from the Korean won to the U.S. dollar.

Source: (Park & Jeong, Kimchi Industry Status in 2018, 2019)

The amount of domestic kimchi consumption in 2018 is estimated to be about 1.82 million tons, which has been on the decline of 1.3% annually since 2010. The reason that total kimchi consumption has been on such a slight decline is mainly due to the decrease in home-made kimchi consumption. On the other hand, consumption of commercial kimchi is increasing that the kimchi market keeps growing. Among the total kimchi consumption, the amount of home-made kimchi shrunk from 1.47 million tons in 2010 to 1.13 million tons in 2018, with an annual decrease of 3.3%. However, the amount of kimchi that household, restaurant, or cafeteria bought increased from 540,000 tons to 690,000 tons in the same period, with an annual increase of 3.0%. As the kimchi market is showing an increasing growth while household, restaurant, and cafeteria tend to buy kimchi instead of making it themselves, it is required to improve the structure of the Korean kimchi industry and strengthen the competitiveness of the Korean kimchi through daring investment and innovation.

Table 2. Domestic Kimchi Consumption

Year	Kimchi Consumption (Tons)				
	Sum	Home-Made	Commercial		
			Amount	Korean	Imported
2010	2,015,096	1,471,886	543,209	350,273	192,936
2015	1,909,398	1,272,136	637,262	413,138	224,124
2016	1,865,249	1,202,379	662,870	409,438	253,432
2017	2,015,476	1,323,328	692,148	416,517	275,631
2018	1,815,548	1,125,412	690,136	399,395	290,742
CAGR (^10^18)	-1.3%	-3.3%	3.0%	1.7%	5.3%

Notes: Consumption data for 2018 are all estimates except imported kimchi. Home-made kimchi means kimchi that are self-made by household, restaurant or household. CAGR is annual increasing rate.

Source: (Park & Jeong, Kimchi Industry Status in 2018, 2019)

Korea's kimchi consumption trend can be summarized as a decrease in the total consumption, growth in market size, and an increase in foreign dependency. The decrease in the total consumption can be attributed mainly to increased income and diversification of food due to the westernization of diet, namely the reduction of the proportion of traditional Korean food centered on rice and kimchi. Despite the decrease in the total consumption of kimchi in Korea, the market size keeps growing because consumers are changing their procurement methods from making kimchi themselves to buying it. On the other hand, the amount of kimchi purchased by restaurants and cafeteria is increasing as the foodservice industry keeps growing. Moreover, it is more economical and convenient for consumers to buy a small amount of kimchi frequently instead of making a lot of kimchi periodically and storing it for a long-term. And such trends will accelerate owing to the increase in social activity time of women and losing an opportunity of learning kimchi-making method.

Currently, most Korean restaurants use Chinese kimchi that it is difficult to find a restaurant in which serves domestically produced kimchi in Korea. According to the World Institute of Kimchi (Park & Jeong, Kimchi Industry Status in 2018, 2019), the amount of kimchi consumed in Korea is about 1.82 million tons in 2018, up from 1.6 million tons in 2015. Among them, 1.13million tons of kimchi was made at a home while the other 690,136 tons of kimchi was produced as a commodity. Meantime, 290,742 tons of kimchi were imported from China, which is 5.5% up of the amount imported in the previous year. The problem is that the imported kimchi accounted for 42.1% of the commercial kimchi, 16% of the total domestic kimchi consumption, and 69.6% of the restaurant and cafeteria consumption. The main reason for the expansion of Chinese kimchi is the price competitiveness of it compared to the domestically produced kimchi.

Meanwhile, the number of kimchi manufacturing companies has increased from 249 in 2015 to 264 in 2017, with an increase in the total production output from US\$888.88 million to US\$1,040.28 million in the same period.

The production output divided by the number of companies has also increased from US\$3.57 million to US\$3.94 million per company.

Table 3. Kimchi Production in Korea

Year	Number of Companies(c)	Production Output (US\$ million)	
		Total(t)	Per one (t/c)
2015	249	888.88	3.57
2016	263	958.80	3.65
2017	264	1040.28	3.94

Note: there is no quantity data for the production output in KOSTAT mining and manufacturing survey.

Source: (KOSTAT, 2018)

To sum up, while the size of the kimchi market is growing even though the total kimchi consumption decreases every year, the Korean kimchi industry is currently encountering a threat by the expansion of imported kimchi, all mostly from China. To be short, Chinese kimchi is gradually encroaching on the Korean kimchi market. In this situation, the Ministry of Agriculture, Food and Rural Affairs (MAFRA) announced the “kimchi industry promotion comprehensive plan 2018~2022” to establish Korea’s status as the birthplace of kimchi through the promotion of the kimchi industry. While kimchi consumption has continued to decline due to a recent decrease in rice consumption, the rise in imports of Chinese kimchi, which is cheaper in raw materials, has dampened the position of Korean kimchi. Under this sense of crisis, MAFRA organized a task force for the promotion of a comprehensive plan from November in 2017 and prepared the comprehensive plan through collecting opinions from experts working in related agencies, and members of the kimchi industry.

Furthermore, through reviewing fosterage plans of the kimchi industry in Korea, this paper aims to summarize the current status of the kimchi market in Korea and its industry promotion strategies and provide a brief summary which may help those who seek to gain information about the kimchi industry of Korea to comprehend the most recent status of it.

Table 4. Main Policy Goals of the Kimchi Industry Promotion Comprehensive Plan 2018~2022

Contents	Goal
Market size of kimchi products	('17) US\$147.66 million → ('22) US\$287.13 million
Expanding the market share of Korean kimchi	('17) 65% → ('22%) 70%
Improvement of kimchi trade balance	('17) →US\$47 million→ ('22) ±0

Source: (MAFRA, 2018)

### Literature reviews

Several studies have been done in order to find out measures for the development of the Korean kimchi industry. Lee & Park (2010) suggested that in order to make the kimchi industry as an industry that supports future well-being diet, industrialize kimchi into health food and favorite food, and secure international industrial competitiveness of it, it is necessary to support R&D, to develop consumer-oriented products, to build a stable raw material base, to create infrastructure such as standardization, to improve related laws and systems.

Hwang (2005) pointed out that the weaknesses of the domestic kimchi industry include the smallness of producers, entry of low-cost kimchi products into the market, excessive competition such as dumping sales, weakening marketing ability, and unstable supply of raw materials.

Kim *et al.* (2007) also mentioned several measures for the improvement of the Korean kimchi industry. Firstly, a safe supply of kimchi raw material and price stability are important. For the second, product traceability of kimchi and securing the safety of kimchi are essential. The modernization of the kimchi factory, securing distribution system, and marketing strategy are also needed. Thirdly, strengthening the functionality of kimchi and developing high value-added kimchi tailored to the health, and setting various grades in kimchi to control excessive competition among kimchi producers and stabilize prices. Research and development of kimchi and industrialization of kimchi are needed. And, for the last, it is required to develop kimchi products and diversify exporting countries by establishing marketing strategies considering a package, packaging size, local cuisine, food culture, and taste of locals all over the world.

Park (2019) conducted a study with the aim of providing basic information necessary to improve the management policy of Korean kimchi producers. As a result, it is found out that the smallness of domestic kimchi producers should be overcome in preparation for the expansion of imported kimchi, and the producers should be scaled and specialized for foreign market development.

Although several studies have been done, there has been a limited review of the fosterage plans of the kimchi industry in Korea. As so, this study will focus on reviewing the comprehensive kimchi promotion plans of the Ministry of Agriculture, Food and Rural Affairs (MAFRA).

### Promotion strategies

This comprehensive plan (MAFRA, 2018) focused on strengthening the price and quality competitiveness of Korean kimchi to counter the expansion of the Chinese kimchi imports. The plan is to expand the kimchi products market from US\$147.66 million in 2016 to US\$287.13 million in 2022 by fostering kimchi-related industries such as kimchi sauce, raise the market share of the Korean kimchi from 65% to 70% by enhancing the quality competitiveness of the Korean kimchi, and adjust the trade balance of the kimchi by boosting the domestic consumption and expanding exports. The comprehensive plan consists of 6 strategies and 24 detailed tasks, and the main contents are as follows.

Table 5. Promotion Strategies of the Comprehensive Plan

Strategy	Contents
1	Fostering kimchi-related industry
2	Improving competitiveness of the Korean kimchi
3	Response to imported kimchi and imports expansion
4	Raising awareness of kimchi and promotion of its excellence
5	Building governance
6	Supporting stable supply of raw materials

Source: (MAFRA, 2018)

The first promotion strategy is to foster a kimchi-related industry. MAFRA will strengthen the manufacturing and safety management of pickled Chinese cabbage, which is a kimchi-related industry, and foster kimchi sauce and kimchi Home Meal Replacement (HMR) industries. The ministry will expand the production and the supply of the pickled Chinese cabbage in main Chinese cabbage production areas and seek to reduce the cost of kimchi production and improve logistics efficiency. It will foster the pickled Chinese cabbage industry by establishing networks of producers in the main production areas and kimchi manufacturers, supporting the production facilities of Chinese pickled Chinese cabbage and the naturalization of byproducts (the current market size of the pickled Chinese cabbage about US\$147.66 million is planned to extend to about US\$250.86 million by '22). The ministry will promote the kimchi sauce and the kimchi HMR industry that uses kimchi. It will expand R&D support for developing kimchi sauces that match local food culture, and development of new kimchi HMR products in response to the expansion of the HMR market. Lastly, the ministry planned to reorganize the World Institute of Kimchi and functions of the Sauce Industrialization Center to reinforce field consulting, supports, and guidance on the industrialization of domestic kimchi companies.

MAFRA's second promotion strategy is to improve the competitiveness of the Korean kimchi. It will introduce an indication system by standardizing and rating the taste and quality of the Kimchi, and pioneer new markets through the development of functional kimchi. The ministry plans to develop a kimchi taste standard index (spicy, salty, sour) and introduce taste indication labeling to offer consumers information about the kimchi taste. To improve the quality of small and medium-sized kimchi manufacturers, MAFRA will provide guidelines for quality and excellent spawn management and will expand customized field technological guidance. World Institute of Kimchi developed excellent starters<sup>1</sup> for kimchi (ex. Wikim38) which can be utilized in the maintenance and management of kimchi quality. To counter the expansion of the health and aging-friendly food market, MAFRA plans to expand support for the development of novel kimchi such as functional kimchi that

<sup>1</sup> Starters are microorganisms that are intentionally added to the fermentation of kimchi to utilize the metabolic capacity of the microorganisms (Jeong & Lee, 2014)

utilizes kimchi lactobacillus.

The third strategy is to respond to imported kimchi and import expansion. MAFRA will strengthen the management of the imported kimchi. The ministry will also pursue export diversification and ease export concentration in Japan by developing products customized to export markets. MAFRA plans to strengthen management and control over the origin of the imported kimchi and the kimchi materials. To reduce the production cost of kimchi, MAFRA plans to develop and distribute kimchi production technology for business use and automated production equipment. The ministry will support joint projects through a consultative group to enhance quality by increasing the bargaining power of small kimchi companies. The government also plans to expand the 'Korean kimchi voluntary indication system' that grants certification marks to the domestically produced kimchi users. The ministry will examine the introduction of 'geographical indication on the country name' to prevent pirating trademarks of the domestically produced kimchi in foreign countries. And the government plans to expand support for developing products and recipes customized to the export market such as developing kimchi dishes combined with local traditional cuisines. Following, MAFRA will support overseas promotion events such as K-Food Fair, hold kimchi export consultation meetings, and expand widespread support to build export infrastructure and explore foreign markets, including support for procedures needed for foreign market development and customs clearance.

Fourthly, MAFRA has a promotion strategy to raise awareness of kimchi and promote its excellence. It plans to promote awareness improvement and kimchi culture events to promote the consumption of kimchi and, expand the base of the kimchi. The ministry will expand kimchi awareness improvement promotion for infants and young adults. It also plans to hold cooking contests, expand the existing kimchi shows to develop kimchi food culture, and enlarge the base of the kimchi.

For the fifth promotion strategy, MAFRA will build governance in the kimchi industry. It plans to establish governance in order to actively gather opinions from the kimchi industry and promote kimchi policies that are in line with the field level. It plans to organize and operate a kimchi policy forum where the government, research institutions, and kimchi association participate.

For the last, MAFRA will support a stable supply of raw materials as its sixth promotion strategy. It will expand its project to stabilize the supply and demand of vegetables to stably secure the kimchi materials. Starting this year, MAFRA plans to add chili peppers to the list of the vegetable price stabilization system to increase the amount of shipment control and reserve. It also plans to seek a stable supply of the kimchi materials through contract-farming mediation between farmers and the kimchi companies.

### **Newly established plan in the previous year**

Last year, MAFRA has introduced a newly established plan, so-called "Kimchi Industry Fostering Plan (MAFRA, 2019)" in order to enhance the quality competitiveness of domestic kimchi and respond to the expansion of kimchi imports, and to expand the domestic kimchi market. In this plan, MAFRA plans to improve the competitiveness of Korean kimchi through quality and safety differentiation in response to the expansion of kimchi imports. Recently, as the preference for Korean kimchi has increased, kimchi exports have risen to the highest level ever, but imports also have been steadily increasing due to the demand for Chinese kimchi, which is cheaper, in the foodservice industry. Under the crisis of the erosion of the domestic kimchi market, MAFRA has gathered opinions from experts, related organizations, producers, consumer groups, and the kimchi industry through three 'Kimchi Industry Policy Forum' and meetings since the second half of last year to prepare a new 'Kimchi Industry Fostering Plan'

In this fostering plan, MAFRA focuses on responding to the expansion of kimchi imports through quality and safety differentiation of Korean kimchi. In order to extend the best before date and develop excellent starters, 'Kimchi R&D roadmap' will be established and promoted. Subsequently, a raw material supply system between the Kimchi Association and the producing area distribution organization will be established to supply kimchi raw materials to producers stably. And, MAFRA will improve the safety of school meal kimchi and increase the accessibility of kimchi for youth through the development and dissemination of 'school meal kimchi standard'. Lastly, the ministry plans to increase the export of kimchi through expanding export logistics cost support. The fostering plan consists of five main projects as follows.

### **Project 1: Differentiation of quality and safety**

MAFRA will establish a 'Kimchi R&D Roadmap' to expand R&D support such as prolongation of best before date in order to improve kimchi marketability. The ministry plans to expand budget and manpower support to improve the marketability such as the extension of kimchi taste and quality period and developing multiple-starters which improve the functionality of kimchi. Supports on developing the kimchi starters will be expanded from 8 researchers with US\$970,000 in 2019 to 20 researchers with US\$1.78 million in 2022. MAFRA also will enhance consumer convenience and safety through developing a huddle technology that simultaneously applies antimicrobial activity starters technology, microbial reduction technology, and low-temperature sterilization

technology altogether. This huddle technology would double the best before date from now (current 30 days to 60 days). In sequence, MAFRA will promote excellent starters supply projects to improve the quality of Korean kimchi. Using kimchi self-help funds, starters in which improve taste and best before date of the kimchi will be provided at half of the original supply price from May of 2019. It will introduce kimchi quality indication system such as kimchi fermentation degree or taste through accumulating big data for establishing and grading the standard index analysis method of kimchi taste.

Table 6. Kimchi R&D Roadmap

Objectives	Technology	Objectives until 2024
Identification of Fermentation Mechanisms and Strengthening Functionality of Starters	Identification of fermentation	Development of fermentation control technology and identification of environmental change fermentation mechanism
	Kimchi starters development	Development of quality and health functional multiple-starters
Process Improvement	Development of starters activity maintenance technology	Freeze-drying 16weeks freeze-keeping, survival rate over 80%
	Hygiene and safety improvement	No detection of hazardous microorganisms in Kimchi over pH 4.5
Functional Material Development	Technology transfer to enhance competitiveness of small producers	Establishment of customized support system
	Intelligent packaging technology	Development of packages with intelligent kimchi packaging technology
	Identification of kimchi's functionality and bio-materialization	Acquisition of individual recognition (clinical experiment), excavation of functional lactobacillus effective material

Source: (MAFRA, 2019)

MAFRA will strengthen quality improvement and risk factor management about distributed kimchi and cafeteria kimchi. For young people with low kimchi intake, the ministry will develop and provide 'school meal kimchi standard' so that students can get more delicious and safe kimchi. It will form 'school meal kimchi producer council (tentative name)' to strengthen inspection and management of school meal kimchi. Following, MAFRA plans to establish guidelines for the management of pickled Chinese cabbage until the second half of 2019 and to improve the safety of pickled Chinese cabbage in cooperation with local governments in the production areas. In addition to existing kimchi producers, the ministry plans to raise the kimchi hygiene level by providing HACCP consulting support for small kimchi producers. The standardization of the raw materials will also be promoted for quality and safety at all stages of kimchi manufacturing.

**Project 2: Expanding the domestic market and developing new markets**

MAFRA will expand the use of Korean kimchi for military meals, restaurants, and cafeterias, and pioneer the domestic and foreign premium kimchi market. In order to improve awareness of kimchi, the ministry will collaborate with Korea Highway Corporation and expand the use of Korean kimchi at the highway rest area which is a local gateway from April of 2019. It will also support quality management, consulting, and publicity for those who use Korean kimchi. Further, MAFRA will expand the supply of Korean kimchi in the form of finished products to the military. It will also develop and expand support on pickle replacement kimchi for children, special and functional kimchi such as kimchi for the elderly and patients. Support, including patent and marketing costs required for developing export products with a limit of about US\$40,600.

**Project 3: Strengthening distribution management of kimchi**

By 2020, MAFRA will make the indication of origin about the salt used for kimchi be mandatory and the ministry plans to improve awareness of Korean kimchi by refining the Kimchi origin voluntary indication system. It also will strengthen the crackdown on communication sales kimchi, which is increasing in imports, and regularly investigate the actual condition of kimchi in circulation and analyze the ingredients. These measures are likely to serve as non-tariff barriers to imported kimchi in the future.

### Project 4: Stable supply and cost reduction of kimchi raw materials

For the first time this year, MAFRA will set up raw material supply standards and unit prices through a business agreement between the Kimchi Association and the producing area distribution organization and will promote a pilot project (from March of 2019) to supply kimchi raw materials to the producers steadily throughout the year.

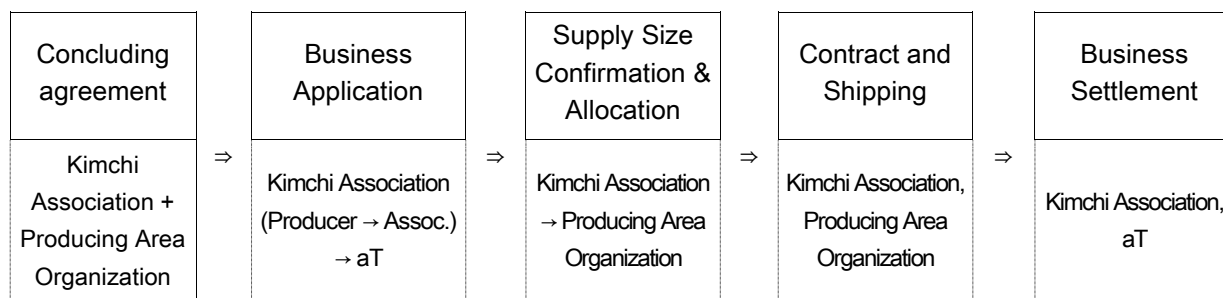


Figure 1. Plan for a Pilot Project

Source: (MAFRA, 2019)

MAFRA plans to support raw material purchase funds and facility modernization funds for producers with the excellent domestic raw material purchase and contract cultivation performance. The funds are limited to US\$2.43 million per company and a 1% preferential interest rate will be applied. The ministry will support the joint purchase cost of kimchi and kimchi raw materials from March of 2019 and reduce production cost through designing and constructing a kimchi production system, research, and development of automation plants.

### Project 5: Expanding exports and strengthening publicity

To develop foreign markets, MAFRA will expand export logistics costs to 18% (currently 9%) and support joint marketing. Subsequently, the ministry will introduce a ‘national name and geographical indication system’ to prevent the theft of Korean kimchi trademarks. Besides, MAFRA will enact ‘Kimchi Day’ to promote the excellence of Korean kimchi and spread the kimchi-making tradition to expand it to kimchi cultural events.

## CONCLUSION

The purpose of this study is to summarize the current status of the kimchi market in Korea and several plans established by MAFRA in order to foster the Korean kimchi industry. Although the total kimchi consumption and self-making kimchi in Korea have been steadily decreasing, the domestic kimchi market is growing as commercial kimchi has increased including domestic products and imported products, mainly from China. The price ratio of Korean kimchi to Chinese kimchi is getting bigger and even worse, Chinese kimchi accounts for nearly 70% of kimchi consumption in restaurants and cafeterias. Under the current crisis of an erosion of the domestic Kimchi market, MAFRA has refreshingly established a “Kimchi Industry Fostering Plan” in 2019.

The plan consists of mainly five projects which could adequately fulfill the suggestions by the past studies. First of all, the ministry plans to differentiate the quality and taste of Korean kimchi through several measures. Secondly, the ministry plans to expand the domestic kimchi market and develop new markets. For the third, MAFRA will strengthen the distribution management of kimchi. Following, the ministry plans to establish stable supply and cost reduction of kimchi raw materials, fourthly. For the last, MAFRA will expand exports and strengthen the publicity of domestic kimchi producers. The fostering plan is expected to help farmers who produce kimchi raw materials to stabilize their management by enhancing the quality competitiveness and consumption of Korean kimchi.

It is difficult to scrutinize exactly how this fostering plan has affected the domestic kimchi industry since the fostering plan has been established for only one year, however it is clear that it will have a positive ripple effect on the kimchi industry overall.

As this study has been done in order to briefly summarize the current status of the kimchi industry in Korea and its promotion plans, there has been a limitation that there is a lack of further research using an economic theory even though this study’s main purpose is to provide a brief summary of Korea’s kimchi industry and its fosterage plans.

## REFERENCES

- Hwang, G. (2005). The Present Status and Development Direction of Export of Korean Kimchi to Japan. *Food Preservation and Processing Industry*. 4(1), pp. 46-56. The Korean Society of Food Preservation.
- Jeong, D., & Lee, J. (2014). Safety Assessment of Starters for Traditional Korean Fermented Foods. *Microbiology and Biotechnology Letters*. 42(1), pp. 1-10. The Korean Society for Microbiology and Biotechnology.
- Kim, S., Yang, J., Kang, S., Chun, H., & Park, K. (2007). The Present Status and Development Plan of the Korean Kimchi Industry. *Food Industry and Nutrition*. 12(2), pp. 7-13. The Korean Society of Food Science and Nutrition.
- KOSTAT. (2018). *Report on Mining and Manufacturing Survey*. Korea National Statistical Office.
- Lee, Y. (1991). Kimchi: The famous fermented vegetable product in Korea. *Food Reviews International*, 7(4), pp. 399-415.
- Lee, Y., & Park, G. (2010). *Mid-to Long-Term Development Strategies of Kimchi Industry*. Seoul-si: Korea Rural Economic Institute.
- MAFRA. (2018). *Kimchi Industry Promotion Comprehensive Plan*. Sejong-si: Ministry of Agriculture, Food and Rural Affairs.
- MAFRA. (2019, 3 7). Capturing Domestic and Foreign Markets through Quality and Safety Differentiation of Korean Kimchi. Sejong-si, South Korea.
- Park, S. (2019). Current Status and Prospect of Kimchi Industry in Korea. *Food Industry and Nutrition*. 24(1), pp. 1-8. The Korean Society of Food Science and Nutrition.
- Park, S., & Jeong, S. (2019). *Kimchi Industry Status in 2018*. Gwangju-si: Wolrd Institue of Kimchi.