

CBI Value Chain Analysis



Seaweed Extracts

Indonesia



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Cover photo: seaweed harvesting in Indonesia

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1. Contents

List of sources.....	4
Glossary.....	5
Executive Summary	6
1. Introduction.....	8
1.1 EU market segmentation for seaweed extracts and seaweed compounds	8
1.2 Indonesian natural ingredient products groups.....	9
1.3 Structure of this report	9
2. The European Market for Seaweed Extracts and Compounds.....	10
2.1 Existing seaweed products directly exported to European markets	10
2.1.1 Trends in the European market	10
2.1.2 European market demand	12
2.1.3 European requirements	17
2.1.4 Value addition.....	18
3. Structure and Governance of the Seaweed Value Chain.....	20
3.1 Existing seaweed products directly exported to European markets	20
3.1.1 Value chain actors	21
3.1.2 Influencers	28
3.1.3 Supporters	29
4. Opportunities, Obstacles and Sustainability for the Seaweed Sector	37
4.1 Existing seaweed products directly exported to European markets	37
4.1.1 Key obstacles to growth of exports to Europe	39
4.1.2 Key opportunities for growth of exports to Europe	42
4.1.3 Sustainability challenges and opportunities.....	43
4.2 Conclusions.....	44
5. Possible Interventions and Support Activities for Seaweed Extracts	45
6. Conclusion.....	49
Annex I — Longlist of Companies Identified and Shortlist of Companies Interviewed	50
Annex II — Roadmap to Seaweed Industry Development 2017–2021	51

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Glossary

ADB: Asian Development Bank
ARLI: Indonesian Seaweed Association
ASC-MSC: Aquaculture Stewardship Council and Marine Stewardship Council
ASEAN: Association of Southeast Asian Nations
ASTRULI: Indonesian Seaweed Industry Association
ATC: alkali-treated chips
BRC: British Retail Consortium
BSO: Business Support Organisation
CBI: Centre for the Promotion of Imports from Developing Countries
CSR: Corporate social responsibility
DC: Developing country
DFID: Department of Foreign and International Development (UK)
DG: Directorate General
EC: European Commission
EU: European Union
FAO: Food and Agriculture Organization of the United Nations
FSSC: Food Safety System Certification
GACP: Good agricultural and collection practices
GMP: Good manufacturing practices
HACCP: Hazard Analysis and Critical Control Points
IFEAT: The International Federation of Essential Oils and Aroma Trades
IPD: Germany's Import Promotion Desk
ISO: International Standards Organization
ITC: International Trade Organization
ITPC: Indonesian Trade Promotion Center
JICA: Japan International Cooperation Agency
MoI: Ministry of Industry
MoMaF: Ministry of Marine Affairs and Fisheries
MoT: Ministry of Trade
MT: Metric tonne
NGO: Non-governmental organisation
NTT: Nusa Tenggara Timur
NTB: Nusa Tenggara Barat
PGA: Propylene glycol alginate
R&D: Research and development
RDC: Raw dried seaweed
SIPPO: Swiss Import Promotion Programme
SME: Small and medium-sized enterprises
SOP: Standard operating procedure
SRC: Semi-refined carrageenan
UNIDO: United Nations Industrial Development Organization
USD: United States dollar
USP: Unique selling point
VCA: Value Chain analysis

Executive Summary

This CBI-commissioned value chain analysis (VCA) identifies opportunities and obstacles in the Indonesian seaweed sector, vis-à-vis European markets for raw dried seaweed, especially value-added products such as seaweed extracts and compounds. This analysis identifies characteristics of trends, demand, requirements and options for value addition, describes the actors and relations in the value chain, identifies clear obstacles and opportunities and proposes targeted interventions.

In addition to this VCA report, CBI developed two additional reports: on essential oils and plant extracts.

Chapter 1: The European market

Based on information on trends, demand, requirements and value addition propositions, the study shows good potential for Indonesian seaweed extracts on European food and feed markets, but a low potential for seaweed compounds on these markets.

Although Indonesia has a large raw material production base, the study also shows the country lacks export competitiveness. Indonesian companies do not take advantage of European market trends that could benefit local producers. In addition, the analysis showed a big difference in compliance between SMEs and big players, and a low ability to meet requirements for value-added products such as compounds.

The table below summarises these aspects of the European market trends, demands, requirements and the opportunities and the potential for Indonesian seaweed extracts and compounds.

Indicator	Seaweed extracts	Seaweed compounds
European market trends	(+-) Indonesian suppliers cannot benefit from all trends	(-) Indonesian suppliers cannot benefit from all trends
European demand	(+) Growing market, perception on quality is low	(+-) Growing market, but very low buyer perception
European market requirements	(+-) Processors meet legal, not always buyer requirements	(-) Indonesia unable to meet high reqs.
Value addition opportunities on the European market	(+) Good margins on further processed extracts	(+) High margins on compounds, but high cost to enter market
Potential for Indonesia	+++	+

Chapter 2: Structure and Governance of the Value Chain

The value chain of seaweed in Indonesia is long and complicated, leading to low levels of traceability and stability in terms of quality and quantity. Coordination among actors in the value chain, and among supporters and influencers is low. Trust, communication on quality and volumes, and transparency in terms of prices is very low. The chain typically involves seaweed farmers, consolidators and traders at different levels (community, district, province), as well as exporters of raw dried seaweed and processors and exporters of seaweed extracts and compounds.

The VCA identified two key associations involved in the sector: ARLI with a sector-wide membership, including farming and trade, and ASTRULI, whose membership consists of processing companies. As for the government, the Ministry of Marine Affairs and Fisheries (MoMaF) and the Ministry of Industry (Mol) play important roles. Furthermore, the sector is the focus of various international programmes of donors and NGOs, including UNIDO and PRISMA.

Chapter 3: Opportunities and Obstacles in the Value Chain

In terms of obstacles, Chapter 3 identifies the following key issues:

- Lack of supply chain management: Many Indonesian seaweed processors act as traders and do not take responsibility to ensure a sustainable supply chain in terms of volumes, quality and traceability. They face therefore many issues around accessing raw materials at the right quantities, the right times and at the right prices.
- Indonesian SMEs lack knowledge specifically on:
 - European market trends, so they do not develop products which meet market needs, and do not leverage high-growth segments in Europe.
 - European market access requirements and standards, so they do not comply with quality, documentation and certification, or the right route to introduce innovative products to the European market.
- No market access: Indonesian SMEs specifically have little contact with the European market and European buyers so they do not learn about buyers' requirements and do not communicate with buyers on product development and improvement, which is particularly vital for compound development.
- Perception of European buyers: In terms of quality, European buyers see problems with Indonesian businesses' food safety management, consistency, documentation and communication with SME suppliers of seaweed extracts.
- In terms of innovation, European buyers do not see Indonesian exporters as prospective suppliers of compounds.
- There is little coordination among players in the seaweed sector, which limits their ability to tackle obstacles beyond the influence of individual companies. There is no common vision on development and local business support organisations (BSOs) do not offer sufficient services to meet the needs of exporting companies.
- Although R&D into seaweed production and extraction exists, the private sector is not well connected with the actors responsible for it. More research in compounds is required.

Chapter 3 identifies the following opportunities:

- Best cases for business where companies can learn from one another;
- Strong government and donor support
- Good R&D support for seaweed extracts.

Chapter 4: Possible Interventions and Support Activities

Based on the low number of companies active in compounds, fewer opportunities in Europe and the higher number of obstacles for seaweed compounds, vis-à-vis seaweed extracts, it was decided to focus the interventions on extracts. This is based on the idea that solving issues up to the level of extracts is also beneficial to compound producers. Chapter 4 proposed the following interventions for seaweed:

- Improve sector coordination
- Set up best practices for supply chain management, sustainability and development of USPs;
- Develop traceability and compliance tools;
- Develop market information tools for the sector;
- Branding;
- Market access;
- BSO service delivery development;
- Improve access to finance.

Conclusions

The conclusions recommends focused market segments, key considerations for interventions to succeed and risks to possible interventions. The research team recommends a market focus on the food sector. In terms of key considerations for interventions in the seaweed sector, we recommend:

- A go or no-go assessment based on the ability of the project to identify suppliers and buyers committed to developing a traceable and sustainable value chain.
- A go or no-go assessment based on the ability to improve cooperation between sector stakeholders, ideally through the development of a joint sector strategy.

- A go or no-go assessment based on the ability to coordinate activities with large donor projects such as UNIDO and PRISMA, and key government institutions, such as Mol and MoMaF.

The research team identified the following key risks for possible CBI interventions:

- Commitment of companies;
- Government interference;
- BSO resources and capacities;
- EU regulatory changes;
- Dissent among sector stakeholders.

1. Introduction

1.1 EU market segmentation for seaweed extracts and seaweed compounds

This VCA considers the food and feed industry as the main user of seaweed extracts and compounds.

Food ingredients can be sold as final products, for example to packers, or to the processing industry as ingredients to be used in different food products. In the case of the product groups considered, only seaweed is sold as a final product in the European market, but this is outside of the scope of this VCA, which focuses exclusively on ingredients for food, feed, cosmetics and health products.

Ingredients for food can be further segmented per functionality and into specialty ingredients and commodity ingredients, as shown in the table below.

Specialty products can be of premium quality, certified, exotic and relatively new to the market. Commodity products are of standard quality and traded in large quantities, some even through futures markets.

In addition to the food industry, animal nutrition is also a big and growing market in Europe. The use of extracts is growing particularly in feed additives, similarly to food supplements, as discussed under health below. Compound feed, including pet food, and medicated feed fall under a separate regulatory framework from food (see section on European requirements).

Figure 1. EU market segmentation for food products

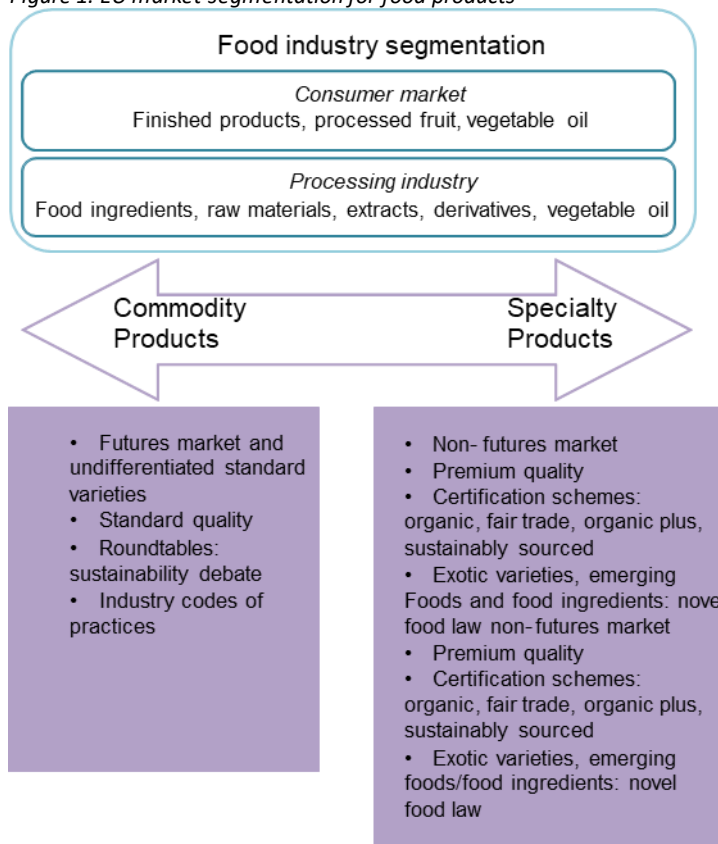


Table 1. Ingredient per functionality

	Examples of natural ingredients used
Functional Ingredients	
Texturisers (e.g. thickeners)	Gums, waxes, resins, hydrocolloids
Flavours	Essential oils, oleoresins, aromatic plant extracts, spices and herbs
Colours	Only natural colorants permitted
Glazing agents	Waxes
Fortification	Plant extracts, seaweed extracts

1.2 Indonesian Natural Ingredient Product Groups

This VCA looks at seaweed extracts and compounds. Seaweed extracts are used mainly for structuring food and beverages. They are based on different seaweed species and have different structuring properties.

- Agar is mainly extracted from *Gracilaria* seaweeds and *Gelidium* seaweeds.
- Carrageenan is mainly extracted from *Eucheuma cottonii* seaweed (kappa type carrageenan) and *Eucheuma spinosum* (Iota type carrageenan). Different extraction methods result in different qualities of carrageenan: alkali-treated cottonii (ATC), semi-refined carrageenan (SRC) or refined carrageenan.

Box 1. Product definition seaweed compounds

Customised compounds based on seaweed extracts and other hydrocolloids for the food and feed sector are used to achieve specific texturing solutions for specific products of manufacturers, often in close coordination with the client.

1.3 Structure of this report

This report is structured in six chapters. Chapter 1 is just an introduction. In Chapter 2, Indonesia's seaweed sector is discussed under four themes:

- European market trends;
- European demand;
- Market requirements;
- Value addition opportunities.

Chapter 3 looks at the structure and governance of the sector looking into the actors, influencers and supporters, the governance structure of the value chain and the horizontal and vertical relationships among them.

Chapter 4 identifies key opportunities and obstacles along the value chain and in terms of the business enabling environment. Chapter 4 also discusses specific risks to CSR in the value chain. In Chapter 5, we propose possible interventions and support activities for the seaweed sector, specifically focusing on resolving issues with seaweed extracts. In Chapter 6, we provide a conclusion associated to an intervention logic and risks.

2.The European Market for Seaweed Extracts and Compounds

This chapter discusses the European market for seaweed extracts and compounds according to four indicators:

- European market trends;
- European demand;
- Market requirements;
- Value addition opportunities.

2.1 Existing seaweed products directly exported to European markets

2.1.1 Trends on the European market

Healthy and natural

Consumer demand for natural and healthy products is increasing. Often, natural products are seen as healthier alternatives to synthetic products, a view which companies increasingly exploit in their marketing strategies. To respond to this trend, producers move away from synthetic to natural ingredients. Companies across all segments are highlighting their use of natural ingredients, which can include certifications to attest naturalness, for example organic certification. The healthy, natural trend is also related to a drive for high-quality products which are traceable throughout the value chain, and more natural extraction techniques.

A relevant factor for seaweed extracts and compounds is that food sold in the European Union must have full ingredient labelling including standard E-number codes that accurately describe additives used in the production of food. Carrageenans are registered under code E407. The clean label trend, which excludes food additives such as seaweed extracts, and has consumers avoiding foods containing E-numbers, poses a threat to carrageenan sales growth in Europe, as manufacturers either avoid or reduce its use.

Organic and new ASC-MSC standard

Helped by an increase in demand for natural products and ingredients, the market for organic products is growing as well. Often organic products represent a small part of the overall market, depending on the specific product. The most mature markets in the EU are in Northwestern European countries, such as Germany, Switzerland the UK and the Nordic countries. The fastest growing markets for organic ingredients are currently in Eastern European countries.

The [EU regulation on organic production and labelling of organic products](#) allows the use of non-certified additives in end products labelled as organic, which includes the additives carrageenan, alginates and agar. Nonetheless, many manufacturers of organic products aim to have all their ingredients organic certified, including the additives.

In response to the demand for certified sustainable seaweeds, the Marine Stewardship Council and the Aquaculture Stewardship Council launched a new [ASC-MSC seaweed standard](#) in 2017, setting the requirements for seaweed harvesting and farming practices. Application of the MSC standard and organic certification in Indonesia is low, with only one agar producer certified for the latter. The general availability of sustainable seaweed extracts is also low.

Traceability

Traceability within value chains is very important due to legislative and buyer requirements, such as certification schemes. Following good practices guidelines in production, harvesting and processing is also increasingly important to access the European market. Suppliers which are able to offer full traceability to their buyers have a competitive advantage.

In this context, the adoption of verifiable, documented traceability systems takes on even more importance for suppliers, helping them to compete with suppliers from countries where traceability is problematic, such as China. In addition to stricter controls, buyers require certifications from recognised and trustworthy sources, which can demonstrate the supplier's commitment to high and consistent quality and safety.

In general, Indonesia is seen as lagging in traceability, which will be further explained under Chapter 3.

Sustainability and ethical sourcing

Awareness among consumers is growing about the effects their purchasing behaviour has on social conditions in production countries, including a growing interest in the source of ingredients. This enhanced consumer interest results in the increased demand for ethically produced products, particularly those that have fair trade or other ethical certifications. Consumers, however, do not always demand these certifications. In fact, there is a growing demand to go beyond certifications, to explain to consumers what true, local benefits the products they buy generate.

Sustainability offers opportunities to companies in terms of marketing (premium, market access). However, working on sustainability is not yet high on the agenda among Indonesian exporters, which makes Indonesia less attractive to buyers compared to other suppliers. To achieve more sustainability would take a substantial change in how Indonesia's seaweed supply chains are set up, as further explained in Chapters 3 and 4.

Shift in processing

Our research has observed a shift in processing towards origin countries. At first, this trend was apparent for low-value extracts such as ATC and SRC, but recently further processed extracts and compounds have also been included. To illustrate this point, Indonesia invested heavily in carrageenan extraction companies around 2012. The European market is increasingly receptive to further processed products and offers great opportunities for exporters from Indonesia. On the other hand, the increasing reliance of buyers in Europe on further processed ingredients can reduce future demand for raw materials, which shows the importance of moving up the value chain. During the company visits in Indonesia, exporters already mentioned that their markets for ATC have been decreasing, as buyers ask them to move up the value chain. However, this requires substantial investments and knowledge which are not available to many processors.

Box 2. Compound production requires large investments

Making compounds requires large investments for the purchase of suitable equipment, but especially to acquire the knowledge to develop customer-based solutions, and hire or outsource staff to guide product development.

Technological developments

To respond to global competition, market saturation and decreasing margins, companies make use of technology innovations aimed at improving performance, increasing efficiency, reducing energy or water consumption or waste, enhancing sustainability and processing yields. Producers in Europe continuously update these technologies and producers in other countries also follow suit. Otherwise, they risk staying behind at a significant disadvantaged position in comparison with European or other competitors, which may already have made these improvements. These trends are highly relevant for seaweed processing, but both Indonesian processors and international buyers indicate that Indonesia is lagging behind substantially in the application of modern technology, reaching a scale where they may become competitively obsolete internationally. Moving from extracts to compounds will further exacerbate this issue.

Vertical integration of supply chains - Responsibility for quality enforced along the chain

Decreasing margins in competitive markets, combined with increasing demands on safety, traceability and quality have prompted various European manufacturers to integrate their supply chain management in their processing operations and rationalise their value chains. This results in:

- Middlemen (local traders, brokers or agents) with a limited value addition function being cut out of value chains, both in Europe as well as in source countries. In the Indonesian seaweed trade, collectors and district

traders continue to play a vital role, and this will remain so in the future in order to consolidate raw dried seaweed from across the archipelago. It is also well understood by buyers that these middlemen play a large role, which does not mean that traceability cannot be achieved. Still, it appears that only a few companies have made efforts to get closer to sources to be able to offer traceability.

- Processors and manufacturers are generally shortening their chains and work with fewer preferred suppliers (importers and producers), on whom they place the responsibility for product quality and delivery volumes. A tighter control over the chain allows them to improve traceability, monitor product safety and quality and achieve process improvements.

Industry consolidation

The EU retail and manufacturing sectors have been consolidating, which in turn also leads to consolidation of processing and trade among and within segments. While some processors now supply conventional and organic product lines to producers of cosmetic, food and health products, others still only offer ingredients to a specific sector. This makes the landscape less clear and more difficult to find truly specialised companies. On the other hand, such diversified companies can also offer good market entry opportunities.

Large players have more market power enabling them to demand more services and lower prices from their suppliers, which smaller suppliers will have difficulty in meeting. Larger players also strive to limit their suppliers to those which offer reliable large quantities and qualities. The associations mentioned the difficulty of entering the market in Europe, particularly because of the large size of European food manufacturers, especially dairy.

In contrast, many smaller processors remain in business and the quantities in demand for many specific natural ingredients are limited. Sourcing through smaller, specialised importers therefore remains vital to EU industries. Indonesian companies have not been able to tap into this channel.

2.1.2 European market demand

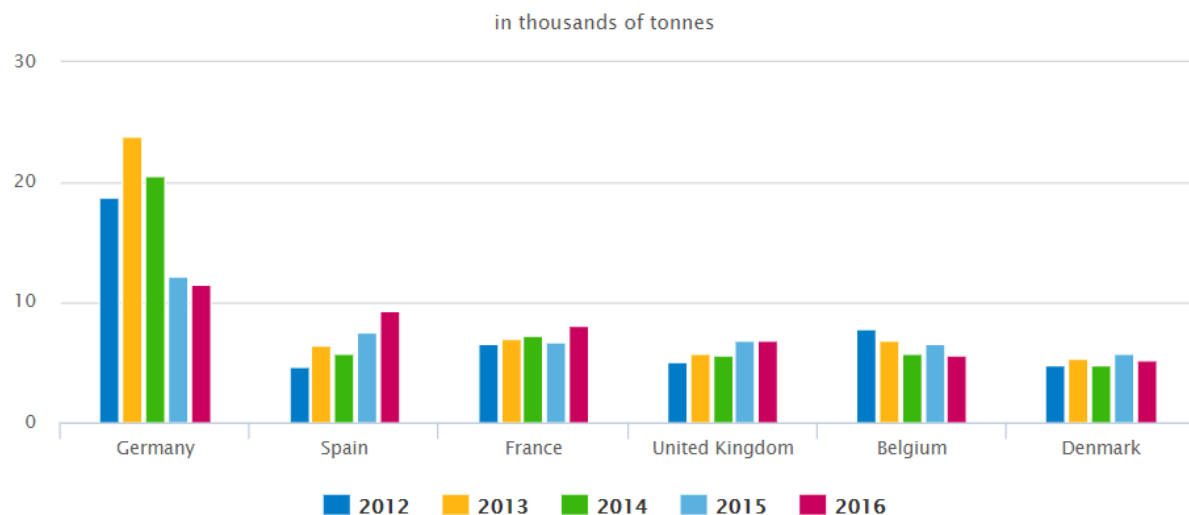
Industry sources indicate a steady increase in demand for seaweed extracts tied to a strong demand for processed foods. The current growth rate of the European seaweed extracts market is estimated at a few percent annually. In the next five years, demand from the European food industry for seaweed extracts is expected to continue to increase slowly based on continuous growth in the needs for food thickening and structuring solutions. However, the clean label trend hampers faster growth, as seaweed extracts are listed as food additives. Buyers also stress that the European market will not be able to absorb large supply increases, when increases from one country are offset by decreases from other suppliers.

Europe imports large quantities of seaweed derivatives, including agar and 'mucilages and thickeners', which comprises different products such as carrageenan and compounds.

Table 2. European Imports of seaweeds

	Imports of EU-28 from Indonesia 2017, in tonnes and million €		Annual growth or decline since 2013, in volume and value		Main importing country in 2017, in value	Main country of origin
1212 Locust beans, seaweeds and other algae	648,309 tonnes	€421 million	-8%	8%	Germany (23%), Spain (15%), Italy (12%)	China (18%), Morocco (12%)
Including:						
121221 Seaweeds and other algae fit for HC	15,411 tonnes	€61 million	-18%	2%	UK (21%), France (16%)	China (16%), Spain (15%), Germany (14%)
121229 Seaweeds and other algae unfit for HC	90,395 tonnes	€63 million	8%	10%	Germany (23%), France (23%)	Chile (15%), Iceland (12%), Ireland (12%)
130231 Agar-Agar	3,769 tonnes	€68.7 million	-3%	9%	Germany (24%), Spain (18%), France (18%)	Spain (22%), China (21%), Morocco (18%)
130239 Mucilages and thickeners	64,377 tonnes	€353 million	-4%	-1%	Germany (16%), Spain (13%), Denmark (11%)	China (15%), Philippines (14%), France (9%)

Figure 2. Main European importers of seaweed extracts (excl. alginates)



- In 2016, EU imports of agar-agar and mucilages and thickeners amounted to €422 million, showing a small increase in value and a decrease in volume.
- Western Europe is the main market for seaweed extracts. Germany, France, the United Kingdom and Spain have large food industries and are the most important end markets in Europe. Spain, Belgium and Denmark are major re-exporters. The port of Antwerp in Belgium is an important entry point for imports to Northwest Europe.
- The main importers of seaweed extracts in Europe are Germany, whose imports are decreasing, and Spain, whose imports are growing. Several of the main European importers of seaweed extracts, including those from Indonesia, are based in Germany. In Spain, the seaweed importers and manufacturers CEAMSA (mainly carrageenan), Hispanagar (agar) and Rokoagar (agar) account for most of the imports of seaweed extracts. CEAMSA also sources from Indonesia.
- The main supplier outside Europe is China. Chinese supplies of low-priced seaweed extracts (carrageenan, agar and alginates) complement the European production of mostly high-priced seaweed extracts and compounds. In this market, Indonesia is a minor source.

Box 3. China is the main competitor for off-the-shelf compounds

China also mostly supplies off-the-shelf compounds combining carrageenan, agar and alginates to complement the European production of mostly high priced off-the-shelf compounds and custom-made solutions. In this market, Indonesia is a minor source.

Table 3. European imports of seaweed from Indonesia

	Indonesia's share of the European market, in value	Imports of EU-28 from Indonesia 2017, in tonnes and million €		Annual growth or decline since 2013, in value	Main importing country from Indonesia in 2017, in value
Locust beans seaweeds and other algae	0.01%	3,606 tonnes	€2.953 million	-11%	France (38%), Denmark (31%)
Seaweeds and other algae fit for HC	0.00%	3.2 tonnes	€12.857 million		
Seaweeds and other algae unfit for HC	0.04%	3,500 tonnes	€2.698 million	2%	France (42%), Denmark (34%)
Agar-agar	0.00%	146 tonnes	€2.520 million	19%	Germany (97%)
Mucilages and thickeners	0.03%	2600 tonnes	€13.4 million	-7%	Netherlands (32%), Denmark (27%), UKI (23%)

Refer to the section on value addition below for price information.

Perception of Indonesia by European players

According to European players interviewed for this VCA, Indonesia is well known as the world's biggest supplier of low-priced seaweeds for extraction of carrageenan and agar. They appreciate the hard work being done by poor farmers and collectors to produce or collect the seaweeds. Some of them also appreciate the elaborate system of traders which allows for bulking of seaweeds to consolidate the quantities required for cost-efficient processing and export. Others stress the negative impact of this trading system on traceability to the source.

On the processing level, the perception is generally less positive. European players perceive Indonesian suppliers to lack proper food safety and quality management and a lack of knowledge on differences between seaweeds, quality aspects of seaweed extracts and their applications, which result often in inconsistent quality.

Box 4. Perception of Indonesian compound producers in Europe is not positive

For blends that combine extracts which do not meet European requirements, this less positive perception is felt more strongly. Blending requires sophisticated research facilities, an understanding of European tastes, the production of samples of final products according to these tastes and highly effective communication. In contrast, the buyers' experience is that Indonesian suppliers lack these skills and understanding and do not have access to these resources in the country. In this sense, they advise to focus on ASEAN markets and the local market, where growth is considered higher, and the sophistication of compound requirements from food manufacturers lower.

Gel strength consistency, for example, is the main quality concern for European buyers of agar from Indonesia. As deviations in gel strength result in a different texture of the food to which the agar is applied, food manufacturers must be able to rely on the consistency of the gel strength. So, when a buyer requires agar with a gel strength of 850, then the actual gel strength of the different lots to be delivered to the buyer must be between 800 and 900. A higher deviation is not acceptable. Suppliers must use an internationally accepted industry method, such as the Nikan-Sui method for measurement of the gel strength.

In relation to prices, Indonesia is not perceived to be price competitive with China. According to one interviewed buyer, agar companies will need a scale of production of around 50 tonnes/month to achieve economies of scale and competitive price levels.

Although not mentioned by importers, the World Bank rates Indonesia very low in terms of contract enforcement, which could deter importers from sourcing more from Indonesia.

Segments in the European seaweed extracts market

Carrageenan and agar have very similar applications. Nonetheless, each of them has unique properties which make them more suitable for specific applications. For example, carrageenan is the preferred water binder for meat processors, but not for all bakery applications. The higher melting point of agar compounds makes that thickener more suitable for use in bakery applications where the thickener is applied before baking. Compounds produced by European processors combine these different extracts in ways that make optimal use of their synergies for specific segments.

Table 4. Major segments and applications for seaweed extracts

Seaweed extract	Segment	Application	Benefits
Carrageenan, alginates	Meat	Meat	Binding meat pieces to re-structure meat and binding water in meat products to reduce costs per kg When using carrageenan, the meat industry mainly uses PES and low-cost, gel-press refined carrageenan
Carrageenan	Dairy products	Chocolate milk, creams, desserts	Cocoa suspension, improvement of milk stability, improvement of emulsion stability, milk gelling. When using carrageenan, dairy manufacturers mainly use PES and alcohol-refined kappa or lambda carrageenan
Alginates, agar		Yoghurt	Improvement of texture, body and sheen
Carrageenan	Bakery	Glazes	Improvement of sheen
Alginates		Pie fillings and icing	Makes icings non-sticky and prevents liquids from the filling from softening the pastry
Alginates	Beverages	Beer foam	Foam stabilisation Manufacturers mostly use high-grade propylene glycol alginate
Alginates	Condiments	Thickening of low-fat mayonnaise and salad dressings	Stabilisation of water-oil emulsions Dressings manufacturers mostly use low-grade propylene glycol alginate
Carrageenan, agar	Confectionery	Jellies	Improvement of texture, body and sheen

The main application of carrageenan is processed meat. Globally, meat processing is estimated to account for approximately 40% of the carrageenan market. Dairy products account for around 30% of the global carrageenan market. The dairy segment is the most dynamic segment for seaweed extracts, where most product development is taking place.

In the 2006–2011 period, more new products that contain semi-refined carrageenan (E407a) were launched worldwide than products containing refined carrageenan (E407). However, the use of E407a in dairy applications has decreased significantly since 2006, whereas their uses in all other categories increased. It may reflect a change in taste since dairy applications typically have more delicate flavours than savoury products.

Most of the new product development activity in the food industry is represented by six end-use product categories: desserts and ice cream; dairy; processed fish, meat, and egg; meals; bakery; and snacks. Desserts and ice cream are dominating the activity. For example, new product development activities containing semi-refined carrageenan (E407a) for desserts and ice cream increased 50.5% from 2006 to 2011.

For the feed industry, buyers indicated that hydrocolloids are not so interesting for animal feed. Quantities used are very limited (1–2 tonnes) and mostly related to milk replacers. The main segment is in the wet feed market. Suppliers to this segment need to take into account low prices, due to the very price competitive pet feed market.

Low-carb food segment

Health and dietary concerns regarding low-carb foods have fluctuated during the past few decades. Low-carb diets were first made famous thanks to the Atkins diet, which reached its first peak in popularity in 2004. The last years have seen a strong resurgence of this trend in Europe, in particular under influence from developments in the American food market. Consumers have access to an ever increasing body of literature and recipes and are looking actively for solutions for reduce the use of carbohydrates in their diet.

Food and beverage manufacturers are making use of this trend by also providing final products which are low in carbs. That includes breakfast cereals, cookies and other desserts, and sport or nutritional products. Food manufacturers are also investing strongly in low-carb varieties of traditional starches in European diets, for example seaweed-based pastas and cauliflower-based rice and hamburger buns. Food additives such as seaweed extracts play a strong role in providing structure to these food products.

Vegan food segment

The number of Europeans who are reducing their consumption of animal products has been increasing significantly due to health, animal welfare and financial reasons.

BioFach, one of the most important European trade fairs for organic and natural products, dedicated part of its [February 2018 trade fair](#) to the world of vegan, showing the potential and possibilities for future product development. This fair corroborates the fact that consumers are less willing to compromise on taste and texture of vegan foods and many expect an eating experience that is similar to eating products containing meat, dairy or eggs. Seaweed extracts play a strong role in providing structure to many of these food products.

Channels to the European seaweed extract market

Types of Importers: importers of seaweed extracts, European compound industry and food manufacturers

- Main players in compound industry: CP Kelco, FMC, Cargill;
- Examples of small compounders: [AGI](#), CEAMSA;
- Food manufacturers in diverse sectors of the food industry use seaweed extracts, including dairy, meat, condiments and bakery products.

Box 5. Channels to the European compounds market

Type of buyer: Highly dependent on the profile. Small-scale compounders, some also trading in Europe, could be interested, although large players are not interested. Food and feed manufacturers could also be interested.

- Examples of small-scale compounders: [TER Chemicals](#), [AGI](#);
- Food manufacturers in diverse sectors of the food industry use compounds, including dairy, meat, condiments and bakery products;
- Pet food manufacturers of canned meat.

Pure traders might consider Indonesian compound suppliers as competitor to their own buyers.

2.1.3 European requirements

The most relevant requirements for seaweeds, seaweed extracts and compounds are the following.

Food safety

Food products and ingredients are covered by an extensive body of legislation. The most important aspects of these laws deal with food safety, which includes hygiene, pesticide residues, contaminants, microbiological criteria, permitted additives, and processes and systems to control these requirements, such as tests and Hazard Analysis and Critical Control Points (HACCP). In addition, buyers can demand food safety, traceability and sustainability standards beyond legislative requirements, e.g. ISO 22000, depending on which specific buyer.

The most established certification in Indonesia among seaweed processors is HACCP, which all the companies interviewed have or are working towards. Certification is done by MoMaF. Four out of 10 companies interviewed have taken steps towards ISO 22000, BRC or FSSC. An estimated 30% of the medium to large companies in the food sector are certified against the FSSC 22000 standard.

All animal feed (including ingredients such as seaweed extracts) imported into the European Union is subject to the General Food Law. Although both food and feed are covered under the General Food Law, the specific hygienic requirements for these two categories are described under different provisions. Regulation (EC) No 1831/2003 [lays down the requirements for feed](#). The regulation also introduces HACCP principles for feed business operators. European Union legislation on [undesirable substances in animal nutrition](#) contains maximum levels of specific substances permitted in feed. As humans consume meat from animals, the maximum levels of specific substances are very strict to prevent risk to human health.

Feed additives may not be put on the market unless authorisation has been given. Agar, sodium alginate and carrageenan (listed as 'Natural products – botanically defined') are listed in Annex I of the [Register of Feed Additives](#) pursuant to Regulation (EC) No 1831/2003.

Organic

To produce organic certified seaweeds, companies must have a system to monitor the quality of the water, i.e. the concentrations of toxins, in which the seaweeds are grown. To produce organic certified seaweed extracts is another story. Whereas it is possible to extract organic certified agar from certified organic seaweeds, and that is done in Indonesia, extraction of alginates cannot be certified. The use of acids and alkalis for alginate extraction does not comply with requirements under EU legislation 834/2007. Organic production of carrageenan is possible but there is no case in Indonesia as of yet.

Entry to seaweed extracts markets requires know-how and high investments costs

Although the production, collection and drying of seaweeds is very accessible, a cost-efficient and reliable extraction of carrageenan, alginates (particularly PGA) or agar from these seaweeds and subsequent compounding requires significant investments. These investments consist of investments in human resources to train and pay the workforce, plus capital in the millions of euros. Extraction facilities need to have a large capacity to supply the large buyers, advanced technology for extraction and high food safety management standards. Without a long-term loan, investments in technology and human resources are only feasible for large, financially strong companies. Access to both know-how and capital is problematic for Indonesian companies.

Requirements of buyers importing directly from origin

While many European buyers prefer to source from suppliers in China and other competitors of Indonesia, a small but growing number of buyers prefers to source directly from suppliers of seaweeds and manufacturers of seaweed extracts in the countries of origin, including Indonesian companies. Requirements of buyers of seaweed extracts may include:

- Technical information on the functional properties of the seaweed extract;

- Highly consistent quality, as they do not have the capacity to standardise themselves;
- Advanced certified food safety management systems, such as [BRC](#) or [IFS](#).

To target European buyers of seaweed extracts directly, a producer needs to develop the following capacities to meet their strict requirements:

- Highly skilled R&D and sales staff, and a high-tech laboratory to provide technical advice to buyers on applications and processing characteristics;
- High degree of control over raw materials production and processing to standardise procedures and achieve greater consistency in quality and volumes;
- Highly skilled operational and quality control staff, and a state-of-the-art production plant for the development and implementation of an advanced food safety management system.

As explained in Chapter 3, many Indonesian processors are currently not able to meet these requirements and will face difficulties meeting them in the future.

Box 6. Additional requirements for compounding

Especially in the mature European markets, food and beverage manufacturers increasingly need tailored texturising systems for their new products. Many of them rely on blenders to do research and develop tailored solutions, such as low-cost seaweed compounds which retain their functional properties under specific conditions of heat and acidity, for example. This often requires the combination of various hydrocolloids. This type of R&D requires close collaboration between end users and blenders. Suppliers of seaweed compounds must be able to advise manufacturers on the application including processing characteristics. According to European buyers, this level of knowledge and market connectivity is currently not present in Indonesia.

2.1.4 Value addition

Local value addition by extraction

Extraction of agar and carrageenan from seaweeds implies value addition. Based on ITC trade data, the average value of seaweeds and algae fit for human consumption was €0.63/kg in 2016. The average value of agar extracted from *Gracilaria* seaweed amounts to €8–15/kg.

Table 5. Price indications for seaweed extracts

Product	Price per kg free on board*
Carrageenan (alcohol refined)	€20
Carrageenan (gel pressed)	€12
Agar (extracted from <i>Gracilaria</i> seaweed)	€10–15
Agar (extracted from <i>Gelidium</i> seaweed)	€30
Alginates (PGA of Chinese origin)	€20
Alginates (sodium alginate)	€12

*Prices are rough indications. Actual prices depend on specifications and market fluctuations, Source: ProFound, 2017

Local value addition through direct exports

Currently, many seaweeds and to a lesser extent seaweed extracts from Indonesia are exported to China, where value addition through various activities such as extraction, compounding and distribution take place. European buyers generally prefer to have short transparent supply chains without unnecessary intermediaries. This implies a preference to source directly in Indonesia, all other factors being equal. This provides an opportunity for Indonesia to add value locally and compete with Chinese companies. On the one hand, European buyers would be interested in sourcing from Indonesia directly, instead of sourcing from China based on Indonesian (or mixed) raw materials, however, as became apparent under indicator 4, there are large concerns around quality as well as quality consistency which will need to be resolved.

Box 7. Local value addition by compounding

Compounding and providing texturising solutions to European buyers imply value addition. Most seaweeds and seaweed extracts are highly standardised products, which allows buyers to put pressure on prices. As compounds are unique products, prices depend much more on the value for the respective buyer. Pricing in the compounds market is based more on the value of the knowledge by the supplier to provide the most suitable solution to the buyer. On the one hand, European buyers would be interested in sourcing from Indonesia directly, instead of sourcing from China based on Indonesian or mixed raw materials, however, as became apparent under indicator 4, there are large concerns around quality as well as quality consistency which will need to be resolved. This means that the vast majority of European food and feed manufacturers would not be interested in working with Indonesian compound manufacturers beyond the basic 'single-source' compounds which are now produced. We expect that companies with a strong ethical background, and a focus to maximise value addition in their sourcing countries, could have an interest and might show a flexibility to work with Indonesian suppliers. However, this niche market is small.

Local value addition by improvement of sustainability

Sustainability is a major issue to European companies and consumers. Obtaining certifications, developing marketing stories and adopting CSR practices can add value to products, open up opportunities and facilitate market access.

- *Certification:* Although sales of organic products in Europe are increasing, the market for organic seaweed compounds represents an insignificant niche market. Only a few companies worldwide have been able to develop organic agar, while organic carrageenan is not available at all. Moreover, organic compounds require each ingredient to be organic certified, which is not feasible in the current market. The new ASC-MSC seaweed standard may present more opportunities. Market prospects since this standard was introduced recently are yet unknown. The ASC-MSC standard is not yet applied in Indonesia.
- *Marketing stories:* In addition to certification standards, there are opportunities to add value by employing marketing stories. They mostly revolve around provenance, including production methods, benefits for communities or the environment, the identity of producers, the environment of production, etc. Increasingly, these marketing stories require strong documentation to back real benefits. Marketing stories are not a focus of Indonesian seaweed extract companies.
- *CSR and company codes of conduct:* By implementing CSR policies or company codes of conduct, companies can set themselves apart from their competitors. Such codes include social and environmental parameters that demonstrate an exporter's commitment to sustainable principles. Although basic compliance is increasingly becoming a market requirement, going beyond the basics can add value to a product and facilitate market access, as some European companies which are committed to sustainability require such codes or policies from their suppliers. Indonesian companies often do not have written codes or other documents to substantiate and promote their CSR practices.

3. Structure and Governance of the Seaweed Value Chain

This chapter describes the structure and governance of the seaweed value chain (VC) looking into:

- What are all the actors, influencers and supporters? How many are active in each part of the VC? What is the governance structure of the VC?
- What are the horizontal and vertical relationships between these actors, influencers and supporters?

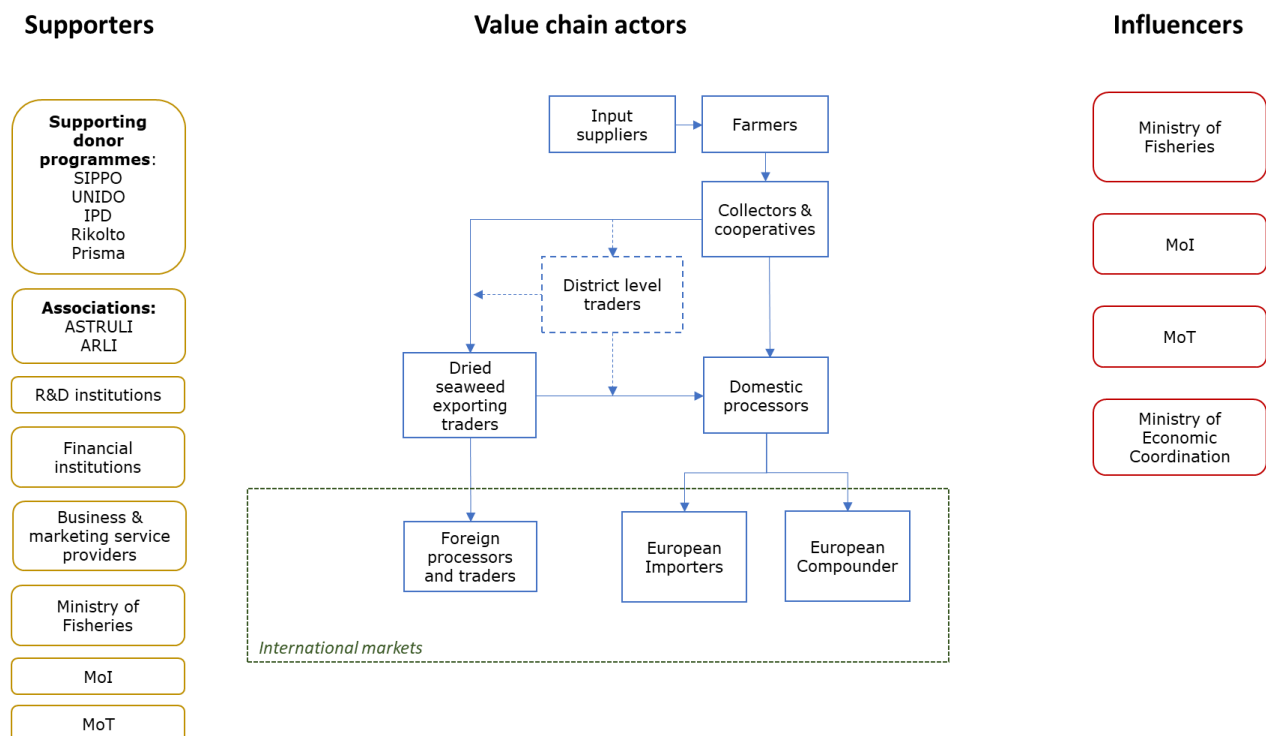
Please note that organisations can have different roles. For example, government agencies often have both an influence role, setting the rules, and a support role, helping value chain actors to comply with the rules. We discuss:

- Value chain actors: All actors from input supply up to buyers in Europe;
- Value chain supporters: Industry associations, international organisations, donors, local NGOs, government organisations and other supporters in key services such as certification, testing, R&D and financial services;
- Influencers: The key roles and responsibilities making up the enabling environment as well as the ministries setting and implementing these rules.

3.1 Existing seaweed products directly exported to European markets

The figure below provides a representation of the value chain for existing seaweed extracts exported to European markets. This section discusses these different players, starting with value chain actors, moving to influencers and finally discussing the variety of value chain supporters.

Figure 3. Value chain of existing seaweed products directly exported to European markets



3.1.1 Value Chain Actors

3.1.1.1 Input suppliers

Farmers need equipment such as lines, ties, buoys and anchors, as well as seedlings. Equipment is easily available through local shops which provide all materials required to build the production system. Collectors often play a role in financing such inputs (see below). Seaweed seedlings are purchased through two channels. The first option is to buy them from one of the nurseries located in every major production area. These are often run by local government agencies. Large farmers purchase seedlings from the nurseries. Smaller farmers often purchase seedlings at an early stage in the farming cycle from larger farmers.

A large portion of seedling production is based on multiplication of existing materials. This has been an ongoing process which according to some stakeholders is leading to a decrease in the quality of seedlings.

3.1.1.2 Seaweed farmers

It is estimated that the total number of households with income from the seaweed production could be 250,000 in Indonesia, with almost 1,000,000 farmers. These are almost exclusively smallholders from coastal communities across the archipelago. Seaweed farms are generally operated by households that have other sources of income, such as construction work, particularly outside the growing seasons. Some seaweed farmers are organised in legal entities, such as cooperatives, or in informal farmer groups. Cooperatives (see below) take on trading roles, especially when they are organised in secondary cooperatives to reach scale, e.g. Kospermindo. Generally, only a low percentage of farmers is organised (no data is available) and many organisations are not effective in performing joint actions.

Farming takes place either in the 'off-bottom' method using stakes to work directly from the sea bottom in shallow waters, for example in Bali; or the 'long line' method which uses 50–100 meter long ropes tied to anchors and large buoys, for example in South Sulawesi. In general, access to sea areas is through traditional ownership and uses structures within the community. There are no formal permitting systems in Indonesia.

Production per household range between 300 and 400 kgs of raw dried seaweed (RDS) to up to 700 kgs, depending on the area. For cultivation, harvest and post-harvest (i.e. drying) farmers use traditional methods, which they were taught when they began producing seaweed, or from their parents or relatives. Drying is done in four ways:

- directly on the ground without base;
- placed on a tarpaulin;
- dried on para-para bed; or
- hung without touching the ground, which is considered best, conforms with Indonesian National Standard (2690:2015), reduces contamination and speeds up drying.

At the farm level drying is done up to 40–45% (*cottonii*) and 40–50% (*gracilaria*).

Application of standard operating procedures (SOPs), often supported in programmes by local governments or NGOs, for good practices is limited. This is the case both with cultivation as well as with drying, since most drying is done on the ground. Moreover, as there is little to no relation between price and quality, the application of such techniques is also sometimes discontinued. Farmers are not motivated to make investments that would improve the RDS quality. According to industry sources, the main benefit of the application of SOPs currently is limited to shorter drying periods, which supports productivity. The private sector hardly invests in the application of good practices, which industry sources explain is caused by the lack of close relations and strong supplier-buyer relations in the chain. Suppliers assume that trained farmers would just sell to other suppliers.

Farmers sell their seaweed to collectors in cash-based transactions. The selling price at the farm level is set entirely by local collectors, who in turn get their prices from district traders or directly from exporting traders. Farmers lack

information on strong price fluctuations on the market or margins in the value chain. If farmers face cash shortages, seaweed is sold even when crops are not matured.

Price fluctuations are large for *cotonii* due to supply-demand fluctuations, depending on demand from China (see below). They are more in balance for *gracilaria*. At the time of research:

- Farm level price for *cotonii* ranged between 10 to 14,000 rupiah (€0.60–0.83), but can be as low 4 to 5,000 rupiah (€0.24–0.29), and as high as 20 to 23,000 rupiah (€1.19–1.36).
- Purchasing price for industry is between 12 and 16,000 rupiah (€0.71–0.95).

In good months, income per farmer can be up to 10 to 30 million rupiah (€593–1,780) per 45–60 days, depending on the number of lines.

3.1.1.3 Collectors, traders and cooperatives

Collectors

Collectors exist in different sizes. Smaller collectors often operate in the same village as farmers. In many cases the collectors are also leading or large farmers. These collectors also play a large role in financing farmers, purchasing the necessary inputs such as lines and seedlings. In return, the collectors get all the harvest. These traditional ‘ifon’ payment systems make farmers highly dependent on these collectors, and makes extension services at farm level difficult.

Besides financing, the role of collectors includes:

- collecting seaweed from the farmer in their area;
- re-drying up to 30–38% for *cotonii*, and 14–16% for *gracilaria*;
- basic cleaning and selling to district traders or directly to larger traders and exporters, depending on the size of operations.

District traders

District traders are often in close contact with collectors to check on availability and arrange transport from collectors to warehouses. Checks on quality, moisture and impurities content are often done there and further drying or cleaning is done if needed. Seaweed is repacked to bales of approximately 100 kg each at this point. Traders then deliver to exporters and local processors.

Cooperatives

There are also various cooperatives involved in seaweed collecting, drying and trading. The development of cooperatives is supported by the Ministry of Cooperatives and international NGOs. The average number of members of a cooperative is 200 producers. The role of cooperatives includes:

- saving and lending money to the members;
- providing technical assistance, particularly with respect to RDS quality control;
- supplying input to the members and selling seaweed to traders, but often also directly to exporters and local processors.

Kospermindo is an example of a secondary cooperative, now operating in 11 districts in Sulawesi, which is also considering starting to process.

Traceability at this level can sometimes be done up to the collector level, but often only to the trader level, as seaweed from different collectors is mixed. No traceability to farm level exists. In terms of quality consistency and improvement, the level of traders and collectors can play a vital role in disseminating information to farmers, in terms of information on good practices and feedback on quality, including moisture, sand, plastic and other contaminants. However, this often does not happen. Buyers stress that there is a need for standards to reduce the use of cable ties, which are a key source of plastic contamination.

3.1.1.4 Exporting traders

Around 100 exporting traders are estimated to be operating in Indonesia, supplying to foreign markets and domestic processors. Up to 80% of cottonii and 20% of gracilaria is exported.

They use different models for sourcing. Some source from five to 10 district traders, while others also work with collectors and have up to 200 suppliers. Business relations can have a long history and many have their own staff or local representatives to liaise with their suppliers. Exporting traders need to source from different areas based on seasonal or weather-induced variation, since salinity and water temperature affect seaweed growth.

Exporters purchase dried seaweed based on spot purchasing orders from China or buyers in other parts of the world. Based on these orders, they give short-term contracts to suppliers to deliver certain amounts RDS, at a certain quality in one or two months at a certain price. Prices change on a weekly basis, based on prices provided by buyers in China, from \$800 to \$2,150. Export prices were considered more attractive than local prices. Payment terms by traders working with Chinese buyers are considered more attractive because they involve direct cash, pre-payments and working capital for sourcing, as opposed to domestic processors which may take weeks after receiving goods.

Before selling to domestic or international processors, exporting traders dry RDS according to buyer requirements. Moisture requirements are generally lower for exports than for the local market, with the lowest content in markets such as Europe — water content for cottonii to Europe is 35%, with 2% impurities. This also results in a higher price. Traders use sensory methods to check moisture content. To ensure adherence to export standards, the provincial government also checks moisture content. Contamination with dirt, plastic and shells needs to be managed at this level, particularly if farmers are not complying with good practices.

3.1.1.5 Processors

In 2007 there were still an estimated 150 seaweed processing companies in Indonesia. Many were set up with government support and were not competitive. Currently:

- There are 40–50 companies, out of which between 30 and 40 are actively producing, compared to three in China;
- Of these companies, there are 21 members of Astruli (see below).
- Out of 32 companies identified during this research¹, there are 13 producing agar agar and another 19 producing carrageenan at different grades ranging from alkali-treated cottoni (ATC), to semi-refined carrageenan (SRC), to refined carrageenan (RC).
- There is currently one organic certified company of agar.

Out of these 32 companies:

- 14 are located in East Java;
- 5 in West Java;
- 3 in Jakarta;
- 5 in South Sulawesi;
- 2 in NTT;
- 1 each in NTB, North Sumatra and Central Java.

¹ During the field work, the local team visited 10 processing companies, with two additional processors (ATC, and semi-refined carrageenan) visited for a short visit together with the international expert. Please note that due to the short visit not all questions in the questionnaire could be discussed with the company in detail and as such the company is not included in further statistics. These are shown in Annex 1. Further statistics on companies are based on these 10 companies.

The average size and level of processing of the companies is very different, ranging from 250 to up to 3,000 tonnes and from basic products to blends. They can be split in three levels:

- Several highly effective companies with the right technology and good connections to the market such as Java Biocolloid for carrageenan and AgarIndo for agar agar.
- Several companies that have developed slowly but face issues in terms of access to finance, human resources, technology and markets.
- A group of struggling companies that face strong challenges to remain active in the market. In addition, some seaweed factories in Eastern Indonesia are government owned and generally not well managed.

No processor is operating at full capacity and some are using as little as 30 to 40% of their production capacity. This is most likely due to a lack of access to seaweed or a lack of market access (see below).

Box 8. Compound producers in Indonesia

The compounds of Indonesian producers appear to be 'single-source' blended products. For example, agar processors offer agar-based compounds, while carrageenan companies offer carrageenan based blends, although combining kappas and iotas. The *agarRA* series is 'a complete range of med-high gel strength pure agar agar powder with customizable textural properties to cater to the customer's end product application'. During interviews with industry stakeholders, there was no indication that importing other hydrocolloids is not possible.

Sourcing practices

Processors buy raw materials through exporting traders, but mostly directly at district traders and larger collectors and cooperatives. In general, the relation between processors and their suppliers is not strong, resulting from a lack of continuity in purchasing and a focus on low price. According to industry sources this is due to an industry focus on competition with China on price. As such, processors only buy when prices are low. Many lack working capital or willingness to hold stock and end up with insufficient supply or unaffordable prices when Chinese buyers offer more attractive prices, hurting their own continuity. Industry sources advise having three to six months of inventory, while most processors only purchase based on orders from buyers.

On the other hand, when demand for seaweed is very high, industry sources indicate that Indonesian processors do not adhere to their own quality standards to get sufficient volumes. Processors do not take control or responsibility over their value chain, not investing in traceability and supply chain development in terms of quality and quantity, nor do they provide incentives in price or offtakes to traders, and thus farmers for improving their quality or adhering to good practices. Industry sources also indicate that farmers do not get feedback on quality. The fluctuation in purchasing also damages trust with suppliers.

Table 6 below provides insights into the types of tools and processes producers put in place to support quality sourcing. It shows a high incidence of quality checks by quality control staff, but a lack of written specifications.

Table 6. Application of sourcing tools and practices, by 10 interviewed companies

Tools and processes	YES	NO
Written specifications agreed with your suppliers?	60%	40%
A list of approved suppliers?	70%	30%
Factory-gate quality checks?	100%	0%
Quality control staff?	100%	0%
Regular supplier audits and visits?	80%	20%
Quality, input or financial support for suppliers?	90%	10%
Batch number?	90%	10%

Considering the lack of action taken by processors, the main challenges mentioned are not surprising:

- Low quality, particularly during the rainy season;
- Lack of supply;
- Competition by Chinese buyers resulting in strong increases in demand and escalating prices;
- Unfair competition from Chinese buyers related to tax rebates provided by the Chinese government;

- High transportation costs.

Some companies are showing better practices and have demonstrated that relationship building is possible, for example PT Hydrocolloi and PT Indo Seaweed.

Box 9. Sourcing of non-seaweed based hydrocolloids for compounding

Sourcing of other hydrocolloids by companies offering compounds is currently not happening. However, it should be possible through distributors in Indonesia, or directly from source countries. Currently, processors indicate this as a weakness, perhaps as they do not know the channels for sourcing these materials nor the specifications they should be looking for. The knowledge on what hydrocolloids are needed, however, is currently not there (see below under processing).

Processing practices

In terms of processing, variation between processors is high in terms of technology, size, testing and certification. Some processors are highly professional outfits which use modern technology, do proper testing and ensure the right capacities of their staff. Companies require:

- Upgraded technology: 60% indicated having access only to outdated machinery;
- Improved human resources: 60% of companies indicated staff experience as an obstacle;
- Improved quality assurance: 40% indicate difficulties with ensuring stable quality and microbiology.

This is the particular case of carrageenan producing companies in other countries, which benefit from much better production processes. Buyers also mention a lack of consistency in quality and food safety, even when companies are HACCP certified. They highlight the need for SOPs from raw material sourcing up to the level of processing and strict adherence to these standards. Moreover, they also stress that processors need to invest in more modern machinery that is more efficient, uses less energy, provides better quality, and increase their scale to be able to compete.

Capital for such investments is often absent, while the idle capacity makes it difficult to justify investments and impacts margins. Some companies remain stuck in intermediate production steps, such as ATC, which international market demand indicated to be decreasing. The situation is better for agar.

Industry sources also indicate that quality is under pressure due to the purchasing behaviour of processors, buying low-quality raw material to cut prices and mixing different qualities. Moreover, some companies try to cut costs by reducing investments in equipment. The operating capacity or the low use of the capacity in some companies makes it difficult to produce at a competitive price.

All the companies interviewed have or are working towards HACCP certification. Certification is done by MoMaF. Four out of 10 companies interviewed have ISO 22000, BRC or FSSC. An estimated 30% of medium to large companies in the Indonesian food sector are certified for the FSC 22000 standard. All companies test for gel strength, moisture content, impurities, metal content and microbiology, among a variety of tests to check product quality. Not all companies can offer food grade extracts.

Table 7. Incidence of testing and certification, by 10 interviewed companies

Tests		Certification	
Gel Strength	100%	Halal	100%
Moisture content	100%	MUI	100%
Impurities	100%	Kosher	50%
Metal content	100%	Organic	10%
Microbiology	100%	Fair-trade	10%
Viscosity	90%		
NUT/clarity	20%		
Pesticide contamination	20%		
Water quality	10%		
Ion Content	10%		

Whiteness	10%
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Most companies outsource all or part of their testing, but 60% of them responded that they would like to do the testing themselves, but lack either the knowledge or the equipment to do so.

Box 10. Processing practices for compounds in Indonesia

Three of the companies interviewed blend seaweed extracts into compounds for exports. Several other companies indicated an interest to move further into the value chain or had done so in the past. Some indicate that they have facilities and staff to do so, while most indicate that they do not have the required know-how, R&D staff or equipment to take this step. Others indicate that they first want to focus on improving in seaweed extracts and stabilising their supply chain and market.

As was mentioned earlier, these compounds are based on their own extracts mostly. This means for example that the carrageenan processors combine different kappa and iota carrageenan and different extract types into various blends for different applications and only in some cases add other hydrocolloids.

This is very different from the European understanding of compounds, which are ready solutions combining a variety of hydrocolloids. European compounders have the knowledge of hydrocolloid properties and functionalities, know their behaviour in different applications and processing conditions, and have the connections in the market to offer compounds which optimise synergies between various hydrocolloids. According to buyers and stakeholders in Indonesia, companies currently lack the know-how and qualified staff, the market understanding, the R&D facilities for testing applications and the knowledge about various hydrocolloids to take this route. Companies indicated that they do not know buyer needs as they are not in contact with them and do not have access to market information. There is also an apparent reluctance to invest in R&D, training of staff and obtaining market information, such as visiting fairs and buyers.

Companies face issues with market knowledge, R&D and staff, and in some cases, also equipment with the blends they currently produce. Access to qualified staff and know-how in Indonesia is limited. An industry source indicated that acquiring such staff either involves training of food chemists coming from universities, or headhunting talent from other companies. Some companies also mentioned current equipment is not suitable for blending product compounds.

Management practices

Eighty per cent of the interviewed companies indicated that they have a business plan, including client management, export marketing, product documentation and certification. Nothing was mentioned in relation to sourcing or supply management, which again underlines the strong trader mentality of processors, which a lack vision in terms of innovation and investments in quality and supply chain development.

Marketing practices

An estimated 85% of the production of carrageenan is exported and the other 15% sold in the domestic market. For agar, the local market is much more important than exports market.

Box 11. Marketing practices for compounds

Local markets are not strong at compounds. Indonesia's domestic market is more based on synthetic thickeners. Ready-to-use natural compounds are often bought from agents of big international processors. Estimates indicate that only 10% of the compound production is sold domestically. Local market development would be needed to change this situation. Still, one company indicated to be focusing on the domestic market.

Indonesian processors report difficulties in entering and maintaining their presence in international markets, citing:

- lack of international access and buyers' network (50% of respondents);
- lack of information on those markets, especially buyers' needs;
- low utilisation of production capacity, linked to high costs;

- competition from Chinese companies who source at high prices in Indonesia, but sell cheaper in international markets (40% of respondents);
- quality at the right grade (e.g. food grade) or microbiology (mentioned by two out of 10 companies);
- a lack of logistics capacities or facilities to market;
- lack of a common strategy to market. Indonesian companies compete on export markets instead of working together on issues of common interest, which is also a key intervention area of the UNIDO project (see below).

Box 12. Additional difficulties for compounds and blends to enter international markets

- hard to penetrate the market due to well-established business relations manufacturers have with European suppliers. Buyers do not switch unless they have issues with existing suppliers;
- small batches and high logistics costs make them less attractive;
- competition from companies in the Philippines;
- buyer's preference to buy pure instead of blended products from Indonesia.

Industry sources indicate that the following issues make it difficult for Indonesian processors to compete with Chinese companies, which have the following advantages:

- Tax rebates;
- Lower energy costs;
- Cheaper chemical inputs;
- Higher labour productivity;
- In some cases, Indonesian players have better logistics to China than to processing locations of Indonesian companies.

The above list is in addition to the better processing technology and economies of scale of Chinese competitors.

In terms of export destinations, the table below shows that European markets are still the most important ones for processors. Unfortunately, extracts and compounds cannot be separated in the questionnaire data. However, Asian, Latin American and North American markets are supplied by the companies in the sample. The companies interviewed export on average around 70% of their volumes, mostly to foreign processors. The relation with these buyers is often based on SPOT buying. All respondents have clients that work in this manner. Around half of the companies were also working under long-term contracts. Few mentioned any joint investments with their buyers.

Table 8. Export destinations, by 10 interviewed companies

Area	Percentage of companies that export to a region
EU	67%
Asia	56%
Latin America	56%
North America	44%
Maghreb	22%
Oceania	11%
Russia	11%
Africa	0%

3.1.1.6 European Trade and Industry

About 30 years ago, the European market for seaweed extracts was very concentrated among few large companies. Four companies (Cargill, FMC, DuPont (Danisco) and CP Kelco) controlled roughly 75% of the industry, covering a large range of activities including seaweed procurement in countries such as Indonesia. They actively supported establishment of new production locations in seaweed production areas through investments and technical assistance.

In the past 30 years, the balance in the industry has shifted. The four large companies mentioned above currently control less than 20–25% of the industry. They are less involved in developing new raw material. Instead, they have established long-term trade relationships with part of their seaweed extract suppliers. In return for their commitment to the trade relationship, which can include technical assistance, they can demand an exclusivity agreement.

Similarly, other smaller European companies limit their stakes in Indonesian business activities to sourcing as buyers. Most of them prefer to be able to switch between suppliers based on the attractiveness of their offers. Only a few companies are interested in investing time and knowledge into the improvement of their suppliers' range.

The sustainability trend in Europe stimulates companies to become more involved in their supply chains. Large multinationals are implementing sustainability policies which force them to take more responsibility for sustainability in their supply chains. They must first know how their supply chains are organised and require their suppliers to provide transparency through reporting systems such as [Supplier Ethical Data Exchange](#) (SEDEX), used by [CP Kelco, DuPont and Cargill](#), or through their own questionnaires or audits. Based on the information about sustainability issues, the European companies may require their suppliers to take measures to improve sustainability. In some cases, when European companies identify major sustainability issues which cannot be addressed by their suppliers alone, they will offer technical support. Such cases were not identified in Indonesia. In fact, the interviewed companies did not mention any sustainability issues of concern to them.

The company Java Biocolloid Europe is the only Indonesian company with a business location in Europe. In this case, the owner ([Hakiki Donarta](#)) is an Indonesian company, which first established the Indonesian seaweed extracts supplier Java Biocolloid, before establishing their European R&D and sales company Java Biocolloid Europe in 2017.

Box 13. The European compounding industry in Indonesia

European compounders source ingredients for their compounds from different origins around the world, including Indonesia. Compounds are supplied in much lower volumes to all but the largest food manufacturers. This makes Europe a highly suitable location for compounding from a logistical point of view. They are not interested in investing in compounding in Indonesia.

3.1.2 Influencers

Food legislation in Indonesia is quite similar to European legislation, covering hygiene and food safety, residues and microbiology. Industry sources indicate that the differences lie mostly on weak enforcement, particular when it comes to smaller companies, or the implementation of particular regulatory areas into guidelines. Compliance in Indonesia does not necessarily mean that companies could also comply with standards expected in Europe.

The Ministries of Fisheries, Industry, Trade, Health, and Finance each are involved in different stages of the seaweed extracts industry. Each agency will oversee, regulate and develop specific parts of the industry. Several ministries also offer services to the sector, which is discussed in Section 3.1.3. Coordination between policies and actions plans and programs between ministries, for example, MoI and MoMAF also conduct trade promotion, and trade-related agencies is limited.

The Ministry for Economic Affairs is in charge of planning and policy co-ordination, as well as synchronisation of policies in the fields of economics within the Indonesian government. The Ministry took the lead in developing an overarching strategy for the seaweed sector in 2016. However, this process currently appears to be stalled. More investigation is needed to determine the causes and potential solutions to restart this process.

Table 9. Role of Indonesian government agencies in the seaweed extracts trade

Ministry	Scope and role	Specific to the seaweed sector
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Marine Affairs and Fisheries	Aquaculture policies and farming development, post-harvest and initial processing.	<ul style="list-style-type: none"> The ministry has a keen interest in supporting the seaweed sector and has specific policies for the sector.
Industry	Industrial policies, processing, export.	<ul style="list-style-type: none"> MoI is strongly interested in the seaweed sector, focusing specifically on processing. Directorate Generals of relevance to sector are: <ul style="list-style-type: none"> SMEs (with a focus on food products); Agro-processing; Chemicals and upstream manufacturing (including companies working the cosmetics sector); International cooperation, marketing and trade promotion. The ministry has a strong focus on development of value added products, as well as stimulating development outside of Java. The ministry also expressed a strong interest in supporting seaweed processors to move into further value addition by developing compounding capacities.
Trade	Trade policies, trade promotion.	<ul style="list-style-type: none"> MoT has an Export Development Strategy which touches upon key issues including product development, market information, coaching, matchmaking, and trade agreements. A seaweed sector specific strategy does not seem to exist.
Cooperatives and SMEs	Developing cooperatives	None identified
Health	Ensuring health standards and issuing health certificates	None identified
Finance	Export and import duties and taxes	None identified
National Education	Education and scientific research	None identified

Adjusted from MoT, Indonesian Essential Oils, 'the scents of natural life'

3.1.3 Supporters

3.1.3.1 Industry organisations

Most companies interviewed were part of an association, most notably ASTRULI.

ARLI

ARLI, *Asosiasi Rumput Laut Indonesia*, the Indonesian Seaweed Association, has around 100 individual members, among which companies, researchers, traders, cooperatives and farmers. It is funded from a levy on seaweed exports. It has a six-person secretariat.

ARLI's mandate is diverse, looking at farmer, trader and processor needs, working in close cooperation with MoMaF to balance industry and export needs. Its mission is to represent industry interests, develop the industry in an integrated way, conserve traditional farming rights, extend seaweed cultivation and develop the processing industry. ARLI seeks to increase communication to plan and address imbalances.

Many of ARLI's activities are implemented in partnership:

- Extending seaweed production in Eastern Indonesia (with Chinese funding):
 - Identifying new suitable production locations;
 - Scoping quality of growing conditions;
- Improvement of seaweed cultivation methods to improve productivity and quality (with DG Aquaculture, MoMaF);
- Market development;
- Dissemination of best practices (funding still needed);
- Events, conferences, etc., such as a planned Hydrocolloid event in Makassar in mid-2019.

Collaboration with Astruli (see below) only happens in case of high-impact events. A recent example where the two organisations joined forces was on the de-listing of carrageenan as permitted non-organic ingredient in organic products in the USA.

We identified the following key needs for support:

- Mission and vision development and planning (objectives, service priorities, service development, including costing);
- Market development is considered a weak spot;
- knowledge to support informed business planning for members;
- Improve connections with other stakeholders in Indonesia and key production countries;
- Sustainability;
- Definition of roles and responsibilities of different types of members.

ASTRULI

Astruli was established in 2014 to represent the seaweed processing industry in Indonesia. The organisation works in close partnership with the Ministry of Industry. It has 21 members out of an estimated 35 companies in seaweed processing, with 18 active members. ASTRULI represents in total about ¾ of the seaweed processing capacity in Indonesia.

According to the interviewed company, benefits of membership were to improve coordination among members, to share information and to advocate for more beneficial policies for the seaweed industry and processing with government institutions. Interviewees indicate that benefits at company level are limited and suggested to:

- Advocate for protection of domestic processing 'local factories before exports' through a domestic market obligation;
- Lobby the government to review regulation on water usage, since the industry uses large volumes of water and produces large volumes of waste water
- Lobby for action against unfair price competition from China due to tax rebates to China's seaweed industry.
- Advocate for implementation of a national seaweed standard.

Cooperation with ARLI is limited, due to their different mandates. Whereas Astruli wants dried seaweed to be available for processing in Indonesia, ARLI aims to ensure that the whole chain is supported and claims that local processors cannot take off local production and offer little security to farmers. Industry sources stress that the split between the two organisations, each working with a different ministry, weakens sector coordination.

Astruli has developed a roadmap for the industry, in close coordination with other stakeholders, aiming for Indonesia to become the world market leader for the carrageenan and agar industries, achieving a minimum export composition of 50:50 for raw materials and processed ingredients. This Roadmap is added hereto as Annex 2.

Astruli works closely with the UNIDO Smart Fish project on issues such as branding, traceability and productivity. A recent workshop identified the following targets:

- A two-fold increase in agar exports by 2020, focusing on consolidation in the EU and the USA, and growth in ASEAN, India and China;
- Matching Chinese carrageenan exports by 2020.

This was to be achieved through trade shows, buyer and supplier missions and a sector website. These should communicate Indonesia's USP in terms of being the world's largest seaweed producer, giving it a beneficial position compared to competitors concerning traceability and raw material supply.

Box 14 ASTRULI and compounds

ASTRULI focuses on extracts, not compounds. However, certain members have an interest in, or are already developing compounds and could benefit from support in terms of product development and marketing.

In terms of resources, the association has a board of directors but no executive positions. Members do not pay a contribution and there is little activity from the association other than lobbying. During the workshop mentioned above, members agreed to take steps for ASTRULI to become more meaningful to the industry. A budget of \$68,500 was proposed to allocate human resources, or at least an executive director and a marketing and communication assistant, to create branding and promotion activities.

Other organisations

- Asperli: Local seaweed association in South Sulawesi, combining local traders, farmers and processors. Other areas in Indonesia are not as strongly organised.
- Indonesian Seaweed Society: Society with around 100 individual members with an interest in the seaweed industry. Organises the Indonesian Seaweed Forum every three years, which focuses on policy development and industry development strategies. The society provides advice to MoMaF in the form of a five-year plan for the industry.
- The Indonesian Picologist Association: This association combines a group of seaweed researchers to share information and coordinate research efforts.
- The Seaweed Centre: A forum of SMEs interested in developing the seaweed sector, for example, developing seaweed processing without synthetic chemicals.

3.1.3.2 International organisations, local NGOs and foundations

A lot of companies benefit or have benefitted from the services of international organisations or local NGOs: Half of the interviewed companies are supported by UNIDO or Prisma, and 60% mentioned the previous mandate of SIPPO. These support activities are usually well rated, although SIPPO's focus on market access was criticised as not sufficient to address wider issues affecting the value chain, such as competitiveness and quality. Fair participation was not considered an effective market entry strategy for the seaweed extract market.

SIPPO

SIPPO, the Swiss Import Promotion Programme helps build capacity for export promotion boards and sector-wide associations in six business sectors, in eleven developing and transitional countries. The programme is managed by Swisscontact in partnership with BHP Brugger and Partners and Helvetas Swiss Intercooperation. In Indonesia, SIPPO is working on fish and seafood, natural ingredients and technical wood and is developing last-mile services for four Indonesian BSOs. Relevant to this sector are its activities with MoT, MoI and DAI. SIPPO works specifically on last-mile support, supporting expansion and quality of BSO services for their members' exports, including in the following areas:

- Market intelligence — providing intelligence and building capacities to produce and disseminate;
- B2B matchmaking — supporting matchmaking activities, building capacities, and networking;
- Client management — helping BSO members understand buyers' needs and join buyer networks in the market.

SIPPO supports each organisation based on annual plans, which are part of a strategy targeting the year 2020. SIPPO has expressed a strong interest in cooperating with CBI and IPD in their activities in the natural ingredients sector.

IPD

IPD, Germany's Import Promotion Desk, has chosen Indonesia as one of its partner countries to work in the natural ingredients and timber sectors. In natural ingredients, IPD works with various spices, essential oils and extracts, coconut products and seaweed products.

IPD works directly with Indonesian companies, linking them to European buyers, particularly German buyers, at key trade fairs such as SIAL, Anuga, In-cosmetics, Biofach, Fi&Ni, Hi&Ni. IPD also helps Indonesian business support organisations improve service delivery to their members through workshops. It partners with MoI and MoT through the National Export Development directorate general. IPD has expressed a strong interest in cooperating with CBI and SIPPO in their activities in the natural ingredients sector.

UNIDO

UNIDO Indonesia has been strongly involved in the seaweed sector within the scope of the SMART-fish project. This project has a total budget of \$3.8 million, funded by the Swiss government. Its current phase will end May 2019, with activities mostly finalised in 2018.

SMART-Fish Indonesia (Sustainable Market Access through Responsible Trading) aims at strengthening the trade capacity of selected value chains in the Indonesian fisheries export sector, while ensuring the preservation of biodiversity through promoting the sustainable use of maritime resources. This is done through advising MoMAF on enacting enabling policies for exports, strengthening the supply side by improving competitiveness of products in terms of price and quality, branding, enhancing compliance with international market requirements, including certification for sustainability standards, and facilitating entry into the respective global value chains. Key activities include round tables, the establishment of a quality centre and masters courses, traceability systems, certification and trade promotion.

The programme has been particularly active in East Java and South Sulawesi, working with eight farmer organisations, two cooperatives or traders and nine processors of both carrageenan and agar. One of the focuses was the development of SOPs to improve quality and quantities produced and show how this can result in better prices. For this purpose, demo farms were established and SOPs disseminated. UNIDO also finances Koltiva to develop Seaweed Trace, a traceability system specifically for the seaweed sector. Current and upcoming activities include:

- Branding and market entry: Trade fair participation in Brussels and the development of a national seaweed branding strategy, which is a one year project.
- Improving traceability through application of Seaweed Trace with Mars, Cargill and six local companies in a pilot. The idea is for Astruli to eventually manage the system and become owner of the data.
- Upscaling SOPs by increasing the number of seaweed farmers using SOPs.
- Product development, including final products.
- In R&D, UNIDO has mapped the different research centres in Indonesia. A total of 27 institutions, either managed by universities or MoMaF were visited. Through this effort, UNIDO wants to improve access of industry to research and researchers, while stimulating improved curricula at these institutions.

Box 15. UNIDO and compounds

For product development of blends such as simple compounds, UNIDO works with Cybercolloids, a private independent Irish product development group specialising in hydrocolloids, focusing on food, nutrition and industrial applications, which conducts technical and market research.

A next phase of the programme on quality standards similar to the MSC in traceability, is under consideration possibly focusing on the seaweed sector to leverage the strong network and expertise of UNIDO in this sector. The programme documents are still being prepared with the project potentially starting mid-2019.

Synergies discussed with CBI included upscaling UNIDO activities to more processors, and to work on capacity building of processors. This last item remains urgent, especially to change the processors' mindset to compete beyond price, but also in traceability, certification and quality, linking them to buyers who are interested in these qualities and are willing to pay a premium for them.

RIKOLTO

Rikolto is entering the seaweed industry in Indonesia and still developing its intervention strategy. Its experience in Indonesia has been specific to cocoa, rice, cinnamon and coffee value chains. Rikolto concluded a feasibility study in

March 2017 focusing on Flores (Sikka, Flores Timur) and Bali (KlungKlung). The target size of the project is €250,000. The focus of the project will be to support farmers on issues of inclusive business, collective marketing, farmer organisation, good practices, quality control and food safety, and market linkages. More specifically these market linkages could provide an eventual link with a future CBI project.

PRISMA

PRISMA is an Australian financed programme aiming to achieve a 30% increase in net incomes for 300,000 smallholder farmer households in eastern Indonesia by 2018. PRISMA works to increase the competitiveness of poor farmers by providing better access to private and public services and improving the business enabling environment. PRISMA also works with private and public sectors to help spur growth in the value chain by reducing barriers to farmer productivity, performance and market access for 16 commodities, of which seaweed is one. The approach PRISMA works under is Making Markets Work for the Poor (M4P).

PRISMA's activities in Indonesia focus on East Nusa Tenggara (West Lombok, Sumba, Flores) tackling key issues of productivity related to insufficient knowledge of cultivation methods and post-harvest production practices; limited private sector investment in improving production standards; lack of innovation, and poor access to markets and finance. PRISMA is developing a seaweed support centre with a nursery, post-harvest and logistic facilities, and a seaweed aggregation system. The project focuses specifically on implementing good farming practices as a priority to develop the sector. It also works with village collectors to provide embedded services to smallholder farmers and improve cultivation techniques. The PRISMA project works with a few processors, however, not very intensively. PRISMA is actively looking into further developing the seaweed industry in Papua, in line with MoMaF priorities.

Prisma started working with seaweed in 2014. Its total budget is €50 million (Phase I, 2014–2019), expanding to €60–70 million (Phase 2, expected 2019–2022). PRISMA is not associated with UNIDO's seaweed activities. Possible cooperation with an eventual CBI programme discussed during a CBI-PRISMA meeting were:

- PRISMA could support farmers producing for processors and exporters supported by CBI;
- PRISMA is not strongly engaged in R&D, which could be an activity for CBI.

A second PRISMA programme of interest is SAFIRA, which seeks to introduce more rural banks and financial service providers to the agricultural sector and develop their products, services and expertises to use the opportunities the agricultural sector can provide.

Kalimajari

Kalimajari is one of the implementing partners of the Prisma project in East Nusa Tenggara (NTT), working in the seaweed sector in Bali and Papua. Its capacity building activities to farmers are set up on extension services. Kalimajari has two staff on the ground in West Papua, three in NTT and one in Bali.

Kalimajari works with different development organisations in the seaweed sector, not exclusively with PRISMA. For example, it helps organise farmer groups, connecting them to processors and access to finance in Bali, West Papua and NTT with local banks and the Rabobank Foundation. In NTT, Kalimajari works with Hydrocolloid Indonesia, and in Papua with Indonusa Algaemas Prima.

Dutch embassy

The Netherlands Embassy has not prioritized the natural ingredients sector in its multi-annual strategic plan. However, the *Landbouwwraad* has expressed interest in supporting the aquaculture industry, which is part of the seaweed industry. The embassy aims to further collaborate with Indonesia's Ministry of Trade in expanding trade with Europe, which coincides with the current initiative (Business Case Idea NI Indonesia final).

3.1.3.3 Other private sector players

During our interviews, we found that seaweed processors make use of various services. For financial services, mostly loans, but certification services include phytosanitary certificates, and in a few cases testing of heavy metals and microbiology. Services for market promotion and agronomical support are not used.

Table 10. Use of business services by seaweed processors

Types of services	% of interviewed company outsourcing this service	Details on the service
Financial services	100%	Bank Loan
Certification	100%	Phytosanitary Certificate, HC
Testing	80%	Heavy metal or microbiology

Certification and testing

Considering the size of the private sector in Indonesia, the availability of certification services, both in terms of auditing and inspection as well as capacity building and business consulting, is limited.

The following certifiers provide voluntary certification in Indonesia:

- Ecocert IMO
- Control Union
- ACT Thailand
- BIOCert Indonesia

Other key certification bodies such as BCS, Ökogarantie, KIWA and CERES do not appear to have operations in Indonesia. Control Union has a relatively dominant position in the organic certification market, offering certification for the organic standards of the EU, USDA and the Japanese Agricultural Standard (JAS). Internal staff estimate that Control Union accounts for up to 90% of the market.

Organic certification for seaweeds requires both attention at the company and its supply chain, as well as of public institutions to designate areas where organic seaweed collection can take place.

Box 16. Organic certification of hydrocolloids for compounds

For compounds, processors also need to ensure that the other hydrocolloids they source are organic. However, general availability of organic hydrocolloids is limited across the board.

In terms of training and business consulting for certification, local suppliers and certifiers indicate a limited capacity for voluntary certifications. Moreover, these often also act as inspectors, which is not an ideal situation. The generally weak organic support sector in Indonesia does not provide good grounds for further development organic certification in Indonesia.

Fair-trade certification is still very uncommon for seaweed.

In terms of training and business consulting for voluntary certification, local suppliers and certifiers indicate a limited capacity for voluntary certifications, but they are often also acting as inspectors, which is also not ideal.

In terms of management, quality and food safety certification, there are more options available. Training, inspection and certification bodies operating in Indonesia include:

- SGS
- TÜV
- SAI
- Bureau Veritas
- Lloyds
- Sucofindo

These bodies offer a full range of food safety testing, inspection and certification services for Global Food Safety Initiative (GFSI) standards such as FSSC 22000, BRC, and ISO standards ISO 9001, ISO 22000 and ISO 14000. SGS is the market leader in Indonesia with an estimated 25% market share.

For testing services which are not available in Indonesia, these certifier use their global network of testing facilities in more sophisticated locales such as in Singapore or Bangkok.

Several national institutes also offer testing services, whereas local governments test the quality of seaweed.

R&D

There is a strong seaweed research sector in Indonesia, but industry sources indicate that research centres are not very well connected among themselves nor with the private sector. To address this issue, UNIDO has researched 27 actors in the marine research sector in public research centres such as the Tropical Seaweed Innovation Centre, as well as in academia to produce a who's who for sector stakeholders.

Box 17. R&D for compounding in Indonesia

In general, industry sources both in Indonesia as well as in Europe recognise that knowledge on the development of compounds in Indonesia is very low, both about understanding the particularities of different hydrocolloids, and in particular hydrocolloids not produced in Indonesia such as alginates, guar, xanthan, etc., as well on supporting the development of compounds for various food applications.

It is estimated that 160 researchers work on seaweed related research across these industries. Universities that have agriculture, farming, or biology programmes are involved in developing the seaweed industry. The following institutions have activities in seaweed (UNIDO, 2015):

- UNPATTI Pattimua University in Ambon, www.unpatti.com;
- UDAYANA Udayana University in Bali, www.unud.ac.id;
- UNSRAT Sam Ratulangi University in Manado, www.unsrat.ac.id;
- UNHAS Hasanuddin University in Makassar, www.unhas.ac.id.

Finance

Although access to finance was mentioned as an obstacle, Indonesia scores quite well in terms of access to credit comparatively to other countries. The World Bank ranked the country 55th among member states.

It has a very well developed financial sector with around 10 commercial banks operating across the country. The biggest players include Mandiri, BRI, BNI, BCA, as well as rural and regional multi-financial operators. Compared to other countries, finance for Indonesia's agricultural sector is well developed, with the sector accounting for 8% of the outstanding loan portfolio, compared to its 14% share of GDP.

However, earlier reports indicated that financial services, especially for SMEs, remain rather one dimensional, focusing on credit with less access to other financial services needed for investment and exports. Moreover, there are indications that finance to companies on the outer islands (70% of outstanding loans is in Java) and women-led SMEs is more problematic — out of an estimated 58 million MSMEs in Indonesia, approximately only 12% have access to credit due to lack of formal financial statements, credit history or collateral (KPMG, 2017).

Farmers lack knowledge finance providers' requirements and access is limited (Wulandari, 2017). Although investments are often small — between \$200 and \$1,000, for example, for applying good practices in seaweed — financing is still required. For low-income farmers, financing usually comes from the informal sector or from traders, as issues with collateral affect them more strongly than SMEs. Products are often also considered inappropriate to small-scale farming (SAFIRA, 2018). Practitioners in Indonesia indicate that the costs of getting farmers ready for finance are high, including improving financial literacy, group formation and management, financial management, in

addition to building connections in the chain with providers of inputs, post-harvest equipment. According to industry stakeholders, financial institutions in Indonesia do not consider these groups as good business cases.

3.1.3.4 Government organisations

Three government organisations support the seaweed sector: The Ministry of Trade, the Ministry of Industry, and the Ministry of Marine Affairs and Fisheries.

Table 11: Focus areas and activities of government agencies

Organisation	Focus areas and activities
Ministry of Trade - DG National Export Development	<p>Five departments are relevant to the sector:</p> <ul style="list-style-type: none"> • Export training — export skills development • Export development cooperation • Export product development — capacity building of private sector • Promotion and branding — market entry facilitation and branding • Export market information — collect and share third party information; ITPC develops trade attaché reports
Ministry of Industry	<p>Mol wants to improve its activities through:</p> <ul style="list-style-type: none"> • implementing international best practices for export development and promotion; • improved understanding of supplier needs; • product-market matching and matching companies to appropriate matchmaking activities; • improved inter and intra-organisation coordination; • capacity development at regional level. <p>The Directorate of Access to Industrial Resources and International Promotion, conducts last-mile activities (Anuga Sial, Biofach). Other DGs of this Ministry could engage more deeply in value chains, for example supporting industrial development, access to equipment, human resource development, R&D, quality and GMP and certification</p>
Ministry of Marine Affairs and Fisheries	<p>MoMaF's seaweed roadmap focuses on seaweed farming, and developing and marketing competitive value-added marine products in global markets. This includes the development of compounds, although the main aim appears to be on increasing extract production. The ministry plans to invest in processing capacity and nurseries and support sustainable and socially responsible production methods, in particular in Eastern Indonesia (West Papua).</p> <p>Its responsibilities include to provide extension services, facilitate availability of production inputs, quality assurance and product safety control of seaweed, marketing and increase production. Key activities included:</p> <ul style="list-style-type: none"> • Trade fair facilitation; • Cooperation with the Smart Fish project of UNIDO (cultivation, traceability, branding); • Trainings on post-harvest and initial processing; • Supporting the application of processing equipment.

4. Opportunities and Obstacles and Sustainability for the Seaweed Sector

The goal of this chapter is to determine the key opportunities for growth and the key obstacles to Indonesian seaweed sector exports to Europe, focusing on the exporting companies and their supply chains. Information on CSR is also provided.

4.1 Existing seaweed products directly exported to European markets

Chapter 2 and 3 provide information on how the value chain for seaweed extracts functions and what are the challenges along the chain. However, many of these challenges can be considered superficial.

Chapter 2 demonstrated a large and growing production capacity for raw dried seaweed. Excess processing capacity for extracts is also available. The European market for extracts is large and several trends offer good opportunities for value addition, such as an increasing demand for sustainably produced ingredients and full traceability, more and further extraction at source, and a need for extracts for emerging market segments, such as vegan and low-carb foods.

Box 18. Opportunities for compounds in the European market

For compounds, Chapter 3 shows that several Indonesian companies already produce compounds. European buyers are looking for simpler and more transparent compounds which are traceable and allow them to make simpler products to meet the clean label trend. There are good opportunities for value addition, such as an increasing drive for sustainably produced ingredients, and a need for compounds in emerging market segments, such as vegan and low-carb foods.

On the flip side, Indonesian processors are not answering to these trends to add value or have a USP in the market. This is important as market growth is slow and some even consider the market as saturated. Buyers also do not consider processors effective in meeting the requirements for safe, high-quality and consistent supply of extracts. Buyers consider the offer less attractive in terms of price and quality as competitors from other countries, such as China. Buyers do not consider Indonesian processors effective in meeting the requirements for safe, high-quality and consistent supply of extracts.

Box 19. Threats for compounds on the Indonesian market

Producing compounds requires sophisticated research facilities, a need to understand European taste, highly effective communication and close contacts with buyers to develop customised products as well as logistics for just-in-time delivery. Indonesian processors supply simpler compounds which are currently not considered attractive by European buyers. Buyers consider Indonesian suppliers to lack the skills, the understanding and the resources. Finally, they also consider prices in Indonesia less attractive.

Chapter 3 provides clear insights into why this situation has arisen. On the positive side, it showed a keen interest of supporters and influencers in the sector, which resulted in a range of beneficial measures. Moreover, the industry is organised. On the negative side, it provided a range of strongly interrelated issues, both within the value chain as well as the business enabling environment (influencers and supporters) which reduce the sector's ability to export directly. These included:

- Difficulties to compete with Chinese players in sourcing and marketing;
- Limited ability to upgrade technology and HR to produce efficiently and consistently;
- Fluctuations in raw material quality, availability and prices;
- High production costs due to a low use of production capacity;
- Lack of a joint marketing strategy towards international buyers.

Box 20. Issues for Indonesian compound production

Several issues are specific to compounds or even more severe in this case:

- Lack of market access and a network of international buyers;
- Lack of knowledge and R&D capacities on compounding, facilities and human resources for compounding;
- Low impression from buyers about Indonesian's abilities for compounding.

Figure 4 Obstacles and opportunities along the value chain, including compounds in bold frame

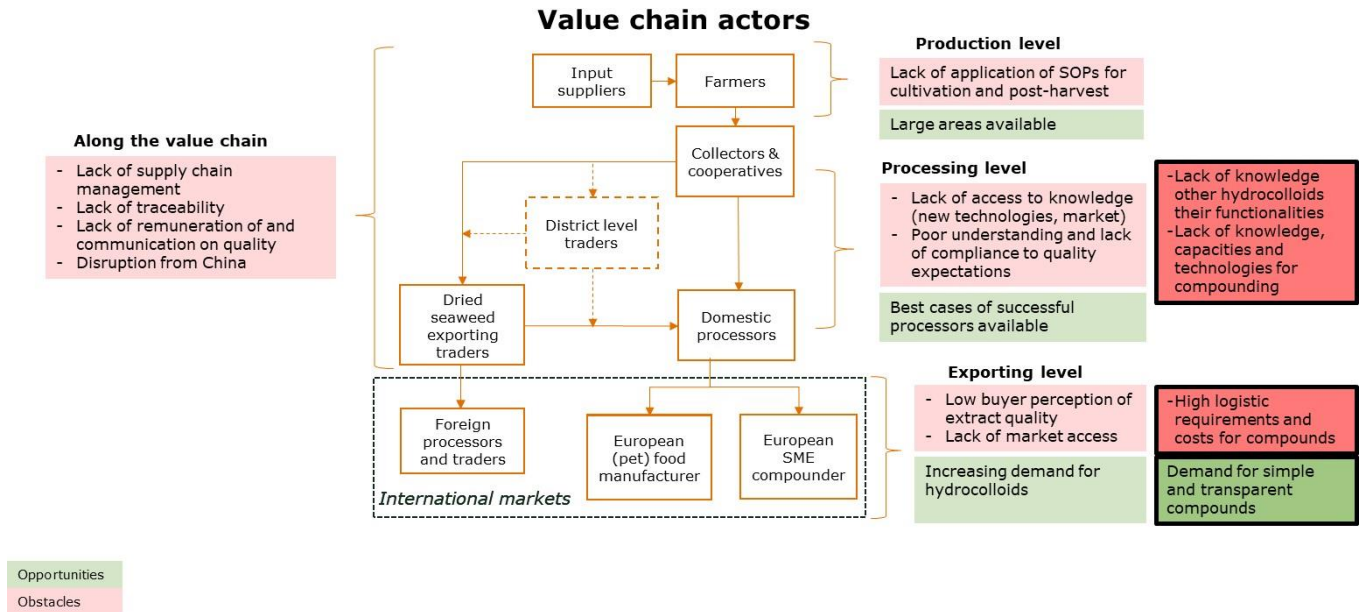
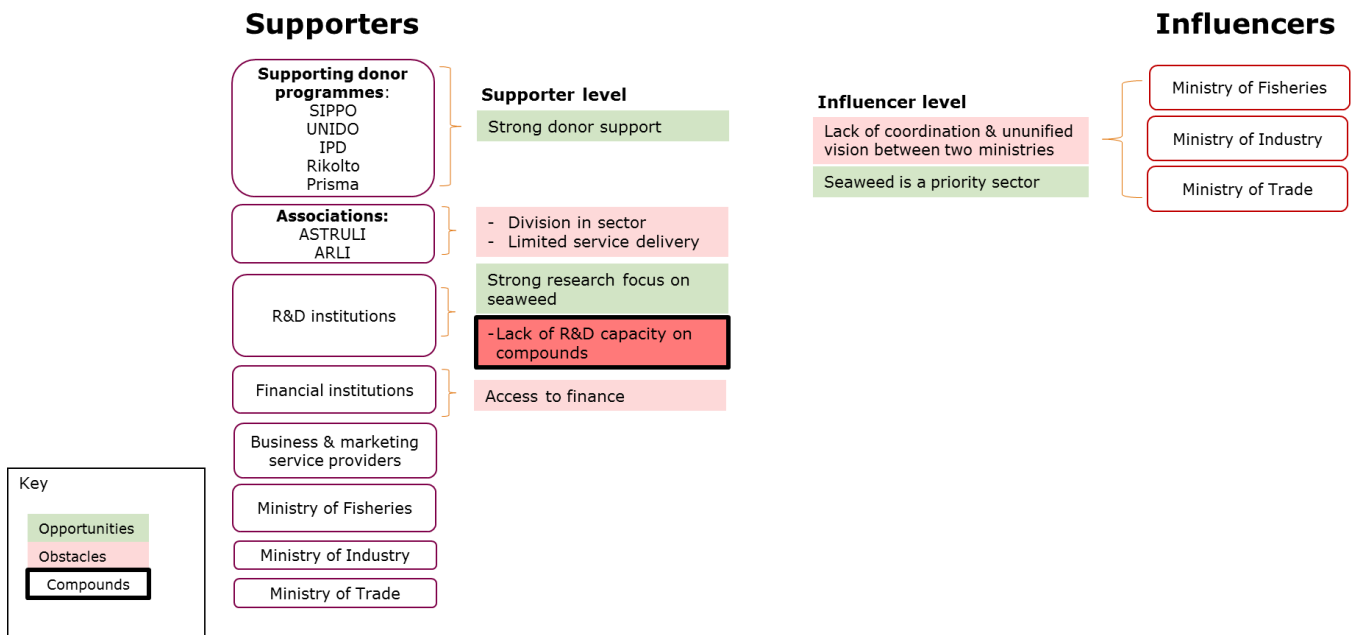


Figure 5 Obstacles and opportunities related to supporting services and influencers including compounds in bold frame



4.1.1 Key obstacles to growth of exports to Europe

The research team concluded that there are several root causes and related obstacles behind these issues, which will need to be resolved for direct exports to happen more effectively. Importantly, they first require solutions for issues impeding direct exports of extracts before moving into compounds. This is foremost the ‘trader mentality’ of many Indonesian processors. Prices and availability cannot improve if the processors do not take responsibility and ownership of their supply chain issues around fluctuating quality, plus the issues raised by European buyers on traceability, consistency, food safety and costs resolved. Without this baseline, obstacles at processing and marketing level cannot be overcome.

Obstacles such as knowledge and market access also need to be resolved for processors to know how, and have the confidence to take ownership and invest.

Box 21. Key obstacles for Indonesian compound producers

The lack of knowledge and the close buyer contacts make it difficult for compound processors to know how, and have the confidence to invest in developing the required facilities and human resources for product development and compound production.

There are also obstacles standing in the way of sector action, particularly a division in the sector between production and raw material exports and processing which impedes developing a common vision and resolving issues such as market access, supply, buyer perception, unfair competition, with joint public-private actions.

The table below describes these key obstacles in the value chain and in the business enabling environment (supporting services and influences).

Table 12 Obstacles in the seaweed value chain including compounds (highlighted)

What is the obstacle?	How does this obstacle impede exports?
Sourcing	
Lack of supply chain management: Most Indonesian processors show a ‘trader mentality’. They do not take responsibility for and do not invest in their supply chain. As such, they cannot establish relationships and systems for an effective traceable supply chain in order to provide high-quality and consistent volumes of raw dried seaweed. A deficient supply chain management hurts trust along the chain and reduces the ability of Indonesian processors to compete with exporters and the Chinese buyers for raw materials.	<ul style="list-style-type: none"> • Inconsistent quality and quantity of supply reduces the competitiveness of Indonesian processors by increasing their costs with low use of production capacity, reducing the quality and consistency of their final products, limiting their ability to leverage trends for sustainability and full traceability, and increasing risk to buyers in Europe.
Lack of traceability: Traceability at this moment can sometimes be done up to the distiller level, but only to the trader level, as seaweed from different collectors is mixed. No traceability to farm level can be guaranteed.	<ul style="list-style-type: none"> • Traceability is a legal requirement for food exports to Europe. Processors who cannot provide traceability cannot export to Europe. • Not being able to offer fully traceable products deprives Indonesian exporters of a USP in comparison with their competitors, stopping them from justifying higher prices or adding value.
Lack of compensation for and communication on quality: There is little to no relation between price and quality. Feedback on quality (e.g. moisture, residues, plastic and other contaminants) is not passed on along the chain. This means farmers are not motivated by any knowledge to improve raw dried seaweed quality through the application of good practices.	<ul style="list-style-type: none"> • The quality of RDS available to processors is of suboptimal and fluctuating quality, either reducing the quality of their final products (if remedial actions in processing are not taken) or increasing costs in order to take remedial actions, making Indonesian less attractive exporters to European buyers. • Seaweed can be contaminated with other matters, such as plastic, requiring remedial action, and bringing a risk of lowering the final product quality, which is not suitable for the market.

<p>Disruptions from China: Chinese traders can get a rebate on taxes imposed by the Indonesian government on raw dried seaweed when they export extracts, which allows them to buy seaweed at higher prices. They are also able to benefit from their massive national market to offer extracts at a very low price on international markets.</p> <p>As Indonesian processors try to compete on price, disruptions from China stimulate inconsistent buying behaviour, which hurts the industry.</p>	<ul style="list-style-type: none"> Seaweed prices fluctuate strongly and are sometimes outside of the price reach of Indonesian seaweed processors. Indonesian processors are not price competitive with Chinese suppliers of extracts.
<p>Lack of application of SOPs: Neither the public nor the private sector invests in the application of good practices. For the latter, this also relates to a lack of trust in the chain, which leads to a fear that trained farmers would sell to others. Even if farmers are trained, many stop applying SOPs because there's no compensation to quality, as seen above.</p>	<ul style="list-style-type: none"> The quality of RDS available to processors is of suboptimal and fluctuating quality leading to low-quality final products, or high costs. Seaweed can be contaminated with other matter such as plastic, leading to final products which are not suitable for the European market.
<p>Climate change causes loss of production: Due to climate change, certain areas are experiencing high losses of seaweed, which cannot survive under the new conditions.</p>	<ul style="list-style-type: none"> The strong supply of raw seaweeds is one of the major strengths of the Indonesian seaweed sector. A decline in seaweed production reduces availability of supplies to processors and may lead to increasing costs.
<p>Deteriorating quality of seaweeds: The propagation of the same young plant material for many years is leading to defects.</p>	<ul style="list-style-type: none"> Low quality raw material results in lower productivity and low-quality end products.
Processing	
<p>Lack of access to knowledge of new technologies and market data: Companies do not have the right information available to guide their business decisions when:</p> <ul style="list-style-type: none"> Applying the right production processes, purchasing new processing and testing equipment for extract production and compounding; Developing the right product for the right market or buyer, which for compounds specifically is vital 	<ul style="list-style-type: none"> Processors cannot make the right decisions on factory improvements, resulting in low productivity and quality and reducing competitiveness in international markets. Difficult access to market knowledge can lead to incorrect decision making on product development, increasing costs and making products unattractive to European buyers.
<p>Poor understanding of and non-compliance with quality expectations: Indonesian suppliers lack proper food safety and quality management, knowledge of quality aspects about seaweed extracts and their effects in applications. This is partly due to a lack of feedback from European buyers on the quality of Indonesian products.</p>	<ul style="list-style-type: none"> When exports do not comply with legal and buyer requirements, companies do not have access to markets, the value of their products is reduced or they are limited to supplying low-quality markets.
<p>Box 22</p> <p>Lack of knowledge on other hydrocolloids and their functionalities: Only few Indonesian processors have knowledge on their specific hydrocolloid (agar or carrageenan) but lack understanding of properties and functionalities of other hydrocolloids (guar, locust bean, etc.)</p>	<p>Box 23</p> <ul style="list-style-type: none"> Without this knowledge exports of 'multi-source' compounds is not possible
<p>Box 24</p> <p>Lack of knowledge, capacities and technology for compounding: Indonesian processors currently lack the know-how, qualified staff and the R&D facilities for formulating, testing and sampling compounds in applications to develop compounds meeting buyer requirements in Europe, whether off-the-shelf, or more specifically customised compounds.</p>	<p>Box 25</p> <ul style="list-style-type: none"> Without this knowledge exports of 'multi-source' compounds is not possible. Opportunities to provide 'single-source' compounds to European buyers is limited.
Exports	
<p>Low buyer perception of extract quality: European players see Indonesian suppliers (especially in the carrageenan sector) as not having the proper food safety and quality management skills, resulting in inconsistent and suboptimal extracts.</p>	<ul style="list-style-type: none"> Low quality perceptions make it more difficult for Indonesian suppliers of carrageenan to export to Europe.

<p>Box 26</p> <p>Low buyer perception of compounding ability: European players do not perceive Indonesian processors as being able to produce compounds meeting their requirements.</p>	<p>Box 27</p> <ul style="list-style-type: none"> • Convincing European food and feed manufacturers will be difficult, making it very difficult for Indonesian suppliers to export to Europe.
<p>Lack of market access: Indonesian processors have limited market exposure, lacking a network of buyers and close relations with buyers. This makes it difficult for Indonesian processors to develop products suitable for the European market and almost impossible to make customised solutions. In reverse, not having suitable products makes it difficult to build relations with buyers.</p>	<p>Box 28</p> <ul style="list-style-type: none"> • Developing compound products meeting buyer needs is not possible. • Even when understood, without close buyer relations it is only possible to export basic off-the-shelf compounds <ul style="list-style-type: none"> • Indonesian SME processors do not offer products which are suitable for the European market. • Indonesian SME processors cannot justify investments in product development as they lack a clear window into the European market.
<p>Box 29</p> <p>High logistic requirements and costs for compounds: European manufacturers are not willing to hold stock of compounds which are bought 'just-in-time'. Indonesian companies need to develop expensive logistical capacities to provide products just-in-time.</p>	<p>Box 30</p> <ul style="list-style-type: none"> • Building up logistical capacities will only be possible for the largest companies and will reduce their competitiveness in the European market compared to large international compounders.

Table 13. Obstacles in the enabling environment including compounds (highlighted)

What is the obstacle?	How does this obstacle impede exports?
Supporters	
<p>Division in the sector: The two main BSOs of the sector, ARLI and ASTRULI are currently not cooperating effectively due to their different visions of the sector (export and domestic processing versus domestic processing first). This makes it difficult to develop a joint vision for the sector and work towards it with different stakeholders.</p> <p>The bargaining position of the sector to advocate for an improved business enabling environment with public institutions is undermined.</p> <p>Exporters are not cooperating on non-competitive issues.</p>	<ul style="list-style-type: none"> • Key obstacles to export markets requiring sector action (e.g. market access, supply, buyer perception, R&D capacities for compounding) are not resolved, reducing the inability of individual processors to export to Europe.
<p>Limited service delivery by BSOs: Currently the two main BSOs have a very limited service portfolio and no capacity to provide services to members in a sustainable way. Key needs of the industry are not identified and are currently not met, in particular:</p> <ul style="list-style-type: none"> • access to information; • training and capacity building to resolve obstacles in the value chain (e.g. SOPs, supply chain management, compliance, technology, market access, branding and promotion); • advocacy and strategy development with ministries. 	<ul style="list-style-type: none"> • Processors lack resources to improve their supply chain, their processing and marketing, reducing their ability to export or add value to their exports.

<p>Box 31</p> <p>Lack of R&D support on compounding: Indonesian research centres strongly focus on seaweed cultivation and processing. There is no strong knowledge and research base on compounding.</p> <p>This reduces their ability to develop products suitable for international markets.</p>	<p>Box 32</p> <ul style="list-style-type: none"> Without this knowledge exports of 'multi-source' compounds is not possible. Opportunities to provide 'single-source' compounds to European buyers are limited.
<p>Limited access to finance: Farmers especially lack access to finance, but seaweed processors also have to deal with this obstacle. Seaweed processors require large capital investments to progress to a higher level of effectiveness and in particular to move into compounding. Currently many do not have such access or face high interest rates. Whether this is supply (offer from financial institutions) or demand driven (seaweed processors have a clear, fundable business case) needs to be researched further.</p>	<ul style="list-style-type: none"> Some seaweed processors do not have investment capital to upgrade their technology, establish required R&D and processing facilities for compounding. This makes it impossible to produce and export compounds. Seaweed processors lack working capital to buy raw materials and hold larger stocks. As such, they are faced with supply problems which can result in low use of production capacity, inability to deliver to clients and higher prices.
Influencers	
<p>Lack of coordination and a unified vision among and within ministries: Companies require clarification on existing services, not knowing what services are available nor how to access them.</p> <p>MoMaF and MoI both have different DGs targeting the seaweed sector as well as different R&D agencies offering services to the industry. There is no overall strategy to cater to the sector's needs and offer services. The ministries base their strategies and services on inaccurate data.</p> <p>Obstacles impeding exports beyond the capacities of individual stakeholders in the value chain are not resolved in an effective and efficient way, for example:</p> <ul style="list-style-type: none"> SOPs at production level and contamination with plastics; Market information and access, including MoT tools Price fluctuations; Legislation impeding imports of hydrocolloids to be used in compounds. 	<ul style="list-style-type: none"> Processors lack resources to improve their supply chain, processing and marketing, reducing their ability to export or add value to their exports. Processors continue to face quality and volume bottlenecks reducing their international competitiveness and in particular their competitiveness in the European market.

4.1.2 Key opportunities for growth of exports to Europe

Below are the key opportunities in the value chain and the business enabling environment provided by supporting services and influencers.

Table 14 Opportunities in the value chain including compounds (highlighted)

What is the opportunity?	How does this opportunity support exports?
Production	
<p>Large areas available for seaweed cultivation: Indonesian seaweed production is large and has increased strongly in the last decade. There is still opportunity to extend into high-productivity and pristine areas, particularly in Eastern Indonesia. However, not all areas have potential due to tourism, pollution and other factors.</p>	<ul style="list-style-type: none"> Indonesia is able to extend production of raw dried seaweed for direct export and local processing into extracts for exports.
Processing	
<p>Best cases of successful business are available: Several companies excel in terms of supply chain management and processing. Moreover, UNIDO is working with a group of exporters to build more success cases.</p>	<ul style="list-style-type: none"> Seeing successful cases of business 'not as usual' is usually the best way to convince other companies to work in a more effective way as well and improve their supply chain, processing and marketing.
Exporting	

<p>Increasing demand for hydrocolloids: The European market and the global market for hydrocolloids are growing slowly but steadily.</p>	<ul style="list-style-type: none"> • Growing markets open opportunities for Indonesian exporters to supply to the European market.
<p><i>Box 33</i></p> <p>More demand for simple, transparent compounds: European manufacturers are increasingly interested in using simpler compounds which are transparent in terms of the hydrocolloids used in them.</p>	<p><i>Box 34</i></p> <ul style="list-style-type: none"> • It is easier to compete with European compounders which make highly sophisticated solutions when they are reluctant to share on composition and origin, which is related to their intellectual property.

Table 15 Opportunities in the enabling environment including compounds (highlighted)

What is the opportunity?	How does this opportunity support exports?
Supporters	
<p>Strong donor support: Several donors support the development of the industry in various ways, both at the level of production, processing and exports. However, coordination among donors is lacking.</p>	<ul style="list-style-type: none"> • Donors address several obstacles to exports that seaweed processors face, including: <ul style="list-style-type: none"> ○ Application of SOPs in selected areas of the country; ○ Application of standards; ○ Improved sustainability along the chain; ○ Traceability through the development of apps; ○ International perceptions of seaweed extracts from Indonesia through a concerted branding effort. • In some cases these benefit the whole industry, while in other cases they can act as best practice for application by other processors.
<p>Strong research focus on seaweed: UNIDO identified 27 research institutes with activities related to the seaweed industry, and 160 researchers active on seaweed research around various subjects. However, research results are not available to the industry, as there is no connection between researchers and industry. UNIDO will report on their activities to provide access to industry and promote coordination among research agencies and between researchers and the private sector.</p>	<ul style="list-style-type: none"> • Companies can benefit from cooperation with R&D institutes to resolve particular obstacles in their company, such as processing, quality or product development, improving their competitiveness. • The supply chain of processors can be improved using research outcomes.
Influencers	
<p>Seaweed is a priority sector: Both MoMaF and MoI have identified seaweed as priority sector for Indonesia and have allocated resources to its development.</p>	<ul style="list-style-type: none"> • Exporters can benefit from investments from both ministries to resolve key obstacles in the value chain.

4.1.3 Sustainability challenges and opportunities

According to an IPD report, Indonesia is relatively advanced at a regional level in ensuring CSR through public and private sector actions when compared to competing countries in the region.

From the fieldwork for this VCA, the following picture of the CSR status in Indonesia's essential oils industry appears. First, knowledge on CSR is limited, and focused on compliance with legislation, 'not doing wrong, instead of doing good'. Second, knowledge of CSR expectations in Europe is low. This may be because seaweed extracts are used in low quantities in products. As such, they do not yet get as much attention from consumers, retailers and manufacturers in Europe as ingredients which are used in higher quantities or which appear more visibly in consumer products in terms of content or marketing.

Based on the fieldwork, the company questionnaires and the verification workshop, we have identified the following key issues for seaweed extracts:

- In terms of environmental legislation compliance and environmental harm, issues arise at the level of farming with plastic waste accumulation on beaches, use of cable-ties and soft plastic buoys, and processing with waste water treatment. Seaweed processing uses a lot of water, and produces large volumes of waste water. The companies interviewed said that they are actively dealing with waste management and water saving. However, to implement these policies more effectively, processors need capital to invest. Compliance in practice is not always done, according to industry stakeholders.

We also identified the following issues:

- Traceability is very limited. In general, traceability systems are not always successful and overall traceability of raw materials within the industry cannot be assured, especially beyond seaweed collectors or even district level traders.
- Child labour could happen at farmer level and is difficult to verify due to a lack of traceability to source. It is common that children help parents, for example to tie seaweed seedlings to lines.
- Fair and sustainable pricing is not practised, prices for raw dried seaweed fluctuate and can go below levels needed for a sustainable livelihood of farmers.

In general, more research is needed in terms of CSR issues, the gravity of these issues, whether they are widespread and what interventions can tackle such issues.

4.2 Conclusions

Based on Chapters 2, 3 and 4, we draw the following conclusions on seaweed extracts and seaweed compounds.

Seaweed extracts

- Seaweed extracts benefit from increasing European demand and there are several opportunities for value addition.
- There are many obstacles facing seaweed processors willing to export to Europe. However, many of the obstacles mentioned can be resolved in the short to medium term, while other obstacles can be resolved on the medium to long term without requiring much further external support. Once certain improvement processes have been set into motion, value chain actors, influencers and supporters in the value chain are expected to be able to continue to develop the sector in a sustainable way.
- Stakeholders already battle several of these obstacles. With improved planning and coordination the effectiveness of these interventions can be further increased.



Seaweed extracts offer good grounds for interventions, which will be discussed in Chapter 5.

Seaweed compounds for food and animal feed market

- Seaweed compounds offer very high potential in terms of value addition, but meeting buyer requirements will be problematic for Indonesian exporters.
- In addition to obstacles facing extracts producers, compound producers face several additional bottlenecks, especially a lack of knowledge on other hydrocolloids and on compounding and a low buyer perception of compounding ability. It is not expected that the obstacles for seaweed compounds can be solved in the short to medium term without very high investments.
- Only few processors currently have the capacity to benefit from interventions in this area.



Seaweed compounds offer little ground for interventions and will not be discussed in Chapter 5. However, compound producers are also expected to benefit from the interventions focusing on seaweed extracts.

5. Possible Interventions and Support Activities for seaweed extracts

The table below shows the interventions proposed for seaweed extracts. It links these interventions to opportunities and obstacles each intervention addresses, describing what role local and development partners could play in each intervention. The table also describes how CBI can provide support initiatives.

It is expected that the activities mentioned below will also benefit producers of seaweed compounds.

Table 16. Proposed interventions for seaweed extracts

What is the solution?	What does it address?	What should local actors, influencers and supporters do?	What are outside supporters doing?	How can CBI contribute?
<p>Improve sector coordination</p> <p>Improve coordination in the sector through development of a sector strategy, building on earlier activities of UNIDO.</p> <p>Such a sector strategy should be kept as simple as possible to quickly start working and focus on:</p> <ul style="list-style-type: none"> • Intermediation between ARLI and ASTRULI; • Connect key associations and ministries in consultative process; • Determining process drivers, and task force; • Identify roadmap for organics; • Sector vision based on realistic market expectation from MI (see below); • Needs to make this vision happen looking at key obstacles in the VCA, such as BSO service delivery, traceability, SOPs, sourcing issues, processing quality, coordination between relevant ministries, market access; • The roles, including responsibilities of relevant stakeholders, sector organisations and ministries, as well as particular DGs within the ministries. • Actions and budgets. <p>Successful development and implementation of the sector strategy requires agreements between the stakeholders on their mandates, which is particularly relevant for ASTRULI and MoI on the one hand and ARLI and MoMAF on the other hand, as these two stakeholder combinations have most difficulty to agree on a common strategy. In discussion with stakeholders, it was found that this would need to be done by key international experts in the sector which are seen as authorities by all parties.</p>	<p>Obstacles</p> <ul style="list-style-type: none"> • Division in sector; • Lack of coordination and lack of a unified vision between the two ministries; • Climate change causes loss of production; • Deteriorating quality of seedlings. <p>Opportunities</p> <ul style="list-style-type: none"> • Strong donor support; • Seaweed is a priority sector. 	<ul style="list-style-type: none"> • ASTRULI has worked on a sector road map; • ARLI has developed a vision on the sector; • MoMAF has a road map of the sector, and MoI is supporting the industry as well. They might also have resources to drive this process; • These stakeholders need to clarify their mandates, activities and strategic goals. 	<ul style="list-style-type: none"> • UNIDO can share insights from their programme on branding, their mapping exercise on sector R&D. In its current mandate, UNIDO is advising MoMAF on enacting enabling policies for exports • PRISMA has less of a business enabling focus, but can bring insights and is well perceived by the sector. • The Dutch embassy expressed interest in supporting the aquaculture sector. 	<ul style="list-style-type: none"> • Start the process by organising a first strategic conference with relevant stakeholders. • Bringing in authoritative experts who can play a role mediating the different stakeholders and secure buy-in. • Bringing in buyers and high-profile speakers who can bring change.

What is the solution?	What does it address?	What should local actors, influencers and supporters do?	What are outside supporters doing?	How can CBI contribute?
<p>Set-up best cases for supply chain management and sustainability</p> <p>An intervention is needed to break through the ‘business-as-usual’ attitude in the seaweed industry. This is best done by developing pilots which show good practices of value addition through improvement of quality and development of USPs to avoid price competition with China. Disseminating such results is likely to lead to crowding-in by other seaweed processors</p> <p>This will require an early connection between committed suppliers and committed buyers. If such a connection cannot be established further investment in export development should be reassessed. Key components need to feed in or benefit from other activities and should include:</p> <ul style="list-style-type: none"> • Application of good supply chain management principles in terms of investing in SOPs at farming level, traceability (see below) fair treatment of suppliers, fair and transparent pricing and contracting etc.; • Capacity building and HR development, including for product development; • Buyer missions (see below) • Dissemination of results and tools nationally (associations, conferences, ministries) and internationally (e.g. conferences, trade fairs) for uptake by other companies. <p>In the meantime, a group of ‘weaker’ or less committed processors can be taken along in matchmaking and dissemination activities and benefit from these activities.</p>	<p>Obstacles</p> <ul style="list-style-type: none"> • Lack of remuneration and communication on quality; • Disruption from China ; • Lack of application of SOPs for cultivation and post-harvest; • Poor understanding and lack of compliance with quality expectations. <p>Opportunity</p> <ul style="list-style-type: none"> • Large areas available. 	<ul style="list-style-type: none"> • European buyers provide technical assistance on SOPs to achieve desired quality; • Indonesian suppliers implement the SOPs with seaweed farmers; • MoMaF can link companies to extension services and offer support in terms of implementing SOPs; • ARLI and ASTRULI can provide additional technical assistance to the buyers and suppliers. 	<ul style="list-style-type: none"> • UNIDO can share SOPs developed on demo farms from their programme. • A next mandate could work on standards, which can be linked to this intervention. • IPD and SIPPO are working on last mile solutions. IPD can support matchmaking activities, while SIPPO can support BSOs to support the process. • RIKOLTO is working on the farming level and can link to selected suppliers working in its target areas. 	<ul style="list-style-type: none"> • Profile buyers and suppliers to identify interest and commitment to value addition through quality improvement. • Use its best practices to design pilots and bring in experts and buyers to drive pilots.
<p>Tool implementation for traceability</p> <p>Improve traceability through application of tools such as SeaweedTrace. Improved traceability enables identification of sources of non-compliance in raw material production and is a first step to improvement of quality of seaweed extracts.</p>	<p>Obstacle</p> <ul style="list-style-type: none"> • Lack of traceability. 	<ul style="list-style-type: none"> • Astruli will be managing the system and become owner of the data. 	<ul style="list-style-type: none"> • UNIDO, Mars, Cargill and six local companies are currently piloting SeaweedTrace. 	<p>Promote traceability through explanation of European buyer expectations and supporting inclusion of traceability in Market Entry Strategies of companies.</p>

What is the solution?	What does it address?	What should local actors, influencers and supporters do?	What are outside supporters doing?	How can CBI contribute?
Develop market information tools for the sector Improve knowledge of markets through production and dissemination of market information. Dissemination needs to penetrate more deeply in the value chain. Improvement of market knowledge helps suppliers to understand buyer requirements and improve their range. These should in particular provide information on technological developments, applications and developments in competing countries.	Obstacle <ul style="list-style-type: none"> Lack of access to knowledge (new technologies, market). Opportunity <ul style="list-style-type: none"> Best cases of successful processors. 	<ul style="list-style-type: none"> ASTRULI can develop market intelligence and training with support to build capacities. MoT and MoMaF both aim to build market intelligence capacities and develop MI products. Several processors in Indonesia already successfully export seaweed extracts to Europe, so they can serve as best cases from which other suppliers can learn. 	<ul style="list-style-type: none"> UNIDO can share insights from their programme on knowledge gaps. SIPPO can build market intelligence capacities with BSOs (already working with MoMaF and MoI). Synchronisation will be required. 	<ul style="list-style-type: none"> Identify knowledge gaps of processors in the pilot. Provide tailored intelligence for specific Indonesian products in an inclusive way with Indonesian stakeholders. Organise trainings with CBI experts to transfer knowledge.
Branding Further improve branding of Indonesian seaweed extracts to improve buyer perception. The improvement of buyer perception will generate more buyer interest and business leads when combined with effective matchmaking activities (see solution on market access). Further translation into company specific branding (e.g. showcasing USPs) can be a following step in this effort.	Obstacle <ul style="list-style-type: none"> Low buyer perception of extract quality. 	<ul style="list-style-type: none"> ASTRULI can organise inputs from their members for the branding strategy and drive branding activities. 	<ul style="list-style-type: none"> UNIDO can share insights from their programme on branding. SIPPO can support BSOs to develop branding strategies and activities. 	<ul style="list-style-type: none"> Validate findings of UNIDO relating to unique selling points of Indonesian seaweeds and branding and strategy in conjunction with the sector strategy. Support pilot companies with implementation of the branding strategy.
Market access in line with pilots Facilitate market access by organising buyer missions to Indonesia. Buyer missions enable Indonesian suppliers to meet buyers, discuss their product and the development options, develop business relations, and tell them the stories behind their business, including stories about the people involved. Such personal contact helps to build trust and commitment. Trade fairs participations are a less effective means to achieve such goals, as was also seen from earlier interventions within the previous SIPPO mandate. Seaweed extracts trade is concentrated and only a few buyers visit trade fairs.	Obstacles <ul style="list-style-type: none"> Lack of market access. Increasing demand for hydrocolloids. Opportunity <ul style="list-style-type: none"> Strong donor support. 	<ul style="list-style-type: none"> ASTRULI can support the organisation of buyer missions to build capacities. MoMaF and MoI are both aiming to provide matchmaking services to the industry. Connect with MoI trade attaches in target markets and leverage trade agreements of Indonesia. 	<ul style="list-style-type: none"> SIPPO and IPD can use their networks to help identify buyers and use insights from their previous experiences to support organisation of missions. SIPPO can train local BSOs such as ASTRULI in market access facilitation. 	<ul style="list-style-type: none"> Identify buyers interested in visiting Indonesia to source seaweed extracts. Support the organisation of buyer missions to Indonesia. Prepare companies in the pilot.

What is the solution?	What does it address?	What should local actors, influencers and supporters do?	What are outside supporters doing?	How can CBI contribute?
BSO service delivery development Improve service delivery of ASTRULI and ARLI after it has been agreed which organisation becomes responsible to offer which service. These could include issues such as <ul style="list-style-type: none"> • MI, focused on technology, requirements, developments (where possible linked to the above MI effort); • Service delivery on testing (own, or referral); • Training modules focused on compliance; • Export marketing and market access; In particular ASTRULI has little human resources, and the feasibility and sustainability of efforts need to be a key focus of an intervention.	Obstacle <ul style="list-style-type: none"> • Limited service delivery. 	<ul style="list-style-type: none"> • MoI, MoT and MoMaF could play a role, in particular in funding activities. • ASTRULI and ARLI need to identify member needs and translate these into a service portfolio relevant to their members. 	<ul style="list-style-type: none"> • SIPPO can assess BSOs in different aspects of export promotion in collaboration. 	<ul style="list-style-type: none"> • Business support organisation development through training.
Improve access to finance Further investigation is needed whether a lack in access to finance is related to supply from financial institutions willing to invest in the value chain, if interest rates are too high or if it is related to demand because seaweed processors do not have a clear, fundable business case.	Obstacle <ul style="list-style-type: none"> • Lack of access to finance. 	<ul style="list-style-type: none"> • MoI, MoMaF could play a role in offering funding. • Private banks need to be included in such an intervention. • Companies need to work on bankable business plans. • BSOs can identify and link to relevant financial institutions. 	<ul style="list-style-type: none"> • PRISMA has experience in access to finance as well as the seaweed sector. 	<ul style="list-style-type: none"> • CBI can support if access is more related to demand, by showing business case and support development of adequate business plans.

6. Conclusion

This concluding chapter looks into potential options for CBI interventions in the seaweed sector, as follows:

- Market segment versus product approach;
- Intervention logic and key considerations for interventions to succeed;
- Risks.

Market segment

This VCA links specific products to specific markets. The focus markets for the research on seaweed extracts were their use as hydrocolloids in the food and food supplements market. Attention was also given to the European market for feed and pet food. For the seaweed sector a focus is proposed on the food sector, with a much smaller opportunity existing for the feed market for producers of feed grade seaweed extracts. In general, feed has lower food safety requirements than food. Many of the SMEs currently operate in this market but have an interest to move up to the food market. As such, the sector can be considered as a stepping stone to the food market. It is advised to not consider this market segment for further product development.

Food supplements are only of interest for seaweed if alternative products are developed, such as seaweed powders and extracts other than hydrocolloids. The same holds for other innovative uses for seaweed, such as a carb-replacer in pastas or its use as a bio-plastic. However, it is expected that interventions in the seaweed extract value chain will also benefit potential producers of such products.

Intervention logic

The research team expects that effective interventions in the seaweed sector, as described above, can have a large impact in terms of export increase, bringing additional companies to export and improving CSR status. However, to be effective, a project in seaweed extracts should be designed according to the following logic:

- Within the value chain, a first step should be the identification of committed suppliers and buyers which are willing to work towards a more traceable and sustainable value chain. If such connections cannot be made due to an unwillingness from buyers to give better terms or processors to take actions, further interventions should not be undertaken.
- Within the business enabling environment, a first step is to align different stakeholders which are currently opposing each other and impeding effective sector action. Ideally a unified strategy, building on activities of the Ministry of Economic Coordination, is developed, but at least cooperation between the key actors (ARLI, ASTRULI, Ministries of Industry, and Marine Affairs and Fisheries) needs to improve for other interventions to be effective and sustainable. If improved communication and coordination cannot be achieved further interventions should not be undertaken.
- Both donors and public sector institutions are investing in the sector. This requires substantial efforts for effective coordination as well as clear agreements for additional interventions to be effective.

Risks

We identified the following key risks for interventions in the essential oil sector during the research:

- Donors change focus;
- Companies are not interested in participating;
- Participating companies do not meet commitments;
- Government interference;
- Environmental contamination or damage risks;
- Agreement amongst sector stakeholders cannot be reached;
- Market changes reduce demand for product.

CSR risks in relation to child labour and labour rights could not be sufficiently researched, so further research is required to clarify the scope, impact and likelihood of such risks.

Annex I — Longlist of companies Identified and Shortlist of Companies Interviewed

Longlist of companies in seaweed

Name of company	Region
AGAR	
Agar Sari Jaya, CV	East Java
Agar Sehat Makmur Lestari, PT.	East Java
Agar Swallow, PT	West Java
Agarindo Bogatama, PT	Tangerang, West Java
Gracindo Nusantara, PT	South Sulawesi
Indoflora Cipta Mandiri, PT	East Java
Indoking Aneka Agar-Agar Industri, PT	North Sumatra
Java Bio-Colloid, PT	East Java
Pantai Samudra, PT.	West Java
Satelit Sriti	East Java
Sinar Kentjana Surabaya, PT	East Java
Srigunting, PT	East Java
Surya Indoalgas, PT	East Java
CARRAGEENAN	
Algae Lestari Sumba Timur, PT	NTT
Algalindo Perdana, PT	East Java
Amarta Carrageenan Indonesia, PT	East Java
Bantimurung Indah, PT	South Sulawesi
Buanatama Fajar Abadi, PT	Jakarta
Cahaya Cemerlang, PT	South Sulawesi
Centram, PT	East Java
Galic Artabahari, PT	West Java
Giwang Citra Laut, PT	South Sulawesi
Gumindo Perkasa Industri, PT	Jakarta
Hydrocolloid Indonesia, PT	West Java
Indo Seaweed, PT	East Java
Indonusa Algaemas Prima, PT	Jakarta
Java Bio-Colloid, PT	East Java
Karagen Indonesia, CV	Central Java
Phoenix Mas, PT	NTB
Rote Karaginan Nusantara, PT	NTT
Wahyu Putra Bimasakti, PT	South Sulawesi
Kappa Carrageenan Nusantara, PT.	East Java

Shortlist of companies in seaweed

CV AGAR SARI JAYA
PT JAVA BIOCOLLOID
PT SURYA INDO ALGAS
CV KARAGEN INDONESIA
PT BUANATAMA FAJAR ABADI
PT GUMINDO PERKASA INDUSTRI
PT HYDROCOLLOID INDONESIA
PT INDO SEAWEEED
PT ROTE KARAGINAN NUSANTARA
PT WAHYU PUTRA BIMASAKTI

Annex II — Roadmap of Seaweed Industry Development Years 2017–2021

