ANALYSIS OF THE FACTORS AFFECTING SEAWEED EXPORTS FROM INDONESIA TO CHINA

BY

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THESIS
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DECLARATION OF AUTHENCITY

Herein I declare the originality of the thesis; I have not presented anyone else's work to obtain my university degree, nor have I presented anyone else's words, ideas or expression without acknowledgment. All quotations are cited and listed in the bibliography of the thesis.

If in the future this statement is proven to be false, I am willing to accept any sanction complying with the determined regulation or its consequence.

Nanjing, May XXX 2023

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ABSTRACT

Seaweed is one of the main commodities in the aquaculture of Indonesia and has been exporting seaweed to China as the main destination country. Every year Indonesia exports seaweed to China with a very large volume compared with exports to other countries around the world. This situation makes Indonesia dependent on the level of seaweed exports to China.

The purpose of this research is to know how some factors affect related to seaweed export from Indonesia to China to determine how to increase seaweed. By using quantitative method, this research analyzes the effect of those factors on seaweed export from Indonesia to China from 2000 to 2021. Those factors are Price of Seaweed, Exchange Rate, Indonesia Inflation, GDP of China, and Volume Production of Seaweed in Indonesia. The data is time series that is gotten from UN Comtrade, *Badan Pusat Statistik Indonesia* or Indonesian Central Bureau of Statistics, World Bank, and Marine and Fisheries Ministry Indonesia. This research uses Multiple Linear Regression method and is processed with SPSS IBM software 26. The result of this research is that Indonesia Inflation, GDP China, and Volume Production Seaweed have positive effect on Total Seaweed Export to China, Exchange Rate has negative effect towards Total Seaweed Export to China, and Price Seaweed has no significant effect on Total Seaweed Export to China.

Keywords: Seaweed Export, Indonesia, China

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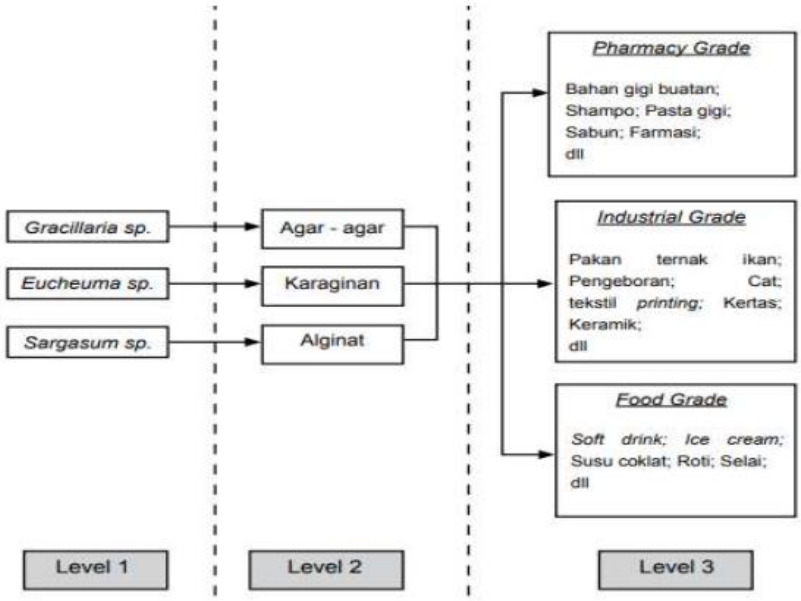
CHAPTER I
INTRODUCTION

1.1 Background

International trade plays important rules to boost the economy. There are a lot of sectors that can be done to do export and import. Seaweed is one of nature-based business opportunity because of the most underused resources on the planet, and it is also one of aquaculture production. Seaweed is leading commodity in the field of aquaculture in Indonesia but the level of seaweed cultivation in Indonesia is still low. The seaweed processing industry in Indonesia also has to be increased because some seaweeds are only dried or processed into semi-finished goods. The seaweed processing industry has not been at the processing stage of seaweed extraction in the level 2 and 3. Indonesia has more than 61,000 km of coastline spread over 17,000 islands and emerged as the largest producer of cultured seaweed in the world after China (Ferdouse *et al,* 2018). Seaweed has been popular since the demand is increasing day by day. Although seaweed has been used for centuries all over the world, it was first only thought of as a food source for coastal communities.

Seaweed has a wide range of uses across numerous industries, and because of the abundance of macronutrients it contains, it also makes a significant contribution to community nutrition. Nowadays, the majority of seaweed supplied for consumption is sold dry. The main commercial seaweed extracts are hydrocolloids like alginates, agar, and carrageenan, which are made from a variety of red and brown seaweed species. It is because Indonesian suppliers and processors lack of knowledge to upgrade the processing level so Indonesia only supply export raw materials of seaweed and seaweed-processed. Seaweed cultivation in Indonesia has a lot of potential, and the country also has a sizable seaweed processing industry. There are several advantages as well as strengths for each seaweed chain player but the real question is whether they can make up for the major risks and flaws that have been identified (Han, Axmann, & Melani, 2022). For the cultivation of Indonesian seaweed commodities reached 769,452 ha. Of that amount, only about 50% or an area of 384,733 ha has been effectively utilized (Sahat, 2013). In addition, being a maritime nation, Indonesia's marine and fishing industries are crucial to the country's economy. Fishing industry makes up 7% of Indonesia's Gross Domestic Income (GDP) (Bahtiar, Wendra, & Tikkyrino, 2023).

Figure 1.1



Seaweed Processing-Industrial Tree

Source: Carolina (2015)

Seaweed has a rare ingredient which is a good source of iodine. Controlling the amount of estrogen and estradiol in the human body is also essential. Making anti-obesity foods is made easier by the fact that the use of seaweed and its isolates tends to promote satiety while reducing postprandial glucose and lipid absorption rates in humans. Due to their anti-microbial qualities, which aid in food preservation, seaweeds are utilized as ingredients or eaten as foods (Perez-Vas, Guillen, & Enriquez-Diaz, 2021). Seaweed leaves are used in some famous goods such as sushi, nori, onigiri, pandan, and etc. Seaweed can also represent a sustainable and renewable source of biomass. The procedure involves crushing the seaweed, and the resulting slurry is made by adding water. Methane is created during fermentation with the aid of microbes. Power gas engines is the result of methane gas to generate electricity (Grand View Research, 2021). Increasing the benefits of seaweed and continuous R&D investment can make the demand of seaweed expected to drive market growth.

According to Grand View Research, with a sales share of 76.2% in 2021, the application segment for human consumption took the lead. Additionally, the demand for seaweeds for direct human consumption is higher in the Asia Pacific region, particularly in China, Indonesia, South Korea, Malaysia, Japan, and the Philippines, due to cultural considerations (Grand View Research, 2021). However, the seaweed trade is not popular like other commodity because not all countries take advantage of the export and import of seaweed. In addition, based on FAO

(2021), the seaweed industry increased from USD 6 billion in 2003 to USD 11 billion in 2019. Ferdouse *et al* (2018) mentioned that there are 221 species of seaweed which have commercial value but about ten species intensively farmed which is divided into 3 kinds, such as:

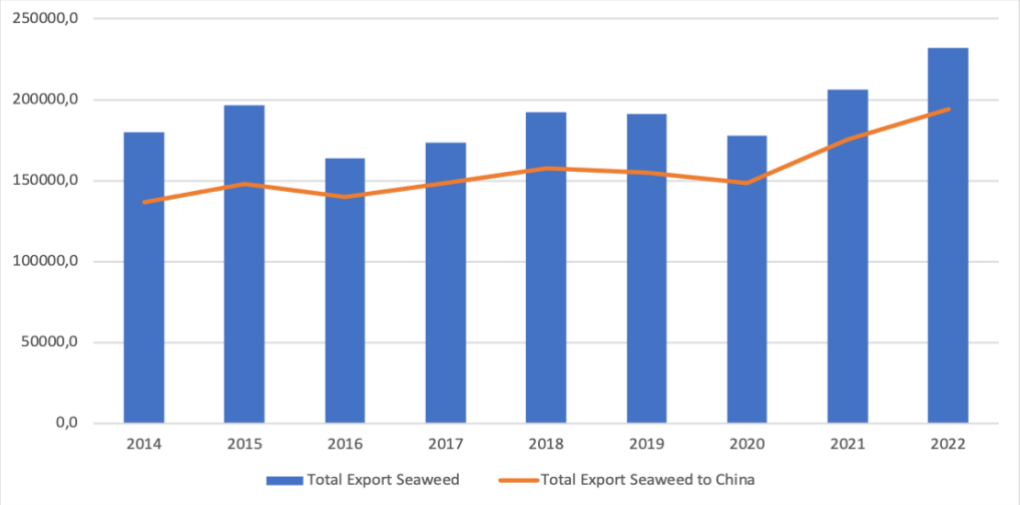
a. Brown seaweed: *Saccharina japonica, Undaria pinnatifid* and *Sargassum fusiforme*

b. Red seaweed: *Porphyra spp., Eucheuma spp., Kappaphycus alvarezii* and *Gracilaria spp*.

c. Green seaweed: *Enteromorpha clathrata, Monostroma nitidium* and *Caulerpa spp*.

In addition, seaweed can be divided into many different types, including *Gelidium, Gelidium, Eucheuma Cottoni, Eucheuma Cottoni, Caulerpa sp,* and *Caulerpa sp.*, as well as *Gracilaria sp.*, can flourish in Indonesian seas (Mulyani, Choiriyah, Sulastri, & Anggraini, 2021). Currently, the global seaweed market is valued more than USD 6 billion annually, and 85% of that market is made up of food goods. Then, nearly 40% of the hydrocolloid market for foods in the world is made up of seaweed-derived extracts such as agar, carrageenan, and alginates. Carrageenan is named after red seaweed found in Carraigin, Ireland that used as gelatin for traditional healing. While, agar and alginates have strong demand in most Asian countries. Agar is mostly made from the seaweed *Gracilaria*, with China leading the world in production with a reported harvest of 2.7 million tons in 2015. Despite having a large domestic market, China also has a sizable international market for alginates, including agar. The two countries that now manufacture and export the most agar are Chile and China. In response to expanding global demand, supplies to the international trade have also increased from Indonesia, Morocco, and Thailand Ferdouse *et al* (2018).

Figure 1.2



Comparison of Total Seaweed Export from Indonesia to All Countries and to China 2014 - 2022(KG)

Source: Badan Pusat Statistik (BPS) or Central Bureau of Statistics Indonesia (processed, 2023)

Leading the seaweed trade, China is the largest seaweed producer (Research and Markets, 2022). Then, Indonesia is the country with high global demand of seaweed-processed (Ferdouse *et al,* 2018) but also with an average export share of around 76% of all Indonesian seaweed exports in raw materials, China is the primary destination nation (Arthatiani, Wardono, Luhur, & Apriliani, 2021) or it can be said that China's is the biggest importer seaweed from Indonesia and Indonesia has exported seaweed with China as main destination according to the data.

The demand for seaweed from the food industry is increasing seeing the data of market share above because of its product efficiency in enhancing dietary value. Then, since trading with China, the primary export market, the price of *Cottonii* seaweed that is the kind of high demand of seaweed, which is primarily exported and used to make carrageenan, which is an additive used to thicken, emulsify, and preserve foods and beverages, has decreased by almost 50%. Seaweed may be able to combat the coronavirus, according to numerous reputable healthcare organizations, including the World Health Organization. This aspect has simultaneously altered consumers' perceptions of seaweed and raised their demand for it.

There are some factors that can be consideration to have an impact on Indonesia's seaweed export to China. Those factors have to be analyzed to find how to improve and maintain export seaweed from Indonesia to China and the challenges of it in international trade between two countries. The steps taken because seaweed as the main commodity in aquaculture Indonesia. This is a justification for conducting research as the factors affecting seaweed exports from Indonesia to China because China as the largest manufacturer of seaweed products and Indonesia as a supplier of raw materials to China.

1.2 Problem formulation

There are a lot of types and benefits of seaweed make a high demand. China and Indonesia have a large total of seaweed trade makes them has a good relationship. Relatively Indonesia's seaweed exports to China contribute quite a lot, although they are still less than other commodities. However, it is a good opportunity for Indonesia to increase the seaweed exports. Therefore, the question for this research is:

1. What are the factors affect seaweed trade between China and Indonesia?
2. How does the factor affect the trade of the seaweed from Indonesia to China?
3. How to improve the export of the seaweed trading between China and Indonesia?

1.3 Research Objective

The objective of this thesis is to know Indonesia's potential of seaweed trade and the reason of it, and the type of seaweed that is high demand to increase the awareness of Indonesia to produce more seaweed. The benefits of seaweed have to be maximized to improve the total trade because it will increase the economy since Indonesia is a maritime country that produce seaweed as much as can if Indonesia itself pay attention to cultivate seaweed. Then, this thesis tries to factors affecting seaweed trade between China and Indonesia and the strategy to improve the seaweed trading and to strengthen the export import as much as other commodities.

1.4 Research Contributions

This research has two major contributions. First, through this research, the researcher provides the information about the factors affecting seaweed export from Indonesia to China because most of the total export of seaweed in Indonesia is exported to China as main destination. Second, the researcher would give information to the following users:

1.Seaweed Exporter in Indonesia

Seaweed exporter is benefitted by this research because this can be the consideration to develop the total export of seaweed from Indonesia to China after seeing the result. The exporter can do better decision making to their product. This information can help the exporter more aware about factors affecting seaweed export to minimize some negative effects that can be happened.

2. Next researchers

This information provides information that can be used for the development of the further research in this study area because in this research, the researcher provided some information about the suitable factors of total export of seaweed and what kind of seaweed that has a high demand from China from authoritative channel such as customs or statistics bureau.

3. Readers

This research can be beneficial for the reader to gain some information about export seaweed as the main commodity of aquaculture.

1.5 Systematic of Writing

This research consists of six chapters. One and the other chapters have different explanations. The six chapter are as follow:

CHAPTER I: INTRODUCTION

This chapter shows the problem, the motivating factor behind it, and a basic summary of the research that includes background information, problem formulations, purpose of research, research contributions, and writing procedures. It also offers an overview of earlier studies in the same subject. The purpose and particular objectives of the research are provided in this chapter.

CHAPTER II: LITERATURE REVIEW

The study of relationships is emphasized in the second chapter and is supported by earlier research studies that used the same theories as the author's references. It consists of a conceptual framework, a theoretical review, conceptual framework, and hypotheses.

CHAPTER III: CURRENT SITUATION OF SEAWEED TRADE BETWEEN CHINA AND INDONESIA

This chapter consists of explaining the current situation of seaweed exports from Indonesia to China. Those are the amount and quantity of the total seaweed export, region in Indonesia that has the highest number of seaweed export to China, and also the product structure.

CHAPTER IV: RESEARCH METHOD

This chapter explains the method used in conducting the research. In this research, the researcher uses quantitative method. This quantitative research uses the secondary data from some sources which aims to understand the export seaweed under study in depth.

CHAPTER V: RESULTS AND DISCUSSION

The research findings would be described and explained in this chapter. It includes some explanation about the factors affecting seaweed export from Indonesia to China.

CHAPTER VI: CONCLUSION AND RECOMMENDATIONS

The last chapter provide the conclusion of the research and the recommendations for further research and recommendations to improve seaweed trading between China and Indonesia.

CHAPTER 2
LITERATURE REVIEW

International trade has an important role in the economics path. It is the process of exchange goods and services such as seaweed. Indonesia as a big country that has a lot of seaweed cultivation land can be one of the largest exporters in the world. China is one of the most importers countries that import seaweed from Indonesia. There are some theories that are related with the research, those are:

2.1 Absolute Advantage (Adam Smith)

Absolute advantage is the capacity of an individual, business, region, or nation to produce more of a good or service per unit of time using the same number of inputs than its rivals, or to produce the same amount of a good or service per unit of time using less inputs. Adam Smith, an economist, introduced the idea of absolute advantage to explain how nations might profit from trade by specializing in producing and exporting the things that they can manufacture more successfully than other nations. Absolute winners can choose to focus on producing and selling a particular commodity or service, and then use the money they make to buy goods and services from other nations. Smith argued that as long as each country has at least one good in which it has a clear competitive edge over other countries, specializing in the products in which they each have an absolute advantage and then selling the goods can benefit all countries. The rationale for why it is advantageous for people, companies, and nations to trade with one another is based on absolute advantage. Each has a distinct edge in manufacturing particular items and services; therefore, the exchange will be advantageous to both parties (Potters, 2023).

In term is Indonesia exports seaweed to China. In addition, there is a simple term in absolute advantage theory by Adam Smith that is free trade exists. Indonesia and China Trade is under the agreement of ASEAN-China Free Trade Area (ACFTA). Indonesia and China have a good relationship especially in term of economy. China as the country with the most populous country in the world and Indonesia as the fourth-largest population in the world, international trade is one way to strengthen the relation between China and Indonesia. One of the most crucial components of the economies of every nation on earth is international trade. Through trade, the economies of the world will converge and form a relationship that favors one nation over another economically (Pamungkas & Hussin, 2022). With the existence of ASEAN-China Free Trade Area (ACFTA) that consists of ASEAN members and China to do trade liberalization makes the relationship between China and Indonesia become stronger. ACFTA intends to reduce or get eliminate of tariffs and barriers, promote investment, and improve

collaboration. The global market industry in China and ASEAN, as well as signs of a quality, price, and quantity war on goods and services, are all connected to the ACFTA. ACFTA has an effect on all parties to the agreement, not just Indonesia (Momenta, 2022). Due to this agreement resulting in several export closures from Indonesia causing some export prices for goods to tend to vary (Ing & Vadila, 2022).

In addition, based on the theory of absolute advantage, Indonesia specializes in producing seaweed as the advantage of maritime country. In 2020, Indonesia exported 168,364 tons of dried seaweed suitable for human consumption to other countries, with China receiving around 83% of the total. A relatively smaller 13,160 tons of dried seaweed that is unfit for human consumption are imported by China, 86% of which comes from Indonesia. Additionally, Indonesia supplied more than 91% of the dried seaweed used for human consumption in China. *Gracilaria* (for Agar) is very consistent in price, although *Cottonii* (a trade name for *Kappaphycus*) has a wide price variation that can range from 5,000 to 25,000 rupiah per kilogram. This makes sense given the increased demand for *Kappaphycus* in China. High price volatility and weekly price changes are common. Prices fluctuate according to what Chinese purchasers are willing to pay, which is related to monthly demand once more (Han, Axmann, & Melani, 2022). According to ARLI (Indonesian Seaweed Association), China is the country which is Indonesia's largest dry seaweed export market where the Chinese people's favorite for consuming seaweed from Indonesia is the main factor in the need for massive imports. The demand for seaweed is increasing in line with the increase in population, and the number of seaweed-based industries growing, as well as the tendency of the world community to return to natural products. Based on UN Comtrade data in 2018, developments in the export value (USD) of Indonesian seaweed over the past five years. It is because in 2016 there was a decrease in the value of exports, and in 2017 there was an increase which contributed to foreign exchange earnings for Indonesia, which was dominated by China. Indonesia earned income based on the largest seaweed export value in 2018 reaching USD 186,949,762 where China is still the largest importer, reaching a total of USD 155,369,987 (Dharmawan & Marhaeni, 2019).

2.2 International Trade Theory

International trade is the term for cross-border economic activity. Consumer goods like food and raw materials are among the commodities that are frequently exchanged. International financial payments, in which the private banking system and the central banks of the trading nations play key roles, promote international trade transactions. International trade and the associated financial transactions are typically carried out to give a nation the commodities it

lacks in exchange for the abundant commodities it produces; these transactions, when combined with other economic policies, tend to raise the standard of living in a given country. The promotion of freer trade between nations has occupied a significant portion of contemporary history of international relations (Robinson, Wonnacott, & Bertrabd, 2023).

There is history of international trade between Indonesia and China. Indonesia and China have been in relations for long time because before Indonesia declared its independence on August 17, 1945, one of the partners of the Indonesian state in economic cooperation is China. While, cooperation between China and Indonesia started to be established on April 13, 1950 (Pamungkas & Hussin, 2022). Then, A memorandum of understanding (MoU) for the development of direct trade relations between China and Indonesia was signed in July 1985 by the China Council for the Promotion of International Trade (CCPIT) and the Indonesian Chamber of Commerce. When the process started, both nations' respective economic reforms were just beginning new phases. Both governments implemented domestic policies that would give the private sector a bigger role, while external policies were focused toward boosting commerce and foreign investment. When considered from this aspect, the formation of direct trade between the two nations in 1985 and the continuing strengthening of their trade relationships could be seen as components of their efforts to integrate their respective economies with the newly developing global economy (Atje & Gaduh, 1999). However, Indonesia has been exporting seaweed since 1960 but seaweed cultivation has only been developed since 1980 in Indonesia (Indonesian Ministry of Trade, 2013). In 2008, China absorbs more than 50% of Indonesia’s seaweed exports (Fitriana, 2012).

The relations between Indonesia and China reached their peak on April 25, 2005 because the Jakarta Declaration of Strategic Partnership was signed. The strategic relationship includes reciprocal cooperation in culture as well as other partnerships, as well as politics and security, the economy and development. The two countries' relations were further improved by this joint statement. For instance, in the economy, the Indonesian government reached the US$30 billion in 2008 trade volume it had aimed for in 2010. In addition, relations between Indonesia and China have been advancing quickly in a number of areas, particularly the economy. The value of trade between Indonesia and China during January through June 2010 was US$19.5 billion, a 66.27% increase over the US$11.72 billion traded during the same period the year before. Such an increase in trade was caused by faster import and export activity between China and Indonesia, which was higher than it was during the same time last year (Sinaga, 2013).

On November 4, 2010, China and Indonesia signed an agreement including ASEAN namely ACFTA (ASEAN-China Free Trade Area). In 2015, specifically the Joko Widodo

administration, have seen no decline in Indonesia's relations with China. Instead, their relationship strengthened. Trade between Indonesia and China reached at $47.2 billion at the start of his administration. The trade, tourist, and investment sectors allocate this value. China is also the largest export destination country for Indonesia (Pamungkas & Hussin, 2022). Furthermore, both China and Indonesia depend heavily on the natural resources found in Indonesia, and Indonesia need the products that China made (Umagapi, 2017).

It is believed that trade relations between Indonesia and China will strengthen and will be marked by an increase in the value of trade between the two countries in the coming years. This belief is in line with business cooperation and a commitment to increase exports and imports of the two countries as well as better investment. In 2021, the total value of Indonesia's trade with China reached more than US$100 billion, an increase of more than 40 percent compared to 2020. Meanwhile, in January-May 2022, the value almost reached US$50 billion, up 27.5 percent compared to the previous period (Dharmasaputra, 2022). On July 26, 2022, the head of Indonesia and China met to develop the new synergy of bilateral relations through the four-pillar cooperation covering politics, economy, people-to-people exchanges, and maritime projects. The two heads of state stated that cooperation is required between them in order to concentrate on growth, organize numerous resources, and collectively provide more uplifting energy. Seaweed is related to the maritime part (Ministry of Foreign Affairs of the People's Republic China, 2022).

2.3 Comparative Advantage Theory

The concept of comparative advantage is most popular according to British economist David Ricardo. Ricardo's theory of comparative advantage explains the advantages of international trade by pointing to the importance of relative opportunity costs in producing products for different markets. In other words, Ricardo looked at how efficiently each country could produce their respective products and how that would benefit the retail market overall. Comparative advantage is commonly used in international trade to quantify the advantage of importing or exporting a product from a particular country. Again, this does not necessarily mean that the most efficient countries will always lead. If a country is the top producer of multiple products, the theory of comparative advantage suggests that country should concentrate on the most advantageous product. Other countries can take over the production of other products, freeing up time and manpower. Comparative advantage benefits all market participants, both through the availability of the best possible quality and price goods, and through the ability for countries to focus their resources on the products that deliver the best

results. According to this theory, comparative advantage can be used to facilitate international trade and support import-export models. Factors that play a major role in comparative advantage theory are labor, raw materials, geographic location, productivity, technology, product innovation, traditions, culture, and preferences (Vaidya, 2023).

Comparative advantage theory relies heavily on international trade. It assumes that different countries trade with each other. Certain countries will therefore have a comparative advantage over others in certain commodities. Of course, this depends entirely on the country's resources. Suppose country A has a large timber industry when trading between countries. Country B has a large mineral industry and needs wood. Country B can also produce wood on its own, but it may be more profitable to produce more minerals. Then you will be able to trade with country A. However, modern comparative advantage has come a long way. There are many companies based in many countries. Therefore, today's companies have a comparative advantage over the country. International trade is still necessary, but the model is much more complex. There are a number of different advantages that a comparative advantage provides. Those are lower opportunity costs mean higher profit margins. That is the biggest advantage. Firms that are able to focus manpower, capital and resources for production that requires lower opportunity costs enable higher profits. The second is improved efficiency. If the country can focus on products that it can produce more efficiently and get less efficient products from other trading partners. The third is competitive advantage leads to other advantages as well. When a company has a comparative advantage, it often gains a competitive advantage as well (Amadeo , 2022).

2.4 Demand Theory

Demand theory refers to a theory that studies the relationship between the demand for consumer goods and their prices. It is the premise of the demand curve that establishes the relationship between the quantity demanded and the price of a product. With more supply of a product or service, its demand decreases with the equilibrium price. Sometimes consumer demand for a product or service is influenced by many factors other than price. This phenomenon known as demand shift causes the demand curve to shift left or right depending on the change in preferences, income, preferences, etc. consumers. For example, as income increases, a person will have more money to buy goods and services available in the market, regardless of whether prices fall or not, which will shift the demand curve to the right (Gordon, 2023).

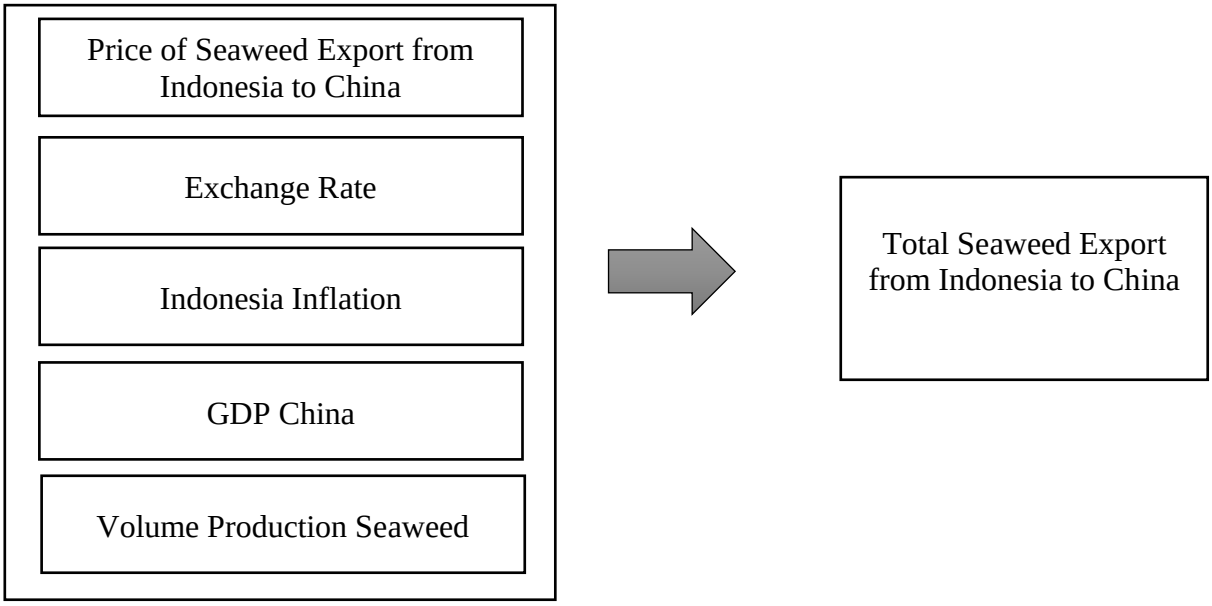
The law of demand introduces an inverse relationship between price and demand for goods or services. It simply shows that, all other factors held constant, demand for a commodity decreases as the price increases. Also, when prices go down, demand goes up. This relationship can be graphed using a tool called the demand curve. The demand curve has a negative slope because it falls from left to right, reflecting the inverse relationship between the price of an item and the quantity demanded over a period of time. Demand increases or decreases due to income and substitution effects. Even if the price of a good falls, individuals can achieve the same level of satisfaction with less effort if it is a regular good. In this case, consumers can buy more products with a given budget. This is the income effect. The substitution effect is observed when consumers switch from a more expensive product to a cheaper alternative. The more people buy a product at a lower price, the higher the demand. Consumers may purchase goods and services more or less based on factors other than price. This is called a change in demand. For example, a consumer who earns more at work will have more disposable income to spend on market goods, shifting the demand curve to the right, regardless of whether prices fall (Hayes, 2020).

2.5 Conceptual Framework

In the theoretical review and introduction has been explained what is the main problem. In this conceptual framework, the researcher want to consistent with the research problem that is some factors affecting seaweed export from Indonesia to China in economics such as price of seaweed export, exchange rate rupiah towards US$, Indonesia inflation, GDP China, and volume production seaweed. Then, the research want to know how the effect of those factors influenced to total seaweed export from Indonesia to China.

In figure 2.1, it described that there are some factors related to the Total Seaweed Export from Indonesia to China suspected to have impacts. Those factors that are suspected are price of seaweed from Indonesia to China, Exchange Rate, Indonesia Inflation, GDP China, and Volume Production Seaweed. Then, this research also will find how those factors influenced total seaweed export from Indonesia to China that has negative or positive effect or even no effect. Some hypothesis will be made towards this situation.

Figure 2.1



Conceptual Framework

2.5 Hypothesis

According to Cambrige Dictionary, hypothesis is an argument or explanation for something that relies on proven facts but not yet supported by evidence. Based on the title, the researcher has some hypothesis such as:

1. Price has a positive effect on total seaweed export from Indonesia to China.
2. Exchange rate has a positive effect on total seaweed export from Indonesia to China.
3. Indonesia inflation has a negative effect on total seaweed export from Indonesia to China.
4. GDP China has a positive effect on total seaweed export from Indonesia to China.
5. Volume Production has a positive effect on total seaweed export from Indonesia to China.

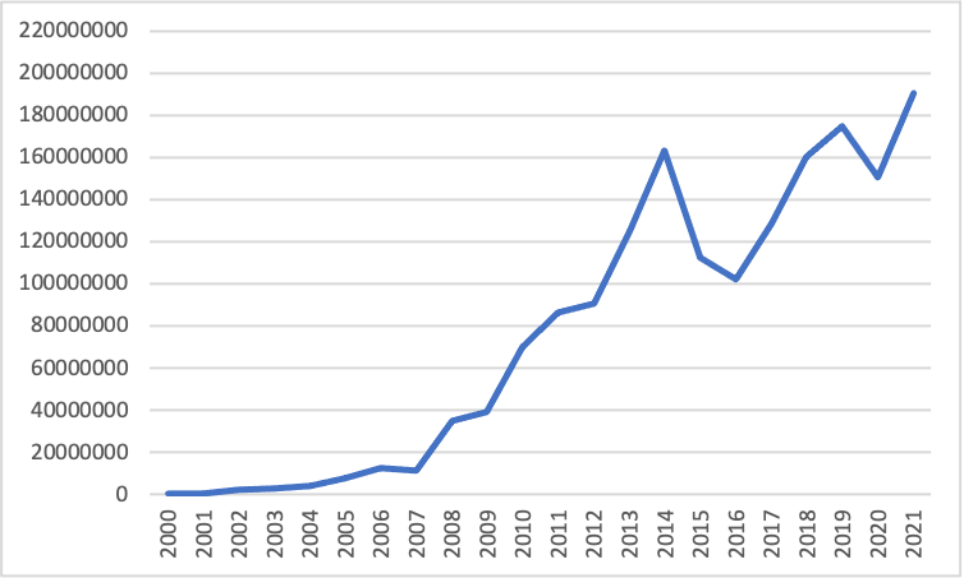
CHAPTER III
CURRENT SITUATION OF SEAWEED TRADE BETWEEN CHINA AND INDONESIA

Indonesia as maritime country has a lot of benefit in term of aquaculture commodity especially seaweed. This opportunity must be utilized in order to further develop seaweed exports. Then, China is Indonesia's largest importer of seaweed exports. In this chapter, it will be explained some of the current situation in Indonesia related to Indonesian seaweed exports to China.

3.1 The Amount of Seaweed Export from Indonesia to China

China is the main destination of seaweed export from Indonesia. However, it is the main destination, it does not make the value of exports always increase because it will definitely be influenced by several factors. The figure below is data that has been collected through the UN Comtrade trusted data website from 2000 to 2021.

Figure 3.1



The Amount of Seaweed Export from Indonesia to China (Value in US$)

Source: UN Comtrade (processed, 2023)

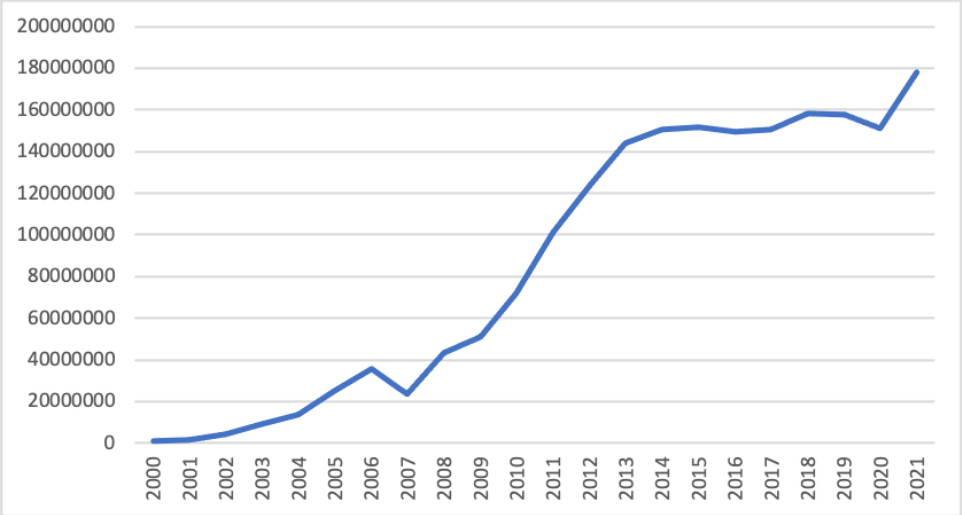
It can be seen within 22 years from 2000 to 2021 based on figure 3.1, the value of the exports always increases but in 2015, 2016 and 2020 there has been a decrease in the value of exports. In 2014, the value of seaweed export has been in 163,012,709 US$ then decline in 2015, in the amount of 112,525,627 US$ where it has high differences compare to before 2014 which the export seaweed always increases. This is the effect of national economic downturn which is not only in aquaculture sector but also other sectors. However, in 2017, the value of seaweed

exports has slowly increased again with a total amount of 128,538,996 US$. It always increases until 2019, then 2020, the value of export decline. This happened because of adaptation to the COVID-19 pandemic which made seaweed prices fall. This decline could occur because of the declining price of seaweed exports from Indonesia to China, even though total seaweed exports did not decrease.

3.2 The Quantity of Seaweed Export from Indonesia to China

It has been explained before that the value of seaweed export decline does not mean the total seaweed export did not decrease. Based UN Comtrade, the total seaweed export has no significant decline where the value of seaweed export is ups and down. There is similarity between the value and the quantity seaweed export from Indonesia to China that is in 2020, it decreases because the adaption to pandemic.

Figure 3.2



Total Seaweed Export from Indonesia to China (Value in US$)

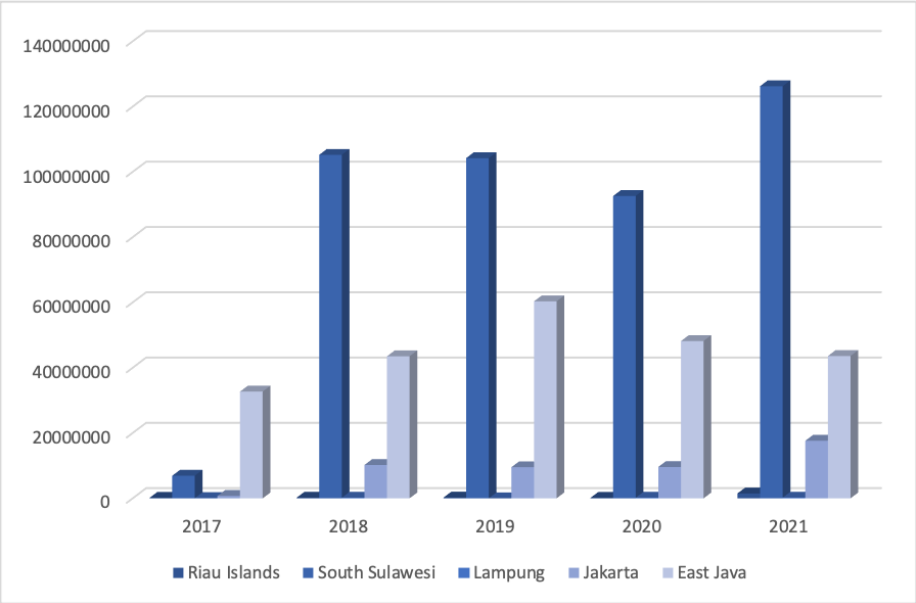
Source: UN Comtrade (processed, 2023)

However, in 2021, the total seaweed export increase again from 151,211,229 kg in 2020 to 178,025,616. Where in 2007, the decreasing of the seaweed prices affected the total export seaweed. The high demand of seaweed makes the quantity of the export always increase. This condition proves the importance of seaweed raw materials from Indonesia to China. It has also been proven that in 22 years, a significant decrease in total seaweed exports has only occurred in 2 years.

3.3 The Region in Indonesia That Export Seaweed to China

Seaweed is produced by almost all provinces in Indonesia, but for export mostly carried out by exporters in the provinces of Riau Islands, Lampung, Jakarta, East Java, and South Sulawesi within five years from 2017 to 2021.

Figure 3.3



	2017	2018	2019	2020	2021
Riau Islands	176188.42	189103.8	245590.18	150920	1502474.9
South Sulawesi	6922567.03	105214518	104216069.9	92618963	126256782.3
Lampung	79528.9	194508.4	8572	219605.5	220204.5
Jakarta	746004.6	10222942	9537756.79	9609928.45	17650652.77
East Java	32705587.4	43523740.3	60335917.46	48184408.05	43607542.56

Indonesia Seaweed Exports to China based on Geographic Position (Value in US$)

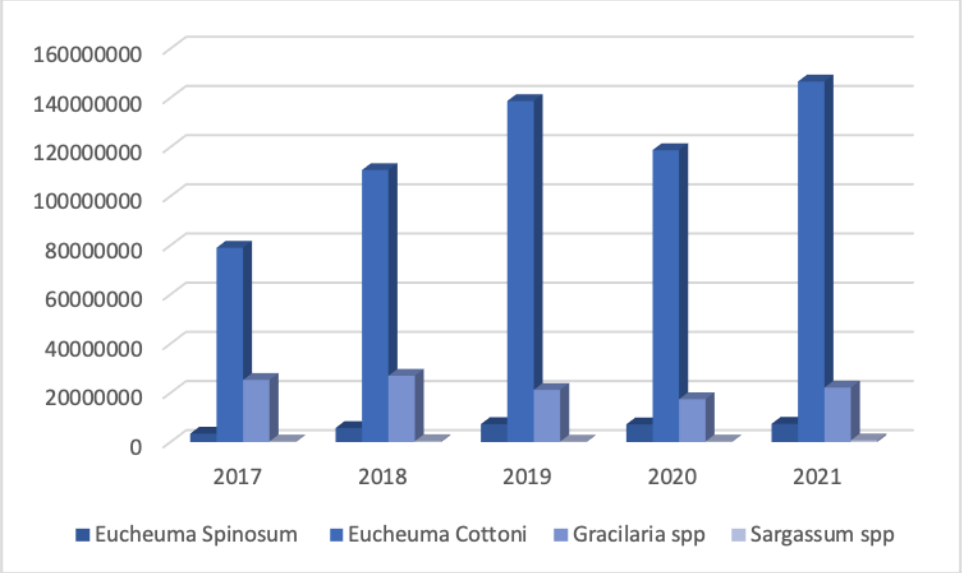
Source: Badan Pusat Statistik Indonesia or Indonesian Central Bureau of Statistics (processed, 2023)

The data shows South Sulawesi and East Java is the highest province of the export seaweed to China. The development of Indonesian seaweed exports during the 2017-2021 period shows positive value from those five provinces in Indonesia. In 2018, South Sulawesi can increase the value of export to China from 6,922,567.03 US$ in 2017 to 105,214,517.9 US$ while East Java has more stable condition. The largest trading port in Indonesia which makes these five regions have a high total export value because they are supported by adequate facilities. In addition, Riau and Lampung have a higher total export value than other regions in Indonesia, they have not been able to offset the total value of seaweed exports, such as Jakarta, South Sulawesi and East Java.

3.4 Type of Seaweed Export from Indonesia to China

Indonesia exports seaweed in two types such as raw materials and seaweed-processed. Raw materials of seaweed are wet seaweed consisting of various types of seaweed in Indonesia which have high demand. Indonesia is well-known for its production of *Eucheuma Cottoni* seaweed, but there are also 3 other types of seaweed that have the highest export value among other seaweeds. Those are *Eucheuma Spinosum, Gracilaria spp,* and *Sargassum spp.*

Figure 3.4



	Eucheuma Spinosum	*Eucheuma Cottoni*	*Gracilaria spp*	*Sargassum spp*
2017	3434432.77	79057873.8	25308065.72	270624.72
2018	5757932.26	110667763.8	26965313.02	400675.15
2019	7331000.04	138732667.9	21230683.37	222953.74
2020	7205268.48	118758034.2	17472311.62	252917.75
2021	7453948.65	146701475.9	22201117.36	720940.81

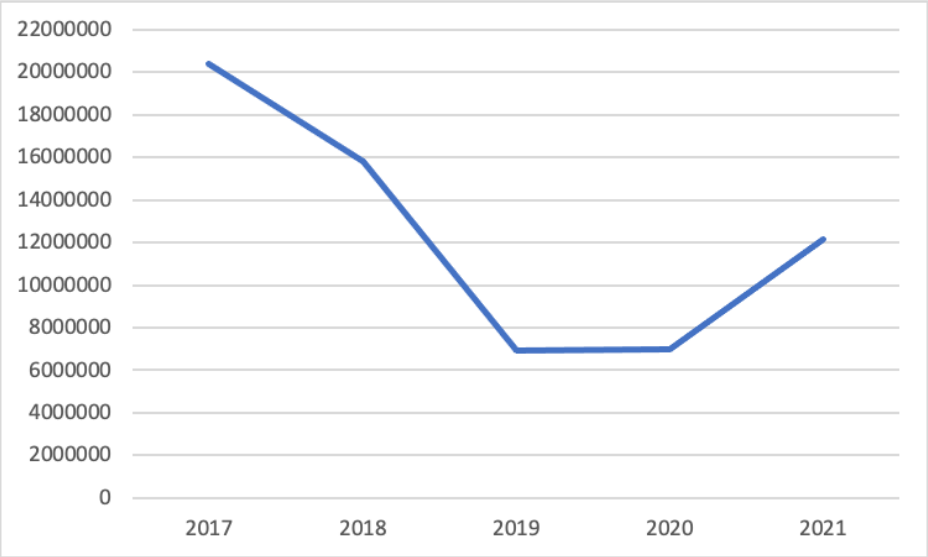
Raw Material Seaweed Exports from Indonesia to China (Value in US$)

Source: Badan Pusat Statistik Indonesia or Indonesian Central Bureau of Statistics (processed, 2023)

It can be seen from figure 3.4 that *Eucheuma Cottoni* is the highest of seaweed export from Indonesia to China within five years from 2017 to 2021. It always increases from 2017 to 2019 and decrease in 2020 in the adaption of pandemic and raise again in 2021. Meanwhile, the second is *Gracilaria spp.* and it has stable condition. In term of *Sargassum spp.*, it has highest value among other types of seaweed but it cannot be balance with *Eucheuma Cottoni*, *Eucheuma Spinosum*, and *Gracilaria spp*, This condition has to be consideration of improving each type of seaweed so there is no a huge differences between one of seaweed value to others.

Apart from exporting raw materials seaweed, Indonesia also exports processed seaweed, although it has not been able to export large amounts of value due to a lack of knowledge among seaweed farmers. This can be seen from the figure below.

Figure 3.5

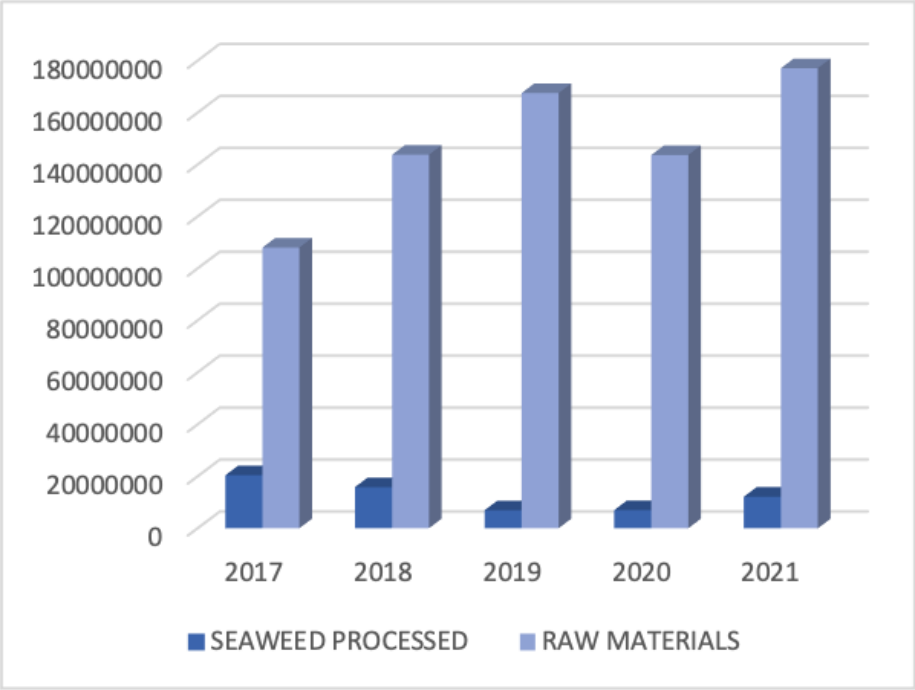


Seaweed-Processed Exports from Indonesia to China (Value in US$)

Source: Badan Pusat Statistik Indonesia or Indonesian Central Bureau of Statistics (processed, 2023)

Within 5 years, from 2017 to 2020, the value of seaweed-processed always decreases and increases in 2021. The lack of knowledge of farmers makes seaweed-processed exports continue to decline but there will also be progress in 2021. The high demand for seaweed exports in the form raw materials also make a significant difference between the export value of seaweed in the terms of raw materials and processed. It shows by the figure below.

Figure 3.6



Comparison of Total Raw Material Seaweed and Seaweed-Processed from Indonesia to China (Value in US$)

Source: Badan Pusat Statistik Indonesia or Indonesian Central Bureau of Statistics (processed, 2023)

Figure 3.6 shows that seaweed exports to China are still dominated by raw materials rather than processed seaweed. Indonesia must maximize the opportunity to export more seaweed-processed and accompanied by increasing raw materials.

CHAPTER IV
RESEARCH METHOD

4.1 Research Design

This research uses the quantitative method using secondary data. The purpose of using secondary data is to use an appropriate statistical test technique to obtain the required information from data released by a certain competent agency or institution then be processed in a systematic and objective and to know the data of seaweed export from Indonesia to China as the main destination from 2000 to 2021.

Quantitative methods according to Babbie (2010) focus on measuring and the statistical, mathematical, or numerical analysis of data gathered through surveys, polls, and other types of research, as well as the manipulation of statistical data that has already been obtained using computing methods. Quantitative research also focuses on collecting numerical data and using it to understand a specific phenomenon or generalize across groups of people.

By this method, the author can collect and analyze numerical data to find and measure factors affecting seaweed export from Indonesia to China.

4.2 Data Source

Data source is the subject from the data that can be obtained. According to Surendran (2023) mentioned that quantitative data is information that is represented as counts or numbers, each of which has a specific numerical value. Data is any quantifiable information that may be used by academics for statistical analysis and mathematical computations so that they can obtain practical conclusions.

In this research, author has main data released from BPS Indonesia (*Badan Pusat Statistik Indonesia* or Indonesian Central Bureau of Statistics) and UN COMTRADE. BPS Indonesia is a non-departmental government institute of Indonesia that is responsible for conducting statistical survey, while UN COMTRADE is the largest depository of international trade data. There is also written data that has been search and got from the literary data such as library research, thesis and dissertations, book reference, internet reference, company website, document materials, and other relevant data to the research orientation.

4.3 Collecting Data Method

Data collection is important because it is the systematic process of gathering observations or measuring in research with several reasons such as objectivity, generalizability, precision, hypothesis testing, and comparison. In quantitative, data collection methods could be done by observations and document review.

1. Data Analytics

   Data analytics is extracting valuable insights process from quantitative data. After knowing the quantitative data, the author has to make sure of the numbers and extract relevant information that can lead to better business decision-making. Quantitative data sets are examined by data analysts to identify trends and make implications about the information they contain.

2. Document review

   After reviewing the latest papers, document review is a technique used to gather data. Due to the accessibility of the documents, it is an efficient and effective method of data collection. Those who serve as a useful resource for obtaining accurate information. Document review has become one of the useful techniques for gathering quantitative research data, in addition to strengthening and supporting the research by offering further research data. Public records and physical evidence are the type of primary document to be analyzed for supporting quantitative research data.

4.4 Operational Variable Definition

Operational variable refers to define and measure a specific variable as it is used in the research. Each operational variable definition in this research such as:

Table 4.1

No.	Variable	Category	Operational Definition	Period	Unit
1	Export Total Seaweed	Dependent (Y)	The total value of export from Indonesia to China	Data period 2000-2021 from UN Comtrade	Tons
2	Price	Independent (X1)	Price of seaweed export from Indonesia to China (value	Data period 2000-2021 from UN Comtrade	USD$

			export divided to total export)		
3	Exchange Rate (ER)	Independent (X2)	Indonesia's currency in USD	Data period from 2000 to 2021 from BPS Indonesia (*Badan Pusat Statistik Indonesia* or Indonesian Central Bureau of Statistics)	Rupiah (Rp) or American Dollar (USD)
4	Inflation	Independent (X3)	Indonesia inflation	Data period from 2000 to 2021 from BPS Indonesia (*Badan Pusat Statistik Indonesia* or Indonesian Central Bureau of Statistics)	Percentage
5	GDP China	Independent (X4)	GDP China as an importer of seaweed Indonesia	Data period from 2000 to 2021 from World Bank	USD$ Millions
6	Volume Production	Independent (X5)	Volume production of seaweed in Indonesia	Data period from 2000 to 2021 from KKP Indonesia (Marine and Fisheries Ministry)	Tons

Operational Variable Definition

4.5 Analysis Method

Analysis method can be done if the data has been collected. The analysis methods which are used in this research are classic assumption test that consists of three test, multiple linear regression, hypothesis test that consists of two test, and coefficient of determination test. In this research, it will be done multiple linear regression. It will analyze some factors of economics that suspected of influencing total seaweed export from Indonesia to China. Those factors are price seaweed export from Indonesia to China, exchange rate, Indonesia inflation, GDP China, and volume production seaweed in Indonesia. Those methods are used to analyze the factors affecting seaweed export from Indonesia to China with help of IBM SPSS 25 software.

4.5.1 Classic Assumption Test

Classical assumption can meet BLUE criteria (Best Linear Unbiased Estimator). It also determines to significant relation of each independent variables' relationship with the dependent variables. This classic assumption will be tested using normality test, heteroscedasticity test, and autocorrelation test.

4.5.1.1 Normality Test

Normality test in the variable factors affecting total seaweed to all countries and total seaweed export from Indonesia to China in tons and million USD. The test uses the Kolmogorov-Smirnov (K-S) statistics so variables being normal when the residual Sig. value is at least 0.05 (Widarjono, 2013).

4.5.1.2 Multicollinearity Test

Multicollinearity test has to be tested to know the relation between independent variable. To do regression test, it has no multicollinearity. It is non-existent if the Varian Inflation Factor (VIF) is less than 10 and tolerance level is more than 0.10 (Amalia, 2018).

4.5.1.3 Heteroscedasticity Test

In good regression, there is no indication of heteroscedasticity. It can be done by the observation through Rank Spearman test. Heteroscedasticity will not exist if the Sig. value of the variable is more than 0.05. This test has the reason of looking at the level of strength of the relationship between two variables with seeing whether the relationships is significant or not.

4.5.1.4 Autocorrelation Test

In autocorrelation test, the data should not have the correlation among them since it is a time series data. To know the autocorrelation test, Run Test can be used in the hypothesis:

Ho: there is no autocorrelation

Ha: there is autocorrelation

It can be done with the compare the value of significant level. If the value of Asymp. Sig. (2-tailed) < α (0.05) so Ha or there is autocorrelation. Furthermore, if the value of the Asymp. Sig. (2-tailed) > α so Ho or there is no autocorrelation.

However, if there is autocorrelation in run test, then it can be using Breusch-Godfrey to detect the heteroscedasticity with degree 2. If there is no autocorrelation in run test, then Breusch-Godfrey is no need to be tested. The basis of decision making of Breusch-Godfrey is if residual degree 2 shows the prob. Sig. 0.000.

4.5.2 Multiple Linear Regression

Multiple linear regression analyzes data how multiple independent variables affect one dependent variable. In this research, multiple linear regression has three steps of analysis.

4.5.3 Hypothesis Test

4.5.3.1 T Test

In statistical t test, testing is done individually. Then, to find out the independent variables affect the dependent variable individually, a statistical t test is needed and Sig. The hypothesis is:

Ho: the independent variable has no effect on the dependent variable.

Ha: the independent variable affects the dependent variable.

The results of this test,

- If the value t < t table, then it fails to reject Ho. This means that the independent variable has no effect on the dependent variable. Meanwhile, if the value of t > t table, then Ho is rejected.
- If the result of Sig. < 0.05 so the Ho is significant and Sig. is $0.05 < \alpha < 0.1$ has a low significant while Sig > 0.1 is not significant.

This means that the independent variables affect the dependent variable. This is the formula to find t table:

T table = (α/2 ; n-k-1 or df residual)

4.5.3.2 F Test

To find out whether the independent variables affect the dependent variable. The F test is carried out by testing the hypothesis, where:

Ho: price seaweed export from China to Indonesia, exchange rate, inflation, GDP China, and volume production have no effect to the total export of seaweed.

Ha: price seaweed export from China to Indonesia, exchange rate, inflation, GDP China, and volume production have effect to the total export of seaweed.

The results of this test, if the F value < F table, then it fails to reject Ho. This means that the independent variables together have no effect on the dependent variable. Meanwhile, if F value > F table, then Ho is rejected. Also, it is using Sig. by seeing the result that is if Sig. < 0.05, it

means significant and vice versa. This means that the independent variables jointly affect the dependent variable. The formula to find F table is:

F table = (k; n-k)

4.5. 4 Coefficient of Determination Test

In this test, the coefficient test aims to find out how good the regression model is and measure the independent variables influence the dependent variable. The coefficient of determination is indicated by the R-Squared number, a good regression model is closer to 1.

CHAPTER V
RESULT AND DISCUSSION

5.1 Description of Research Data

In this research, it will be showed the result of the research according to the method that has been used. There are six data variables that have been obtained for research such as total export seaweed from Indonesia to China, price of seaweed per kilogram, exchange rate, inflation in Indonesia, GDP China, and volume of seaweed production. Those data have been collected from 2000-2021 from accurate and reliable sources such as UN Comtrade, World Bank, BPS Indonesia (*Badan Pusat Statistik Indonesia* or Indonesian Central Bureau of Statistics), and KKP Indonesia (Marine and Fisheries Ministry). The result will be described by normality test, multicollinearity test, heteroscedasticity test, autocorrelation test, T test, F test, and coefficient and determination test using software IBM SPSS 26.

Table 5.1

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Total Seaweed Export to China (Tons)	22	1211.62	178025.62	86273.14	65590.30
Price of seaweed export to China per kilogram	22	.28	1.11	.70	.29
Exchange Rate	22	8465	14481	11145.55	2181.49
Inflation in Indonesia	22	1.68	17.11	6.2068	4.01595
GDP China (US$ millions)	22	1211346.87	17734062.70	7424549.63	5197642.50
Volume Production of Seaweed in Indonesia (Tons)	22	246923	11269342	5196447.10	4422507.67
Valid N (listwise)	22				

Source: IBM SPSS 26 (processed, 2023)

In table 4.1 showed that the total of observation in seaweed export from Indonesia to China is 22 years from 2000-2021. In those analysis, it can be got some result that are:

1. Mean of total seaweed export to China is 86,273.14 tons with the highest amount of export is 178,025.62 tons in 2021 and minimum amount is 1,211.62 tons in 2000.
2. The average of price of seaweed export from Indonesia to China is 0.70 ($/kg) with the highest price is 1.11 ($/kg) in 2019 and the lowest price is 0.28 ($/kg) in 2000 and 2001.
3. The average of the exchange rate of rupiah towards dollar is Rp11,145.55 with the highest amount is Rp14,481 in 2018 and the lowest is Rp8465 in 2003.
4. The average of GDP China is 7,424,549.63 million US$ with the highest amount is 17,734,062.65 million US$ in 2021 and the lowest is 1,211,346.87 million US$ in 2000.
5. The average of volume production seaweed in Indonesia is 5,196,447.10 tons with the highest of volume production is 11,269,342 tons in 2014 and the lowest is 246,923 tons in 2001.

5.2 Result of Research

In this research, there is the processes of multiple linear regression. It is how the factors affecting total seaweed export from Indonesia to China. The result of the research and the description of the statistical analysis using some analysis method, those are:

1.A Normality Test

To decide that the data is normal or not, Asymp. Sig. (2-tailed) has to be > 0.05 in Kolmogorov Smirnov test. It can be seen from Asymp. Sig. (2-tailed) below that is 0.200 > 0.05. It means six variables that has been collected in regression has normal distribution.

Table 5.2

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual (2)
N		22
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	7007.26523281
Most Extreme Differences	Absolute	.136
	Positive	.136
	Negative	-.103
Test Statistic		.136
Asymp. Sig. (2-tailed)		.200[c,d]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

Normality Test Result

Source: IBM SPSS 26 (processed, 2023)

1.B Multicollinearity Test

In this research, variable price of seaweed export to China per kilogram (X1) has Tolerance 0.212 and VIF 4.714. It means that there is no multicollinearity in regression model because the value Tolerance 0.212 > 0.10 and VIF 4.714 < 10.00. The second variable is exchange rate (X2) has Tolerance value 0.112 and VIF 8.917. In this variable, multicollinearity is not happened because of the tolerance value 0.112 > 0.10 and VIF value 8.917 < 10.00. The third variable is inflation in Indonesia (X3) with Tolerance value is 0.398 and VIF 2.512. Then, I this variable, there is no multicollinearity because Tolerance value 0.398 > 0.10 and VIF value 2.512 < 10.00. Then, variable of volume production of seaweed in Indonesia (X5) has Tolerance value 0.121 and VIF value 8.287. It means there is no multicollinearity in this variable because of Tolerance value 0.121 > 0.10 and VIF value 8.287 < 10.00.

However, in variable GDP China (X4) has multicollinearity because Tolerance value 0.045 < 0.10 and VIF value 22.296 > 10.00. In multicollinearity test, there is no problem if continue to use regression model even though there are still multicollinearity problems. It is

not cured because it still produces a BLUE estimator because BLUE estimator problem does not require the assumption that there is no correlation between independent variables.

Table 5.3

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	64854.589	20540.181		3.157	.006		
	Price of seaweed export to China per kilogram	-7495.133	13081.554	-.033	-.573	.575	.212	4.714
	Exchange Rate	-8.682	2.398	-.289	-3.621	.002	.112	8.917
	Inflation in Indonesia	1258.059	691.346	.077	1.820	.088	.398	2.512
	GDP China (US$ millions)	.009	.002	.695	5.510	.000	.045	22.296
	Volume Production of Seaweed in Indonesia (Tons)	.010	.001	.656	8.529	.000	.121	8.287

a. Dependent Variable: Total Seaweed Export to China (Tons)

Multicollinearity Test Result

Source: IBM SPSS 26 (processed, 2023)

1. C Heteroscedasticity Test

In term of decision making of Rank Spearman test, from the output below, it can be seen that Sig. (2-tailed) on the variable price of seaweed export to China per kilogram is 0.738, the variable exchange rate is 0.926, the variable inflation Indonesia is 0.899, the variable GDP China is 0.970, and the variable volume production of seaweed in Indonesia is 0.950. Those variables have Sig. (2-tailed) > 0.05 which means there is no heteroscedasticity.

Table 5.4

Correlations

			Unstandardized Residual (2)	Price of seaweed export to China per kilogram	Exchange Rate	Inflation in Indonesia	GDP China (US$ millions)	Volume Production of Seaweed in Indonesia (Tons)
Spearman's rho	Unstandardized Residual (2)	Correlation Coefficient	1.000	-.076	.021	.029	.008	.014
		Sig. (2-tailed)	.	.738	.926	.899	.970	.950
		N	22	22	22	22	22	22
	Price of seaweed export to China per kilogram	Correlation Coefficient	-.076	1.000	.571**	-.541**	.850**	.775**
		Sig. (2-tailed)	.738	.	.006	.009	.000	.000
		N	22	22	22	22	22	22
	Exchange Rate	Correlation Coefficient	.021	.571**	1.000	-.437*	.789**	.712**
		Sig. (2-tailed)	.926	.006	.	.042	.000	.000
		N	22	22	22	22	22	22
	Inflation in Indonesia	Correlation Coefficient	.029	-.541**	-.437*	1.000	-.755**	-.601**
		Sig. (2-tailed)	.899	.009	.042	.	.000	.003
		N	22	22	22	22	22	22
	GDP China (US$ millions)	Correlation Coefficient	.008	.850**	.789**	-.755**	1.000	.905**
		Sig. (2-tailed)	.970	.000	.000	.000	.	.000
		N	22	22	22	22	22	22
	Volume Production of Seaweed in Indonesia (Tons)	Correlation Coefficient	.014	.775**	.712**	-.601**	.905**	1.000
		Sig. (2-tailed)	.950	.000	.000	.003	.000	.
		N	22	22	22	22	22	22

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Heteroscedasticity Test Result

Source: IBM SPSS 26 (processed, 2023)

1. D Autocorrelation Test

According to the SPSS output in runs test, it can be known that the value of Asymp. Sig. (2-tailed) is 0.275 > 0.05 so there is no autocorrelation in this regression model which means

Ho is accepted. In this second step of multiple linear regression, it uses runs test because 1-degree is enough to prove that there is autocorrelation in this regression model.

Table 5.5

Runs Test

	Unstandardized Residual (2)
Test Value[a]	-1179.04767
Cases < Test Value	11
Cases >= Test Value	11
Total Cases	22
Number of Runs	15
Z	1.092
Asymp. Sig. (2-tailed)	.275

a. Median

Autocorrelation Test Result

Source: IBM SPSS 26 (processed, 2023)

5.2.1 Hypothesis Test

1.E T test

From the table output 5.6, it shows that there are 3 factors that has significant effect on total seaweed export because Sig. < 0.05 that are exchange rate is 0.002, GDP China is 0.000, and volume production of seaweed in Indonesia is 0.000. Inflation has also significant because 0.05 < 0.088 < 0.1 but not as strong as three factors before. In addition, price of seaweed export to China per kilogram has no significant effect because Sig. > 0.1 with the result 0.575.

Table 5.6

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	64854.589	20540.181		3.157	.006		
	Price of seaweed export to China per kilogram	-7495.133	13081.554	-.033	-.573	.575	.212	4.714
	Exchange Rate	-8.682	2.398	-.289	-3.621	.002	.112	8.917
	Inflation in Indonesia	1258.059	691.346	.077	1.820	.088	.398	2.512

	GDP China (US$ millions)	.009	.002	.695	5.510	.000	.045	22.296
	Volume Production of Seaweed in Indonesia (Tons)	.010	.001	.656	8.529	.000	.121	8.287

a. Dependent Variable: Total Seaweed Export to China (Tons)

T Test Result

Source: IBM SPSS 26 (processed, 2023)

In this research, the basis of decision making is also using the value of t with the comparison of t table that is 2.120 or -2.120. This t table is from:

T table = (α/2; n-k-1 or df residual)

T table = (0,025; 16) => using df residual

T table = 2.120 or -2.120 (from distribution t table)

According to output table SPSS in Coeffients, the results are:

- Variable Price of Seaweed to China per Kilogram (X1)

  Ho = t < t table (2.120 or -2.120)

  Ha = t > t table (2.120 or -2.120)

The value of t-statistic in variable of price of seaweed export to China per kilogram (X1) is -0.573. It can be decided that Ho is accepted and Ha is rejected because the value of t-statistic -0.573 < t-table 2.120. It means price of seaweed export to China per kilogram (X1) has no significant effect on total export seaweed to China (Y).

- Variable Exchange Rate (X2)

  Ho = t < t table (2.120 or -2.120)

  Ha = t > t table (2.120 or -2.120)

The value of t-statistic in variable of price of seaweed export to China per kilogram (X1) is -3.621. It can be decided that Ho is accepted and Ha is rejected because the value of t-statistic -3.621 < t-table 2.120. It means exchange rate (X2) has negative effect on total export seaweed to China (Y).

- Variable Inflation in Indonesia (X3)

In the variable of inflation in Indonesia (X3) is using $\alpha = 0.1$ so the calculation of t is:

T table = (α/2; n-k-1 or df residual)

T table = (0,05; 16) => using df residual

T table = 1.746 or -1.746 (from distribution t table)

After getting the calculation of $\alpha = 0.1$ so:

Ho = t < t table (1.746 or -1.746)

Ha = t > t table (1.746 or -1.746)

The value of t-statistic in variable inflation in Indonesia (X3) is 1.820. It can be decided that Ho is rejected and Ha is accepted because the value of t-statistic 1.820 > 1.746. It means inflation in Indonesia (X3) has a positive effect on total export seaweed to China (Y).

- Variable GDP China (X4)

  Ho = t < t table (2.120 or -2.120)

  Ha = t > t table (2.120 or -2.120)

The value of t-statistic in variable GDP China (X4) is 5.510. It can be decided that Ho is rejected and Ha is accepted because the value of t-statistic 5.510 > t-table 2.131. It means GDP China has a positive effect on total export seaweed to China (Y).

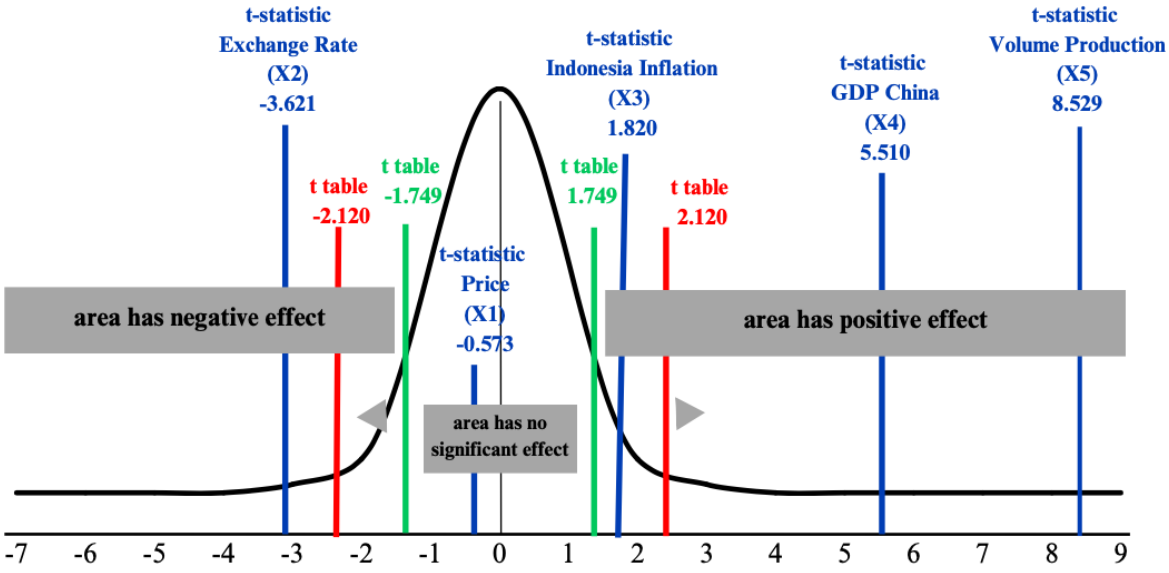
- Variable Volume Production Seaweed in Indonesia (X5)

  Ho = t < t table (2.120 or -2.120)

  Ha = t > t table (2.120 or -2.120)

The value of t-statistic in variable volume production seaweed in Indonesia (X5) is 8.529. It can be decided that Ho is rejected and Ha is accepted because the value of t-statistic 8.529 > t-table 2.120. It means volume production seaweed in Indonesia has positive effect on total export seaweed to China (Y).

Figure 5.1



The Result Of Multiple Linear Regression

1.F F test

The variable of price seaweed export from China to Indonesia (X1) is not included in this hypothesis f test because price seaweed export from China to Indonesia (X1) has no significant effect in hypothesis t test. According to the output table, Sig. is < 0.05 which means the f value is significant and the value of f is 360.630. It means Ho is rejected because the value of f 360.630 > f-table 2.96. This number is from:

F table = (k; n-k)

F table = (4; 17)

F table = 2.96 (from distribution f table)

It can be concluded that exchange rate (X2), inflation (X3), GDP China (X4), and volume production (X5) have significant effect simultaneously to the total export of seaweed (Y).

Table 5.7

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	89291535639.785	4	22322883909.946	360.630	.000[b]
	Residual	1052293224.794	17	61899601.458		
	Total	90343828864.579	21			

a. Dependent Variable: Total Seaweed Export to China (Tons)

b. Predictors: (Constant), Volume Production of Seaweed in Indonesia (Tons), Inflation in Indonesia, Exchange Rate, GDP China (US$ millions)

F Test Result

Source: IBM SPSS 26 (processed, 2023)

1. G Coefficient Determination Test

According to output table SPSS, it can be known that the value of coefficient determination or R square is 0.988 or 98.8%. It means that variable exchange rate (X2), inflation (X3), GDP China (X4), and volume production (X5) simultaneously have effect on total export seaweed from Indonesia to China in the amount of 98.8%. Meanwhile, 1.2% (100%-98.8% = 1.2%) is influenced by other variable in outside the regression equation or other variables that is not examined. The effect of those four variables is strong because the value of R square is near 1. And price seaweed export from China to Indonesia (X1) is also not included in this test because of price seaweed export from China to Indonesia (X1) has no significant effect on the hypothesis t test.

Table 5.8

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.994[a]	.988	.986	7867.629977

a. Predictors: (Constant), Volume Production of Seaweed in Indonesia (Tons), Inflation in Indonesia, Exchange Rate, GDP China (US$ millions)

Coefficient Determination Test Result

Source: IBM SPSS 26 (processed, 2023)

5.3 Interpretation of the Results of the Analysis in Multiple Linear Regression

a. The effect of Price Seaweed Export to China per Kilogram towards Total Seaweed Export to China

Coefficients variable Price Seaweed Export to China per Kilogram (X1) is -0.573 in between of -1.746 and 1.746 in t-table and in term of Sig. is > 0.1 which means price of seaweed export to China has no significant effect. It is because the total seaweed export to China looked from how much the total seaweed and quality of the seaweed, it is not looked from the price. The price of seaweed will affect the value of total export not the total of export of seaweed in this case. Thus, these results are not the same as the hypothesis in this research that price has a positive effect on total seaweed export from Indonesia to China.

b. The effect of Exchange Rate towards Total Seaweed Export from Indonesia to China

Coefficients variable Exchange Rate (X2) is -3.621 towards Total Seaweed Export to China (C). This number is higher than t-table that is -3.621 > -2.120 with the area of negative effect and in term of Sig. is < 0.05 which means Exchange Rate has strong negative effects. This coefficient will show increase (depreciation) as much as Rp1 with the other remain assumption factors as well then, the Total Seaweed Export to China from Indonesia will decrease as much as -3.621 which has negative effect. If the exchange of rupiah towards dollar experience continuous reinforcement, so Total Seaweed Export to China will increase. Otherwise, if the exchange of rupiah towards dollar experience continuous decline, then Total Seaweed Export to China will decrease. Thus, these results are not the same as the hypothesis that is exchange rate has a positive effect on total seaweed export from Indonesia to China since the result of the analysis is exchange rate has a negative effect on total seaweed export from Indonesia to China.

c. The effect of Indonesia Inflation towards Total Seaweed Export to China

Coefficients variable Indonesia Inflation (X3) is 1.820. This number in between -1.746 < 1.820 < 1.746 which is the area of low significant effect or low positive effect on the Total Seaweed Export to China because in term of Sig. is 0.05 < 0.088 < 0.1. This is not in accordance with the hypothesis that is Indonesia inflation has a negative effect on total seaweed export from Indonesia to China because Indonesia inflation has no effect on total seaweed export to China. It can be known with the high amount of the total seaweed export to China than other

country that China has a highly demand of seaweed. China will import seaweed from Indonesia not really looking on the inflation that happened in Indonesia. It is the same case with the total export of seaweed that decrease in the inflation rate also can give low support the total seaweed export to China.

d. The effect of GDP China towards Total Seaweed Export from Indonesia to China

Coefficient variable GDP China (X4) is 5.510 towards Total Seaweed Export to China with the number of t-table is 2.120. This number is higher than t-table which is 5.510 > 2.120 which is the area that has positive impact on Total Seaweed Export to China and also in this variable, the value of Sig. is < 0.05 which means GDP China has strong significant effect. It means that the increase in 1 unit of GDP China with the other remain assumption factors as well then will also increase the Total Seaweed Export to China as much as 5.510. This result showed that GDP China can support the total seaweed export from Indonesia to China. This condition is in line with the hypothesis that GDP China has a positive effect on total seaweed export from Indonesia to China.

e. The effect of Volume Production Seaweed in Indonesia towards Total Seaweed Export from Indonesia to China

Coefficient variable Volume Production Seaweed in Indonesia (X5) is 8.529 toward total seaweed export to China with the t-table is 2.120. This result is higher than t-table which is 8.529 > 2.120 that is in positive area and in term of the value of Sig. < 0.05 that Volume Production has strong significant effect. It means that the increase of 1 unit of volume production seaweed in Indonesia will increase the Total Seaweed Export as much as 8.529. It can be concluded Volume Production Seaweed can support Total Seaweed Export. This condition can be happened because if the volume production seaweed in Indonesia increase then the need of domestic is fulfilled so the total export will also increase. High demand of Indonesian seaweed can be the consideration of increasing volume production seaweed even though Indonesia producer has not been able to produce seaweed in level 2 and 3. Then, when Indonesia can produce seaweed in level 2 and 3 so the number of volume production will be increase as well. This is also in line with the hypothesis that is Volume Production has a positive effect on total seaweed export from Indonesia to China.

f. The effect of Exchange Rate, Indonesia Inflation, GDP China, and Volume Production Seaweed simultaneously affecting total seaweed export from Indonesia to China

Coefficient variable exchange rate (X2), inflation (X3), GDP China (X4), and volume production (X5) simultaneously have effect on total export seaweed from Indonesia to China in the amount of 98.8% which is really high. It means those variables can be simultaneously have strong impact even though Price of seaweed from Indonesia to China and Indonesia Inflation have no effect if they are individuals. This is in line with the hypothesis that is Exchange Rate, Indonesia Inflation, GDP China, and Volume Production Seaweed have simultaneously affect on total seaweed export from Indonesia to China.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This research measures the factors affecting towards total seaweed export from Indonesia to China using time series from 2000-2021. This measuring using multiple linear regression to know the condition of total seaweed export to China as main destination seeing from the high difference in the number of seaweed exports from Indonesia to China and throughout the country.

a. According to the research, it can be concluded that price of seaweed export is no significant effect to total seaweed export. It can be influenced by other variables such as importer needs the quality of the seaweed, so the price does not matter when the quality is good. Price will influence the value of export not the volume of total export. It is not in line with the first hypothesis before doing research that price has positive effect on total seaweed export while the result is price does not give any effect on total seaweed export.
b. According to the research, it can be concluded that exchange rate has negative effect to total seaweed export. It is because the declining in exchange rate makes the producer of seaweed does not want to sell their product to other countries. It is not in line with the first hypothesis of exchange rate give positive impact to total seaweed export because after doing research exchange rate has negative impact to total seaweed export.
c. According to the research, it can be concluded that Indonesia inflation has low positive effect on total seaweed export from Indonesia to China. This is not in line with the first hypothesis before doing research that is giving negative impact because after doing research, inflation in Indonesia has no effect on total seaweed export from Indonesia to China because the decreasing of inflation in Indonesia cannot support the seaweed export to China.
d. According to the research, it can be concluded that GDP China has positive effect on total seaweed export from Indonesia to China. The increasing of GDP China will support the total seaweed export from Indonesia so this is in line with the first hypothesis before doing research and the result after doing research.

e. According to the research, it can be concluded that volume production of seaweed in Indonesia has positive effect on total seaweed export from Indonesia to China because if the need of domestic has been fulfilled then Indonesia can export more seaweed. This is in line with the first hypothesis before doing research and the result after doing research.

f. According to the research, it can be concluded that Exchange Rate, Indonesia Inflation, GDP China, and Volume Production Seaweed have simultaneously affect on total seaweed export from Indonesia to China with strong effect as high as the result of the research also in line with the hypothesis.

6.2 Recommendation

According to the research, the researcher can give some recommendation to Indonesian government to support seaweed export from Indonesia to China.

1) There needs to be special attention from the government regarding the volume of seaweed production. The large number of Indonesian waters for seaweed cultivation is not accompanied by the knowledge of seaweed farmers to increase the amount of production. Then, the lack of knowledge of farmers regarding seaweed processing at levels 2 and 3 to increase the price of exported seaweed so that it also increases export prices.
2) Indonesian government has to maintain bilateral relations with China, because choosing Indonesian seaweed exports to China as the main destination and China's stable GDP has prevented Indonesia from getting a serious enough impact on seaweed export activities from Indonesia to China.
3) The government needs to maintain the stability of the rupiah exchange rate against the dollar to encourage exports because the strengthening value of the rupiah can encourage the amount of seaweed exports.
4) Marine and Fisheries Ministry should develop seaweed variants that have high competitiveness in the international market so that more and more seaweed can be exported.

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APPENDIX

APPENDIX I: Research Data

Year	Total Seaweed Export to China (Tons)	Value export in kilogram (To get price per kilogram)	Price ($/kg)	Exchange Rate	Inflation in Indonesia	GDP China (US$ million)	Volume Production Seaweed (Tons)
2000	1211.619	337423	0.28	9595	9.35	1211346.87	247939
2001	1602.988	451623	0.28	10400	12.55	1339395.72	246923
2002	4186.863	2552991	0.61	8940	10.03	1470550.02	278811
2003	9337.005	3138937	0.34	8465	5.06	1660287.97	296510
2004	13784.961	4009975	0.29	9290	6.4	1955347	419247
2005	24926.415	7613157	0.31	9830	17.11	2285965.89	918247
2006	35834.441	12875745	0.36	9020	6.6	2752131.77	117084
2007	23318.145	11179508	0.48	9419	6.59	3550342.74	1506096
2008	43620.103	35232665	0.81	10950	11.06	4594307.03	1841555
2009	51085.758	39007905	0.76	9400	2.78	5101703.07	2318490
2010	72212.865	70277467	0.97	8991	6.96	6087163.87	3517975
2011	101229.738	86385496	0.85	9068	2.76	7551500.12	4530955
2012	123401.641	90375663	0.73	9670	4.22	8532229.99	7091679
2013	143725.437	124954069	0.87	12189	8.38	9570406.24	7806691
2014	150854.742	163012709	1.08	12440	8.36	10475682.92	11269342
2015	151639.989	112525627	0.74	13795	3.35	11061553.08	11050301.25
2016	149717.556	101827054	0.68	13436	3.02	11233276.54	10456043
2017	150784.365	128538996	0.85	13548	2.68	12310409.37	10547552
2018	158557.628	160282971	1.01	14481	3.02	13894817.55	10320202
2019	157740.050	174445143	1.11	13901	2.72	14279937.5	9775986
2020	151211.229	150783824	1.00	14105	1.68	14687673.89	9618421
2021	178025.616	190727256	1.07	14269	1.87	17734062.65	9092031

APPENDIX II: Distribution t Table

d.f	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$
1	3.078	6.314	12.71	31.82	63.66
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
31	1.309	1.696	2.040	2.453	2.744
32	1.309	1.694	2.037	2.449	2.738
33	1.308	1.692	2.035	2.445	2.733
34	1.307	1.691	2.032	2.441	2.728
35	1.306	1.690	2.030	2.438	2.724
36	1.306	1.688	2.028	2.434	2.719
37	1.305	1.687	2.026	2.431	2.715
38	1.304	1.686	2.024	2.429	2.712
39	1.304	1.685	2.023	2.426	2.708
40	1.303	1.684	2.021	2.423	2.704
41	1.303	1.683	2.020	2.421	2.701
42	1.302	1.682	2.018	2.418	2.698
43	1.302	1.681	2.017	2.416	2.695
44	1.301	1.680	2.015	2.414	2.692
45	1.301	1.679	2.014	2.412	2.690
46	1.300	1.679	2.013	2.410	2.687
47	1.300	1.678	2.012	2.408	2.685
48	1.299	1.677	2.011	2.407	2.682
49	1.299	1.677	2.010	2.405	2.680
50	1.299	1.676	2.009	2.403	2.678
51	1.298	1.675	2.008	2.402	2.676
52	1.298	1.675	2.007	2.400	2.674
53	1.298	1.674	2.006	2.399	2.672
54	1.297	1.674	2.005	2.397	2.670
55	1.297	1.673	2.004	2.396	2.668
56	1.297	1.673	2.003	2.395	2.667
57	1.297	1.672	2.002	2.394	2.665
58	1.296	1.672	2.002	2.392	2.663
59	1.296	1.671	2.001	2.391	2.662

d.f	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$
61	1.296	1.671	2.000	2.390	2.659
62	1.296	1.671	1.999	2.389	2.659
63	1.296	1.670	1.999	2.389	2.658
64	1.296	1.670	1.999	2.388	2.657
65	1.296	1.670	1.998	2.388	2.657
66	1.295	1.670	1.998	2.387	2.656
67	1.295	1.670	1.998	2.387	2.655
68	1.295	1.670	1.997	2.386	2.655
69	1.295	1.669	1.997	2.386	2.654
70	1.295	1.669	1.997	2.385	2.653
71	1.295	1.669	1.996	2.385	2.653
72	1.295	1.669	1.996	2.384	2.652
73	1.295	1.669	1.996	2.384	2.651
74	1.295	1.668	1.995	2.383	2.651
75	1.295	1.668	1.995	2.383	2.650
76	1.294	1.668	1.995	2.382	2.649
77	1.294	1.668	1.994	2.382	2.649
78	1.294	1.668	1.994	2.381	2.648
79	1.294	1.668	1.994	2.381	2.647
80	1.294	1.667	1.993	2.380	2.647
81	1.294	1.667	1.993	2.380	2.646
82	1.294	1.667	1.993	2.379	2.645
83	1.294	1.667	1.992	2.379	2.645
84	1.294	1.667	1.992	2.378	2.644
85	1.294	1.666	1.992	2.378	2.643
86	1.293	1.666	1.991	2.377	2.643
87	1.293	1.666	1.991	2.377	2.642
88	1.293	1.666	1.991	2.376	2.641
89	1.293	1.666	1.990	2.376	2.641
90	1.293	1.666	1.990	2.375	2.640
91	1.293	1.665	1.990	2.374	2.639
92	1.293	1.665	1.989	2.374	2.639
93	1.293	1.665	1.989	2.373	2.638
94	1.293	1.665	1.989	2.373	2.637
95	1.293	1.665	1.988	2.372	2.637
96	1.292	1.664	1.988	2.372	2.636
97	1.292	1.664	1.988	2.371	2.635
98	1.292	1.664	1.987	2.371	2.635
99	1.292	1.664	1.987	2.370	2.634
100	1.292	1.664	1.987	2.370	2.633
101	1.292	1.663	1.986	2.369	2.633
102	1.292	1.663	1.986	2.369	2.632
103	1.292	1.663	1.986	2.368	2.631
104	1.292	1.663	1.985	2.368	2.631
105	1.292	1.663	1.985	2.367	2.630
106	1.291	1.663	1.985	2.367	2.629
107	1.291	1.662	1.984	2.366	2.629
108	1.291	1.662	1.984	2.366	2.628
109	1.291	1.662	1.984	2.365	2.627
110	1.291	1.662	1.983	2.365	2.627
111	1.291	1.662	1.983	2.364	2.626
112	1.291	1.661	1.983	2.364	2.625
113	1.291	1.661	1.982	2.363	2.625
114	1.291	1.661	1.982	2.363	2.624
115	1.291	1.661	1.982	2.362	2.623
116	1.290	1.661	1.981	2.362	2.623
117	1.290	1.661	1.981	2.361	2.622
118	1.290	1.660	1.981	2.361	2.621
119	1.290	1.660	1.980	2.360	2.621

60	1.296	1.671	2.000	2.390	2.660	120	1.290	1.660	1.980	2.360	2.620

APPENDIX III: Distribution F table

Degrees of freedom for Denominator	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161	200	216	225	230	234	237	239	241	242	244	246	248	249	250	251	252	253	254
2	18,5	19,0	19,2	19,2	19,3	19,3	19,4	19,4	19,4	19,4	19,4	19,4	19,4	19,5	19,5	19,5	19,5	19,5	19,5
3	10,1	9,55	9,28	9,12	9,01	8,94	8,89	8,85	8,81	8,79	8,74	8,70	8,66	8,64	8,62	8,59	8,57	8,55	8,53
4	7,71	6,94	6,59	6,39	6,26	6,16	6,09	6,04	6,00	5,96	5,91	5,86	5,80	5,77	5,75	5,72	5,69	5,66	5,63
5	6,61	5,79	5,41	5,19	5,05	4,95	4,88	4,82	4,77	4,74	4,68	4,62	4,56	4,53	4,50	4,46	4,43	4,40	4,37
6	5,99	5,14	4,76	4,53	4,39	4,28	4,21	4,15	4,10	4,06	4,00	3,94	3,87	3,84	3,81	3,77	3,74	3,70	3,67
7	5,59	4,74	4,35	4,12	3,97	3,87	3,79	3,73	3,68	3,64	3,57	3,51	3,44	3,41	3,38	3,34	3,30	3,27	3,23
8	5,32	4,46	4,07	3,84	4,69	3,58	3,50	3,44	3,39	3,35	3,28	3,22	3,15	3,12	3,08	3,04	3,01	2,97	2,93
9	5,12	4,26	3,86	3,63	3,48	3,37	3,29	3,23	3,18	3,14	3,07	3,01	2,94	2,90	2,86	2,83	2,79	2,75	2,71
10	4,96	4,10	3,71	3,48	3,33	3,22	3,14	3,07	3,02	2,98	2,91	2,85	2,77	2,74	2,70	2,66	2,62	2,58	2,54
11	4,84	3,98	3,59	3,36	3,20	3,09	3,01	2,95	2,90	2,85	2,79	2,72	2,65	2,61	2,57	2,53	2,49	2,45	2,40
12	4,75	3,89	3,49	3,26	3,11	3,00	2,91	2,85	2,80	2,75	2,69	2,62	2,54	2,51	2,47	2,43	2,38	2,34	2,30
13	4,67	3,81	3,41	3,13	3,03	2,92	2,83	2,77	2,71	2,67	2,60	2,53	2,46	2,42	2,38	2,34	2,30	2,25	2,21
14	4,60	3,74	3,34	3,11	2,96	2,85	2,76	2,70	2,65	2,60	2,53	2,46	2,39	2,35	2,31	2,27	2,22	2,18	2,13
15	4,54	3,68	3,29	3,06	2,90	2,79	2,71	2,64	6,59	2,54	2,48	2,40	2,33	2,29	2,25	2,20	2,16	2,11	2,07
16	4,49	3,63	3,24	3,01	2,85	2,74	2,66	2,59	2,54	2,49	2,42	2,35	2,28	2,24	2,19	2,15	2,11	2,06	2,01
17	4,45	3,59	3,20	2,96	2,81	2,70	2,61	2,55	2,49	2,45	2,38	2,31	2,23	2,19	2,15	2,10	2,06	2,01	1,96
18	4,41	3,55	3,16	2,93	2,77	2,66	2,58	2,51	2,46	2,41	2,34	2,27	2,19	2,15	2,11	2,06	2,02	1,97	1,92
19	4,38	3,52	3,13	2,90	2,74	2,63	2,54	2,48	2,42	2,38	2,31	2,23	2,16	2,11	2,07	2,03	1,98	1,93	1,88
20	4,35	3,49	3,10	2,87	2,71	2,60	2,51	2,45	2,39	2,35	2,28	2,20	2,12	2,08	2,04	1,99	1,95	1,90	1,84
21	4,32	3,47	3,07	2,84	2,68	2,57	2,49	2,42	2,37	2,32	2,25	2,18	2,10	2,05	2,01	1,96	1,92	1,87	1,81
22	4,30	3,44	3,05	2,82	2,66	2,55	2,46	2,40	2,34	2,30	2,23	2,15	2,07	2,03	1,98	1,94	1,89	1,84	1,78
23	4,28	3,42	3,03	2,80	2,64	2,53	2,44	2,37	2,32	2,27	2,20	2,13	2,05	2,01	1,96	1,91	1,86	1,81	1,76
24	4,26	3,40	3,01	2,78	2,62	2,51	2,42	2,36	2,30	2,25	2,18	2,11	2,03	1,98	1,94	1,89	1,84	1,79	1,73
25	4,24	3,39	2,99	2,76	2,60	2,49	2,40	2,34	2,28	2,24	2,16	2,09	2,01	1,96	1,92	1,87	1,82	1,77	1,71
30	4,17	3,32	2,92	2,69	2,53	2,42	2,33	2,27	2,21	2,16	2,09	2,01	1,93	1,89	1,84	1,79	1,74	1,68	1,62
40	4,08	3,23	2,84	2,61	2,45	2,34	2,25	2,18	2,12	2,08	2,00	1,92	1,84	1,79	1,74	1,69	1,64	1,58	1,51
50	4,08	3,18	2,79	2,56	2,40	2,29	2,20	2,13	2,07	2,02	1,95	1,87	1,78	1,74	1,69	1.63	1,56	1,50	1,41
60	4,00	3,15	2,76	2,53	2,37	2,25	2,17	2,10	2,04	1,99	1,92	1,84	1,75	1,70	1,65	1,59	1,53	1,47	1,39
100	3,94	3,09	2,70	2,46	2,30	2,19	2,10	2,03	1,97	1,92	1,85	1,80	1,68	1,63	1,57	1,51	1,46	1,40	1,28
120	3,92	3,07	2,68	2,45	2,29	2,18	2,09	2,02	1,96	1,91	1,83	1,75	1,66	1,61	1,55	1,50	1,43	1,35	1,22
∞	3,84	3,00	2,60	2,37	2,21	2,10	2,01	1,94	1,88	1,83	1,75	1,67	1,57	1,52	1,46	1,39	1,32	1,22	1,00