

Identification of the seaweed biostimulant market (phase 1)

Deliverable 1.1.1.

Part of Bio4safe WP1 Market analyses

Executed by Stichting Noordzeeboerderij / North Sea Farm Foundation

Identification of the biostimulant market (phase 1)

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Identification of the seaweed biostimulant (phase 1)

Preface

This report is part of the Interreg 2 seas project Bio4safe. The project is coordinated by PCS Ornamental Plant Research (Belgium) and includes 7 other partners including Research Station Proeftuin Zwaagdijk (NL), North Sea Farm Foundation (NL), Yncréa Hauts de France, establishment ISA Lille (France), Vegetables Pole Region North (France), NIAB (UK) and Dove Associates (UK) and Ghent University (Belgium). The Bio4safe-project runs for a period of four years, started in 2017 and is funded by Europe via the Interreg 2 Seas Programme.

This report is a co-production of several team members of the North Sea Farm Foundation; Eef Brouwers, Marlies Draisma, Koen van Swam, Jasper Veen and Lieuwe Burger. The North Sea Farm Foundation is a non-profit organisation aimed at realising a sustainable seaweed industry in the Netherlands and surrounding EU countries. The North Sea Farm Foundation is leading the market study in Bio4safe to elaborate on the economic potential of seaweed based biostimulants.

Of course we want to thank our partners and observer partners of the Bio4safe project. And special thanks goes to Els Pauwels (PCS), Maaïke Perneel (University of Gent), Heleen de Norre (FOD Volksgezondheid), Dirk Jan Vos (DanVos and Huiberts), Hans Bleumink (Olmix), Nele Ameloot (Greenyard Horticulture) and Elisabeth Bömcke (Fertilizers Europe).



Identification of the biostimulant market (phase 1)

List of abbreviations

CAGR	The Compound Annual Growth Rate is the mean annual growth rate of an investment over a specified period of time longer than one year. The period is in this research set on 2017-2022. The unit of CAGR is: % per year during the 5 year forecast period.
CE	Conformité Européenne
D	Deliverable
FMCS	Fertilizer material and crop support
PPP	plant protection products
WP	Work package

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1 | Introduction & methodology

Introduction & methodology

Introduction to the project and report

This market study is part of the Bio4safe Interreg project for the European Union. This project aims to reduce water use and fertilizer use in horticulture by using biostimulants and innovative tools. This combination will result in up to 20% reduction of water and 10% of fertilizer usage, depending on the crop. By specifically including biostimulant based on seaweeds, economic opportunities for seaweed producers will be explored and developed.

The project comprises of 6 work packages:

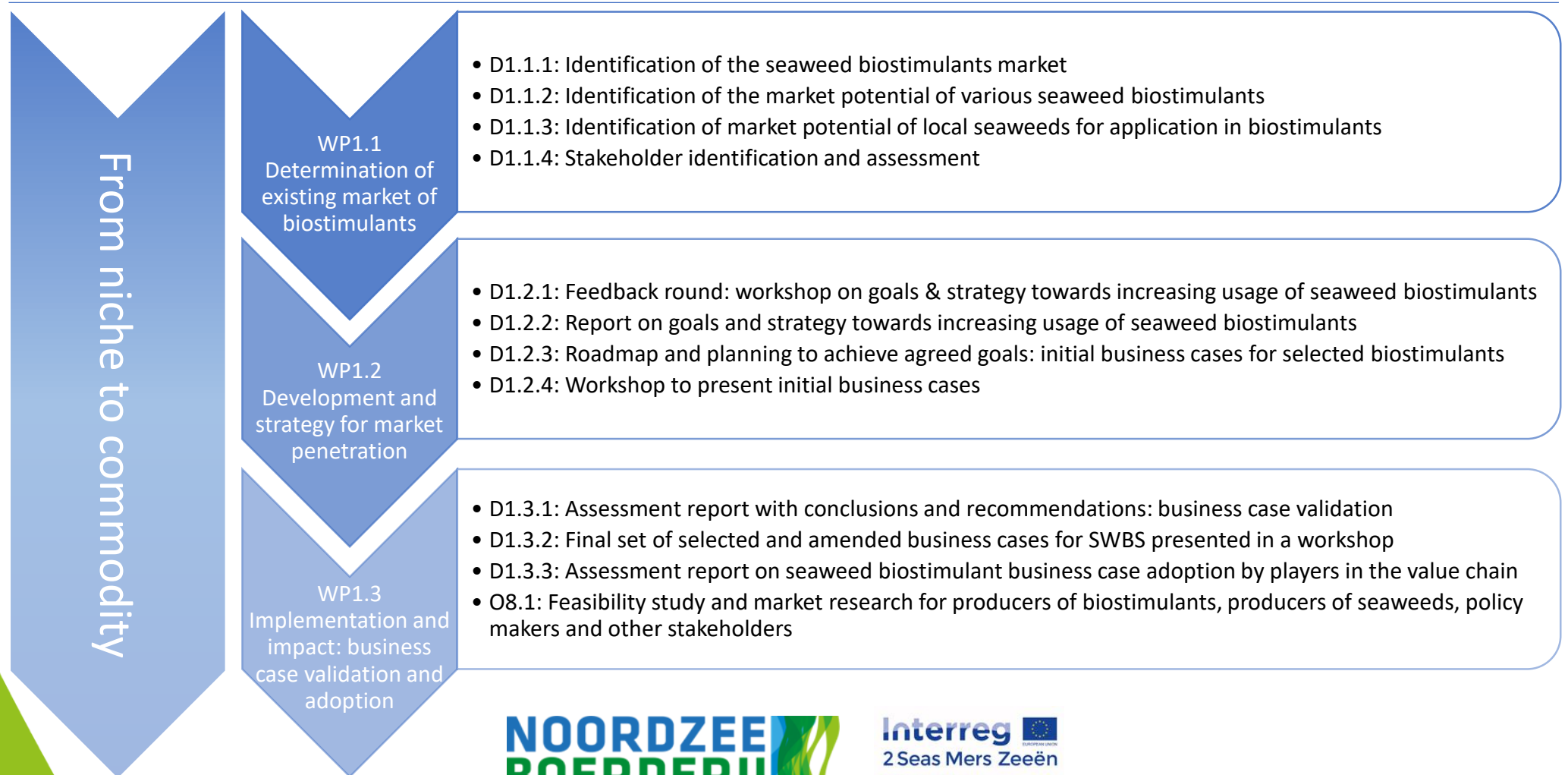
- Work Package 1: Market study: development of business models for producing biostimulants from seaweeds
- Work Package 2: Demonstration, implementation and adoption of biostimulants and sensor tools (trials)
- Work Package 3: Collecting and analysing cross-border data to develop information database and apps to access the information (trials)
- Work Package 4: Policy protocol
- Work Package 5: Project management
- Work Package 6: Communication

This report is part of **Work Package 1: Market study: development of business models for producing biostimulants from seaweeds** and as such constitutes the required **deliverable D1.1.1 Identification of the seaweed biostimulants market** as part of activity **WP1.1 - Determination of existing market of biostimulants**

The following sheets briefly demonstrate the relation between these various elements.

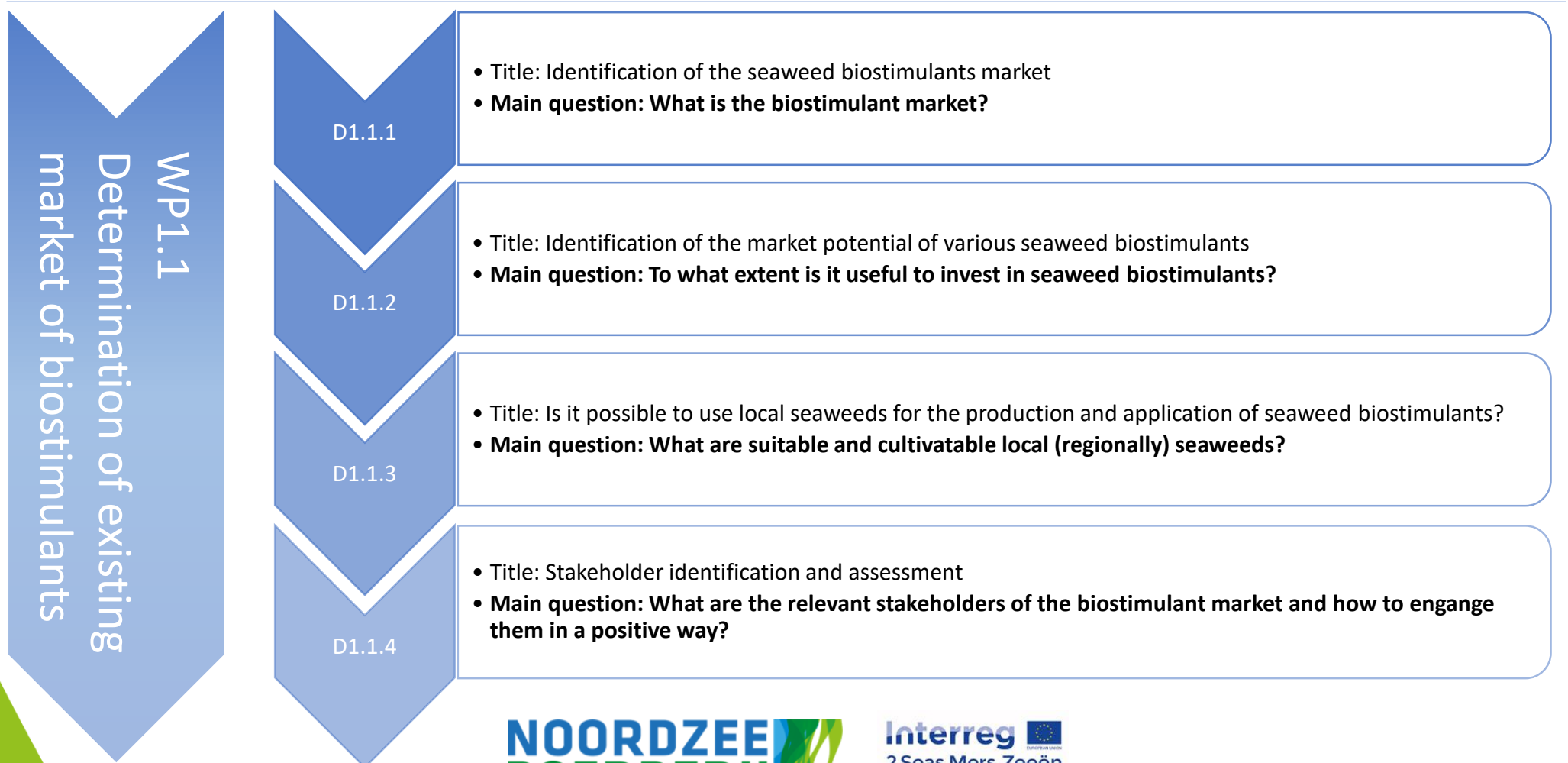
Introduction & methodology

Activities and deliverables for Work Package 1



Introduction & methodology

Deliverables and main questions for Activity 1.1



Introduction & methodology

Scope for Deliverable D1.1.1

D1.1.1: Identification of the seaweed biostimulants market

- **What is the biostimulant market?**
 - General description of biostimulants: definition, function and application
 - Broad identification of the biostimulants market: globally, EU wide and regionally
 - Identification of the seaweed based biostimulants as part of the total market
 - Assessment of the results, conclusions and recommendations for next steps

Introduction & methodology

Executorial approach for Deliverable D1.1.1

Market data for the seaweed biostimulant market study were obtained by means of literature/desk research from publicly available sources. The focus was to obtain information from the biostimulants market (in the broadest sense) globally, in Europe and in the 2 seas countries (Belgium, France, The Netherlands and United Kingdom). In addition, the (observing) partners of Bio4safe and several relevant stakeholders were consulted by snowball sampling. For each of these three market levels (globally, EU and regionally) this report looks into the context, volume, value, the relevant stakeholders and regulations of the associated biostimulant market and in particular, seaweed extracts market.

With the use of literature study a dataset has been compiled consisting of value and volume. Subsequently the data has been expert reviewed and aligned appropriately.

In this approach the research team encountered limited sources on specific regions. Also the publicly available reports weren't always coherent, sometimes even contradicting, in their declarations of value, volume and usage of biostimulants. Also standard statistical institutions that are generally consulted for market research such as FAO or WorldBank, do not have reports on biostimulants.

Furthermore this report will form the basis for the other activities and deliverables as part of WP1.1 and as such the objective for this report is to:

- Conclude (initially) on the main drivers for the biostimulant market;
- Conclude (initially) on the opportunities and weaknesses associated with the market potential of seaweed biostimulants;
- Identify the main gaps in data, knowledge and stakeholders associated with the (seaweed) biostimulants market.



Figure 1: 2-seas region as defined by the Interreg 2-seas programme

2 | Scientific knowledge

Scientific knowledge

Definition of biostimulants

It is relevant to use a clear definition for the term biostimulant as there is still some ambiguity in the EU as well as globally. The paper as published in [9] tries to address this ambiguity by proposing a scientific based definition. We therefore propose to use this definition as the basis for Work Package 1:

« A plant biostimulant is any substance or micro organism applied to plants with the aim to enhance nutrition efficiency, abiotic stress tolerance and/or crop quality traits, regardless of its nutrients content. »

This definition could be completed by:

« By extension, plant biostimulants also designate commercial products containing mixtures of such substances and/or microorganisms. »

With respect to discussion with future stakeholders, we have noticed that they easily try to define biostimulants as something they already know, it is beneficial to note that the above definition also exclude a number of functions, i.e. biostimulants are by definition not: fertilizers/nutrients, pesticides, nor soil improvers, [9].

Scientific knowledge

Biostimulants – range of applications

In the various document sources the application range of biostimulants vary between the agriculture, horticulture, ornamentals and other applications' industries. It is however not clearly described, at least not in any source we have identified sofar, whether biostimulants are more or less effective in either of these industries. Nevertheless, we do get the overall impression that biostimulants are used and effective in all of these four industry categories. Therefore we will make a summary of the biostimulants applications in each of these industries to provide an initial indication of the effectiveness of biostimulants per industry category. However, this is by no means intended as a limitative list.

Table 1: Range of applications of biostimulants

Industry category	Applications extracted from the various overviews in (Calvo, 2014) [2] and (Battacharyya, 2015) [1] and EBIC publications [5]
Agriculture Row crops on large areas	Potatoes, cereals, soybean, wheat, maize, rice, oilseed rape, sugar beet, barley
Horticulture Vegetables, fruits, etc.	Fruits: Watermelon, apple, banana, grape, olive, orange, papaya, pear, strawberry, lemon trees, etc. Vegetables: bean, cabbage, broccoli, carrot, cauliflower, cucumber, eggplant, lettuce, onion, pepper, spinach, tomatoe, etc.
Ornamentals Cut flowers, plants, bulbs, forest seedlings, etc.	Amaranthus tricolor, Marigold, Petunia, Pansy and Cosmos, paper birch, beech
Other applications Pastures, sporting fields, etc.	Turf and forage grasses, tall fescue sod, turf grass, rye grass

Scientific knowledge

Biostimulants – categories and definitions

In general the literature proposes various categories for biostimulants. The published paper of Du Jardin, 2015 [9] tries to summarise this into an overall categorisation that aligns with the above definition of biostimulants. This categorisation will be used as the basis for this report:

Biostimulant categories	Category definitions
1. Humic and fulvic acids	Humic substances (HS) are natural constituents of the soil organic matter, resulting from the decomposition of plant, animal and microbial residues, but also from the metabolic activity of soil microbes using these substrates. HS are collections of heterogeneous compounds, originally categorized according to their molecular weights and solubility into humins, humic acids and fulvic acids.
2. Protein hydrolysates and other N-containing	<ul style="list-style-type: none"> • Amino-acids and peptides mixtures that are obtained by chemical and enzymatic protein hydrolysis from agro industrial by-products, from both plant sources (crop residues) and animal wastes (e.g. collagen, epithelial tissues), and the alternative definition: • Protein hydrolysates consisting of a mixture of peptides and amino acids of animal or plant origin and individual amino acids such as glutamate, glutamine, proline and glycine betaine. [2]
3. Seaweed extracts and botanicals	The use of fresh seaweeds as a source for biostimulants
4. Chitosan and other biopolymers	A de-acetylated form of the biopolymer chitin, produced naturally and industrially
5. Inorganic compounds	Chemical elements that promote plant growth and may be essential to particular taxa but are not required by all plants are called beneficial elements
6. Beneficial fungi	Fungi [that] interact with plant roots in different ways, from mutualistic symbioses (i.e. when both organisms live in direct contact with each other and establish mutually beneficial relationships) to parasitism
7. Beneficial bacteria	With regard to the agricultural uses of biostimulants, [beneficial bacteria] are covered by two main types within this taxonomic, functional and ecological diversity: (i) mutualistic endosymbionts of the type <i>Rhizobium</i> and (ii) mutualistic, rhizospheric PGPRs ('plantgrowth-promoting rhizobacteria').

Table 2: Biostimulant categories as derived from [9]

Scientific knowledge

Biostimulants – mode of application and benefits

In general the benefits of the application of biostimulants in agriculture, horticulture, on ornamentals and other applications is described as follows:

Mode of application/method of treatment		Benefits / effects	(Possible) mechanisms
Arial application	<ul style="list-style-type: none"> Foliar spray Seed treatment Post harvest treatment 	Biotic and abiotic stress tolerance	Regulation of genes
Soil application	<ul style="list-style-type: none"> Mixing with water (added to soil, hydroponics) Mixing with the soil/hydroponics 	Enhanced growth response	Increased accumulation of osmolytes
<p>Table3: Effects of biostimulants on crop productions, from their cellular targets in plants to whole-plant physiological functions, to agricultural/horticultural functions, and ultimately to expected economic and environmental benefits [4,7,15]</p>		Enhanced nutritional quality	Improved water use efficiency
		Soil/substrate quality benefits	Physiological and biochemical changes
			Rhizosphere effects

In the subsequent table some examples are provided of how application, effects and mechanisms are presented in the various scientific publications:

Function	Humic acids	Protein hydrolysate	Glycine betaine	Seaweed extracts	Rhizobacteria
Physiological function (i.e. action on whole plant processes)	Increased linear growth of roots, root biomass	Protection by flavonoids against UV and oxidative damage [7]	Maintenance of leaf photosynthetic activity under salt stress	Increased tissue concentrations and root to shoot transport of micronutrients	Increased lateral root density and surface of root hairs
Agricultural/horticultural function (i.e. output traits relevant for crop performance)	Increased root foraging capacity, enhanced nutrient use efficiency	Increased crop tolerance to abiotic (e.g. salt) stress	Increased crop tolerance to abiotic (e.g. high salinity) stress	Improved mineral composition of plant tissues	Increased root foraging capacity, enhanced nutrient use efficiency

Table4: examples of functions of various biostimulants in horti- and agriculture

Scientific knowledge

Seaweed based Biostimulants – Conclusions on their distinct benefits

(Re)discovering seaweed extracts

The use of fresh seaweeds as source of organic matter and as fertiliser is ancient in agriculture, but biostimulant effects have been recorded and researched only recently. This prompts the commercial use of seaweed extracts and of purified compounds, which include the polysaccharides laminarin, alginates, ulvans and carrageenans and their breakdown products. Other constituents contributing to the plant growth promotion include micro- and macronutrients, sterols, N-containing compounds like betaines, and hormones [3,10]. Several of these compounds are indeed unique to their algal source, explaining the increasing interest of the scientific community and of the industry for these taxonomic groups [9].

Molecular compounds: light weight versus heavy weight

The biostimulant effects often have been attributed to the presence of plant growth hormones and related low molecular weight compounds present in the extracts [16,17] but other research suggests that larger molecules including unique polysaccharides and polyphenols may also be important as biostimulants, as allelochemicals, and for enhancing resistance to stress [6,11,14,18], [2].

Seaweed extracts as circular biostimulant

It appears that there is no distinct difference in terms of methods of applications or mode of actions between seaweed based biostimulants and the other categories of biostimulants. However, a clear benefit arises from the fact that seaweed and therefore seaweed based biostimulants can be produced in a sustainable and circular way (recuperating eutrophicated nutrients). As such they may provide a vital building block for our future circular agriculture and horticulture production systems.

Special? Yes. How special? Unknown.

In addition, although the complete mechanisms that underlie the observed positive effects of seaweed biostimulants are not known, there are a number potential components [9] that are unique to algae. If these products, in the future, turn out to be important to the mode of action of the associated seaweed biostimulant product and biostimulants in general, then this would be an additional benefit of seaweed based biostimulants.

3 | Market overview

Global, Europe and 2 seas region

Market overview

Setup of this section

This section gives an overview of the existing markets, globally, in Europe and in the 2 seas region. This information is collected by reviewing public information as well as direct interviews with relevant stakeholders. There is quite some information available and that gives a fairly complete, albeit coarse, overview of the various markets. It becomes more difficult when trying to focus on specific regions as well as countries. In this case there is very limited information available making it more difficult to draw a clear picture.

In the following parts of this section a market overview of existing markets is provided for the:

- Global, European and 2-seas regions

The latter comprising of,

- France, United Kingdom, Belgium and The Netherlands

For each region we have tried to collect the following market information, insofar available as public information and/or from stakeholder interviews:

- Context of the specific market;
- Volume & value of the market;
- Relevant stakeholders; and
- Relevant regulations and other considerations.

At the end of this report, this information and/or lack of it, will be discussed in chapter 4, conclusions & next steps.

Market overview

Existing Market Global

Existing Market Global Total Value

Global biostimulant market [12]

- The global market size for biostimulants in 2016 is estimated at approx. € 1.45 billion and is projected to reach approx. €2.66 billion in 2022. This comes down to a cumulative aggregated growth rate (CAGR) of approximately 11% per year over the forecast period from 2016 until 2022.

Global seaweed-based biostimulant market [12]

- The seaweed-based biostimulant market accounted for a value of €483mln of the global biostimulants market in 2016 and is projected to reach €894mln in 2022. This market segment is projected to grow at a CAGR of approximately 11%.

Table 5: Global biostimulant market value in millions of euro's, by active ingrediënt, [12, adapted].

Active ingredient	Market value 2016 (Million EUR)	Percentage of total (%)	Projection 2022 (Million EUR)	Percentage of total projection (%/y)	CAGR (%/y)
Seaweed extracts	483	33,3	894	33,6	10,5
Humic substances	450	31,1	827	31,1	10,4
Vitamins and amino acids	148	10,2	269	10,1	10,3
Microbials amendments	141	9,7	262	9,9	10,6
Trace Minerals	140	9,6	256	9,6	10,4
Others	87	6,0	150	5,6	10,1
Total	1449	100,0	2658	100,0	10,4

Existing Market Global Total Value

Global biostimulant market segmented by crop type in value [12]

- More than 40% of the total global biostimulant market value is represented by the biostimulants used for row crops, also the CAGR is the highest for row crops.
- Row crops in this table are assumed to include only cereals, oilseeds, pulses and fiber crops

Table 6: Global biostimulant market value in millions of euro's, by crop type, [12, adapted]

Crop type	Market size 2016 (mln EUR)	Percentage of total (%)	Projection market size 2022 (mln EUR)	Percentage of total projection (%)	CAGR (%/y)
Row crops	587	40,5	1088	40,9	10,6
Fruits and vegetables	357	24,7	657	24,7	10,5
Turf and ornamentals	152	10,5	276	10,4	10,2
Others	352	24,3	637	24,0	10,2
Total	1448	100,0	2658	100,0	10,4

Existing Market Global

Value biostimulants per global region

Global biostimulant market per global region [12]

- Europe accounts for approximately 40% of the global market for biostimulants and as such represents a total value of € 580mln.
- As such, Europe appears to be the largest market for biostimulants

Table 7: global market in millions of euro's , by Region, [12].

Region	Market value 2016 (mln EUR)	Percentage of total (%)	Projection market value 2022 (mln EUR)	Percentage of total projection (%/y)	CAGR (%/y)
Europe	580	40,0	1090	41,0	10,9
Asia Pacific	396	27,3	769	28,9	11,5
North America	210	14,5	340	12,8	8,2
South America	203	14	354	13,3	9,5
Rest of the world	60	4,2	104	3,9	9,4
Total	1448	100,0	2658	100,0	10,4

Existing Market Global

Value seaweed-based biostimulants per global region

Global seaweed-based biostimulant market per global region [12]

- Europe accounts for approximately 40% of the global market for seaweed-based biostimulants and as such represents a total value of €194mln.
- As such, Europe appears to be the largest market for seaweed-based biostimulants.

Table 8: global market value of the seaweed extract segment in millions of euro's , by Region, [12].

Region	Market value 2016 (mln EUR)	Percentage of total (%)	Projection market value 2022 (mln EUR)	Percentage of total projection (%/y)	CAGR (%/y)
Europe	194	40,1	369	41,2	11,1
Asia Pacific	124	25,8	245	27,5	11,6
North America	74	15,4	122	13,7	8,4
South America	68	14,2	119	13,3	9,4
Rest of the world	22	4,5	39	4,3	9,7
Total	482	100,0	894	100,0	10,5

Existing Market Global

Total area

Global biostimulant market segmented by crop type in area [12]

- The total global biostimulant market in 2016 covered an area of approximately 14.3 million hectares. It is projected to reach approximately 27.6mln hectares in 2022, resulting in a CAGR of more than 11% per year.
- Almost 40% of the total amount of globally treated area is used to produce row crops. The CAGR also appears to be slightly higher for row crop applications of biostimulants.
- The total area of agricultural lands in the world is estimated at 4,869.0 mln ha [22]. As such 0.3% of the total agricultural lands in Europe are treated with biostimulants.

Table 9: global market size of biostimulants in thousands of hectares, by crop type. [12, adapted]

Crop type	Market size 2016 (hectares)	Percentage of total (%)	Projection market size 2022 (hectares)	Percentage of total projection (%)	CAGR (%/y)
Row crops	5.579.300	39,0	10.800.300	39,1	11,8
Fruits and vegetables	3.292.300	23,0	6.333.700	23,0	11,7
Turf and ornamentals	1.372.400	9,6	2.590.000	9,4	11,3
Others	4.076.100	28,5	7.869.500	28,5	11,8
Total	14.319.200	100,0	27.593.500	100,0	11,7

Existing Market Global Context

From the available sources it appears that the main drivers for the global biostimulant market are: 1) sustainable environment, 2) rise in demand for cost-effective products, and 3) environmental conservation [12]. In addition a few considerations are provided with respect to the various global regions.

North America [12]

The nutritive value of the soil in North America has been reduced due a high demand for agricultural production. The agricultural production has been in decline due to climatic issues *e.g.* droughts and soil degradation. The biostimulant market is expected to grow, because of the increase in demand for high yield and a production with a reduced use of agrochemicals.

South America [12]

The agricultural sector is growing in South America. Biostimulants are mostly applied in plantation crops, cereals, and fruits & vegetables. The market growth of biostimulants in South America is limited because there are only a few R&D activities, which results in a lower technical know-how.

Europe

See section Existing European market

Asia Pacific [12]

The Asian Pacific region is the most populated part of the world, the population is still growing, which results in a need for higher food production in this region. The need for a higher food production makes the Asian Pacific region a key market for the biostimulant industry.

Existing Market Global

Relevant stakeholders

- **EBIC: European Biostimulant Industry Council - Europe**
 - “The European Biostimulant Industry Council (EBIC) promotes the contribution of plant biostimulants to make agriculture more sustainable and resilient and in doing so promotes the growth and development of the European Biostimulant Industry” (<http://www.biostimulants.eu/>)
- **The Biostimulant Coalition - North America**
 - The Biostimulant Coalition is a group of interested parties cooperating to proactively address regulatory and legislative issues involving biological or naturally-derived additives and / or similar products, including but not limited to bacterial or microbial inoculants, biochemical materials, amino acids, humic acids, fulvic acid, seaweed extract and other similar materials. The coalition is a nonprofit affiliation of interested parties.

The five largest companies involved in the production, marketing or distribution of biostimulants, [12]

- **Arysta LifeScience** : focused on helping customers cultivate business growth through the development, marketing and distribution of innovative, high-quality chemical solutions for today’s dynamic agrosience and health & nutrition science marketplace (<https://www.arystalifescience.com/>)
 - **Valagro**: leader in the production and commercialization of biostimulants and specialty nutrients. (www.valagro.com)
 - **Biolchim** : leader in the production of Special Fertilisers, nowadays considered among the most important in Italy and the most dynamic on the international markets (<http://www.biostimulants.eu/about/members/biolchim-spa/>)
 - **Syngenta**: a global agribusiness company that produces agrochemicals and seeds (<https://www.syngenta.com/>)
 - **Koppert**: Provides an integrated system of specialist knowledge and natural, safe solutions that improves crop health, resilience and production. (<https://www.koppert.com/company/#c29683>)
- **Other relevant companies**: BASF, ISAGRO, ITALPOLLINA, BIOAG ALLIANCE, FMC Cooperation, ADAMA Agricultural solutions, ILSA

Market overview

Existing Market Europe

Existing Market Europe

Total value

European biostimulant market

- The European Market size for biostimulants is in 2016 €580mln and is projected to reach €1,090bln in 2022 with a CAGR of 11,1% per year during a 5-year forecast period [12].
- The seaweed extracts biostimulant market accounted for €194mln, approximately 33% of the total European biostimulants market in 2016 and is projected to reach €369mln in 2022 with a CAGR of approx. 11% per year, [12].
- This market data correlates with similar data from [5] and [19] in which a biostimulant market size of between €500mln-€600mln is estimated and a growth rate of approximately 10% is estimated for the foreable future from the year 2011, [5].

Table 10: total European biostimulant market value in millions of euro's, by active ingrediënt. [12, adapted]

Active ingredient	Market value 2016 (Million EUR)	Percentage of total (%)	Projection market value 2022 (Million EUR)	percentage of total projection (%)	CAGR (%/y)
Seaweed extracts	194	33,4	369	33,8	11,1
Humic substances	191	32,9	357	32,7	10,8
Vitamins and amino acids	53	9,2	90	8,3	10,6
Microbials amendments	56	9,7	106	9,7	11
Trace Minerals	48	8,3	90	8,3	10,7
Others	38	6,5	71	6,5	10,8
Total	580	100,0	1083	100,0	10,9

Existing Market Europe

Total value

European biostimulant market segmented by crop type in value [12]

- Almost half of the total market value of biostimulants in Europe is represented by the use of biostimulants for row crops.
- Row crops in this table are assumed to include only cereals, oilseeds, pulses and fiber crops

Table 11: total European biostimulant market value in millions of euro's, by crop type. [12, adapted]

Crop type	Market value 2016 (Million EUR)	Percentage of total (%)	Projection market value 2022 (Million EUR)	Percentage of total projection (%)	CAGR (%/y)
Row crops	281	48,5	533	48,9	11
Fruits and vegetables	178	30,7	337	30,9	11
Turf and ornamentals	69	12,0	128	11,7	10,5
Others	51	8,8	92	8,5	10,2
Total	579	100,0	1090	100,0	10,9

Existing Market Europe

Total area

European biostimulant market segmented by crop type in area [12]

- The total European biostimulant market in 2016 covered an area of approximately 4,4 million hectares. It is projected to reach approximately 8.4mln hectares in 2022, resulting in a CAGR of more than 11% per year.
- Half of the total amount of treated area in Europe is used to produce row crops. The CAGR is also slightly higher for row crop application of biostimulants in Europe.
- The total area of agricultural lands in Europe is estimated at 467.2 mln ha [22]. As such 0.9% of the total agricultural lands in Europe are treated with biostimulants

Table 12: global market size of biostimulants in thousands of hectares, by crop type [12, adapted]

Crop type	Market size 2016 (hectare)	Percentage of total (%)	Projection market size 2022 (hectare)	Percentage of total projection (%)	CAGR (%/y)
Row crops	2.170.500	49,6	4.174.700	50,0	11,7
Fruits and vegetables	1.268.800	29,0	2.412.700	28,9	11,5
Turf and ornamentals	515.700	11,8	973.000	11,6	11,3
Others	442.200	10,1	792.100	9,5	10,4
Total	4.397.200	100,0	8.352.500	100,0	11,5

Existing Market Europe

Context

Market drivers and context [19]

- As for the global biostimulant market the European market drivers for biostimulants appear to be mostly similar. Europe however provides additional context for these general market drivers in terms of clear targets for a more sustainable agriculture industry with anticipated reductions as derived from the Paris 2030 climate accord:
 - Green house gas emissions
 - Increased use of renewable energy
 - Increased energy efficiency
- Furthermore the EU has set legislative standards on clean air, which will have an impact on fertilizer use, and
- There is, in general, a key focus on the environmental issues to which agriculture can have a significant positive contribution. These are:
 - Water quality
 - Air quality
 - Green house gas emissions

Taking into consideration the observed positive effects on crops nutrient uptake, i.e. fertilizer use efficiency, yield per hectare and crop quality then biostimulants indeed could play a significant role in the European agricultural sector. In that sense biostimulants are seen as an innovative product in the industry.

Existing Market Europe

Context

Biostimulants in the relevant European agricultural context [19]

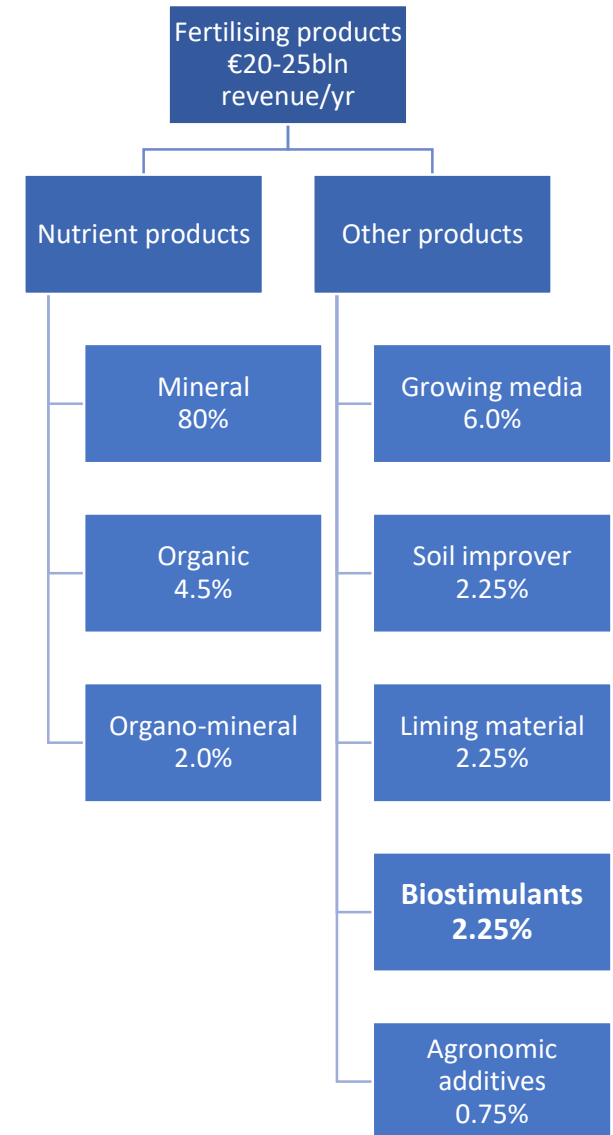
- The figure shows the current market of fertilisers in Europe. More than 86% of the total European market value of products that farmers use to influence their yield and crop quality comprises of nutrient products (fertiliser).
- In this overview biostimulant products are categorized as “other products” and constitute 2.25% of the total market of fertilising products.
- In general it can also be observed that the EU Commission as well as the “fertilizer industry” have similar views on the market issues of today:
 - Efficient use of macro-nutrient (P,K,N);
 - Easy access for (new and innovative) fertilizing products in the EU; and
 - Harmonisation of applicable regulation within the EU.

Consideration with respect to relevant regulations and policies in the EU

- Biostimulants are a relatively new category of products that support crop growth in basically two ways: 1) plant health and efficiency and 2) plant resistance against abiotic stress.
- In the EU there appear to be two regulations that are applicable for adding substances to crops:
 1. EC 2003/2003: relating to fertilisers and associated with anything that support plant growth enhancement
 2. EC 1107/2009: relating to plant protection products (commonly referred to as PPPs) and associated with anything to supports plants in addressing abiotic stresses

In addition there are additional national (additional or complementary) regulations concerning fertilizers and PPPs.

Figure 2: Fertilising product overview Europe, [19, adapted]



Existing Market Europe

Context

- One of the challenges is that plant biostimulants tend to perform both functions: growth enhancement AND abiotic stress resistance. So this begs the question on what regulation is best applicable.
- The registration process for fertilisers appears to be the easiest and hence, more often it is then decided to categorise a plant biostimulant product as fertiliser type product under regulation EC 2003/2003.
- Apart from the fact that this is not fully correct due to the double function of biostimulants, there appears to be the additional problem that the EC 2003/2003 fertiliser regulation is often also translated (with differences) on member state level. This means that access for a biostimulant product in one member state does not automatically mean access to any of the other EU member states. It goes without saying that a specific EC regulation for biostimulants that is applicable to all member states and provides access to each member state upon registration would be beneficial for the development of the biostimulant market in the EU.
- Currently the European internal market is, due to divergent national rules and standards, difficult to access for innovative fertilization products. Thereby the current procedure for approval of fertilizers as long and complicated to experience. The present proposal aims to complete the procedure to shorten and simplify approval in order to make more use the innovative power of the fertilizer sector. Since 2016 there is an European Commission proposal that aims at the requirements for the marketing of (1) fertilizers, soil improvers, growing media, (2) agronomic additives and (3) biostimulants between EU Member States. As a fertilizer meets the European requirements for that product, it can be used throughout internal market are sold under CE label (Conformité Européenne). (source: www.tweedekamer.nl)

This assessment was based on [8], [20], [21] and stakeholder interviews.

Existing Market Europe

Relevant stakeholders

- **EBIC - EU**
 - “The European Biostimulant Industry Council (EBIC) promotes the contribution of plant biostimulants to make agriculture more sustainable and resilient and in doing so promotes the growth and development of the European Biostimulant Industry” (<http://www.biostimulants.eu/>)
- The five largest companies involved in the production, marketing or distribution of biostimulants (Marketandmarkets, 2017)
 - **Arysta LifeScience** : focused on helping customers cultivate business growth through the development, marketing and distribution of innovative, high-quality chemical solutions for today’s dynamic agrosience and health & nutrition science marketplace (<https://www.arystalifescience.com/>)
 - **Valagro**: leader in the production and commercialization of biostimulants and specialty nutrients. (www.valagro.com)
 - **Biolchim** : leader in the production of Special Fertilisers, nowadays considered among the most important in Italy and the most dynamic on the international markets (<http://www.biostimulants.eu/about/members/biolchim-spa/>)
 - **Syngenta**: a global company agribusiness that produces agrochemicals and seeds (<https://www.syngenta.com/>)
 - **Koppert**: Provides an integrated system of specialist knowledge and natural, safe solutions that improves crop health, resilience and production. (<https://www.koppert.com/company/#c29683>)



Market overview

Existing Market France

Existing Market France

Total value

Biostimulant market France

- The total market value of biostimulants in France is in 2016; €78mln. It is projected to reach €150mln in 2022. The CAGR is 11.3% per year during the forecast period.
- The seaweed extracts segment in France accounted for €28mln of the French biostimulants market in 2016, which corresponds to 36% of the total market value [12]. It is projected to reach €54mln in 2022.
- The seaweed extracts segment is projected to grow at the highest CAGR of 11.5% during the forecast period [12].

Table 13: Market value of the French biostimulant market in millions of euro's, by active ingrediënt. [12]

Active ingrediënt	Market value 2016 (Million EUR)	Percentage of total (%)	Projection 2022 (Million EUR)	Percentage of total projection (%)	CAGR (%/y)
Seaweed extracts	28,1	36,0	54,4	36,3	11,5
Humic substances	26,0	33,3	49,6	33,0	11,1
Vitamins and amino acids	6,6	8,5	12,6	8,4	11,0
Microbials amendments	6,3	8,1	12,2	8,1	11,4
Trace Minerals	5,5	7,0	10,6	7,0	11,2
Others	5,6	7,1	10,8	7,2	11,3
Total	78,1	100,0	150,1	100,0	11,3

Existing Market France

Total value

France biostimulant market segmented by crop type in value [12]

- Almost 60% of the total market value of biostimulants in France is represented by the biostimulants used for row crops

Table 14: Market value of the French biostimulant market in millions of euro's, by crop type. [12]

Crop type	Market size 2016 (Million EUR)	Percentage of total (%)	Projection market size 2022 (Million EUR)	percentage of total projection (%)	CAGR (%)
Row crops	46,8	59,9	89,8	59,8	11,2
Fruits and vegetables	15,6	20,0	28,8	19,2	11,4
Turf and ornamentals	7,7	9,9	14,7	9,8	11,1
Others	7,9	10,1	15,4	10,3	11,5
Total	78,1	100,0	150,1	100,0	11,3

Existing Market France

Total area

France biostimulant market segmented by crop type in area

- The total area of agricultural lands in France is estimated at 28.7 mln ha [22]. As such 1.8% of the total agricultural lands in France are treated with biostimulants
- The total biostimulant market in France covered in 2016; approximately 500,000 hectares. It is projected to reach 990,000 hectares in 2022. The GACR is 12.1 % per year during the forecast period. [12]
- More than 60% of the total volume of the biostimulant market in France is used for applications on row crops. [12]

Table 15: Market size of the French biostimulant market in thousands of hectares, by crop type. [12]

Crop type	Market size 2016 (Thousand hectares)	Percentage of total (%)	projection market size 2022 (Thousand hectares)	Percentage of total projection (%)	CAGR (%/y)
Row crops	317,3	62,7	620,0	62,5	12,1
Fruits and vegetables	91,8	18,1	183,3	18,5	12,5
Turf and ornamentals	45,8	9,0	91,2	9,2	12,4
Others	51,1	10,1	97,3	9,8	11,6
Total	506,1	100,0	992,3	100,0	12,1

Existing Market France

Context

- There are more than 45 sellers and marketers of biostimulants in France [8]
- Most of the algae produced in France are coming from Bretagne, they are either cultivated or harvested. It has been estimated that the total production of algae in France is around 70,000 tonnes, from which wild algae are the major part. Only 50 tonnes is produced by seaweed farming. 75% of the harvested algae are going to the food industry, chemistry and microbiology. Only 6% is used for agricultural purposes [8]
- In France the most important agricultural crops are; cereals, oilseeds, vegetables and orchard crops. The application of biostimulants increases the yield and provide a more nutritious environment. Additionally, biostimulants can give the crops increased strength, especially during the early development stage. This gives the crops a higher change to withstand heavy rains, salinity and drought events in France. France accounted for 13,47% of the total value of the European biostimulants market in 2015. [12]
- A survey has been carried out in France to estimate how many farmers use biostimulants and why. The results show that more than 60% of the interviewed French farmers use biostimulants. The main reasons for the use of biostimulants are respectively: 1) decrease the use of chemicals, 2) reduce the impact of farming on the environment and 3) to increase the yield [8].

Existing Market France

Relevant stakeholders

List of companies, which are active on the French biostimulant market. The description below shows how the companies describe themselves

- **Timac-Agro:** Manufacturer and commercialises fertilisers and nutritional specialities for crops and animals. (www.timacagro.com)
- **Elicityl:** Biotech company devoted to complex sugar engineering and production. (www.elicityl-oligotech.com)
- **Ecobios:** Producer of innovative proven effective products dedicated to responsible agriculture
- **Roullier Group:** A major operator in Animal and Plant Nutrition. (<http://www.roullier.com>)
- **Premier Tech:** A leading producer in horticulture and agriculture industry. (www.premiertech.com)
- **Fraysinnet Group:** Manufacturer concentrated organic fertilizers based on selected noble raw materials (www.groupe-frayssinet.fr)
- **BASF-Beckerunderwood:** Producer phytopharmaceutical products (<https://agriculture.basf.com>)
- **Lallemand Plant Care:** Specializes in supplying biological plant protection, biostimulation and biofertilization.
- **Lesaffre- Agrauxine:** Development and manufacture products from microorganisms for crop protection, biocontrol and stimulation of plants biostimulation.
- **Borregaard:** Produces advanced and environmentally friendly biochemicals, biomaterials and bioethanol that can replace oil-based products.

Existing Market France

Regulation

- The market growth is limited by its slow regulatory approval for biostimulant products, which can sometimes take nearly 2 years. [12] They fall under the pesticide or fertilizer legislation. These two product types need to be reviewed and authorized before market entry. Except when they fall under general EU legislation, [24].
- Biostimulant products can be introduced on the market as fertilizer material and as crop support (FMCS). However, they can also be considered as plant protection products (PPP), which means they have to follow the rules for this particular market, but they are not called biostimulants. The reason for this is that FMCS products have to have direct influence on the growth rate of the plant. PPP have not a direct influence on the growth rate, they help the plant to resist biotic stress. A major issue is that some biostimulants have both aspects, which means it is often not clear which rules are applicable. [8]
- FMCS products are easier to regulate than the PPP. Therefore, most of the biostimulants are registered as FMCS. In Europe there are two main methods to certify FMCS. The rules are different depending on the country where the product is certified. Therefore, it is important to find and develop new methods for certifying biostimulants. The EU is working on this issue since 2009, but specific text has not been published yet. [8]
- Some recent changes have been made in legislation on natural substances used as biostimulants. But it is questionable whether these alterations have positive impact for biostimulant products, [24].

Market overview

Existing Market United Kingdom

Existing Market United Kingdom

Total value

Biostimulant market United Kingdom

- The total market value of biostimulants in the UK is in 2016; €40,6mln. It is projected to reach €75,6mln in 2022. The CAGR is 10,7%.
- The seaweed extracts segment in the UK accounted for €13,6mln of the UK biostimulants market in 2016, which corresponds to 33,6% of the total market value [12]. It is projected to reach €25,6mln in 2022.
- The seaweed extracts segment of the UK biostimulant market is projected to grow at the highest CAGR of 10,9% during the forecast period. [12]

Table 16: Market value of the UK biostimulant market in millions of euro's, by active ingrediënt. [12]

Active ingredient	Market value 2016 (Million EUR)	Percentage of total (%)	Projection 2022 (million EUR)	Percentage of total projection (%)	CAGR (%)
Seaweed extracts	13,6	33,6	25,6	33,9	10,9
Humic substances	13,0	32,0	24,0	31,8	10,6
Vitamins and amino acids	3,9	9,5	7,1	9,4	10,5
Microbials amendments	3,8	9,3	7,0	9,3	10,7
Trace Minerals	3,5	8,7	6,7	8,8	10,8
Others	2,7	6,8	5,1	6,7	10,7
Total	40,6	100,0	75,6	100,0	10,7

Existing Market United Kingdom

Value

United Kingdom biostimulant market segmented by crop type in value [12]

- More than half of the total market value of biostimulants in the UK is represented by the use of biostimulants for row crops
- The CAGR is almost the same for all the crop types.

Table 17: Market value of the UK biostimulant market in millions of euro's, by crop type. [12]

Crop type	Market size 2016 (Million EUR)	Percentage of total (%)	Projection market size 2022 (Million EUR)	Percentage of total projection (%)	CAGR (%)
Row crops	20,8	51,3	41,4	51,3	10,6
Fruits and vegetables	12,3	30,2	24,4	30,2	10,8
Turf and ornamentals	4,8	11,7	9,5	11,7	10,5
Others	2,8	7,0	5,6	7,0	10,7
Total	40,6	100,0	80,6	100,0	10,7

Markets and markets 2016

Existing Market United Kingdom

Total Area

United Kingdom biostimulant market segmented by crop type in area

- The total area of agricultural lands in the United Kingdom is estimated at 17.1 mln ha [22]. As such 1.8% of the total agricultural lands in the United Kingdom are treated with biostimulants.
- The total biostimulant market size in the UK covered in 2016; 313,000 hectares. It is projected to reach 637,000 hectares in 2022. The GACR is 11% per year. [12]

Table 18: Market size of the UK biostimulant market in thousands of hectares, by crop type. [12]

Crop type	Market size 2016 (hectare)	Percentage of total (%)	projection market size 2022 (hectare)	percentage of total projection (%)	CAGR (%)
Row crops	173.800	55,5	327.800	51,4	11,2
Fruits and vegetables	98.600	31,5	183.700	28,8	11
Turf and ornamentals	45.300	14,5	84.300	13,2	10,9
Others	23.600	7,5	41.600	6,5	9,9
Total	313.300	100,0	637.300	100,0	11,0

Existing Market United Kingdom

Context

- The UK majorly produces cereals, oilseeds, potatoes, and vegetables, and wheat. The agricultural practices utilized in the UK are highly advanced and mechanized, with considerable knowledge about organic farming methods and precision farming. The adoption of biostimulants in order to replenish the nutrients has become a common practice. The country's comparatively smoother regulatory process further encourages the launch of more innovative products. Unlike acid-based biostimulants, the naturally available seaweed varieties in the UK and their rising demand for agricultural purposes provide opportunities for manufacturers to establish themselves in the market.
- Significant events in the world market for AFA since 2010 have been observed: Formation of a manufacturing and marketing alliance between Koch Fertiliser Trading SARL and Agrotain International, followed by the launch in April 2010 of Koch Advanced Nitrogen (urea stabilized with NBPT) in the UK. [legal framework Eu]

Legal and regulatory framework by EBIC [<https://biostimulants.weebly.com/united-kingdom.html>]

- Fertilizers for sale in the UK do not have to be registered and there is no specific regulatory framework for biostimulants. Biostimulants do not have to be authorised /registered as long as they do not claim any direct effect on pests or diseases. The Fertilisers Regulations 1991 as amended specify the labelling and packaging of the product and place a responsibility on the manufacturer to declare the nutrient content of the product. The Regulations include a series of Schedules listing type designations of fertilisers ([source](#)). [website EBIC]
- In the UK, manufacturers or importers of such product usually check with the [Chemicals Regulation Directorate](#) (CRD) in advance to make sure their products and climates are considered outside the scope of the pesticide regulation.
- In both UK and Ireland, mixtures of biostimulants with nutrients can be sold under the Fertilisers Regulations. They are marketed either as EC fertiliser or non-EC fertiliser. Only the nutrient content needs to be declared. It is not necessary to validate the claim of [the biostimulant effect](#). The relevant legislations is [Regulation 2006 No 2468](#) and [Fertilizer Regulation 1991 No 2197](#) as amended.

Existing Market United Kingdom

Relevant stakeholders

List of organizations, which are relevant for the UK biostimulant market.

- **DEFRA:** Department for Environment, Food and Rural Affairs
- **EA:** Environment Agency
- **Chemicals Regulation Directorate (CRD)**

List of companies, which are active on the UK biostimulant market.

- **ODUS UK:** Producer of innovative and environmentally friendly Micro Organic Agro Chemical Products (<http://www.odusuk.com/>)
- **Biotechnica:** Company developing and producing innovative biological products for agriculture, horticulture and sports turf to the highest standards. (<http://www.biotechnica.co.uk/>)
- **Origin UK Operations Ltd.:** A national manufacturer and distributor of fertiliser with a strong local presence throughout the country. (<http://www.originfertilisers.co.uk/>)



Market overview

Belgium & The Netherlands

Existing Market Belgium & The Netherlands

Context, volume & value

- Compared to larger European countries Belgium and the Netherlands seem to have limited information on the biostimulant market. There is no clear reason why information on this market is lacking. Especially in the Netherlands it was expected to easily attain market information on biostimulant use due to the large size of the horticulture and agriculture sector. The lacking number therefore shouldn't be perceived as not interesting countries to build and expand on for biostimulant applications.
- Relevant information for this part of the market study is obtained by literature research and by interviews of project partners and observer partners (Olmix, Greenyard Horticulture, Huiberts Bloembollen, University of Gent and others). All interviewed parties see activities related to biostimuli in agriculture or horticulture. Specific attention was given by interviewees to flower bulb farming, tree farming, sports fields and hobby gardening.
- Seaweed species that are used as biostimulants are among others: *Ascophylum Nodosium*, *Ulva sp.* and *Soliera sp.*.
- The risk for biostimulants products of 'overpromising' is mentioned by interviewees. For large scale and professional applications, growers need more 'hard proof' and results on (seaweed) biostimulants. Positive results should be substantiated by scientific research.
- Several interviewees mentioned perceived growth of the use of biostimulants and therefore their sales. As demand is increasing in several sectors in the Netherlands, volumes seem to stay lower than other European countries. In a MarketsandMarkets report on biostimulants The Netherlands is declared as 'Rest of Europe' together with Sweden, Denmark and Norway. Production volume and value for Belgium biostimulant market are not publicly available in literature.

Existing Market Belgium & The Netherlands

Relevant stakeholders BE & NL

- **Proefcentrum voor Sierteelt** : Belgian organization for ornamental plant research
- **Belgische Sierteelt- en groenfederatie**: advocacy for Belgian growers and traders of ornamental plants and nursery stock (<https://www.avbs.be>)
- **Federale Overheidsdienst Volksgezondheid**: part the Ministry of public health of Belgium, active in 9 regions.
- **Koppert Biological Systems**: provides an integrated system of specialist knowledge and natural, safe solutions that improves crop health, resilience and production. (<https://www.koppert.com/company/#c29683>)
- **Melspring (part of Olmix Group)**: A leading seller of seaweed biostimulants for general plant care applications. (<https://www.olmix.com/nl/melspring>)
- **University of Gent**: Knowledge institution with significant knowledge on (seaweed)biostimulants (<https://www.ugent.be>)

- **Greenport West-Holland**: Network organization to promote horticulture business and interests in the South and Western part of the Netherlands. (<https://greenportwestholland.nl/>)

- **Tradecorp – nutri-performance**: Tradecorp are experts in micronutrients and speciality fertilisers (<http://tradecorp.com.es/en/>)
- **Syngenta**: Specializes in supplying biological plant protection, biostimulation and biofertilization.

- **RIVM**: Dutch National institute for public health and the environment (<https://www.rivm.nl/RIVM>)
- **Meststoffen Nederland**: sector organization which represents the Dutch fertilizer sector (<https://www.meststoffennederland.nl/>)

Existing Market Belgium & The Netherlands

Regulation

The Federal Agency for Safety of the foodchain (FAVV) in Belgium is responsible for the monitoring of fertilizers, biostimulants and cultivation substrate (belgium.be, 2017). In Belgium products are documented in a longlist of products. If your product is not on the list For products that are not mentioned in federal law, the competent minister can grant an exemption. This exemption makes it possible to trade the product as fertilizer, soil improvement agent, cultivation substrate or related product. Companies must also request permission from the competent minister to mention certain specific properties on the label of a fertilizer, soil improver or cultivation substrate. Notable, more and more questions enter at the regulation department in Belgium about biostimulants. This might indicate a slight increase of interest in the use of biostimulants.

The Netherlands is positive about the inclusion of a category for biostimulants in new EU policies. These innovative products often have an indirect fertilising value, due to the occurrence of abiotic stress or the addition of microorganisms to increase nutrient absorption. This category offers companies that are innovative the possibility to develop a framework for placing these new products on the market, whereby it must be clear which claim the product carries. The Netherlands will emphasize that there is a clear distinction between crop protection agents and biostimulants. The Netherlands also believes that the list of micro-organisms can be described more specifically. For biostimulants and agronomic additives, the proposal provides a so-called type assessment in derogation from the other fertilizers. The Netherlands believes that the procedure for recognizing innovative products should be proportionate and should not require a great deal of time and should be strongly cost-increasing. [23]

4 | Conclusion & Next steps

Conclusion & next steps

What is the biostimulant market?

Biostimulants stimulate resilience of agri- or horticulture production systems

In general, biostimulants can be applied to maintain or increase crop yields and crop quality without increasing or even whilst reducing fertilizer use. As such biostimulants may trigger a more innovative approach to crop production and land use: employ naturally based substances to increase the plants' robustness against abiotic influences rather than using chemically based substances to reduce the instances and gravity of unfavourable growing conditions. An important boundary condition in this respect is that by employing biostimulants the volume and quality of the yields remain the same as a minimum. In addition a favourable regulatory framework as well as easy access to "application manuals" for end-users are important to consider as boundary conditions. In this way biostimulants can support the transition to a more sustainable and circular agriculture industry.

Biostimulants market is significant and small

In terms of value (> €1bln), land-application (>14mln ha) and global players/stakeholders the biostimulant market appears to be a significant global market. However, compared with the global agricultural industry (including horti, ornamentals & others) it is still a very small market, e.g. for Europe approximately 2.5% of the total "fertiliser" market. However, given the above benefits of biostimulants and the required global transitions towards sustainable and circular it is expected to grow significantly in the future. Seaweed-based biostimulants appear to cover approximately one-third of the total market of biostimulants. Due to their sustainable production process they are and will remain a biostimulant of interest to the market.

Limited data sources

Today there are few reliable sources of public information on market and application data for biostimulants. Therefore cross-verifying data proves difficult, although in this report it has been possible to verify the high-level numbers on a global and European level. At this stage it is assumed that the only viable way of obtaining additional verified data is via direct stakeholder interviews.

New markets require special attention

In general biostimulants are perceived as a promising though a relatively new category. This means the market will not collectively adopt it as part of their production process. Boundary conditions for this to occur include among others: (additional) scientific proof of positive (and potentially negative) effects, product availability and application manuals for end-users, regulatory framework and standardisation. There does not appear to be a lack of enthusiasm and interest in the market as it appears that many stakeholders see the need for innovative solutions that allow them to address challenges of the transition to the sustainable and circular economy. Nevertheless there are sufficient "early adaptors" that are already convinced of the benefits of biostimulants such as innovative (organic) crop producers, golf course owners, etc.

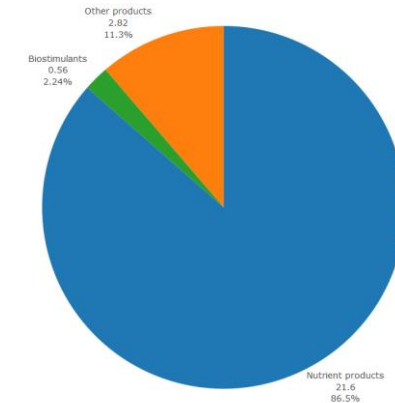


Figure 3: Total European biostimulant market value (€-mln) 2016, by application

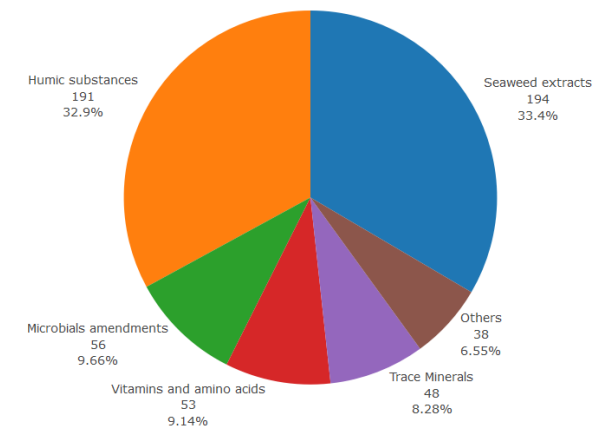


Figure 4: Total European biostimulant market value (€-mln) 2016, by ingredient

Conclusion & next steps

Main market drivers

To conclude we briefly indicate the main drivers for biostimulant market:

Figure 5: Market drivers for the biostimulant market

Economic

There seems to be an **existing biostimulant market** (in terms of volume and value) at an international and regional level.

Positive projections made by commercial parties are difficult to interpret because market data is not documented by independent institutions.

Also **mentioned, positive large scale effects on yields** have not been researched appropriately.

Environmental

Climate change, land scarcity and decreasing biodiversity put **pressure on conventional horti- and agricultural systems**.

There also is **increasing pressure from societal and environmental organisations** towards more sustainable and circular production systems.

Biostimulants can support with addressing the challenges associated with these trends.

Regulatory

Divergent national regulations and standards impede access for innovative fertilization products to these markets.

Currently there is **no uniform regulation at a global or EU level**.

New EU phosphate legislation can push farmers towards the use of biostimulants to lower their phosphate footprint.

Market acceptance

Biostimulants are **relatively new**. The degree of institutionalization and acceptance of biostimulant use in agri- and horticulture is currently not widespread.

Framing of biostimulants as 'candy for the plant'.

Many in the scientific community consider biostimulants to be **lacking peer-reviewed scientific evaluation** [2].

Conclusion and next steps

Summary of next steps

D1.1.1: Identification of the seaweed biostimulants market

- **What is the biostimulant market?**
 - ✓ General description of biostimulants: definition, function and application
 - ✓ Broad identification of the biostimulants market: globally, EU wide and regionally
 - ✓ Identification of the seaweed based biostimulants as part of the total market
 - ✓ Assessment of the results, conclusions and recommendations for next steps

D1.1.2: Identification of the market potential of various seaweed biostimulants

- **What is the market potential of seaweed biostimulants?**
 - Identification of commonly used seaweed species for biostimulants and their applicability
 - In depth analysis of industry categories objectives and needs – specifically related to seaweed biostimulants
 - Detailed overview of market drivers and barriers in the seaweed biostimulant market (logistics, knowledge, regulations, etc.)
 - Description and SWOT analysis of seaweed biostimulants supply chain: global, European, regional
 - Assessment of the results, conclusions and recommendations for next steps

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