

Undaria market sizing Japan & South Korea

New Zealand Trade and Enterprise



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kpmg.com/nz

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We passionately believe that the flow-on effect from focusing on helping **fuel the prosperity** of our clients significantly contributes to ensuring that our communities, and ultimately our country and all New Zealanders, will enjoy a more prosperous future.

Contents

Executive summary **5 – 12**

Purpose, outcomes and testing with industry experts	5
Report approach and methodology	6 – 7
Summary of market sizing findings	8
Value chain insights	9
Primary interview insights	10
The opportunity and size of the prize	11

Appendices **13 – 91**

Global seaweed market and initial impact of COVID-19	14 – 15
Introduction to Undaria Pinnatifida	16 – 20
Japan deep dive	21 – 49
South Korea deep dive	50 – 80
Japan and South Korea competitive landscape	81 – 91



Purpose, outcomes and testing with industry experts

Background

Undaria has been described as “*the gorse of the sea*” and while sentiment remains that this remains an invasive species (as its status in the biosecurity act implies) there is growing awareness of the economic opportunities with Undaria exports as an under-developed opportunity.

New Zealand has been harvesting Undaria for several years, mostly for domestic consumption, but recently commenced exports in 2019.

New Zealand’s Government is supportive of these moves recently announcing an ambitious aquaculture strategy to become a NZD\$3bn industry by 2035.

Purpose

The objective of this engagement is to ‘size’ the potential markets available for Undaria exports to Japan and South Korea on behalf of New Zealand Trade and Enterprise and the New Zealand industry, including cultivators, harvesters, processors and exporters.

Specifically, it outlines the total volumes produced locally, imported and exported in the target markets. The size of each segment by value, volume throughout the value-chain including high-level categories, anticipated growth and market trends.

The report determines issues effecting supply and demand, perceived drivers of value within each stage of the value chain and the competitive landscape and basis of advantages.

Primary subject-matter expert testing

The report includes primary and secondary market research which we have then validated through primary interviews with industry experts within each market, namely Japan and South Korea.

Sustainable value benefits

Harvard reported that coastal ecosystems sequester large amounts of carbon, outlining ‘coastal ecosystems sequester away surprisingly large amounts of carbon’ indicating a future Undaria market has the ability to contribute significantly to New Zealand’s commitment to becoming a carbon neutral county by 2050.

This report seeks to provide insight into three key areas for the Japan and South Korea markets for Undaria pinnatifida :

1

Sizing of each market, by volume, value, segment and trends

2

Breakdown of each market’s value chain and profit pools

3

Validation and insight through primary interviews with industry experts

EXECUTIVE SUMMARY

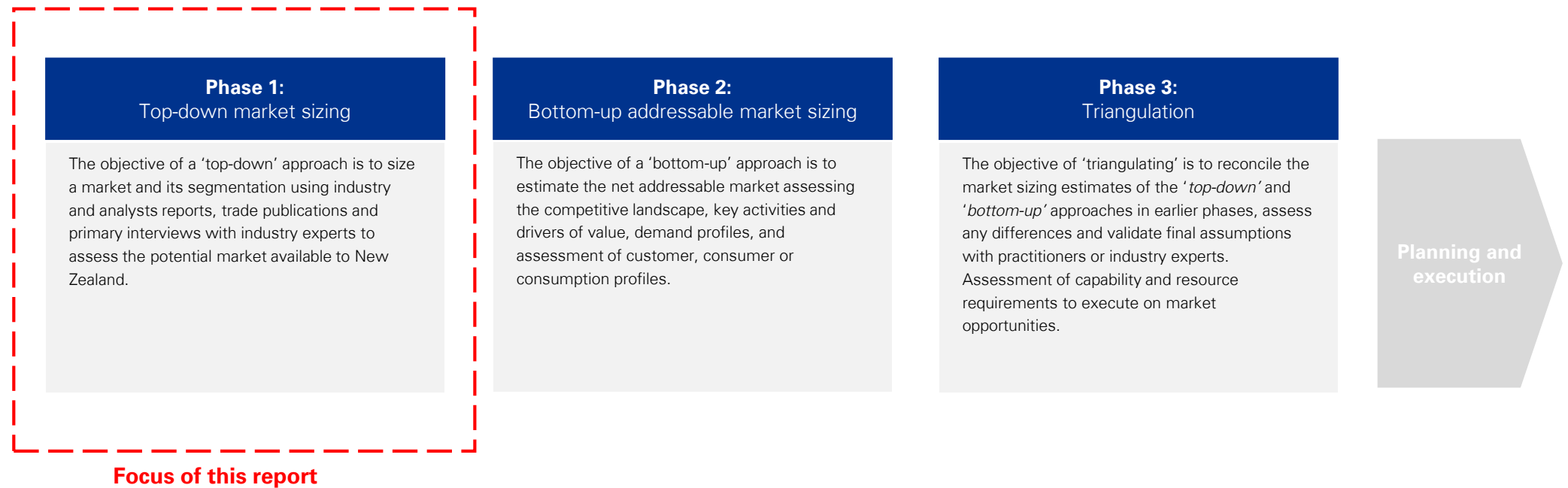
This is the first phase to identifying market opportunities, sizing the Japan and South Korea markets using a 'top-down' approach

KPMG uses a three-phase methodology commonly used in industry to size markets, with the initial phase being 'top-down', then 'bottom-up', with the final phase being a 'triangulation' to reconcile the findings across all phases.

This report is based on phase one, or the 'top-down' approach only, to assess the opportunity available to New Zealand for Undaria in Japan and South Korea.

This approach to market sizing ensures a cost effective way of estimating an overall size of a market, ensuring there is value potential before pursuing the next stage. By determining and assessing the materiality of the market up-front, this helps decision making for a go/no-go pursuit of market/product entry and/or expansion opportunities.

In some cases go/no-go decisions can be reached prior to completing all three phases.



EXECUTIVE SUMMARY

KPMG leveraged a variety of primary and secondary information sources to compile insights on the Undaria markets of Japan and South Korea

KPMG have compiled insights from numerous information sources across trade associations, research databases, government, third-party research and primary interviews with industry experts.

Using a broad range of sources ensures that NZTE have a well-rounded and validated view of the Undaria market in both Japan and South Korea.

Primary interviews

Japan

- Kota Ohashi (JOFIEA)
- Oshima Yuichiro (Sojitz Foods)
- Shimizu Sataro (Sojitz Foods)
- Shoichiro Kataoka (Sankou Foods)
- Shintaro Nakamura (NZTE)
- Seishi Gomibuchi (MBIE)

South Korea

- Sang Min Lee (Daesang Corporation)

Desktop research

Trade associations

- Monterey Bay Aquarium
- Invest Korea

Research databases

- Capital IQ
- Euromonitor International

Government sources

- FAO
- OECD
- Ministry of Finance, Japan
- Unipass Customs, South Korea
- Ministry of Agriculture, Forestry and Fisheries, Japan
- USDA Foreign Agricultural Service
- IMF
- International Trade Centre
- Ministry of Oceans and Fisheries, South Korea
- Ministry of Foreign Affairs and Trade
- Ministry of Business, Innovation and Employment
- Korea Agricultural and Fisheries Food Distribution Corporation

Third-party research

- Radiant Insights
- Allied Market Research
- Tansley Insights
- Seaweed.ie
- International Trade Statistics
- Tridge
- BIM
- Science Direct
- CNN
- Japan Times
- Korea Herald
- Monterey Bay Seaweeds
- e-Algae; Algae
- Food Navigator – Asia
- Korea Science
- URI EDC
- FishSite
- Ozy
- Live Japan
- Japan Today
- Thyroid Research Journal
- NPR
- Forbes
- Sora News 24
- Semantic Scholar
- Japan Experience
- Global News Wire SeaFood Source
- Tree Hugger
- Korea Times
- Business Korea
- Korean-Products
- aT Center
- Bloomberg
- Trade Korea
- De Gruyter
- The Mainichi

EXECUTIVE SUMMARY

Japan appears to be a much more attractive market, due to a range of factors across imports, forecast demand and the competitive environment

The collation of insights across a number of primary and secondary sources has provided a rounded view of market insights for Japan and South Korea.

A ranking across key decision factors has shown that Japan is a preferred market for a number of reasons, as described below:

- Both Japan and South Korea are large markets for Undaria, where it primarily supplied for human consumption.
- Japan has a large demand for imports, making up c.87% of total supply, while South Korea is largely supplied by locally grown product with very low imports.
- Japanese imports are served almost exclusively by China (72%) and South Korea (28%) but there has been a decline in Chinese imports over recent years due to concerns around food safety and levels of heavy metals and chemicals observed in testing. South Korean imports are low volume and low value, typically \$1.00-2.00 USD/kg.
- New Zealand has existing and pending trade agreements with the New Zealand-Korea FTA established in 2015, and CPTPP (2018). New Zealand is positioned advantageously to competitors with reductions in tariffs and duties over a period of time, streamlined access and overall Government-to-Government relations.
- Both Japan and South Korea have a competitive industry around processing and packing. Despite Japan being heavily import dependent, a large amount of processing is done onshore.
- Consumer preferences are highly influenced by provenance and potential food safety concerns. There is a positive perspective of New Zealand in both Japan and South Korea with high confidence in food safety and a perception of clean oceans.
- Primary interviews with industry experts indicated Japan demand is expected to remain stable, while South Korea is expected to decline.

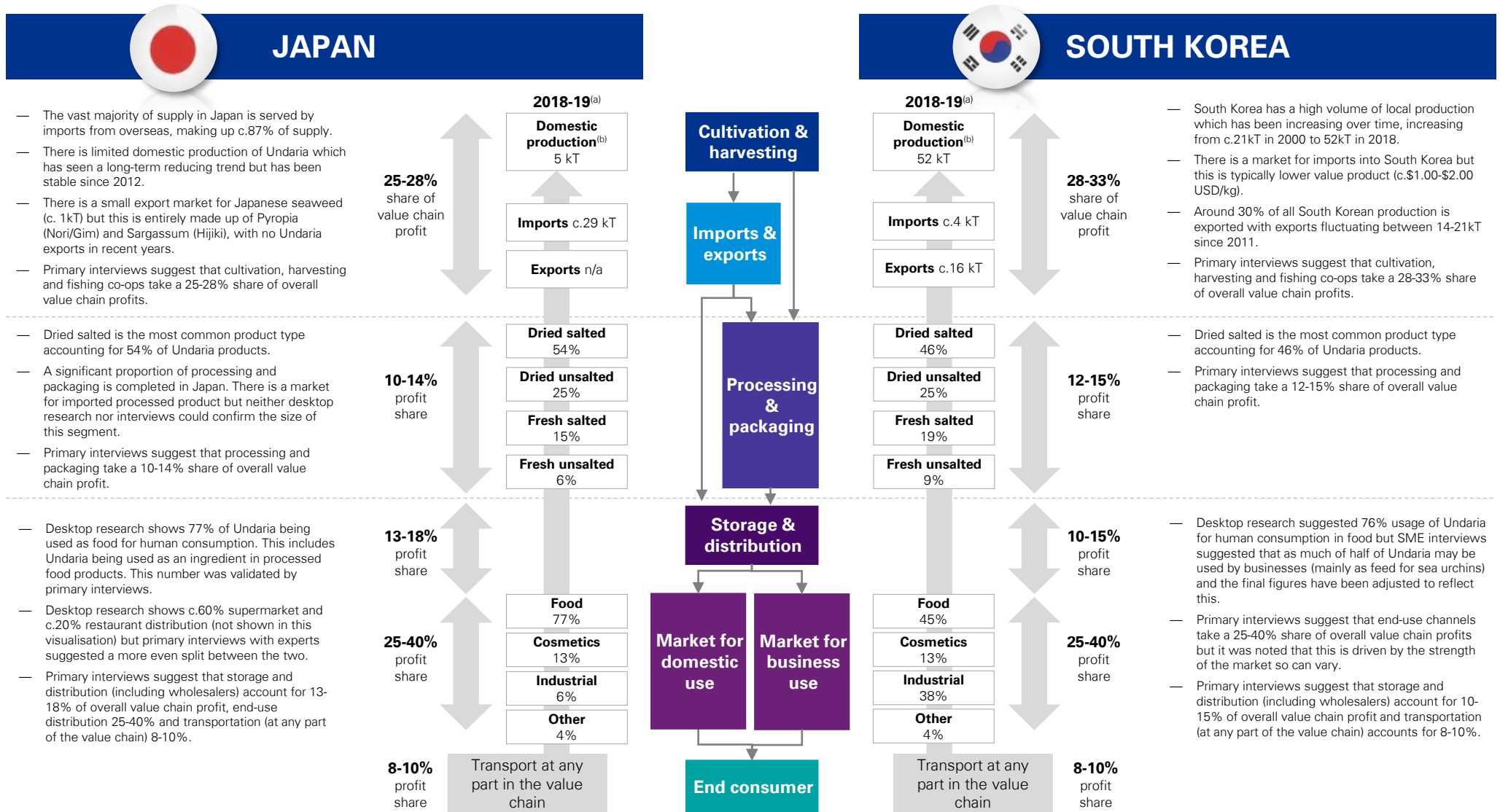
Decision factor	Japan	South Korea
End-use market size ^(a)	USD\$1,692m	USD\$1,280m
Import market value ^(a)	USD\$88m (~87% supply)	USD\$6.4m (~8% supply)
Import volume ^(a)	c. 29 kT	c. 4 kT
Trade and regulation	CPTPP (2018)	New Zealand-Korea FTA (2015)
Competitive environment	Reduction in Chinese imports due to food safety concerns	Challenging import market and high number of domestic growers
Fit with New Zealand brand	Positive consumer sentiment towards New Zealand food safety and clean oceans	Positive consumer sentiment towards New Zealand food safety and clean oceans
Forecast growth	Stable	Stable to declining
Overall market attractiveness	4.5 out of 6	3.0 out of 6

Note: (a) 2019

Source(s): Radiant insights, ITC, OECD, FAO, Ministry of Agriculture, Forestry and Fisheries Japan, Statistics Korea, International Trade Centre, SME interviews

EXECUTIVE SUMMARY

Japan is heavily reliant on Undaria imports, while South Korea is a large producer of Undaria with low demand for imports



Note: (a) Weight in kilotons (kT) (2019) (b) Converted from 'live weight' to 'product weight' using FAO guidance (2018)

Source(s): Radiant insights, ITC, OECD, FAO, Ministry of Agriculture, Forestry and Fisheries Japan, Statistics Korea, International Trade Centre, SME interviews

EXECUTIVE SUMMARY

Primary interviews with industry experts have provided insight across the value chains of both markets



JAPAN

- Health authorities are increasing inspections on Chinese production due to heavy metal and chemical contamination causing reductions in supply.
- The definition of *quality* begins with good harvest practices (e.g. thinning to optimise productivity).
- There is increasing adoption of innovation in cultivation and harvest (e.g. machine for thinning and removal of foreign materials during harvest).
- Seaweeds like Kombu and Undaria are very efficient at removing carbon from the atmosphere (with research indicating up to 20 times that of trees).
- The largest challenge for new entrants was cited to be 'quality' but comments were that, given the poor food safety of Chinese product, this should not be a significant obstacle for New Zealand, and best done in partnership with Japanese partners through knowledge exchange.
- One expert recommended analysing the use Undaria as feed to *fatten* and export sea urchins as a higher valued product rather than Undaria in raw form.

- Product is often imported "raw" – which is defined as salted and frozen for further processing and value-add in Japan. The most prevalent end product is dried Undaria.
- Product differentiation begins with quality harvesting practices and robust, safe and secure food systems.
- Processors place value on purity of ocean water quality and distinctly differentiate the grades of Undaria by growing conditions attributing colour, taste, texture and thickness of the meat to those conditions (e.g. an emphasis on how Undaria is grown and what processes have been done).
- The thickness of the meat can dictate the channel for distribution with both thick and thin meats maintaining value for different uses.
- There is an increase in adoption of automation in processing procedures such as de-ribbing although there are differing perspectives between experts on the productivity gains from this (e.g. inaccuracy of machines versus traditional hand-cut method).
- Waste from processing and production is channelled into animal feed and fertiliser production.
- Japan's domestic production achieves market premiums of c. \$20.00-\$30.00 USD/kg because of a combination of growing conditions and harvest practices, integrity of food systems and traditional methods use to produce for historically trusted brands.

- Demand for Undaria in Japan was described as 'huge' and 'stable' with limited changes in volume. It has high demand for domestic use in cooking as well as business use through restaurants and is a key ingredient in diet staples such as miso soup and furikake.
- Primary interviews illustrated that the use of innovation is not an automatic return on investment, as traditional production methods can, on occasion create better returns than using technology.
- Japanese consumers perceive Undaria as a low-calorie food with positive health benefits which lead to high consumption, in multiple formats (from condiments, to salads to other staples).
- Consumers identify *quality* as a number of attributes with the primary being food safety followed by others such as colour, taste, texture and thickness of the meat.

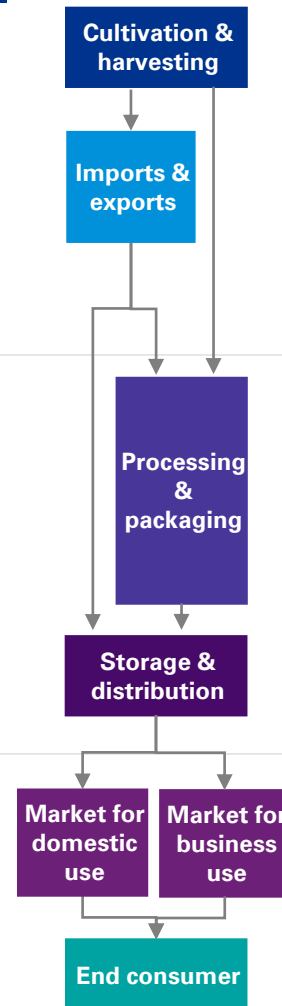


SOUTH KOREA

- There is some technological innovation around Undaria cultivation, but South Korean efforts have been primarily focussed on Pyropia (Gim). However, three new species of Undaria are being test harvested, with a focus on increasing yields through project 'Gold Seed'. The project is funded and led by the Korean Government. Korean Government appoint research institutes to cultivate new species, with successful species to be distributed to fishermen.
- South Korea export Undaria to a number of global markets including Japan, China, USA, Vietnam and others. Japan (30%) and China (20-30%) are the largest export markets and the USA has a growing demand for Undaria stems. Recently the Undaria root is growing popularity in Japan due to its health benefits.
- For exported product, there is a mix of processed product and "raw" (typically salted and frozen for preservation). Processes export formats include: chilled and sliced as a meal (side dish); dried and seasoned as snacks and; dried and packaged with sauce included to replace snacks such as crisps.

- Most manufacturers of Undaria products purchase raw Undaria from fishermen. Processing includes boiling, salting, de-ribbing, washing and drying. Commonly one company will cover harvesting and processing. The biggest players in this area are 'Goyang', 'NamHea' and 'Myongcheon Fishermen's Group'.
- Key product attributes are colour and texture. The cleanliness of manufacturing sites is also important, especially for dried Undaria products.
- Given the most common use in human consumption is for making soup, having a texture that does not break down when fully-boiled is important. 'Softer' Undaria is harvested in the southern regions and is best for soup. Undaria with a stronger, chewy texture where it retains elasticity even after being fully boiled is harvested in the northern regions.
- Competitiveness is strongly linked to how you develop safe, secure processes and systems that build trust around hygiene and food safety. Over time consumers tie these attributes to brand and ongoing trust.
- Undaria with health and safety certification helps with competitive advantage. Manufacturers who salt and dry the Undaria in the same place have competitive advantage as this is perceived more clean and safe. The government's Ministry of Food and Drug Safety approval is valued for food safety accreditation, brand and perception. Suppliers with established brands conduct their own safety checks and are able to position their product in the market as safer food to eat.

- Large market for seaweed in South Korea but largest consumed variety is Pyropia (Gim). Undaria is estimated at 10-20% of the overall seaweed demand. Whilst seaweed as a whole is growing, demand for Undaria is stagnating and beginning to decrease.
- The B2B market is highly competitive with low profitability. The B2C market is typically about twice the profits of B2B. With the business market dominated by use of Undaria as sea-urchin feed, this provides little opportunity to differentiate and create premium product.
- In human consumption, there is a decreasing local demand for Undaria. Undaria is typically used in home cooking in South Korea and the growing trend towards eating out.



EXECUTIVE SUMMARY

The primary market opportunity lies in Japan, where there is demand for quality Undaria and an appetite to pay for quality

The 'top-down' market sizing has generated insights that provide an initial view of potential market opportunity. This has identified the primary opportunity within Japan and areas to focus around growing import price.

What have we learnt?

The Japan Undaria market is much more attractive than the South Korean market due to a higher reliance on imports, greater forecast demand and recent reduction in Chinese imports presenting opportunities for new importers.

99.98% of all imports of Undaria into Japan are from China and South Korea with a market totalling USD\$88.0m. 72% of this value is attributable to China, with the remaining 28% South Korea.

Recent perceptions of China's water purity and product quality has led to a CAGR of -6.6% over the last three years with import value reducing from USD\$73.0m to USD\$63.0m. The lower quality of product from China also commands a lower price, typically \$1.50-\$3.00 USD/kg

Over the same period imports from South Korea have grown from USD\$21.0m to USD\$25.0m, a CAGR of +7.1%. Primary interviews indicating Korea's challenges are cultivars intolerance to rising water temperatures leading to the launch a support programme valued at USD\$438.0m by the Government named the 'Golden Seed Project (GSP)' which includes seaweeds.

2019 imports of Undaria into Japan

Importer	Volume	Value	Price	3y CAGR
China	22.1 kT	USD\$63.6m	\$1.50-\$3.00 USD/kg	-6.6%
South Korea	7.0 kT	USD\$24.6m	\$3.00-\$4.00 USD/kg	+7.1%

Pricing variation for imported and domestic production is significant ranging from \$1.50 to \$30.00 USD/kg indicating an appetite to pay for quality Undaria. Primary interviews with industry experts determined the upper end of prices are achieved through an organisations ability to meet a complex set of requirements throughout the value-chain, not only the needs of a consumer.

Domestically produced Undaria achieves ave. prices of \$7.00-\$10.00 USD/kg with some areas such as Sendai achieving prices of up to \$30.00 USD/kg. These prices are achieved as a result of the traditional harvesting approaches, known quality growing locations and brands trusted by consumers.

It is our understanding through primary interviews at the time of writing this report that New Zealand's exports of Undaria to Japan are achieving approx. \$3.00 USD/kg ^(a).

According to one primary interview, the form and cost structure make the current New Zealand export model to Japan unsustainable. New Zealand should actively seek ways to improve price and margins to make Undaria exports economically viable.

The primary enabler to increasing New Zealand import prices is developing 'trust' in the systems in which the Undaria is cultivated, and how it is harvested. The environment in which it is grown such as water purity, temperature and production density as well as attributes themselves such as thickness of meat, processing techniques and brand are all drivers of value.

The expectation is that collaboration with industry experts from the local market will be essential. This will help to guide cultivation and harvesting development and critically facilitate positive communication around New Zealand product quality in-market.

One factor that may contribute to how New Zealand defines success for this initiative is the carbon sequestration benefits linked to Undaria, meaning Undaria systems would help to support wider government goals.

New Zealand's success will not be determined by one factor in isolation. It is the ability to execute simultaneously on four key initiatives to achieve a premium. New Zealand has the potential to cultivate high-quality Undaria from integral production systems, develop consumer trust with assistance from market based industry experts to capitalise on the opportunity.

Initial findings indicate the New Zealand Undaria industry can move well beyond the current price of \$3.00 USD/kg to position itself as a preferred country of import and compete with premium domestic production ranging from \$7.00 USD/kg up to \$30.00 USD/kg.

What do we need to know next?

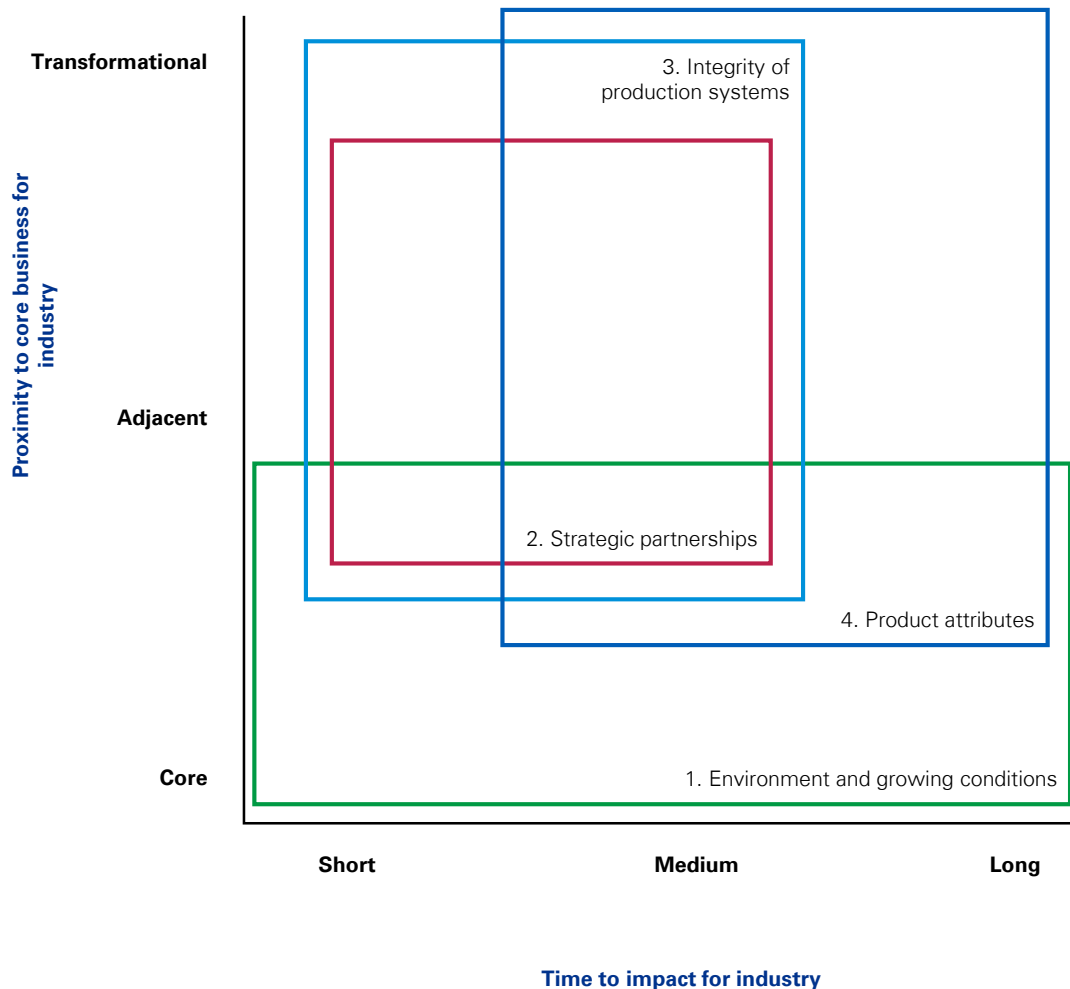
The insight reveals four areas of strategic focus that should be considered as part of the bottom-up market sizing to identify addressable market:

1. Environment and growing conditions
2. Integrity of production systems
3. Strategic partnerships
4. Product attributes

EXECUTIVE SUMMARY

The pursuit of four pathways will begin to evaluate the potential for New Zealand to capture the identified opportunity in Japan

Based on the learnings from phase one of the market sizing exercise, it became apparent there are four areas of strategic focus that should be considered as part of the next phase, of bottom-up analysis to determine the addressable market-size.



1. Environment and growing conditions

- New Zealand's growing regions have a level of quality disparity from a market perspective. Otago is considered the 'best' based on temperature, purity and the nutrient levels in the water.
- In-market processors place value on the purity of ocean water quality and temperature as it determines grades of Undaria.
- A comprehensive assessment of New Zealand's growing areas would allow the opportunity to prioritise regions for investment while simultaneously lifting the perception of New Zealand's Undaria market with consistently high quality exports.

2. Strategic partnerships

- Primary interviews highlighted the criticality and an almost non-negotiable fundamental dependency of forming a strategic partnership with a market based industry expert to determine market centric value drivers and guide the most efficient pathway to value.

3. Integrity of production systems

- The perception is that New Zealand has safe and secure food systems which are critical to building a foundation of trust.
- New Zealand has an opportunity to establish a set of industry 'best practices' suited to its growing conditions guided by the strategic partnership with an in-market industry expert.

4. Product attributes

- New Zealand's ability to produce Undaria with high quality attributes is interdependent on earlier activities of establishing optimal growing environments, guidance from strategic market partnerships and integral production systems and practices.
- Capturing attribute value is however determined by the industries ability to simultaneously execute and communicate product quality through in-market partnerships, branding and packaging.

Appendices



Global market trends and initial impact of COVID-19



Global seaweed market is expected to witness a steep growth by 2027 dominated by growth in the Asia-Pacific market

Key observations

- The global seaweeds market is expected to grow at a CAGR of 9.2% from 2020 to 2027.
 - The expected growth of market is driven by increasing demand for organically derived products and their high nutritional value in food applications. Increasing investments in end-use segments such as agriculture and animal feed will also drive the demand for seaweed.
-
- Asia-Pacific dominated the global commercial seaweed market in 2019 and is expected to grow at a sharp rate by 2027 due to increasing production and demand from countries such as China, Japan, Indonesia and South Korea. The demand for commercial seaweed in the food sector is expected to boost the growth of the market in this region.
-
- Seaweed is used for various applications within sectors such as food, cosmetics and pharmaceutical holding the majority of the market share. Rising awareness about the health benefits of seaweed is increasing demand for seaweed-derived snacks.
 - There is an increased use of seaweeds in the pharmaceutical sector due to its nutritional value, and the food and cosmetics industries as the demand for aquatic plant extracts are used as thickening and gelling agents.
-
- Edible seaweed account for over 85% of share of the total seaweed market and is widely used as an ingredient in beverages, nutritional products, and food production.
 - The Asia-Pacific region accounts for majority of edible seaweed production with China being the highest producer followed by Indonesia, Philippines, South Korea and Japan, respectively.
 - In edible seaweed exports, Indonesia accounted for over 57% of the volume, followed by South Korea of 18% in 2019.
 - In terms of imports, China and Japan lead the share with 58% and 13% of the total import volume respectively, in 2019.
-

Covid-19 observations

Positive

- Spike in medical testing for COVID-19 globally has offered market opportunities for new products, such as high bacto agar from Garcillaria, which serves as laboratory medium for COVID-19 testing.
- In South Korea, the government has provided low interest loans (1.3%) to aquaculture and fisheries businesses facing cash flow difficulties due to COVID-19.
- In Japan, USD\$30m has been kept aside for measures such as allocation of funds to market diversion initiatives such as purchasing, transporting, and storing of species that are experiencing large declines in demand and prices due to COVID-19.

Negative

- COVID-19 has adversely effected the seaweed and aquaculture industries with supply chain disorder and mandatory lockdowns.
 - Due to the pandemic countries such as Japan and South Korea witnessed a rise in trade deficit caused by supply disruptions and halts to production.
 - Companies producing carrageenan stopped their production in many parts of Japan and South Korea causing a fall in demand with only large agar processing companies operational based on raw material availability, however, most small enterprises have been forced to cease operations.
 - Government responses of imposing travel bans, strict border controls, and reduced air traffic in Japan and South Korea has reduced the demand for food servicing companies, affecting the demand for Undaria due to lower footfall in restaurants and food serving outlets.
 - Sharp drop in the demand for Undaria is also observed from importing countries.
-

Source(s): Radiant insights gathered through primary interviews and research

Introduction to *Undaria pinnatifida*



EXECUTIVE SUMMARY

Introduction to *Undaria pinnatifida*

Undaria pinnatifida, otherwise known as wakame or Asian kelp, is an annual kelp native to northeast Asia and Russia. It is the basis of a large aquaculture industry in Japan, Korea and China. In the 1970s, *Undaria* expanded to non-native areas, and is now available in other parts of the world including Europe, North America, South America and Australasia.

Risk and impact factors

- Invasive plant that has proven invasiveness outside its native range – wakame is listed as 100 worst globally invasive species as of 2018
- Fast-growing and highly mobile (easily spreads/grows in different areas)
- High reproductive potential and high genetic variability

Uses in cuisines and health benefits

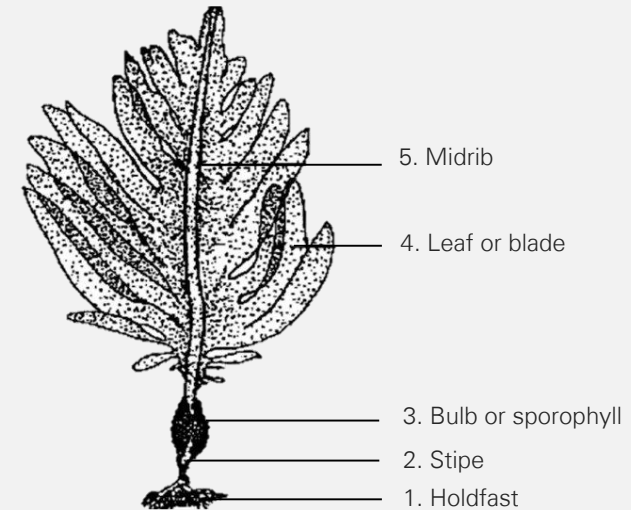
Undaria pinnatifida (wakame), is a species of edible seaweed, a type of marine algae, and a sea vegetable. It has a subtly sweet, but distinctive and strong flavour and texture. It is most often used as human food and often can be found in soups and salads. The leaves should be cut into small pieces as they will expand during cooking.

Based on the research by the Rural Development Administration and the Korean Ministry of Knowledge Economy, consumption of *Undaria* has significantly positive impact on growth performance from increased ADG and feed efficiency and immune status (increased IgG). Furthermore, it significantly reduces cholesterol concentration and improves fatty acid profile. Moreover Fucoïdan extracted from *Undaria* has significantly induced osteoblastic cell differentiation and has potential in use as a functional food ingredient in bone health supplements.

Other names

The common name was derived from the Japanese name wakame (ワカメ, わかめ, 若布, 和布). In English, it can be called "sea mustard"; in Chinese, it is called qúndài cài (裙帶菜); in French, it is called "wakamé" or "fougère des mers" (sea fern); and in Korea, it is known as miyeok (미역).

The anatomy of *Undaria pinnatifida*



- 1. Holdfast:** Generally crust like, edible.
- 2. Stipe:** The stipe is the stalk of a seaweed and is edible as a pickle or relish.
- 3. Leaf or blade:** Used mainly for human consumption in cooking as well as feed in agriculture e.g. sea urchins
- 4. Bulb or sporophyll:** Used to extract Fucoïdan and used as a functional food ingredient and health supplement.
- 5. Midrib:** Typically removed during processing. Lower value. It can be pickled and eaten as a bar snack.

Note: The roots and stems are separated during the processing of seaweed as human food.

SEAWEED MARKET SEGMENTATION

Seaweed or sea vegetables are a form of algae that grow in the sea and are found in different colours based on their pigmentations

Seaweed Market by Product^(a)



Red

- Red seaweeds are one of the oldest groups of eukaryotic algae
- The Rhodophyta also comprises one of the largest phyla of algae, containing over 7,000 currently recognized species

Examples



Porphyra purpurea



Pyropia (Nori/Gim)



Brown

- Brown seaweeds are usually large, and range from 20 m to smaller species of 30–60 cm long
- The more useful brown seaweeds grow in cold waters in the Northern and Southern Hemispheres



Undaria pinnatifida

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Ecklonia cava



Green

- Green seaweeds can be leafy or tubular in shape
- Colour is typically dark green to yellow, with a thick, spongy texture



Sea lettuce



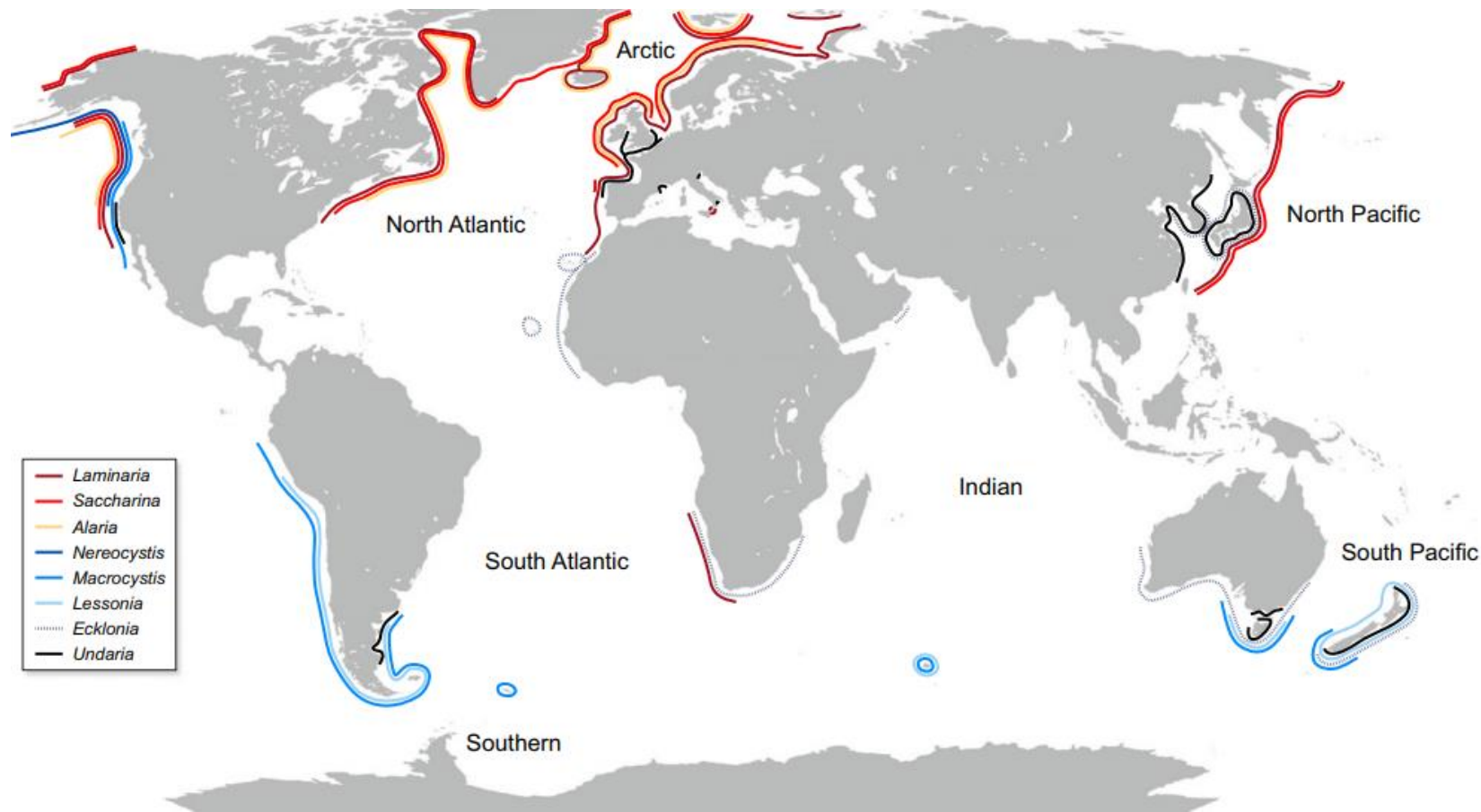
Chlorella

Note(s): (a) Based on pigmentation
Source(s): FAO; URI EDC

GLOBAL DISTRIBUTION OF MAJOR SPECIES

Brown seaweeds are distributed along 25% of the world's coastlines, where they function as foundation species in coastal marine ecosystems

Approximate global distribution of major kelp genera (Laminariales), 2019



Undaria specifically only grows in a small number of locations around the world namely:

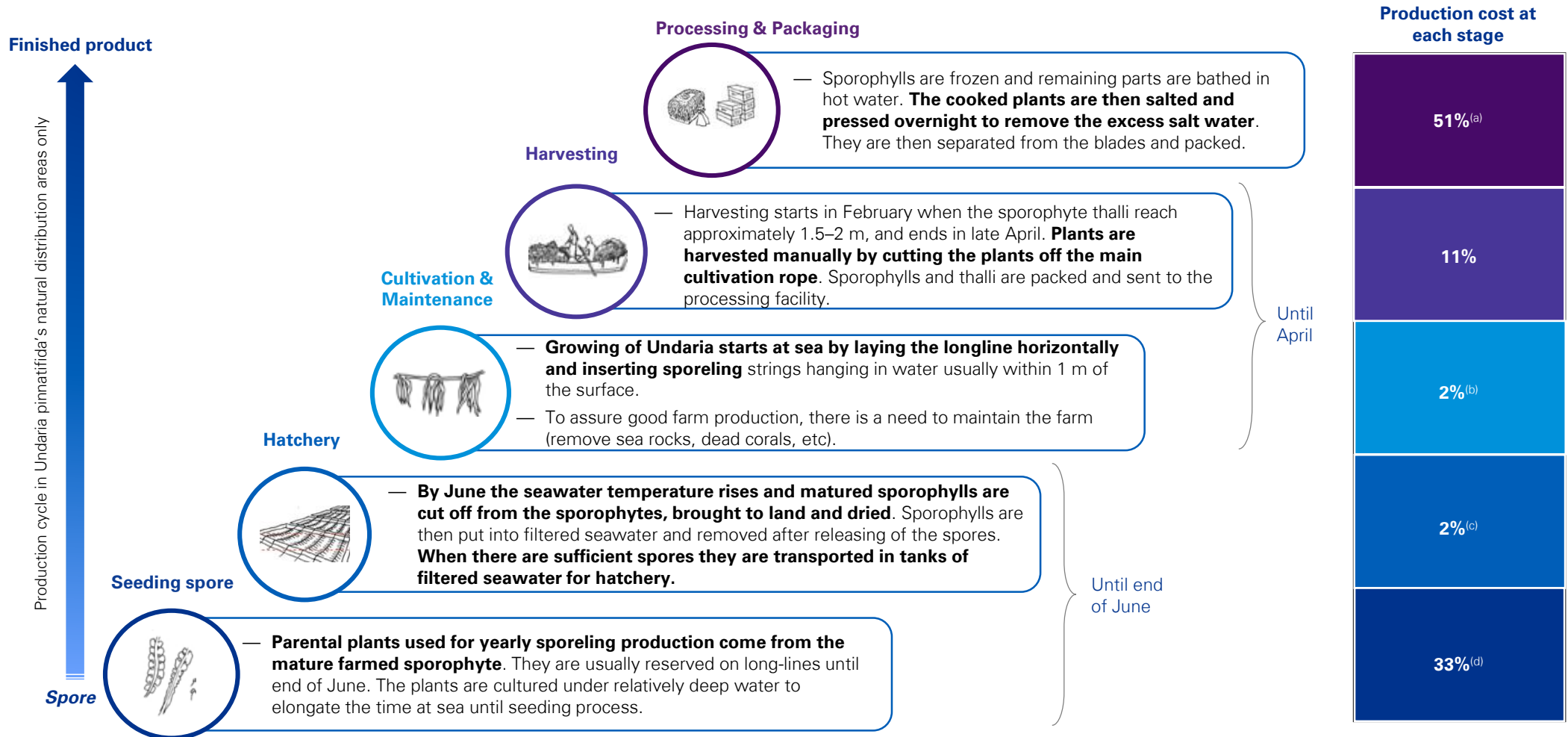
- Japan
- South Korea
- China
- Europe (mainly Spain, UK and France)
- Canada
- Argentina
- Australia
- New Zealand

Source(s): Tansley Insights

PRODUCTION CYCLE – UNDARIA PINNATIFIDA

The production cycle for Undaria takes about an year to complete, however the timings of these vary greatly among global distributions

In its natural distribution areas (Yellow Sea, East China Sea, Sea of Japan), the sporophyte lifecycle stage generally appears between late October and early November (autumn), grows rapidly from December to March (winter-early spring), and reproduces in April (spring). However, this well-defined seasonal reproductive cycle is not necessarily consistent where the species has been introduced into new regions.



Note(s): (a) Addition of 49% share of Transportation and drying and 2% share of packaging; (b) Share for farm management process; (c) Share for planting process; (d) Share for tying seed process

Sources(s): FAO; Radiant Insights

Japan market sizing

- 1 **Market summary**
- 2 **Demand insights**
- 3 **Supply insights**
- 4 **Undaria value chain**

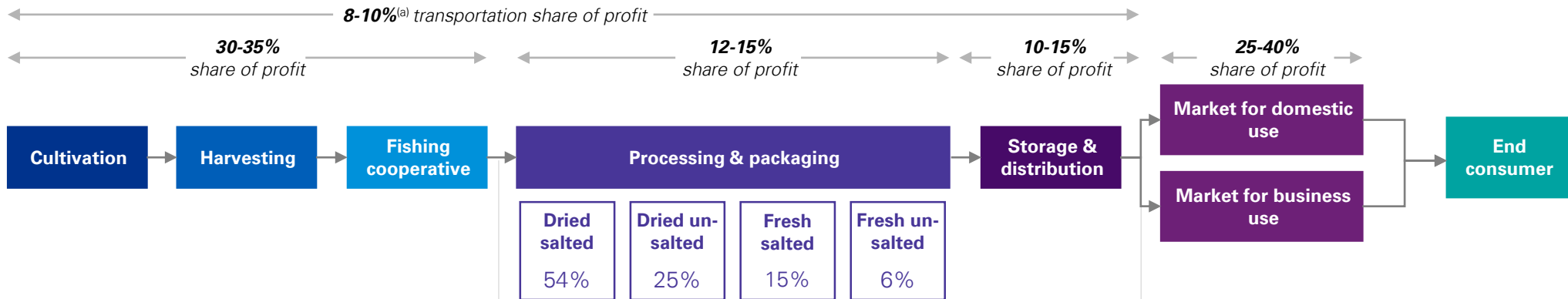


Desktop research of the market for Undaria pinnatifida in Japan provides insight into the scale of the market and key trends

	MARKET SIZING	MARKET TRENDS
Market size^(a) <i>(2019)</i>	USD\$1,692m	
Demand	— Spending per household on Undaria has increased +3.7% p/a versus overall food of +0.8% indicating growth in Undaria as a product.	<ul style="list-style-type: none"> — The government have used import quotas with some countries on other seaweed products and entered into a Pyropia (Nori) import quota expansion with South Korea that will increase imports in stages out to 2025. — Rise in sea temperature, unfavourable government regulations and rise in imports seem to negatively impact seaweed production in Japan with production decreasing over the long-term but has been stable over the last five years.
Production	— In 2018, domestic production made up 13% of all market supply. Undaria production levels have been stable over the last five years but overall seaweed production has been declining (-1.5% CAGR), Undaria share of overall production is currently 12%.	<ul style="list-style-type: none"> — The Japanese market has strict regulation on food safety, plant protection and labelling with a number of laws that govern this including the Food Safety Basic Act, Food Sanitation Act, Health Promotion Law, Plant Protection Law and the Food Labelling Law.
Imports	— Imports make up c.87% of market supply and are almost exclusively product from China (72%) and South Korea (28%) with <1% of imports from other territories. Chinese import share has been decreasing, down from 81% in 2016 with replacement coming from South Korea.	<ul style="list-style-type: none"> — Due to the recent COVID-19 pandemic Japan has experienced supply chain disruption causing a trade deficit and causing some seaweed production to halt.
Processing	— Both final product and “raw” product is imported (typically blanched, salted and frozen). There is a competitive industry around processing and packaging and a large amount of this activity occurs onshore.	<ul style="list-style-type: none"> — The government’s response to COVID-19, imposing travel bans, banning large gathering and closing restaurant has caused a large demand reduction in the food servicing sector.
Product variation	— The majority of Undaria is produced for human consumption (77%). Of this, almost 80% is dried product with dried salted the most popular format (54% of all human consumed Undaria).	<ul style="list-style-type: none"> — Government regulations around the clean up of Japan’s rivers have led to a decline in the runoff of agricultural wastes and fertilisers into the ocean. In turn this has stripped the river waters of essential nutrients that help the seaweed grow having a negative impact on production levels.
Pricing	— Undaria pricing has increased (+3.4% CAGR) over the last five years. The primary driver of price variation is provenance. Domestically harvested Undaria charges a c.2-10x premium and Undaria from South Korea has a 10-20% premium over Chinese Undaria.	<ul style="list-style-type: none"> — Through cross-breeding, cultivators have bred a new cultivar of Undaria, NW-1, which delivers higher yield and has a higher sea water temperature tolerance.
Distribution	— An estimated 58-61% of human-consumed Undaria is distributed through supermarkets or hypermarkets and estimated 13-17% through restaurants.	<ul style="list-style-type: none"> — Food safety is a strong driver of consumer behaviour with consumers placing a premium on provenance. The seas of China are perceived to be less clean which drives a lower price and Chinese imports have been reducing over the last few years. — Japanese consumers have a positive view of New Zealand in terms of environmental purity and food safety.
Competition	— Riken Foods is the largest player in the market, one of a number of vertically integrated competitors.	<ul style="list-style-type: none"> — Notable recent new importers of seaweed into Japan into Tonga, Canada and Senegal who imported 85, 36 and 17 tonnes of seaweed in 2019 respectively
Summary	The value of the Undaria market is increasing driven by increasing prices. The vast majority of the market is supplied by imports from China and South Korea.	Demand for Chinese imports is reducing due to concerns over food safety, presenting an opportunity for new market entrants.

EXPERT INTERVIEWS

Primary interviews with industry experts have validated desktop findings across the value chain and provided targeted and specific insight



Primary expert interview insights

- Health authorities are increasing inspections on Chinese production due to heavy metal and chemical contamination causing reductions in supply.
- The definition of *quality* begins with good harvest practices (e.g. thinning to optimise productivity).
- There is increasing adoption of innovation in cultivation and harvest (e.g. machine for thinning and removal of foreign materials during harvest).
- Seaweeds like Kombu and Undaria are very efficient at removing carbon from the atmosphere (with research indicating up to 20 times that of trees).
- The largest challenge for new entrants was cited to be 'quality' but comments were that, given the poor food safety of Chinese product, this should not be a significant obstacle for New Zealand, and best done in partnership with Japanese partners through knowledge exchange.
- One expert recommended analysing the use Undaria as feed to *fatten* and export sea urchins as a higher valued product rather than Undaria in raw form.

Primary expert interview insights

- Product is often imported "raw" – which is defined as salted and frozen for further processing and value-add in Japan. The most prevalent end product is dried Undaria.
- Product differentiation begins with quality harvesting practices and robust, safe and secure food systems.
- Processors place value on purity of ocean water quality and distinctly differentiate the grades of Undaria by growing conditions attributing colour, taste, texture and thickness of the meat to those conditions (e.g. an emphasis on how Undaria is grown and what processes have been done).
- The thickness of the meat can dictate the channel for distribution with both thick and thin meats maintaining value for different uses.
- There is an increase in adoption of automation in processing procedures such as de-ribbing although there are differing perspectives between experts on the productivity gains from this (e.g. inaccuracy of machines versus traditional hand-cut method).
- Waste from processing and production is channelled into animal feed and fertiliser production.
- Japan's domestic production achieves market premiums of c. \$20.00-\$30.00 USD/kg because of a combination of growing conditions and harvest practices, integrity of food systems and traditional methods use to produce for historically trusted brands

Primary expert interview insights

- Demand for Undaria in Japan was described as 'huge' and 'stable' with limited changes in volume. It has high demand for domestic use in cooking as well as business use through restaurants and is a key ingredient in diet staples such as miso soup and furikake.
- Primary interviews illustrated that the use of innovation is not an automatic return on investment, as traditional production methods can, on occasion create better returns that using technology.
- Japanese consumers perceive Undaria as a low-calorie food with positive health benefits which lead to high consumption, in multiple format (from condiments, to salads to other staples).
- Consumers identify *quality* as a number of attributes with the primary being food safety followed by others such as colour, taste, texture and thickness of the meat.

Note(s): (a) represents transportation at any part of the value chain

Source(s): Radiant Insights, validated through primary expert interviews

Japan market sizing

1 Market summary

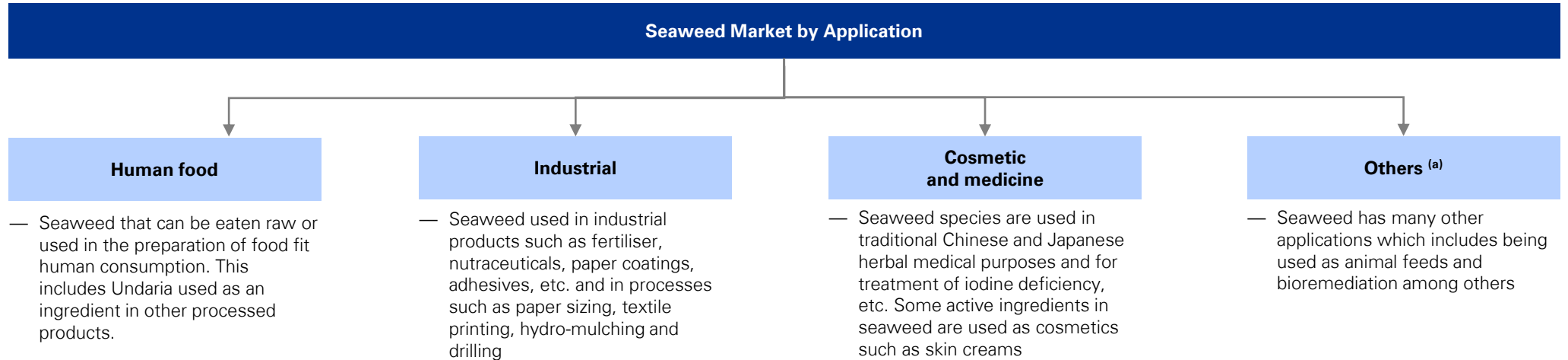
2 Demand insights

3 Supply insights

4 Undaria value chain



Seaweed fit for human consumption accounts for more than 75% of market share in Japan



% estimated volume market share 2019)



77%

6%

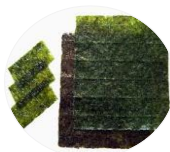
13%

4%

Types of seaweed (b)



Undaria pinnatifida
(Wakame, Miyeok)



Pyropia
(Nori, Gim, Laver)



Eucheuma



Kappaphycus



Laminaria
(Oarweed)



Ascophyllum nodosum



Macrocystis
(Kelp)

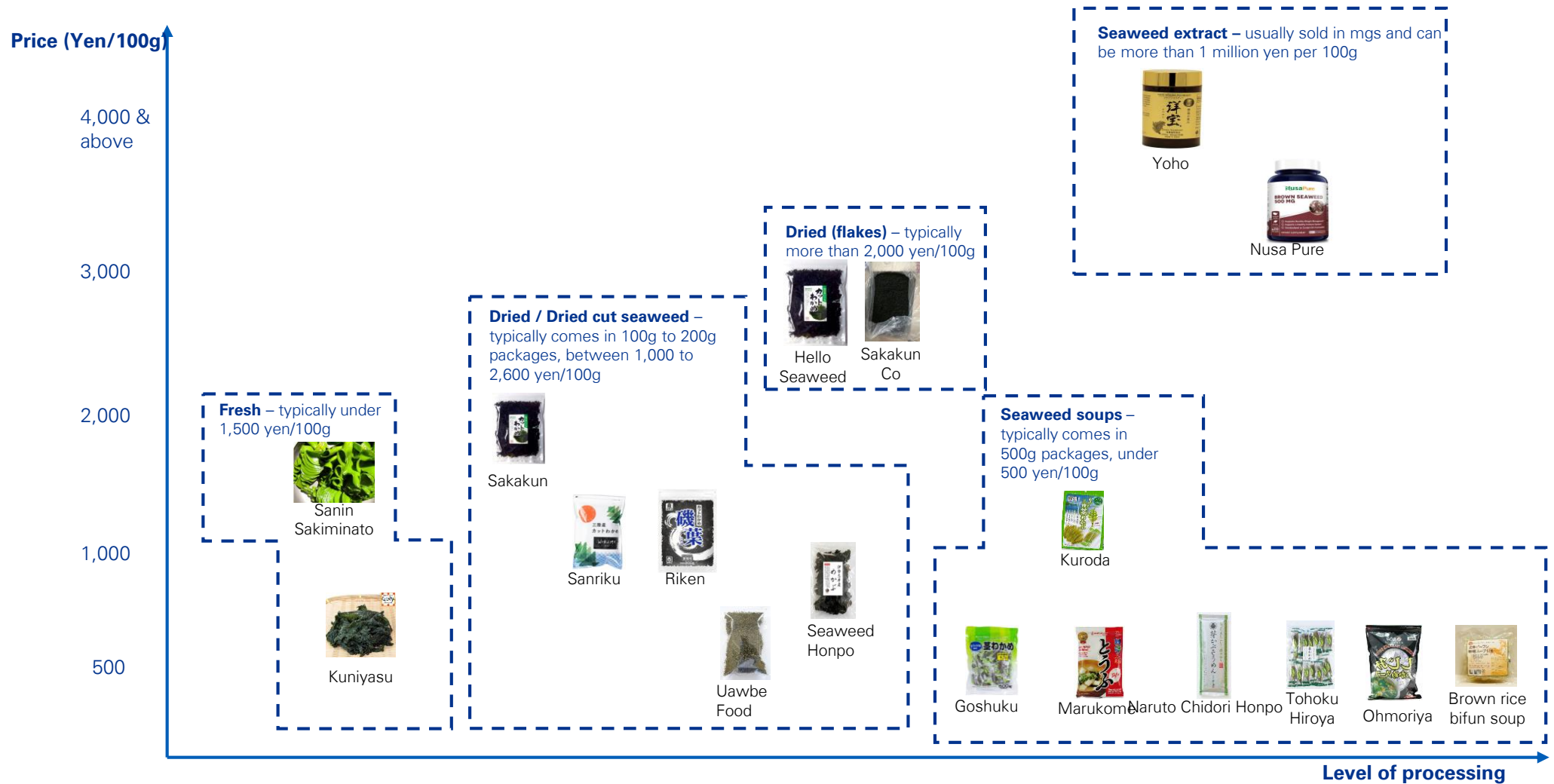


Gracilaria

Note(s): (a) Others include animal feed and wastewater treatment applications ; (b) Illustrative and not exhaustive
Source(s): FAO; Seaweed.ie, Radiant Insights

DEMAND – PRODUCT FORMATS

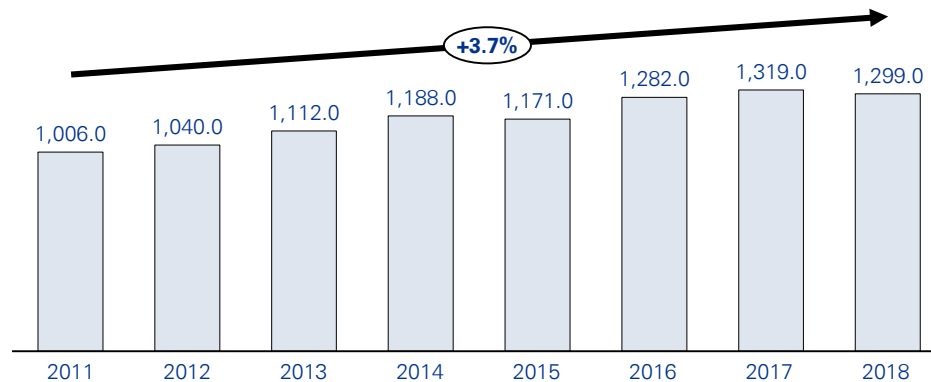
In Japan, *Undaria pinnatifida* is consumed in multiple forms, primarily dried cut, in soups and as snacks, sold mostly through e-commerce channels



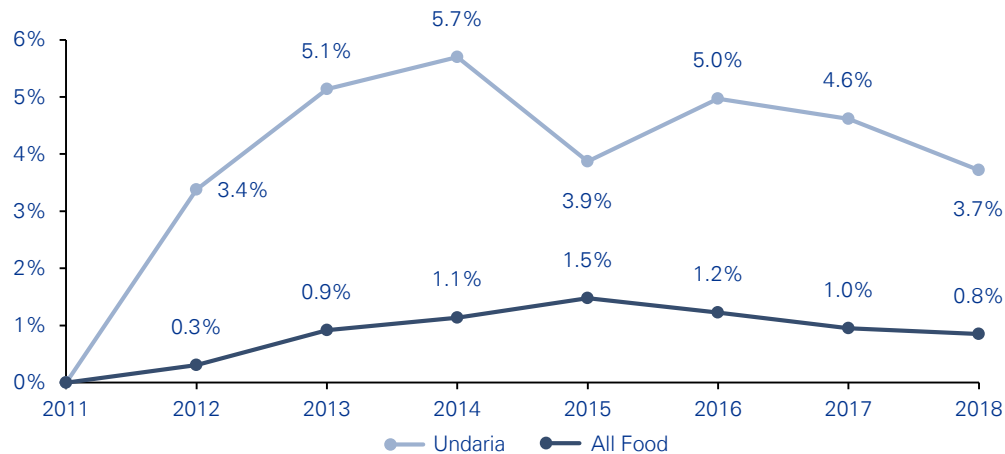
DEMAND – EXPENDITURE PER HOUSEHOLD

Driven by its health benefits, expenditure on *Undaria pinnatifida* seaweed has grown faster than that of total food expenditure between 2011-2018

Japan yearly expenditure per household on *Undaria pinnatifida* for total households, 2011-2018, JPY



Growth of Japan expenditure per household for total households, 2011-2018, JPY



Comments

- Expenditure by Japanese households on *Undaria pinnatifida* seaweed has been growing steadily at ~3.7% CAGR during the time frame 2011-2018.
- The growth in expenditure per household for *Undaria* is driven by the change in food patterns of Japanese people who are now leaning towards a more healthier lifestyle.
 - The demand for *Undaria* is high as it is one of the most commonly consumed seaweed served in salads and soups in the Japanese cuisine including the miso soup which is known widely for its health benefits.
 - *Undaria* is one of the seaweeds that is not only popular in Japan but also worldwide because of how well it complements all dishes.
- Growth in expenditure of *Undaria Pinnatifida* outstripped that of total food. Growth of total food expenditure was only 0.8% versus 3.7% for *Undaria Pinnatifida* over the same period.

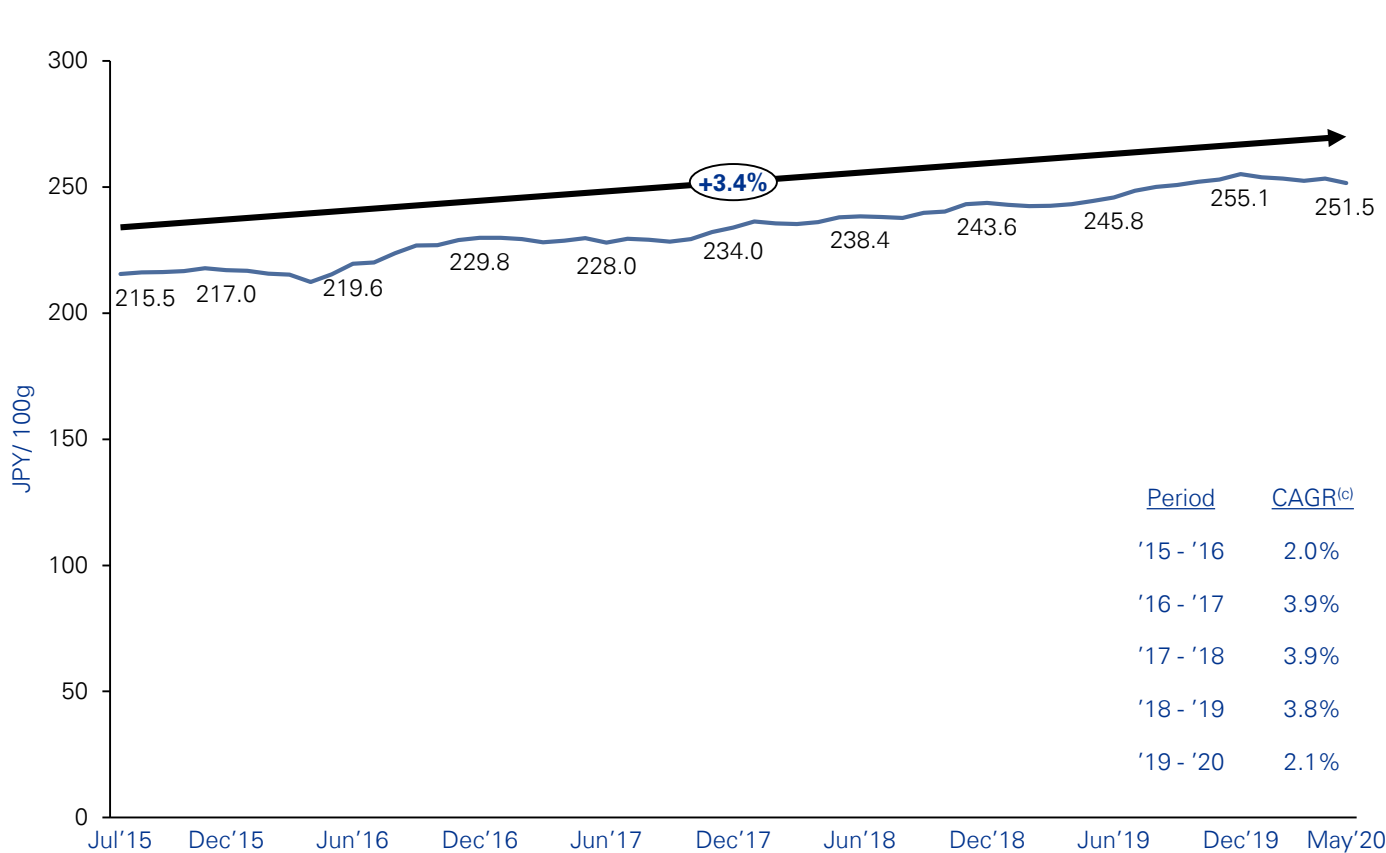
Historical seaweed consumption trends

- Around the 1950s, Japanese transitioned from a traditional to a Westernized diet leading to decline in consumption of certain seaweed species along with simultaneous increase in others.
- While kombu consumption decreased from 844 to 685 g/year per household, *Undaria* consumption rose from 727 to 1,234 g/year per household between 1963 and 1973 perhaps, due to relatively low iodine contents in *Undaria* regarding kombu.
- However, daily seaweed consumption per person in Japan has remained relatively consistent over the last 40 years (4.3 g/day in 1955 and 5.3 g/day in 1995).

Source(s): e-Stat, portal site of official statistics of Japan; Live Japan; Japan Today; Thyroid Research Journal

Driven by its health benefits, expenditure on Undaria pinnatifida seaweed has grown faster than that of total food expenditure between 2011-2018

Undaria pinnatifida retail market price in Japan, Jul'15 – May'20, JPY/ 100g^{(a)(b)}



Comments

— The prices for Undaria pinnatifida in Japan have increased over the last five years with a 3.4% CAGR over this period. The average price over the last five years is 234.4 JPY/ 100g

Note(s): (a) Data till 2000 is available but has been kept from Jun 15 for consistency; (b) Prices have been calculated as the average of monthly retail price of Undaria Pinnatifida in 81 cities defined as 'Cities with Prefectural Government and Cities with Population of 150,000 or More'; (c) The CAGR for the '15-'16 period has been calculated using average for 2016 and last 6 months of 2015 and for '19-'20 period, the average of 2019 and first 5 months of 2020

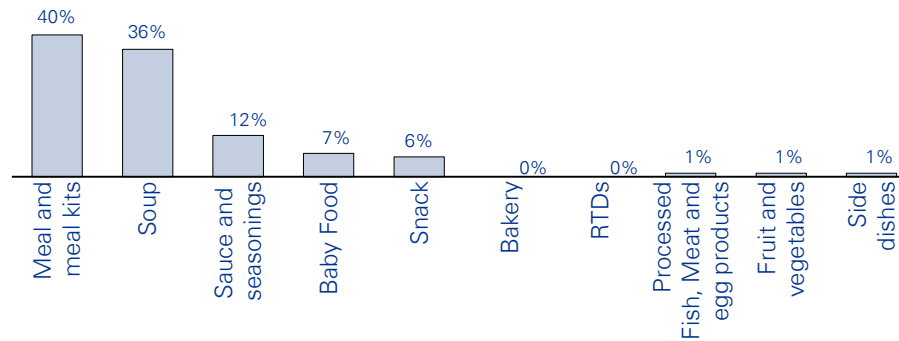
Source(s): e-Stat, portal site of official statistics of Japan

Usage of Undaria as an ingredient seems to grow along with rise in preference of Japanese for healthy pre-prepared and ready-to-eat food

Trend / insight	Supporting statistics	Comments
-----------------	-----------------------	----------

Use of Undaria pinnatifida (as an ingredient) by food and drink category, 2014-2019, %^(a)

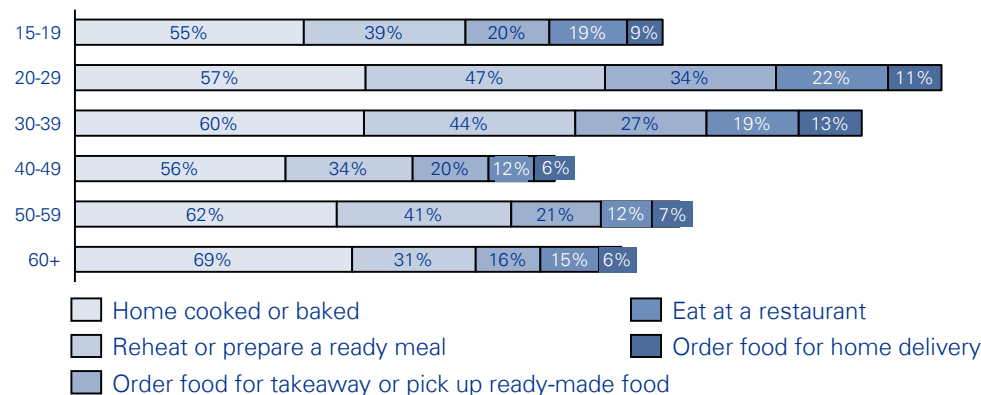
Strong use of Undaria pinnatifida and other types of seaweed in meals



- Seaweed is a staple in the Japanese diet and an essential in meals like miso soup, onigiri, sushi, salads and nori bento among others.
- The most common way to consume Undaria Pinnatifida is in meals and meal kits, followed closely by soup where consumers feel like they can best enjoy the taste as well as extract the nutritional benefits from consuming the product.

Frequency of consumption by meal type, at least weekly, 2020, %^(b)

Rise in preference for pre-prepared foods



- The home cooked or baked foods are still the top category of consumption of meals by consumers, which makes Undaria pinnatifida as an ingredient attractive.
- There is a rise in demand for pre-prepared foods due to health benefits and ease of buying.
- Suppliers such as convenience stores are boosting sales by including pre-prepared and ready-to-eat nutritional meals in their stores due to rising demand for the same especially amongst Japanese in 20-39 age group.

Note(s): (a) Based on a sample of 397 food and beverage products containing Undaria Pinnatifida and 9745 food and beverage products containing algae from Mintel GNPD; (b) The results are based on a survey that captures consumer trends and their lifestyle habits during 2019 and 2020 for 1,003 respondents

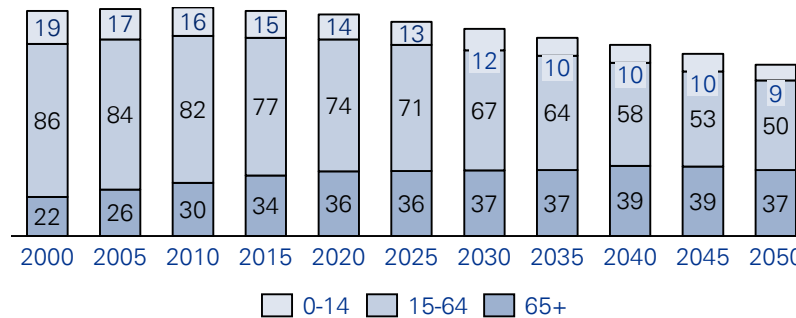
Source(s): Euromonitor International; Data received from client

Despite shrinking customer base due to falling birth rates, inclination of Japanese towards healthy lifestyle seems to increase seaweed demand

Trend	Supporting statistics	Comments
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Japan’s demographic forecast, # of people, 2000-2050, million

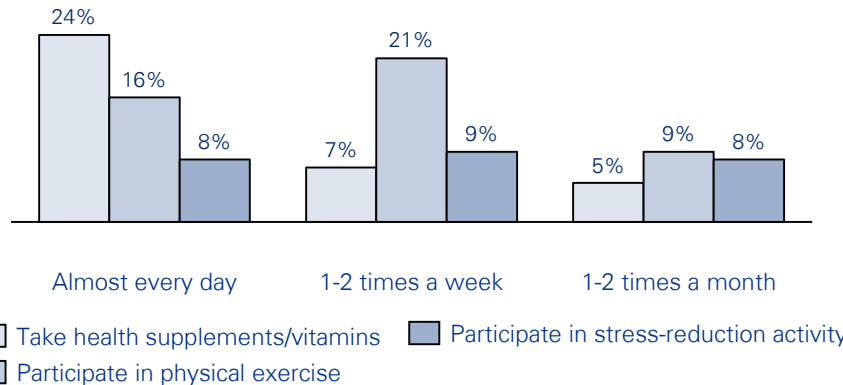
Fall in birth rates resulting in contraction of the seaweed customer base



- The number of babies born in Japan fell an estimated 5.9% in 2019 to fewer than 900,000, the first time since 1899.
- The population is decreasing and expectation that demand would follow this trend, but current data indicates the opposite.
- The traditional Japanese diet (especially popular among the older generation) is predominantly seafood i.e. large consumption of fish and seaweed which carry a low risk for cancer and arteriosclerosis.

Frequency of key health-related actions, 2020, %^(a)

Increased focus on health and wellness, in sync with the nutritional benefits offered by seaweed



- Seaweed in all its forms – kelp, dulse, Undaria pinnatifida, algae or nori has been known to be rich in nutrition and lead to health benefits, resulting in their increased popularity in Japan.
- Also, there seems to be a lot of availability of kelp products.
 - *“A lot of kelp products are now available in alternative health food shops: it’s a right of passage for these foods to be sold there first”*
- Damon Gameau, filmmaker, 2040 environmental documentary

Note(s): (a) The results are based on a survey that captures consumer trends and their lifestyle habits during 2019 and 2020 for 1,003 respondents
Source(s): Euromonitor International; CNN; NPR

Japan market sizing

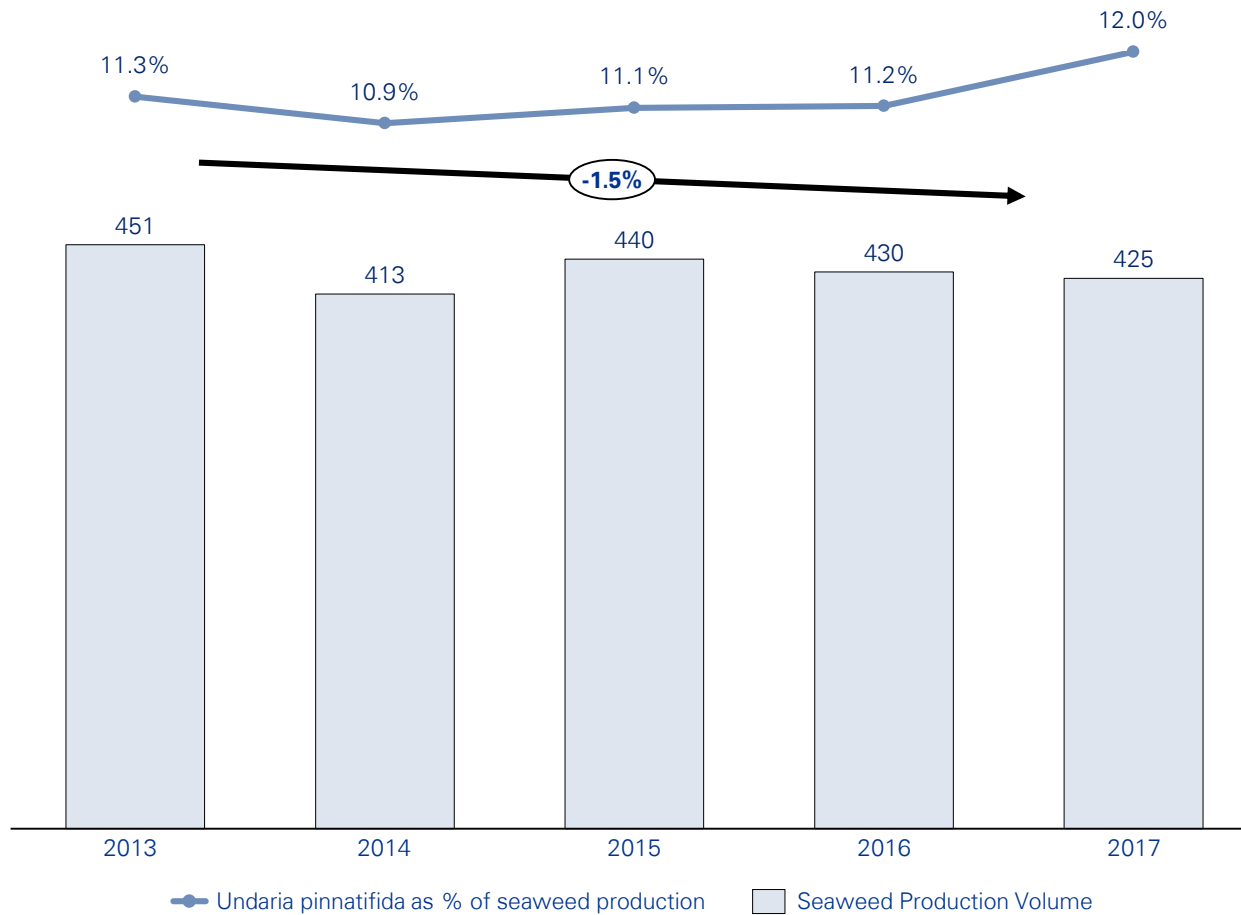
- 1 Market summary
- 2 Demand insights
- 3 Supply insights
- 4 Undaria value chain



SUPPLY – SEAWEED PRODUCTION

While seaweed production in Japan experienced negative growth during the time frame 2013-2017, Undaria's % share remained almost stable

Seaweed production volume^(a) and Undaria pinnatifida as % of seaweed production in Japan, 2013-2017, tonne (000s) and %



Comments

- Seaweed production in Japan has declined at ~1.5% CAGR during the time frame 2013-2017.
- Undaria pinnatifida as a percentage of seaweed production remained almost stable within the range of 10-12% during the same time frame.

Note(s): (a) Seaweed production volume represents the addition of seaweeds production volume under marine fishery and marine aquaculture (seaweeds – Undaria and laver – nori)

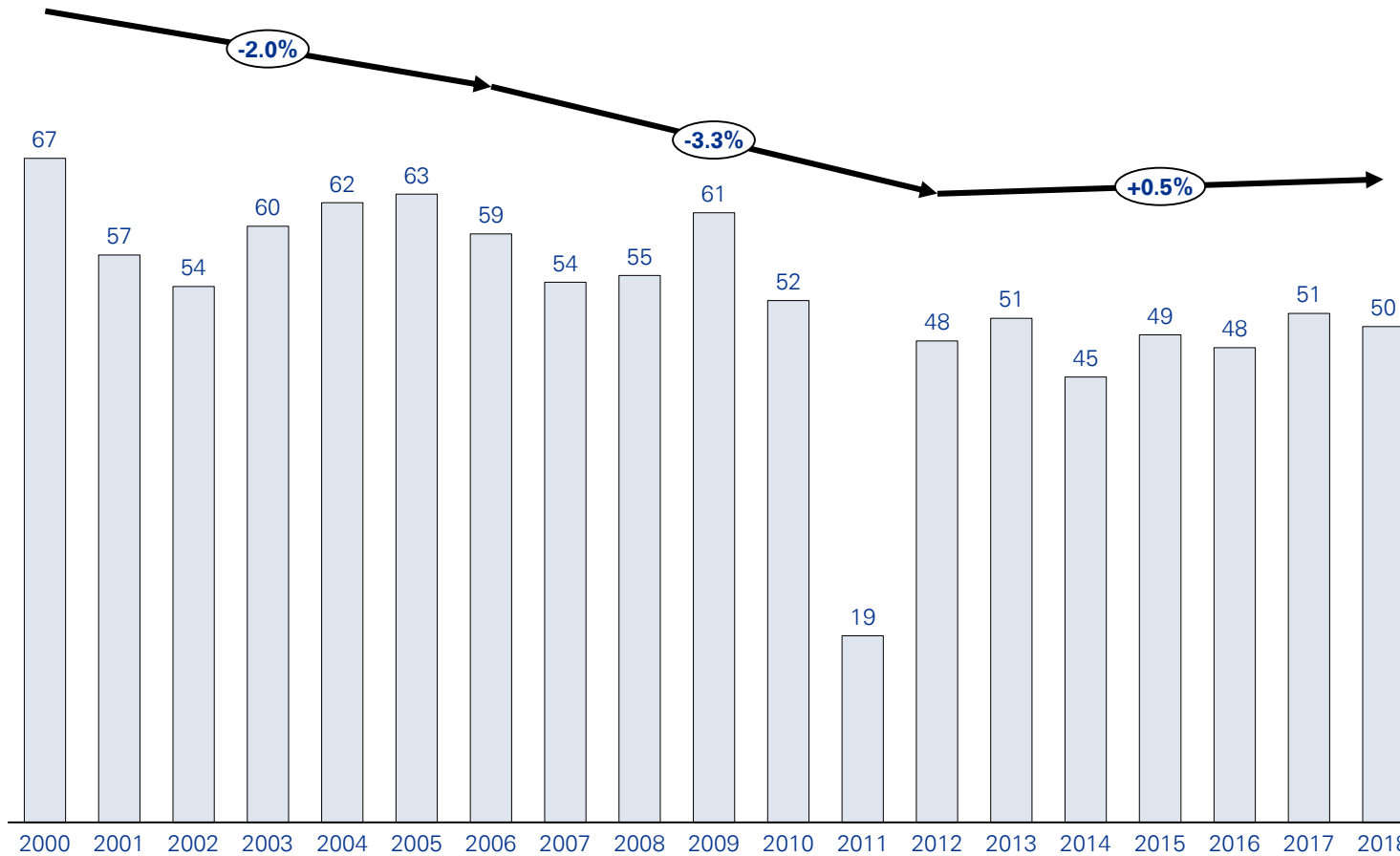
(b) The weight here is quoted in live/wet weight. This is roughly 10x that of product weight observed at other points in the value chain.

Source(s): Ministry of Agriculture, Forestry and Fisheries, Japan

SUPPLY – UNDARIA PINNATIFIDA PRODUCTION

Undaria production in Japan witnessed a sharp fall in 2011 driven by the impact of the Tōhoku Tsunami, followed by normal production from 2012 onwards

Undaria pinnatifida production volume in Japan, 2000-2018, tonne (000s)



Comments

- In 2011, the production witnessed significant drop and reached at a level of 19,000 tons purely driven by the impact of the Tōhoku Tsunami .
- Reduced supply of Undaria pinnatifida affected balance of supply and demand of raw materials across Japan resulting in a subsequent increase in imports for 2011.

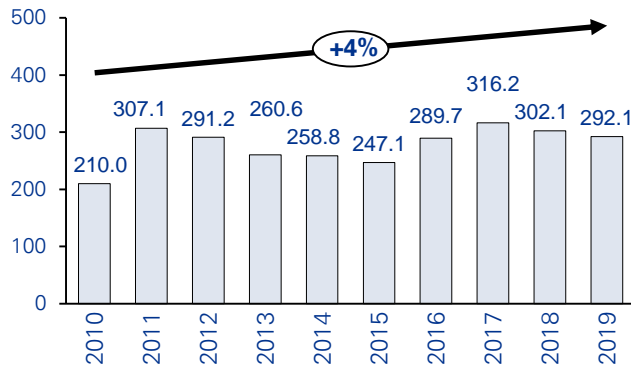
Note(s): The weight here is quoted in live/wet weight. This is roughly 10x that of product weight observed at other points in the value chain.

Source(s): OECD; Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries, Japan

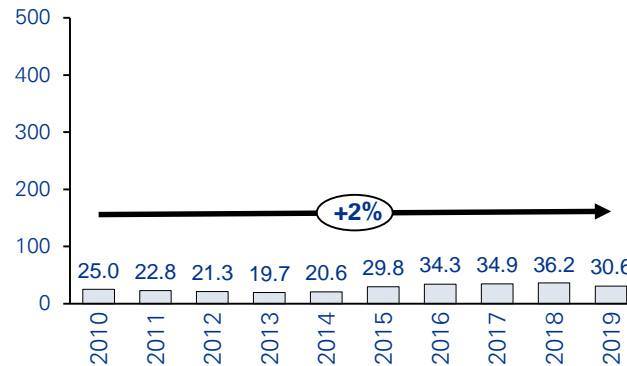
SUPPLY – OVERVIEW OF IMPORTS AND EXPORTS

While imports have surged owing to rise in domestic taxes & competition from emerging countries, making Japan a net importer of seaweed...

Japan seaweed and other algae import value, 2010-2019, USD million^(c)



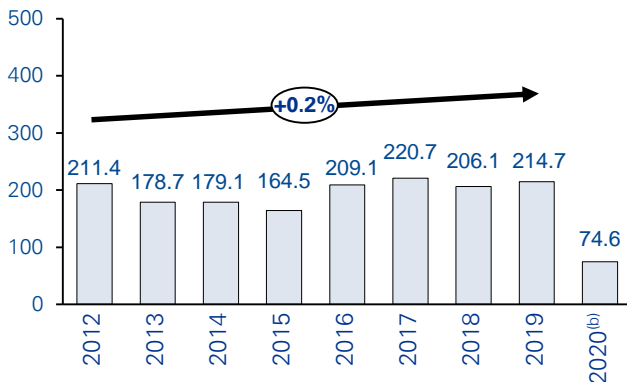
Japan seaweed and other algae export value, 2010-2019, USD million^(c)



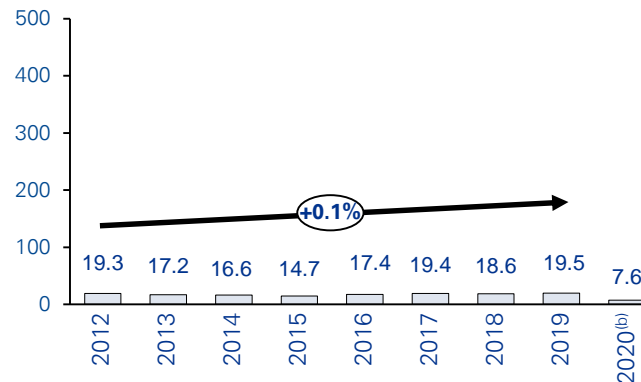
Comments

- This analysis uses HS code 1212 (top charts) representing "Seaweeds and other algae fit for human consumption"
- The lower charts represent HS code 121221 which is a subset of all edible seaweeds and represents trade of Pyropia (Nori/Gim), Sargassum (Hijiki) and Undaria (Wakame).

Japan Pyropia, Sargassum and Undaria import value, 2012-2020, USD million^{(a)(b)}



Japan Pyropia, Sargassum and Undaria export value, 2012-2020, USD million^{(a)(b)}



Imports

- Domestic tax hikes such as increase in sales tax and consumption tax in 2019 along with high competition from emerging markets have increased Japan's imports from other countries.
- There is a rise in imports of seaweed (HS 1212) since 2015, as Japan expanded its import quota (to take place in stages by fiscal 2025) for South Korean Pyropia during this period.
- Top supplying countries for imported seaweed in 2019 are China and South Korea.

Exports

- There has been a rise in exports of seaweed in Japan since 2012 as the demand for Japanese Pyropia has been rising globally. This said, exports are very low and almost negligible for Undaria specifically.
- Top markets for seaweed exported by value in Japan for 2019 are USA and China.

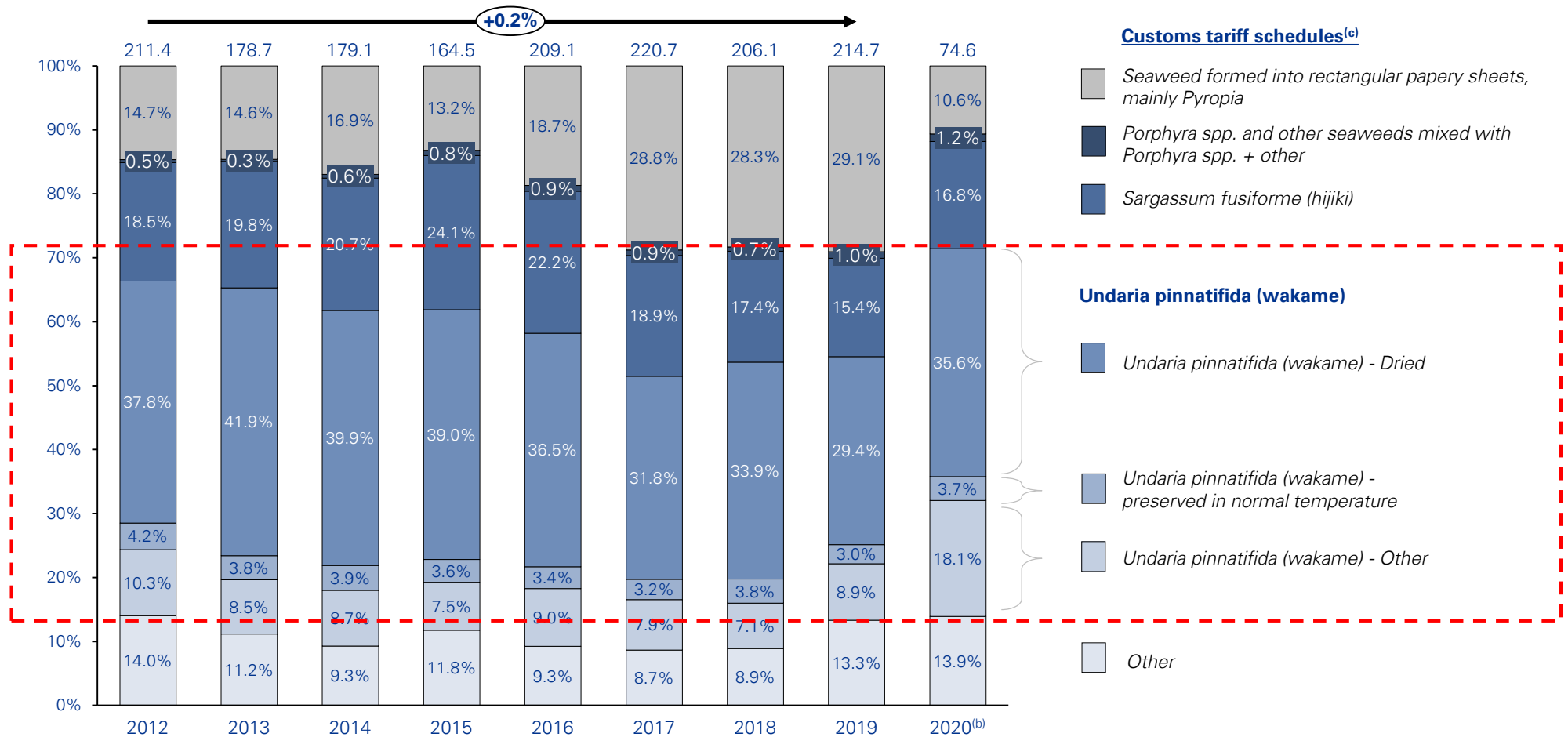
Note(s): (a) The data corresponds for HS product code 1212 (top charts) and 121221 (bottom charts) - Seaweeds And Other Algae Fit For Human Consumption; (b) Values for 2020 till date, and do not include forecast figures for the complete year and hence CAGR has been calculated only till 2019; (c) The data corresponds for HS product code 1212 - Locust beans, seaweeds and other algae fit for human consumption

Source(s): Trade Statistics - Ministry of Finance Japan; International Trade Statistics

SUPPLY – IMPORTS

Undaria pinnatifida in dried form accounts for the majority share in total seaweed imports in Japan

Japan Pyropia, Sargassum and Undaria import value, 2012-2020, USD million (a)(b)



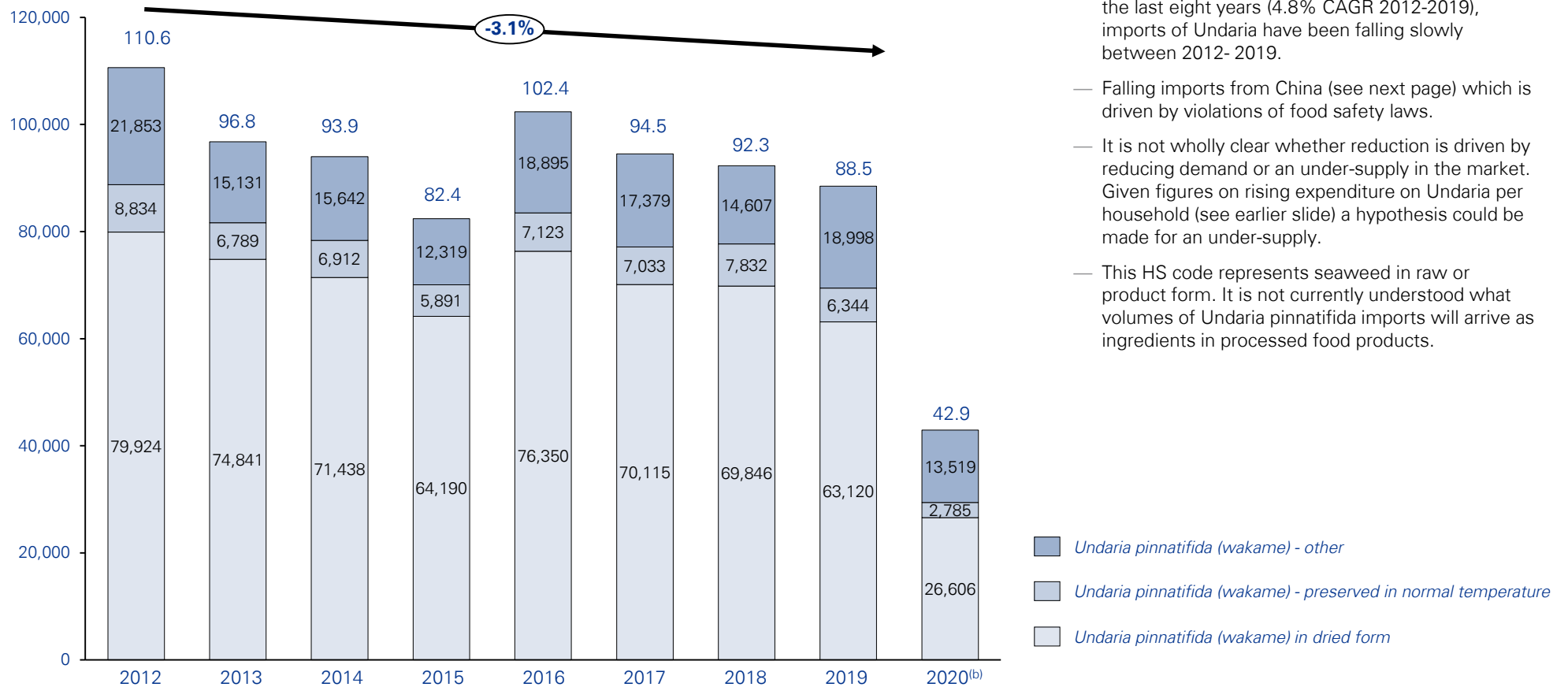
Note(s): (a) The data corresponds for HS product code 121221 - Seaweeds And Other Algae Fit For Human Consumption; (b) Values for 2020 till date, and do not include forecast figures for the complete year and hence CAGR has been calculated only till 2019; (c) Customs tariff schedules as provided by Tokyo Customs department

Source(s): Trade Statistics - Ministry of Finance Japan

SUPPLY – IMPORTS

While *Undaria pinnatifida* imports make up a large share of seaweed for human consumption, their total volumes appear to have fallen in the last eight years

Japan *Undaria pinnatifida* import value, 2012-2020, USD millions^{(a)(b)}



Comments

- While imports of seaweeds for human consumption (HS 121221) have been growing over the last eight years (4.8% CAGR 2012-2019), imports of *Undaria* have been falling slowly between 2012- 2019.
- Falling imports from China (see next page) which is driven by violations of food safety laws.
- It is not wholly clear whether reduction is driven by reducing demand or an under-supply in the market. Given figures on rising expenditure on *Undaria* per household (see earlier slide) a hypothesis could be made for an under-supply.
- This HS code represents seaweed in raw or product form. It is not currently understood what volumes of *Undaria pinnatifida* imports will arrive as ingredients in processed food products.

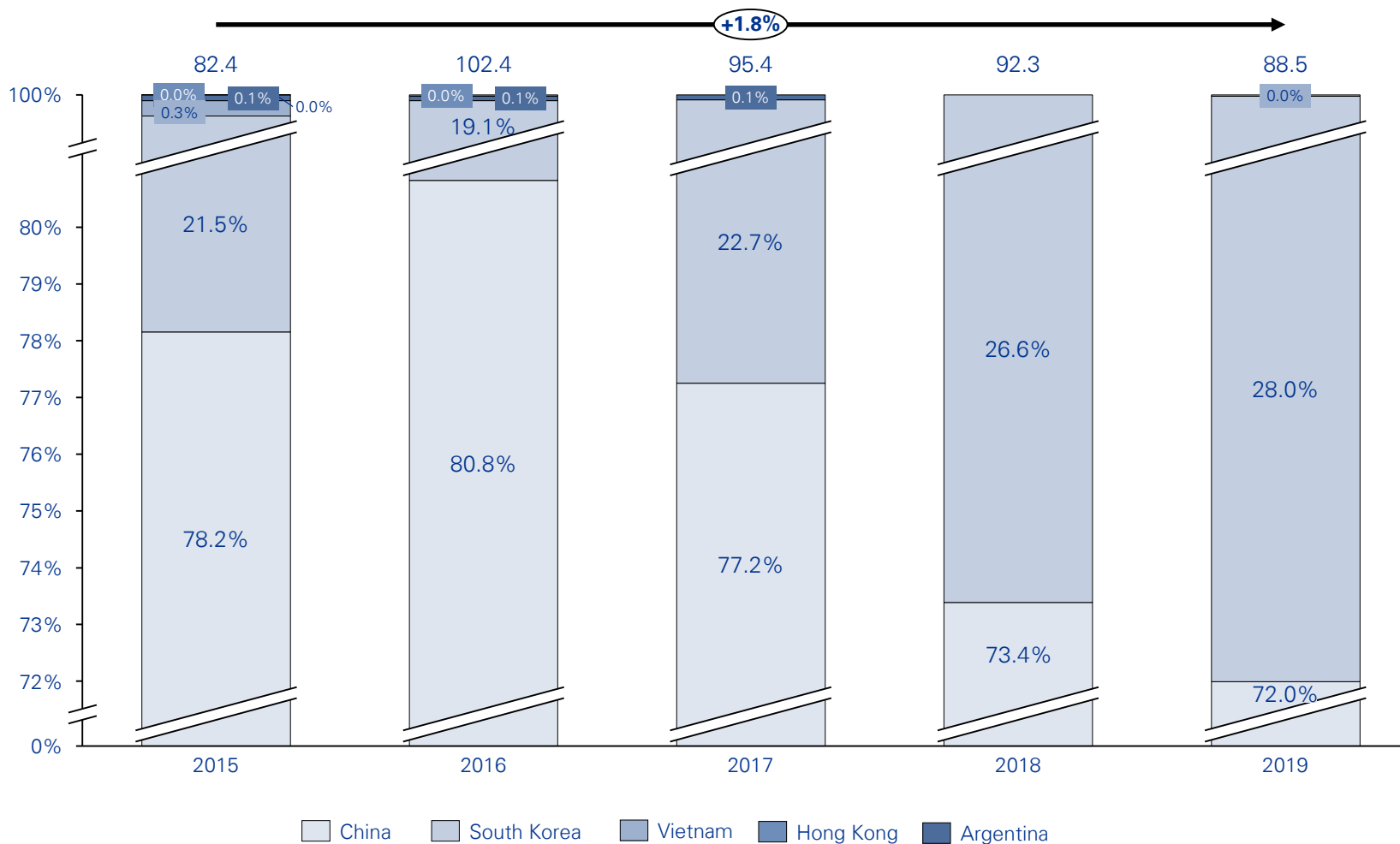
Note(s): (a) The data corresponds for HS product code 121221 - Seaweeds And Other Algae Fit For Human Consumption; (b) Values for 2020 till date, and do not include forecast figures for the complete year and hence CAGR has been calculated only till 2019; (c) Customs tariff schedules as provided by Tokyo Customs department

Source(s): Trade Statistics - Ministry of Finance Japan

SUPPLY – IMPORTS

China and South Korea are almost the exclusive providers of Undaria imports into Japan with a shift of imports from China to South Korea in recent years

Japan Undaria pinnatifida imports by source country, 2015-2019, USD millions



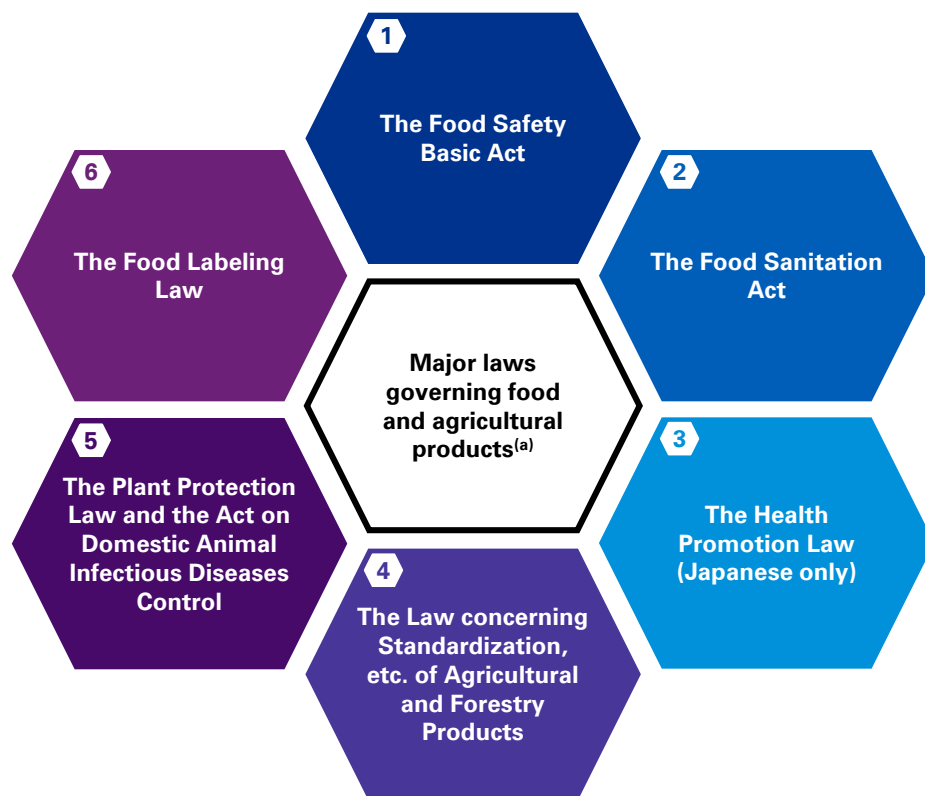
Comments

- The most notable trend is the decreasing volume of imports from China over the last four years, with replacement imports from South Korea.
- The primary industry interviews have validated this trend and noted a higher number of food safety violations and shrinking demand for Chinese Undaria given food safety concerns.
- Since 2017, imports from China have decreased from USD\$73m to USD\$64m. Meanwhile South Korea has increased from USD\$21m to USD\$25m.

Source(s): Japan Ministry of Agriculture, Forestry and Fisheries and other

A robust regulatory framework exists for Japan’s food processing and manufacturing industry with a number of laws

Major regulations for food and agricultural products in Japan^(a)



- 1 **The Food Safety Basic Act:** Sets the principles for developing a food safety regime and establishes the role of the Food Safety Commission (FSC), a food-related risk assessment body.
- 2 **The Food Sanitation Act:** Under the jurisdiction of the Ministry of Health, Labour and Welfare (MHLW), the Act sets specifications and standards for foods and beverages, food apparatus, food containers and packages, additives, contaminants, and agrochemical residues, and prohibits the sale and imports of foods and beverages containing harmful substances.
- 3 **The Health Promotion Law (Japanese only):** Under the jurisdiction of MHLW, aims to improve public health by setting guidelines and implementing measures to promote people’s improved health.
- 4 **The Law concerning Standardization etc. of Agricultural and Forestry Products (JAS Law):** Administered by the Ministry of Agriculture, Forestry and Fisheries (MAFF), is a voluntary quality assurance system for foods, beverages (excluding alcohols) and forestry products.
- 5 **The Plant Protection Law and the Act on Domestic Animal Infectious Diseases Control:** Administered by MAFF as Japan’s national plant protection and animal health authority. Both laws aim to prevent pests and diseases from spreading and establishing in Japan by requiring inspections for domestic and imported plants.
- 6 **The Food Labeling Law:** Under the purview of the Consumer Affairs Agency (CAA), sets food labelling standards (e.g., Countries of Origin Labeling requirements, allergen labeling, expiration date labeling, foods with functional claims, etc.) as well as penalties in the event of a violation.

Note(s): (a) Including imports

Source(s): USDA Foreign Agricultural Service

Japan market sizing

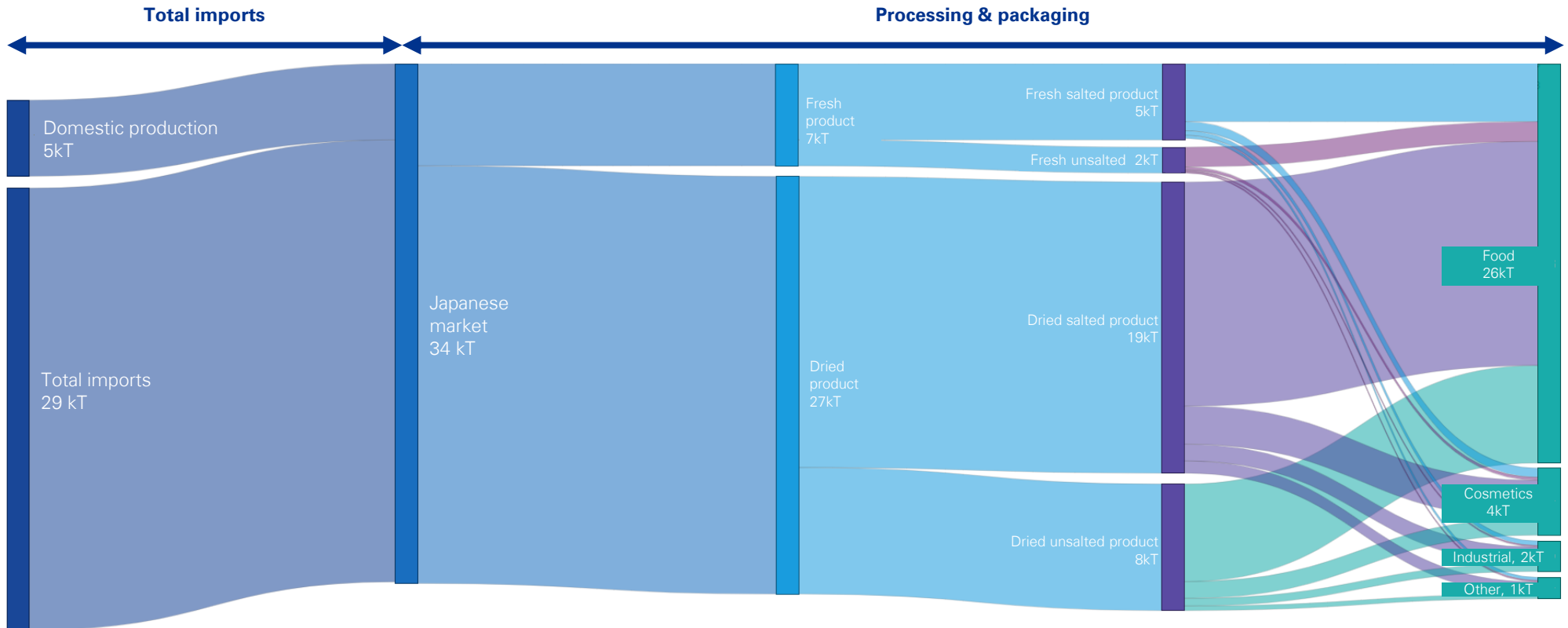
- 1 Market summary
- 2 Demand insights
- 3 Supply insights
- 4 **Undaria value chain**



VALUE CHAIN

Volume flows of *Undaria pinnatifida* in the Japanese market

Volume mass balance of *Undaria pinnatifida* in the Japanese market, 2018 (Kilotons)



Comments

- The Japanese market is primarily supplied from imports – making up around 90% of overall supply.
- The level of “raw” imports (i.e. processing done onshore) versus final packaged product imports is unknown, but primary interviews indicated that the majority of product imports are “raw” for processing in Japan.
- Japanese exports of *Undaria* are minimal (c.1kT) and are not illustrated on the above graphic.

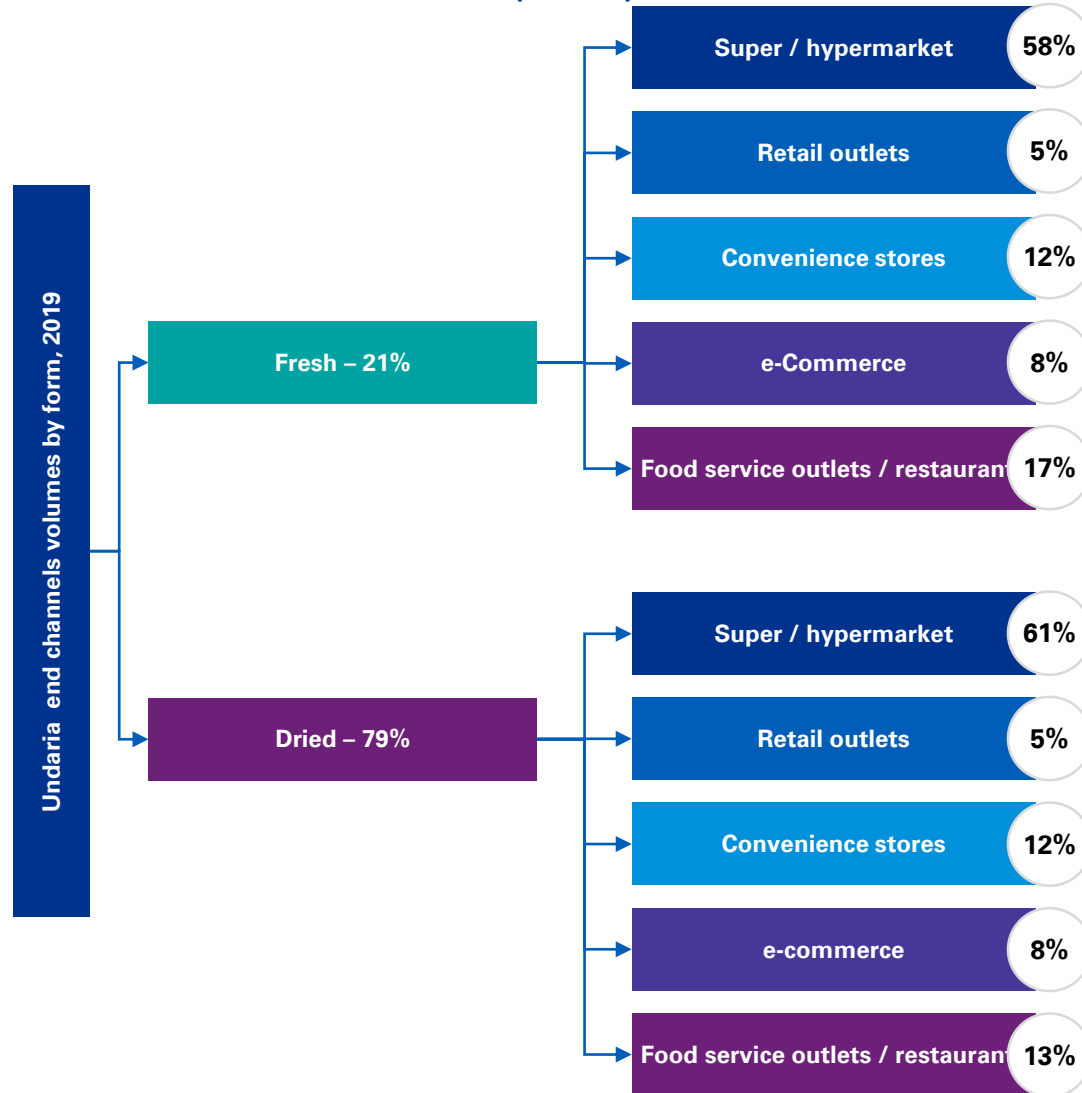
Note(s): All volumes shown as processed weight (production volumes adjusted using FAO guidance of 10x from wet/live weight to product weight)

Source(s): OECD, ITC, FAO, Ministry of Agriculture, Forestry and Fisheries, Japan; Radiant Insights

VALUE CHAIN

Undaria reaches the end consumer through various channels, most prominently super / hyper markets and food services

Channels for seaweed fit for human consumption - Japan



Comments

- Super / hyper markets and food service outlets account for the vast majority of product volumes (~74% of total volumes).
- Desktop research suggested 76% usage of Undaria for human consumption in food but primary interviews suggested that as much of half of Undaria may be used by businesses (mainly as feed for sea urchins) and the final figures have been adjusted to reflect this.
- Primary interviews suggest that end-use channels take a 25-40% share of overall value chain profits but it was noted that this is driven by the strength of the market so can vary.

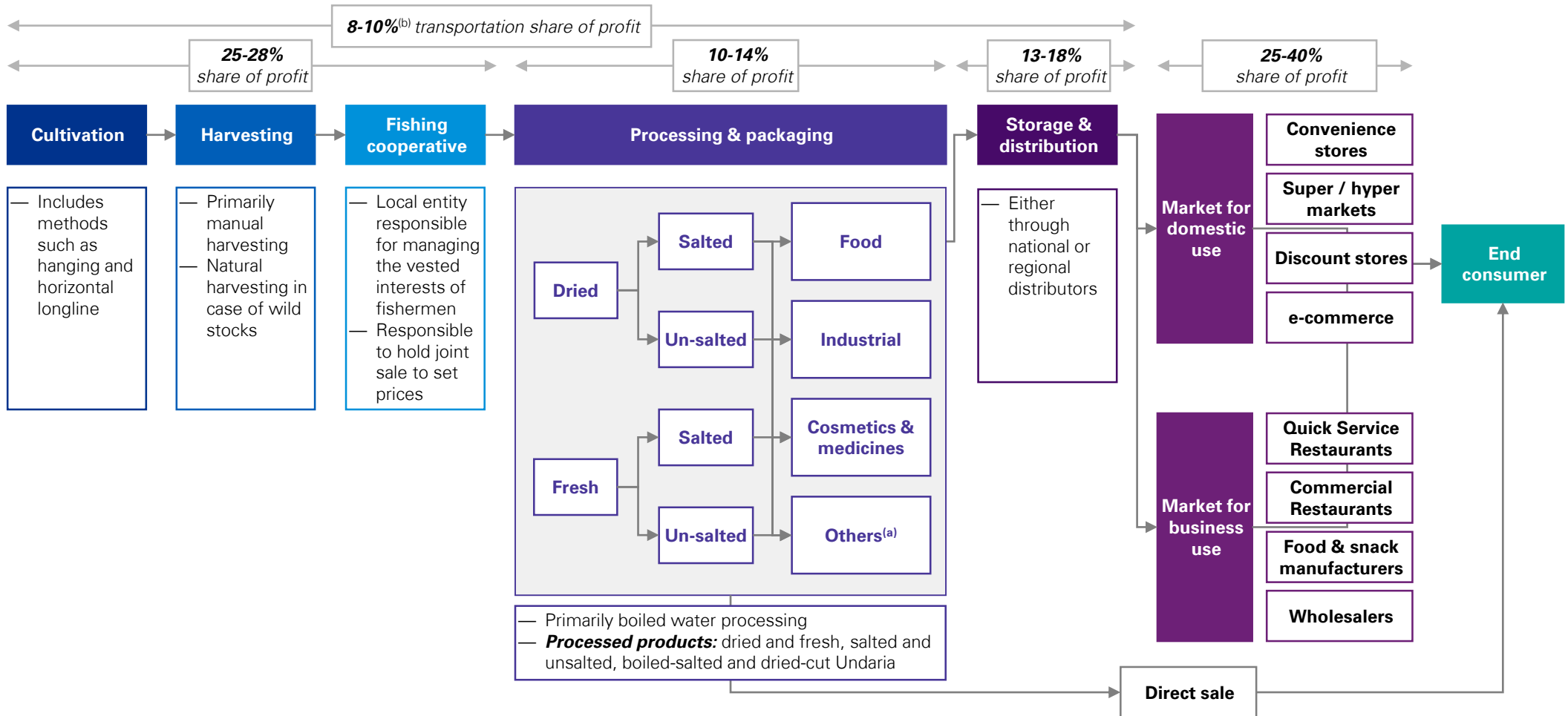
Channel definitions

- **Supermarket/hypermarket:** defined as large self-service shops selling food and household goods.
- **Retail outlets:** smaller neighbourhood shops, selling daily essentials
- **Convenience stores:** stores with extended opening hours, selling limited range of products such as goods and groceries. We also have considered the local wet shops for direct consumer to be included under this segment.
- **e-Commerce:** selling of the products through online portals or shops are considered under this segment.
- **Food service outlets/restaurants:** food outlets and restaurants using Undaria in all forms to serve take away consumers and diners are considered under this segment. Sales of Undaria from wet market to restaurants and food service outlets have been considered under this segment.

VALUE CHAIN - OVERVIEW

A robust value chain exists in Japan seaweed market, aimed at delivering value to the end consumer via multiple points of sale

Value chain for seaweed fit for human consumption – Japan



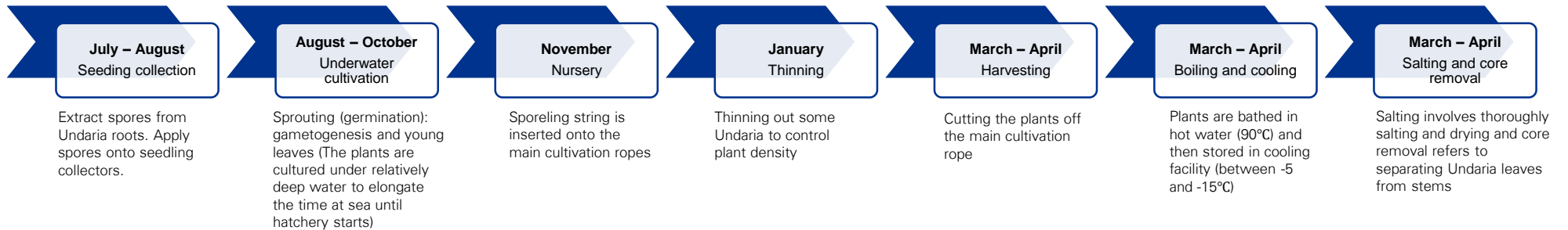
Note(s): (a) Other applications include usage of Undaria in animal feed and wastewater treatment; (b) Refers to transportation of products at any level of the value chain

Source(s): FAO; USDA Foreign Agricultural Service; BIM; Company websites; Capital IQ as accessed during Jun'20; Japan Times; Sora News 24; Primary Interviews with industry experts, Radiant Insights

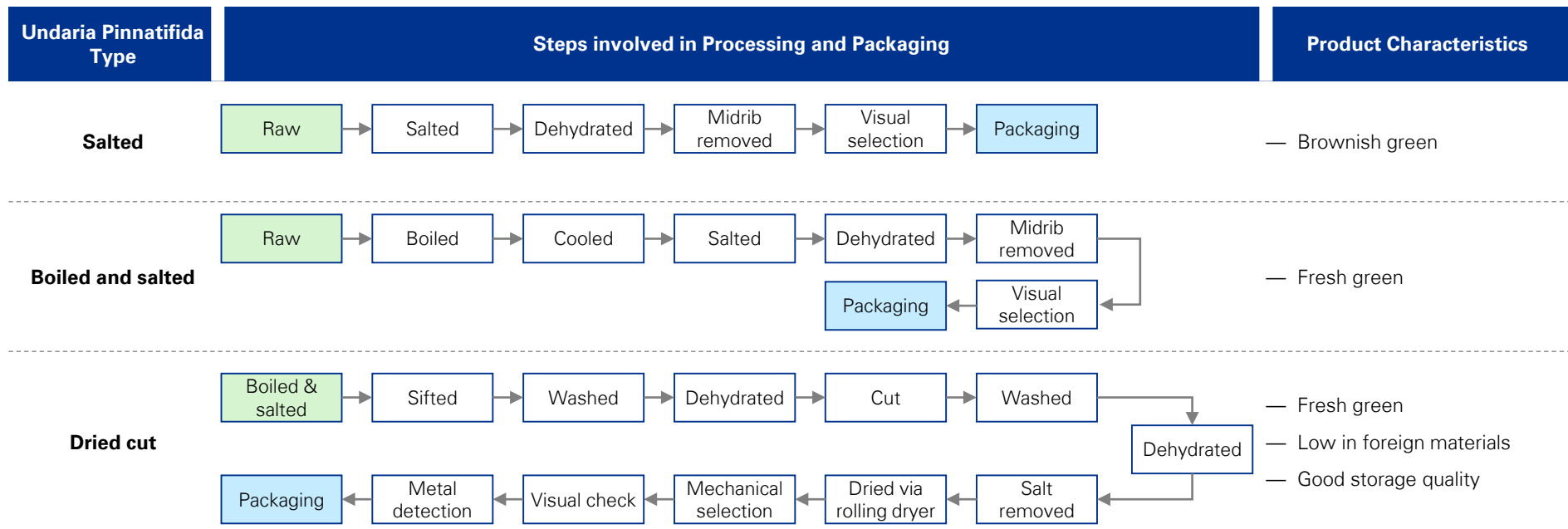
VALUE CHAIN – PROCESSING AND PACKAGING

Undaria pinnatifida products generally follow a mechanical process involving boiling and salting

Undaria Pinnatifida lifecycle based on Japan's Eastern Seaboard



Undaria Pinnatifida products and their processing in Japan



Source(s): FAO; Semantic Scholar

VALUE CHAIN – HARVESTING AND PROCESSING

There is increasing use of innovative approaches to improve farming and processing efficiency

While there is adoption of innovation and automation there are differing perspectives between experts on the productivity gains from this (e.g. inaccuracy of machines versus traditional hand-cut method).

1



Development of an automatic Undaria thinning machine

Thinning helps to control plant density. The reaping blade attached to the automatic Undaria thinning machine cuts Undaria attached to the top surface of seedling ropes increasing efficiency.

Without machine: 160 minutes per 100metres (per worker)

With machine: 69 minutes per 100 metres (per worker)

Tests are ongoing to ensure safety especially for running the machine offshore in periods of high waves.

2



Development of automatic Undaria harvesting machinery

Using dredge nets winder improves health and safety, especially preventing numbers of back injuries for the workers. The time spent on on-shore harvesting is improved by the reaping blades attached to all the surface of reaping rope.

Depending on the farmers, the size and parts of the harvested Undaria are different.

3



Development of Undaria salting processor:

In the salting process Undaria is boiled, massaged in salt, rested (overnight), dried and then desalted.

The high-speed salting processor enables farmers to complete the process within 40-50 minutes.

Saturated saline is mixed into the water to create a flow. This leads to an even salting process and reduced operation time.

The use of the machine is considered main-stream for Undaria farmers and they were widely adopted during the Great East Japan Earthquake.

4



Development of Undaria core removal machine:

After the boiling and salting process, Undaria leaves are separated from stems manually (one by one) which requires a large amount of time.

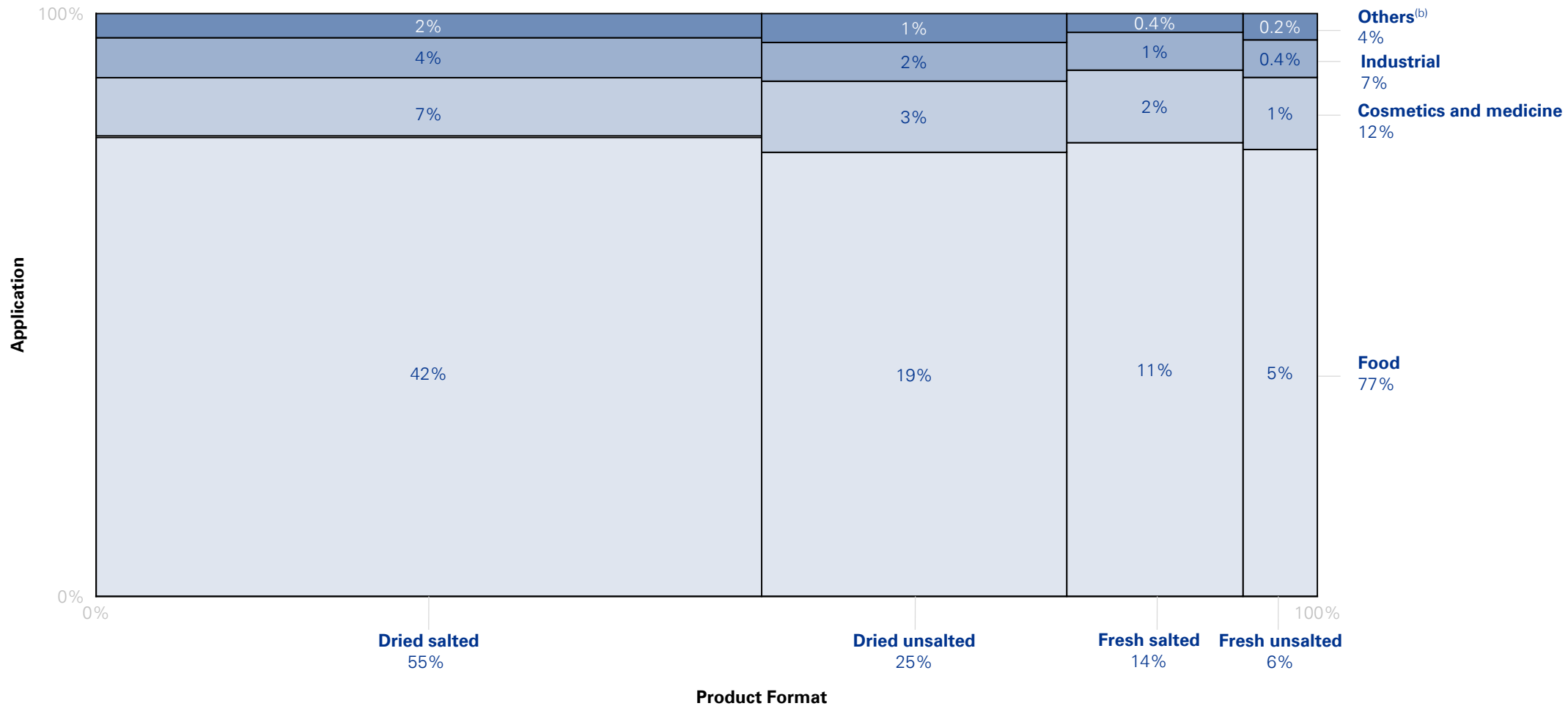
Some core removal machines are already developed and improved efficiency is estimated. However, there are some issues such as the method of loading Undaria to the machine and the quality of the end product.

Machine develop continues to improve although a high number of processors still rely on manual core removal at present.

VALUE CHAIN – VALUE STREAMS OF UNDARIA PINNATIFIDA

Dried salted product distributed through food channels (including as an ingredient) accounts for 40% of all Undaria use in Japan

Volume distribution of Undaria pinnatifida by product format and application in Japan, 2019^(a)



Note(s): (a) Illustrative; (b) Others include animal feed and wastewater treatment applications

Source(s): Radiant Insights

VALUE CHAIN – AVERAGE PRICE

Undaria pinnatifida's fresh product formats show a lower price per volume across all application types

Average price by product format and application in Japan, 2019, USD/kg

	Fresh salted	Fresh unsalted	Dried salted	Dried unsalted
Food	\$3.58	\$3.45	\$3.91	\$3.72
Industrial	\$2.94	\$3.19	\$3.13	\$3.58
Cosmetic & medicines	\$3.46	\$3.31	\$3.74	\$3.62
Others	\$2.18	\$2.44	\$2.19	\$2.66

"The largest driver of pricing variation is product origin and the perception of food safety. Chinese Undaria is cheaper as the seas are seen as more 'dirty' whereas South Korean Undaria is 10-20% more expensive and Japanese grown around double the price of Chinese product"

– Primary interview with industry expert

Average price by product type and distribution channel in Japan, 2019, USD/kg

	Fresh	Dried
Super / hypermarket	\$3.36	\$3.61
Retail outlets	\$3.41	\$4.00
Convenience stores	\$3.49	\$3.82
e-commerce	\$3.58	\$4.32
Food Service Outlets / restaurants	\$3.66	\$3.70

"Aside from product origin there are some levels of product that command greater price based on colour, flavour profile, texture and the thickness of the leaves and there are some premium products that differentiate themselves based on this quality"

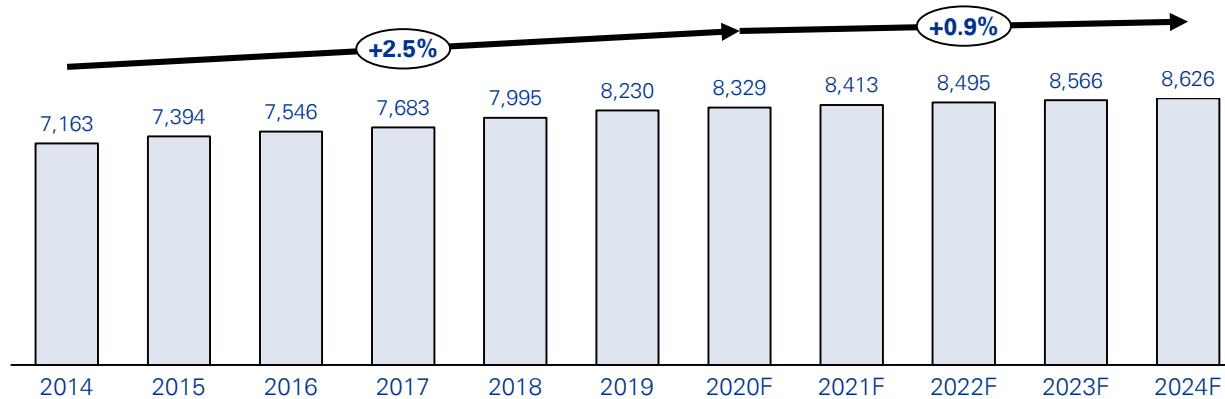
– Primary interview with industry expert

Source(s): Radiant Insights

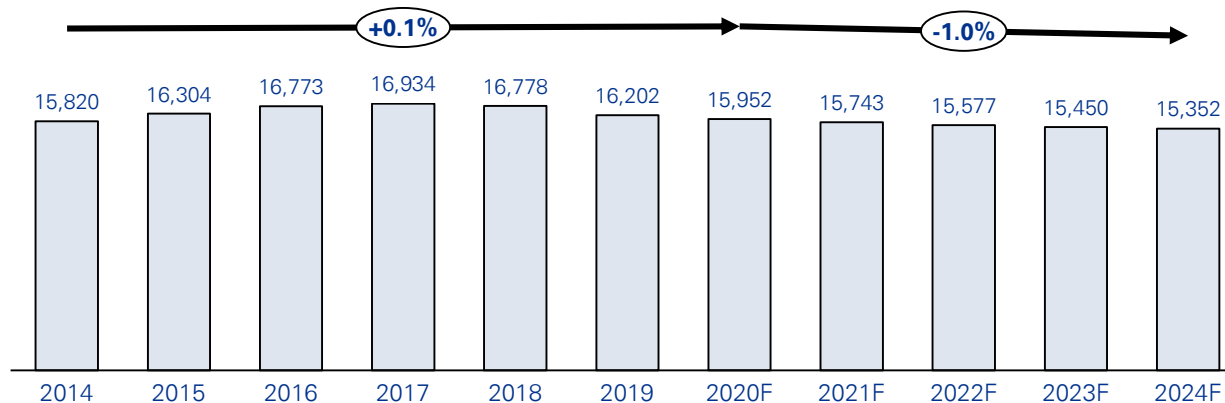
VALUE CHAIN – END MARKET – DOMESTIC USE (1/2)

Convenience stores are forecast to grow at +1% CAGR and supermarkets shrink at -1% CAGR due to forecast rise in e-commerce

Japan convenience stores market size (sales), 2014-2024, JPY billion



Japan supermarkets market size (sales), 2014-2024, JPY billion



Comments

Convenience stores

- Major convenience store brands are closing down a number of unprofitable outlets and re-assessing their location strategy for planned new stores, which slowed down store network expansion.
- There appears to be adoption of digital platforms such as use of mobile apps instead of traditional 'brick and mortar' outlet sales.

Supermarkets

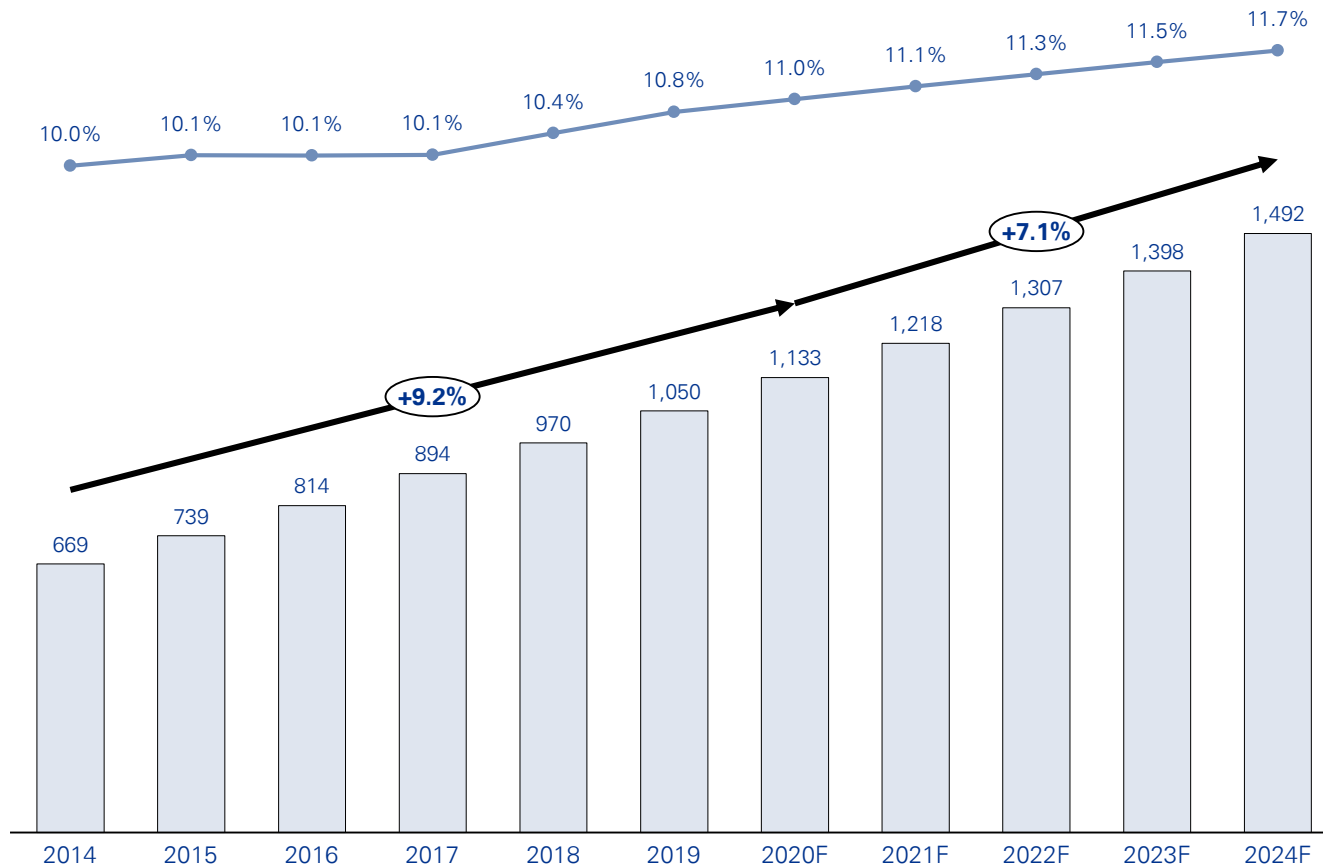
- Being used as an essential ingredient in daily diet of Japanese, seaweed is a popular item of sale in supermarkets.
 - Nori, Furikake and Gohan Desu Yo paste are some common seaweed products found at most of the supermarkets.
 - Hijiki and Okinawa Mozuku are also heavily used seaweed products in Japanese households.
- However, increasing online sales and labour shortage seem to negatively impact the seaweed sales in supermarket by 2024.

Source(s): Euromonitor International; Japan Experience; Fish Site; Live Japan

VALUE CHAIN – END MARKET – DOMESTIC USE (2/2)

Online sales of food and beverage is expected to surge at +7.1% CAGR (2020-25) in Japan extending observed increases in e-commerce

Japan food and beverage e-commerce market size, 2014-2024, JPY billion and %



Comments

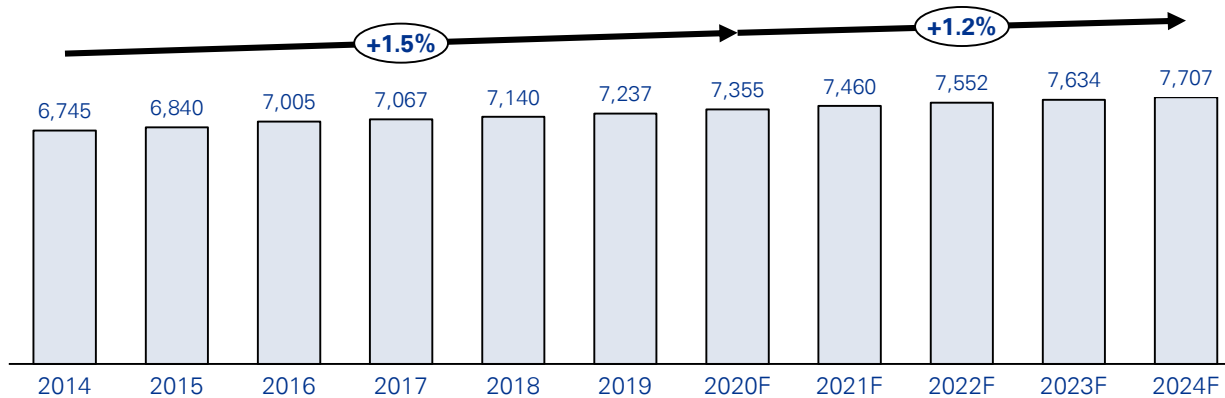
- Online sales channel is expected to grow as consumers are increasingly adopting e-commerce based platforms.
- Range of e-commerce options seems to be prevalent across the value chain, as manufacturers tend to increase their D2C (Direct-to-Consumer) e-commerce sales via mobile apps.
- Japanese seaweed companies are also expanding their cross-border sales to other countries by developing e-commerce websites.

● Food and beverage as a % of total e-commerce sales
 □ Food and beverage

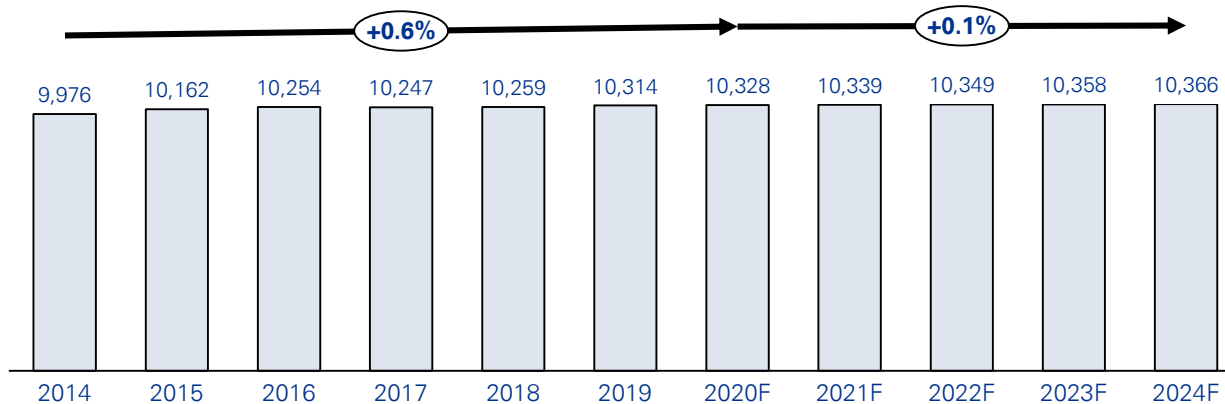
Source(s): Euromonitor International

Labour shortage and customer base contraction due to aging population, availability of ready-to-eat meals seem to impact the food service industry

Japan limited-service restaurants market size (sales), 2014-2024, JPY billion



Japan full-service restaurants market size (sales), 2014-2024, JPY billion



Comments

Limited-service restaurants

- Japan is facing a labour shortage which in turn is slowing growth in the consumer foodservice industry.
- However, to counter impact of contracting customer base, limited-service restaurant operators are seeking to drive growth by:
 - Offering new healthy options
 - Cashless payment methods
 - Adoption of digital platforms.

Full-service restaurants

- Increase in ageing population and in turn, their preference for eating at home.
- Availability of packaged ready-to-eat meals at convenience stores poses unfavorable conditions for full-service restaurants.
- However, in order to counter the impact, full-service restaurant operators are exploring home delivery options and digital solutions such as electronic tablet ordering systems and cashless payments.

Source(s): Euromonitor International

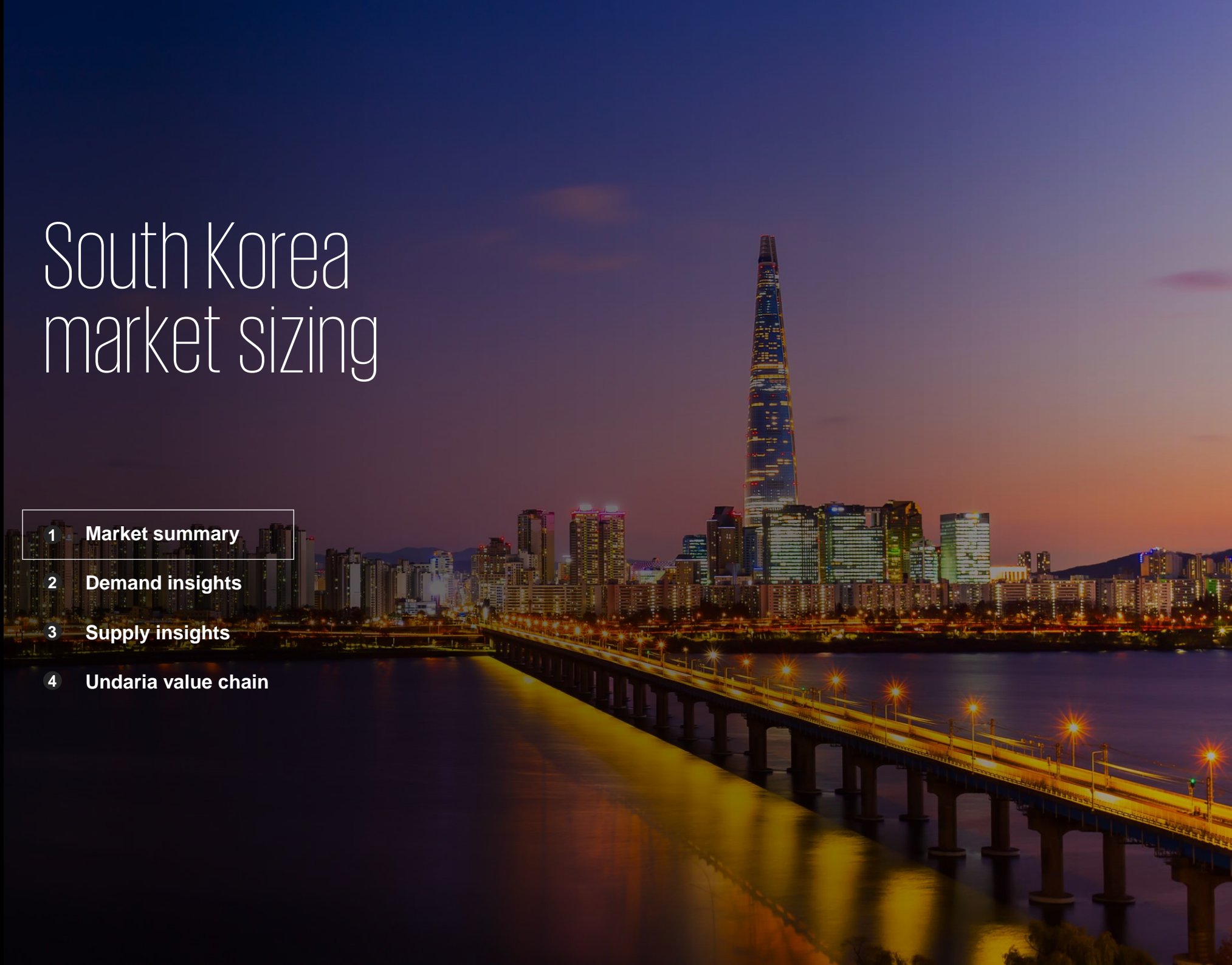
South Korea market sizing

1 **Market summary**

2 **Demand insights**

3 **Supply insights**

4 **Undaria value chain**

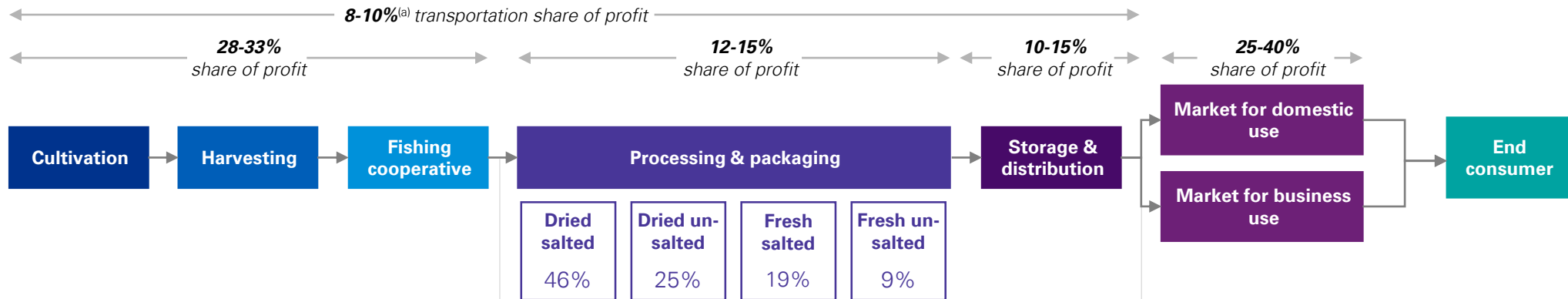


Desktop research of the market for *Undaria pinnatifida* in South Korea provides insight into the scale of the market and key trends

MARKET SIZING		MARKET TRENDS
Market size^(a) <i>(2019)</i>	USD\$1,280m	<ul style="list-style-type: none"> South Korea is a net exporter of seaweed and the second largest producer behind China. In 2018, South Korea produced 1,710 kilotons of seaweed out of which 30% was <i>Undaria</i>.
Demand	<ul style="list-style-type: none"> Consumption of seaweed per capita in South Korea has almost doubled in the last nine years, now at 27.8kg per capita per annum. 	<ul style="list-style-type: none"> <i>Saccharina japonica</i> and <i>Pyropia</i> spp are the larger volume seaweeds produced in South Korea. Each accounted for a third of South Korean seaweed production. <i>Pyropia</i> is a high-value seaweed and actually accounts for 66% of overall export value.
Production	<ul style="list-style-type: none"> South Korea is the second largest producer of <i>Undaria</i> in the world behind China. Domestic product exceeds the size of domestic demand and has increased at 7.2% CAGR over the last eight years. Japan, China and the USA are the top 3 destinations for South Korean <i>Undaria</i> exports. 	<ul style="list-style-type: none"> South Korea is also a large exporter of Abalone and experiences high demand for seaweed as Abalone feed – typically fulfilled through <i>Saccharina</i> and <i>Undaria</i>.
Imports	<ul style="list-style-type: none"> Given the high levels of production in South Korea, demand for imports is low. That said there is a small market for imports representing around 8% of the supply. 	<ul style="list-style-type: none"> The South Korean government established the Seaweed Research Centre and made the development of the industry a priority. In 2012 they introduced a certification and rating systems, establishing standards around quality, seeking to improve perceptions around export quality and differentiate from Chinese seaweed.
Processing	<ul style="list-style-type: none"> There is presence of a number of vertically integrated players in the market as well as a number of specialist food processors. It is unclear to what extent product is processed and then exported versus raw product exports. 	<ul style="list-style-type: none"> The government created a seaweed belt centered on Gyeonggi and Jeolla provinces which resulted in the restructuring of small-scale producers.
Product variation	<ul style="list-style-type: none"> A large percentage of <i>Undaria</i> is for human consumption (45%) with a similar amount (38%) for industrial use. Of this, around 70% is dried product with dried salted the most popular format (46% of all human consumed <i>Undaria</i>). 	<ul style="list-style-type: none"> The 'Golden Seed Project' is a government funded R&D investment for the development of agricultural cultivars. This has led to the development of more productive strains of key seaweed species using techniques such as selective breeding, hybridisation, mutation and radiation treatment.
Pricing	<ul style="list-style-type: none"> <i>Undaria</i> pricing has reduced in the last two years with prices fluctuating between \$9.50 and \$11.00 USD/kg. Overall, price has reduced at -2.0% CAGR over the last five years. 	<ul style="list-style-type: none"> Southern and eastern sea temperatures around the Korean Peninsula surged by 2.9°C in 2018 due to global warming and typhoons which has an ongoing negative impact on the seaweed cultivation farms.
Distribution	<ul style="list-style-type: none"> An estimated 56-58% of human-consumed <i>Undaria</i> is distributed through supermarkets or hypermarkets and estimated 12-18% through restaurants. 	<ul style="list-style-type: none"> Increasing consumer consciousness around environmental sustainability is forcing the industry to adjust to the challenges of developing practices in line with demands of eco-friendly and health-conscious consumers. In 2019, a seaweed company in South Korea obtained the world's first ASC-MSC (Aquaculture Stewardship Council-Marine Stewardship Council) certification and more such steps are expected in future.
Competition	<ul style="list-style-type: none"> There are a broad range of competitors across the value chain, some vertically integrated such as DYSS Korea and Kyeong Cheon Foods. 	<ul style="list-style-type: none"> Food processing companies in South Korea have been focusing on expanding their businesses to international markets. This is expected to drive the demand for <i>Undaria</i>.
Summary	<p>There is high and growing demand for <i>Undaria</i> in South Korea and but, as the second largest producer of <i>Undaria</i> in the world, the market for imports is small.</p>	<p>The South Korean government is highly invested in the success of the seaweed industry making numerous interventions to improve export prospects.</p>

EXPERT INTERVIEWS

Primary interviews with industry experts have validated desktop findings across the value chain and provided targeted and specific insight



Primary expert interview insights

- There is some technological innovation around Undaria cultivation but South Korean efforts have been primarily focussed on Pyropia (Gim). However, three new species of Undaria are being test harvested, with a focus on increasing yields through project 'Gold Seed'. The project is funded and led by the Korean Government. Korean government appoint research institutes to cultivate new species, with successful species to be distributed to fishermen.
- South Korea export Undaria to a number of global markets including Japan, China, USA, Vietnam and others. Japan (30%) and China (20-30%) are the largest export markets and the USA has a growing demand for Undaria stems. Recently the Undaria root is growing popularity in Japan due to its health benefits.
- For exported product, there is a mix of processed product and "raw" (typically salted and frozen for preservation). Processes export formats include: chilled and sliced as a meal (side dish); dried and seasoned as snacks and; dried and packaged with sauce included to replace snacks such as crisps.

Primary expert interview insights

- Most manufacturers of Undaria products purchase raw Undaria from fishermen. Processing includes boiling, salting, de-ribbing, washing and drying. Commonly one company will cover harvesting and processing. The biggest players in this area are 'Goyang', 'NamHea' and 'Myongcheon Fishermen's Group'.
- Key product attributes are colour and texture. The cleanliness of manufacturing sites is also important, especially for dried Undaria products.
- Given the most common use in human consumption is for making soup, having a texture that does not break down when fully-boiled is important. 'Softer' Undaria is harvested in the southerly regions and is best for soup. Undaria with stronger, chewy texture where it retains elasticity even after being fully boiled is harvested in the northerly regions.
- Competitiveness is strongly linked to how you develop safe, secure processes and systems that build trust around hygiene and food safety. Over time consumers tie these attributes to brand and ongoing trust.
- Undaria with health and safety certification helps with competitive advantage. Manufacturers who salt and dry the Undaria in the same place have competitive advantage as this is perceived more clean and safe. The Government's Ministry of Food and Drug Safety approval is valued for food safety accreditation, brand and perception. Suppliers with established brands conduct their own safety checks and are able to position their product in the market as safer food to eat.

Primary expert interview insights

- Large market for seaweed in South Korea but largest consumed variety is Pyropia (Gim). Undaria is estimated at 10-20% of the overall seaweed demand. Whilst seaweed as a whole is growing, demand for Undaria is stagnating and beginning to decrease.
- The B2B market is highly competitive with low profitability. The B2C market is typically about twice the profits of B2B. With the business market dominated by use of Undaria as sea-urchin feed, this provides little opportunity to differentiate and create premium product.
- In human consumption, there is a decreasing local demand for Undaria. Undaria is typically used in home cooking in South Korea and the growing trend towards eating out.

Note(s): (a) represents transportation at any part of the value chain

Source(s): Radiant Insights, validated through primary expert interviews

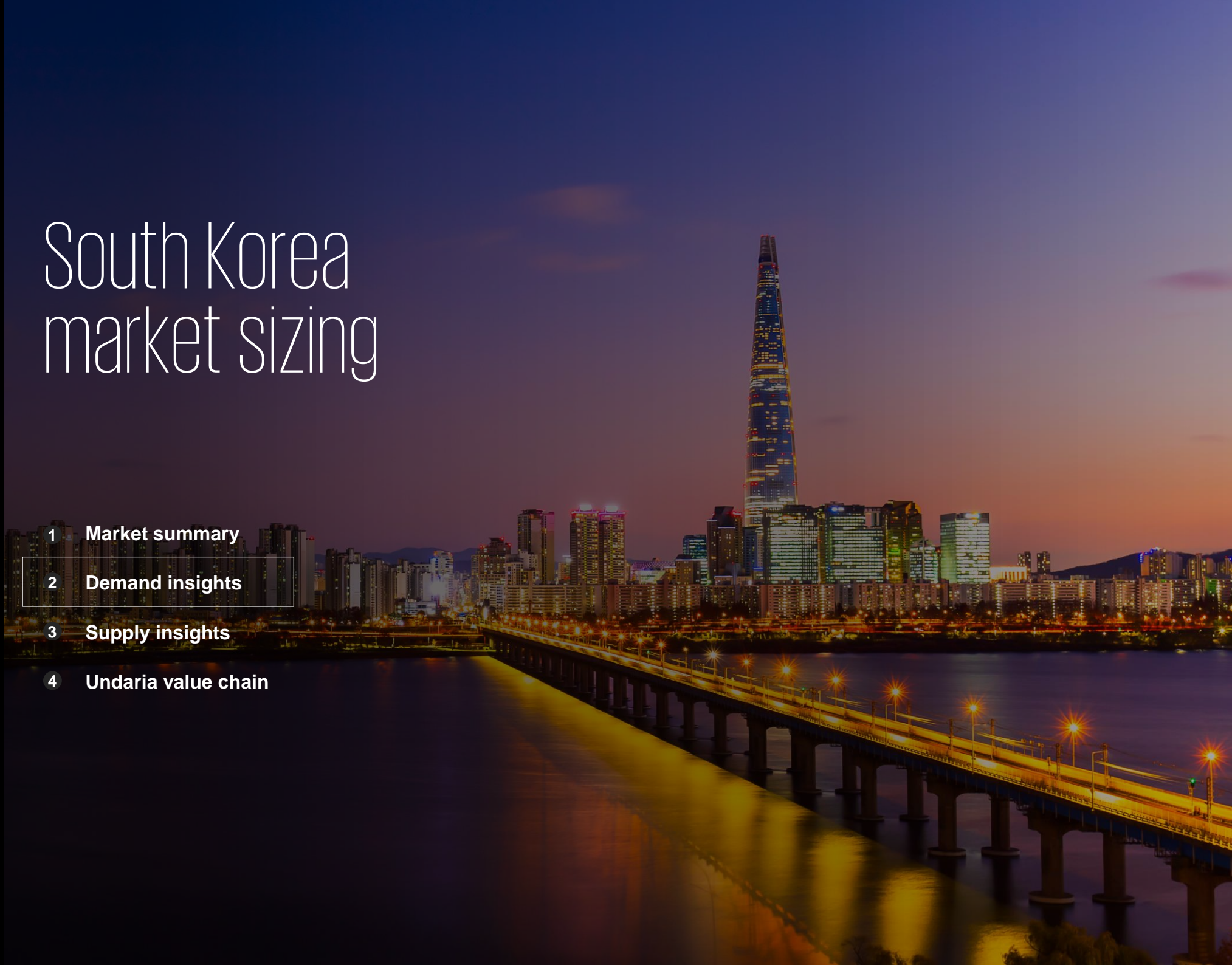
South Korea market sizing

1 Market summary

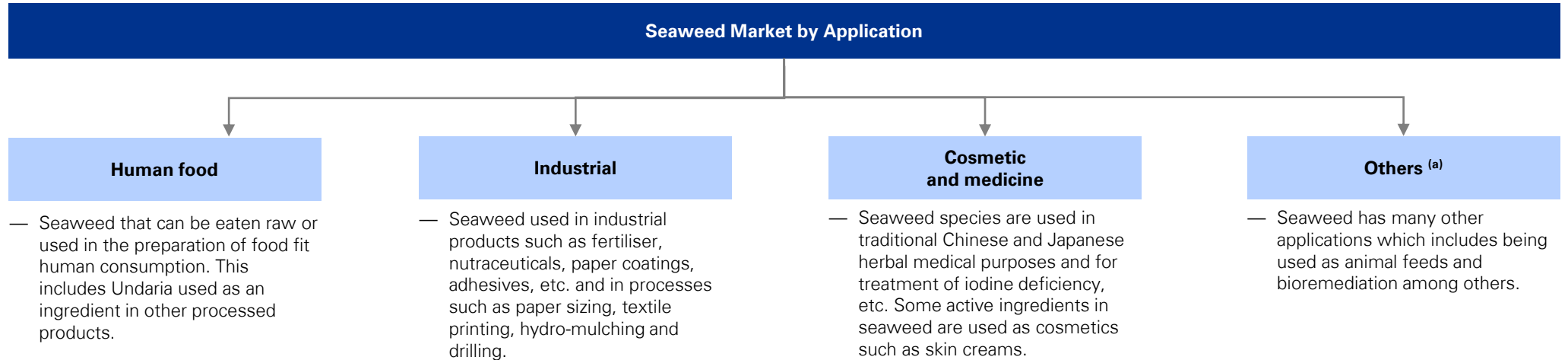
2 Demand insights

3 Supply insights

4 Undaria value chain



Seaweed fit for human consumption accounts for more than 45% of market share in South Korea



% estimated volume market share (2019)



45%

38%

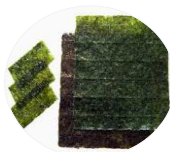
13%

4%

Types of seaweed ^(b)



Undaria pinnatifida
(Undaria, Miyeok)



Pyropia
(Gim, Laver)



Eucheuma



Kappaphycus



Laminaria
(Oarweed)



Ascophyllum nodosum



Macrocystis
(Kelp)

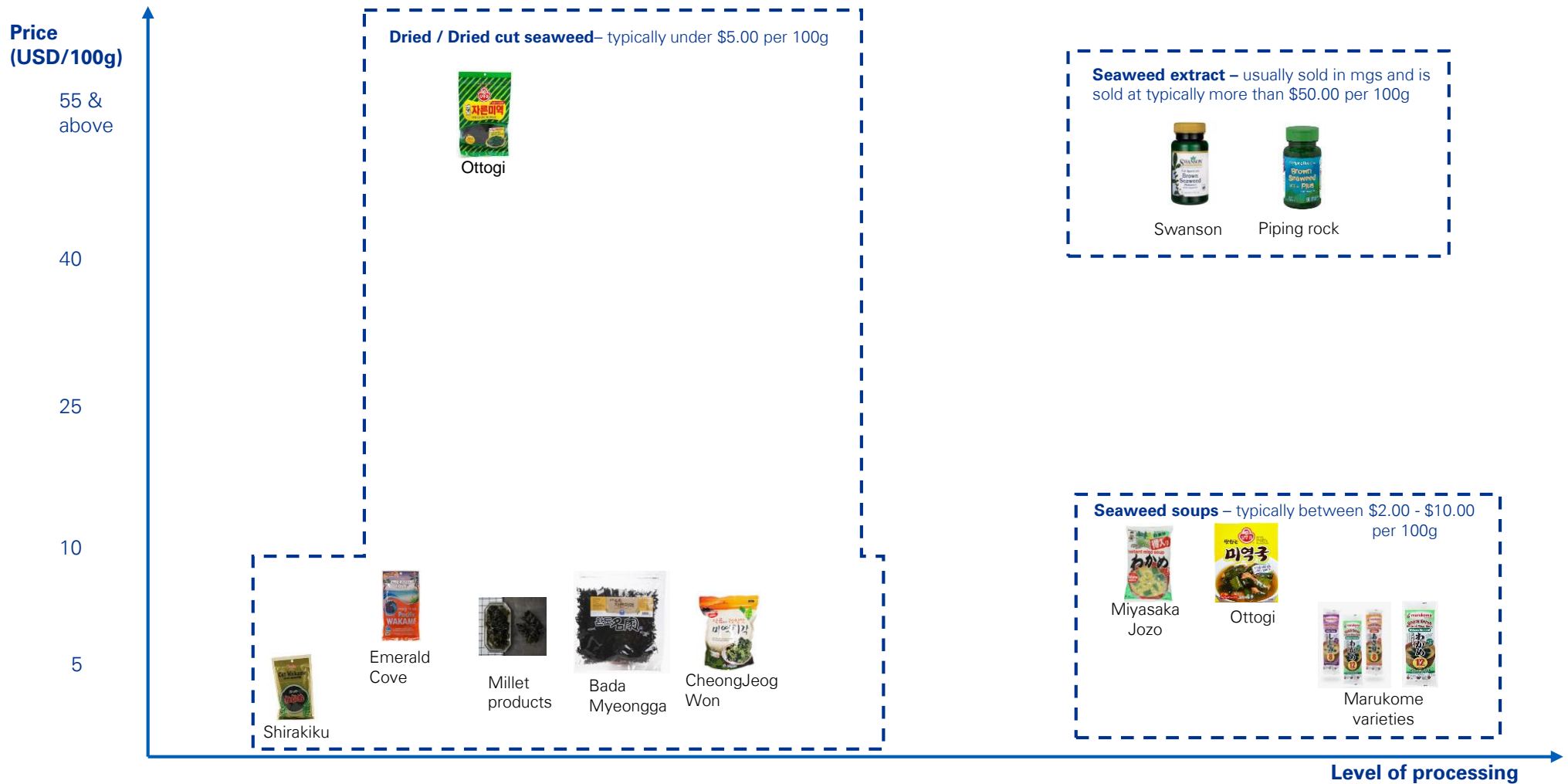


Gracilaria

Note(s): (a) Others include animal feed and wastewater treatment applications ; (b) Illustrative and not exhaustive
Source(s): FAO; Seaweed.ie, Radiant Insights, primary expert interviews

DEMAND – PRODUCT FORMATS

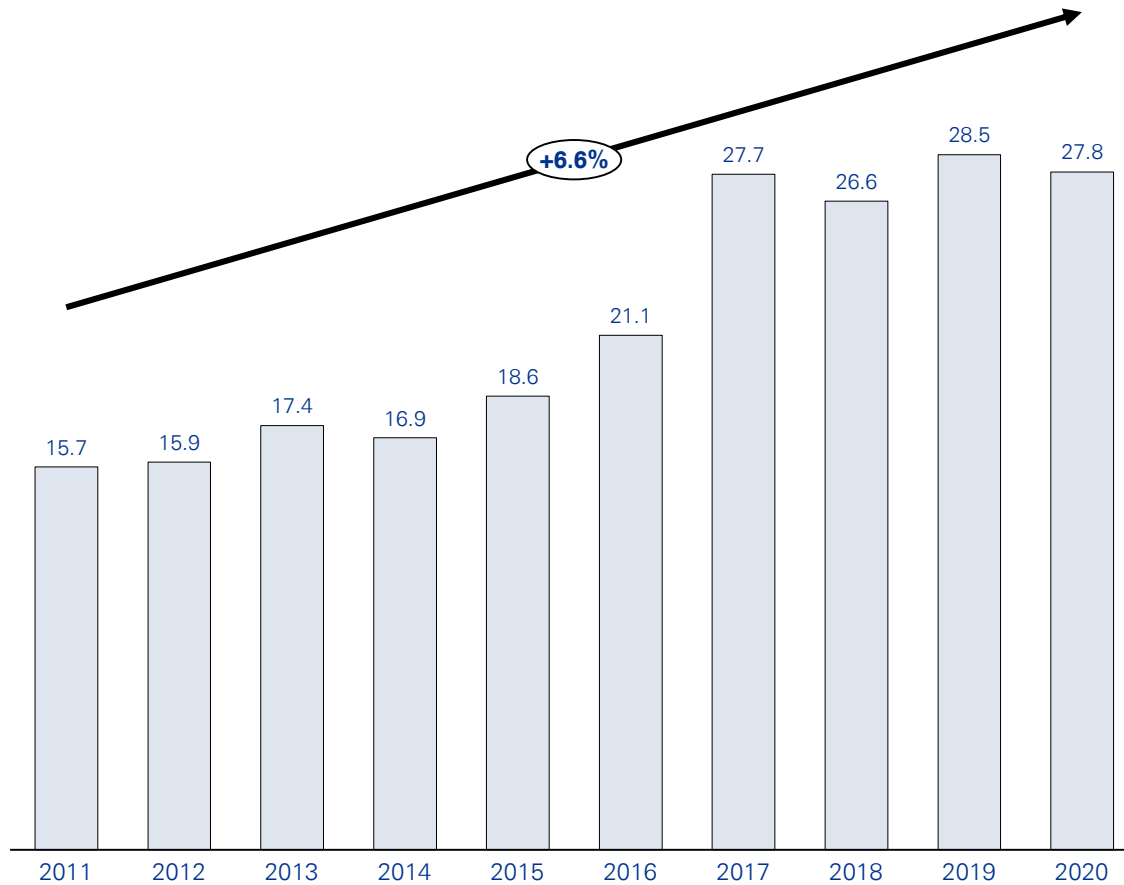
Undaria pinnatifida is sold in various product formats in South Korea, primarily dried, dried cut and in soups, across multiple point of sales



DEMAND – PER CAPITA SEAWEED CONSUMPTION

With +6.6% CAGR, the annual per capita seaweed consumption has nearly doubled over the last decade

South Korea annual seaweed consumption, 2011-2020, kg/per capita



Comments

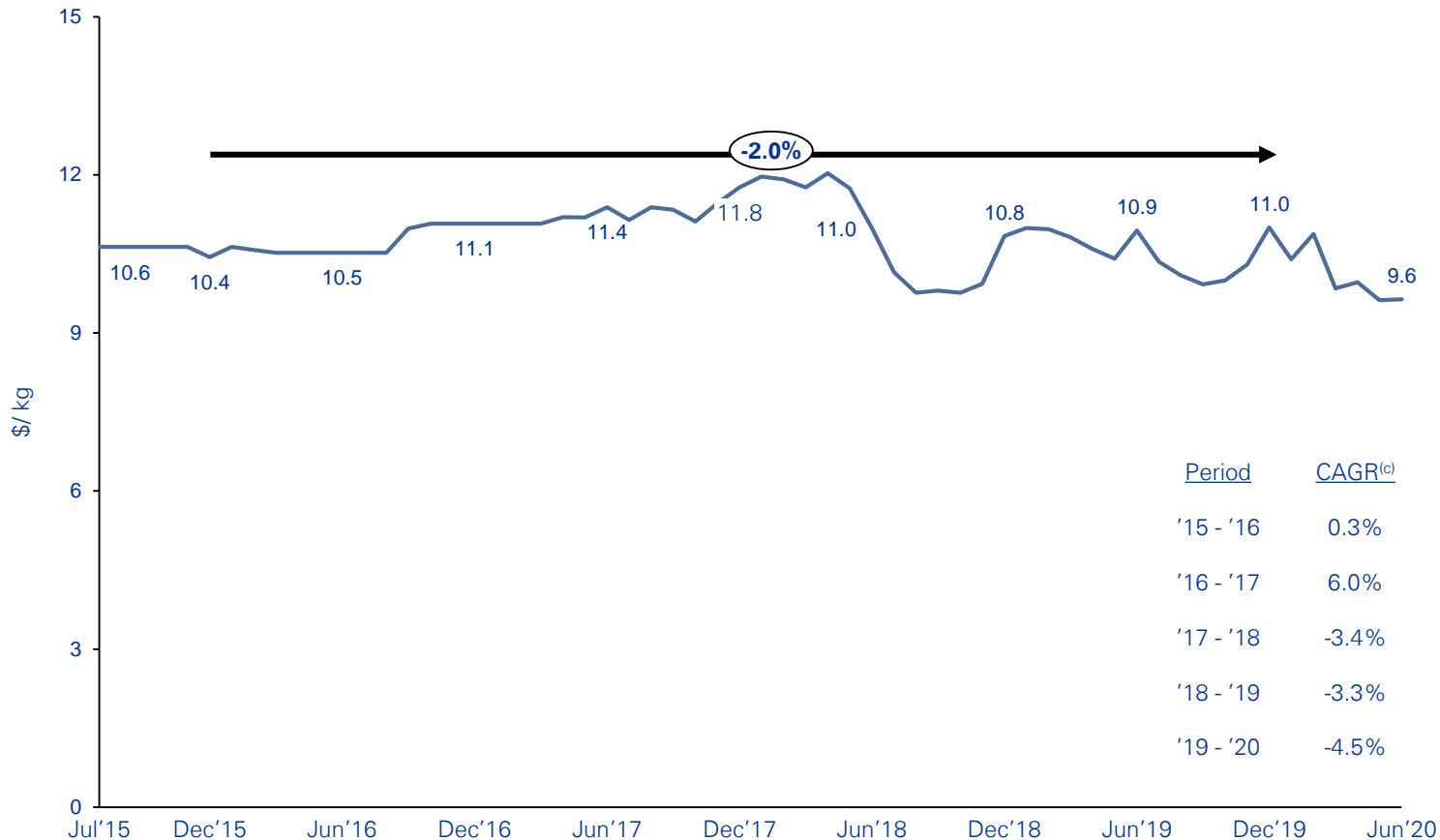
- The seaweed consumption has risen in the past 9 years by 6.6% CAGR and has nearly doubled over the last decade.
- Seaweed production has expanded rapidly in response to increased consumption of dried, seasoned laver.
 - Seaweed is a common ingredient in South Korean cuisine and processed foods.

Source(s): USDA Foreign Agricultural Service

DEMAND - PRICING

With an average price of \$10.60 per kg, *Undaria pinnatifida* price in South Korea has been gradually declining at -2.0% CAGR over the last five years

Undaria pinnatifida wholesale market price in South Korea, Jul'15 – Jun'20, USD/per kg^{(a)(b)}



Comments

- Average prices for *Undaria pinnatifida* in South Korea during 2015-2020 have been about \$10.60 USD/per kg.
- The prices have been fluctuating post the peak in Apr'18 followed by a sharp dip in Aug'18.

Note(s): (a) The figures for *Undaria* price are from Jul'15 onwards; (b) The figures of retail prices have been calculated using the average price for Daegu (North Gyeongsang), Gwangju, Daejeon and Busan which are densely populated regions in South Korea; (c) The CAGR for the '15-'16 period has been calculated using average for 2016 and last 6 months of 2015 and for '19-'20 period, the average of 2019 and first 6 months of 2020

Source(s): Tridge

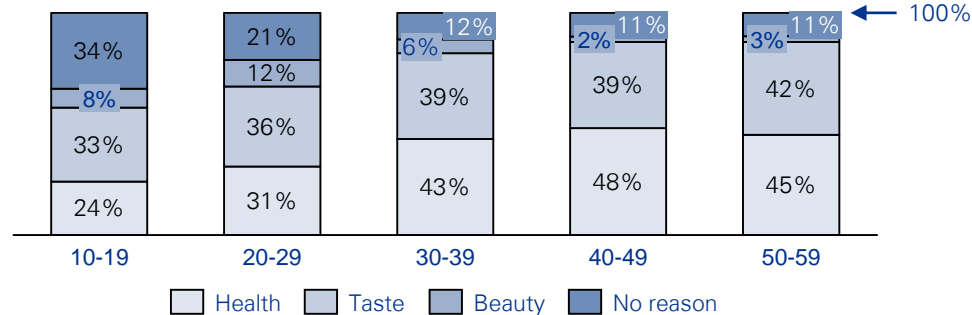
DEMAND – CONSUMER BEHAVIOUR AND DEMOGRAPHIC DRIVERS

Customer food trends in South Korea show a strong preference towards eating healthy and nutritional meals mostly amongst the 30+ age group...

Trend	Supporting statistics	Comments
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Relationship between reason for eating seaweed and subjects by age group, 2015, %^(a)

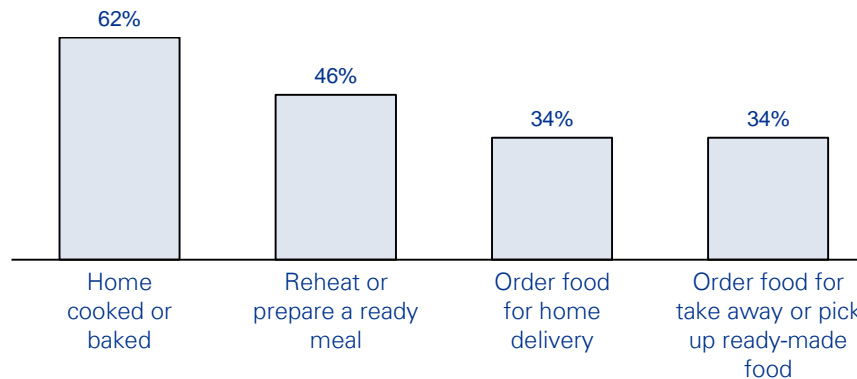
Increasingly focus on maintaining good health



- High focus on maintaining good health has led South Koreans to adopt measures with nutritional benefits.
- Seaweed being used in fresh vegetable salads and soups is one of the factor driving consumer demand .
- A cross sectional study in 2019 states that a higher consumption of seaweed maybe associated with lower prevalence of asthma among South Korean adults due to its nutritional benefits.

Frequency of consumption by meal type, at least weekly, 2020, %^(b)

Rise in demand of ready meals and nutritional packaged snacks



- There is a rise in demand for ready meals, primarily preferred by high number of single person households.
- Seaweed are also becoming popular as packed snacks and side-dish.
 - *“The seasoned dried seaweed has been promoted as a healthy snack that can replace potato chips and popcorn, with fewer calories and lots of vitamins”*
- Lee Jong-eun, Dongwon F&B official

Note(s): (a) The results are based on a study that assesses the consumption of seaweed by Koreans using a questionnaire where 1,218 subjects were surveyed based on different regions of Korea, age, gender, education, job, marital status; (b) The results are based on a survey that captures consumer trends and their lifestyle habits during 2019 and 2020 for 1,021 respondents

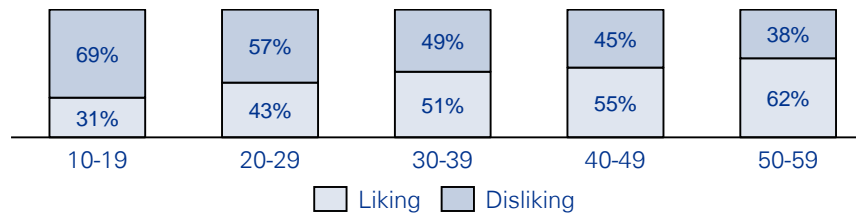
Source(s): Euromonitor International; A Study on Utilization and Consumption of Seaweeds in Some Regional Residents

...which is evident from the rise in popularity of seaweed among South Korean adults driven by the multiple health benefits

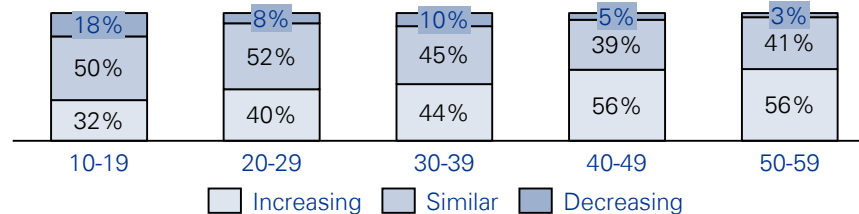
Trend	Supporting statistics	Comments
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Growing popularity of seaweed consumption among South Korean adults

Relationship between preference of seaweed and subjects by age group, 2015, %^(a)



Relationship between purchase intent of seaweed and subjects by age group, 2015, %^(a)



- There is an increase in both seaweed consumption as well as the intent to purchase seaweed by people in 30+ age group.
- Consumers in the South Korea have maintained their strong preference for seafood, with the average per capita fish consumption reaching 58.4 kg from 2013 to 2015.
 - Seaweed accounts for nearly 30% of this and is expected to increase by 2025.

Note(s): (a) The results are based on a study that assesses the consumption of seaweed by Koreans using a questionnaire where 1,218 subjects were surveyed based in different regions of Korea, age, gender, education, job, marital status
 Source(s): Statista; Korea Science - A Study on Utilization and Consumption of Seaweeds in Some Regional Residents

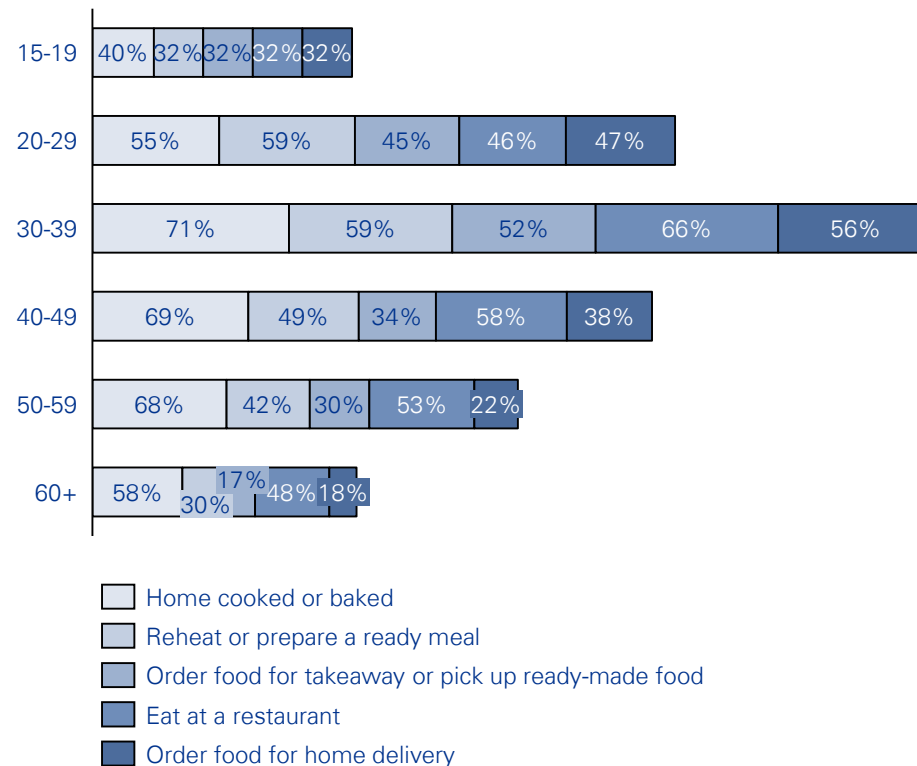
DEMAND – CONSUMER BEHAVIOUR AND DEMOGRAPHIC DRIVERS

Customers are also preferring home delivery and take away food options as it appears to be more convenient and suited to their lifestyles

Trend	Supporting statistics	Comments
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Frequency of consumption by meal type in South Korea, at least weekly, 2020, %^(a)

Consumers increasingly prefer home delivery and take away option of food



- Most people order food for takeaway or home delivery through mobile apps at least weekly which has further increased during current Covid-19 pandemic.
 - Preference for home delivery and takeaway options amongst the South Koreans is driven by the ease of convenience of customers.
- People in the age group 20-29 and 30-39 seem to prefer more of reheat or prepare ready meal and take away ready-made food among other age groups.

Note(s): (a) The results are based on a survey that captures consumer trends and their lifestyle habits during 2019 and 2020 for 1,021 respondents

Source(s): Euromonitor International

South Korea market sizing

1 Market summary

2 Demand insights

3 Supply insights

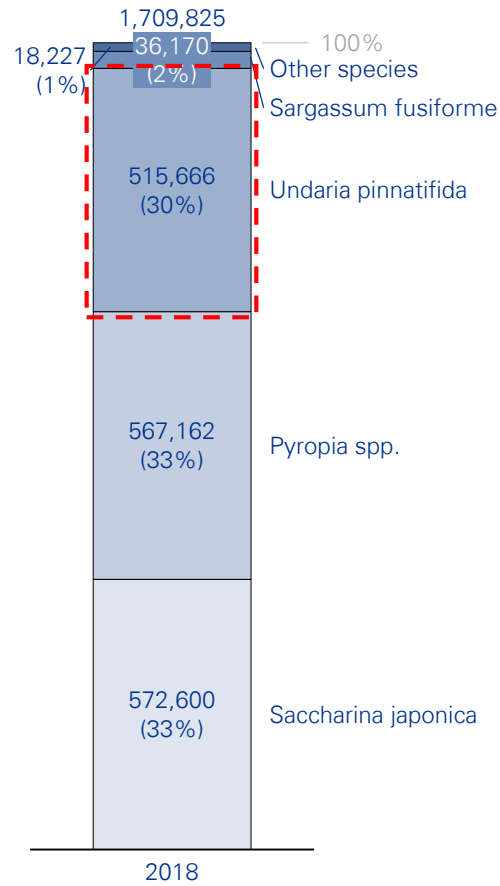
4 Undaria value chain



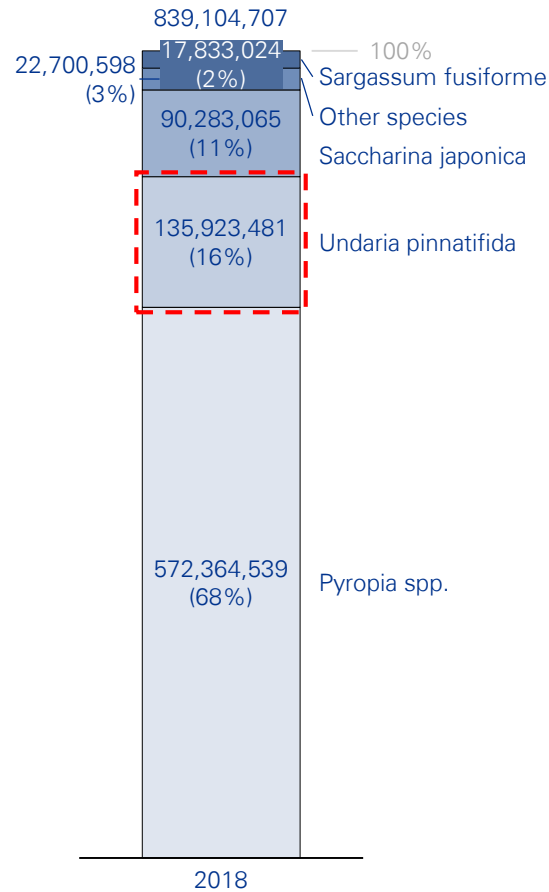
SUPPLY – SEAWEED PRODUCTION

Undaria has a 30% share of South Korea's seaweed production but only accounts for 16% of total value driven by lower than average pricing

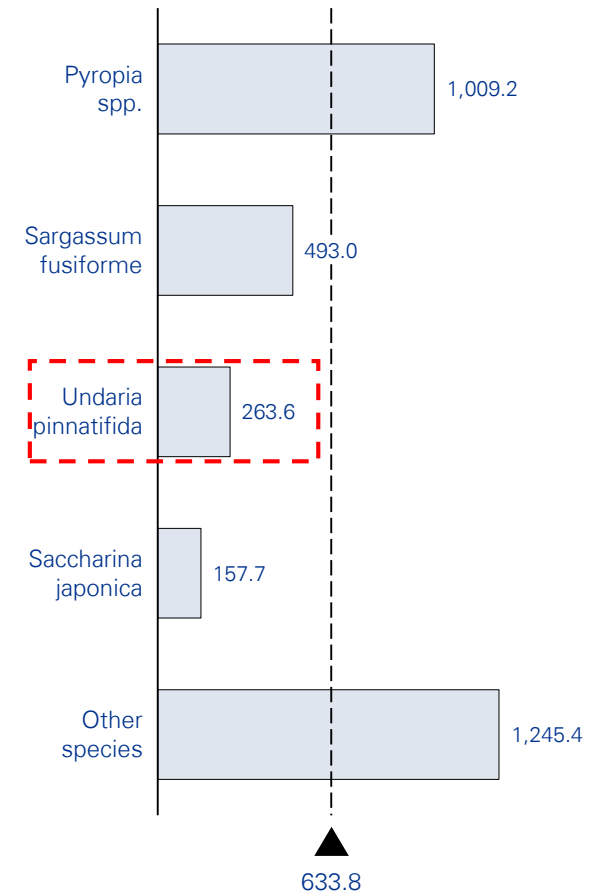
Farmed seaweed production volume in South Korea by species, 2018, tonnes



Farmed seaweed production value in South Korea by species, 2018, KRW 000s



Farmed seaweed price in South Korea by species, 2018, KRW/tonne

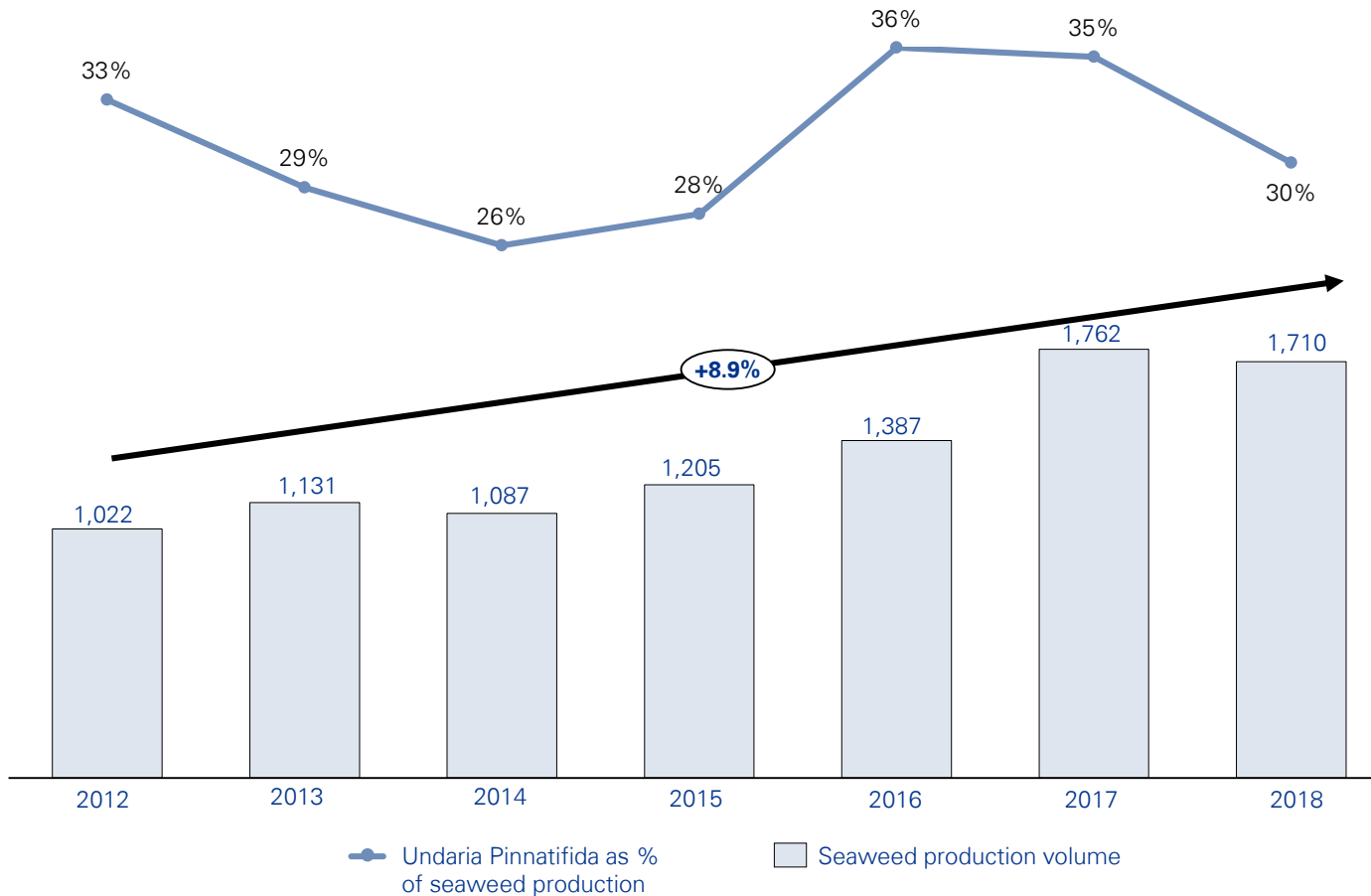


Source(s): Statistics Korea, Fishing Production Trend Survey

SUPPLY – SEAWEED PRODUCTION

While seaweed production has witnessed healthy growth post 2012, Undaria's percentage share has been fluctuating

Seaweed production in South Korea, 2012-2018, tonne (000s) and %



Comments

- Seaweed production in South Korea has grown at ~9% CAGR during the time frame 2012-2018.
- *"The south coast of South Korea produces about 90 percent of the country's seaweed crop, [and] since 1970, farmed seaweed production has increased by ~8% per year."*
 - Alex Voiland, NASA science writer

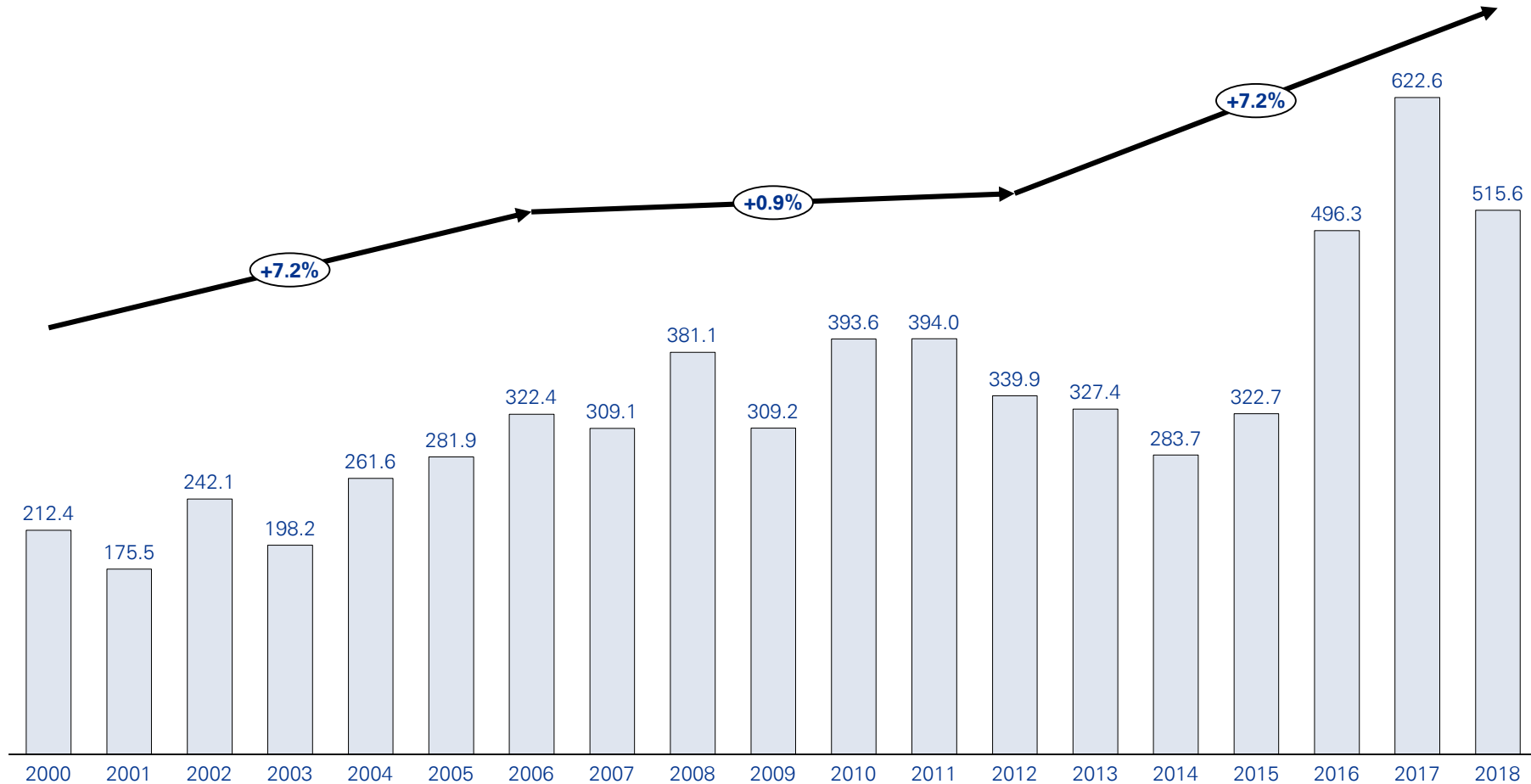
Note(s): The weight here is quoted in live/wet weight. This is roughly 10x that of product weight observed at other points in the value chain.

Source(s): Statistics Korea, Fishing Production Trend Survey; Treehugger

SUPPLY – UNDARIA PINNATIFIDA PRODUCTION

Undaria pinnatifida production in South Korea has primarily followed an upward trend during the last two decades

Undaria pinnatifida production volume in South Korea, 2000-2018, tonne (000s)



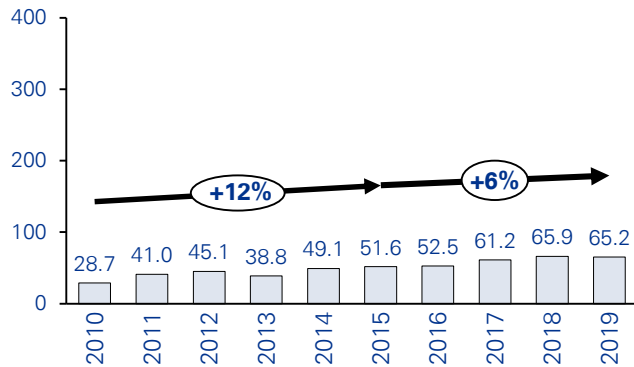
Note(s): The weight here is quoted in live/wet weight. This is roughly 10x that of product weight observed at other points in the value chain.

Source(s): OECD; Treehugger

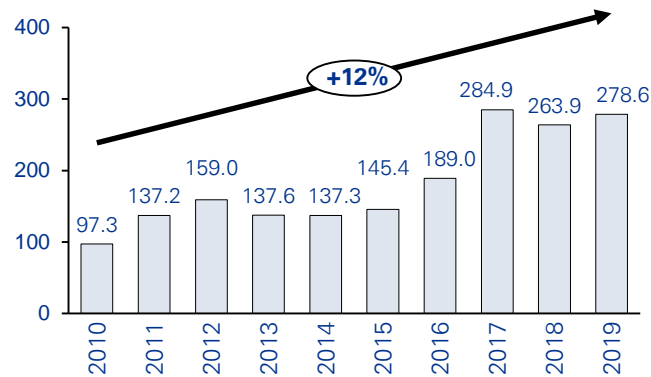
SUPPLY – OVERVIEW OF IMPORTS AND EXPORTS

South Korea is a net exporter of seaweed and has seen a rise in exports since 2017, as it was the biggest supplier of dried laver and gim in that year

South Korea seaweed and other algae import value, 2010-2019, USD million^(c)



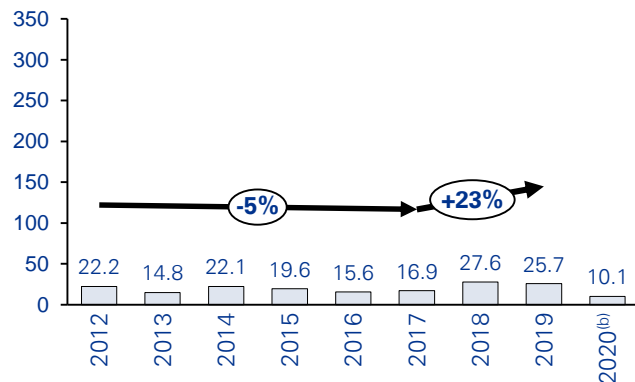
South Korea seaweed and other algae export value, 2010-2019, USD million^(c)



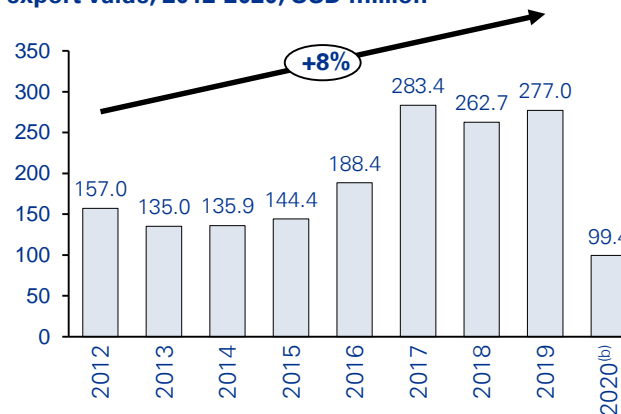
Comments

- This analysis uses HS code 1212 (top charts) representing “Seaweeds and other algae fit for human consumption”.
- The lower charts represent HS code 121221 which is a subset of all edible seaweeds and represents trade of Pyropia (Nori/Gim), Sargassum (Hijiki) and Undaria (Wakame).

South Korea Pyropia, Sargassum and Undaria import value, 2012-2020, USD million^{(a)(b)}



South Korea Pyropia, Sargassum and Undaria export value, 2012-2020, USD million^{(a)(b)}



Import

- The strong increasing trend of imports sees South Korea continues to be a significant purchaser of agrifood and seafood products from world markets.
- Top supplying countries for imported seaweed in 2019 include Japan, Thailand and China.

Exports

- There was a sharp increase in export value for HS Code 121221 in 2017 as South Korea in that year became the world’s biggest supplier of dried laver and gim seaweed.
- Top markets for seaweed exported by value in South Korea for 2019 are Japan, China and the USA.

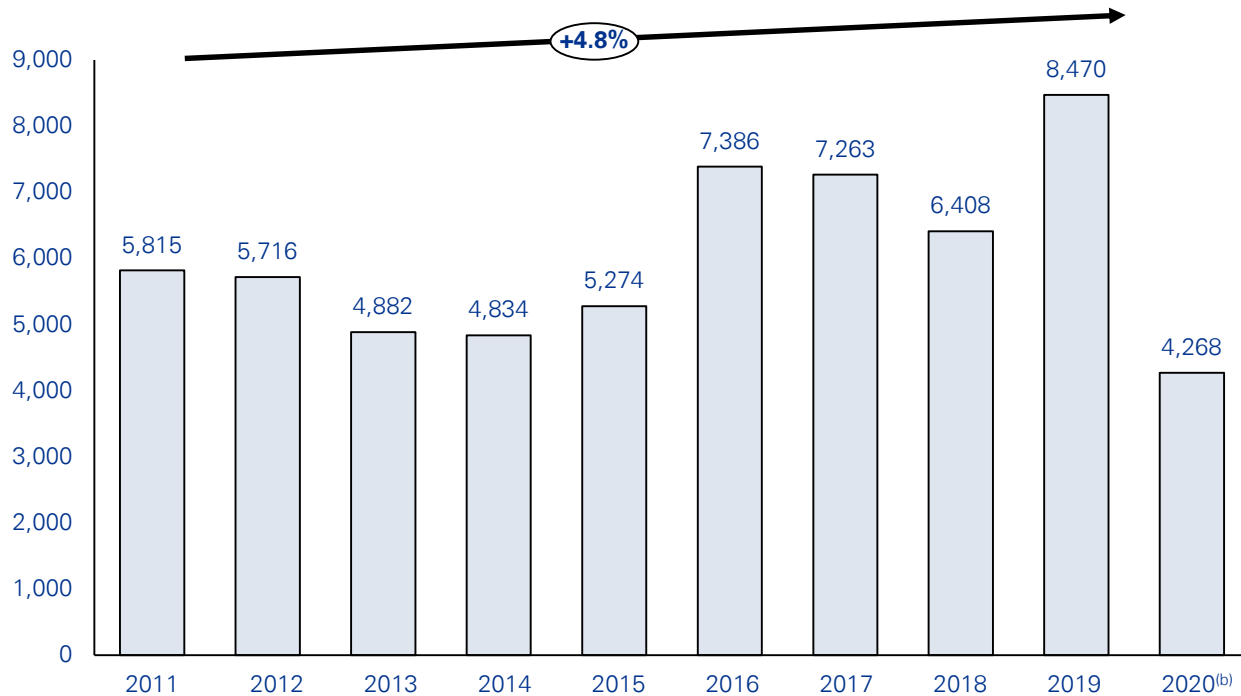
Note(s): (a) The data corresponds for HS product code 121221 - Seaweeds And Other Algae Fit For Human Consumption; (b) Values for 2020 till date, and do not include forecast figures for the complete year and hence CAGR has been calculated only till 2019; (c) The data corresponds for HS product code 121221 - Seaweeds And Other Algae Fit For Human Consumption

Source(s): Unipass customs Korea; International Trade Statistics

SUPPLY – IMPORTS

While the total volume of *Undaria pinnatifida* imports have fluctuated over the past years, there is still a strong growth trajectory

South Korea *Undaria pinnatifida* import value, 2011-2020, USD millions^{(a)(b)}



Comments

- While imports of seaweeds for human consumption have been fluctuating over the years, there is an overall positive trend (4.8% CAGR 2011-2019).
- The total import value was at its lowest in 2014 (USD\$4,834m) and peaked in 2019 where it reached USD\$8,470m. Based on the half year result in 2020, the strong growth in imports will continue.

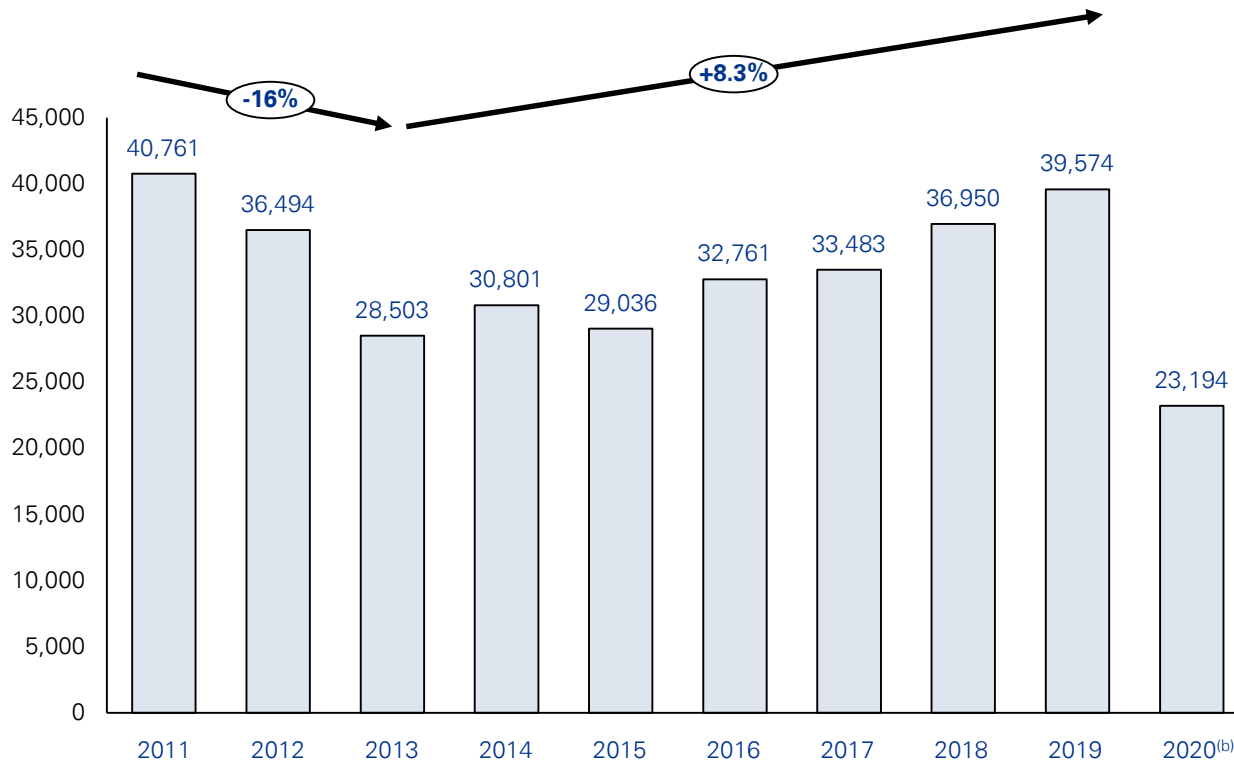
Note(s): (a) The data relates to all imports/exports (depending on page) of *Undaria pinnatifida* as defined the Korea Agricultural and Fisheries Food Distribution Corporation; (b) Values for 2020 till date, and do not include forecast figures for the complete year and hence CAGR has been calculated only till 2019;

Source(s): Korea Agricultural and Fisheries Food Distribution Corporation

SUPPLY – EXPORTS

Undaria pinnatifida exports have steadily increased over recent years, following a peak in 2011/2012 caused by the Tōhoku Tsunami in Japan

South Korea Undaria pinnatifida export value, 2011-2020, USD millions(a)(b)



Comments

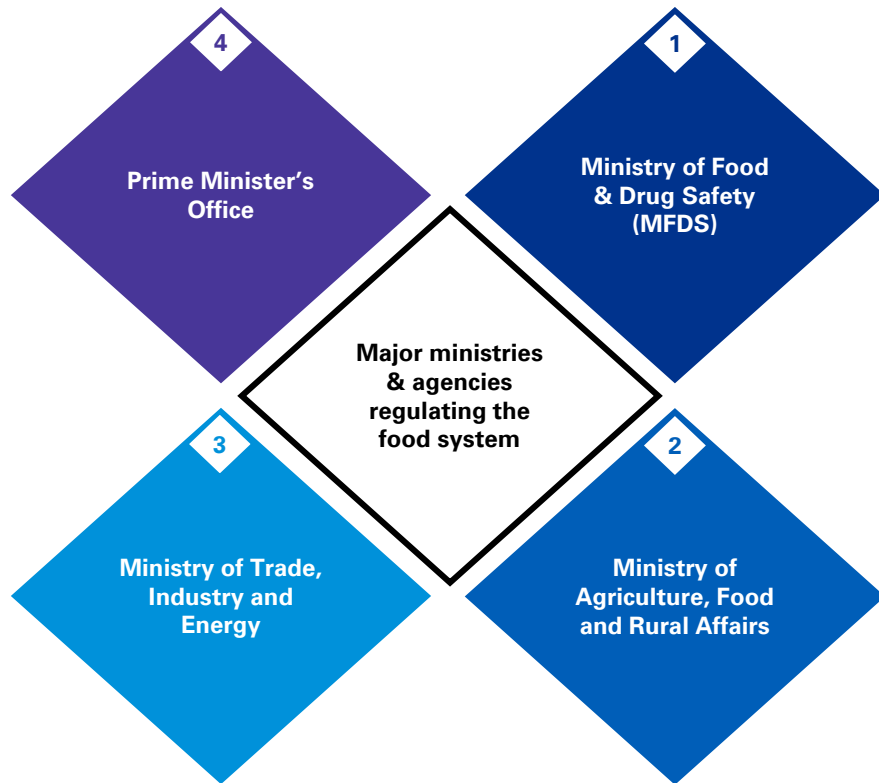
- There was a spike in South Korean exports of Undaria to Japan in 2011/2012 driven by the 2011 Tōhoku Tsunami which had a large impact on Japanese production of Undaria.
- Since then exports have been gradually increasing at a CAGR of +8.3% peaking in 2019 with an export value of USD\$39m.
- This largely mirrors the increases observed in South Korean production.

Note(s): (a) The data relates to all imports/exports (depending on page) of Undaria pinnatifida as defined the Korea Agricultural and Fisheries Food Distribution Corporation; (b) Values for 2020 till date, and do not include forecast figures for the complete year and hence CAGR has been calculated only till 2019;

Source(s): Korea Agricultural and Fisheries Food Distribution Corporation

South Korea has a well defined regulatory framework, comprising of multiple ministries, for its food processing and manufacturing industry

Major ministries and agencies for food and agricultural products in South Korea



1 Ministry of Food & Drug Safety (MFDS):

- The Food Sanitation Act
- Functional Food Act
- Special Act on Children's Dietary Life Safety Management
- Special Act on Imported Food Safety Management
- Food Code
- Food Additive Code
- Labeling Standards for Food
- Labeling Standards for Genetically Modified Food
- Functional Food Code
- Inspection Guidelines for Imported Food
- Livestock Product Sanitary Management Act
- Labeling Standards for Livestock Products

2 Ministry of Agriculture, Food and Rural Affairs:

- Import Health Requirements for Various Animals
- Plant Protection Act
- Import Plant Inspection Guideline
- Agricultural Products Quality Management Act
- Act on the Management and Support for the Promotion of Eco-Friendly Agriculture/Fisheries and Organic Foods
- Guideline for Country of Origin (COO) for Agricultural Products

3 Ministry of Trade, Industry and Energy

- LMO (Labeling of living modified organisms) Act and subordinate regulations

4 Prime Minister's Office

- Framework Act on Food Safety

Source(s): USDA Foreign Agricultural Service

South Korean food manufacturing and processing industry is supported by the government through many policies that help maintain product quality...

Trend	Comments	Impact
<p>Regulation and initiatives by the government to enhance growth</p>	<ul style="list-style-type: none"> — Ministry of Food and Drug Safety in 2019, implemented a one-strike-out policy for HACCP - verifying risks in the process of managing raw materials, manufacturing, processing and distributing food. Companies violating these standards would be canceled immediately without notification. — In 2020, South Korean MAFRA^(a) took an initiative, ‘2030 Food industry Vision’, to boost five major food sectors: ready-to-eat/ convenience foods, environmentally-friendly foods, export oriented food, specialty food and functional foods. <ul style="list-style-type: none"> – For ready-to-eat/ convenience foods, MAFRA^(a) aimed at improving the overall system including taxes and quality standards – In the export sector, the government reviewed non-tariff barriers and organised cold-chain and logistics centers for local companies which were facing difficulties in exporting their products – In the functional food market, ‘aggressive support’ policy was analyzed <ul style="list-style-type: none"> – <i>“..We will improve the relevant regulations for the use of ingredients manufacturing dietary supplements”</i>-an official statement from MAFRA^(a) — To help domestic and foreign food companies in their manufacturing process, the government planned an R&D center South Korea National Food Cluster or Foodpolis which is a one-stop support system for the entire food manufacturing process. <ul style="list-style-type: none"> – <i>“..Technical assistance from experts having illustrative careers at multiple food research institutes and companies will be provided to firms in Foodpolis”</i> – an official statement from South Korea National Food Cluster agent 	
<p>Supply chain disruptions</p>	<ul style="list-style-type: none"> — South Korean food processing companies, to a large extent rely on imported intermediate goods for its value chain. — South Korea’s imports of basic and intermediate agricultural products were about USD\$13.3bn in 2018. <ul style="list-style-type: none"> – America is one of the biggest suppliers for commodities and intermediate products who’s products accounted for USD\$3.9bn or 26.9% of total imports which are used in feed, industrial and food manufacturing process — COVID-19 pandemic has greatly affected countries such as USA, China and Europe, leading to disruption in the importation of intermediate products feeding into South Korea’s various supply chains. 	

Note(s): (a) Ministry of Agriculture, Food and Rural Affairs; (b) According to a report of the Korea International Trade Association
 Source(s): The Korea Herald; Food Navigator – Asia; Invest Korea- Investment Opportunities in Korea- Food and Beverage

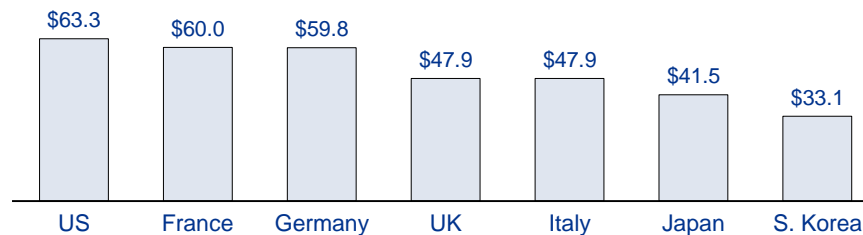
However, with the current COVID-19 pandemic, supply chain disruptions as well as a few operational inefficiencies seem to be prevalent

Trend	Comments	Impact
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- South Korean manufacturing sector's labour productivity has been falling since 2011 and the average annual labour productivity growth for 2011-2015 was at an all time low of 2.2%.
 - *"A decline in total factor productivity growth was caused by the shortage of innovative companies and inefficient labor and resource distribution"* – official statement from Bank of South Korea
- Government hiked the minimum wage by 10.9% for 2019, with an aim to reach 10,000 KRW/hour by 2020 to tackle the labour productivity problem which in turn had unintended consequences like hiring cuts, business shutdowns, job losses, income polarisation and rise in unemployment.
 - As a result, the local manufacturing firms either laid-off their employees or relocated their production plants overseas in order to achieve high operational efficiencies, in turn leading to rise in unemployment.

Operational inefficiencies driving high unemployment

Average added value output by a worker, USD/hour, 2016



- From 2010-2017, South Korea was behind many advanced economies such as Japan, Germany and France – which saw labour productivity in the manufacturing sector increase to 4.1%, 4.0% and 2.9%, respectively.
 - High aging population of South Korea is another factor that has reduced the productivity in the country.

Source(s): Korea Herald; Business Korea; Korea Times

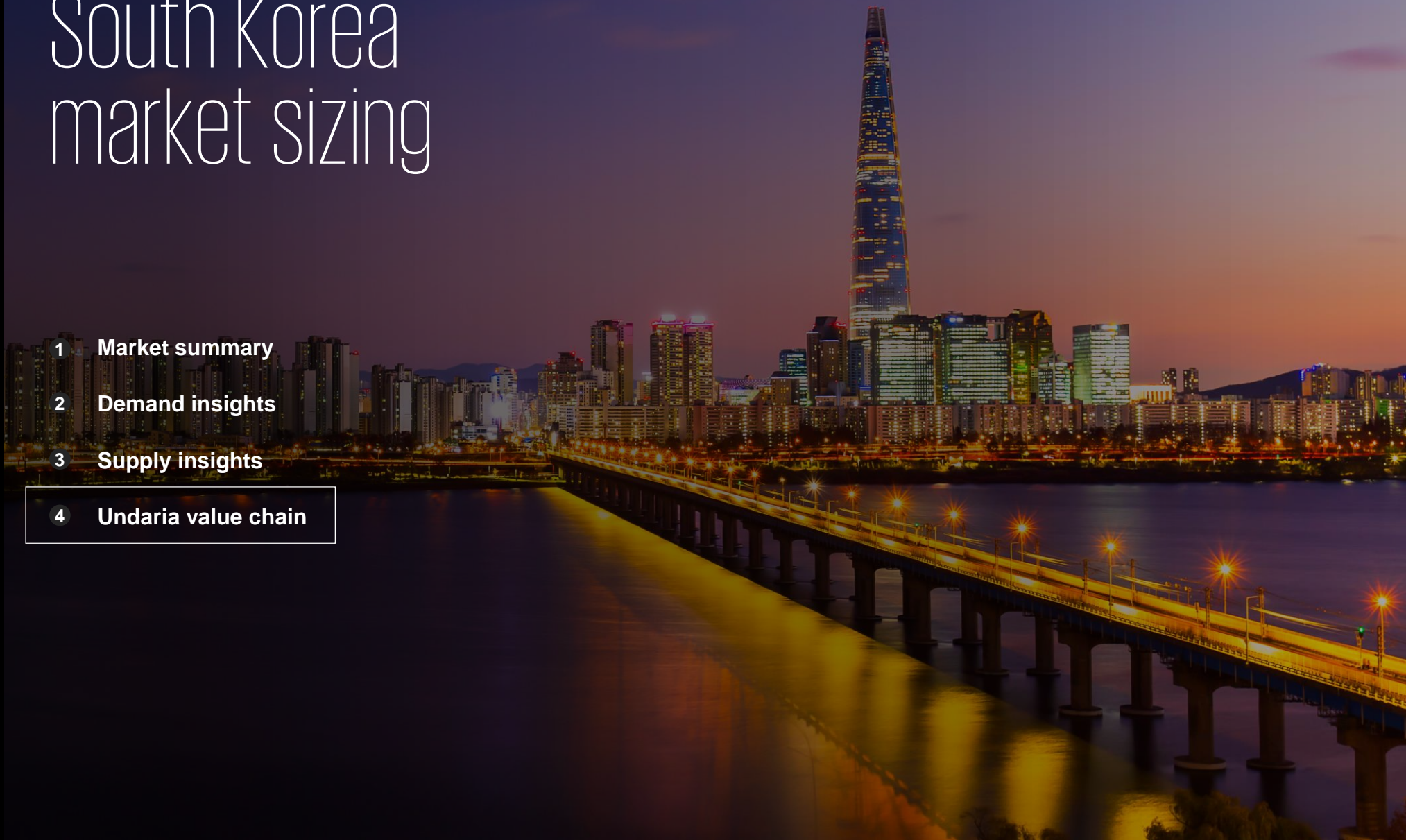
South Korea market sizing

1 Market summary

2 Demand insights

3 Supply insights

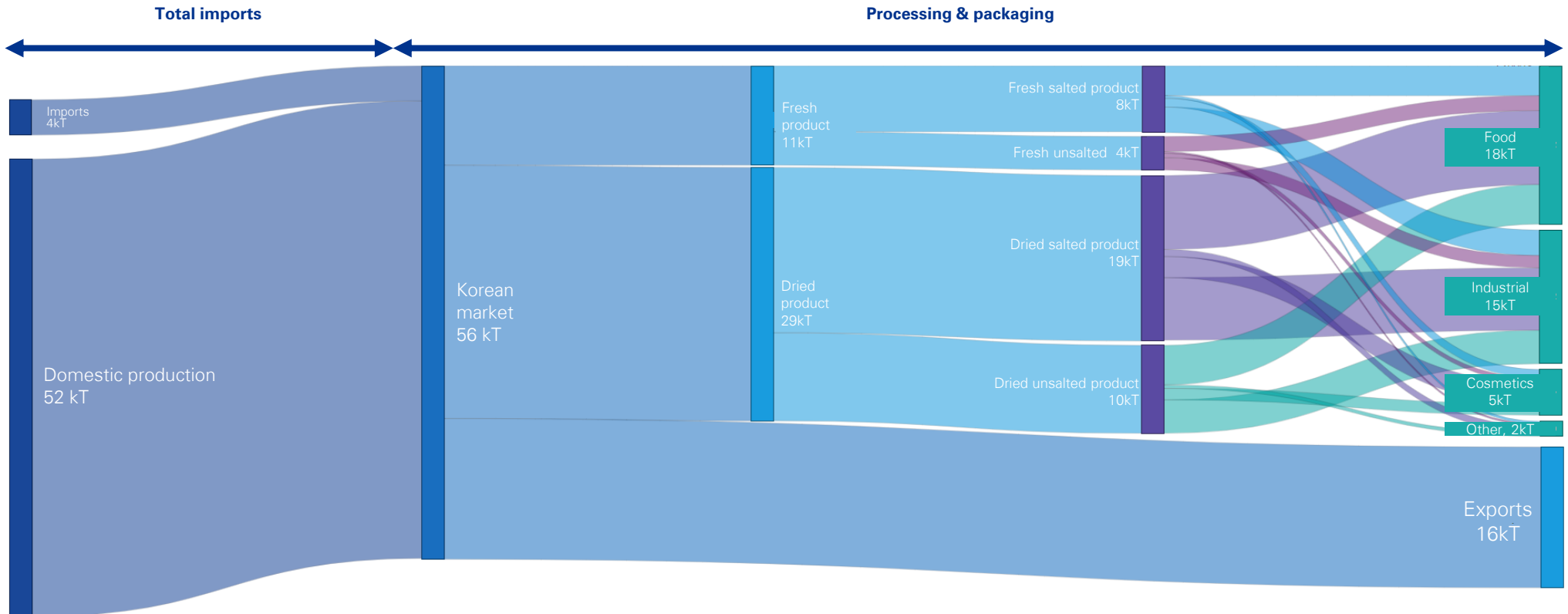
4 **Undaria value chain**



VALUE CHAIN

Volume flows of Undaria Pinnatifida in the South Korean market

Volume mass of Undaria pinnatifida in the South Korean market, 2018 (kilotons)



Comments

- The South Korean market is primarily supplied from domestic production – making up 93% of overall supply.
- There is a large market of exports from South Korea, with 31% of all domestic production exported (primarily to Japan, China and the USA).
- There are large markets for both human consumption and also industrial use. Industrial use is dominated by the use of Undaria as feed for aquaculture.

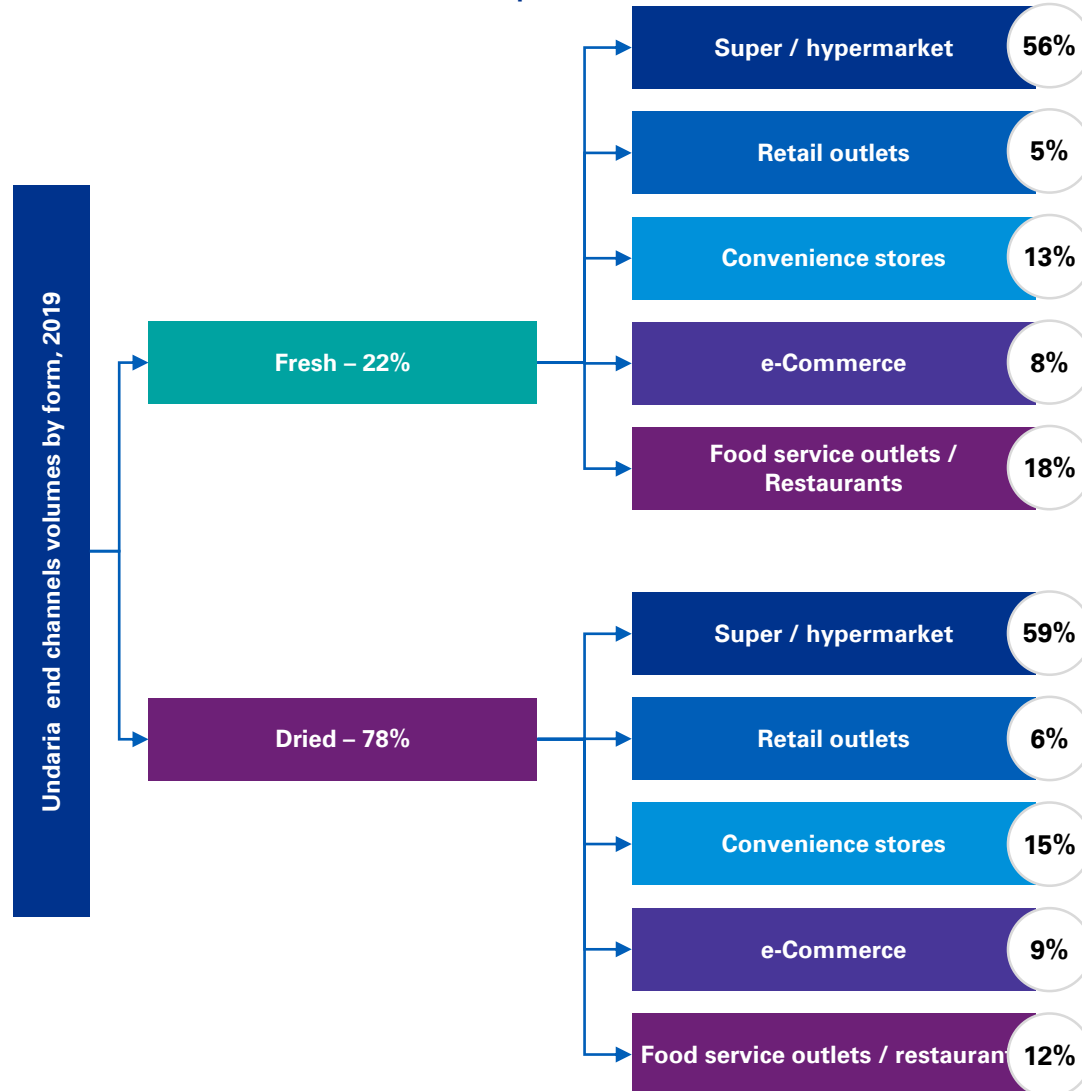
Note(s): All volumes shown as processed weight (production volumes adjusted using FAO guidance of 10x from wet/live weight to product weight)

Source(s): OECD, ITC, FAO, Korea Agricultural and Fisheries Food Distribution Corporation, Statistics Korea, Fishing Production Trend Survey; Radiant Insights

VALUE CHAIN

Undaria reaches the end consumer through various channels, most prominently super / hyper markets and food services

Channels for seaweed fit for human consumption - South Korea



Comments

- Super / hyper markets and food service outlets account for the vast majority of product volumes (~72% of total volumes).

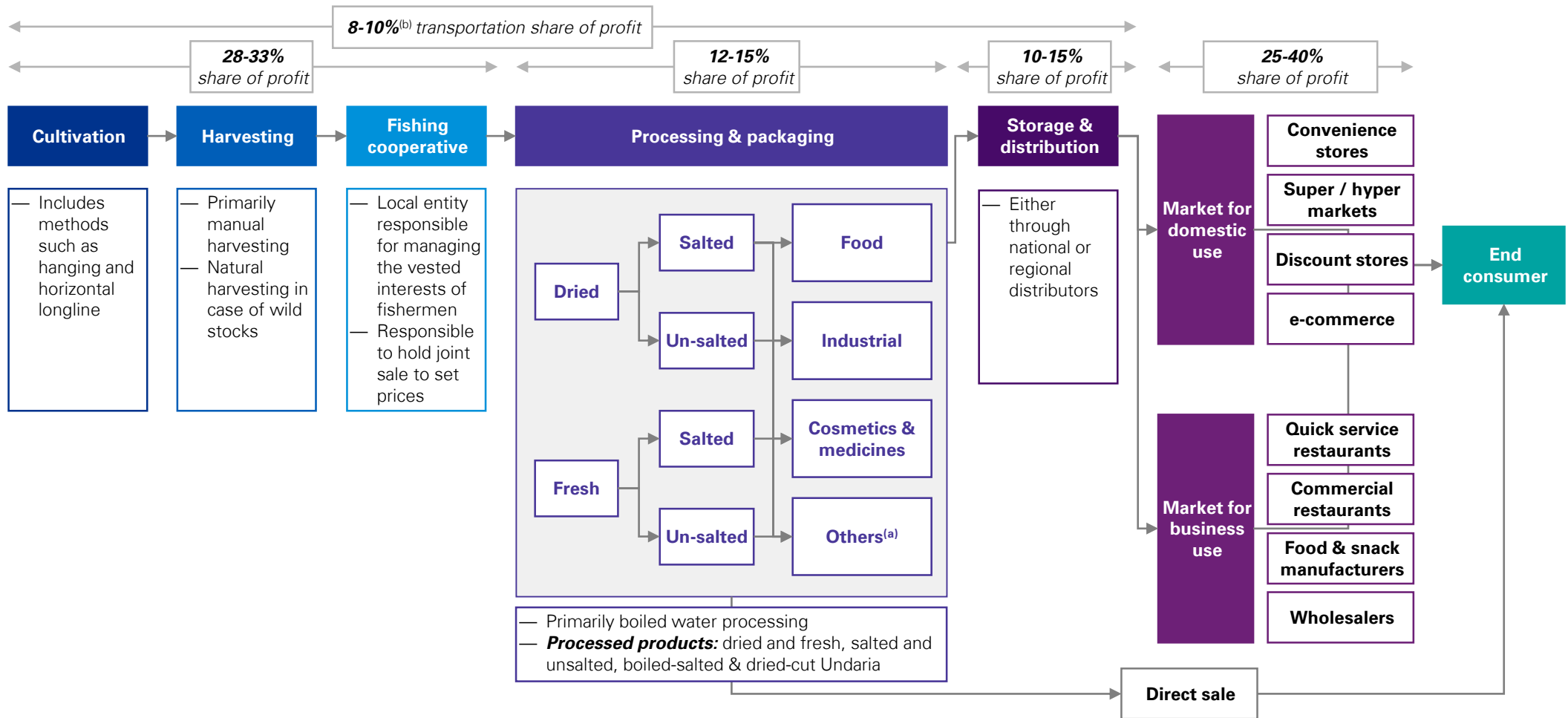
Channel definitions

- **Supermarket/hypermarket:** defined as large self-service shops selling food and household goods.
- **Retail outlets:** smaller neighbourhood shops, selling daily essentials.
- **Convenience stores:** stores with extended opening hours, selling limited range of products such as goods and groceries. We also have considered the local wet shops for direct consumer to be included under this segment.
- **e-Commerce:** selling of the products through online portals or shops are considered under this segment.
- **Food service outlets/restaurants:** food outlets and restaurants using Undaria in all forms to serve take away consumers and diners are considered under this segment. Sales of Undaria from wet market to restaurants and food service outlets have been considered under this segment.

VALUE CHAIN - OVERVIEW

A robust value chain exists in seaweed South Korea market aimed at delivering value to the end consumer via multiple points of sale

Value chain for seaweed fit for human consumption - South Korea



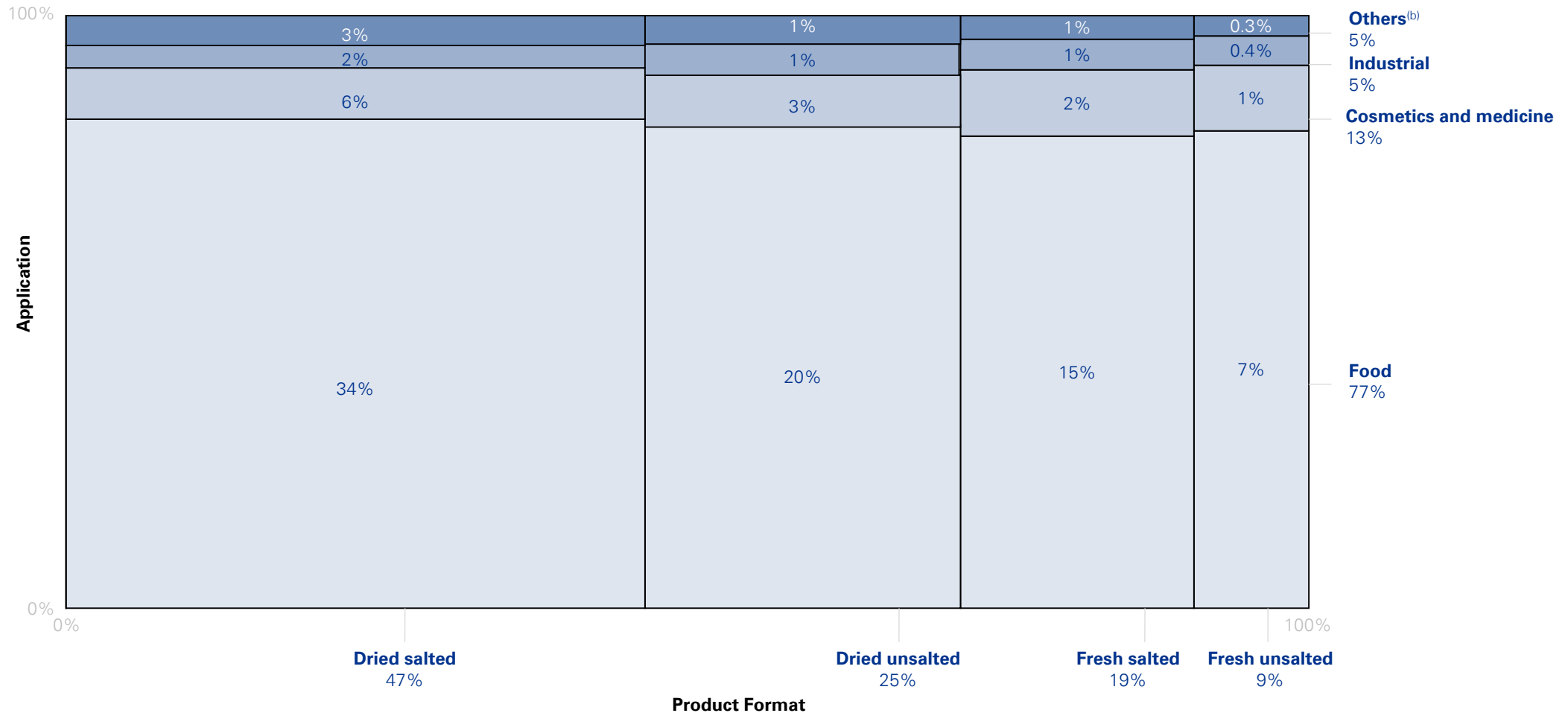
Note(s): (a) Other applications include usage of Undaria in animal feed and wastewater treatment; (b) Refers to transportation of products at any level of the value chain

Source(s): FAO; USDA Foreign Agricultural Service; BIM; Company websites; Capital IQ as accessed during Jun'20; Korean Products; Monterey Bay Aquarium; Primary Interviews with industry experts, Radiant Insights

VALUE CHAIN – VALUE STREAMS OF UNDARIA PINNATIFIDA

Dried salted product distributed through food channels (including as an ingredient) accounts for 31% of all Undaria use in South Korea

Volume distribution of Undaria pinnatifida by product format and application in South Korea, 2019^(a)



Note(s): (a) Illustrative; (b) Others include animal feed and wastewater treatment applications

Source(s): Radiant Insights

VALUE CHAIN – AVERAGE PRICE

Undaria pinnatifida's fresh salted product format and dried unsalted show the lowest price in South Korean end markets

Average price by product format and application in South Korea, 2019, USD/kg

	Fresh salted	Fresh unsalted	Dried salted	Dried unsalted
Food	\$3.43	\$3.57	\$3.78	\$3.59
Industrial	\$3.47	\$3.43	\$3.81	\$3.37
Cosmetic & medicines	\$3.44	\$3.50	\$3.68	\$3.55
Others	\$3.92	\$2.93	\$2.82	\$4.04

"The texture of the product is important when it comes to price. Given the majority of human-consumed Undaria is used in soup, it is important that the Undaria is soft but not so soft that it breaks down when boiled."

– Primary interview with industry expert

Average price by product type and distribution channel in South Korea, 2019, USD/kg

	Fresh	Dried
Super / hypermarket	\$3.37	\$3.74
Retail outlets	\$3.44	\$3.49
Convenience stores	\$3.53	\$3.70
e-commerce	\$3.63	\$3.87
Food Service Outlets / restaurants	\$3.73	\$3.14

"Food safety is critical in pricing. There are government certification standards that help to establish a product as clean and safe. The larger organisations can do their testing in-house once they have established trust."

– Primary interview with industry expert

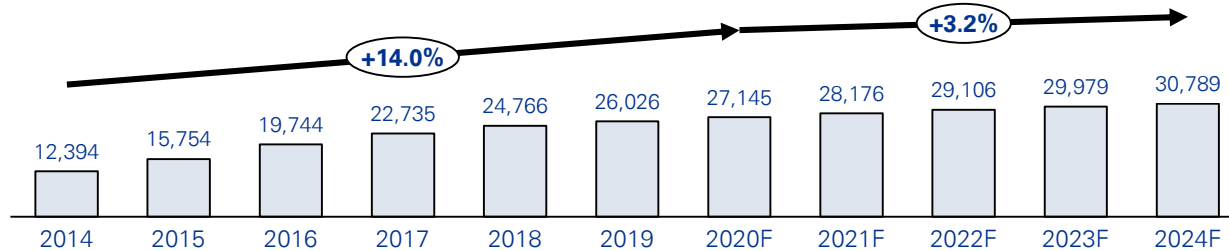
Source(s): Radiant Insights

Cheapest product format within an application

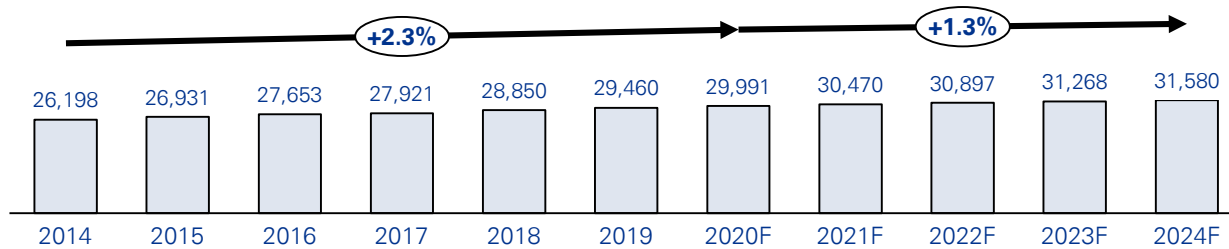
VALUE CHAIN – END MARKET – DOMESTIC USE (1/2)

Unlike supermarkets, convenience and discount stores are forecasting strong growth due to preference for ready-to-eat meals and private label brands

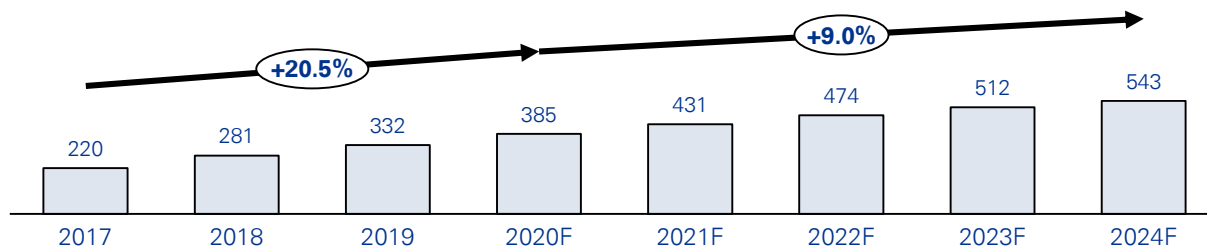
South Korea convenience stores market size (sales), 2014-2024, KRW billion



South Korea supermarkets market size (sales), 2014-2024, KRW billion



South Korea discount stores market size (sales), 2017-2024, KRW billion



Comments

Convenience stores

- Strong growth over the past five years, due to changing lifestyle, increasing preference for ready-to-eat food items by single-person households, has attracted competition.
- In order to counter the impact, store operators are entering into partnerships with 3rd party delivery platform providers.

Supermarkets

- Slow food sales growth expected due to escalated competition from online retailers and limited space to build new stores.
- Being a major retail channel for imported foods, supermarkets pose threat for local products. In response, government has imposed certain regulations on supermarkets, impacting their sales.

Discount stores

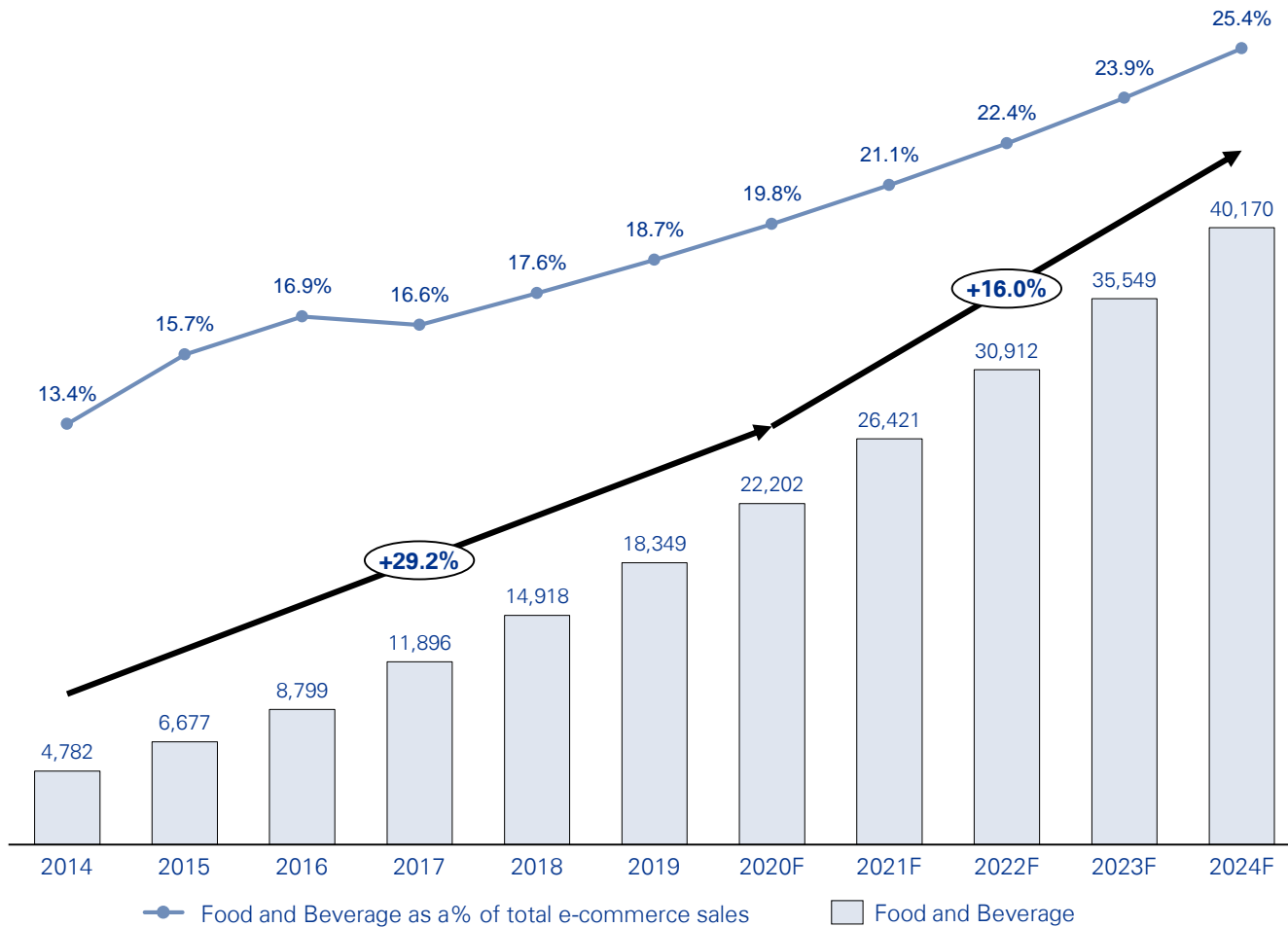
- Value sales expected to increase driven by popularity of private label brands and strategic location of discount stores.
- Location within shopping malls helps increase customer footfall.

Source(s): Euromonitor International; USDA Foreign Agricultural Service

VALUE CHAIN – END MARKET – DOMESTIC USE (2/2)

A proliferation of online platforms is driving e-commerce growth for food and beverage in South Korea and is expected to grow further at ~16% CAGR (20-24)

South Korea food and beverage e-commerce market size, 2014-2024, KRW billion and %



Comments

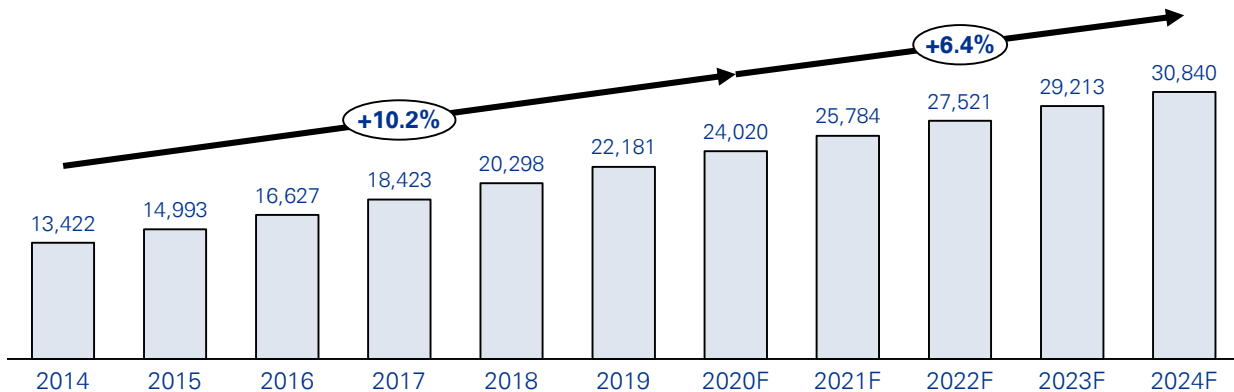
- With ease of convenience provided by online sales channels driving their popularity, the e-commerce sales for food and beverage is expected to grow by 2024.
- Grocery players including hypermarkets, supermarkets and convenience stores are venturing into online domain by developing their own websites and partnering with delivery platforms.
 - For example, SSG.com was created by Shinsegae Group.

Source(s): Euromonitor International

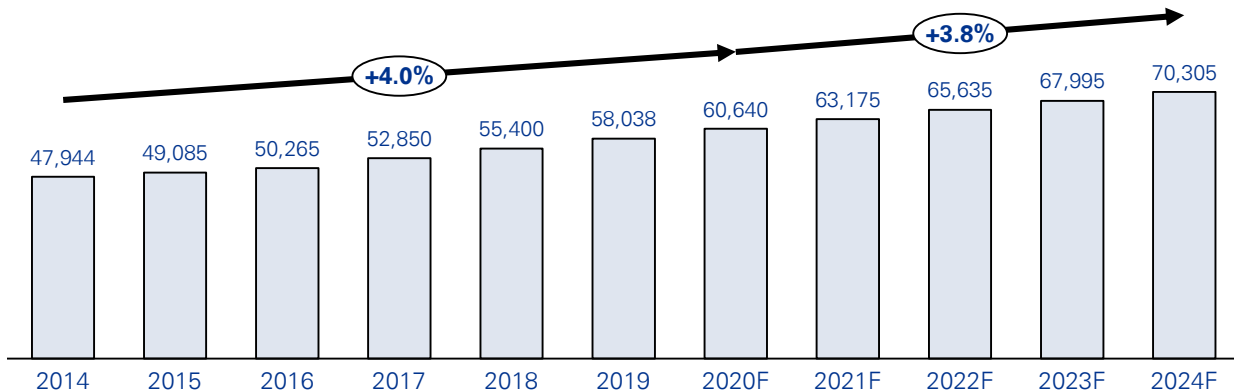


Preference for fast meals by single-person households and Chinese dining popularity drive growth for limited and full-service restaurants respectively

South Korea limited-service restaurants market size (sales), 2014-2024, KRW billion



South Korea full-service restaurants market size (sales), 2014-2024, KRW billion



Comments

Limited-service restaurants

- Consumer preference for simple and fast meals seems to encourage market growth.
- With development of good quality menus at reasonable prices by convenience store operators, the limited-service restaurant sales at convenience stores are increasing rapidly.
 - For example, lunch-box and sandwich options amongst the single-person households appear to be popular.

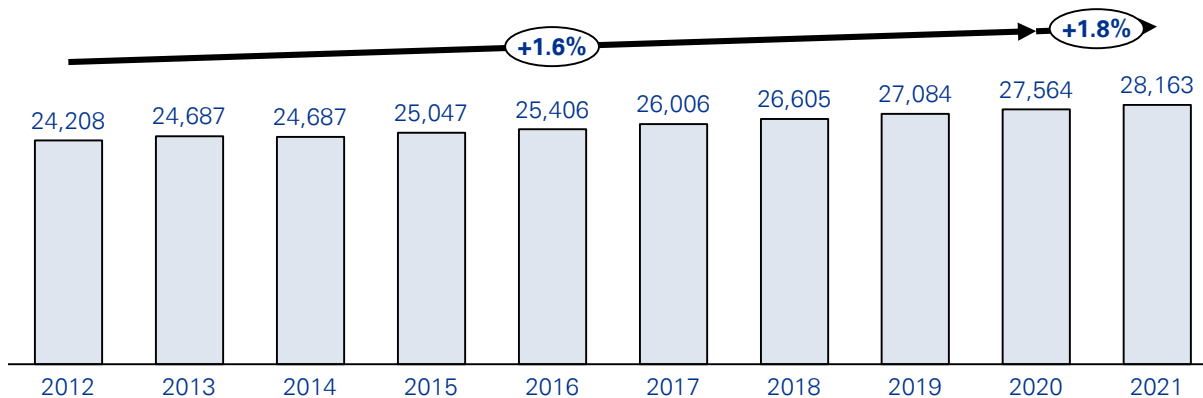
Full-service restaurants

- Increasing popularity of Chinese dining such as the Chinese spicy sauce ma-la has become one of the big trends in food in South Korea.
- With the increasing number of single-person households and emergence of online food delivery, share of full-service restaurant sales accounted for by online delivery is expected to continue to grow.

Source(s): Euromonitor International

Rising health consciousness and preference for ready-to-eat meals seems to drive growth for the packaged food manufacturing industry in South Korea

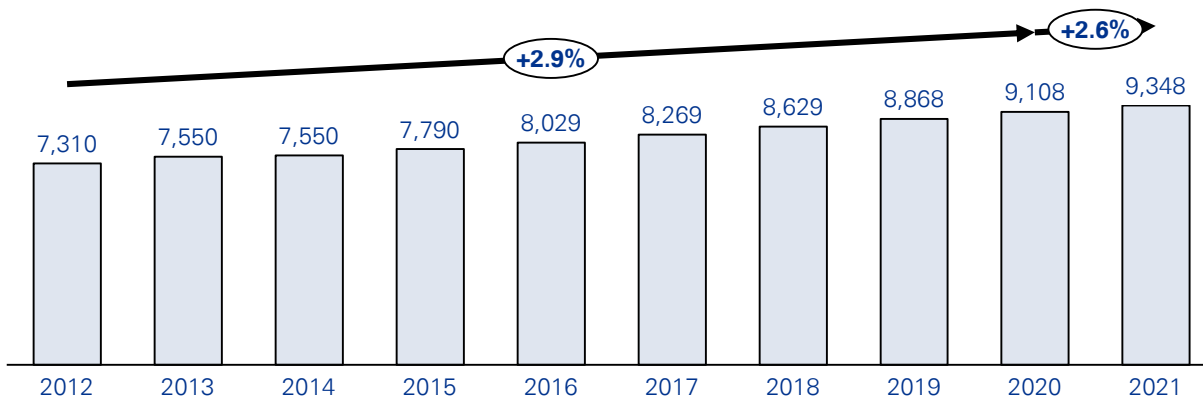
South Korea packaged food retail sales, 2012-2021, KRW billion



Comments

- Packaged food retail sales in South Korea have grown with ~2% CAGR during the last 8 years and is expected to grow by ~2% forecasted to 2021.
- Preference for convenient and healthier food products has been driving growth for ready-to-eat meals sub-category.

South Korea packaged health and wellness food retail sales, 2012-2021, KRW billion



- Packaged health and wellness food retail sales appear to follow positive trajectory with increasing ageing population and health consciousness of South Koreans.

Source(s): Euromonitor International; 2018 FI Korea, aT Center, Seoul, Korea

Competitive Landscape

Japan & South Korea



COMPETITIVE LANDSCAPE

Undaria pinnatifida is sold in various product formats, primarily dried and as ingredient in soups by the industry players in Japan and South Korea

Undaria pinnatifida product formats across industry players(a)

Dried ^(b)		Fresh			
Furu Wakame-Chan (Riken Vitamin)	Parikko (Masunaga Shokushin)	Nama Wakame-chan (Riken Vitamin)	Salted Naruto (K Seaweed)		
Raw salted		Used as ingredient in soups and rice			
Wakame (Otomegusa)	Instant soup (Riken Vitamin)	Wakame rice (Hagoromo Foods)	Salmon rice (Hagoromo Foods)	Mentaiko rice (Hagoromo Foods)	

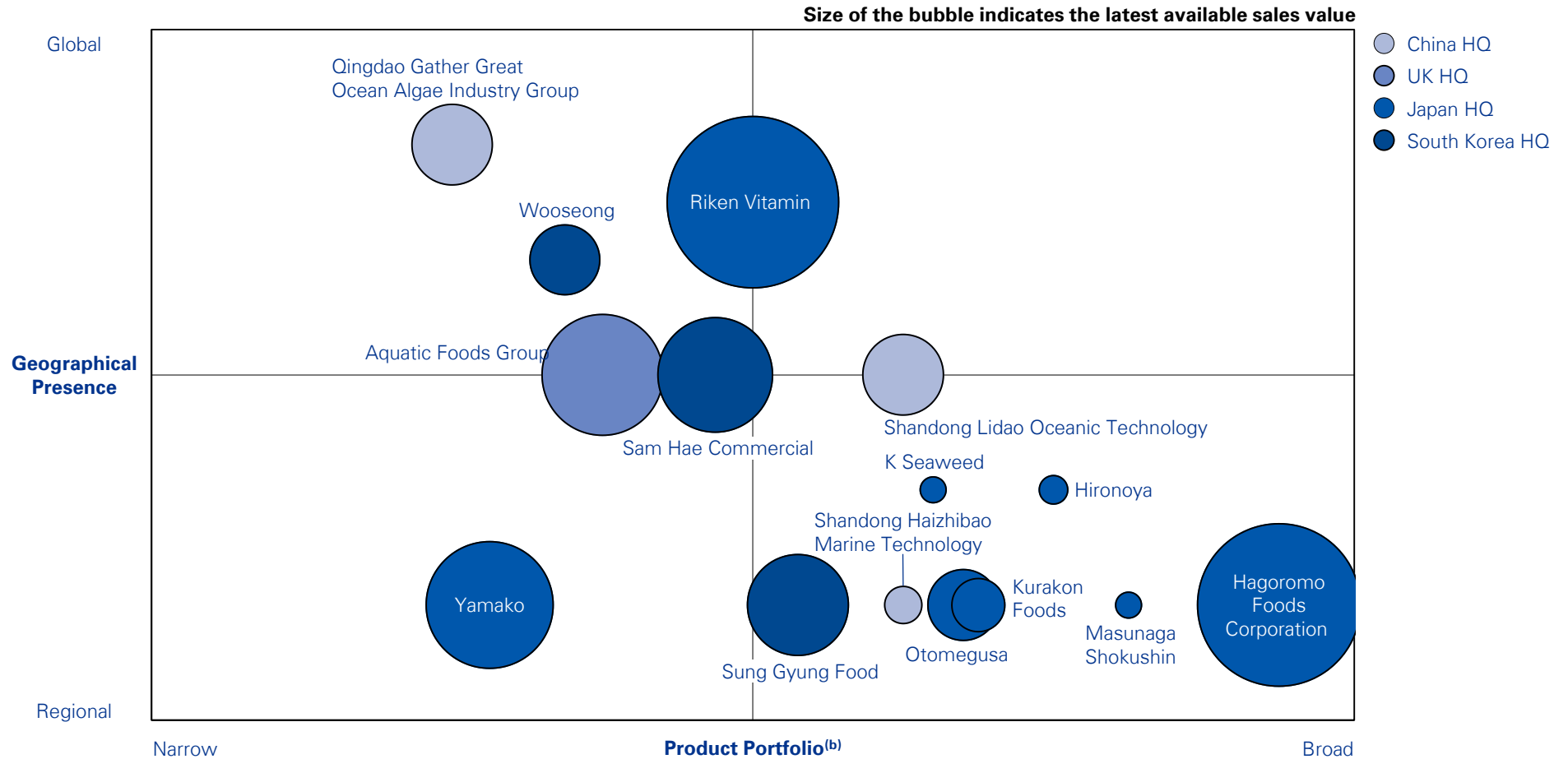
Note(s): (a) Illustrative and not exhaustive; (b) Includes dried cut

Source(s): Radiant Insight; Capital IQ as accessed during July 2020; Company websites; Trade Korea; Korean-Products

COMPETITIVE LANDSCAPE

Most of the Japan-based players appear to have regional presence and a broader product portfolio relative to other players in South Korea and China

Competitor positioning in the seaweed industry^(a)



Note(s): (a) Does not include players for which revenue wasn't available; (b) Indicative of only food related products offered by competitors

Source(s): Radiant Insights; Company websites; Capital IQ; Trade Korea; Korean-Products; Bloomberg

COMPETITIVE LANDSCAPE

While China based players are vertically integrated across the value chain, players in Japan and South Korea are only into processing and storage

Competitor positioning across value chain^(a)

Country	Company ^(b)	Cultivation	Harvesting	Processing & Packaging	Storage & Distribution
Japan	Hagoromo Foods Corporation	✗	✗	✓	✓
	K Seaweed	✗	✗	✓	✓
	Kurakon Foods	✗	✗	✓	✓
	Masunaga Shokushin	✗	✗	✓	✓
	Matsumoto Corporation	✗	✗	✓	✓
	Otomegusa	✗	✗	✓	✓
	Riken Vitamin	✗	✗	✓	✓
	Yamako	✗	✗	✓	✓
South Korea	DYSSKOREA	✗	✗	✓	✓
	Garimi	✓	✓	✓	✓
	Kyeong Cheon Foods	✗	✗	✓	✓
	Nam Kwang Food	✗	✗	✓	✓
	Sam Hae Commercial	✗	✗	✓	✓
	Sung Gyung Food	✗	✗	✓	✓
China	Fuzhou Lianjiang Tianyuan Aquatic Products	✓	✓	✓	✓
	Qingdao Gather Great Ocean Algae Industry Group	✓	✓	✓	✓
	Shandong Haizhibao Marine Technology	✓	✓	✓	✓
	Shandong Lidao Oceanic Technology	✓	✓	✓	✓
UK	Aquatic Foods Group	✗	✗	✓	✓

Note(s): (a) Based on the qualitative information available online; (b) Not exhaustive as players without information on website / no online website and secondary sources have not been included

Source(s): Radiant Insight; Capital IQ as accessed during July 2020; Company websites; Trade Korea; Korean-Products

Competitor profiles (1/7)



Qingdao Gather Great Ocean Algae Industry Group

Year Founded	— 2000 (2012) ^(a)
Ownership	— Private
Sales (Value)	— USD 28 Million (2019)
Employee #	— NA
Manufacturing Plant	— China
Geographic Presence	— America, Australia, Europe, Japan, Korea and other South-east Asia and 80 countries
Key Products	— Compound seaweed protein feed - Kelp-based compound feed — Edible alginate - Used as thickeners, emulsifiers, adhesives, sizing agents
Description	— Headquartered in China and exports products to 50 countries globally. Its products are largely used in processed food such as meat, dairy, and beverages.
Key Differentiating Capabilities	— Robust global presence with focus on technology and research
Company Website	— http://en.judayang.com/



Aquatic Foods Group

Year Founded	— 2014
Ownership	— Private
Sales (Value)	— USD 143.5 Million (2016)
Employee #	— NA
Cultivation Site	— NA
Geographic Presence	— China, Japan, South Korea, USA
Key Products	— Processed frozen seafood — Seaweed-based foods — Marine snack foods
Description	— Headquartered in St Helier, Jersey, the company engages in processing and selling aquatic products, agricultural, meat products and pre-packaged food products
Key Differentiating Capabilities	— Robust presence in USA and Asia Pacific
Company Website	— https://www.fis.com/fis/companies/details.asp?l=e&company_id=166282



Shandong Lidao Oceanic Technology

Year Founded	— 1999
Ownership	— Joint-stock enterprise
Sales (Value)	— USD 29 Million (2019)
Employee #	— 500 (2019)
Manufacturing Plant	— NA
Geographic Presence	— China, Taiwan, Europe
Key Products	— Dried Kelp — Salted Kelp — Cooked Dried Kelp — Instant food
Description	— Headquartered in China company is involved in processing agriculture products and offers other products. It operations include raising, catching, and processing of marine food products
Key Differentiating Capabilities	— Diversification of portfolio
Company Website	— https://www.bloomberg.com/profile/company/0476767D:CH

Note(s): (a) Year when the company started production of Undaria Pinnatifida

Source(s): Radiant Insights; Company websites, Capital IQ as accessed during July 2020

COMPETITIVE LANDSCAPE

Competitor profiles (2/7)



Fuzhou Lianjiang Tianyuan Aquatic Products

Year Founded	— 2000
Ownership	— Private
Sales (Value)	— NA
Employee #	— 300 (2019)
Manufacturing Plant	— NA
Geographic Presence^(a)	— Japan
Key Products	<ul style="list-style-type: none"> — Slated Kelp - Includes kelp flower, knot, tender seedlings, seaweed strips, and small Kelp — Dried Kelp - Includes dry kelp round, dry small kelp knots, and dry small kelp
Description	— Headquartered in Dacheng Village Fuzhou, China, the company is involved in kelp breeding, processing, and scientific research. It processes kelp products through quick-drying and salt stained automated production line
Key Differentiating Capabilities	— Research and development capacity
Company Website	— https://www.bloomberg.com/profile/company/AATQMZ:CH



Shandong Haizhibao Marine Technology

Year Founded	— 2008
Ownership	— Private
Sales (Value)	— USD 45,400 (2019)
Employee #	— 700
Cultivation Site	— Produces kelp at Jiaodong Peninsula
Geographic Presence^(a)	— China
Key Products	<ul style="list-style-type: none"> — Organic fresh kelp^(b) — Stewed fresh — Organic salted fresh kelp head — Organic salted fresh kelp silk — Organic fresh kelp head — Organic fresh whole fresh kelp
Description	— Headquartered in Shandong province, China, the company engages in the production of kelp based fertilizer
Key Differentiating Capabilities	— Caters to domestic end-use markets
Company Website	— http://www.haizhibao.net/



Kurakon Foods

Year Founded	— 1921
Ownership	— Private
Sales (Value)	— USD 0.5 Million (2019)
Employee #	— 61 (2019)
Manufacturing Plant	— Osaka, Miyazaki
Geographic Presence^(a)	— Japan
Key Products	<ul style="list-style-type: none"> — Cut Undaria — Enzo Undaria — Haiboshi Undaria
Description	— Headquartered in Osaka, Japan, the company is involved in processing and sales of products including kombu, Undaria, hijiki, boiled soybeans, sea vegetables, and quick-cooking products.
Key Differentiating Capabilities	— Caters to domestic end-use markets
Company Website	— http://www.kurakonusa.com/

Note(s): (a) The list is not exhaustive due to limited information; (b) Includes organic fresh little kelp
 Source(s): Radiant Insights; Company websites; Capital IQ as accessed during July 2020; Bloomberg

Competitor profiles (3/7)



Riken Vitamin

Year Founded	— 1949 (1964)(a)
Ownership	— Public
Sales (Value)	— USD 830 Million (2019)
Employee #	— 2,285 (2019)
Manufacturing Plant	— Soka, Chiba, Tokyo, Kyoto, Osaka
Geographic Presence	— USA, Europe, Singapore, China, Malaysia, Japan, Germany
Key Products	— Food Emulsifier — Distilled diglyceride ester — Natural Food Colors — Seasonings — Dried and Expanded Undaria
Description	— Headquartered in Tokyo, Japan, the company produces products through four business segments including food ingredients, food applications, healthcare and chemicals
Key Differentiating Capabilities	— Wide product portfolio
Company Website	— https://www.rikenvitamin.com/



Hironoya

Year Founded	— 2010
Ownership	— Private
Sales (Value)	— USD 20,300 (2019)
Employee #	— NA
Cultivation Site	— Coast of Sanriku
Geographic Presence^(b)	— USA, Japan
Key Products	— Undaria seaweed — Fresh fish — Sea squirt — Northern purple sea urchin — Shellfish
Description	— Headquartered in Iwate, Japan, the company produces seaweed products including Undaria, kelp, funori, mekabu, soki kombu, laver and others
Key Differentiating Capabilities	— Caters to domestic markets
Company Website	— https://www.bloomberg.com/profile/company/7917833Z:JP



Masunaga Shokushin

Year Founded	— 1958
Ownership	— Private
Sales (Value)	— USD 12,000 (2019)
Employee #	— 37 (2019)
Manufacturing Plant	— Masak
Geographic Presence^(b)	— Japan
Key Products	— Dried Undaria — Parikko Undaria (Cup) — Other food products(c)
Description	— Headquartered in Ehime, Japan, the company produces and offers many consumer food products such as dried, mixed, roller-pressed, fingerling, grilled, kanbaiko, nuts and portioned products
Key Differentiating Capabilities	— Caters to limited niche markets
Company Website	— http://www.masunaga-s.com/english/

Note(s): (a) Year when the company started production of Undaria Pinnatifida; (b) The list is not exhaustive due to limited information; (c) Others include dried, mixed, roller-pressed, fingerling, grilled, Kanbaiko, portioned products and nuts
Source(s): Radiant Insights; Company websites; Capital IQ as accessed during July 2020; Bloomberg

COMPETITIVE LANDSCAPE

Competitor profiles (4/7)



K Seaweed

Year Founded	— 1960
Ownership	— Private
Sales (Value)	— USD 10,300 (2019)
Employee #	— NA
Cultivation Site	— Island of Shikoku
Geographic Presence^(a)	— Japan, USA
Key Products	— Fresh salted Naruto Undaria — Fresh salted Naruto kuki Undaria — Hidaka and Rausu Akaba Konbu — Hijiki
Description	— Headquartered in Saitama, Japan, the company's Undaria production is associated with National Federation of Fisheries Co-operative Associations and offers Sanriku sea-based Undaria
Key Differentiating Capabilities	— Strong regional presence
Website	— https://www.kseaweed.com/



Sam Hae Commercial

Year Founded	— 1968
Ownership	— Private
Sales (Value)	— USD 95.8 Million (2019)
Employee #	— NA
Manufacturing Plant	— Buan-Gun, Gimpo-si, Los Angeles
Geographic Presence	— South Korea, China, Japan, Thailand, Taiwan, USA
Key Products	— Seasoned seaweed (Myungga, Chosari) — Roasted seaweed — Seaweed snacks
Description	— Headquartered in Seoul, South Korea, the company develops and produces seasoned lavers. It offers dried laver, small laver, F15-laver for kim-bap, and brown seaweeds
Key Differentiating Capabilities	— Caters to domestic markets
Website	— http://www.samhae.co.kr/eng/



Sung Gyung Food

Year Founded	— 1981
Ownership	— Private
Sales (Value)	— USD 56.7 Million (2019)
Employee #	— NA
Manufacturing Plant	— Daejeon
Geographic Presence^(a)	— South Korea
Key Products	— Seasoned laver snack — Sheet and fried laver — Rice roll laver — Toasted laver — Rice crust snacks
Description	— Headquartered in Daejeon, South Korea, the company produces seaweed snacks of kelp and Kim
Key Differentiating Capabilities	— Caters to domestic markets
Website	— https://sunggyung.tradekorea.com/main.do?SESSIONID_TK=X0CPJlOnGofX49yT_Lk-YKXPHQvKexfsiPkrs-TlaxaBKV7pUmTt173797113211422197535

Note(s): (a) The list is not exhaustive due to limited information

Source(s): Radiant Insights; Company websites; Capital IQ as accessed during July 2020; Korean-Products; Trade Korea

Competitor profiles (5/7)



Hagoromo Foods Corporation

Year Founded	— 1931
Ownership	— Public
Sales (Value)	— USD 770 Million (2020)
Employee #	— 710 (2020)
Manufacturing Plant	— Yaizu-shi, Shizuoka-shi, Nagoya-shi, Kuwana-gun
Geographic Presence^(a)	— Japan
Key Products	<ul style="list-style-type: none"> — Sara an Nozomi Nori series — Seasoned, grilled seaweed and side dish — Kamikireru — Hand-rolled glued seaweed — Other food products(b)
Description	— Headquartered in Shizuoka, Japan, the company manufactures and sells various food and seaweed products
Key Differentiating Capabilities	— Strong regional presence
Website	— https://corp.hagoromofoods.co.jp/ja/english.html



Matsumoto Corporation

Year Founded	— 1960
Ownership	— Private
Sales (Value)	— NA
Employee #	— NA
Manufacturing Plant	— Hakodate
Geographic Presence^(a)	— Japan
Key Products	<ul style="list-style-type: none"> — Dessert kelp — Tororo, Shiofuki, Tsukudani kelp — Seaweed snacks, cooking kelp, kelp rolls — Nori — Various formats of kelp including shredded, oden, natto, shaving powder
Description	— Headquartered in Sakai, Japan, the company provides seaweed processing services and products
Key Differentiating Capabilities	— Caters to domestic markets
Website	— http://www.matsumoto-trd.co.jp/en/outline/



Otomegusa

Year Founded	— 1979
Ownership	— Private
Sales (Value)	— USD 14.5 Million (2019)
Employee #	— 30
Manufacturing Plant	— Nishinomiya, Sumoto City
Geographic Presence^(a)	— Japan
Key Products	<ul style="list-style-type: none"> — Dried cut seaweed — Salted raw Undaria — Packed seaweed — Seaweed salad — Hijiki and kelp
Description	— Headquartered in Nishinomiya, Japan, the company produces sea algal products such as Undaria, kombu and hijiki
Key Differentiating Capabilities	— Caters to domestic markets
Website	— http://www.otomegusa.com/

Note(s): (a) The list is not exhaustive due to limited information; (b) Others include Tuna, cooking material, desserts, pasta, sauce, rice, seasonings, pet food, etc.
 Source(s): Radiant Insights; Company websites; Capital IQ as accessed during July 2020; Korean-Products

COMPETITIVE LANDSCAPE

Competitor profiles (6/7)



Wooseong

Year Founded	— 1987
Ownership	— Private
Sales (Value)	— USD 13.9 Million (2011)
Employee #	— NA
Manufacturing Plant	— NA
Geographic Presence	— South Korea, Japan, USA, Europe
Key Products	— Guun-Gim (Roasted laver) — Dol-Gim (Seasoned laver) — Chosun-Gim (Traditional korean seasoned laver)
Description	— Headquartered in Icheon, South Korea, the company produces seaweed products and exports its Gun-Gim products to Japan, USA and Europe
Key Differentiating Capabilities	— Global presence
Website	— https://www.bloomberg.com/profile/company/WSE0Z:KS



Yamako

Year Founded	— 1974
Ownership	— Private
Sales (Value)	— JPY 18.1 Billion (2019)
Employee #	— 599
Manufacturing Plant	— Yanagawa, Anjo, Saga
Geographic Presence^(a)	— Japan
Key Products	— Nori
Description	— Headquartered in Anjo shi, Japan, the company engages in the production and processing of Nori
Key Differentiating Capabilities	— Strong regional presence
Website	— https://www.bloomberg.com/profile/company/YMKOZ:JP



Nam Kwang Food

Year Founded	— 1981
Ownership	— Private
Sales (Value)	— NA
Employee #	— NA
Manufacturing Plant	— NA
Geographic Presence	— South Korea, Japan, Russia, China
Key Products	— Stone and Traditional laver — Dried sea tangle — Laver rice roll — Salted and dried seaweed (includes laver) — Laver sheets and side dish
Description	— Headquartered in Pusan, South Korea, the company manufactures and sells seaweed products. It buys raw laver and ships out finished seaweed products
Key Differentiating Capabilities	— Global presence
Website	— http://www.namkwangfood.co.kr/skin_combi1/namkwangfood.php

Note(s): (a) The list is not exhaustive due to limited information

Source(s): Radiant Insights; Company websites; Capital IQ as accessed during July 2020; Korean-Products

COMPETITIVE LANDSCAPE

Competitor profiles (7/7)



Kyeong Cheon Foods

Year Founded	— NA ^(b)
Ownership	— Private
Sales (Value)	— NA
Employee #	— NA
Manufacturing Plant	— NA
Geographic Presence^(a)	— South Korea
Key Products	<ul style="list-style-type: none"> — Laver (seasoned laver and dried seaweed) — Sea mustard — Sesame oil — Perilla oil — Roasted sesame seeds
Description	— Headquartered in Seoul, South Korea, the company is a manufacturer of seasoned and roasted traditional Korean seaweed products
Key Differentiating Capabilities	— Strong regional presence
Website	— https://kclaver.tradekorea.com/company.do



DYSSKOREA

Year Founded	— 1989
Ownership	— Private
Sales (Value)	— NA
Employee #	— NA
Manufacturing Plant	— NA
Geographic Presence	— South Korea, USA, China, Canada
Key Products	<ul style="list-style-type: none"> — Seaweed snacks — Fried seaweed (laver) — Roasted nori
Description	— Headquartered in Chungcheongnam-do, South Korea, the company engages in manufacturing, distributing and selling seasoned seaweed (laver)
Key Differentiating Capabilities	— Robust presence in the domestic market
Website	— http://www.dysskorea.com/en/



Garimi

Year Founded	— 2002
Ownership	— Private
Sales (Value)	— NA
Employee #	— NA
Manufacturing Plant	— Mokpo, Soan, Gapyeong
Geographic Presence	— South Korea, Europe, Asia, North and South America
Key Products	<ul style="list-style-type: none"> — Roasted seaweed (laver, nori) — Seasoned seaweed (laver) — Dried seaweed (laver)
Description	— Headquartered in South Korea, the company is a specialized seaweed manufacturer. Apart from harvesting, it is integrated in all the other value chain processes
Key Differentiating Capabilities	— Global presence
Website	— https://garimi.tradekorea.com/main.do;JSESSIONID=TK=R3-PK7_g8WvsYQFeknFMXs1OTKCOG4zjU9x_kiFaHnyCd4V8LYti5l-1574457296l1277878764

Note(s): (a) The list is not exhaustive due to limited information; (b) Company website not accessible. Multiple sources providing contradictory information and hence, kept NA
 Source(s): Radiant Insights; Company websites; Capital IQ as accessed during July 2020; Trade Korea; Korean-Products

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