



World Scientific News

An International Scientific Journal

WSN 220 (2026) 93-101

EISSN 2392-2192

Analysis of Seaweed-Based Product Development: A Case Study of MSMEs Ulva-Q (Snack) and Winanaz (Crackers) in Bagolo Village, Pangandaran

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<https://doi.org/10.65770/QUZW9837>

ABSTRACT

Seaweed has the potential to be developed into a variety of food products, but its development on an SME scale is constrained by limited resources and support. This study aims to analyze the sources of ideas, driving factors, and inhibiting factors in the development of seaweed-based products at the Ulva-Q SME, which processes Ulva into snacks and shredded seaweed, and the Winanaz SME, which processes Gracilaria into crackers in Bagolo Village, Kalipucang Subdistrict, Pangandaran Regency. The study was conducted in September 2026 through interviews and observations of SME operators, with locations selected using purposive sampling. The results show that Ulva-Q's initial idea stemmed from a government program, while Winanaz was launched through the business owner's personal initiative. Students served as a source of ideas for both SMEs, whereas support from cooperatives and banks was only received by Ulva-Q. Product development was driven by the desire to preserve product identity, improve production efficiency, enhance packaging competitiveness, and add value through diversification. The constraints faced included the availability of raw materials, which depended on natural conditions, limited cold storage capacity, varying levels of market and institutional access, and packaging challenges.

Keywords: Driving Factors, Constraining Factors, Product Development, Seaweed, SMEs.

(Received 3 August 2026; Accepted 19 September 2026; Date of Publication 28 October 2026)

1. INTRODUCTION

Seaweed is a marine biological resource with the potential to be developed as a food ingredient. The polysaccharides, proteins, fatty acids, minerals, and various bioactive compounds found in seaweed support its use in the development of various food products [1]. This utilization can be achieved through product diversification so that seaweed is not only used as a raw material but also processed into food products with more diverse characteristics and economic value. Various seaweed-based food products have been developed, providing this commodity with opportunities for continued development into products that meet market needs [1]. Processing seaweed into food products requires a targeted product development process.

Based on the concept of product development, a product can be developed by creating new products or improving existing ones so that their characteristics, quality, and economic value align with consumer needs. This development can be achieved through adjustments to raw materials, processing methods, product form or size, packaging, and marketing strategies. Development ideas may stem from technological advancements, market conditions, or consumer needs. In food product development, consumer involvement is a key aspect because information regarding consumer preferences and needs can serve as the basis for determining the characteristics of the product to be developed [2]. Consumer needs are not limited to product taste but may also include price, ease of consumption, nutritional content, safety, and sensory characteristics such as aroma, texture, and appearance.

Product development must consider the alignment between product characteristics and market needs. Understanding consumers can also help business owners determine the changes or innovations needed to ensure a product is accepted by the market [2]. Product development in SMEs may face various constraints. Factors such as the availability of raw materials, equipment capabilities, production capacity, capital, human resources, marketing, and regulations can influence a business's ability to bring a product idea to fruition. Research by Prabowo *et al.* [3] shows that the product development process in Indonesian SMEs is related to the business's ability to identify and resolve problems that arise during the innovation process. Meanwhile, a study by Ueasangkomsate and Suksatean [4] on food SMEs indicates that new product development involves various stages, ranging from planning to commercialization.

We focused this study on Bagolo Village, Pangandaran Regency, as this village is known as an area with several seaweed-processing SMEs. Based on our observations, the Winanaz and Ulva-Q SMEs were selected as research subjects because both operate in the seaweed processing sector but use different types of seaweed and produce different end products. The Winanaz SME processes *Gracilaria* seaweed into crackers, while the Ulva-Q SME processes *Ulva* seaweed into snack products. These differences in raw materials and product forms were the primary reasons for selecting these two SMEs, as they allowed us to examine their processing methods, product forms, packaging, and marketing strategies. Kurnia *et al.* [7] have examined the Winanaz SME from the perspective of agroindustrial feasibility by analyzing costs, revenue, income, and business viability. The study yielded an R/C ratio of 2.47 and concluded that the Winanaz SME's seaweed cracker agroindustry is viable for operation and development.

A previous study by Junianto *et al.* [5] discussed the development of seaweed snack products at the Ulva-Q SME, including a business overview, production processes, and challenges faced in product development. That study also highlighted concerns regarding product shelf life as well as the need to develop processing and marketing technologies. Additionally, the study by Dwirani *et al.* [6] examined the characteristics of processed *Ulva lactuca* seaweed snacks at the Ulva-Q SME, covering processing methods and product characteristics. The Ulva-Q SME has been the subject of research regarding both product development and product characteristics.

This study provides an overview of the business's economic conditions but does not specifically address product development based on sources of ideas, consumer needs, the innovation process, or the limiting factors encountered in product development.

Based on previous studies, the Ulva-Q SME and the Winanaz SME have been examined from several aspects, but with different focuses. The study on the Ulva-Q SME primarily addressed the development and characteristics of seaweed snacks, whereas the study on Winanaz focused on agroindustrial feasibility. Research combining these two SMEs within a single product development analytical framework remains limited, particularly regarding sources of ideas, consumer needs, development processes, limiting factors, and innovation opportunities for seaweed snacks and crackers. The differences in the types of products produced by these two SMEs provide an interesting basis for examining how seaweed-based product development is applied to businesses with distinct product characteristics.

Therefore, this study aims to analyze seaweed-based product development at the Ulva-Q and Winanaz SMEs in Bagolo Village, Pangandaran. The analysis is based on interviews with SME operators to identify sources of product development ideas, factors driving the development process, and constraints encountered. The results of this study are expected to provide an overview of seaweed-based product development at the SME level and complement previous studies that have focused more on product characteristics, business development, and agroindustrial feasibility.

2. RESEARCH METHOD

The research was conducted in September 2026 at two seaweed-processing SMEs, namely Winanaz and Ulva-Q, located in Bagolo Village, Kalipucang Subdistrict, Pangandaran Regency, West Java. The study employed observational methods and interviews with SME operators. These two SMEs were selected through purposive sampling because they are both seaweed processing businesses with distinct product characteristics: seaweed crackers at Winanaz and seaweed snacks at Ulva-Q.

3. RESULT AND DISCUSSION

3.1. SME Profiles

The results of interviews with two seaweed-processing SMEs in Bagolo Village, Kalipucang Subdistrict, Pangandaran Regency revealed similarities and differences in business profiles and product development processes. Winanaz produces seaweed crackers made from *Gracilaria*, while Ulva-Q produces snacks and shredded seaweed made from fresh *Ulva*, with quite striking differences in production scale and marketing areas. The profiles and product development aspects of these two SMEs are presented in Table 1.

Table 1. Profiles and Comparison of Product Development at Winanaz and Ulva-Q SMEs.

Aspect	Winanaz	Ulva-Q
Final Product	Seaweed crackers	Seaweed snacks
Main raw materials	<i>Gracilaria</i>	<i>Ulva</i>
Year of Market Launch	2017	2018

Sources of product development ideas	Pangandaran Souvenir Center (2 stores), not yet online store	Souvenir and resellers in Bali, Sumatra, Banten, Bandung, and Solo
Sources of product development ideas	Regional Tourism Potential	Department Programs and Guidelines
Major Challenges	Weather or tides affect raw materials, equipment capacity, and limited marketing	Availability of raw materials, high cost of production
Development Plan	Sauce products	New flavor varieties (shrimp, kecombrang, onion, sesame)

Source: Interview results, 2026

3.2. Sources of Product Development Ideas



Figure 1. Interview sessions with MSME owners (a) Winanaz, (b) Ulva-Q.

The initial sources of product development ideas for the two seaweed MSMEs in Bagolo Village differed fundamentally between external drivers and independent initiatives. At the Ulva-Q MSME, the initial idea stemmed from technical guidance provided by the government's P2WKSS program, which introduced the processing of Ulva as a food ingredient to the Karapyak community. In contrast, the Winanaz SME pioneered its seaweed crackers purely through the personal initiative of the business owner, who recognized an opportunity in Pangandaran's tourism sector a region in need of souvenirs with distinctive local characteristics and pursued this venture without technical guidance, enduring numerous failures before the product gained market acceptance. This pattern aligns with the findings of Azizah and Isbandono [8] that innovative activities in village-level fisheries MSMEs tend to emerge only when external guidance is provided, while independent initiatives by business owners rarely result in breakthroughs without external encouragement. Winanaz's success without initial guidance serves as an interesting exception to this general pattern, though it came at the cost of a longer trial-and-error process.

In addition to the start-up phase, students participating in internships or Community Service Programs (KKN) served as a key source of ideas contributing to both SMEs. At Ulva-Q, student input regarding the use of a spinner machine formed the basis for a change in the fish floss production process, shifting from a process based on fish scraps to one produced directly from fresh seaweed. At the Winanaz SME, KKN students and students from BTH University in Tasikmalaya also contributed ideas for two packaging design changes after the first packaging was created by the business owner herself.

Student involvement in both cases demonstrates that academic networks can serve as a relatively accessible source of technical ideas for household-scale SMEs, even if not always through formal government programs.

Supporting institutions such as cooperatives and banks also served as sources of ideas, though this was only experienced by the Ulva-Q SME. Training and guidance from cooperatives and banks provided Ulva-Q with ideas and direction to change its marketing strategy, shifting from initially targeting local small shops to positioning its products as souvenirs marketed through interprovincial resellers, reaching as far as Bali, Sumatra, Banten, Bandung, and Solo. This aligns with the findings of Dzikrullah and Chasanah [9] that cooperatives play a crucial role in helping MSMEs expand market access, in addition to technological expertise and capital. The Winanaz MSME has not yet obtained ideas from such institutional channels, which partly explains why its scope of ideas is relatively more limited compared to Ulva-Q's.

Consumers and observations of similar products on the market also served as direct sources of ideas for both MSMEs. Suggestions to add shrimp to Winanaz's crackers and to use MSG in Ulva-Q's abon are examples of ideas that came from consumers, although neither was ultimately implemented. Ulva-Q also derived ideas from observations of similar products on the market, which helped inform the development of its original and spicy shredded meat variants. The breadth of Ulva-Q's sources of ideas, including government programs, students, financial institutions, consumers, and market observations, helps explain why its product portfolio has become more diverse than Winanaz's, whose sources of ideas remain more limited.

3.3. Drivers of Product Development

The primary driving factor behind product development at both SMEs is the desire to refine and maintain product quality in line with their unique characteristics. When receiving consumer feedback, both SMEs are motivated to evaluate how well that feedback aligns with the product identity they have established, rather than simply implementing it as is. Winanaz briefly tried adding shrimp to its crackers but discontinued the practice because the shrimp flavor overpowered the product, causing it to lose its signature seaweed character; in fact, consumers who tasted it said it was no different from ordinary shrimp crackers. The Ulva-Q SME was also motivated to maintain its concept of a natural product without preservatives, even though it received feedback suggesting the use of flavor enhancers, as this was deemed to contradict the product's main selling point. This drive to preserve such an identity demonstrates that product development in household-scale SMEs is not only driven by the desire to instantly meet market tastes but also by the desire to maintain the unique selling points that distinguish their products from competitors.

The desire to improve production efficiency serves as a driving force in its own right, particularly for the Ulva-Q SME. The adoption of a spinner was driven by the need to produce abon more efficiently directly from fresh seaweed, replacing the previous method, which relied on seaweed crumbs and was less practical. This motivation aligns with the findings of Sundari *et al.* [10] that the use of oil-draining machines in home-based fish abon agroindustries has been shown to improve production efficiency and the consistency of product quality compared to manual methods. The Winanaz SME has not yet shown a similar drive toward investing in mechanical technology; its product development is driven more by the desire to find the right ingredient formulation, such as experiments in grinding seaweed directly before eventually switching to using whole seaweed mixed with chicken eggs.

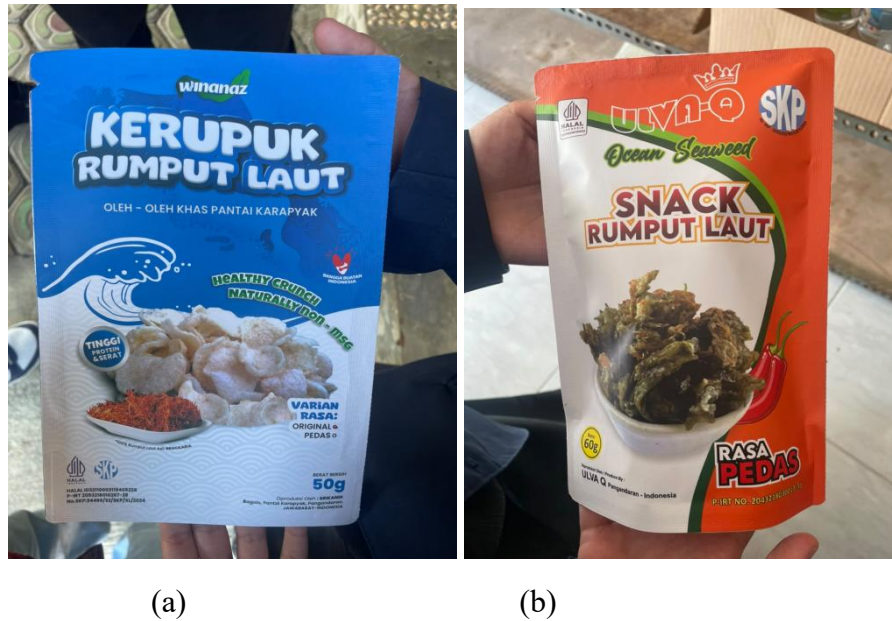


Figure 2. Product packaging of SMEs (a) Winanaz, (b) Ulva-Q.

The drive to strengthen product competitiveness also underpins packaging improvements at both SMEs, consistent with the findings of Najib *et al.* [11] that packaging assistance has proven effective in enhancing the competitiveness of household SME products. For the Ulva-Q SME, this drive was reinforced by a shift in consumer perception, particularly among young people and college students, who began associating Ulva-based products with modern, value-added foods such as nori [12]. This shift prompted Ulva-Q to reposition its products from mere conventional street-stall snacks to premium souvenirs, while also justifying the relatively high cost of goods sold resulting from the use of fresh, preservative-free raw materials [13]. Such a drive has not yet been explicitly evident at the Winanaz SME, where packaging development is driven more by practical needs, such as cost efficiency in materials, rather than a market repositioning strategy.

The drive to add value to products through diversification is also evident in the future development plans of both SMEs. Winanaz is encouraged to develop a natural-ingredient sauce to complement its crackers, although the production process is acknowledged to be quite lengthy, so the product has not yet been widely marketed. Ulva-Q is encouraged to consider several new flavor variants for its abon products, such as onion, sesame, shrimp, and kecombrang, to expand consumer choices. This trend aligns with the findings of Fitriana and Purnamasari [14] that the diversification of seaweed-based products has the potential to increase added value while opening up new business opportunities; thus, the drive to continue innovating is fundamentally rooted in long-term economic motives, rather than merely maintaining the quality of existing products.

3.4. Factors Hindering Product Development

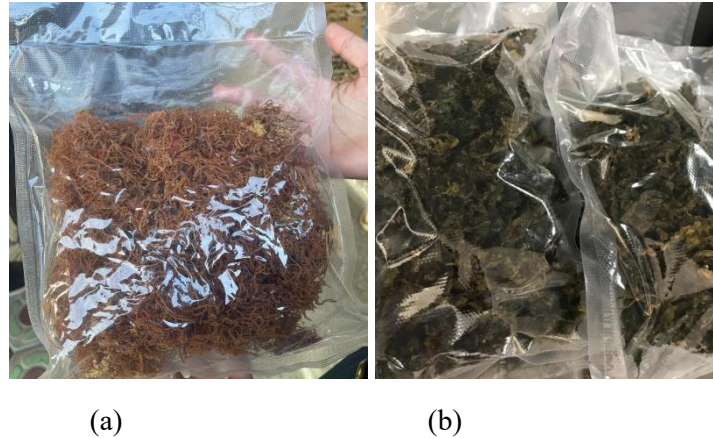


Figure 3. Raw materials: (a) Gracilaria in Winanaz MSME products, (b) Ulva lactuca in Ulva-Q SME products.

The most common barrier faced by both SMEs relates to the availability of raw materials, which depends on natural conditions. Winanaz relies on tidal conditions to harvest Gracilaria seaweed and on sunny weather for the sun-drying process, so production does not run optimally during the rainy season. The Ulva-Q SME faces a different issue, the unstable availability of fresh Ulva in the local area, which has, on several occasions, forced the business owner to source raw materials from Makassar materials that differ in quality and taste from local ones. Such vulnerabilities are common among household-scale marine product processing SMEs. As noted by Wulandari *et al.* [15], the unpredictable availability of raw materials due to seasonal factors is one of the main constraints facing coastal fisheries SMEs, in addition to limited capital and rudimentary marketing practices.

In addition to natural supply fluctuations, limited storage infrastructure also acts as a barrier, particularly for the Ulva-Q SME, which uses fresh raw materials without synthetic preservatives. Fresh Ulva seaweed is prone to quality degradation and discoloration if stored for too long before processing, while the lack of cold storage facilities a common challenge for household-scale SMEs results in a very short shelf life for their raw materials. This situation is consistent with the findings of Fleurence and Levine [16], which states that limited cold storage facilities often pose a technical challenge in smallscale fresh seaweed processing. This limitation requires Ulva-Q to process raw materials immediately after they are obtained, thereby restricting its flexibility in building inventory to anticipate future raw material shortages.

Another limiting factor relates to restricted access to marketing channels and supporting institutions, which ultimately creates a disparity in business scale between the two MSMEs. Winanaz has not received the same cooperative or banking support as Ulva-Q, so its marketing still relies on a consignment system centered around two local souvenir centers in Pangandaran and has not yet expanded into online sales. These limitations result in Winanaz having a relatively smaller production scale and slower growth compared to Ulva-Q, which has reached markets across provincial borders. Such disparities in institutional access underscore that barriers to product development do not always stem from technical aspects of production but also from disparities in the external support received by business operators.

Branding and packaging challenges are also faced by the Ulva-Q SME, given that packaging serves a dual purpose as both a branding medium and a cost-control tool [17].

These SMEs' efforts to reduce production costs by downsizing packaging in response to rising plastic prices actually sparked resistance from retailers and souvenir shops, as the smaller packaging negatively impacted the product's visual appeal on display shelves (visual merchandising), even though the net product volume remained unchanged. This situation aligns with the findings of Simmonds and Spence [18] that the visual perception of packaging often influences consumer purchasing decisions more than the actual quantity of the product; consequently, Ulva-Q ultimately decided to increase the size of its packaging again. Such obstacles demonstrate that decisions regarding cost efficiency in packaging cannot be separated from considerations of market perception, particularly for products marketed through physical retail channels such as souvenir shops.

4. CONCLUSIONS

The development of seaweed-based products at the SMEs Ulva-Q and Winanaz originated from different sources of ideas. Ulva-Q drew many of its ideas from external sources, such as government programs, student input, guidance from cooperatives and banks, and market trends. In contrast, Winanaz's initial ideas stemmed purely from the business owner's initiative, who identified an opportunity in creating souvenirs unique to tourist destinations, although the business later also received input from students. This development process was driven by both SMEs' strong desire to maintain the quality and distinctive characteristics of their products, improve production efficiency, refine packaging designs to better attract buyers, and their commitment to continuous innovation in creating new flavors or products.

However, this product development is not without its challenges. The main issue both face is the unpredictable supply of seaweed raw materials, as it is highly dependent on weather and natural conditions. In addition, they also face challenges due to a lack of cold storage facilities to maintain the freshness of raw materials, difficulties in adjusting package sizes to remain attractive without raising prices, as well as limited access to mentoring support and a marketing reach that has not yet met expectations. Therefore, technical assistance and expanded marketing access are urgently needed so that these two SMEs can grow more effectively.

Acknowledgement

We would like to express our gratitude to Ms. Dian, owner of the Winanaz SME, and Ms. Herni, owner of the Ulva-Q SME, for their willingness to serve as sources and share information regarding their SME products.

References

- [1] L. E. Healy, X. Zhu, M. Pojić, C. Sullivan, U. Tiwari, J. Curtin, and B. K. Tiwari, "Biomolecules from macroalgae—Nutritional profile and bioactives for novel food product development," *Biomolecules*, vol. 13, no. 2, Art. no. 386, 2023, doi: 10.3390/biom13020386.
- [2] R. P. F. Guiné, S. G. Florença, M. J. Barroca, and O. Anjos, "The link between the consumer and the innovations in food product development," *Foods*, vol. 9, no. 9, Art. no. 1317, 2020, doi: 10.3390/foods9091317.
- [3] R. Prabowo, M. L. Singgih, P. D. Karningsih, and E. Widodo, "New product development from inactive problem perspective in Indonesian SMEs to open innovation," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 6, no. 1, Art. no. 20, 2020, doi: 10.3390/joitmc6010020.
- [4] P. Ueasangkomsate and S. Suksatean, "New product development process of Thai SMEs in food industry," *Procedia CIRP*, vol. 128, pp. 393–398, 2024, doi: 10.1016/j.procir.2024.06.029.

- [5] Junianto, I. S. Al Iksani, A. D. Septian, R. S. Alika, and F. N. Yonesa, “Pengembangan produk snack rumput laut (studi kasus UMKM Ulva-Q) di Pangandaran,” *Jurnal Intelek Insan Cendikia*, vol. 1, no. 10, pp. 7120–7128, 2024.
- [6] P. Dwirani, Y. H. Sipahutar, A. Prayudi, and D. A. Natalia, “Karakteristik olahan snack rumput laut *Ulva lactuca* di UMKM Ulva-Q, Pangandaran, Jawa Barat,” in *Prosiding Seminar Nasional Ikan XII*, Samarinda, Indonesia, Jun. 2024, pp. 309–320.
- [7] K. H. Kurnia, D. Rochdiani, and A. Y. Isyanto, “Kelayakan agroindustri kerupuk rumput laut Winanaz di Desa Bagolo Kecamatan Kalipucang Kabupaten Pangandaran,” *Jurnal Ilmiah Mahasiswa Agroinfo Galuh*, vol. 10, no. 1, pp. 21–32, 2023, doi: 10.25157/jimag.v10i1.8444.
- [8] S. N. Azizah and P. Isbandono, “Implementasi pengembangan UMKM perikanan di pedesaan (studi kasus di Desa Tejoasri, Kabupaten Lamongan),” *Inovant*, vol. 3, no. 2, pp. 194–209, 2025.
- [9] A. A. Dzikrullah and U. Chasanah, “Optimalisasi peran koperasi dalam mendukung UMKM: Meningkatkan akses modal, penguasaan teknologi, dan ekspansi pasar,” *Jurnal Investasi Islam*, vol. 5, no. 1, pp. 667–686, 2024.
- [10] R. S. Sundari, D. S. Umbara, and A. Mulyadi, “Aplikasi adopsi inovasi teknologi mesin peniris minyak untuk agroindustri rumahan abon ikan,” *Jurnal Sembadha*, vol. 1, no. 1, pp. 46–49, 2018.
- [11] M. Najib, D. Ramadani, and N. Safitri, “Desain kemasan inovatif sebagai upaya meningkatkan daya saing produk home industry UMKM,” *Dinamisia: Jurnal Pengabdian Kepada Masyarakat*, vol. 6, no. 6, pp. 2055–2063, 2022.
- [12] D. Birch, K. Skallerud, and N. A. Paul, “Who are the future consumers of seaweeds? Insights from Australia,” *British Food Journal*, vol. 121, no. 3, pp. 603–615, 2019, doi: 10.1108/BFJ-03-2018-0189.
- [13] R. A. Aziz, S. M. Nor, N. T. W. Ong, and E. F. Ooi, “Factors influencing consumer purchase intention towards organic food: Evidence from Malaysia,” *Journal of Pharmaceutical Negative Results*, vol. 13, no. 8, pp. 3283–3297, 2022, doi: 10.47750/pnr.2022.13.S08.403.
- [14] I. Fitriana and R. Purnamasari, “Diversifikasi produk rumput laut untuk meningkatkan nilai tambah di sektor perikanan,” *Jurnal Ekonomi dan Pembangunan*, vol. 19, no. 2, pp. 112–125, 2020.
- [15] Y. S. Wulandari, S. Abadi, F. A. Zahra, and A. F. Syahputra, “Peningkatan pengetahuan dan keterampilan pelaku UMKM perikanan melalui sosialisasi manajemen dan pemasaran,” *Jurnal Inovasi Hasil Pengabdian Masyarakat (JIPEMAS)*, vol. 6, no. 2, pp. 257–268, 2023, doi: 10.33474/jipemas.v6i2.19385.
- [16] J. Fleurence and I. Levine, Eds., *Seaweed in Health and Disease Prevention*. London, U.K.: Academic Press, 2016.
- [17] B. Rundh, “The role of packaging within marketing and value creation,” *British Food Journal*, vol. 118, no. 10, pp. 2491–2511, 2016, doi: 10.1108/BFJ-10-2015-0390.
- [18] G. Simmonds and C. Spence, “Thinking inside the box: How seeing products on, or through, the packaging influences consumer perceptions and purchase behaviour,” *Food Quality and Preference*, vol. 62, pp. 340–351, 2017, doi: 10.1016/j.foodqual.2016.11.010.