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Market Trends and Demand Analysis for Seaweed Products in Occidental Mindoro: Implications for Business Development

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ABSTRACT

The main focus of this study is to generate new ideas about the market trends and demand for seaweeds in Occidental Mindoro which in turn will be beneficial in the creation of new products and innovation. This research took 100 farmers and 384 consumers of seaweeds and carefully selected using random sampling. A survey instrument and a descriptive method were used in collecting and analyzing the data. Through this, it was found that there is a downturn with the production volume of some farmers of about 10-20% in recent years because of the changes or fluctuations in market demand and usually producing 1-5 tons. While, majority of the farmers are cultivating less 100 kgs. for each species namely: Eucheuma denticulatum (spinosum), Kappaphycus striatum (vanguard), Kappaphycus alvarezii (cottonii) using just one farm site. The farmers refused the adoption of technology due to limited financing; and development of seaweed-based products are occasionally done. Fluctuations in the selling price is experience in a very frequent manner and has vastly been acknowledged seasonal production variations as an influencing factor. The strategy used in seaweeds is competitive pricing, allowing this sector to take advantage within the competition and only few are engaged in product innovation. The demand analysis implies that there is a promising market for product development and innovation. With this, it is suggested that the seaweed farmers shall adopt technology and be engaged in training programs that supports environmental and business sustainability.

Keywords: *Market Trends; Demand Analysis; Seaweeds*

INTRODUCTION

The seaweed industry plays a very important role in the economy of the Philippines as one of the world's leading producers of, particularly, the red seaweed species required for the production of carrageenan. Seaweed cultivation and processing bring substantial benefits to the livelihoods of coastal communities besides being major raw materials for local consumption and export markets. It also agrees with the Philippine vision for sustainable aquaculture in response to overfishing and loss of marine biodiversity. Hence, seaweed has also become a strategic resource in the country's long-term agricultural and economic planning.

Besides its economic importance, seaweed is also gaining recognition for its ecological benefits. It has also been considered as a carbon sink, with several studies indicating its potential to absorb high levels of carbon dioxide, thus being an efficient method of mitigation to climate change. Seaweed is also used as raw material in different industries: food, cosmetics, pharmaceuticals, and biofuel manufacturing. The demand for the plant has risen in both national and international markets. This continuous expansion of its usages provides an opportunity for rural development, especially in those provinces that have untapped marine resources.

One of the regions in the Philippines that are rich in marine resources is Occidental Mindoro. In fact, this place is very feasible to develop into a seaweed farming community. The majority of its communities are along the coasts and its people rely on the sea for livelihood. The said venture is appropriate for local economic development since they obtain their livelihood in the sea. According to Food and Agriculture Organization of United Nations (2018), seaweed farming is often promoted in developing countries as a sustainable livelihood for small-scale fishing communities.

However, with such potential, Occidental Mindoro has failed to maximize such seaweed production compared to other regions in the country. As such, Region IVB was one of the top seaweeds in the Philippines with 344 606.77 MT in 2018, and now experience downturn in recent years (Bureau of Fisheries and Aquatic Resources, 2022). Moreover, the region including the Province of Occidental Mindoro has registered 1.47 million metric tons, a 2.1 percent drop from the 2019 output of 1.5 million metric tons (Philippine Statistics Authority, 2021). It is characterized by inadequate physical infrastructures, inaccessibility to more lucrative markets, and an absence of government support which may enable full exploitation of the resource in the region. There was a need to understand how such factors influenced opportunities for climate-smart agriculture to ensure food security

Besides these, limited knowledge or application of improved farming practice and sustainable farming enhances these setbacks. Seaweed growers in Occidental Mindoro usually depend on traditional methods that result in low yields and variable quality of the product. Similarly, this inefficiency was caused by insufficient training and technology transfer from national agencies. This has ultimately made the local farmers unable to respond to the increasing demand for quality products offered by both local and international markets.

Some of these challenges have huge impacts: if left unaddressed, the province will continue to forfeit the benefits accorded by seaweed farming in terms of economic uplift and job creation, aside from its environmental conservation perspective. Besides, the world market of seaweed products keeps on growing due to an increased demand for seaweed as sources of sustainable materials and superfoods. Thus, non-resolution of these problems in local production may result in Occidental Mindoro falling behind in comparison to other provinces that are already well on their way to developing their seaweed industries.

In spite of a number of studies being conducted on seaweed farming in the Philippines, a highly noticeable gap in research still exists in the trends in the market and demand analysis for seaweed products in Occidental Mindoro. While previous research focused on seaweed farming practices and environmental impacts, as well as broader economic implications for the country, only a meager understanding of the demand pattern and market potential of seaweed products has been put forward in the context of the local economy of Occidental Mindoro and in integration with global supply chains.

Thus, this study aims to focus on analyzing market trends and demand for seaweed products in Occidental Mindoro. The research problem lies in deciphering the dynamics of the market, identifying key trends, and understanding consumer preferences. This information is crucial for entrepreneurs and businesses looking to invest in seaweed-related ventures, as it provides insights into potential market gaps and areas for innovation. The overarching goal is to inform strategic business development initiatives that align with the demands of the local and global markets.

METHODS

Research Design

The study used descriptive research to discern the market trends and demand analysis as inputs for product development of seaweeds. This study has undergone methodical assessment including collecting and interpreting data to determine the underlying trends and demand shaping the seaweed production landscape. Through this, the researchers were guided with clear and data-driven view of the current market, farmers, and businesses conditions that may be used to develop or innovate new and existing products, marketing strategies, and investment opportunities. According to Nassaji (2015), descriptive research has its goal of describing a phenomenon and its characteristics and concerned more with what rather than how or why something

Sources of Data and Data Gathering Instrument

A two-fold structured questionnaire was used in order to efficiently gather data on the market of seaweeds in Occidental Mindoro. The first part of the instrument assessed the market trends of seaweeds which was answered by farmers in the province. While the second part focused on providing insights about the demands on seaweed products that are currently existing in the market. More so, the research used a four-point Likert scale (ranging from "strongly agree (4)" to strongly disagree (1)).

Sampling Technique

In order to analyze the demand for seaweed products, a purposive sampling was used in selecting the farmers who answered the questionnaires, ensuring the inclusion of respondents with relevant knowledge or experience about seaweeds production. This allowed the researchers to get reliable answers from the farmers, leading to accurately understanding the trends in seaweed market. Particularly, one hundred (100) seaweed farmers were taken to answer the questions relative to the current market conditions of seaweeds in the province, where their data are taken from the Department of Agriculture-Provincial Office.

A random sampling was used to select respondents for assessing the demand of seaweeds in Occidental Mindoro. This method ensured that the respondents would be carefully and equally chosen, resulting in a representative sample that reduced selection bias. Thus, this sampling method selected for populations which are highly homogenous where the members of the research are randomly selected to participate in the research (Bhardwaj, 2019) Through this, reliable insights about the seaweed products demand were generated from three hundred eighty-four (384) consumers. This sample was generated from the total population in Occidental Mindoro within the age range of 16 and above and computed using Raosoft Calculator. Where, the population data are taken from the Philippine Statistics Authority-Occidental Mindoro Provincial Statistical Office.

Research Procedure

The following sequence of activities were done in order to come up with the results and findings of the study.

Conceptualization, Review Literatures and Theoretical Basis. Defined objectives of the study, select and review related literatures and studies that would support the research objectives.

Respondents and participants identification. Determined the people who will be responsible in answering the questionnaires and those who will play significant part in data collection procedure.

Instrument preparation. Instrument was prepared and constructed based on available related literatures and studies.

Data collection, management, and analysis. In the process of data collection, the approval of respondents was assured before the data gathering commence. Specifically, the researchers collected data from respondents in Occidental Mindoro. Also, collected data were encoded systematically using Microsoft excel and treated using SPSS version 21. After the data were encoded, it was analyzed using different statistical tools such as mean, frequency distribution, and percentages.

Interpretation of data. After the analysis, the data were interpreted and discussed. And, hypotheses of the study were tested and answered.

RESULTS AND DISCUSSION

Result

Seaweed Production Profile

Shown in table 1 are the profiles of seaweed production in Occidental Mindoro. In terms of number of years in operations, the results showed the significant number of newer seaweed production ranging within 1-5 years. This was seconded by those who are operating within the range of 6-10 years having twenty-three (23) or 55% responses from the farm owners. While, only one or 1% represents the rare few that have maintained a long-standing status in seaweed farming. While, in terms of monthly net income as categorized in different income ranges reveal that majority or fifty-nine (59%) of the seaweed farms earn at the lower end of income range of PhP2,000 – PhP6,800. Finally, only one or 1% earns within the highest income spectrum of PhP21,201 – PhP26,000.

Table 1. *Seaweed production profile*

Number of Years in Operation	f (n=100)	Percentage (%)
1-5 years	55	55
6-10 years	23	23
11-15 years	9	9
16-20 years	10	10
21-25 years	2	2
26-30 years	1	1
Net Income (Monthly)		
P2,000-P6,800	59	59
P6,801-P11,600	30	30
P11,601-P16,400	2	2
P16,401-P21,200	8	8
P21,201-P26,000	1	1

Market Trends for Seaweed Products

As shown in table 2, results were found about the production factor of the seaweed producers across all categories in Occidental Mindoro. In terms of total volume of seaweed, the farm produces in last year, the results show a considerable number of seaweed farms (58) producing 1-5 tons indicating that the production falls within small scale. Comes next with thirty-eight (38) are producing less than 1 ton of seaweeds and followed by two farms producing within the category of 5-10 tons and 11-20 tons, respectively. In terms of seaweed production volume changed over the past 3 years, majority (n=31) of the seaweed farms decreased production by 10-20%. While only few or three of seaweed farms increased production volume by 10-20%.

With the changes in the production volume of seaweeds, some factors were found to be significant reasons. The sudden decrease in the production volume on the majority of seaweed farms was reasonably influenced by changes in market demand (n=38, 38%). While most of the owners or seaweed farmers are managing just one cultivation site, but only few or fifteen (15) are managing more than 5 farming sites. In support to the abovementioned result, there is a decreased (n=44, 44%) with the number of farms managed over the past 5 years.

Based on the results garnered from the respondents, the major species of seaweeds that the farmers are cultivating in Occidental Mindoro is Eucheuma denticulatum (spinosum) (n = 41, 41%), followed by Kappaphycus alvarezii (cottonii) (n = 30, 30%), and Kappaphycus striatum (vanguard) (n = 29, 29%). While in terms of the estimated production volume for each species cultivated, half of the farms were able to

produce below 100kgs of each species of seaweeds. Finally, the seaweed farmers are experiencing various challenges, but market demand fluctuation was seen as the major problem in the industry.

Table 2. *Production factor of the seaweed producers in Occidental Mindoro*

Production Factor	f (n=100)	Percentage (%)
Total volume of seaweed your farm produced last year		
Less than 1 ton		
1-5 tons	38	38
5-10 tons	58	58
11-20 tons	2	2
More than 20 tons	2	2
	0	0
Seaweed production volume changed over the past 3 years		
Increased by more than 20%		
Increased by 10-20%	0	0
Remained stable (0-10% change)	3	3
Decreased by 10-20%	15	15
Decreased by more than 20%	31	31
Not applicable (new farm)	29	29
	22	22
The main reasons for the increase or decrease in production volume.		
Improved farming techniques		
Expansion of cultivation area	12	12
Changes in market demand	33	33
Environmental factors	38	38
Financial constraints	17	17
	0	0
The number of seaweed farms or cultivation sites managed.		
1		
2-3	34	34
4-5	28	28
More than 5	23	23
	15	15
The change in the number of farms managed over the past 5 years.		
Increased		
Decreased	20	20
Remained the same	44	44
Not applicable (new farmer)	26	26
	10	10
Species of seaweeds being cultivated		
Eucheuma denticulatum (spinosum)	41	41
Kappaphycus striatum (vanguard)	29	29
Kappaphycus alvarezii (cottonii)	30	30
The estimated production volume for each species cultivated.		
Below 100 kgs.		
101-200 kgs	51	51
201-300 kgs.	15	15
301-400 kgs.	21	21
401-500 kgs	4	4

501 kgs and above	8	8
	1	1
Main challenges faced in seaweed production		
Climate change and environmental factors	20	20
Market demand fluctuations	22	22
Access to quality seeds	14	14
Financial constraints	19	19
Labor availability	3	3
Pest and disease management	10	10
Regulatory issues	12	12

Shown in table 3 was the results regarding the technological adoption and innovation factor of seaweed producers in Occidental Mindoro. But with the results, it has shown that most of the farmers refused to adopt advanced seaweed farming through technology in the past 5 years (n=85, 85%), while only fifteen (15%) have adopted technology and innovate farming operations. With this, the majority of the farmers (n=50, 50%) were able to use water quality monitoring systems that is necessary in ensuring the conditions for the growth of healthy seaweeds.

Relatively, the adoption of new technologies in seaweed farming have greatly enhanced the environmental sustainability (n=39,39%) over other factors such as increased productivity, improved product quality, reduced operational costs, and no significant impact at all. The reason for the non-adoption of new technology of the majority of seaweed farmers as stated in the aforementioned result is the limited access to financing (n=41, 41%). Lastly, in terms of frequency of engagement in product development activities, forty (n=40) of the seaweed farmers were occasionally engaged.

Table 3. *Technological adoption and innovation factor of seaweeds producers in Occidental Mindoro*

Technological Adoption and Innovation Factor	**f (n=100)**	**Percentage (%)**
Adopted new technologies in seaweed farming operations in the past 5 years.		
Yes		
No	15	15
	85	85
Types of technologies adopted		
Automated farming equipment	15	15
Water quality monitoring systems	50	50
Advanced drying and processing machines	35	35
Influenced of the adoption of new technologies in seaweed farming operations.		
Increased productivity	11	11
Improved product quality	16	16
Reduced operational costs	25	25
Enhanced environmental sustainability	39	39
No significant impact	9	9
Barriers encountered in adopting new technologies		
Lack of technical expertise	15	15
Limited access to financing	41	41
Inadequate infrastructure	31	31
Resistance to change	13	13
Frequency of engagement in product development activities		
Continuously (year-round)		
Regularly (several times a year)	0	0
Occasionally (once a year)	0	0
Rarely (every few years)	40	40
Never	33	33
	27	27

The following results in table 4 show the economic and market factor of seaweed producers in Occidental Mindoro. According to the producers, seaweeds are currently selling within the range of ₱40-60 per kilogram (n=31, 31%), while only few or nineteen (19) of them could able to sell their seaweeds at the highest price of more than ₱60 per kilogram. Correspondingly, the average market price of the seaweeds has remained stable for the past year accordingly (n=37, 37%), over the few or five farmers who were able to experience significant increase in the market selling price of their produce that has considerably been influenced by the increasing production cost (n=42, 42%) and least affected by international market trends (n=6, 6%).

Further, the fluctuations in the selling price for seaweeds are being experienced in a very frequent manner by the majority of the producers (n=29, 29%) and has vastly been recognized that seasonal production variations caused this to happen (n=29, 29%). In greater part, this condition has negatively affected the seaweed producers where their profits are reduced (n=42, 42%).

Table 4. *Mindoro Economic and market factor of seaweeds producers in Occidental Mindoro*

Economic and Market Factor	f (n=100)	Percentage (%)
Current average selling price of seaweed		
Less than ₱20 per kilogram	24	24
₱20 - ₱40 per kilogram	26	26
₱40 - ₱60 per kilogram	31	31
More than ₱60 per kilogram	19	19
Average market price of seaweed changed over the past year		
Increased significantly		
Increased slightly	5	5
Remained stable	19	19
Decreased slightly	37	37
Decreased significantly	17	17
	22	22
Factors that influence the current market price of seaweed		
Market demand	19	19
Production costs	42	42
Quality of the seaweed	26	26
Availability of seaweed	7	7
International market trends	6	6
How often the fluctuations in the selling price of seaweeds		
Very frequently (monthly)	29	29
Frequently (every 3 months)	25	25
Occasionally (every 6 months)	28	28
Rarely (once a year or less)	18	18
Main causes of price fluctuations in the seaweed market		
Changes in demand	20	20
Seasonal production variations	29	29
Market competition	25	25
Environmental factors (e.g., climate, weather)	17	17
Government policies or regulations	9	9
Global economic conditions	0	0
Effect of price fluctuations in business operations		
Positively (increased profits)	24	24
Negatively (reduced profits)	42	42
No significant impact	34	34

Table 5 shows the competitive factors of seaweeds producers in Occidental Mindoro. Further, producers have predominantly (n=39, 39%) responded that the industry contributed to less than 5% of country's market share, and has increased over the last 3 years (n=29, 29%). Moreover, there is a low level of competition within the seaweed production industry as agreed by a considerable percentage of

respondents (n=41, 41%). Vastly, the seaweed producers use competitive pricing as strategies to gain competitive advantage within a low variance of competition in the industry (n=61, 61%), while offering highly unique seaweed products (n=35, 35%), and typically offers processed seaweeds in the market (n=41, 41%).

Table 5. *Competitive factor of seaweeds producers in Occidental Mindoro*

Competitive Factor	f (n=100)	Percentage (%)
Estimated market share in the country		
Less than 5%	39	39
5% - 10%	16	16
11% - 20%	16	16
21% - 30%	29	29
More than 30%	0	0
Changed in market share over the last 3 years		
Significantly increased	22	22
Increased	29	29
No change	38	38
Decreased	11	11
Significantly decreased	0	0
Level of competition in the seaweed industry?		
Very high	0	0
High	13	13
Moderate	35	35
Low	41	41
Very low	11	11
Strategies that are utilized by the competitors to gain a competitive advantage.		
Price competition	61	61
Product innovation	15	15
Market expansion	13	13
Quality improvement	11	11
Branding and marketing	0	0
The uniqueness of the seaweed products compared from the competitors		
Highly unique		
Somewhat unique	35	35
Similar to competitors	24	24
Not unique	26	26
	15	15
Types of seaweed products being offered		
Raw seaweed	34	31
Processed seaweed (dried, powdered, etc.)	41	41
Seaweed-based food products	25	25
Seaweed-based cosmetics	0	0
Seaweed-based pharmaceuticals	0	0
Seaweed-based bio-packaging	0	0

Demand Analysis for Seaweed Products

At the outset, it was stated that the overall aim of the study is to provide comprehensive understanding about the demand for seaweed products in Occidental Mindoro through descriptive analysis. The present tables show the results for demand analysis in terms of consumer preferences and perceptions, consumer purchase behavior, market and environmental influences for seaweed products.

Table 7 presents the results indicating the range of preferences and perceptions of consumers that influence their decisions in buying seaweed products. Based on the overall result, the consumers have high preferences and perceptions for seaweed products across all measured indicators (M = 3.00, SD = .446). On average, the consumers prefer highly to buy fresh seaweeds over dried or processed varieties, while

there is some variability in their preferences across the sample (M = 3.12, SD = .750). Moreover, health benefits are highly regarded as vital consideration in making decision as evidently shown with its result (M = 3.08, SD = .699). Though the result is high, the consumers have the least thought of the seaweed product texture as influencing factor in making decision (M = 2.88, SD = .762). Further, the texture plays a part but not overwhelmingly so.

Table 6. *Consumer Preferences and Perceptions for Seaweeds Products in Occidental Mindoro*

Indicators	Mean	SD
1. Prefer fresh seaweed products over dried or processed varieties.	3.12	.750
2. Prefer flavored seaweed products more than plain varieties.	3.06	.716
3. The health benefits of seaweed are important when deciding whether to purchase it.	3.08	.699
4. Consider seaweed to be a superfood because of its nutritional benefits.	3.01	.724
5. Enjoy the taste of seaweed during meals and snacks.	2.91	.765
6. The texture of seaweed products is a key factor in decision to purchase them.	2.88	.762
7. Prefer seaweed products with a crunchy texture.	3.03	.729
8. Loyal to specific brands when buying seaweed products.	2.96	.752
Total	**3.00**	**.446**

Legend: 1.00-1.75 Very Low; 1.76-2.50 Low; 2.51-3.25 High; 3.26-4.00 Very High

In this section, the results provide valuable understanding about the purchase behavior of seaweed product consumers. Hence, it includes varying degree of agreement on their behavior. Based on the result, the consumer purchasing behavior falls predominantly within the "high" range considering all the indicators (M = 2.91, SD = .474).

In purchasing seaweed products, the consumers have "high" awareness about the health benefits in consuming seaweed products (M = 2.99, SD = .775). Regarding the preferred points of purchase, the consumers intended mostly to buy seaweed from local markets" (M = 2.95, SD = .773), over supermarkets (M = 2.93, SD = .765), and online (M = 2.93, SD = 1.79) fall within the extent of "good". This indicates that while the consumers prefer more to purchase from local markets, but due to the availability in other selling platforms, the consumers have varying reasons where to purchase. However, seaweeds are one of the products that are not regularly consumed and notably marked as "high" (M = 2.84, SD = .736).

Table 7. *Extent of Consumer Purchase Behavior for Seaweeds Products in Occidental Mindoro*

Indicators	Mean	SD
1. Aware of the health benefits of consuming seaweed products.	2.99	.775
2. Knowledgeable about the different uses of seaweed in food and non-food products.	2.87	.751
3. Regularly seek out information on the nutritional value of seaweed.	2.91	.747
4. Consume seaweed products on a regular basis.	2.84	.736
5. Typically buy seaweed products in bulk.	2.87	.803
6. Purchase small quantities of seaweed products at a time.	2.88	.759
7. Buy seaweed products only when they are on sale or discounted.	2.90	.771
8. Usually buy seaweed from supermarkets.	2.93	.765
9. Prefer to buy seaweed from local markets.	2.95	.773
10. Often purchase seaweed products online.	2.93	1.79
Total	**2.91**	**.474**

Legend: 1.00-1.75 Very Low; 1.76-2.50 Low; 2.51-3.25 High; 3.26-4.00 Very High

This section provides data about the level of market and environmental influences for seaweed products in Occidental Mindoro. The research examined how the market forces such as prices and product

availability, and environment concerns. The market and environmental factors have been noted with high influence in purchasing decision for seaweed products (M = 2.95, SD = .520).

Particularly, the consumers have highly regarded that safety regulations are influencing their purchasing decision (M = 3.05, SD = .702). Where, the frequent availability of seaweed products in stores has closely influence consumers in buying (M = 3.02, SD = 1.67). Thus, the consumers perceived that the convenience in finding the seaweed products in the local market has been influencing them generating high result (M = 2.88, SD = .796), however, among all indicators, the aforementioned received the lowest result.

Table 8. *Level of Market and Environmental Influences for Seaweeds Products in Occidental Mindoro*

Indicators	Mean	SD
1. Find it easy to purchase seaweed products in the local market.	2.88	.796
2. Seaweed products are readily available at the stores where I shop.	3.02	1.67
3. Can access a wide variety of seaweed products in my area.	2.91	.802
4. Advertising influences my decision to purchase seaweed products.	2.95	.748
5. More likely to buy seaweed products when they are on promotion or sale.	2.91	.768
6. Food safety regulations influence my decision to buy seaweed products.	3.05	.702
7. Seaweed purchasing habits change based on seasonal availability.	2.95	.772
Total	**2.95**	**.520**

Legend: 1.00-1.75 Very Low; 1.76-2.50 Low; 2.51-3.25 High; 3.26-4.00 Very High

Discussion

Market trends in Seaweed products

Findings on the market trends in Seaweed production suggests that the farmers are predominantly operating in a small-scale category and might be currently facing a downturn in the production due to various factors such as the environment, economic, and most importantly market conditions. This might bring a concern for sustainability and growth, while those few producers who have significantly increase their production volume might be using unique or advanced practices that can also help other farmers improved seaweed yields. However, innovation and technology adoption are not widely embraced because of their limited access to financing, indicating the low efforts in engaging into product development activities that could help them improve their income. Since the importance of seaweed farming was relatively evident in the economy and community, some private sectors and government agencies in other countries are providing financial assistance like seeds, planting tools, clothesline equipment, and others (Anh & Hanh, 2021); and in developing a product, several factors need to be considered, including the support provided by the government through training on the adoption of advanced manufacturing technology, improving food quality standards, research, and food innovation (Busthanul et al., 2023). Also, it was found that adoption of technology has not greatly influence the seaweed operations but rather significantly contributes to the enhancement of environmental sustainability in which the impact may not be soon realized, but it may pose long-term positive impact towards the industry operations and profitability. When sustainable environmental practices are integrated in business operations, it may help to adapt to changing market conditions, mitigate probable disruptions, and ensure long-term viability or otherwise build long-term resiliency (Wolniak, et al., 2023).

Over the past year, the average market price for seaweed remains stable for most of the producers. They have seen that production cost has heavily impacted this stable condition in market price. This implies that the cost of materials used in producing seaweeds or other seaweed products remain consistent or the same. However, variations of seasons in the country might have led from an occasionally to a very frequent fluctuations in the selling price of seaweeds. By this instance, it can create substantial impact to the seaweed industry and may lead to financial variability and reduced profit margins. This instance might subsequently conform with the statement of Bureau of Fisheries and Aquatic Resources, where it warns the industry in the country relative to the increasing competition in the production of Eucheuma with the countries such as Indonesia and Malaysia (Food and Agriculture Organization of the United Nations, 2023).

Further, it was also found that the majority of farmers has experienced no change in the market share but some said there was an increase in the last 3 years. This indicates a relatively stable market within this sector. However, though it is stable, this condition might also bring some challenges if not taken care of, such as its inability to grow or expand in the local, national, or global market. Moreover, they use competitive pricing as business strategy over other samples such as product innovation, market expansion, and quality improvement to stand out in an almost identical market. This points to a balanced competitive market, that implies the stagnant situation of the seaweed farmers. Hence, Busthanul (2023) mentioned that seaweed product innovation is one of the industry activities that could help in increasing the added value and competitiveness of seaweed commodities. This suggests that the seaweed producers may embrace innovation in product development to increase market share and drive growth. Johnson et al. (2023) found existing gaps in seaweed industry including requirement for diversification of seaweed-based products' value chain and development of processing, products, or fodder replacement industries.

Demand Analysis for Seaweed Products

Based on the result, the high perception and preference of consumers for seaweed products implies that there is a promising market for seaweeds and positive inclination of the consumers to these products. Thus, most of the consumers prioritize fresh seaweeds, others may still want to purchase dried or processed products that are made of seaweeds or in other forms. Relatively, consumers decision to buy seaweed products were influenced by the health benefits they would gain, that is why they prefer more the fresh seaweeds than those which are already processed with reduced nutrients. Health consciousness is the key psychological factor of the buyers influencing their willingness to pay for purchasing followed by product quality, taste, packaging, price, and consumers look for convenience in shopping and are less influenced by market offerings and sales assistance in the store while buying health and wellness food products (Ali & Ali, 2020). In order to boost the seaweed market, the seaweed products producers must consider optimizing the health benefits to attract more buyers and increase profitability.

The high regards of the consumers to the health benefits of seaweed products, contributes mainly to their behavior in purchasing. This means that health consciousness is one of the influencing factors that creates demand for seaweed products. According to Roohinejad et al. (2017), edible seaweeds are rich in antioxidants, dietary fibers, essential amino acids, vitamins, phytochemicals, polyunsaturated fatty acids, and minerals. Thus, it is vital that the seaweed producers were able to highlight the health benefits in marketing their products. While, this factor may be used by the producers as an opportunity to develop and innovate products out of seaweeds that would meet the dietary requirements of consumers, as seaweeds are not one of those products that are not regularly consumed. With the seaweeds rich content of biological substances, vitamins, minerals, fiber, and antioxidants, seaweed is garnering considerable attention for its potential health benefits, it can be used in creating new products that would significantly reach both preference and health of its consumer (Hima & Velvizhi, 2020).

Further, the consumers have notably considered market and environmental factors in buying seaweed products, but on top of it is the food safety regulations. This accentuates on the point that the consumers are more likely buying products if these are being sold in the market in adherence to the necessary requirements and standards as imposed by the authorities. With the empirical review of Adams (2023), food safety regulations play a vital role in maintaining consumer confidence, in the safety and quality of food products, with stricter regulations associated with higher trust levels. More so, the availability of this type of product in the stores is another reason why the consumers are purchasing, implying that the consistent presence of seaweed products can boost sales. While, the frequent stock outs of products, remain one of the biggest issues in the retail business because they directly contribute to lost sales and reduced profits, and indirectly contribute to reduced loyalty and potential loss of customers (Avlijaš, Milicevic, & Golijanin, 2018). Thus, the convenience in finding seaweed products in the local market has seen to be considerably high, but it is still the least concern among others by the consumers in buying.

CONCLUSION

In summary, the study provides comprehensive understanding about the market trends and demand analysis of seaweed products in Occidental Mindoro. Thus, the findings indicate that in a considerably decreasing production of seaweeds, a large number of producers are operating in small scale producing less than 1 ton of seaweeds due to the environment, economic, and market trends. The producers have not experience significant change in the market share for seaweeds due to its stable conditions. However, this shall post a preemptive concern for growth and sustainability. While adoption of technology seems to have not influence much the production of seaweeds but rather pose significant impact to environmental sustainability. The demand analysis implies that there is a promising and interesting market for product development and innovation focusing on the seaweed products that are fresher, nutritious, and compliant to food safety regulations.

Based on the findings of this study, the following are recommended:

1. The farmers may be encouraged to adopt technology or advanced seaweed techniques through seaweed training programs that would substantially help them in increasing profit and productivity;
2. The farmers may consider partnership with agencies for possible funding and donations of technology and other programs;
3. The farmers may strengthen its partnership with local authorities and Higher Education Institution in providing them the knowledge about environmental preservation in consideration of its long-term positive impacts and sustainability; and
4. The farmers may consider innovation of seaweed products to sell in the market that are much concern with nutritional and health benefits, and compliance with food safety regulations.

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