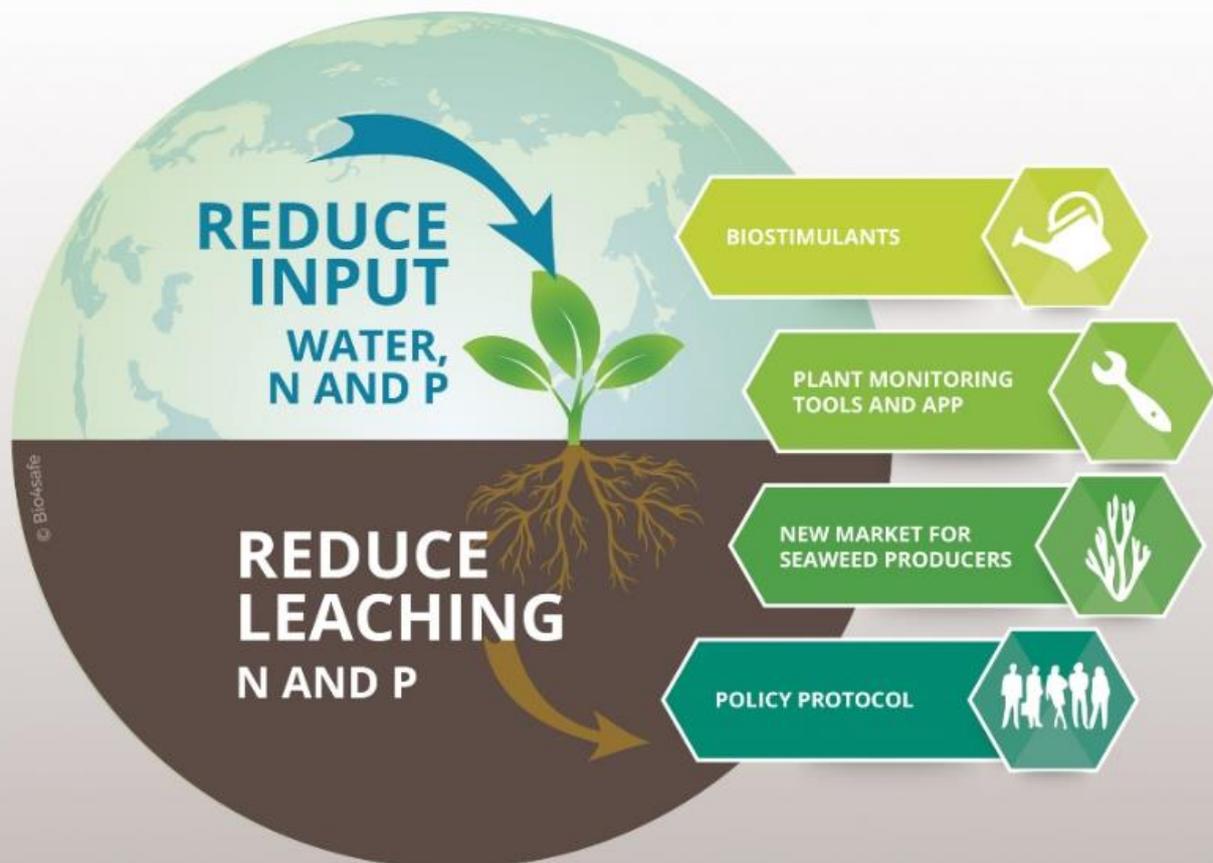


# Deliverable 1.1.4: Report on the Stakeholder identification and assessment as part of the Bio4safe project



## 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), Pôle Légumes Région 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.

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### Disclaimer:

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## Table of Contents

<b>Preface .....</b>	<b>2</b>
<b>List of tables and figures .....</b>	<b>5</b>
<i>Tables .....</i>	<i>5</i>
<i>Figures.....</i>	<i>5</i>
<b>1 Introduction .....</b>	<b>6</b>
1.1 <i>Recap of preceding deliverables in A1.1.....</i>	<i>8</i>
1.2 <i>Description from the approved project application .....</i>	<i>8</i>
1.3 <i>Content of this report.....</i>	<i>8</i>
<b>2 Methodology.....</b>	<b>9</b>
2.1 <i>Introduction.....</i>	<i>9</i>
2.2 <i>Interview setup.....</i>	<i>9</i>
2.2.1 <i>Stakeholder categories .....</i>	<i>9</i>
2.2.2 <i>Interview questions .....</i>	<i>11</i>
2.2.3 <i>Execution of the interviews .....</i>	<i>12</i>
2.3 <i>Stakeholder engagement .....</i>	<i>14</i>
2.3.1 <i>Active sharing of project reports .....</i>	<i>14</i>
2.3.2 <i>Online stakeholder sessions (Skype).....</i>	<i>14</i>
2.3.3 <i>Interactive partner meeting with stakeholders session .....</i>	<i>15</i>
<b>3 Results.....</b>	<b>16</b>
3.1 <i>Stakeholder scan of seaweed based biostimulant market .....</i>	<i>16</i>
3.1.1 <i>Stakeholder scan: approached stakeholders .....</i>	<i>16</i>
3.1.2 <i>Stakeholder scan: interviewed stakeholders .....</i>	<i>16</i>
3.2 <i>Results of interviews &amp; context .....</i>	<i>17</i>
3.2.1 <i>Biostimulant market information .....</i>	<i>17</i>
3.2.2 <i>Quantitative market data .....</i>	<i>17</i>
3.2.3 <i>Qualitative market data.....</i>	<i>17</i>
3.2.4 <i>Biostimulant market potential.....</i>	<i>18</i>
3.2.5 <i>Seaweed based biostimulant supply chain.....</i>	<i>18</i>
3.3 <i>Online stakeholder sessions (Skype).....</i>	<i>19</i>
3.3.1 <i>Part 1: presenting input for the participants' discussion .....</i>	<i>19</i>
3.3.2 <i>Part 2: Feedback and insights from the participants .....</i>	<i>19</i>
3.4 <i>Interactive stakeholder session .....</i>	<i>21</i>
3.4.1 <i>Objectives stakeholder session.....</i>	<i>21</i>
3.4.2 <i>Methodology during session .....</i>	<i>21</i>
3.4.3 <i>Stakeholder categories .....</i>	<i>22</i>
3.4.4 <i>Statement results.....</i>	<i>23</i>
3.4.5 <i>Conclusions interactive stakeholder session .....</i>	<i>25</i>
3.5 <i>SWOT analysis of the seaweed based biostimulant market .....</i>	<i>26</i>
3.5.1 <i>SWOT 1 – based on desk research &amp; initial stakeholder interviews.....</i>	<i>26</i>
3.5.2 <i>Review of the <b>Strengths</b> compared to stakeholder feedback .....</i>	<i>26</i>
3.5.3 <i>Review of the <b>Weaknesses</b> compared to stakeholder feedback.....</i>	<i>27</i>

3.5.4	Review of the <b>Opportunities</b> compared to stakeholder feedback .....	27
3.5.5	Review of the <b>Threats</b> compared to stakeholder feedback .....	27
3.5.6	SWOT 2 – updated after stakeholder consultation .....	28
<b>4</b>	<b>Conclusions, recommendation &amp; next steps.....</b>	<b>29</b>
4.1	<i>Introduction.....</i>	29
4.2	<i>Overview of the relevant stakeholders.....</i>	29
4.3	<i>Potential of the biostimulant market – SWOT .....</i>	29
4.4	<i>Assessment of results, conclusion and recommendations .....</i>	29
4.4.1	Conclusions .....	29
4.4.2	Recommendations .....	30
4.4.3	Learnings for Bio4safe program and WP1 .....	30
4.4.4	Next steps .....	31
<b>5</b>	<b>Bibliography .....</b>	<b>32</b>
	<b>Attachment 1: Background information document.....</b>	<b>33</b>
	<b>Attachment 2: Longlist interview questions .....</b>	<b>35</b>

## List of tables and figures

### Tables

Table 1: Overview stakeholder categories and corresponding biostimulant value chain segments (D1.1.2. & D1.1.3.).....	10
Table 2: Example questions for interviewing a biostimulant producer per question category .....	11
Table 3: Overview of contacted and interviewed stakeholders .....	13
Table 4: Stakeholder groups as used during observer meeting.....	22

### Figures

Figure 1: Setup of Work Package 1.....	7
Figure 2: Setup of Activity 1.....	7
Figure 3: Objective of Deliverable 1.1.4 (this report) .....	7
Figure 4: The number of approached stakeholders per defined stakeholder category .....	16
Figure 5: Number of interviewed stakeholders per defined stakeholder category .....	17
Figure 6: Photo of observer partner meeting at Pôle Légumes during interactive stakeholder session.....	21
Figure 7: Overview of the position per statement of the 4 different stakeholder categories .....	23
Figure 8: SWOT analysis of seaweed biostimulant market (General & Global and European and 2 Seas Region level), based on Interviews (D1.1.2) .....	26
Figure 9: Updated SWOT analysis of seaweed biostimulant market (General & Global and European and 2 Seas Region level), updated after stakeholder consultation. ....	28
Figure 10: Objective of Deliverable 1.1.4 (This report).....	29
Figure 11: Setup of work package 1 and the objective of Deliverable 1.2.1.....	31

## 1 Introduction

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
- Work Package 3: Collecting and analysing cross-border data to develop information database and apps to access the information
- 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 D1.1.4 Stakeholder identification and assessment** as part of activity **WP1.1 - Determination of existing market of biostimulants**. Figures 1 & 2 on the next page briefly demonstrate the relation between these various elements.

### Setup of Work Package 1

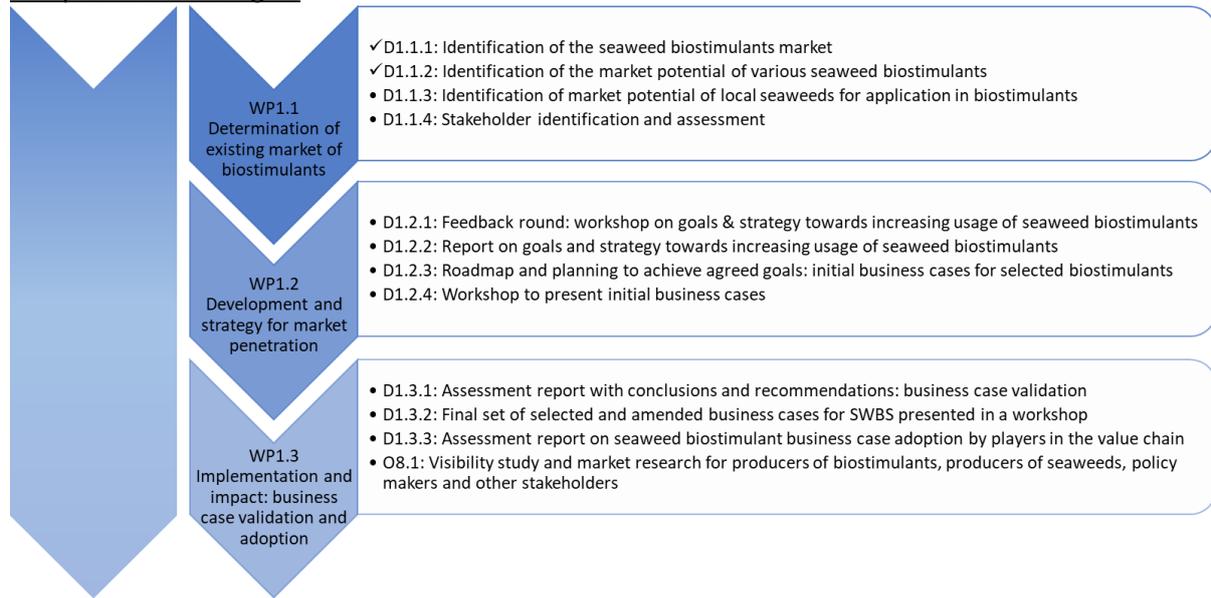


Figure 1: Setup of Work Package 1

### Setup of Activity 1

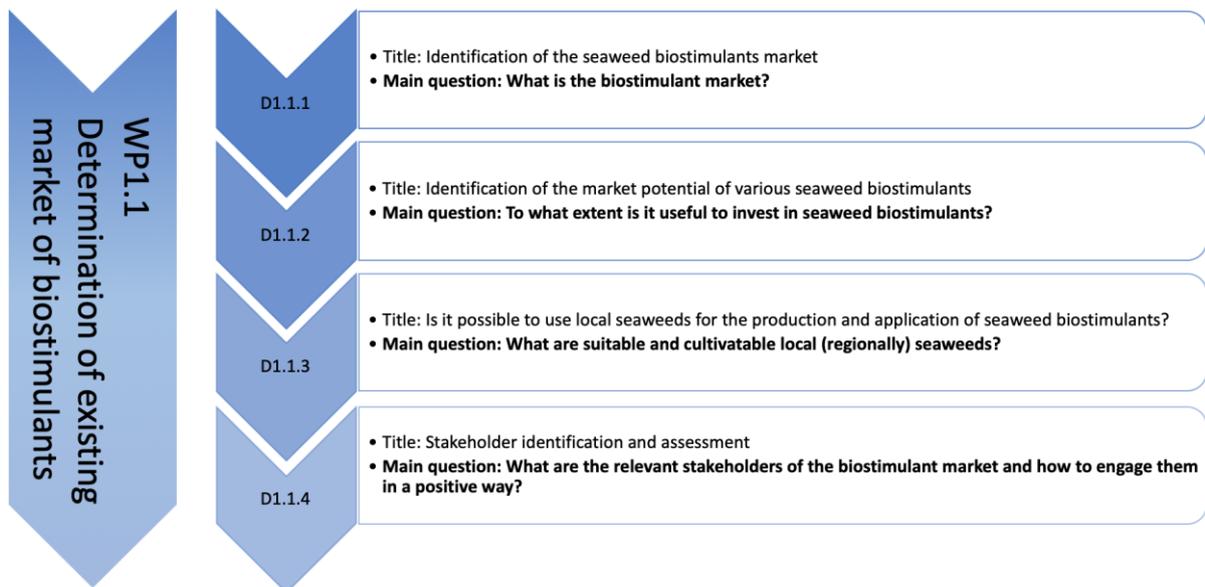


Figure 2: Setup of Activity 1

### Objectives for Deliverable 1.1.4 (this report)

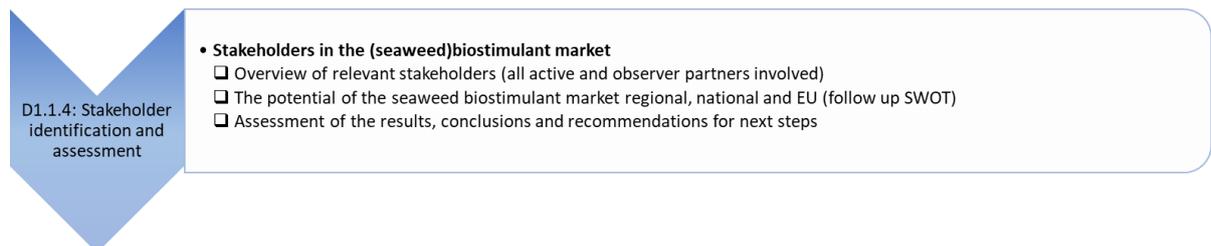


Figure 3: Objective of Deliverable 1.1.4 (this report)

## 1.1 Recap of preceding deliverables in A1.1.

In deliverable 1.1.1, North Sea Farm Foundation (NSF) has gathered publicly available information by means of online research, acquired market information with all partners and observer partners. Together with several interviews/meetings with for example Zwaagdijk, PCS, ISA Lille, Olmix, local stakeholders and others. The initial data was provided for the different regions by making use of the network of partners mainly in The Netherlands, Belgium and France which resulted in a community of more than 80 possible relevant stakeholders (this was also the starting point of stakeholder selection).

Deliverable 1.1.2 provides an overview of drivers and barriers of the seaweed biostimulant market making use of a SWOT analysis. In this phase of the project NSF worked in close collaboration with Ghent University in conducting interviews.

Looking from the seaweed farmers perspective 1.1.3 provides insights in local (2seas region) seaweed species and potential of the species for biostimulants. All data in the deliverables is supported by interviews with stakeholders, observer partners, partners and biostimulant producers.

For this deliverable 1.1.4 information from the desk study, stakeholder interviews, the interactive partner meeting and stakeholder skype sessions are gathered to elaborate on the SWOT analysis made in D.1.1.2. and to update this analysis where required. The updated SWOT analysis will then be used to build towards a strategy (guidelines) on how to engage relevant stakeholders and further develop seaweed biostimulant market (roadmap).

## 1.2 Description from the approved project application

As part of activity A1.1 as part of work package 1 (WP1), deliverable 1.1.4 (D1.1.4) is included with the aim of identifying stakeholders and to obtain their insights so that they may be used to determine the focus of the subsequent activities in WP1.

The exact description of D1.1.4 is as follows:

*Whether a new development becomes successful or not depends to a large extent on stakeholder acceptance. For this reason, stakeholders associated with seaweed biostimulant application will be identified and consulted including regional, national as well as EU wide stakeholders (all active and observer partners involved). Furthermore, the identified stakeholders will be interviewed with the aim of acquiring their view on biostimulants, their view on their potential as well as their potential threats.*

## 1.3 Content of this report

This report, the “stakeholder identification and assessment report as part of the Bio4safe project” will therefore include:

- Overview of approached, contacted and interviewed stakeholders;
- Results of all stakeholder engagement activities;
- Evaluation of desk study results (D1.1.1.-D1.1.3) with stakeholder feedback in an updated SWOT analysis; and
- General conclusions and recommendations for next steps.

## 2 Methodology

### 2.1 Introduction

In this project one of the objectives of North Sea Farm Foundation is to work towards stakeholder engagement in order to push market developments. To do so, we needed to acquire elaborate information about the biostimulant market and the drivers and barriers which stakeholders experience. This has been done with the help of partner and stakeholder interviews. Additionally, we have presented and evaluated results from earlier work with stakeholders. This was a second step in engaging with relevant stakeholders. Also, we have actively shared reports and organized interactive discussions. This is an ongoing process, as (new) stakeholders will be kept involved thoroughly in future work. These stakeholders are the *real* owners of the biostimulant value chain. They need to feel ownership of the problems, solutions and way forward. This (stakeholder) work will set the basis for developing and executing a roadmap to develop the seaweed based biostimulant market.

### 2.2 Interview setup

#### 2.2.1 Stakeholder categories

Several categories of stakeholders have been identified, based on desk research on the value chain of biostimulants. This has been executed and reported in D1.1.2. & D1.1.3. The different types of commercially active stakeholders in the biostimulant value chain have been described below in table 1. Some stakeholder categories have shown to be active in multiple segments of the value chain. Next to the commercially active stakeholders in the biostimulant value chain, there are other types of stakeholders that are involved in the topic of biostimulants. These stakeholder categories include: science institutes, governments and branch organisations.

This means that in total there were 11 stakeholder categories:

1. Seaweed producer (seaweed farmer, harvester)
2. Seaweed processor
3. Biostimulant producer
4. Biostimulant trader (trader, repackaging, rebranding)
5. Biostimulant agent
6. Retail & wholesale
7. End-user (farmers, gardening professionals, household consumers)
8. Science & Research
9. Branch organization
10. Government
11. Other

Table 1: Overview stakeholder categories and corresponding biostimulant value chain segments (D1.1.2. & D1.1.3.)

Stakeholders categories	Description	Active within value chain segments
<b>Seaweed producer (seaweed farmer, harvester)</b>	Cultivate or harvest seaweeds.	<ul style="list-style-type: none"> <li>Seaweed cultivation/ Wild harvest</li> </ul>
<b>Seaweed processor</b>	Processes raw material seaweeds into extracts. To be used by biostimulant producers.	<ul style="list-style-type: none"> <li>Logistics, processing &amp; biostimulant production</li> </ul>
<b>Biostimulant producer</b>	Buying seaweed extracts or semi-final biostimulant products. Also (re)package and (re)brand to sell directly to end-users (farmers/consumers), sometimes via traders or agents.	<ul style="list-style-type: none"> <li>Logistics, processing &amp; biostimulant production</li> <li>Distribution &amp; trading</li> <li>Sales to end-users</li> </ul>
<b>Biostimulant trader (trader, repackaging, rebranding)</b>	Buying biostimulant end-products in large quantities. Also repackaging and rebrand for agents or end-users. Note: they do NOT modify the product composition itself.	<ul style="list-style-type: none"> <li>Distribution &amp; trading</li> <li>Sales to end-users</li> </ul>
<b>Biostimulant agent</b>	Can be used by biostimulant producers and biostimulant traders, as a middle man, to bring their product to retail & wholesale or directly to end-users.	<ul style="list-style-type: none"> <li>Distribution &amp; trading</li> <li>Sales to end-users</li> <li>End-users</li> </ul>
<b>Retail &amp; wholesale</b>	Sell biostimulant end-products to end-users e.g. Gamma, Home depot and Hornbach.	<ul style="list-style-type: none"> <li>Sales to end-users</li> </ul>
<b>End-user (farmers, gardening professionals, household consumers)</b>		<ul style="list-style-type: none"> <li>End- users</li> </ul>
<b>Science &amp; research</b>		
<b>Branch organization</b>		
<b>Government</b>		
<b>Other</b>		

## 2.2.2 Interview questions

In close collaboration with Ghent University, the North Sea Farm Foundation developed a set of interview questions for each category of stakeholders. In general, the outline of an interview consisted of the following question categories:

- General information interviewee and background of the company/organisation;
- General information about biostimulants and acquaintance with (seaweed based) biostimulants;
- Market information and market drivers & barriers;
- Seaweed based information;
- Other points for follow up or discussion.

For each of these question categories specific questions per stakeholder category were formulated, see also table 2. During the execution of the interviews, the questions were not necessarily always asked in set sequence. The complete longlist of interview questions is provided in the attachment: Longlist of interview questions.

Table 2: Example questions for interviewing a biostimulant producer per question category

Questions for interviewing a <i>biostimulant end-product producer</i>	Question category
Can you give a general introduction of yourself and your organization?	General information interviewee and background of the company/organisation
In what regions are you active/do you produce your products?	General information about biostimulants and acquaintance with (seaweed based)biostimulants
In what regions do you sell/distribute your biostimulant products?	General information about biostimulants and acquaintance with (seaweed based)biostimulants
How do you sell/distribute your products, only B2B or also directly to individual consumers?	General information about biostimulants and acquaintance with (seaweed based)biostimulants
What part of you biostimulant products are based on seaweed?	General information about biostimulants and acquaintance with (seaweed based)biostimulants
To whom do you sell your biostimulant products: agriculture (row crops), (greenhouse) horticulture, fruit orchards, ornamentals?	General information about biostimulants and acquaintance with (seaweed based)biostimulants
Is this the same for seaweed biostimulants?	General information about biostimulants and acquaintance with (seaweed)biostimulants
How is the market for biostimulants doing, is it declining, stable or growing?	Market information and drivers & barriers
Is this the same for seaweed biostimulants?	Market information and drivers & barriers
What do you think is the potential of biostimulants ?	Market information and drivers & barriers

Is this the same for seaweed biostimulants?	Seaweed based information
What are the biggest challenges with (seaweed) biostimulants?	Market information and drivers & barriers
Is your primary focus production of biostimulants?	General information about biostimulants and acquaintance with (seaweed based)biostimulants
What type of seaweed biostimulants do you produce?	Seaweed based information
Do you see challenges in using seaweed biostimulants in your production?	Seaweed based information
Where do you get your seaweeds from? (EU, imported, directly from farmers, etc.)	Seaweed based information
How do you get you raw materials for seaweed biostimulants and in what form? (dried, liquified or fresh)	Seaweed based information
Is it easy to get the raw materials for seaweed biostimulants and can you get enough of it?	Seaweed based information
Would you prefer another source or different form of the raw material, for example cultivated seaweed instead of wild harvest?	Seaweed based information
Do you have a closing statement or remark?	Points for follow up or discussion

### 2.2.3 Execution of the interviews

In total 58 different stakeholders were approached from which 47 responded. The project partners and observer partners were mainly approached informally via e-mail, skype or face to face. The project partners' network was used to contact relevant (new) stakeholders for interviews. In total 26 interviews have been conducted by either the North Sea Farm Foundation or Ghent University. The largest group of the interviewed stakeholders belong to the stakeholder category *biostimulant producers*. Table 3 gives an overview of the stakeholders, categories, status of interview and their relation to the Bio4safe program.

The North Sea Farm Foundation and Ghent University made a report of each conducted interview. These reports were sent to the corresponding stakeholder for feedback and approval for further use in the Bio4safe project. In order to create a useful overview of the obtained information from the interviews, the acquired information was processed into spreadsheets (the online tool *Airtable* has been used for this). This method for processing the obtained information has been chosen in order to ensure that the statements of the different stakeholders remain anonymous.

Table 3: Overview of contacted and interviewed stakeholders

	Organization	Stakeholder category	Status	Relation to project
1	Acadian Seaplants	Biostimulant producer	Interviewed	Other
2	Agrauxine	Biostimulant producer	Contact, no interview	Observer partner
3	Agriculture and Horticulture Development Board (AHDB)	Branch organization	Contact, no interview	Observer partner
4	Algaia	Biostimulant producer, Seaweed processor	Interviewed	Other
5	Algreen	Seaweed producer (seaweed farmer, harvester)	Interviewed	Other
6	AQUIMER	Science & Research	Contact, no interview	Observer partner
7	Arramara	Seaweed producer (seaweed farmer, harvester), Seaweed processor	Interviewed	Other
8	Belgische sierteelt- en groenfederatie (AVBS)	Branch organization	Contact, no interview	Observer partner
9	BioAtlantis	Biostimulant producer, Seaweed producer (seaweed farmer, harvester), Seaweed processor	Interviewed	Other
10	Biotechnica	Biostimulant producer, Seaweed processor, Seaweed producer (seaweed farmer, harvester)	Interviewed	Other
11	BMS Micro Nutrients NV.	Biostimulant trader (trader, repackaging, rebranding)	Interviewed	Other
12	COMPO EXPERT	Biostimulant producer	Interviewed	Other
13	Danvos	Biostimulant producer	Interviewed	Other
14	Dove Associates	Science & Research	Contact, no interview	Partner
15	EBIC: European Biostimulants Industry Council	Branch organization	Interviewed	Other
16	Ecostyle	Biostimulant trader (trader, repackaging, rebranding), Retail & wholesale	Interviewed	Other
17	Energieonderzoek Centrum Nederland (ECN)	Science & Research	Contact, no interview	Observer partner
18	Federale Overheidsdienst Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu	Government	Interviewed	Observer partner
19	Ghent University	Science & Research	Interviewed	Partner
20	Greenport West-Holland	Branch organization	Contact, no interview	Observer partner
21	Greenyard Horticulture Belgium	Biostimulant trader (trader, repackaging, rebranding), Biostimulant producer	Interviewed	Observer partner
22	Huiberts Biologische Bloembollen	End-user (farmers, gardening professionals, household consumers)	Interviewed	Observer partner
23	Institut agricole et horticole de Genech	Science & Research	Contact, no interview	Observer partner
24	Koninklijk Belgisch Instituut voor Natuurwetenschappen (KBIN), OD Natuurlijk Milieu	Science & Research	Contact, no interview	Observer partner
25	Koppert Biological Systems	Biostimulant producer	Interviewed	Other

26	l'Association des Producteurs d'Endives de France (APEF)	Branch organization	Contact, no interview	Other
27	La direction régionale de l'alimentation, de l'agriculture et de la forêt (DRAAF) Hauts-de-France	Government	Contact, no interview	Observer partner
28	Lallemand Plant Care	Biostimulant producer	Interviewed	Other
29	Lima Europe NV.	Biostimulant producer	Interviewed	Other
30	LTO Glaskracht	Branch organization	Contact, no interview	Observer partner
31	NIAB EMR	Science & Research	Contact, no interview	Partner
32	Olmix Group (fused with PRP Technologies)	Biostimulant producer, Seaweed producer (seaweed farmer, harvester), Seaweed processor	Contact, no interview	Observer partner
33	PlantWorks / Root Grow	Biostimulant producer	Contact, no interview	Observer partner
34	Pôle Légumes Région Nord	Science & Research	Contact, no interview	Partner
35	Pôle Nutrition Santé Longévité (Pôle NSL)	Branch organization	Contact, no interview	Other
36	Proefcentrum voor Sierteelt	Science & Research	Contact, no interview	Partner
37	Proeftuin Zwaagdijk	Science & Research	Interviewed	Partner
38	Roullier Group-Timac Agro	Biostimulant producer	Interviewed	Other
39	RSK ADAS Ltd	Biostimulant producer	Contact, no interview	Observer partner
40	Seaweed Harvest Holland	Seaweed producer (seaweed farmer, harvester)	Interviewed	Other
41	Seed Valley	Other	Contact, no interview	Observer partner
42	Stichting Zeeschelp	Science & Research	Interviewed	Other
43	Tradecorp	Biostimulant producer, Seaweed producer (seaweed farmer, harvester), Seaweed processor	Interviewed	Other
44	Valagro	Biostimulant producer	Interviewed	Other
45	Yncréa Hauts de France, établissement ISA Lille	Science & Research	Contact, no interview	Partner
46	Zeewaar	Seaweed producer (seaweed farmer, harvester)	Interviewed	Other
47	Zetadec	Science & Research	Interviewed	Other

## 2.3 Stakeholder engagement

In order to build a community and actively engage stakeholders in the project, several ways of communicating have been used, such as e-mail, phone, skype and face-to-face stakeholder sessions.

### 2.3.1 Active sharing of project reports

Deliverables 1.1.1., 1.1.2. and 1.1.3. have been actively shared with partners, observer partners and several stakeholder from the table above by email.

### 2.3.2 Online stakeholder sessions (Skype)

In addition, skype sessions were employed as an opportunity to actively discuss preliminary results of Work Package 1 (and on request other work packages). Skype gives the opportunity to present results

and interact with stakeholders in a time efficient way. Up to now, The North Sea Farm Foundation has organized two online stakeholder sessions for which all approached stakeholders were invited. During these online stakeholder sessions the results of the earlier deliverables (D1.1.1., D1.1.2. & D1.1.3.) were presented and discussed. The following stakeholders joined the online stakeholder sessions:

- Greenyard Horticulture;
- Proefcentrum voor Sierteelt;
- Pole Aquimer;
- Agriculture & Horticulture Development Board;
- Agrauxine;
- Algaia;
- Biotechnica;
- Lima Europe NV.; and
- Ecostyle.

### 2.3.3 Interactive partner meeting with stakeholders session

As part of the observer partner meeting, which took place in September 2018, the North Sea Farm Foundation and Pôle Légumes Région Nord, Yncréa Hauts de France, établissement ISA Lille and Proefcentrum voor Sierteelt organized an interactive discussion session with different stakeholders. Due to reasons of practicality 4 categories of stakeholders were distinguished during this session;

- Farmers & Advisors;
- Technicians/Researchers;
- Biostimulant producers; and
- State/Government.

During this session multiple statements were presented and discussed in order to make explicit different opinions and views of the different stakeholder groups on topics related to biostimulants e.g. price and regulation. The results will be used in the development of the roadmap. The following stakeholders joined the interactive discussion session during this observer partner meeting:

- Proefcentrum voor Sierteelt;
- Ghent University;
- NIAB EMR;
- Yncréa Hauts de France, établissement ISA Lille;
- Pôle Légumes Région Nord;
- Proeftuin Zwaagdijk;
- Agriculture and Horticulture Development Board (AHDB);
- Olmix Group;
- Agrauxine;
- Greenyard Horticulture;
- Tradecorp;
- Compo Expert;
- La direction régionale de l'alimentation, de l'agriculture et de la forêt (DRAAF) Hauts-de-France;
- l'Association des Producteurs d'Endives de France (APEF); and
- Pôle Nutrition Santé Longévité (Pôle NSL).

### 3 Results

In this chapter the results of the stakeholder engagement activities are presented.

#### 3.1 Stakeholder scan of seaweed based biostimulant market

##### 3.1.1 Stakeholder scan: approached stakeholders

As already mentioned, a total of 58 different stakeholders is approached from which 47 provided useful information in context of this project. Figure 4 shows the stakeholder categories to which contacted stakeholders belong. Some stakeholders cover multiple stakeholder categories, hence the total number in the figure adds up to a total of 58. All categories are covered by the identified stakeholders except the category of biostimulant agent.

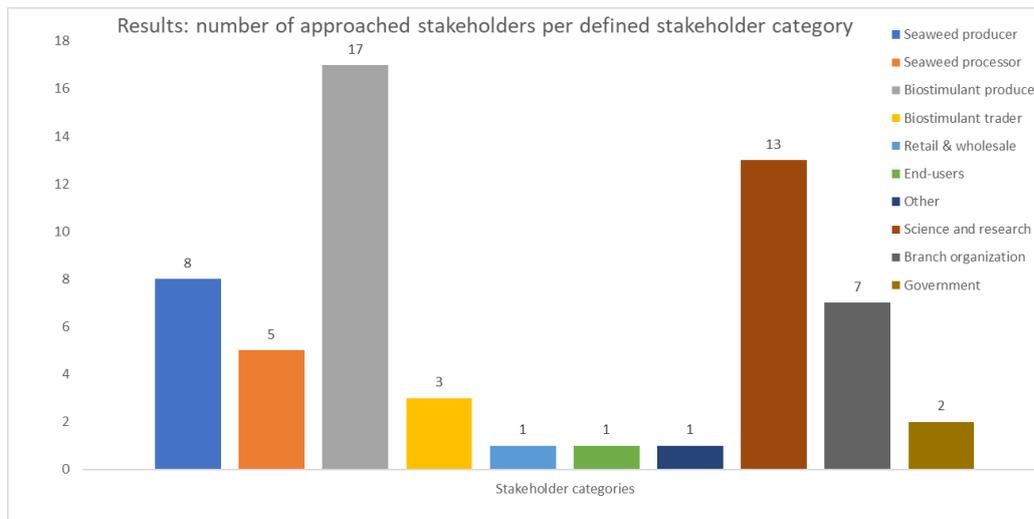


Figure 4: The number of approached stakeholders per defined stakeholder category

It should be noted that almost 30% of the approached stakeholders are biostimulant producers. This can possibly be explained by the fact that biostimulant producers are mostly larger organizations that can easily follow research programs. At the same time they have an interest in increasing the biostimulant market and to explore new possibilities for product development. Additionally, these companies are often easy to find on the internet or via the partner network. The second most represented stakeholder category is ‘Science and Research’, which can be explained by the fact that most of the Bio4safe project partners are science institutes.

End-users, retail & wholesale, agents, traders and the government are still underrepresented. More organizations of these stakeholder categories should be approached in future activities.

##### 3.1.2 Stakeholder scan: interviewed stakeholders

In total 26 interviews were conducted by either the North Sea Farm Foundation or Ghent University. Figure 5 shows in which stakeholder categories the interviewees are active. Nearly half of the interviewed stakeholders are biostimulant producers. Some of the interviewed biostimulant producing companies are harvesting and processing their own seaweed to produce biostimulant end-products, which means that they are active in multiple stakeholder categories.

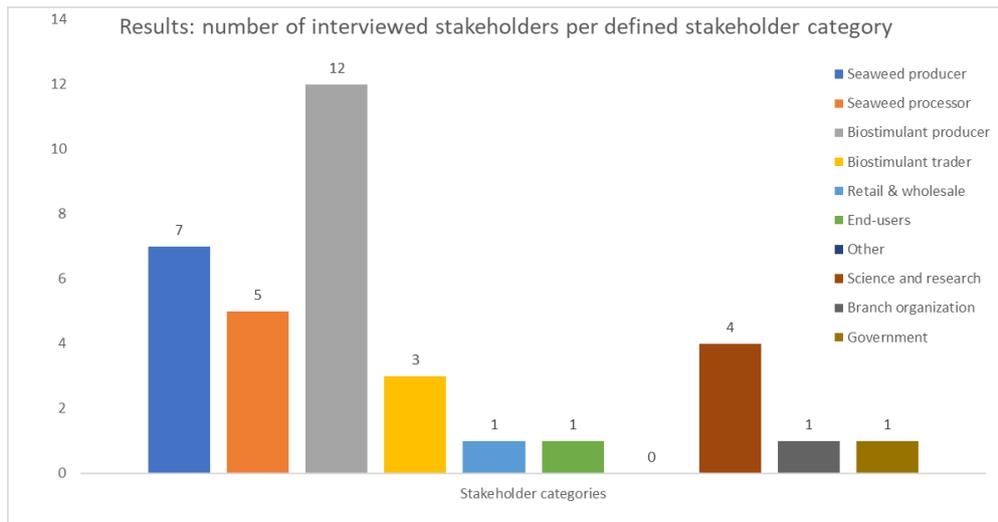


Figure 5: Number of interviewed stakeholders per defined stakeholder category

## 3.2 Results of interviews & context

### 3.2.1 Biostimulant market information

As stated in the earlier reports (D1.1.1. through to D1.1.3.) it is quite difficult to get detailed biostimulant market information in terms of revenue and growth. Let alone specific seaweed based biostimulant markets. Out of the 26 interviewed stakeholders, a limited number of 12 provided feedback on the existing market, usually in terms of barriers or challenges they encounter when operating on the market of today. Only 3 provided quantitative data on the current market and this was limited to some general estimates on volume and growth.

### 3.2.2 Quantitative market data

From the interviews it was noted that the total biostimulant market will grow to approx. €3bln in 2022 and seaweed will then account for approximately €1.2bln. Our general feeling was that this was not an estimate of the stakeholders themselves but rather derived from a well-known market outlook report [27].

Furthermore, stakeholders experienced growth rates between 10-20% per annum basis. This is perceived as an interesting number as this appears to be based on the per annum revenue increase as witnessed by the stakeholders themselves. Due to reluctance to provide more accurate data we have not been able to discriminate between the general and specific seaweed-based biostimulant market.

### 3.2.3 Qualitative market data

As listed in the previous reports as market drivers and barriers, almost all interviewed stakeholders identify regulations when interviewed on the (seaweed) biostimulant market. In total 12 out of the 26, all of them being biostimulant producers. This includes seaweed producers that exercise wild-harvest production methods but zero seaweed cultivators. Clearly the cultivators are focussing on a different market, mostly food, and even when informed about biostimulants their interest in the application remains very limited.

#### In short summaries of general observations:

- The highest demand comes from regions with heat and drought stress, *will EU be one of these markets?*
- Regulation is an issue
- Predictable results are still a challenge – for the suppliers and the users
- Sometimes the product is unknown

- Sometimes it is too expensive for the application (in the current market)
- Biostimulants are here to stay

### 3.2.4 Biostimulant market potential

There has been quite some feedback by stakeholders on the market potential. Out of the 26 interviewed parties, 15 provided feedback any some form on market potential. The common denominator is that the stakeholders believe that the market for biostimulants wil grow, no single stakeholder has been identified that had a different opinion and this in itself is an interesting and valuable observation.

The stakeholders believe that the positive biostimulant market potential is usually based on a combination of larger global policy transitions such as climate change and pesticide/fertilizer legislation as well as changed circumstances of farmers (droughts, biodiversity, market demands) that will make them more willing to look for alternative solutions. Because of all of these reasons, stakeholders believe the market potential is quite significant. These “drivers” have also been identified in the earlier reports and the SWOT analysis thus the feedback from the stakeholders generally confirms this picture.

However, all of them make cautionary remarks in this respect. The market growth will be dependent on a number of boundary conditions to be fulfilled. All of these conditions have been identified as barriers in earlier reports. The feedback of the stakeholders confirm this image. The general feeling that is conveyed after assessing all of the stakeholders feedback is that there is a belief in the potential of the biostimulant solution and thus market, however there is quite some uncertainty whether this will ultimately materialise. Each stakeholder lists other boundary conditions to fulfil market potential. To summarize them; it should be clear

- when to use biostimulants (under what circumstance, in what locations);
- how to use them correctly (application, legislation); and
- what the return of investment is (will it work, what will it cost, what will be my (increased) revenues).

The biostimulant producers have indicated these concerns but to some extent they probably also apply to other stakeholders (not interviewed) such as end-users as they represent the customer base of the producers.

In conclusion it can therefore be stated that – also in combination with the section above on the current market – biostimulants are here to stay. How large this market will become remains to be seen and is dependent on many factors. The potential for a large market, significant compared to existing fertilizers and pesticides, is definitely a possible scenario for the future.

### 3.2.5 Seaweed based biostimulant supply chain

Most stakeholders clarify how they produce their biostimulants. Only a limited number of stakeholders have provided feedback on the *robustness* of the current and future seaweed supply chain, just 6 out of 26. The overall impression is that for the coming years there is no problem with sourcing (in terms of volume) from their current seaweed supply. However, if the market potential really increases, then the supply chain needs to be reviewed in terms of required volumes. As indicated above, the potential of market growth is present but whether and when this will materialise, is still uncertain for most stakeholders. Therefore, investing in the seaweed supply chain is not top of mind with the biostimulant producers.

An opportunity to start looking in to the seaweed supply chain is provided in terms of stability of the product. A limited number of stakeholders, 3 out of 26, indicate that they sometimes struggle with the quality of the raw material seaweed. Better control over this, e.g. via cultivation instead of wild-

harvest, could be a reason for them to start investment in the supply chain earlier. However, it is our anticipation that this investment decision (shifting from wild harvest to cultivation) is highly dependent on a clear identification of mode of action of the seaweed biostimulants. When it is clear what compounds lead to what effect in yield and quality of the crops (and therefore return on investment for the biostimulant end-user) only then will it be acceptable for a biostimulant producer to start investment in improvements of the seaweed supply chain.

### 3.3 Online stakeholder sessions (Skype)

As part of the stakeholder identification & assessment 2 online stakeholder sessions were organised with the aim of informing the by then identified stakeholders of our initial results in reports D1.1.1 to D1.1.3 and to obtain their feedback. During the stakeholder sessions the North Sea Farm foundation presented these preliminary results. Several companies, observer partner and partners joined the stakeholder sessions. By means of screen sharing the information was shared with the participants. This was then followed by a brief discussion with the participants in order to obtain their feedback and insights.

#### 3.3.1 Part 1: presenting input for the participants' discussion

At the start of the session the results of our earlier reports were presented to the participants. After an elaborated presentation the main insights from these reports were summarised for the participants as follows:

- There is a large potential for growth of the biostimulant market
  - In terms of value > 1 billion euros.
- The annual growth rate of today's biostimulant market is between 5-15%
- In the 2-seas region there are only limited seaweed species available for biostimulant products
  - In this respect *Ascophyllum Nodosum* is the main and most important species. This is a wild harvested seaweed.
- In the scenario of significant market growth then the supply needs to look into using cultivated seaweed as feedstock in addition/ instead of currently wild-harvested seaweeds.

Based on the above insights and the favourable market outlook, we proposed the following statement to the participants of the stakeholder session:

*With the above positive outlook it is remarkable that not everybody is using, trying and testing (seaweed)biostimulants yet?*

In addition, the following verification questions were also asked towards the end of the session:

- *Are we using the right numbers (market numbers). Are we going in the right direction?*
- *Are we on the right track in identifying the relevant knowledge gaps between stakeholders?*

#### 3.3.2 Part 2: Feedback and insights from the participants

Based on the above inputs and questions the participants have provided ample feedback. In order to provide an overview of these response, these have been categorised under the main categories as used throughout this work package:

Economic:

- For developing a viable business case for local (cultivated) seaweed based biostimulants, as step-by-step approach is recommended. Sharing knowledge in sessions like this also helps.
- It could be interesting to use the Bio4safe project to build a value chain around cultivated seaweeds.

- The emphasis on row crops is somewhat surprising. Because they are low value. High value crops tend to be more attractive.

Environmental:

- There are also different needs for plants/crop types throughout the season. Seaweed should be seen as a stimulant to create a positive change in the plant or soil. In sum, contribution of a (seaweed)biostimulant at a certain plant or crop type is location, weather and soil specific.

Market acceptance:

- Use of more specific local numbers. The (wild-harvest) seaweed production figures are higher than presented, e.g. more towards 80.000 ton of fresh seaweed in Brittany.
- Very useful to bring market information together and check with the sector whether it corresponds with current market.
- The more information you can gather on the market, the better. This is what makes producers enthusiastic to produce and sell more. More market information could also help to convince the end user using more biostimulants. Scientific evidence from the producer can be perceived as biased information. Collection and sharing of knowledge by a party like North Sea Farm Foundation could help

Regulatory:

- New European regulation should be in place by 2020 (with a new fertilizer regulation). Everyone needs to register his biostimulants by then, in order to validate the products to be able to sell the product.

Science & Technology:

- More information about the mode of action is required.
- Several companies and organizations are interested in the results of the test trials.

Other:

- Knowledge gap within the value chain is perceived as one of the bottlenecks.

The insights of the online seminar confirm the insights North Sea Farm Foundation has gathered in the previous deliverables. In addition companies and organizations shared the vision of North Sea Farm Foundation that different parts of the value chain make use of different sources of information and level of knowledge differs within the value chain of biostimulants and seaweed biostimulants.

The main question (*... it is remarkable that not everybody is using, trying and testing (seaweed)biostimulants yet?*) did not have one clear answer. Varying from a demand for more specific information about biostimulants, to more market information, to more information on test trials, mode of action and many others. In general, it could be concluded that the knowledge gap among stakeholder categories is confirmed. But also, that they agreed that it is remarkable that with the many advantages not everybody is using, trying and testing (seaweed)biostimulants yet. Perception among stakeholder categories differ about: environmental bottlenecks, market information and market development (although they agree on continuous growth), functioning and effects of biostimulants in local circumstances and a viable business case for seaweed biostimulants.

The participants of the stakeholder sessions (skype) were positive about this way to stay updated about the project bio4safe. As follow up, the North Sea Farm Foundation will keep the companies and organizations informed during the rest of the project starting by an invite for the stakeholders session in March 2019 in the Netherlands (the Hague).

### 3.4 Interactive stakeholder session

As part of the Bio4safe observer partner meeting in September 2018, the North Sea Farm Foundation, ISA Lille, PCS, & Pôle Légumes organized an interactive discussion with observer partners as well as other stakeholders attending this session. This chapter provides a short summary of the objectives of the session, applied method, results and is concluded with some brief conclusions.



Figure 6: Photo of observer partner meeting at Pôle Légumes during interactive stakeholder session

#### 3.4.1 Objectives stakeholder session

The stakeholder session had the following objectives:

1. To have a discussion with the participants on (seaweed)biostimulants in general,
2. To understand participants' level of knowledge on biostimulants, their properties and the market,
3. To exchange knowledge about the market, the price, the technical aspects, and any other relevant information,
4. To get a better understanding of the general sentiment on biostimulants, its market as well as their general potential for the future,
5. To get a better understanding of any differences between stakeholder groups in perception of the relevance of biostimulants, its markets as well as their general potential for the future,

The aim was to specifically get end-users, i.e. farmers, to attend this session as this stakeholder group had been missing in the previous stakeholder engagement activities as described in the chapters above. And although Pôle Légumes have tried to get as many farmers attending as possible, in the end none turned up. However, a number of biostimulant product representatives were present and they are regularly visiting the farmers with their products, so they were able to provide some insight into the perception of this stakeholder group during the session.

#### 3.4.2 Methodology during session

The methodology was specifically aimed at activating the participants during this session. The aim was to identify any differences of opinion between the various stakeholder groups. For this a positive setup was employed, in which slightly provocative statements were used to trigger useful discussions on biostimulants. This was done as follows:

- **Materiality board:** A board was introduced that would allow the participants to rank or rate each statement on two main axes

- **Horizontal:** from “not true” to “true”
- **Vertical:** from “I’m sure” to “I’m not sure”
- **Group formation:** All stakeholders were divided into groups corresponding to their stakeholder category as presented in chapter 2.

After the group formation, the individual statements were presented:

- **Explain:** Each statement was projected on the projector in English and in French. Every statement related to the earlier identified categories: economic, environmental, market acceptance, regulatory, science & technology or other.
- **Group consultation:** After presenting the statement each (stakeholder) group would discuss it to determine its position regarding the statement.
- **Statement on the board:** Then, each group would put its position regarding the statement on the materiality board with a post-it. As each group had its own color any differences in position would be easily identifiable. Then the group member would clarify its position on the materiality board to the participants.
- **Plenary discussion:** After all groups had put their position towards the statement on the board, then the differences (if any) were discussed in a short plenary discussion.

### 3.4.3 Stakeholder categories

As explained above, the participants were divided into four groups. One group per stakeholder group:

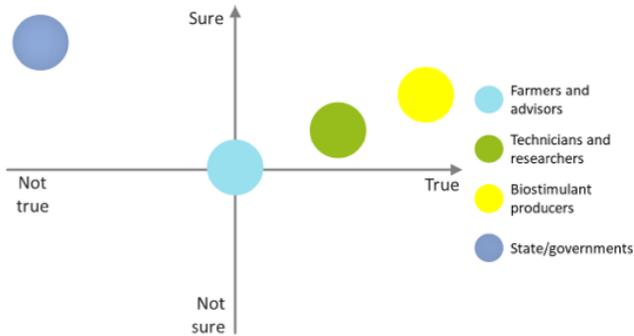
*Table 4: Stakeholder groups as used during observer meeting*

Farmers and advisors – Agriculteurs et conseillers
Technicians/researchers – Techniciens/chercheurs
Biostimulant producers – Producteurs de produits
State/governments - Administration

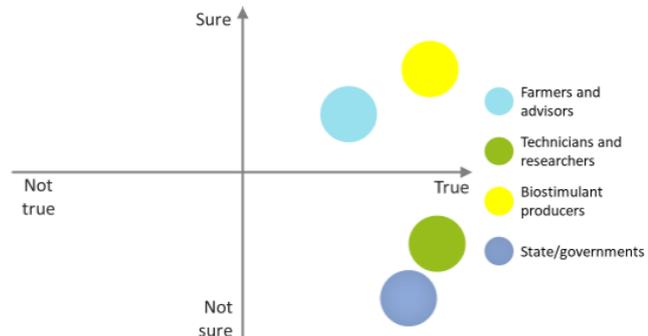
### 3.4.4 Statement results

In figure 7 an overview of the discussed statements and positioning of the stakeholder categories is presented. Followed by a brief explanation and interpretation of the matrices.

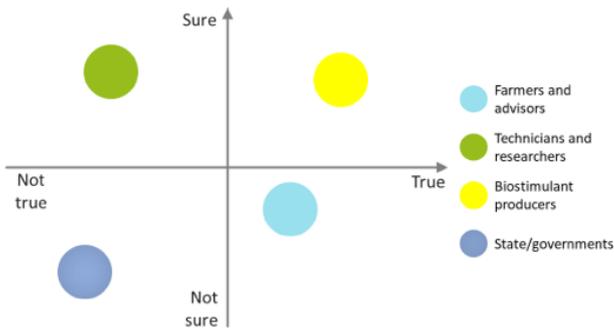
Statement 1: I've heard about biostimulants before and I know exactly how to use it



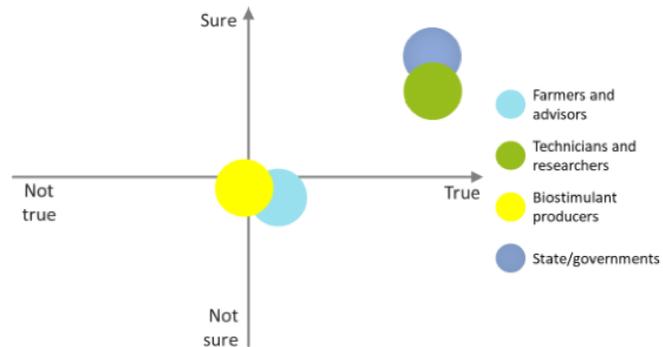
Statement 2: Biostimulants can help me to produce my crops in a sustainable way



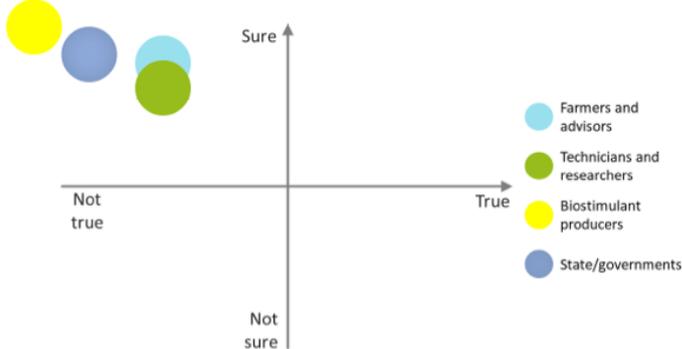
Statement 3: I can use biostimulants to get more money from my crops



Statement 4: Using biostimulants is expensive



Statement 5: There are clear regulations for using biostimulants



Statement 6: Having access to information on biostimulant efficiency and experiments could convince me to use biostimulants

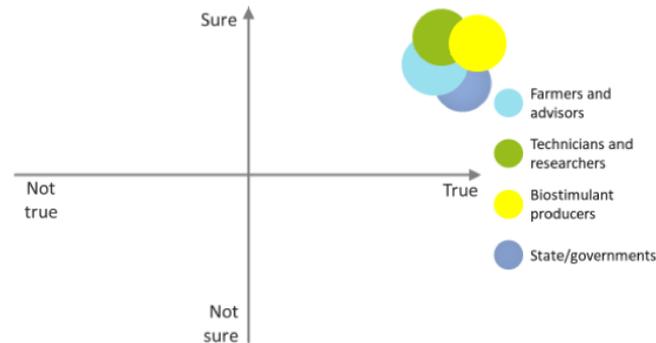


Figure 7: Overview of the position per statement of the 4 different stakeholder categories

#### 3.4.4.1 *Statement 1: I have heard about biostimulants before and I know exactly how to use it.*

Participants were all quite sure on their position regarding this statement and that is obvious as you would know if you ever heard about biostimulants or not. The point that caused the spread on the true-axis was that participants are to some various degrees uncertain on how to use the biostimulants correctly. There also appears to be some uncertainty with the biostimulant producers.

Government is standing out with their position on this statement. They are aware of what biostimulants are, as a product category, but they are sure that they don't know how to use them. This is quite interesting given also that this is an often-communicated concern of stakeholders on lack of or inhomogeneous regulations. To reaffirm this observation, it would be interesting to ask to government stakeholders whether they do know how to apply fertilizer and pesticides or having this knowledge in their network is sufficient.

#### 3.4.4.2 *Statement 2: Biostimulants can help me to produce my crops in a sustainable way.*

All participants think that this is true or should be true. However, there is some spread on whether they are sure about this. Of course, the biostimulant producers have to be most sure in this case but it is interesting to see that the researchers/technicians are apparently not fully convinced. This seems to align with identified barriers in the earlier reports (D1.1.2 & D1.1.3) were a requirement for more research and evidence was identified.

#### 3.4.4.3 *Statement 3: I can use biostimulants to get more money from my crops.*

The most interesting observation is the split between the biostimulant producers and researchers/technicians on this statement. The biostimulant producers are quite sure that biostimulants are adding more value to crops. There is of course a difference between the economic and the agronomic optimum so some of the positive effects may not materialise in economic value, hence their slight reservation.

On the other hand, the researchers/technicians are quite sceptical on this. They argue that the market value of a crop to a large extent is also determined by other than production costs (e.g. competition within the market etc.). This is a very interesting observation, clearly both stakeholder groups consider the agronomic benefits of using biostimulants (e.g. quality, reduced leaching, fewer chemicals, etc.) however it appears to be a challenge to monetise this extra value. It could be a observation worth considering the future roadmap: what can be we do to connect economic value to the beneficial effects of biostimulants.

#### 3.4.4.4 *Statement 4: Using biostimulants is expensive*

There appear to be to teams for this statement: 1) researchers/technicians & state/government and 2) Farmers/advisors & biostimulant producers. However, there are different arguments for each groups positioning on the materiality board. Basically, it comes down to two main points:

- Yes, because:

There are more, cheaper solutions available to come to the same and, even more important, predictable results (fertilizer/chemicals)

- Yes, unless:

You start considering other aspects as part of your cost assessment: Ecosystem impacts: if environmental cost of using more fertilizer, chemicals or water would be taken into account, then using costly biostimulants in order to reduce those inputs could prove the more economical option  
Insurance for abiotic stress conditions: if during the growth season unforeseen abiotic stress conditions occur, e.g. severe drought, then biostimulants may save a large part of your production. The use of biostimulants in that case is not expensive. If the abiotic stress condition does not occur, then the use of biostimulants had little or no effect and would thus be expensive.

The observation that could be made from the above is that framing and correct use (i.e. under the right circumstances) for biostimulant products is very important. Basically, this could be coarsely summarised managing expectations of the effects of biostimulants and prevention of over-promising.

#### *3.4.4.5 Statement 5: There are clear regulations for using biostimulants*

All four stakeholders are sharing the opinion that there are currently no clear regulations for the usage of biostimulants. In particular the biostimulant producers are experiencing this lack of clear legislation as a serious issue. The regulations differ per country and on the EU level there are no regulations present. Producers are not able to claim easily certain (technical) effects of their products. For example, in France producers have to register a product claim, which is both time consuming and expensive.

The feedback of the participants therefore clearly reaffirms this point, as was also clearly indicated in the earlier feedback from stakeholders in the chapters above.

#### *3.4.4.6 Statement 6: Having access to information on biostimulant efficiency and experiments could convince me to use biostimulants*

All the participating stakeholders are sure that having access to information on biostimulant efficiency and experiments will lead to more farmers starting to use biostimulants. The biostimulant producers are already distributing more elaborate information about their products. Together with statement 5, participants are fully aligned on this statement. Therefore, it seems appropriate that the Bio4safe is spending time and budget on dissemination of knowledge as part of the project, e.g. via the development of an app.

### 3.4.5 Conclusions interactive stakeholder session

An interactive session such as this one turned out to be very useful. Participants enjoyed and welcomed this form of providing feedback and, it resulted in very useful insights. It is therefore worth considering having more of this type of interactive sessions with stakeholders and observer partners.

What is very obvious from the above listed feedback is that participants fully agree on:

- Lack of and inhomogeneous regulations is a clear threat and market barrier
- The (seaweed) biostimulant market will benefit from more knowledge on function, mode of action and correct application

On other points, participants clearly indicate that there is an issue but there appears to be quite some discussion on how these issues are then to be addressed. These evolves around the following questions:

- Is it beneficial to use biostimulants for agriculture production
- Does it, or when does it make economic sense to use biostimulants

These questions are justified, as confirmed by participants. However, a correct answer, especially an answer that all can agree to, is difficult to formulate. Therefore, it seems appropriate to assume that these points are relevant to try to address in the subsequent roadmap activity: what can be done to get consensus on an adequate answer/approach for these important questions.

### 3.5 SWOT analysis of the seaweed based biostimulant market

In the earlier deliverable D1.1.2 the SWOT analysis for the seaweed based biostimulant market was introduced. This provided an overview based on the desk research as well as several stakeholder interviews that had been performed at that stage (mid 2018). The SWOT analysis made a distinction between the general/global market and the EU/2-seas region as the latter is the focus of the Bio4safe project.

Since then more stakeholders have been approach by means of

- In depth interviews (see chapter 3.1 and onwards)
- Online stakeholder session (see chapter 3.3)
- Interactive stakeholder session (see chapter 3.4)

Based on this new input this SWOT analysis will now be reviewed and updated. To this end chapter 3.5.1 presents the original SWOT analysis from D1.1.2., SWOT 1. Chapter 3.5.2 describes the new stakeholder feedback in terms of strengths, weaknesses, opportunities and threats and the results are presented in chapter 3.5.3 in an updated SWOT.

#### 3.5.1 SWOT 1 – based on desk research & initial stakeholder interviews

As indicated above, in the report *D1.1.2: Seaweed Biostimulant Market* the below SWOT overview was included:

General & global	<b>Strengths (internal – positive)</b> <ul style="list-style-type: none"> <li>• New <b>applications</b> for biostimulants</li> <li>• Increased <b>demand</b> for (seaweed based) biostimulants</li> </ul>	<b>Weaknesses (internal – negative)</b> <ul style="list-style-type: none"> <li>• Knowledge about <b>mode of action</b> is limited</li> <li>• Regulation about requirements labelling is not adequate</li> <li>• Proper application of biostimulants is prone to specific <b>soil conditions</b> of clients</li> <li>• Low prices of seaweeds with lower quality</li> </ul>
	<b>European &amp; 2 Seas Region</b> <ul style="list-style-type: none"> <li>• <b>High quality seaweeds</b></li> <li>• <b>Sustainable production</b> of seaweeds</li> <li>• Improved <b>market</b> knowledge for biostimulant <b>producers</b></li> <li>• Improved <b>product</b> knowledge for <b>providers</b> and <b>clients</b></li> </ul>	
European & 2 Seas Region	<b>Opportunities (external – positive)</b> <ul style="list-style-type: none"> <li>• <b>Growing</b> market demand</li> <li>• Climate change and related <b>abiotic stress</b></li> <li>• Decrease in the (demand to) use agrochemicals</li> <li>• Possible <b>more seaweed species</b> can be utilized for biostimulant production</li> </ul>	<b>Threats (external – negative)</b> <ul style="list-style-type: none"> <li>• Market opportunism, products with <b>false claims</b> are entering the market</li> <li>• <b>Legislation</b> is not consistent, different definitions and legislation of biostimulants per country</li> </ul>
	<ul style="list-style-type: none"> <li>• More extreme dry and wet periods, increase of abiotic stress, increased demand biostimulants</li> <li>• Development of <b>tools</b> to show return on investments for clients</li> </ul>	

Figure 8: SWOT analysis of seaweed biostimulant market (General & Global and European and 2 Seas Region level), based on Interviews (D1.1.2)

#### 3.5.2 Review of the Strengths compared to stakeholder feedback

Stakeholders clearly state that biostimulants, irrespective of their composition, have a clear added value in agricultural production. When looking at the interviews, then the observation is made that little distinctions is made for seaweed biostimulants. However, when talking to seaweed biostimulant producers then they primarily provide feedback from the perspective of their own products. We will therefore assume that these responses are relevant for the seaweed biostimulant SWOT analysis as well as to the more general biostimulant market.

The seaweed biostimulant producers indicate that one of the strengths of seaweed biostimulants comes from resistance to drought and heat stress, especially when they are produced from tidal seaweed species. And although not specifically mentioned as such, we have observed that

Ascophyllum Nodosum is such a tidal species and it is abundantly available in the EU/2-seas region and is being produced (although by means of wild-harvest) in a sustainable fashion. Sustainable availability of the tidal seaweed species Ascophyllum Nodosum is therefore listed as a specific strength.

Other strengths have not been observed during the interviews. That gives the impression that other potential strengths are not top of mind with the stakeholders today or not yet known. On the other hand, this was also not a specific question to them in the interviews. This is something that can be considered when developing the roadmap next year, to ask feedback from stakeholders on the SWOT.

### 3.5.3 Review of the **Weaknesses** compared to stakeholder feedback

The approached stakeholders are quite forward with weaknesses of the biostimulant market. There is little discrimination here between general and seaweed biostimulants. However, as explained above where this concerns seaweed biostimulant producers have assumed that these count as feedback on the seaweed biostimulant market. The main point of weakness that is presented in many forms in the interviews and the other sessions could be summarised as “lack of predictable results with biostimulants”. A number of causes are presented by the stakeholders but the ones that stand out are:

- Lack of knowledge of mode of action of the biostimulant products/feedstock
- Lack of knowledge on correct application method for specific crops/soil
- Lack of knowledge on correct application method for specific circumstances (type of stress, stress relief or stress mitigation)

And these causes are present in the full value chain: from seaweed producer to end-users and regulators. On this point no specific distinction is observed for the EU/2seas region compared to the global market.

The weakness that is mentioned a few times is the lack of crop growth stress in the 2-seas region. There is limited heat and drought stress in this area thus little need for protection against it during crop production. Biostimulants therefore seem to add limited value to the agricultural industry in this region compared to other regions that do experience these forms of stress.

### 3.5.4 Review of the **Opportunities** compared to stakeholder feedback

The observed opportunities as mentioned by the stakeholders usually were mentioned in context of benefits of (seaweed) biostimulants as well as market potential. These opportunities can be roughly summarised into three main points:

- Climate change driving abiotic stress events, leading to an increased demand for biostimulants
- Primarily legislative requirement for more effective use of nutrients from a sustainability and/or economical point of view (not so much in the EU, more in Asia/China)
- Consumer preference for safer and more environmentally friendly produced food (fewer chemicals), this is observed globally

### 3.5.5 Review of the **Threats** compared to stakeholder feedback

Where in the above section it has been described that it was sometimes difficult to distinct feedback from stakeholders on SWOT-aspects, for threats this is clearly not the case. Almost all stakeholder, irrespective of the category they belong to, mention regulations/legislations as a major issue. This is certainly also a dominant theme from all (seaweed) biostimulant producers and this is

understandable as they are the parties that have to get the products admitted in the various markets. This point can be summarised as follows: there are sometimes no distinct regulations, no regulations at all or different regulations between the various markets. Particularly different rules within the EU countries has been mentioned very often by the biostimulant producers.

Another threat that is obvious from the stakeholders' feedback is predictability on the return of investment from using biostimulants (will it work, what will it cost, what will be my (increased) revenues/reduced losses). This point has also been listed as a weakness above. However, many stakeholders mention this point as an issue, for almost all stakeholder categories (see also the chapter on the interactive stakeholder session). The implicit message that is given by the stakeholders could be summarised as follows (paraphrased): if the biostimulant products do not deliver (sufficiently) on their promise, then the market will start to dismiss them as a suitable solution and market growth may not materialise as a consequence. This is therefore the reason to also include this point as a threat. For the 2-seas region this is particularly relevant as this region suffers less from stress conditions (at least heat and drought), therefore farmers using biostimulants and seeing little to no results is a higher risk for this reason.

### 3.5.6 SWOT 2 – updated after stakeholder consultation

The above input has been added to the SWOT1 overview to produce the below SWOT 2 overview, the additions are clearly indicated by means of red text:

General & global	<b>Strengths (internal – positive)</b> <ul style="list-style-type: none"> <li>New <b>applications</b> for biostimulants</li> <li>Increased <b>demand</b> for (seaweed based) biostimulants</li> <li><b>Tidal seaweed species very useful for agriculture production in areas under high heat and drought stress</b></li> </ul>	<b>Weaknesses (internal – negative)</b> <ul style="list-style-type: none"> <li>Knowledge about <b>mode of action</b> is limited</li> <li>Regulation about requirements labelling is not adequate</li> <li>Proper application of biostimulants is prone to specific <b>soil conditions, crops and circumstances</b> of clients</li> <li>Low prices of seaweeds with lower quality</li> </ul>
	European & 2-SeaRegion <ul style="list-style-type: none"> <li><b>High quality seaweeds</b></li> <li><b>Sustainable production</b> of seaweeds</li> <li>Improved <b>market</b> knowledge for biostimulant <b>producers</b></li> <li>Improved <b>product</b> knowledge for <b>providers</b> and <b>clients</b></li> <li><b>(strength today) Reliable and sustainable availability of tidal seaweed species Ascophyllum Nodosum (EU region)</b></li> </ul>	
General & global	<b>Opportunities (external – positive)</b> <ul style="list-style-type: none"> <li><b>Growing</b> market demand</li> <li>Climate change and related <b>abiotic stress</b></li> <li>Decrease in the (demand to) use agrochemicals</li> <li>Possible <b>more seaweed species</b> can be utilized for biostimulant production</li> <li><b>Legislative requirement for more effective use of nutrients</b></li> </ul>	<b>Threats (external – negative)</b> <ul style="list-style-type: none"> <li>Market opportunism, products with <b>false claims</b> are entering the market</li> <li><b>Legislation</b> is not consistent, different definitions and legislation of biostimulants per country</li> <li><b>Lack of trust in the biostimulant promise by end-users</b></li> </ul>
	European & 2-SeaRegion <ul style="list-style-type: none"> <li>More extreme dry and wet periods, increase of abiotic stress, increased demand biostimulants</li> <li>Development of <b>tools</b> to show return on investments for clients</li> </ul>	

Figure 9: Updated SWOT analysis of seaweed biostimulant market (General & Global and European and 2 Seas Region level), updated after stakeholder consultation.

## 4 Conclusions, recommendation & next steps

### 4.1 Introduction

As part of the stakeholder identification and assessment activity, the following question was addressed: What are the relevant stakeholders and how to engage them in a positive way? Executing this activity has resulted in an overview of relevant stakeholders we have engaged with in various ways; interviews, online stakeholder sessions and face-to-face interactive stakeholder session. Activity 1.1.4. resulted in an updated version of the SWOT analysis of the seaweed biostimulant market. Many stakeholders, from all categories, have indicated that they welcomed the Bio4safe project and its objective of improving developments in the seaweed biostimulant market.

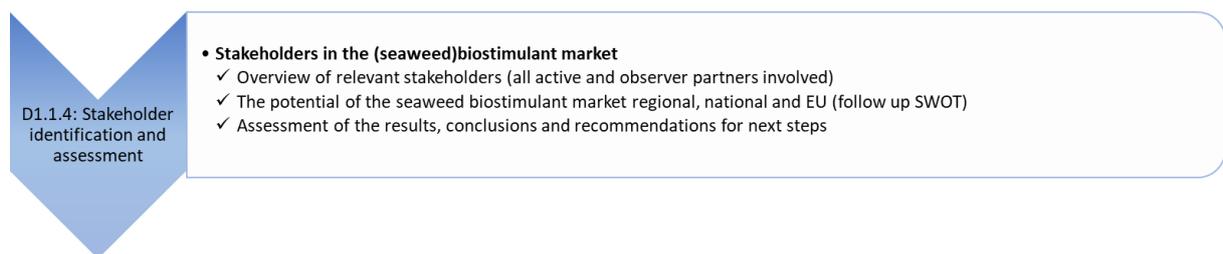


Figure 10: Objective of Deliverable 1.1.4 (This report)

### 4.2 Overview of the relevant stakeholders

A significant number have been approached (57 stakeholders), contacted and interviewed. All of them are relevant stakeholders. Specific stakeholder categories could be included more in next steps, such categories include: traders, agents, retail/wholesale, end-users and government. This inclusion would serve development of a roadmap and strengthen strategies to improve seaweed biostimulant market development.

### 4.3 Potential of the biostimulant market – SWOT

An update of the SWOT analysis on the potential of the seaweed biostimulant market has been performed. To a large extent the points of the initial SWOT have been confirmed by interviewed stakeholders. However, not having asked specific feedback from the stakeholders on the SWOT results required a lot of interpretation during the evaluation. The SWOT analysis is valuable input for the future roadmap, so it is recommended to follow this up in the next phase, e.g. integrate this with the stakeholder workshop in March 2019.

### 4.4 Assessment of results, conclusion and recommendations

#### 4.4.1 Conclusions

The results of this activity have been above of what was expected at the start. Significant number of stakeholders have been approached and were interviewed to provide insightful feedback. The reason it is considered above what was expected is the enthusiasm and commitment that was observed during these engagement activities. Many stakeholders were very positive that there was an initiative that tried to help companies in the biostimulant industry to identify their issues and to come-up with solutions for the future. This commitment is a valuable asset for the remainder of this project and in particular the activities in this work package. It will enable to develop roadmaps and business cases that are acceptable and usable for the biostimulant industry after completion of the Bio4safe project.

#### 4.4.2 Recommendations

Based on the above conclusions we have come to the following recommendations for future work in increasing the seaweed biostimulant market in the 2 Seas Region.

With the overall objective to work towards a seaweed based biostimulant market that is more sustainable, scalable and more resilient:

- More value chain collaboration: Stakeholders should connect, share knowledge, increase awareness of their interdependency (role for Bio4safe project). Stakeholders could join forces and cooperate in the development of the roadmap. “Collaboration is the new way of competing.” In this way the sector will become more resilient and better able to respond to its always changing environment.
- The biostimulant sector in Europe should invest in lobby to develop unified legislation related to biostimulants, as it is an important barrier/threat for current and future growth.
- It would be valuable to monetise the ecosystem services of the application of seaweed biostimulants, e.g.. climate resilience, nutrient efficiency and fewer chemicals & fertilizer.
- With the current estimated growth of the biostimulant sector it will be essential to work towards an increased level of resilience of the (local) supply chain of seaweeds that can be used for the production of seaweed based biostimulants. See also the insight from deliverable 1.1.2: combining of wild harvest with cultivation, diversification of seaweed species, resilient supply chain, improve breeding technologies.
- Scientific evidence is required to strengthen the knowledge base about functionalities and mode of action of seaweed biostimulants. Here lies a role for the science-based stakeholder category.
- The governments should work towards clear regulations that will enhance a sustainable growth of the (seaweed)biostimulant market in the 2 Seas Region and Europe.

#### 4.4.3 Learnings for Bio4safe program and WP1

Learnings from results of deliverable 1.1.4. for North Sea Farm for future activities is to:

- Work towards more inclusive stakeholder engagement activities (end-users, traders, government, etc.)
- Develop increased attention on ways how first steps in market developments can be made. Here the objective would be to support market growth of seaweed biostimulants.
- Develop constructive relations between value chain stakeholders (industrial organizations), regulatory and legislative institutions and governments.
- Gain better insights and develop inclusive or specific strategies in a roadmap that serves the 2-seas region seaweed biostimulant market development.
- Realize more integral cooperation and knowledge sharing on research subjects that are part of the Bio4safe program. E.g. ecosystem services / ecological impact, mode of action of seaweed biostimulants and opportunities for diversification of seaweed species to form raw material input for biostimulant producers.

#### 4.4.4 Next steps

WP1.1: Determination of the existing market of (seaweed)biostimulant market is hereby completed (figure 11). The start of the next phase is an interactive stakeholder session in March 2019.

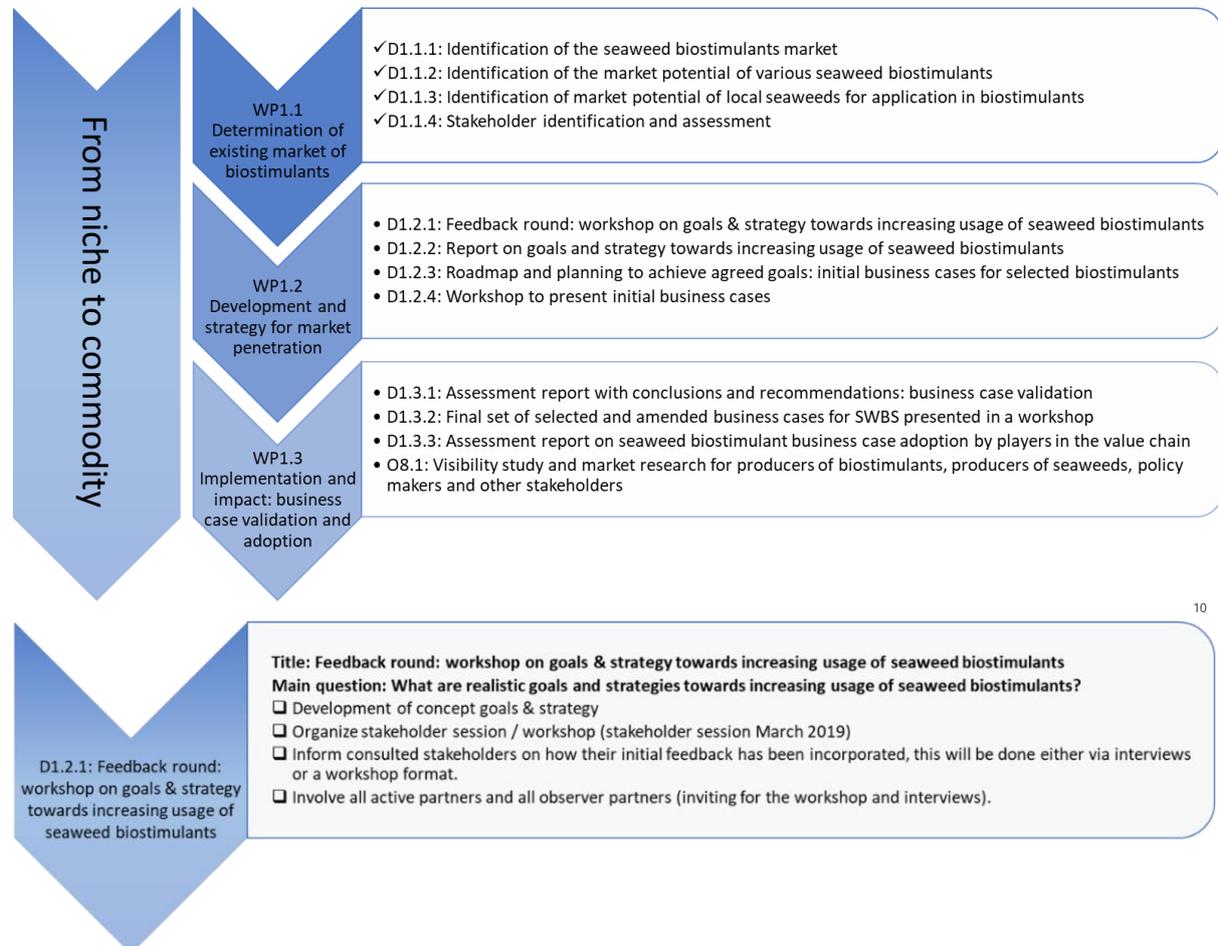


Figure 11: Setup of work package 1 and the objective of Deliverable 1.2.1.

In the next phase of this work package North Sea Farm foundations works in close collaboration with the stakeholder categories towards the following goals and strategy.

#### Goals and strategy to:

- Increase the use of seaweeds that can be commercially and sustainably cultivated in the 2 Seas Region in the application of seaweed biostimulants.
- Increase the number of seaweed species and varieties (within a species) that can be used to produce seaweed biostimulants. The focus should herewith be on seaweeds that can be commercially and sustainably cultivated in the 2 seas region.
- Increase the use of existing seaweed biostimulants.
- Increase the application range of existing seaweed biostimulants.

**A roadmap will be developed towards achieving these goals.** This roadmap will include the development of various business cases for various types of existing seaweed biostimulants. It will include the potential for new supply chain alternatives making selected seaweed biostimulants more effective, more sustainable and/or reduce production costs.

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## Attachment 1: Background information document

# Interreg 2 Seas - BIO4SAFE



The Bio4safe project aims to significantly reduce water and fertilizer input in horticulture by making use of commercially available biostimulants and innovative plant sensors. The project, funded by the 2 Seas Interreg Programme is coordinated by the Ornamental Plant Research Centre (PCS, Belgium) and started the 1st of August 2017.

### Description of the project

The 2 Seas Region (coastal region across the southern North Sea and The Canal) is known for its intensive horticulture which demands significant amounts of water and nutrients. Several EU directives aim to protect water quality by preventing N and P leaching and anticipate to water shortage. Besides these legislative environmental pressures, economic reasons force growers to reduce water and nutrient input. This project aims to improve water and fertilizer use efficiency of plants by using biostimulants (seaweed extracts and beneficial microbes). The combination of biostimulants and innovative plant sensors will result in a reduced input of water and fertilizers by 20% respectively 10%. The project includes demonstration trials on different horticultural crops (lettuce, tomato, hydrangea, strawberry, tulips, chrysanthemum, raspberry) in the four countries to promote the use of biostimulants to diverse target groups. Further, the potential of using biostimulants based on seaweeds in horticulture will be analysed, in order to create economic opportunities for seaweed producers in the 2 Seas Region.

Today, every Member State has its own regulation on commercialising biostimulants. By 2020, the EU will implement a common European legal framework for the trade of biostimulants, but it remains unclear how positive effects of biostimulants on water and nutrient use efficiency of plants should be quantified. Therefore, with this project, we aim to create a standardised protocol that can be used by accredited laboratories to objectively evaluate the impact of biostimulants on water and fertilizer use efficiency of plants.

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), Pôle Légumes Region North (France), NIAB (UK) and Dove Associates (UK) and Ghent University (Belgium). The Bio4safe-project runs for a period of four years and is funded by Europe via the Interreg 2 Seas Programme and the Province East Flanders, Belgium.

## Objectives

These are the objectives of BIO4SAFE:

- To reduce water input in horticultural crops by 20%
- To reduce fertilizer input in horticultural crops by 10%
- To develop a protocol for policy makers to measure the impact of biostimulants on fertilizer and water use efficiency of plants
- To elaborate a market study to calculate the economic potential of seaweed based biostimulants for seaweed producing companies in the region



## Role of the North Sea Farm Foundation

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. To achieve this, the existing market of biostimulants will be determined for every country of the 2 seas region (2SR), EU wide and globally. In order to show the economic potential of seaweed based biostimulants for the seaweed producing companies in the region.

Contactperson:

Marlies Draisma, Stichting Noordzeeboerderij, [marlies@noordzeeboerderij.nl](mailto:marlies@noordzeeboerderij.nl), +316 11 77 55 34

## Attachment 2: Longlist interview questions

Question category	Question	BS-producer	BS-user	Seaweed producer	Other
0_General information	Hi, my name is [XXXX] from North Sea farm foundation. We are a non-profit organization and we're currently involved in the Bio4safe project. This is a non-commercial project, so we're not trying to sell you anything, and its aim is to improve the efficiency in agri- & horticulture with the help of biostimulants and in particular with biostimulants made from seaweed. And we are contacting you to see if you have heard about these biostimulants and to discuss if this could be interesting for you as well.	X	X	X	X
0_General information	Am I speaking to [XXXX] from [COMPANY] and have I contacted the right department for this?	X	X	X	X
0_General information	What is your role/function in the company/organization?	X	X	X	X
01_Information about interviewee	What is your name	X	X	X	X
01_Information about interviewee	What is your function	X	X	X	X
01_Information about interviewee	Are you male or female?		X	X	
01_Information about interviewee	Could I ask you for your age?		X	X	
01_Information about interviewee	And is your job/company a family tradition or did you start if yourself?		X		
02_Do you know of biostimulants	Have you ever hear about biostimulants and do you know what they are?		X		
02_Do you know of biostimulants	Why do you or don't you use biostimulants?		X		
03_Information about interviewee's company/organization	I'm first going to ask you a few questions about your organization. First, I need to get a general understanding of what you're doing in order to understand what questions I need to ask. But don't worry, if you don't like the questions or are not able/willing to provide information just state that the "information is confidential" and I'll skip to the next point..	X	X	X	X
03_Information about interviewee's company/organization	Is your company privately owned or part of a larger organization?				
03_Information about interviewee's company/organization	Approximately how many people are working in your company		X		
03_Information about interviewee's company/organization	Do you consider yourself to be a small, medium or large company in you sector?		X		
03_Information about interviewee's company/organization	Is it possible/willing to indicate how much product you produce on a yearly basis?		X		
03_Information about interviewee's company/organization	Are you a member of an industry/sector organization				
04_ what can biostimulants do for you	What kind of crops do you produce?		X		
04_ what can biostimulants do for you	Do you have any issues with water shortage or restrictions on fertilizer		X		
04_ what can biostimulants do for you	If you have a biostimulant product that could help with reducing water or fertilizer, would that be interesting for all of your products?		X		
04_ what can biostimulants do for you	Does that apply to all of your products?		X		
04_ what can biostimulants do for you	Do you believe that biostimulants could have such a positive effect on growth, water and fertilizer efficiency?		X		
04_ what can biostimulants do for you	Would you be interested in producing and/or supplying seaweeds for biostimulants?			X	
05_ what biostimulants can do for you	in case of producing seaweeds specifically for biostimulants, what would be a minimum price for you to make it viable: €/kg-w and €/kg-dry			X	

05_ what biostimulants can do for you	Would you be interested in supplying your waste stream seaweeds for biostimulants?			X	
05_ what biostimulants can do for you	in case of waste stream, what would be a minimum price for you to make it viable: €/kg-w and €/kg-dry			X	
06_Information company's core activities	In what regions are you active/do you produce you products	X	X	X	
06_Information company's core activities	In what regions do you sell/distribute your biostimulant products	X			
06_Information company's core activities	How do you sell/distribute your products, only B2B or also directly to individual consumers	X		X	
06_Information company's core activities	What part of you biostimulant products are based on seaweed	X			
06_Information company's core activities	To whom do you sell your biostimulant products: agriculture (row crops), (greenhouse) horticulture, fruit orchards, ornamentals	X			
06_Information company's core activities	Is this the same for seaweed biostimulants?	X			
06_Information company's core activities	To whom do you sell your seaweeds to: food producers, feed producers, biostimulant producers, farmers			X	
06_Information company's core activities	In what form do you sell the seaweed (dried, fresh(wet) or as a liquid)			X	
06_Information company's core activities	Has the seaweed been pre-processed or extracted before selling it?			X	
06_Information company's core activities	In what regions are you active/do you produce you products			X	
06_Information company's core activities	How do you sell/distribute your products, only B2B or also directly to individual consumers			X	
05_Information company's core activities	To whom do you sell your seaweeds to: food producers, feed producers, biostimulant producers, farmers			X	
05_Information company's core activities	In what form do you sell the seaweed (dried, fresh(wet) or as a liquid)			X	
05_Information company's core activities	Has the seaweed been pre-processed or extracted before selling it?			X	
06_Biostimulant market information	How is the market for biostimulants doing, is it declining, stable or growing	X			
06_Biostimulant market information	Is this the same for seaweed biostimulants?	X			
06_Biostimulant market information	What do you think is the potential of biostimulants	X			
06_Biostimulant market information	Is this the same for seaweed biostimulants?	X			
06_Biostimulant market information	What are the biggest challenges with (seaweed) biostimulants				
07_Production of biostimulants	Is your primary focus production of biostimulants?	X			
07_Production of biostimulants	Do you produce seaweed biostimulants?				
07_Production of biostimulants	What type of seaweed biostimulants do you produce?	X			
07_Production of biostimulants	Do you see challenges in using seaweed biostimulants in your production?	X			
07_Production of biostimulants	Is there enough high quality seaweed available for you production?	X			
07_Production of biostimulants	For which industries do you produce?	X			
07_Production of biostimulants	Is the seaweed you use affordable?	X			

07_Production of biostimulants	Where do you get your seaweeds from? (EU, imported, directly from farmers, etc.)	X			
07_Production of biostimulants	How do you get you raw materials for seaweed biostimulants and in what form (dried, liquified or fresh)	X			
07_Production of biostimulants	Is it easy to get the raw materials for seaweed biostimulants and can you get enough of it?	X			
07_Production of biostimulants	Would you prefer another source or different form of the raw material	X			
08_Seaweed market information	How is the market for seaweeds doing, is it declining, stable or growing			X	
08_Seaweed market information	Is this the same for all of your seaweeds?			X	
08_Seaweed market information	What do you think is the potential of the seaweed market in Europe			X	
08_Seaweed market information	What are the biggest challenges for the seaweed market			X	
08_Seaweed market information	What are the biggest challenges for the seaweed supply			X	
09_Seaweed production	What part of your seaweed production is from cultivation and what part is from wild-harvest?			X	
09_Seaweed production	What type of seaweeds do you produce			X	
09_Seaweed production	What seaweeds do you cultivate and where (location) do you produce them			X	
09_Seaweed production	What seaweeds do you obtain from wild-harvest and where (location) do you produce them			X	
09_Seaweed production	Do you (pre-)process your seaweed yourself? And if yes, do you have a waste stream?			X	
10_What are you doing with biostimulants?	For what application are you using biostimulants		X		
10_What are you doing with biostimulants?	For what products are you using biostimulants		X		
10_What are you doing with biostimulants?	Are these all of your products?		X		
10_What are you doing with biostimulants?	What type of biostimulant are you using?		X		
10_What are you doing with biostimulants?	Is it clear to you how you have to apply it?		X		
10_What are you doing with biostimulants?	Do see any benefits in your products of using biostimulants		X		
10_What are you doing with biostimulants?	What could be improved on the product?		X		
10_What are you doing with biostimulants?	Have you ever used a seaweed based biostimulant		X		
10_What are you doing with biostimulants?	Would you be interested to try that?		X		
10_What are you doing with biostimulants?	What is your expectation of this, do you think it will work better than other biostimulants?		X		
11_Closing statement	If you want to be further involved and are interested in the market and further developments... in 2019 we will organize an conference with several stakeholders from the seaweed and biostimulant sector. We can sent you an invite and keep you updated.				
12_InDepth information	What is the main driver/business of your company / organization?	X	X	X	X
12_InDepth information	What makes your company special? What is unique?	X	X	X	X