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KGID 2025 Green Growth: The Path to Sustainable Jobs

Seaweed Solutions: Blue Carbon, Climate Resilience, and Food Security

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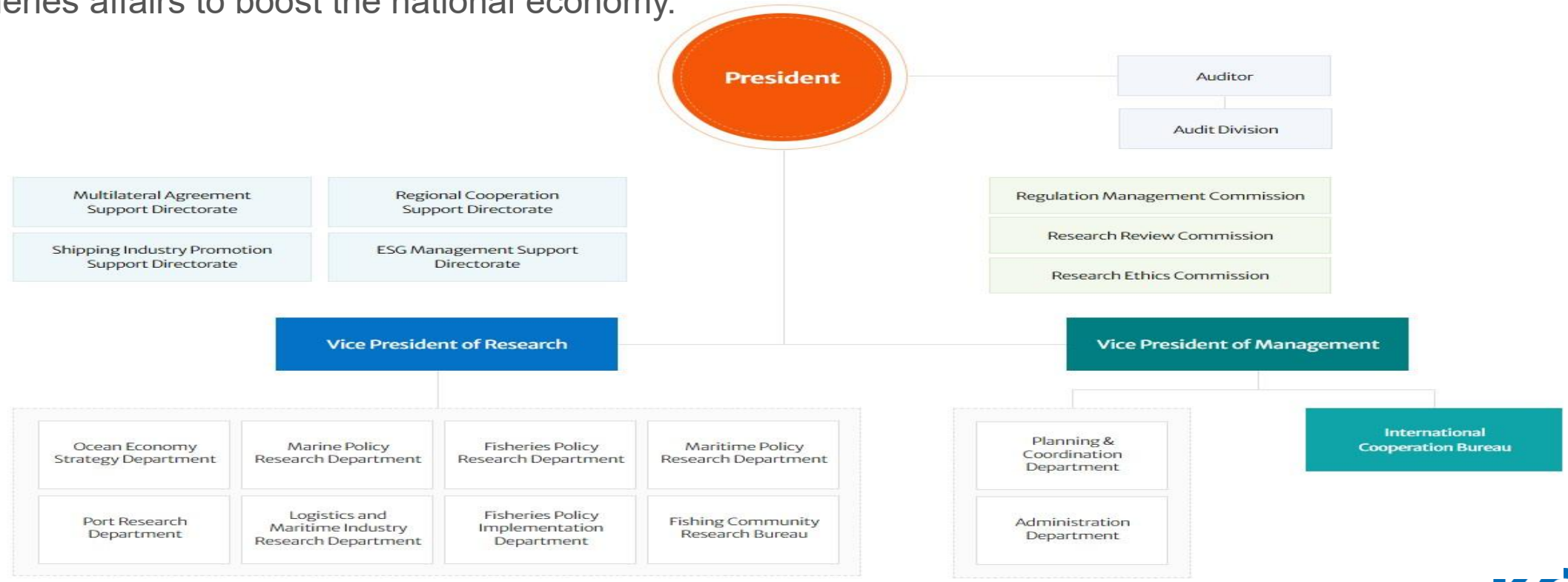
Seaweed Solutions: Blue Carbon, Climate Resilience, and Food Security

- The Korea Maritime Institute (KMI) is a government-funded research institute established under the auspices of the Prime Minister's Office to contribute to the formulation of national policies in maritime and fisheries affairs to boost the national economy.



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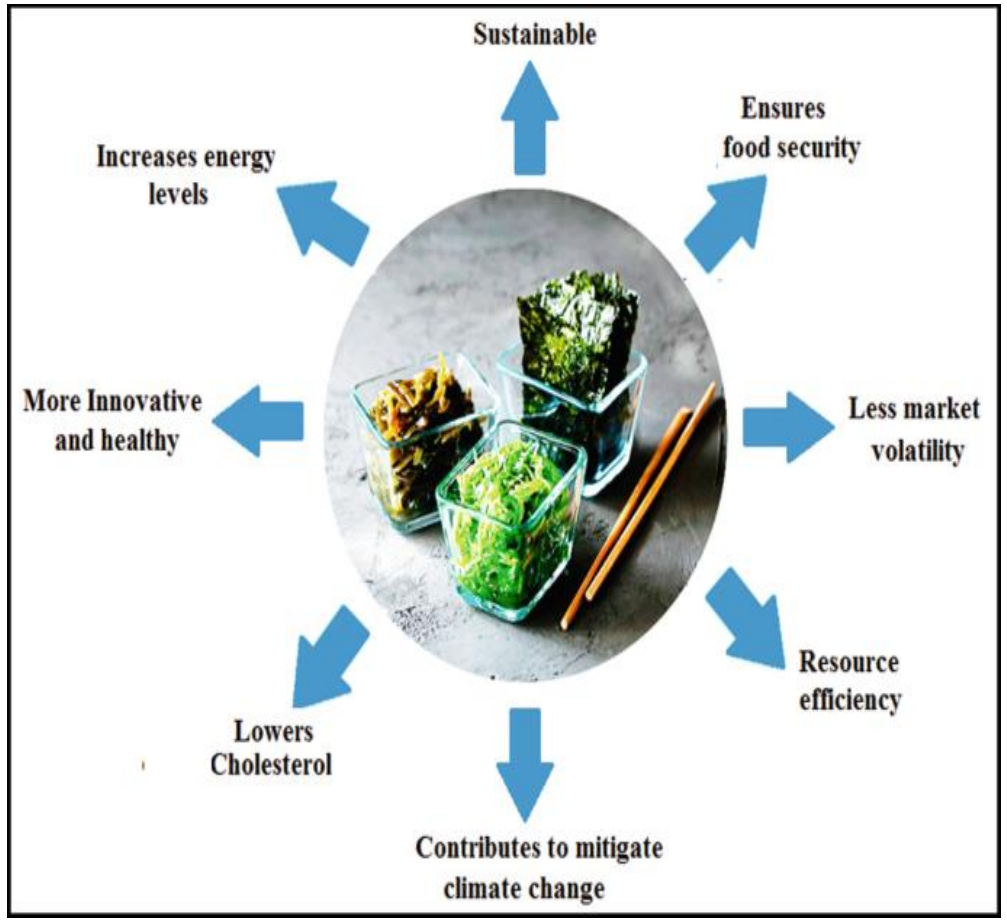
Seaweed Solutions: Blue Carbon, Climate Resilience, and Food Security



Source: Yesuraj et al, 2022

Cheng-Gang Ren et al, 2022

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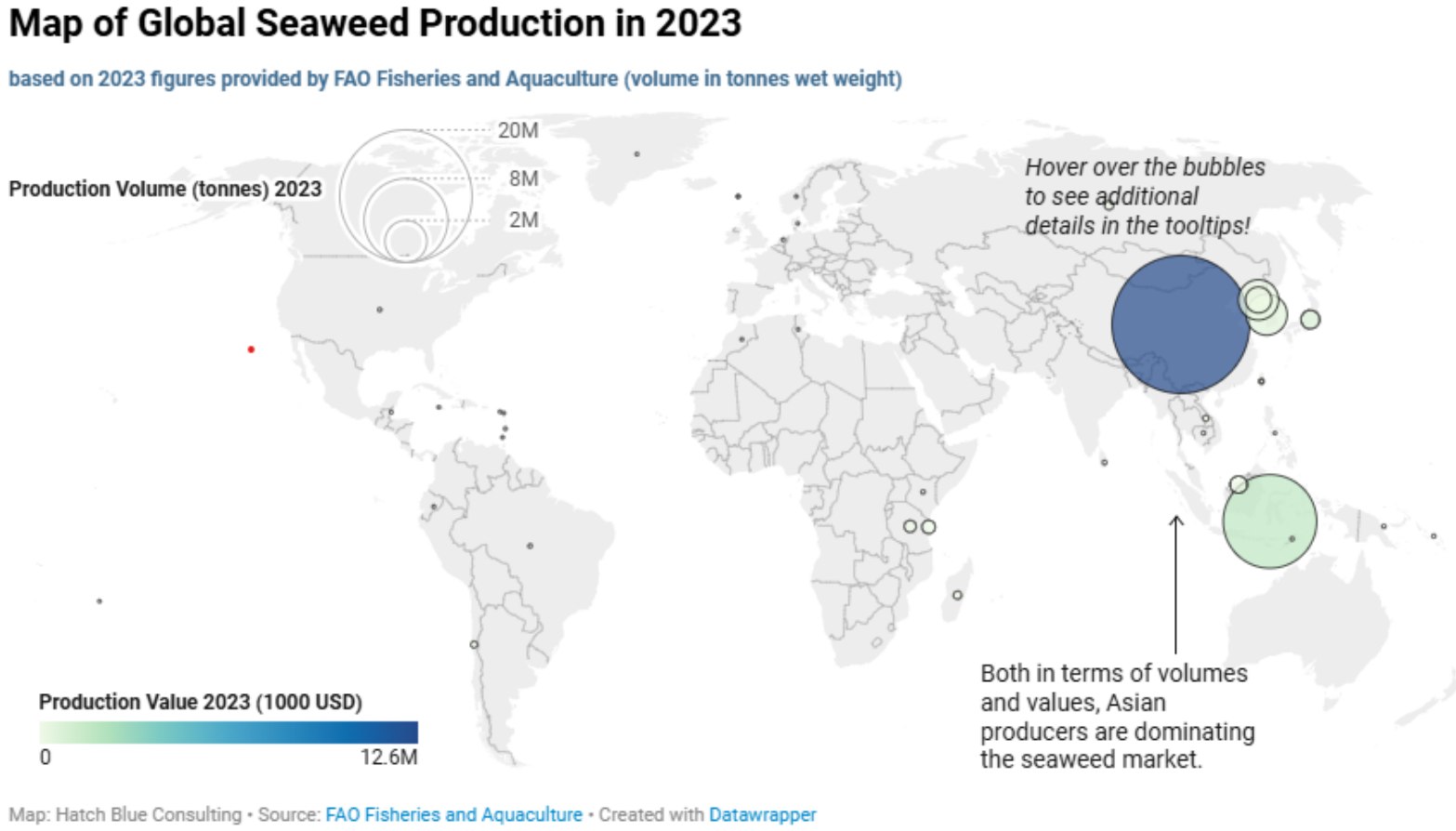
Global Seaweed Aquaculture

- Asia dominate both production volume and market value, representing more than 98% of global market share.
- China and Indonesia are the largest seaweed producers, contributing 56% and 27% of global farmed seaweed, respectively. Korea and the Philippines (PH) each produce 4%, while non-Asian economies account for less than 2% as of 2020.



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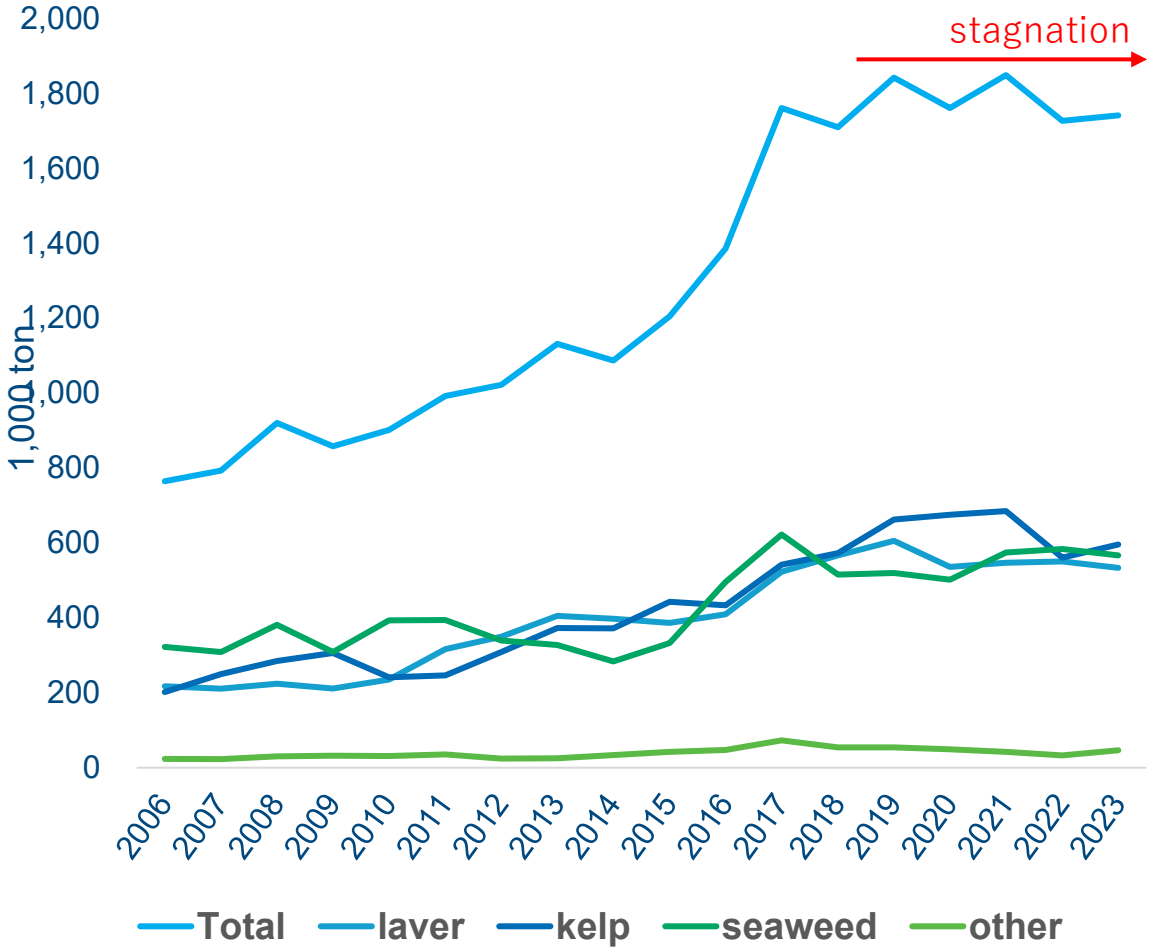
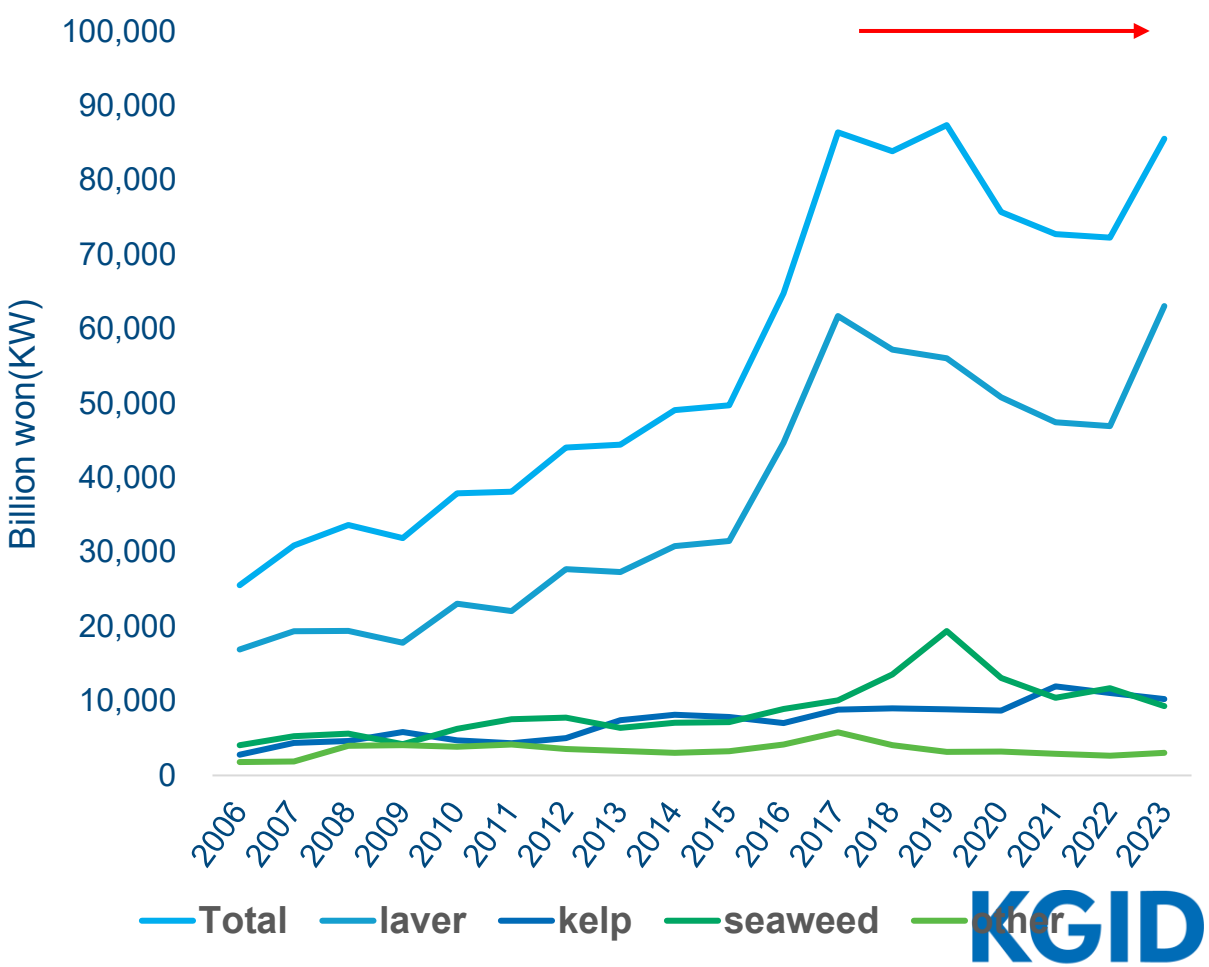
Current Status of Seaweed Aquaculture in Korea





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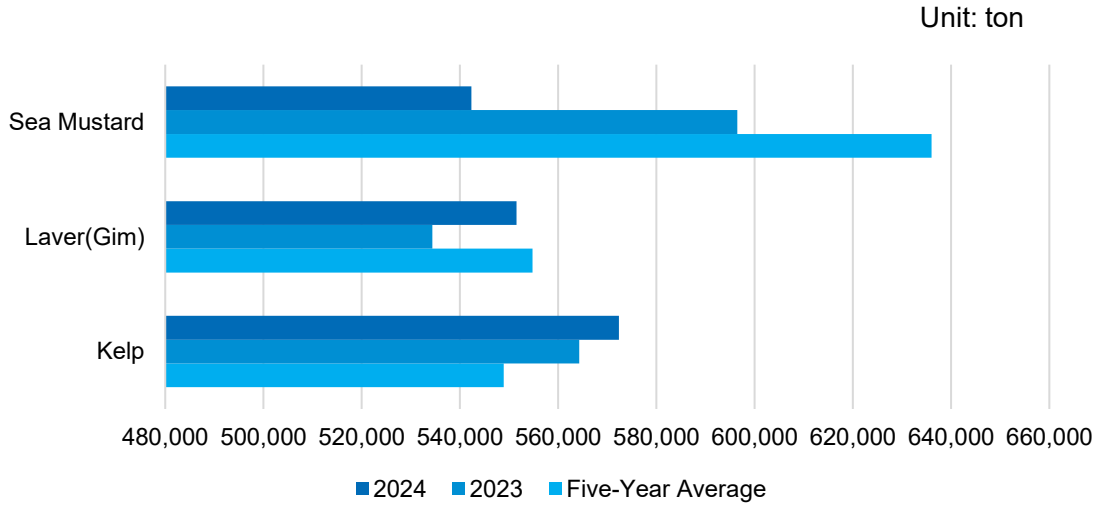
Current Status of Seaweed Aquaculture in Korea

- Sea Mustard (Miyeok) showed growth both year-over-year (+1.4%) and against the 5-year average (+4.3%)
- Laver (Gim) slightly increased compared to the previous year (+3.2%) but declined compared to the 5-year average (-0.6%)
- Kelp (Dasima) experienced significant declines both year-over-year (-9.1%) and against the 5-year average (-14.7%)



Source: Ministry of Ocean and Fisheries

Sea mustard

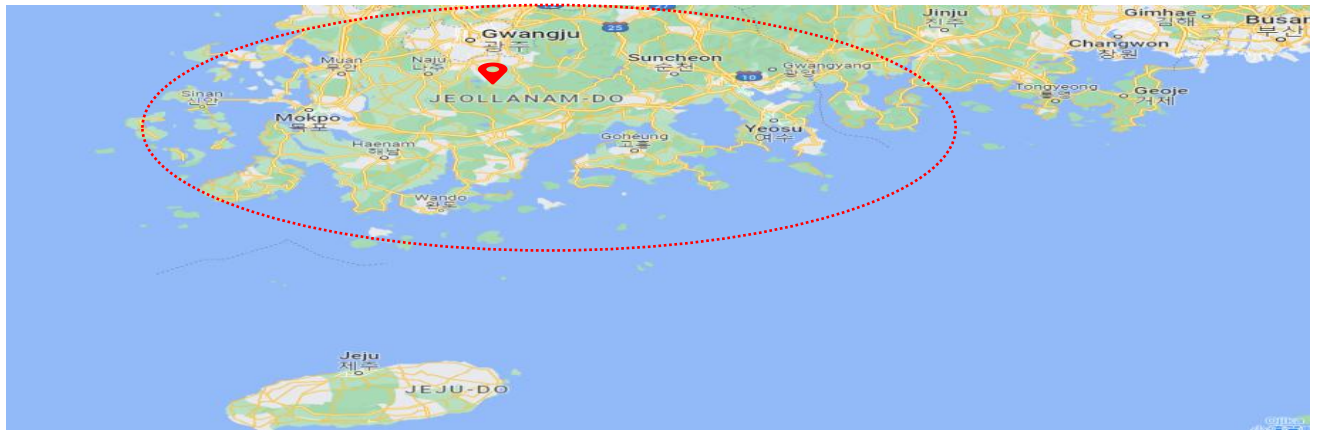
Kelp

Laver(Gim)

green laver

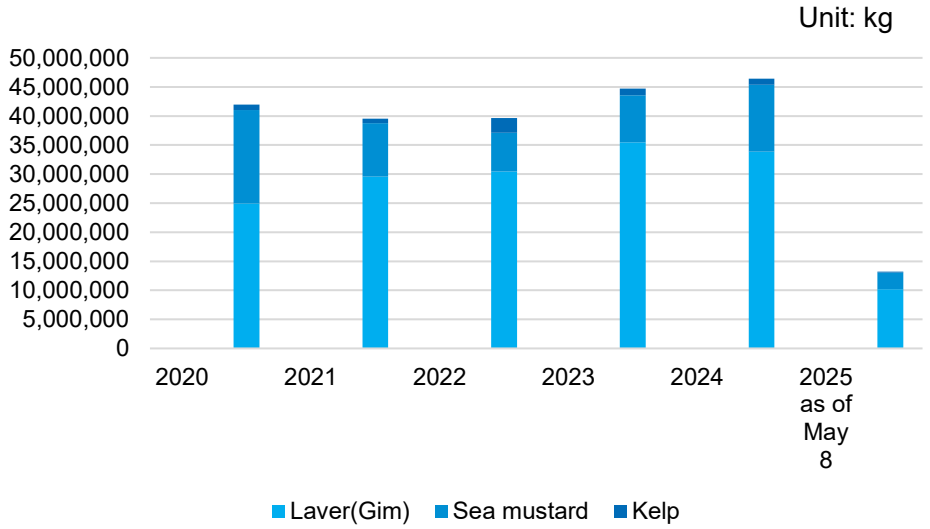
Current Status of Seaweed Aquaculture in Korea

- The total number of seaweed aquaculture permits in South Korea is 2,244
- Jeollanam-do accounts for 80% of Korea's seaweed production, with 2,890 farms legally operating on 61,332 ha of ocean area
- Chungcheongnam-do and Jeollabuk-do also have notable numbers of permits, particularly for laver (Gim) and seaweed
- Busan is primarily focused on laver and seaweed, while Ulsan specializes in sea mustard (Miyeok).
- Jeju-do does not have any seaweed aquaculture permits

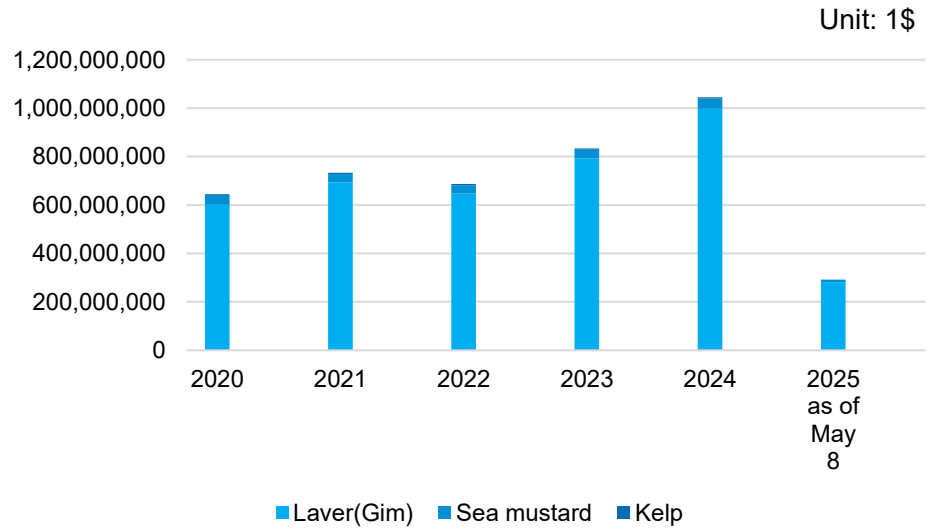


Current Status of Seaweed Aquaculture in Korea

- Dried Form Dominance: All three types are exported primarily in dried form, optimizing for international markets.
- Peak in 2024: Exports for Laver and Sea Mustard peaked in 2024 before declining in 2025.



Source: https://www.kfishinfo.co.kr/kor/view.do?no=626#



Source: https://www.kfishinfo.co.kr/kor/view.do?no=626#

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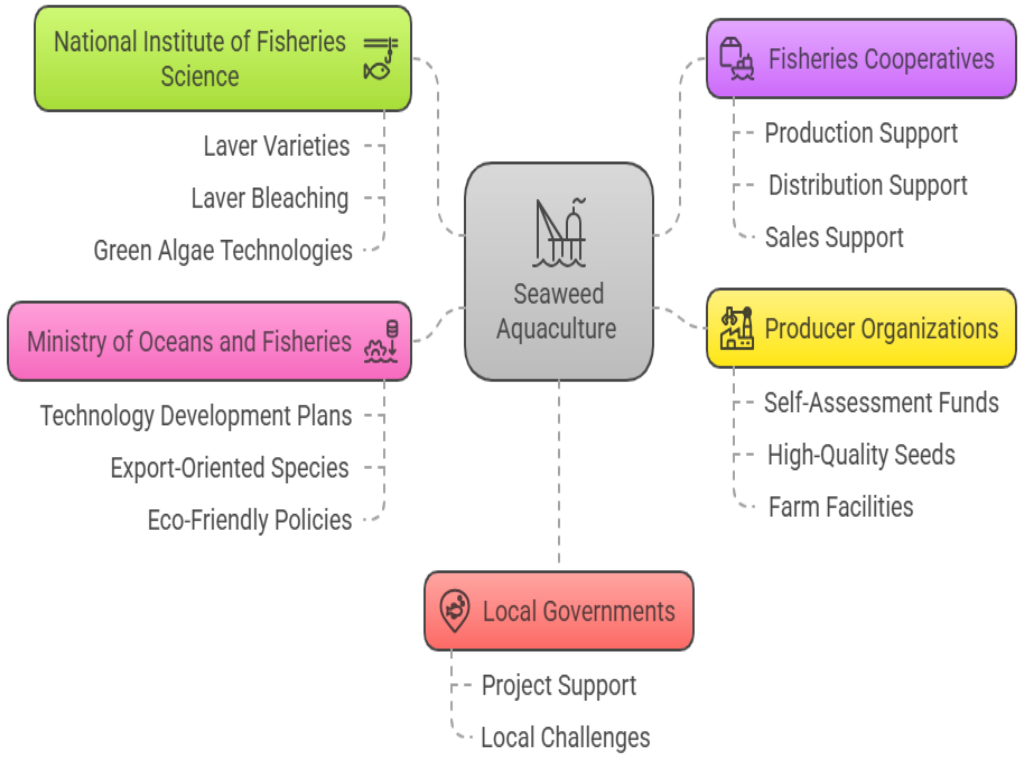
Seaweed Aquaculture Governance

- The governance of seaweed aquaculture in Korea is a multi-level collaboration involving national institutions, cooperatives, producer groups, the central government, and local governments.
- Fisheries Cooperatives handle on-the-ground support for production, marketing, and sales.
- Producer Organizations work towards enhancing competitiveness through quality seed distribution, infrastructure improvement, and export packaging.
- The Ministry of Oceans and Fisheries (MOF) sets the strategic direction, eco-friendly policies, and long-term development goals.
- The National Institute of Fisheries Science (NIFS) leads technological development, genetic resource management, and climate adaptation research.
- Korea Fisheries Resources Agency (FIRA) *(Under MOF)* Conducts stock enhancement and seed release programs for seaweed resources.
- Local Governments act as facilitators for regional projects and address local farming issues.



Seaweed Aquaculture Support Policies

- Modernization and Energy Efficiency Support
- Support for the modernization of processing technologies and the introduction of energy-saving facilities for the stable production of dried Laver (Gim)
- Development of New High-Temperature Resistant Varieties
- Development of new heat-resistant Laver varieties from 2024 to 2026 to adapt to rising sea temperatures.
- Introduction of the Dried Laver Grading System from 2024 to 2027 to standardize quality.
- High-Quality Laver Production
- Promotion of high-quality Laver production through enhanced raw Laver (Mulgim) quality management
- Implementation of R&D projects such as: AI-based Dried Laver Quality Grading Solution Development and Demonstration (2024–2026)
- Development of Technology to Reduce Heavy Metals in Dried Laver (2026–2030)
- Distribution Structure Improvement and Trade Transparency
- Establishment of Dried Laver Exchange Market standards to improve distribution transparency and trade efficiency

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Seaweed Aquaculture Support Policies

- Expansion of the K-GIM brand to enhance brand value and global market recognition

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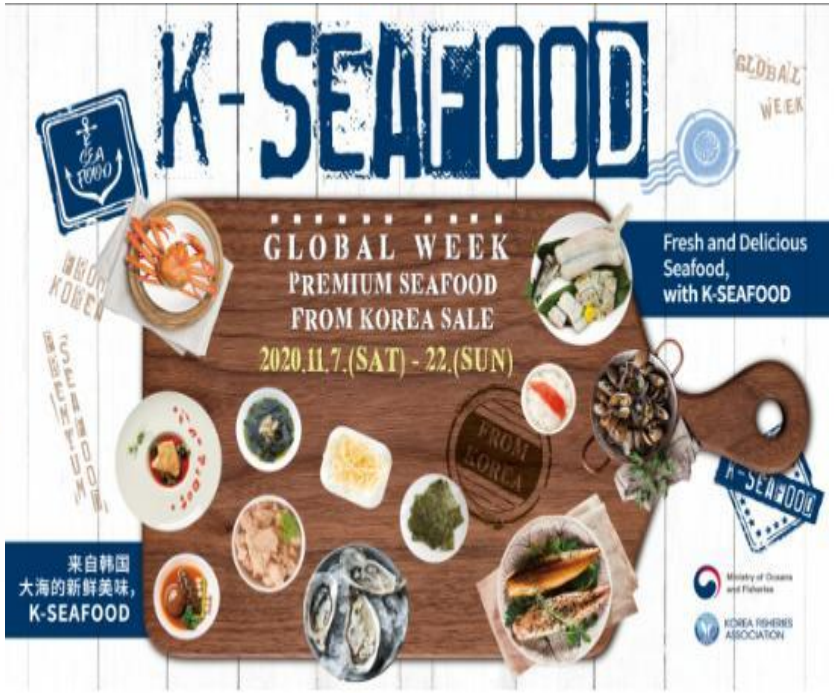

Seaweed Aquaculture Support Policies

- In response to the deteriorating environment for Laver (Gim) aquaculture caused by rising sea temperatures due to extreme climate events, research and development (R&D) efforts are being promoted to develop land-based aquaculture technologies for Laver, aiming to create a controlled and sustainable farming environment on land
- Promotion of subtropical seaweed aquaculture technology development

Land based laver farming

Caulerpa okamurae

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Mitigating Climate Change using Seaweed

Sea Reforestation Project – Preventing Coastal Desertification

- The project aims to prevent **“Gaechnogeum”** (seaweed forest degradation) and **marine desertification**, both of which pose serious threats to fishermen’s income and marine ecosystem stability.
- Due to the rapid increase in *Gaechnogeum* occurrence and its projected expansion by **2060**, large-scale restoration efforts have been implemented.
- As of **2024**, a total of **347.20 km²** of marine forests have been created along the national coastline, including **41 sites** in the West Sea, **101 sites** in the East Sea, **69 sites** in Jeju, and **52 sites** in the South Sea.
- Since **2009**, marine forests absorb about **117,000 tons of carbon dioxide per year**.
- Restoration methods include **removal of barren substrates (“Gae-ttakgi”)**, **control of grazing species**, **installation of underwater structures**, **deployment of artificial seed bags**, **direct transplantation of seaweeds**, and **removal of marine debris**.
- Additionally, **seagrass forests** are being restored in the **West and South Seas**, where natural seagrass habitats are concentrated.

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Mitigating Climate Change using Seaweed

Methods of Marine Forest Creation

- Removal of barren substrate
- Grazing species control
- Installation of underwater structures
- Installation of artificial seed bags
- Direct transplantation of seaweeds
- Marine debris removal

<바다숲 조성해역 수중사진>

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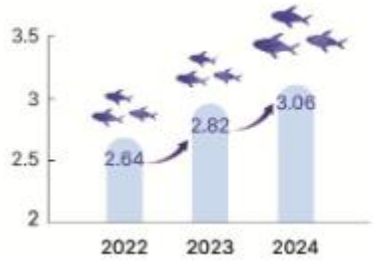
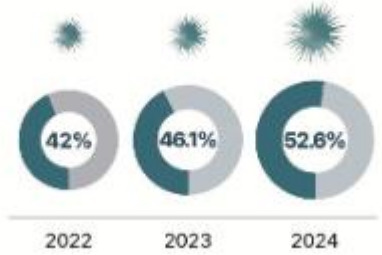
Mitigating Climate Change using Seaweed

- The project has led to significant outcomes, including **enhanced coastal ecosystem health**, **increased biodiversity**, **reduction in *Gaechnogeum*** occurrence, **growth in seaweed biomass**, and a **surge in juvenile fish populations**, contributing to the long-term sustainability of marine ecosystems.

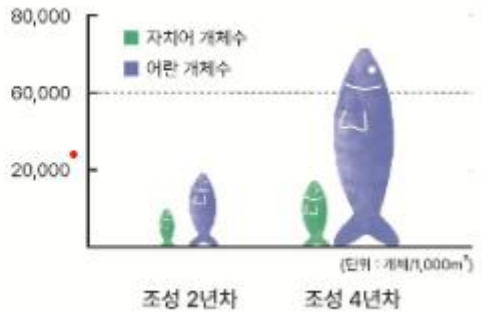


Biodiversity Increased



Reduction of “Gaechnogeum” (Barren Ground)

Seaweed Biomass



Fish Eggs and Juvenile Fish

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Policy for Mitigating Climate Change

Blue carbon refers to carbon absorbed and stored by marine ecosystems. Currently, **salt marshes, seagrasses, and mangrove forests** are internationally recognized as blue carbon ecosystems. However, **tidal flats and seaweeds (such as laver and kelp)** are still in the process of being officially recognized by the **IPCC (Intergovernmental Panel on Climate Change)**. To achieve this, ongoing efforts are focused on **scientific validation, conservation, and evidence-based research** to support their recognition.

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Net Zero Policy

- Climate Change Response Policy in the Marine and Fisheries Sector (2050 Carbon Negative Target)

- Carbon Negative Goal: Reduce emissions by 7.3 million tons from 2018 levels to achieve net emissions of -3.24 million tons by 2050.
- Fisheries and Fishing Villages: Reduce emissions by replacing old vessels, decommissioning, and expanding high-efficiency equipment.
- Marine Energy: Expand carbon reduction technologies.
- Blue Carbon: Enhance and systematically utilize blue carbon as a carbon sink.

Policy for Mitigating Climate Change

- The 2023 Blue Carbon Strategy by the Ministry of Oceans and Fisheries focuses on enhancing marine carbon absorption and achieving net-zero by 2050 through ecosystem expansion and international certification of new carbon sources.
- Collaboration with private sectors and local governments is also emphasized to strengthen climate resilience.

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Moving forward (potential areas of cooperation)

- Enhancing sustainable value chain
- Developing seaweed policies and management model
- Capacity building for SSF
- Sharing ROK’s experience and technologies

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Thank you!

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