Deliverable No. 2.3

Project acronym:

AquaVitae

Project title:

New species, processes and products contributing to increased production and improved sustainability in emerging low trophic, and existing low and high trophic aquaculture value chains in the Atlantic

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Deliverable D2.3

Report on second developmental phase in case studies WP2, with user acceptance testing feedback

23/08/2022

Executive Summary

This deliverable (D2.3) summarises the case study (CS) work of the second development loop that are contained in Work Package 2 (WP2; grow-out) of the AquaVitae Project, and it follows on from D2.2 in which the research and innovation (R&I) from the first development loop was presented. These CS's report on the progress that has been made between M19-M36 of the project, and the development of a new low trophic species (LTS), products and processes in the grow-out phase (i.e., post-hatchery to harvest) of aquaculture production. This deliverable also includes a report-back on the user acceptance feedback related to this work. The CS's that have contributed to these tasks of WP2 include:

- New macro-algae species (CS1);
- Offshore macro-algae culture (CS2);
- Land-based integrated multitrophic aquaculture (IMTA; CS3);
- Sea based IMTA (CS4);
- Biofloc IMTA (CS5);
- Sea urchin roe enhancement (CS6);
- Native oyster production (CS8);
- Offshore production of blue mussel (CS9);
- Freshwater finfish in Brazil (CS10);
- Marine finfish in Brazil (CS11);
- By-products from LTS aquaculture (CS12); and
- Algae into LTS aquafeeds (CS13).

The outcome of the work carried out in the CSs' linked to WP2 will contribute to the development of all of the aquaculture value chains (VC) in AquaVitae: macroalgae culture (VC1); IMTA (VC2); echinoderm culture (VC3); shellfish culture (VC4); and finfish culture (VC5). The focus of the innovation and research here is on developing aquaculture grow-out technology with a circular reuse of products and a reduction in the industry's environmental impact.

All detailed planning, scientific, technical and innovation information for each CS that advanced the completion of WP2 tasks were presented previously (Annex 1 of Deliverable D1.1; Case Study specific work plans) and the details of this progress to month-36 are presented in Annex 1 of Deliverable D1.4 (Detailed Case Study Reports, M36). Annex 1 of Deliverable D1.4 has not been duplicated here, so this deliverable should be read in in conjunction with D1.4. That annex specifically contains an abstract/summary for each CS, and these M36 Case Study Reports detail the methods used and results obtained for all case study tasks. Where applicable, the results are discussed in the CS reports and in a final section, the progress, deviations, problems/solutions and planned future outlooks for next reporting period are provided (Annex 1 of Deliverable D1.4).

Fifty-seven project outcomes are presented as part of this WP, in the form of reports, processes and products. These are produced by 12 of the 13 CS that make up AquaVitae (AV). A description of the main outcomes (including the requirement specification of each), the completeness of these tasks, and their exploitation potential have been identified and presented here. This was largely made possible through the creation of a reporting system developed jointly by WP1, 2 and 3, and the production of a database that made this, and other task details, readily available.

The percentage completeness of the tasks that report to WP2 ranged from 0% to 100% complete. Most CS tasks are on track with average completeness of 71% across all tasks that report to WP2, which is largely in line with the progress that might be expected since we are in month-36 of the 54-month project. Tasks that show no progress were either not scheduled to start before month-36 or (in one

instance) it was not possible to begin a task due to technical issues, which have subsequently been resolved. All tasks will be completed before the end of the project.

A second stakeholder feedback survey was developed and implemented by WP1, 2 and 3 in this reporting period, highlighting the joint-planning and cooperation among the leadership of these work packages. An overall analysis of these surveys is presented in Annex 2 and Annex 3: One-hundred-fifty-one stakeholders participated in the survey and together, this resulted in 223 surveys across work that reports to WP1, 2 and 3. Case study survey details are presented in Annex 4. Sixty-six of the respondents focused on outputs that report to WP2 (Table 11; Figures 1 – 9). These stakeholders were primarily from research (47%) and from industry (37%), and they largely confirmed that the case study outputs that report to WP2 are relevant to stakeholders. Close to 90% of respondents felt that WP2 outcomes are likely to positively impact economic and environmental sustainability of aquaculture, and 62% thought that the aquaculture industry would adopt the work within the next five years. The survey will continue for the duration of the AquaVitae project. Industry stakeholders completed 98 surveys, and their response (presented in Annex 5, which is limited to industry stakeholder feedback only) was similar to that of the overall survey of WP1, 2 and 3 results. An increased effort will be made to involve stakeholders from outside of research, development, and education, particularly increasing the number of industry, NGO, investment and government respondents. The outcome of the survey will be used by case study and case study task leaders in the final stages of their research and in developing exploitation strategies to ensure that the research and innovation developed in this project will impact the aquaculture industry.

The main users of this deliverable will be the leaders of WP1-3, WP5-7 scientists, WP9 participants and the CS leaders. The next, and final phase of the project (M36-M54), will see the CS task leader completing their research and development, and further developing exploitation plans for outcomes that have been identified with this potential.

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A reader's guide to accessing the information presented in Deliverables D1.4, D2.3 and D3.3

Work Packages (WP) 1, 2 and 3 developed a coordinated reporting system for all the case study (CS) that contribute to these work package tasks. They also developed a single stakeholder acceptance feedback survey. Due to the close synergy between these work packages, the case study progress and user acceptance feedback are relevant to WP1,2 and 3. To reduce repetition, the details of the progress and the survey are not repeated in deliverables D1.4, D2.3 and D3.3, but reference to these details is made between the deliverables.

This is how each of these deliverables is structured and where the progress details and stakeholder survey information can be found:

	D1.4	D2.3	D3.3
• Progress report method	✓	✓	✓
• M19-M36 progress for each WP	✓	✓	✓
• CS specific progress	Annex 1	-	-
• User acceptance survey method	✓	✓	✓
• Links to the online surveys	-	Annex 1	-
• Survey overview - commentary	-	✓	-
• Survey overview - graphics	-	Annex 2&3	-
• Survey WP specific - commentary	✓	✓	✓
• Survey WP specific - graphics	✓	✓	✓
• Survey CS specific - graphics	-	Annex 4	-
• Survey limited to industry respondents	-	Annex 5	-

1. Introduction

i. Synopsis AquaVitae

AquaVitae is the name of this research and innovation project, funded by the EU's Horizon 2020 programme. The project started in June 2019 and is scheduled to be finished within 48 months (extended by six months to 54-month due to COVID). The consortium includes a total of 35 members, from 16 countries. All partners border the Atlantic Ocean; Brazil, South Africa and Namibia in the south, and Europe and North America in the North. The project's overall aim is to introduce new low trophic species (LTS), products and processes to marine aquaculture value chains across the Atlantic.

ii. Scope and motivation of Deliverable D2.3

Work Package 2 (WP2) contributes to the overall aim of AquaVitae (AV) by developing research/innovation in the grow-out of low trophic species (LTS) in aquaculture. The research and innovation reported here feeds from progress made in WP1 (hatchery production) and delivers to WP3 (post-harvest technology development) (Figure 1).

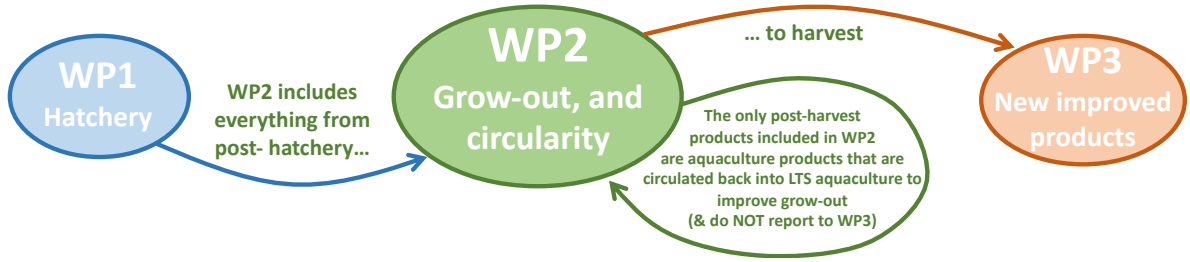


Figure 1: Work Package 2 (WP2) will report on research and innovation aimed at aquaculture grow out (including product that is circulated back into the production of low trophic species). WP2 will feed from work developed for hatchery production (WP1) and deliver reports, process and products that will contribute to the development of post-harvest product development (WP3).

Together, WP1, 2 and 3 contribute to AV's overall goal of introducing new low trophic species (LTS), products and processes into various aquaculture value chains across the Atlantic, emphasising circular reuse of products and reduced environmental impact. This report will demonstrate the synergies developed by WP1, 2 and 3 in the first reporting period (D2.2) and that have continued over the course of the last 36-months (including the second development loop), making it possible for WP2 to contribute to AV's overall aim. As such, the focus of D2.3 remains to:

1. identify and highlight the main outcomes of all the AV case studies (CS) that will contribute to the tasks of WP2, with particular emphasis on their requirement specifications (i.e., aspects of the work that will contribute to the innovative qualities of the project outcomes) and exploitation potential (i.e., the contribution they will ultimately make to the aquaculture industry and society);
2. to demonstrate and comment on the progress of these CS's;
3. to show how WP1, 2 and 3 have worked together to develop an efficient reporting system that will feed into the AV project and make the innovative outcomes of the project (and in this instance, particularly those of WP2) easily accessible to the other work packages (i.e., WP4 to WP10) that make up the AV project; and
4. to present stakeholder acceptance feedback on the progress that has been made to date.

The progress that has been made in the research and innovation that is being reported in D2.3 is drawn from the CS's that contribute to WP2. This post-hatchery to harvest research and innovation will focus on improved aquaculture production performance and efficiency and value-adding through sustainable, circular processes that aim to work towards zero waste and reduced environmental impact in aquaculture production. The report also presents an analysis on how stakeholders view the AquaVitae work during the second loop of the development of this work; and this will contribute towards the project's focus on the exploitation of the work and ensuring that it will impact the aquaculture industry around the Atlantic Ocean.

2. Methodology

i. Progress Report

Note: The approach and method adopted in WP2 is the same as that presented in Deliverables D1.4 and D3.3.

Following the spiral model of innovation methodology (Figure 1 of D1.1), CS leaders have completed their second innovation loop and reached a second, in some cases, final prototype stage. Here, a prototype translates to any sort of output from a CS, may that be a new or improved product (including new species & technical hardware), process or a report.

To gather the necessary information for this deliverable, three tools were used:

- firstly, the completed Case Study reports that used the "*CS Report Template"* (Appendix 1, D1.2) that was completed by CS leaders at month-24, month-30 and month-36, and will be updated at 6-monthly intervals for the duration of the project;
- secondly, the "*AquaVitae WP 1 - 3 database"* (Appendix 2, D1.2). In order to clearly match the work and outputs of all case studies with the best fitting WP (WP1-3; and
- thirdly, a technical case study report for the work from M19-M36 that was filled in by all CS partners Annex 1 of D1.4 (Detailed Case Study Reports (M19-M36)).

To generate the tables summarising the outputs of the second development phase, a number of filters were set in the database. This allowed extraction of the information specific to WP3. The product specifications were requested by email from all partners and added to the tables.

ii. User acceptance testing feedback

WP1-3 leaders prepared and disseminated a detailed survey questionnaire at the start of the AquaVitae project (Annex 1, D1.1), to understand the industry perspective on, and identify the industry and commercial relevance of the planned innovative outputs coming from the 13CSs. Based on the lessons learned from this first questionnaire process and 18M reporting period, the leaders of WP1-3 started an iterative process to create CS specific surveys in order to understand the impact generated by the key outputs of the different CSs and collect user acceptance testing feedback for D1.4. Due to the high number of identified Key Exploitable results (KERs) – a total of 139 KERs coming from 59 individual Case Study Tasks – a decision was taken to highlight the most relevant as "flagship Key Exploitable Results" (fKER) and provide stakeholders in the surveys only with the selected flagship results that match their interest.

Selection Process fKERs: The selection process was based on the expert opinion of the CS leaders. From their R&I activities CS leaders selected the most mature and ready for uptake at an appropriate

industry level outputs as their flagships. These were then discussed by CS leaders individually with the leaders of WP1-3. In some cases, one or more KERs of one CS task were combined into one fKER. This exercise resulted in a total of 45 fKERs. Table 2 of Deliverable D1.4 summarises these fKERs together with the individual, detailed description that was provided as an explanation to the survey's respondents.

Selection of questions: The questions were formulated by the leaders of WP1-3 with the help of specialist in survey design from WP8. After a feedback loop with the CS leaders, the final questions were compiled, and link to each survey is available in Annex 1 of Deliverable D2.3. The questions are intended to identify user acceptance testing feedback, i.e.:

- the industry's perspective on the CS outputs in terms of applicability / industry uptake
- the (potential) economic, environmental and social impact of the outputs

In addition, WP5 can use the survey results to identify CS outputs to develop market driven strategies for. WP7 can use them select outputs for their business, socio-economic and profitability analysis.

Ethics and data protection: The potential for ethical issues has been considered by the project partners. Prior to its lunch the survey was presented to the coordinator for approval. The survey was and will be conducted with participants' rights to privacy and confidentiality. No identifiable personal information is collected or stored, and participation was/is on a voluntarily basis. Each individual stakeholder must give their consent to participate in the survey. Data will only be presented on an aggregated level to comply with international and national rules for confidentiality including GDPR. Any participant has the right to limit the use of any information they provide and may request.

Target group: People familiar with aquaculture and potential interest in outputs from coming from SME/Industry, Association, Policy, NGO, Research, and other backgrounds. Annex 2 of D2.3 "Respondent background" shows the broad range and different groups of surveyed participants and their various interests in the aquaculture industry.

Implementation: Different from the original plan set in D1.1/2.1/3.1, the case study events planned for M13, M24 and M36 were cancelled due to COVID restrictions. Therefore, it was not possible to carry out or align the survey as a part of these big scale events. Out of necessity, an online survey using Google forms was implemented. All case study leaders were asked to reach out to relevant stakeholders for them and proved them the link to the survey that contained the fKERs of interest to them. A minimum 10+ respondents per CS was given as benchmark. The 12th of May 2022 marked the end date for data collection. Using a standard survey (where necessary translated to Portuguese or French) (link to each survey can be found in Annex 1 of D2.3) participants answered a set of general questions on their position with regard to AquaVitae and the aquaculture value chain and were then introduced to a short-list of 2-6 fKERs only that correspond with their interest in the aquaculture industry. A total of 151 stakeholders (Annex 2 of D2.3) commented on a total of 45 fKERs (Table 2 of D1.4). This resulted in 223 surveys on products and processes that are likely to originate from the AquaVitae project. The number of respondents (151) is not consistent with the number of assessments that were carried out nor the number of answers recorded. Some respondents chose to review only one fKER, very few noted that none of the fKERs were of interest to them, while other respondents chose to review two or more fKERs in their survey. In many cases the respondent had the opportunity of selecting more than one answer to a single question, which increased the number of responses that were recorded for these questions. In some instances, respondents chose not to answer none-mandatory questions, which reduced the number of responses to a question.

Exception CS11: Different from all other CSs, the delays caused by COVID in CS11 were so severe that the selected finfish species was changed from Brazilian flounder to Southern Black Drum in M25. For that reason, only preliminary fKERs were agreed upon as they lacked maturity by the time the surveys were created (they can be found in the complete fKER table; Table 2 of D1.4). Currently CS11 is using

a preliminary survey to evaluate if the selected the outputs can actually be considered as flagships. By the time of the creation of this deliverable, no information was available to the leaders of WP1-3.

3. A synopsis of the progress to date

Eleven of the 13 AquaVitae CSs continue to report innovative outcomes that contribute to the tasks of WP2 and a twelfth CS now reports to WP2 (due to changes that were made in the experimental design of CS11). As such, the total of these outcomes has increased to 57 over the course of the last two years. They take the form of 20 reports, 25 processes and 12 products (Tables 1 to 10). To ensure that there is no duplication in reporting due to an overlap with work that involves grow-out (WP2) and hatchery production (WP1) or grow-out (WP2) and post-harvest product (WP3) (i.e., an overlap of WP2 with either WP1 or WP3), we have decided not to report on this work in all work packages. Outcomes that report to WP2 and WP1 will not be reported here, but in WP1 only; similarly, outcomes that report to WP2 and WP3 will also not be reported here but will be reported in WP3 only.

The innovative contribution of each CS has been summarised using the main exploitable outcomes of the CS task, together with its percentage completeness and a summary of the outcome's requirement specification (Tables 1 to 10). These tables also include outcome "identifier" numbers, and these will link each outcome to the other task details, such as progress at different stages of the project, problems and solutions that the researchers have identified, its current technology readiness level (TRL), a description of the contribution that the work will make towards taking it beyond state of the art, and overall CS task progress (Annex 1 of D1.4).

The overall progress of the CS tasks that report to WP2 is currently on track with where we would expect them to be. On average, these tasks are 71% complete (n=57; Table 1 to 10); this corresponds with the 36-month duration of the 54-month project, and places the progress slightly ahead of schedule. The percent completeness ranged from 0% (in two instances) to 100% completed (in seven instances; Tables 1 to 10), with the majority of the other tasks closer to 65% complete. The reasons for 0% completeness: In the first case, contaminated seawater prevented the start of the trials, but a solution has been developed that involves a procedure to decontaminate the water. This task is ready to start, and efforts are in place to ensure that it will be completed. In the second, the task was only scheduled to start in mid-2022, so zero progress was expected in this 36-month report.

Current TRL levels of the CS tasks that report to WP2 ranged between 1 and 8, with an overall average of 4.6 ± 2.0 (n=57; Tables 1 to 10). Fourteen percent of the outputs (i.e., 8 out of the 57 outputs), that report to WP2, currently have a TRL level of 5 or more (Table 1 to 10).

A more detailed account of the progress made by each CS, which is supported by scientific, technical, and innovative information/data, has been presented in Annex 1 of Deliverable D1.4 (*Case Study Reports to M36*). Note that these detailed CS progress reports correspond with the case study *Work Plans* that were presented previously (Annex 3, D1.1).

Large portions of the work in this project began ahead of the Covid-19 pandemic, and it was possible in some instances to make research progress through the pandemic; however, it still resulted in substantial delays that culminated in the need for a six-month extension. All CS tasks that report to WP2 will be completed either ahead of or in the extended period of the project.

The pandemic also hindered the progress of many planned collaborative initiatives. While face-to-face meetings and workshops could not take place for a large portion of this reporting period, online collaboration and planning continued, and the researchers made progress that included close

collaboration between partners in the North and South of the Atlantic. For example, some of the research that is reported in CS2, CS3, CS4, CS7 and CS13 highlights the benefit of a coordinated effort between partners. In some of the experiments, researchers have adopted a similar experimental design using common controls and test treatments for organisms from different locations and tested in different geographical regions. This has consequently made it possible for participants to draw more reliable comparisons between studies carried out in different counties, within the program. This example, will be presented at the European Aquaculture Conference later in 2022 and will materialise in a peer reviewed publication.

Currently, there are five peer-reviewed publications that are logged as originating from the research and innovation of the AquaVitae project. This provides evidence of the quality of this work and collaboration that is taking place in the project. The number of publications will increase dramatically towards the end of the project and continue to grow after the project is complete.

Most of the CS tasks that report to WP2 continue to contribute to making the aquaculture industry more innovative through developing more sustainable methods of production and the development of circular processes to achieve zero waste in aquaculture production (Table 1 to 10). For example, tasks in CS3 (land-based IMTA) took local wild sea cucumbers from the South African coast and developed technological processes to use them to remove solid waste from land-based abalone rearing facilities, reducing the frequency of having to physically remove the solid waste and to handle the abalone, while also producing an alternative product (i.e., sea cucumber with potential value in Asian markets). This innovative research is now complete; but since it took place under industry conditions and industry was directly involved in the research, the result remained applicable and technology transfer took place during the period of the experiment. Many of the CS tasks that report to WP2 (CS1 to 13) have adopted similar approaches, where researchers worked very closely with their industry partners. The updated details of this work are documented in Annex 1 of Deliverable D1.4.

Good progress has been made in cross-cutting case studies (i.e., CS12 and CS13; Tables 9 and 10) that focus on the circularity of aquaculture value chains and the potential to use by-products from LTS to improve the blue-bioeconomy. Much of the outcome of this work involves grow-out technology development (and is reported in WP2) and much will result in post-harvest products; so its bulk will be reported in WP3 as the project progresses. Similarly, the work that aims to utilize macroalgae to improve and optimize feeding strategies for low trophic species is currently reported in WP2, but will result in post-harvest products (WP3). Numerous CS have contributed to innovation associated with the circular economy (e.g., CS2, CS3, CS4 and CS5; Tables 2 – 5), whereas they will be brought together primarily in the cross-cutting CS12 and CS13 that focus on recycling aquaculture waste and the inclusion of LTS in aquafeeds (Tables 9 and 10). As previously described, the detailed progress of the work completed to month-36 in these CS, is presented in Annex 1 of Deliverable D1.4.

Table 1: All outputs related to WP2 from CS1 (New macro-algae species) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
1	1.2.1	Process	A new method for cultivation of *Codium tomentosum* in substrates in earthen pounds.	Cultivation of *C. tomentosum* in substrates will improve the deployment and harvest of biomass, and will allow upscale its production in underutilised, low cost, earthen pounds. This will be done in an organic certified land-based IMTA.	tbc	60%	3	T2.2
1	1.4.1	Process	A new method for cultivation of *Ulva* Spp. in substrates in earthen pounds.	Cultivation of *Ulva rigida* in substrates will improve the deployment and harvest of biomass, and will allow upscale its production in underutilised, low cost, earthen pounds. This will be done in an organic certified land-based IMTA.	tbc	0%	4	T1.2, T2.2

Table 2: All outputs related to WP2 from CS2 (Offshore macro-algae culture) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
2	2.1.1	Report	Site selection map for offshore macro-algae cultivation in the Faroe Islands.	GIS map.	N	100%	3	T2.2
2	2.1.2	Report	Report describing selected parameters and suitable offshore macroalgal cultivation sites in the Faroe Islands.	Report can be used to indicate suitable offshore macroalgal cultivation sites in the Faroe Islands, based on established criteria for depth, current speed, wave height, and distance to pollution sources, marine traffic and recreational areas.	N	100%	3	T2.2
2	2.2.1	Process	Incorporating used fish farm equipment in macroalgal cultivation.	Conduct a benefit analysis of new vs. old (re-use) equipment. Indicate standards for strength and annual durability of the re-used equipment.	N	100%	6	T2.2

2	2.2.2	Report	Report on the incorporation of re-use material in macroalgal cultivation.	Demonstrate the large-scale re-use of aquaculture equipment in macroalgal cultivation.	N	100%	6	T2.2
2	2.3.1	Process	A new mechanical harvesting method for growth lines seeded with S. latissima at MACRs.	Improve logistics to ensure low-cost handling and high-quality storage stable macroalgal biomass.	Y	95%	7	T2.2
2	2.4.2	Product	Ocean cultivated kelp included in an abalone diet.	Cost effective feed with reduced environmental footprint. Feed will adhere to industry standards with regard to risk management and ingredient traceability.	Y	75%	1	T2.4
2	2.5.1	Process	Optimised cultivation system, harvesting and landing logistics	Design of cultivation rig based on the principles of the MacroAlgal Cultivation Rig	tbc	100%	2	T2.2
2	2.6.1	Report	Site selection map for offshore macro-algae cultivation in the Atlantic Ocean.	GIS map.	N	100%	3	T2.2
2	2.6.2	Report	Report describing selected parameters and suitable offshore macroalgal cultivation sites in the Atlantic Ocean.	Find suitable sites for large scale production (>500 ha) in open ocean environments in the Atlantic Ocean.	N	100%	3	T2.2
2	2.7.1	Report	Feasibility study/knowledge transfer plan for an industrial partner outside of Europe.	Road map for how to implement seaweed cultivation offshore outside of Europe. Make technology transfer agreements or other type of commercial communication.	N	0%	n/a	T2.2

Table 3: All outputs related to WP2 from CS3 (Land based IMTA) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
3	3.4.1	Process	Abalone/sea cucumber IMTA production.	This deliverable will produce a protocol, supported by evidence (data), for land based IMTA production of a new species that will include a description of how to integrated the new species into an existing aquaculture production system used to farm a different organism	N	75%	3-4	T2.2
3	3.6.1	Process	Abalone IMTA production/nutrition and systems.	Here we will describe the production of abalone (i.e. growth and feed conversion) on an abalone farm, where they are produced using various feeding strategies (e.g. fed formulated feed and fresh land based IMTA algae, versus the same land based IMTA algae incorporated into a pellet, versus non-IMTA algae incorporated into the formulated pellet) and the data will be used to motivate the most efficient production process for industry.	N	85%	3-4	T2.2, T2.4
3	3.7.1	Product	Pelletised abalone feed containing land-based IMTA grown seaweed.	Produce compound feed integrating IMTA produced macroalgae to demonstrate the effects of IMTA production on nutritional aspects and benefits for circular processes.	Y	75%	3	T2.2, T2.4
3	3.7.2	Report	Life cycle analysis of land based IMTA.	The deliverable will include a life cycle analysis (LCA) carried out under industry conditions where land based IMTA will be compared with conventional aquaculture, and a “cradle-to-grave” analysis will be carried out on both, using data (i.e., C, N, P flow) collected over the same period in the same environment. This will be among the first real, evidence-based analysis that quantifies the benefit (or not) of IMTA in terms of energy flow and cost savings under commercial conditions on a land based abalone farm.	N	75%	3	T2.2, T2.4

Table 4: All outputs related to WP2 from CS4 (Sea based IMTA) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
4	4.1.1	Process	Method to make algae biosecure when introduced to an abalone feed.	First method to make IMTA (and other sources) of algae biosecure when fed to abalone, where the nutritional value of the feed is not compromised. Process will adhere to industry standards with regard to risk management and ingredient traceability.	Y	75%	4	T2.2, T2.4
4	4.2.1	Process	Coproduction of algae with mussels.	More efficient use of existing infrastructure aimed at job creation and reduced environmental footprint. Adhere to environmental legislation/monitoring and black economic empowerment legislation in South Africa.	tbc	90%	7	T2.2, T2.4
4	4.3.1	Report	Data supporting use of abalone diet with alternative LTS dietary ingredient, that originates from sea based IMTA.	Cost effective feed with reduced environmental footprint. Feed will adhere to industry standards with regard to risk management and ingredient traceability.	Y	90%	7	T2.2, T2.4
4	4.4.1	Process	New prototype and protocol for co-cultivation of lobsters and oysters, for increased food production and restocking purposes.	Process will contribute to reduce environmental footprint of aquaculture production methods and will make production more cost-effective; contribute to developing new industry standards.	tbc	90%	7	T2.2
4	4.4.2	Process	Adaptation of the culture system for Swedish environmental conditions, with stratified waters and large fluctuations in temperature, salinity and plankton availability.	Process will contribute to reduce environmental footprint of aquaculture production methods and will make production more cost-effective; contribute to developing new industry standards.	tbc	90%	7	T2.2

4	4.4.3	Process	Evaluation of low tech and relatively inexpensive method for on growth of lobster juveniles in sea-based systems that request minimized rearing and no additional food supply.	Process will contribute to reduce environmental footprint of aquaculture production methods and will make production more cost-effective; contribute to developing new industry standards.	tbc	90%	7	T2.2
4	4.5.1	Report	Production site evaluation.	The first 3D hydrodynamic model for the region Vágar, Faroe Islands.	N	75%	7	T1.5, T2.2, T6.2
4	4.5.2	Process	Development of mussel seeding lines for wild settlement and optimal growth.	The mussel spat availability in Faroese waters will be clarified and settlement on two types of seeding lines investigated.	tbc	75%	2	T1.5, T2.2, T6.2
4	4.5.3	Report	Evaluating the IMTA potential with salmon/blue mussel coculture.	The potential waste assimilation by blue mussel around a commercial scale fish farm will be modelled taking into account the spatial constraints. This will add to the knowledge already established around the subject of fish mussel co-culture.	N	75%	7	T1.5, T2.2, T6.2
4	4.5.4	Report	Evaluation of the influence of salmon/blue mussel/seaweed coculture on fjord ecology.	Evaluation of the influence of IMTA on the fjord ecology, when the lower trophic species are not feeding directly on the waste from the higher species.	N	75%	7	T1.5, T2.2, T6.2
4	4.6.2	Product	Saccharina latissima obtained in abalone IMTA co-culture.	Process will contribute to reduce environmental footprint of aquaculture production methods and will make production more cost-effective; contribute to developing new industry standards.	Y	90%	7	T2.2, T2.4

Table 5: All outputs related to WP2 from CS5 (Biofloc IMTA) and CS6 (Sea urchin roe enhancement) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
5	5.1.1	Process	Optimised grow out system (optimised aeration system).	Optimizing biofloc aeration system for shrimp production in biofloc, improving the nitrification improving shrimp production for farmers.	tbc	95%	8	T2.2
5	5.2.1	Process	New IMTA system design (shrimp, mullet and *Ulva* production in biofloc system).	Optimizing rearing system in biofloc by diversification of the species, improving the efficiency in nutrient use.	tbc	85%	7	T2.2
5	5.3.1	Process	New IMTA production system for shrimp farmers.	Optimising rearing system in ponds by diversification of the species (IMTA), improving the efficiency in nutrient use inside the system and profitability.	tbc	60%	5	T2.2
6	6.1.1	Process	Protocols for sea urchin roe enhancement - technology transfer.	A description of the protocols for the live holding of sea urchins in land-based systems for roe enhancement. This will include, feeding and density related information and sampling methodology for measuring the efficacy of roe enhancement. The protocols will be aimed at a non-scientific audience.	N	65%	7	T2.2
6	6.1.2	Process	Land based holding system for sea urchin roe enhancement.	The output will be split into two types: (1) Commercial prototype (commercially sensitive) of a land-based raceway system with an integrated tipper self-cleaning system. Testing this system will be part of the project output (Norway) (2) Tech Transfer: Land-based holding system design parameters (e.g. raceway and inlet water designs) to enable industry to run sea urchin roe enhancement trials (Spain).	Y	65%	7	T2.2, T3.2

Table 6: All outputs related to WP2 from CS8 (Native oyster production) and CS9 (Offshore production of blue mussel) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
8	8.3.1	Report	Recommendations of oyster grow-out systems for Scandinavia and Brazil including adaptation of existing techniques and newly developed systems.	In areas with emerging industries, traditional culture systems developed for existing culture species are often used also for new species, resulting in sub-optimal culture conditions and processes. Tech-transfer and adjustment of already existing culture techniques is therefore needed.	N	70%	3-5	T2.2
8	8.3.2	Report	New culture system for oysters.	In areas with emerging industries, traditional culture systems developed for existing culture species are often used also for new species, resulting in sub-optimal culture conditions and processes. Development of new systems adapted to local conditions is therefore needed.	Y	70%	3-5	T2.2
8	8.3.3	Report	A new protocol for heat treatment of fouling on oysters will be developed	Fouling of calcifying worms may reduce product value significantly. This type of fouling is more difficult to manage compared to soft bodied fouling organisms and barnacles, and protocols must be developed to allow efficient treatment of fouling.	To be confirmed	70%	3-5	T2.2
9	9.3.1	Process	Adapted mussel cultivation systems.	Initiating the work to modifying existing systems to be submerged .	tbc	85%	5	T2.2
9	9.4.1	Process	Protocol for heat treatment of calcifying worms on blue mussels during the production cycle.	Developing a protocol for on-site fouling treatment of calcifying worms on blue mussels and by providing an industry scale demonstration facility for knowledge transfer to the aquaculture industry.	tbc	80%	4	T2.2

Table 7: All outputs related to WP2 from CS10 (Freshwater finfish in Brazil) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
10	10.1.1	Process	Optimised protocol for captive reproduction of pairs of Arapaima gigas in earth ponds.	Protocol designed to increase spawning rates of A. gigas using synthetic hormonal inducers for pairs in earth ponds.	tbc	70%	3	T1.2, T2.2
10	10.2.2	Report	Evaluation of triploid tambaqui reared in farms in the Amazon region.	Description of the growth performance of triploid tambaqui when reared at the Amazon farming conditions, in comparison with the diploid form.	N	70%	3	T2.2
10	10.2.3	Report	Evaluation of triploid tambaqui reared in farms in other climate zones in Brazil.	Description of the growth performance of triploid tambaqui when reared at the Savanas farming conditions, in comparison with the diploid form.	N	70%	3	T2.2
10	10.3.1	Report	Predictive models to identify the type, number and length variation of intermuscular bones in tambaqui, Colossoma macropomum.	A method to estimate the intermuscular bone variations to be include in a future tambaqui breeding program.	N	80%	2	T2.2

Table 8: All outputs related to WP2 from CS11 (Marine finfish in Brazil) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
11	11.4.1	Process	Protocols for natural spawning of Black Drum.	Description of a natural spawning protocol for this species in a recirculating aquaculture system.	Y	50%	2	T1.1, T1.2, T1.4, T2.1, T2.2
11	11.4.2	Product	Southern Black Drum larvae.	Production of juveniles of a new species for aquaculture.	Y	50%	2	T1.1, T1.2, T1.4, T2.1, T2.2
11	11.5.1	Process	Protocol for weaning larvae into dry diets.	Description of a weaning protocol for larvae of this species in a recirculating aquaculture system.	Y	50%	2	T1.1, T1.2, T1.4, T2.1, T2.2
11	11.5.2	Report	Description of the digestive tract of Southern Black Drum larvae.	Description of the development of the digestive tract of this species, from newly hatched larvae to the juvenile stage.	N	50%	2	T1.1, T1.2, T1.4, T2.1, T2.2
11	11.6.1	Report	Report on temperature on growth, survival, and oxidative status of juvenile Southern Black Drum reared in RAS.	Report on the effect of temperature on growth, survival, and oxidative status of juvenile Southern Black Drum reared in RAS.	N	50%	2	T1.1, T1.2, T1.4, T2.1, T2.2
11	11.6.2	Report	Report on salinity on growth, survival, and oxidative status of juvenile Southern Black Drum reared in RAS.	Report on the effect of salinity on growth, survival, and oxidative status of juvenile Southern Black Drum reared in RAS.	N	50%	2	T1.1, T1.2, T1.4, T2.1, T2.2

Table 9: All outputs related to WP2 from CS12 (cross cutting by products from LTS aquaculture) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
12	12.1.1	Report	Incorporation of shellfish aquaculture to the international carbon trading scheme.	Performs tailored estimates of the CO_2 sequestration potential of shellfish aquaculture and proposes the triad highest added value, lowest carbon footprint and longest carbon sequestration to identify the best applications for shellfish $CaCO_3$ for each case study.	tbc	100%	5	T2.3
12	12.2.1	Process	Protocol for the alkalinisation of the coastal waters of Galicia.	Environmental engineering application of $CaCO_3$ from shellfish aquaculture consisting on adding crusted shells to carbonate ion oversaturated adjacent shelf waters where it can be immobilized for decades. It will be applied to the coastal waters of Galicia, main producer of shellfish in Europe using shell from the mussel industry. Application of this protocol will require authorisation from the Galician government.	N	80%	2	T2.3

Table 10: All outputs related to WP2 from CS13 (cross cutting LTS into aquafeeds) and their requirement specifications (with: CS = corresponding Case Study Number; Ident. = specific identifier; Pot. Product (Y/N/tbc) = potential for becoming a future sellable product (Yes, No, to be confirmed); Complete = level of completeness at M36, with regard to what is expected by the end of the project; current technology readiness level (TRL); WP task = the WP task to which each output reports, according to description of action).

CS	Ident.	Output type	Detail	Requirement Specifications	Pot. Product (Y/N/tbc)	Com-plete	Current TRL	WP task
13	13.1.1	Product	Diet formulation for European abalone macroalgae-based.	The formulation that will include macroalgae needs to be nutritional balanced (protein, amino acids, lipid, fatty acids, vitamin and minerals) for European abalone juveniles to meet the known requirements for optimal growth.	Y	53%	4	T2.4
13	13.1.2	Product	Diet formulation for African abalone harvested kelp-based.	The formulation that will include kelp needs to be nutritional balanced (protein, amino acids, lipid, fatty acids, vitamin and minerals) for African abalone juveniles to meet the known requirements for optimal growth.	Y	53%	6	T2.4
13	13.1.3	Product	Diet formulation for African abalone with sea-based IMTA macroalgae.	The formulation that will include macroalgae needs to be nutritional balanced (protein, amino acids, lipid, fatty acids, vitamin and minerals) for African abalone juveniles to meet the known requirements for optimal growth.	Y	53%	6	T2.4
13	13.1.4	Product	Diet formulation for African abalone with land-based IMTA macroalgae.	The formulation that will include macroalgae needs to be nutritional balanced (protein, amino acids, lipid, fatty acids, vitamin and minerals) for African abalone juveniles to meet the known requirements for optimal growth.	Y	53%	6	T2.4
13	13.1.5	Process	Process to produce biosecure macroalgae for African abalone.	First method to make IMTA (and other sources) of algae biosecure when fed to abalone, where the nutritional value of the feed is not compromised. Process will adhere to industry standards with regard to risk management and ingredient traceability.	Y	53%	5	T2.4
13	13.1.6	Product	Diet for European abalone macroalgae-based.	The diet will have a pellet quality (e.g. density, durability, hardness, water stability), size, and shape suitable for the species and stage.	Y	53%	4	T2.4
13	13.1.7	Product	Diet for African abalone harvested kelp-based.	The diet will have a pellet quality (e.g. density, durability, hardness, water stability), size, and shape suitable for the species and stage.	Y	53%	6	T2.4
13	13.1.8	Product	Diet for African abalone with sea-based IMTA macroalgae.	The diet will have a pellet quality (e.g. density, durability, hardness, water stability), size, and shape suitable for the species and stage.	Y	53%	6	T2.4
13	13.1.9	Product	Diet for African abalone with land-based IMTA macroalgae.	The diet will have a pellet quality (e.g. density, durability, hardness, water stability), size, and shape suitable for the species and stage.	Y	53%	6	T2.4

4. User acceptance feedback testing

The AquaVitae Project is developing 139 outputs in the form of reports, products, and processes called "key exploitable results" (KERs) and that will result from case study tasks that report to WP1, 2 and 3. It was not considered feasible to collect stakeholder feedback on all these outputs, because some are less likely to have impact, while others are supporting-outputs that contribute to key-outputs that will impact the aquaculture industry, and some are likely to impact when applied in combination with others; as such, these KER were either not considered in the user acceptance feedback analysis or they were combined to form joint KER's that are more likely to have impact. Together with WP1, 2 and 3 leadership, the case study leaders selected a short-list of outputs (some on their own and some a combination of KERs) that considered these concerns and called them "flagship" key exploitable results (fKERs). This short-list of 45 fKERs is presented in Table 2 of Deliverable D1.4, and stakeholder surveys were carried out on the fKERs only. From that list, 24 fKERs resulting from case study research and innovation reports to WP2 were presented to stakeholders for assessment (Table 11).

Table 11: Flagship key exploitable results (fKERs) that originate from research tasks that contribute to WP2 were presented to stakeholders in a survey (fKERs in red have not yet been included in the survey). Blue indicates fKERs that have not been tested since their development is still considered preliminary.

flagship KER No.	flagship KER Name	Short description	based on output No. (Indent)	WP task
fKER1.2	A new method for cultivation of *Codium tomentosum* in substrates in earthen pounds.	Cultivation of *C. tomentosum* in substrates will improve the deployment and harvest of biomass, and will allow upscale its production in underutilised, low cost, earthen pounds. This will be done in an organic certified land-based IMTA.	1.2.1	T2.2
fKER1.4	A new method for cultivation of *Ulva* Spp. in substrates in earthen pounds	Cultivation of *Ulva rigida* in substrates will improve the deployment and harvest of biomass, and will allow upscale its production in underutilized, low cost, earthen pounds. This will be done in an organic certified land-based IMTA.	1.4.1	T1.2, T2.2
fKER2.1	Report - Site selection report and map for offshore macroalgae	Identifying suitable offshore cultivation sites based on depth, current speed, wave height, and socioeconomic activities is a precursor to kick-start the seaweed industry.	2.1.1, 2.1.2, 2.6.1, 2.6.2	T2.2
fKER2.2	Process - A new mechanical harvesting method for vertical grow lines seeded with S. latissima on a MacroAlgal Cultivation Rig	Fully automated harvesting will enable low-cost and high-speed handling of seaweed biomass as a necessity for upscaling of production in the Atlantic Ocean.	2.3.1	T2.2
fKER3.2	Process - Co-culture of abalone & sea cucumber	Sea cucumber remove solid waste from land-based abalone tanks, reduces cleaning, labour costs, and handling. Plus potential new product in sea cucumber.	3.4.1, 3.5.1	T2.2, T3.2
fKER3.3	Process - Life cycle analysis of land based IMTA	Quantification of financial and enviro. cost/saving in land-based abalone farming, when using abalone/ulva IMTA and/or replacing fishmeal with algae in feeds.	3.7.2	T2.2, T2.4

fKER4.1	Process - Method to make algae biosecure when introduced to an abalone feed.	Eliminates pathogenic bacteria, fungi and viruses, and reduces the chance of introducing macroalgae-born pathogens to abalone farms via the feed.	4.1.1	T2.2, T2.4
fKER4.3	Process - IMTA production of lobster with minimal rearing and no additional food supply	Low tech and relatively inexpensive method for on-growth of juvenile lobsters in sea-based systems.	4.4.3	T2.2
fKER4.4	Process - IMTA of salmon and blue mussel	A better understanding of the uptake of fish farm waste by blue mussels in an IMTA system.	4.5.3	T1.5, T2.2, T6.2
fKER4.5	Process - IMTA of abalone and macro-algae (*Saccharina/Alaria/Ulva*)	Novel methods for the co-culture of abalone and macro-algae using the same space at sea.	4.6.1-.3	T2.2, T2.4, T3.2
fKER5.1	Process – Optimisation of aeration and nitrification in the biofloc system.	Improve shrimp production in biofloc system by optimization of aeration and nitrification.	5.1.1	T2.2
fKER5.2	Process – Development of an IMTA system for rearing shrimp, mullet and Ulva in biofloc system	New IMTA system in biofloc for production of shrimp, mullet and seaweed with high efficiency, yield, and low environment impact.	5.2.1	T2.2
fKER5.3	Process – development of an IMTA system to produce shrimp, oyster and seaweeds in ponds	New IMTA system in ponds for organic production of shrimp, oyster and seaweed with high efficiency and low environment impact.	5.3.1	T2.2
fKER6.1	Protocols for sea urchin roe enhancement	Establishing effective and industry usable protocols for sea urchin roe enhancement. Including transport of urchins to facilities, holding systems, feed regimes, live holding and transport to market.	6.1.1	T2.2
fKER9.3	Adapted mussel cultivation systems	Test and implement adaptions of novel production technologies to offshore conditions for mussel production and identification of different challenges within different countries.	9.3.1	T2.2
fKER9.4	Protocol for heat treatment of calcifying worms on blue mussels during the production cycle	Development and implementation of protocols for sea-based fouling treatment of blue mussels at industrial scale.	9.4.1	T2.2
fKER10.2	Process - Evaluation of triploid tambaqui reared in farms in the Amazon region	Production of triploid tambaqui can potentially increase productivity with faster growing sterile fish.	10.2.2	T2.2
fKER10.3	Process - Predictive models to identify the type, number and length variation of intermuscular bones in tambaqui, *Colossoma macropomum*	Ability to predict intermuscular bones in tambaqui offspring can aid genetic improvement programs to reduce/eliminate bones in tambaqui.	10.3.1	T2.2
fKER11.2	Protocol - Optimised process for natural spawning of Black Drum	Description of a natural spawning protocol for this species in a recirculating aquaculture system	11.4.1	T1.1, T1.2, T1.4, T2.1, T2.2

fKER11.3	Protocol for weaning larvae into dry diets	Description of a weaning protocol for larvae of this species in a recirculating aquaculture system	11.5.1	T1.1, T1.2, T1.4, T2.1, T2.2
fKER11.4	Description of the digestive tract of Southern Black Drum larvae	Development of the digestive tract of this species, from newly hatched larvae to the juvenile stage	11.5.2	T1.1, T1.2, T1.4, T2.1, T2.2
fKER11.5	Evaluation of the effect of temperature on growth, survival, and oxidative status of juvenile Southern Black Drum reared in RAS	Report on the effect of temperature on growth, survival, and oxidative status of juvenile Southern Black Drum reared in RAS	11.6.1	T1.1, T1.2, T1.4, T2.1, T2.2
fKER11.6	Evaluation of the effect of salinity on growth, survival, and oxidative status of juvenile Southern Black Drum reared in RAS	Report on the effect of salinity on growth, survival, and oxidative status of juvenile Southern Black Drum reared in RAS	11.6.2	T1.1, T1.2, T1.4, T2.1, T2.2
fKER13.1	Product - Abalone feed with IMTA macro-algae	Feed that improves growth, FCR and gut microbiome. Cleaner production and reduced environmental impact.	13.1.4, 13.1.8	T2.4

One-hundred-and-fifty-one respondents participated in the WP1, 2 and 3 stakeholder survey between 22 March and 12 May 2022. Just over 30% of the stakeholders that participated were AquaVitae project members. An additional 25% were somehow involved in the project; whereas the balance (44%) was not involved in the project at all (Annex 2, Figure 1). Although most respondents were involved in research and development, there was a solid industry representation of 37% (Annex 2, Figures 3 and 4). Close to half of the respondents were from Europe, while most of the balance was mainly from South America and South Africa (Annex 2, Figure 2).

Sixty-four percent of the respondents concurred that the WP1, 2 and 3 AquaVitae innovation outputs that were reviewed would result in either new products or new processes, with the balance (36%) resulting in improved products or processes (Annex 3, Figure 1). Between 70 and 88% of respondents thought that the AquaVitae research would either improve or greatly improve the economic, environmental and social sustainability of the aquaculture industry (Annex 3, Figures 2, 3 and 4); while the impact of the work on these indicators was slightly less for the respondent's organization, with about 28-35% of the respondents thought they would have no effect on their organization (Annex 3, Figure 5, 6 and 7). This is probably an artifact of most respondents being in research, development, and education rather than producers in the aquaculture industry. The work is likely to address technical challenges mostly (51-52%), but will also address concerns with legislation (13-16%) and consumer perception (15-24%; Annex 3, Figures 8 and 9). Overall, 58% of the respondents considered that the AquaViate research is likely to have an impact on the aquaculture industry within the next five years, while 11% considered that these outputs are less likely to be adopted by the industry in that period, and 31% were undecided (Annex 3, Figure 10). Similar trends were observed when the results were analysed based on feedback from industry respondents only (Annex 5).

The detailed stakeholder responses to the fKERs associated with each of the case studies (CS1 to CS13), and that report to WP1, 2 and 3, are presented in Annex 4. The following analysis draws on these stakeholder reviews, but includes a combined analysis of all outputs from the case study surveys that report to WP2 only: Sixty-six respondents reviewed the outputs that related to WP2; and interestingly, 92% of these respondents were drawn from outside of the AquaVitae project (Figure 2). Thirty-eight

percent of the participants had already tested the products/processes, and 50% were interested in either testing them, collaborating in further development or including the products/processes in their production lines (Figure 3). A large portion (47%) were involved in research and education, but the majority were from industry (49%), with the balance from government (Figure 4). Two-thirds of the respondents considered that the research would result in new products or processes, and the balance thought the work would improve existing products and processes (Figure 5). Close to 90% of respondents thought that the WP2 work would improve or greatly improve the economic and environmental sustainability of the aquaculture industry (Figure 6 and 7), whereas 71% thought the social sustainability of the aquaculture industry would be improved through the implementation of this work (Figure 8).

Most respondents (55%) thought that the outputs of the case studies that report to WP2 would address technical challenges associated with aquaculture (Figure 9). They considered that concerns associated with consumer perception (23%) and legislation (15%) were also addressed in this research and innovation project (Figure 9). The majority (62%) of the stakeholders that reviewed WP2 outputs considered that this work is likely to be implemented in industry in the next five years, 11% considered this unlikely and 27% were undecided (Figure 10).

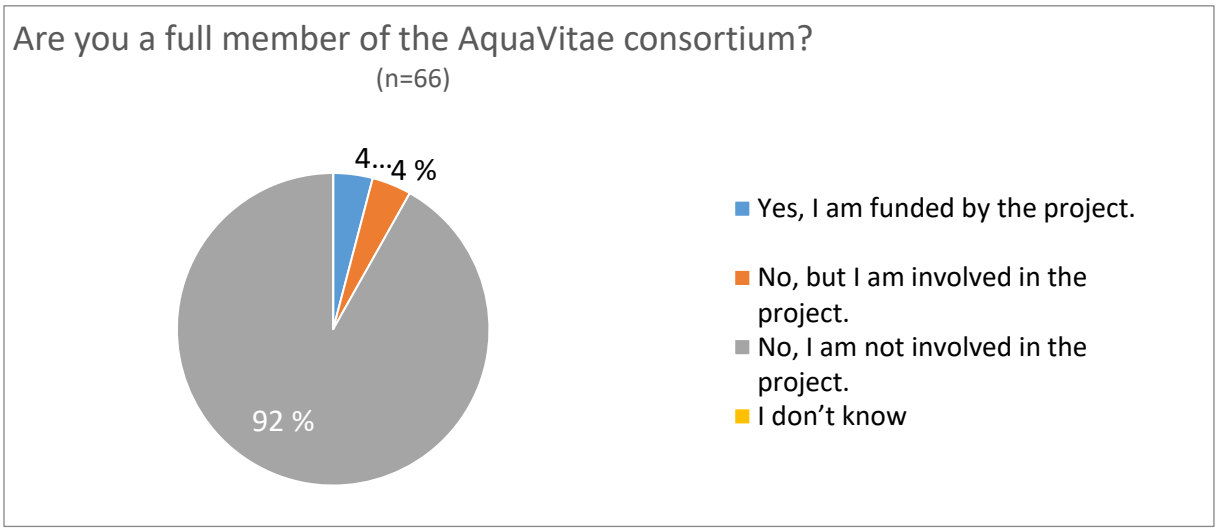


Figure 2: Relation to the AquaVitae Project of respondents that participated in survey on fKERs related to WP2 (AquaVitae stakeholder survey, 12 May 2022).

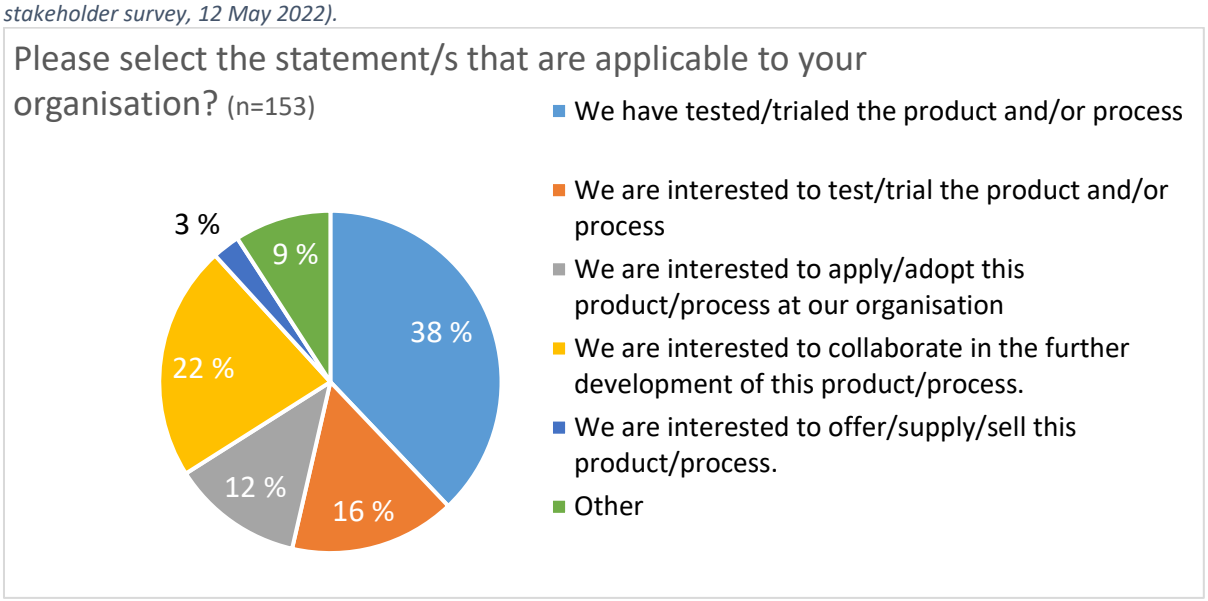


Figure 3: Background of respondents that participated in survey on fKERs related to WP2 (AquaVitae stakeholder survey, 12 May 2022).

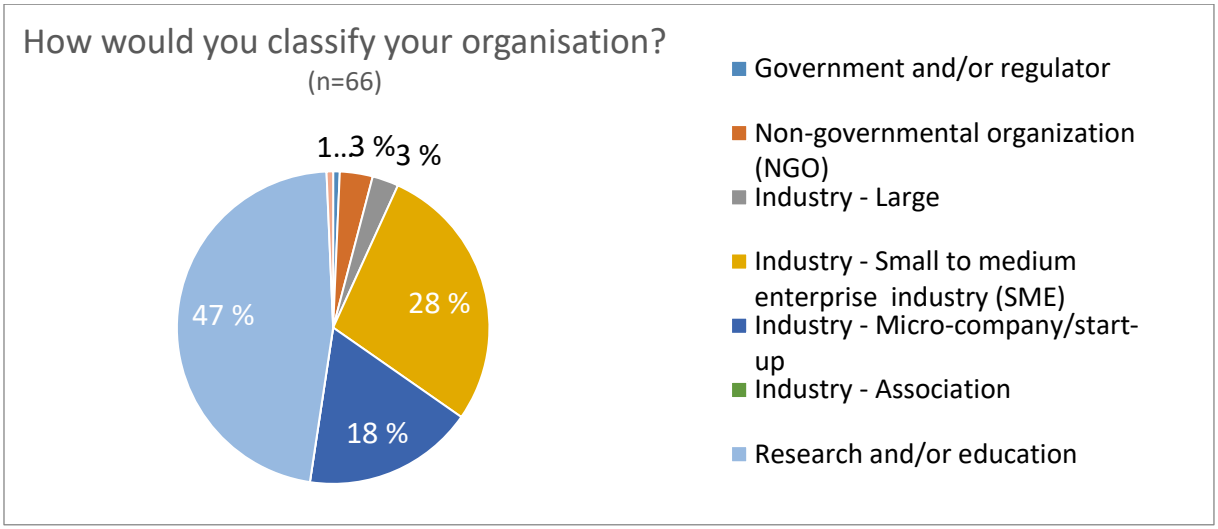


Figure 4: Interest in fKERs related to WP2 of respondents that participated in survey (AquaVitae stakeholder survey, 12 May 2022).

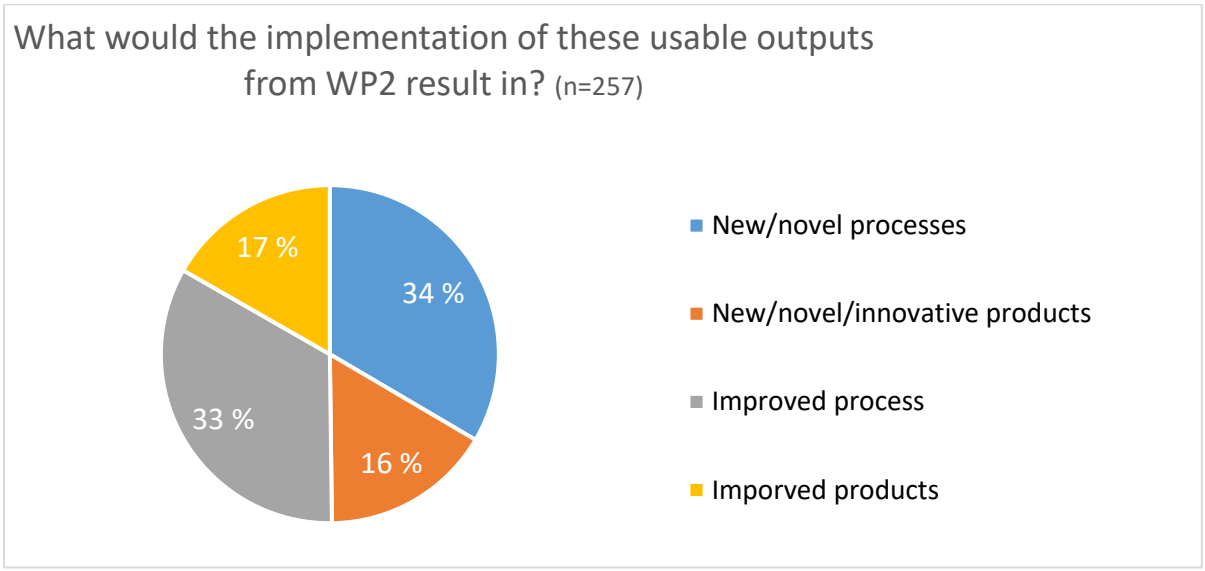


Figure 5: Stakeholder's expected outcome if the fKERs that relate to WP2 were to be implement by the industry (AquaVitae stakeholder survey, 12 May 2022).

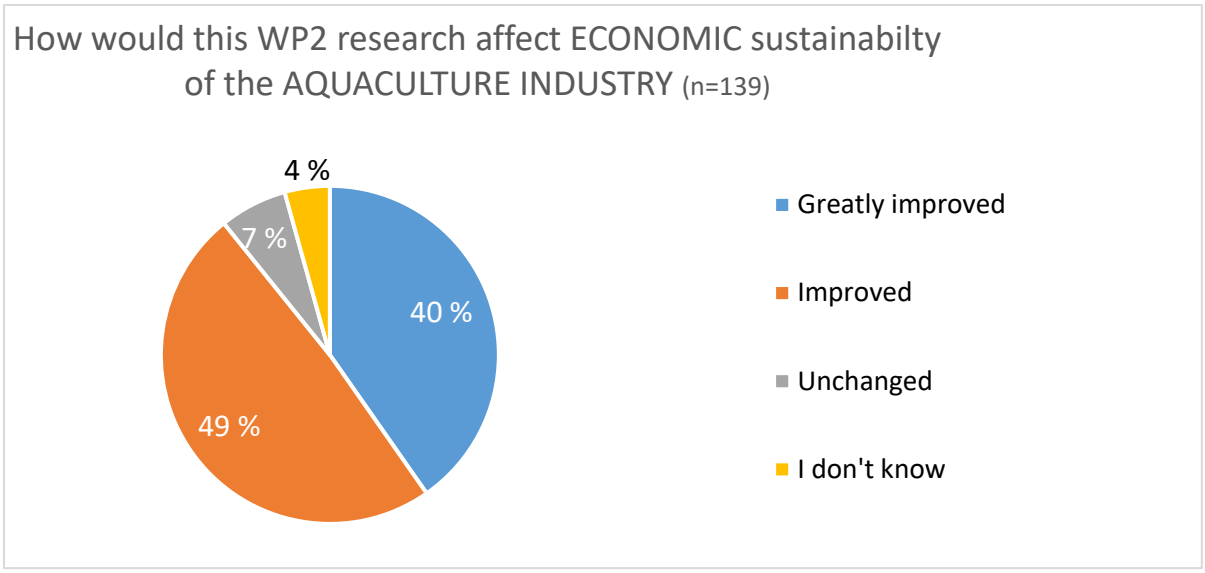


Figure 6: Stakeholder's expectation on the impact on economic sustainability of the aquaculture industry, following the implementation of the selected fKER related to WP2 (AquaVitae stakeholder survey, 12 May 2022).

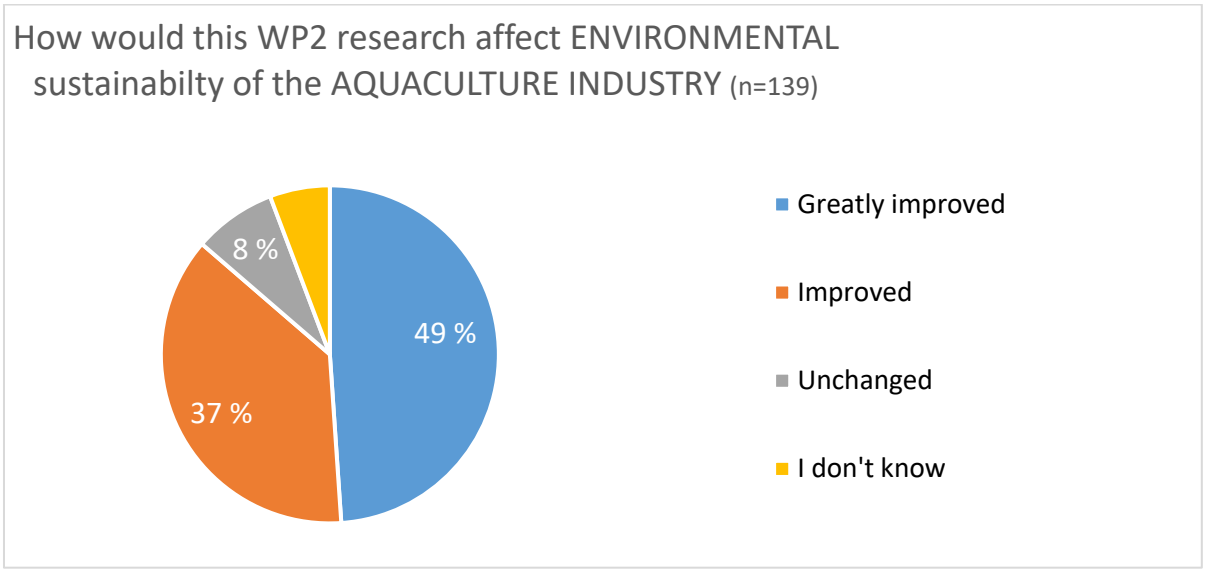


Figure 7: Stakeholder's expectation on the impact on environmental sustainability of the aquaculture industry, following the implementation of the selected fKER related to WP2 (AquaVitae stakeholder survey, 12 May 2022).

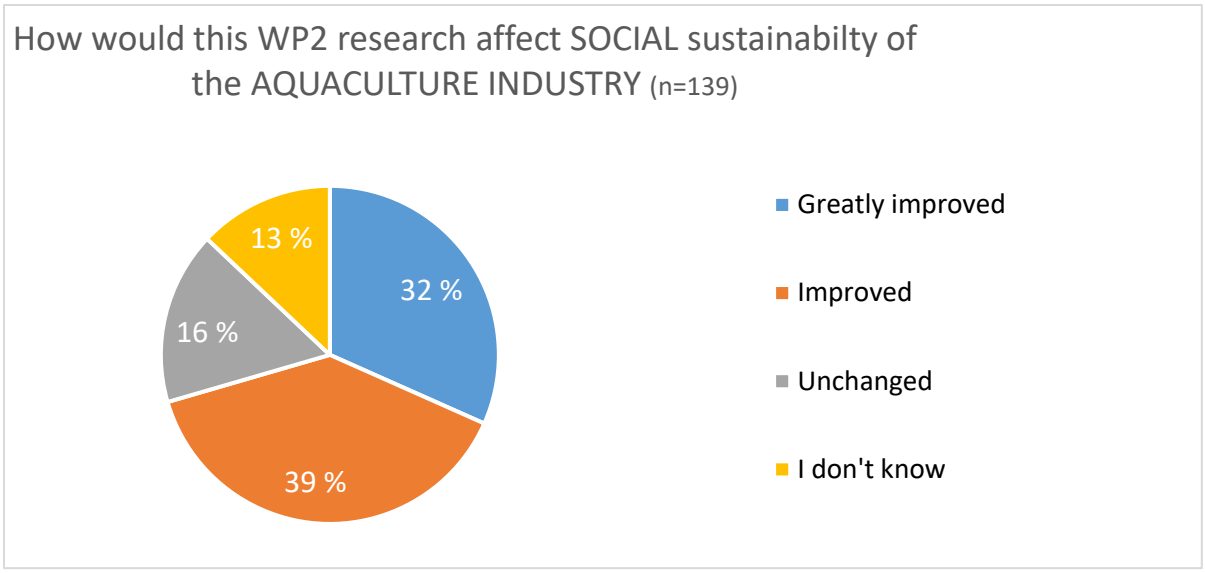


Figure 8: Stakeholder's expectation on the impact on social sustainability of the aquaculture industry, following the implementation of the selected fKER related to WP2 (AquaVitae stakeholder survey, 12 May 2022).

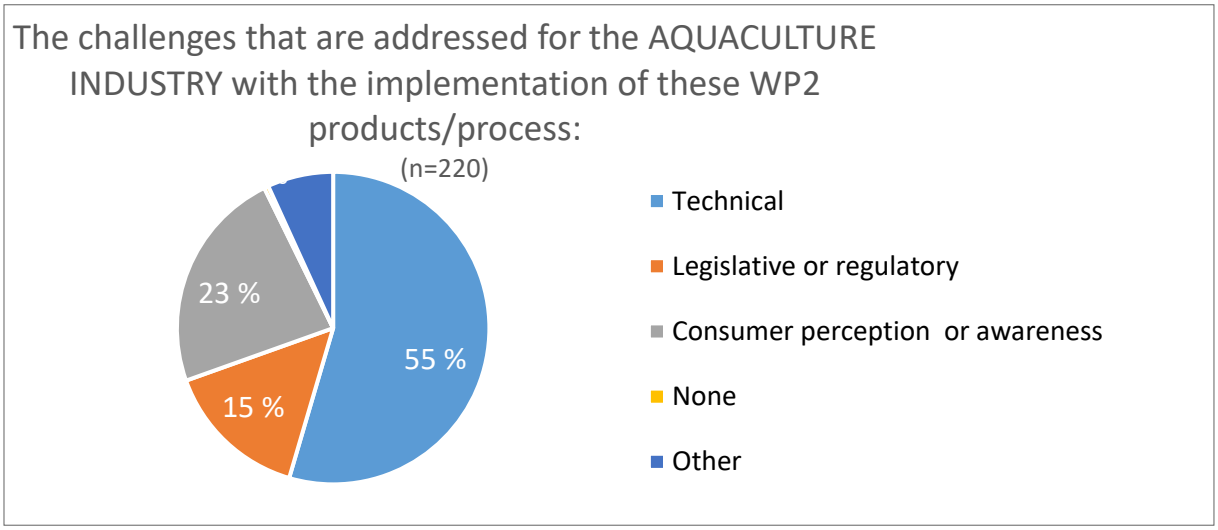


Figure 9: Stakeholder's view on the challenges of the aquaculture industry that will be addressed, following the implementation of the selected fKER related to WP2 (AquaVitae stakeholder survey, 12 May 2022).

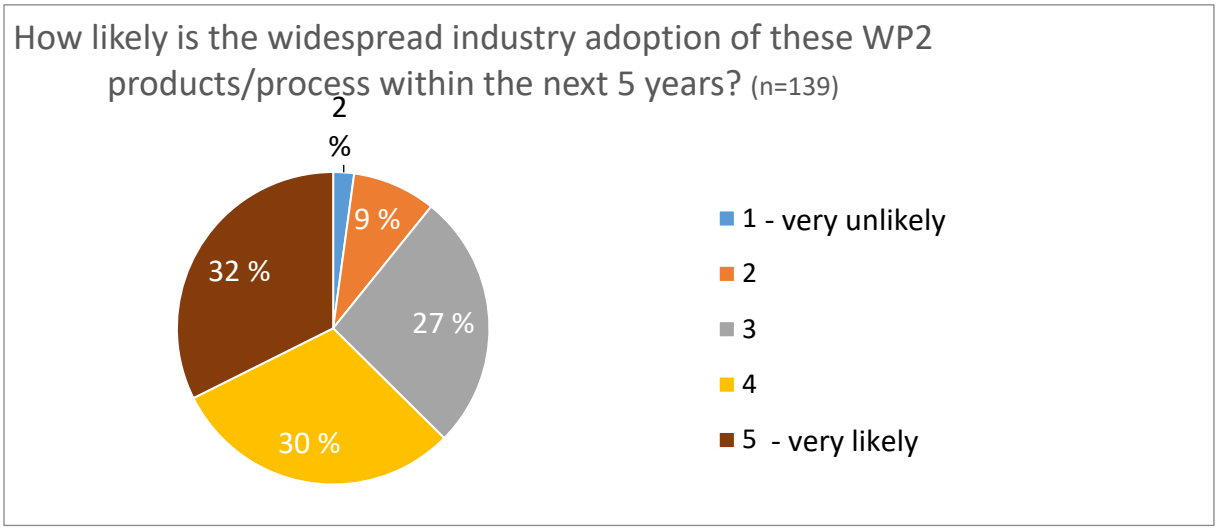


Figure 10: Stakeholder's view on the likelihood of the adoption of the selected fKER related to WP2 by the aquaculture industry within the next five years (AquaVitae stakeholder survey, 12 May 2022).

5. Conclusion

The AquaVitae project has resulted in 139 exploitable results, each supported by detailed experimental design and data collected by 35 partners across 16 countries bordering the Atlantic Ocean. The common reporting system developed in WP1, 2 and 3 has made it possible to present a synthesis of these data generated over the last 36 months. This report focused on the progress of all tasks that resulted in 57 exploitable outputs that report to WP2. The tasks that generated these outputs are nearing completion with an average completeness of just over 70% and an average TRL that is approaching 4. Tasks that were delayed due to technical issues or due to Covid will be completed within the extended period of the project.

Despite travel restrictions caused by the COVID pandemic, case study task leaders still produced innovative research that demonstrated synergistic, collaboration between partners from different geographical areas. This has consequently made it possible for researchers to draw more reliable comparisons between studies carried out in different countries, within the program.

The stakeholder feedback survey that was developed and implemented by WP1, 2 and 3 further demonstrates the joint planning and cooperation among the leadership of these work packages. Overall, the survey has confirmed that the case study outputs that report to WP1, 2 and 3 are relevant to stakeholders and that the work is likely to have impact on aquaculture in the near future.

The stakeholder survey that was developed in WP1, 2 and 3 and presented here, will continue for the duration of the AquaVitae project. An increased effort will be made to involve stakeholders from outside of research, development and education, and to particularly increase the number of industry, NGO, investment and government respondents. The outcome of the survey will be used by case study and case study task leaders in the final stages of their research, and in developing exploitation strategies to ensure that the research and innovation that has been developed in this project will have impact in the aquaculture industry.

Annex 1 – Links to stakeholder feedback surveys

CS	Google forms link	Barcode link
1	https://docs.google.com/forms/d/e/1FAIpQLScJyVCRJkfCML5QfQPdDyXkKnub3eqSrVz0SZbJsooV4DTRBQ/viewform	
2	https://docs.google.com/forms/d/e/1FAIpQLSdCMdanzWV2hggx8GYzktUnKc512xiM1m6ojSnZhcfk_msprQ/viewform	
3, 4 and 7	https://docs.google.com/forms/d/e/1FAIpQLScPUrCFLFye7nfcRq7jkPje7cuPsgnIQC0bnikEv3iN3i5JoQ/viewform	
4	https://docs.google.com/forms/d/e/1FAIpQLSc9lbPy8LT0NTCdj4_6DDfLog9si8xCZGJz7f6UVKV13kKRKw/viewform	
5	English: https://docs.google.com/forms/d/e/1FAIpQLSeN3VbZ8vpAJD8ibPdC5Dt8oGgBfPok4FKLjfA8Uj_GteP5rg/viewform Portuguese: https://docs.google.com/forms/d/e/1FAIpQLSfBmesjoq7gPGBhMAH9_zPU7Ddh69iVTRvYy-apMNAFYyqgyw/viewform	English: Portuguese:
6	https://docs.google.com/forms/d/e/1FAIpQLSe5CCEgmeJIhFHpRYnpg1orhENaeN1tKuBzxxaiH2FqCoaqnA/viewform	
7	https://docs.google.com/forms/d/e/1FAIpQLSfv1RR5QbCrEAAxohSu6hmfuMnyID5Y3BzeFXtLGZt3J0vJ_A/viewform	
8	https://docs.google.com/forms/d/e/1FAIpQLSeJI_enSqexA36RRndt51mVVsOt5suUuRqIf2JWrWJiNNmUcg/viewform	

9	https://docs.google.com/forms/d/e/1FAIpQLSeWS7zGKI5o7mzlEd-Bof6roR-97XPdqEUW5gv6cvmGuPUVmA/viewform	
10	English: https://docs.google.com/forms/d/e/1FAIpQLSc1SuOT31eQyXk-ZMSDMjb-bxzOBra7D4cXqjoj2nUp4TFjuw/viewform Portuguese: https://docs.google.com/forms/d/e/1FAIpQLSeIWc7I2LhDQnz47Z4UHOpa9zIgZZWKKYWDT-3FcPQqdOvCsg/viewform	English: Portuguese:
11	Portuguese: https://docs.google.com/forms/d/e/1FAIpQLSd0B5djyVjyi2kJt7ZpFyFYZxtDFNreJFPpbnzmP54268ZO4w/viewform	
12	https://docs.google.com/forms/d/e/1FAIpQLSdz74q5G3d5Uxx6ZFKDJO7c3zVNDPoNpZn10Y8sZkJz6tt5hw/viewform	
13	https://docs.google.com/forms/d/e/1FAIpQLSdrn6YXHzcV3rl-TANS6Pgot-e9WjkdQFLw1122tBQf6RA6CA/viewform	

Annex 2 – Respondent background: WP1, 2 and 3 stakeholder feedback (M36)

One-hundred-and-fifty-one stakeholders were interviewed between 22 March 2022 and 12 May 2022. A description of the stakeholder group is presented in Figures 1 to 4.

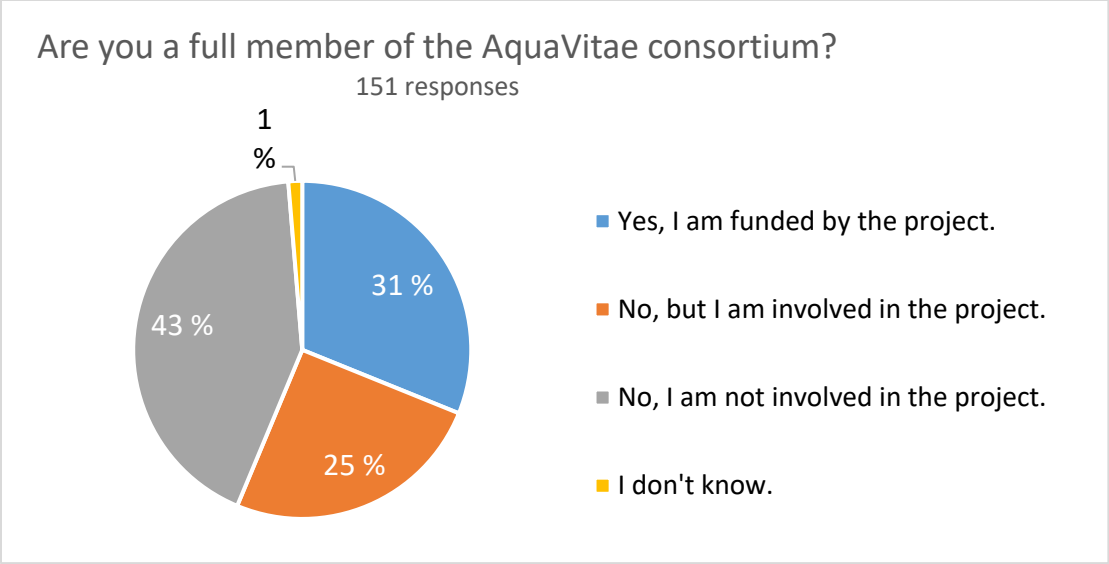


Figure 1: Respondent's association with AquaVitae. Stakeholder surve, to 12 May 2022.

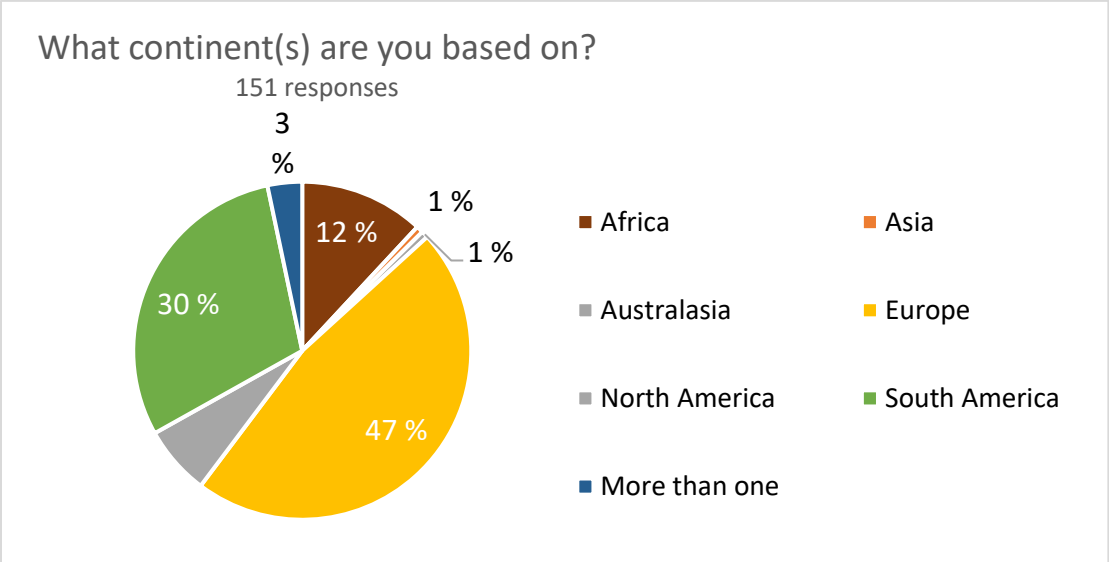


Figure 2: Geographic location of respondents that participated in AquaVitae stakeholder survey, to 12 May 2022.

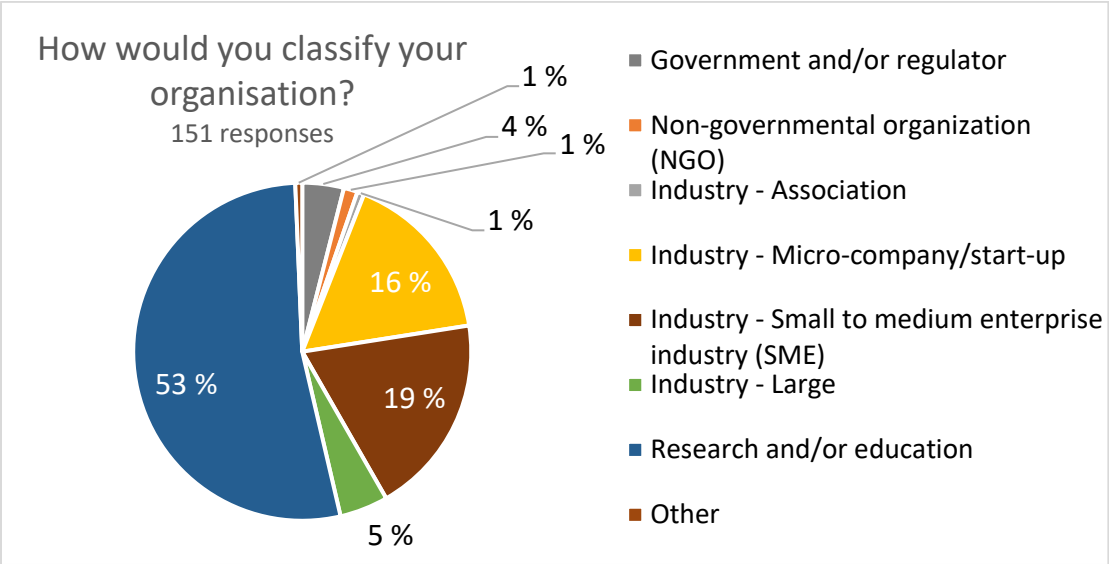


Figure 3: The role of respondents in the aquaculture value-chain (AquaVitae stakeholder survey, to 12 May 2022.

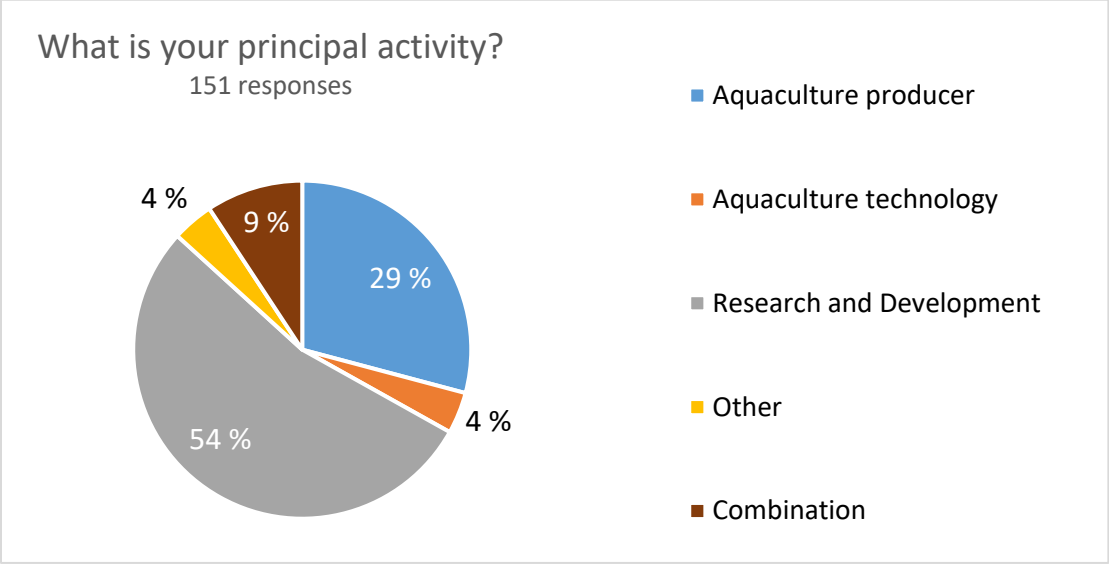


Figure 4: Business activity of stakeholders that participated in the AquaVitae stakeholder survey to 12 May 2022.

Annex 3 – Overall analysis of the WP1, 2 and 3 Stakeholder Survey (M36)

Aquaculture stakeholders were interviewed between 22 March 2022 and 12 May 2022. They came from different groups and had different interests in the aquaculture industry (Annex 2 of D2.3). They were invited to respond to a selection of "flagship" key exploitable results (fKERs; Table 2 of Deliverable D1.4); that is, they participated in a survey on a selection of products/processes that will materialize from the AquaVitae project and that researchers and project management consider likely to have impact on the value chains to which they contribute. The respondents were all presented with a shortlist of fKERs only, based on their interest in the aquaculture industry (i.e., they were not presented with all the fKERs; only those likely to be of interest to them).

A total of 151 stakeholders (Annex 2 of D2.3) commented on a total of 45 fKERs (Table 2 of Deliverable D1.4), using a standard survey (link to all surveys in Annex 1 of D2.3). This resulted in 223 surveys on products and processes that are likely to originate from the AquaVitae project. The combined outcomes of these surveys are presented in Figures 1 to 10.

It should be noted that the number of respondents (151) is not consistent with the number of assessments that were carried out nor the number of answers recorded. In some instances, respondents chose not to answer a question, which reduced the number of responses to a question. Furthermore, in many cases the respondent had the opportunity of selecting more than one answer to a single question, which increased the number of responses that were recorded for the question substantially. Also, some respondents chose to review only one fKER, some noted that none of the fKERs were of interest to them, while other respondents chose to review two or more of the fKERs in their survey; this also contributed to the variation in the number of answers that were recorded.

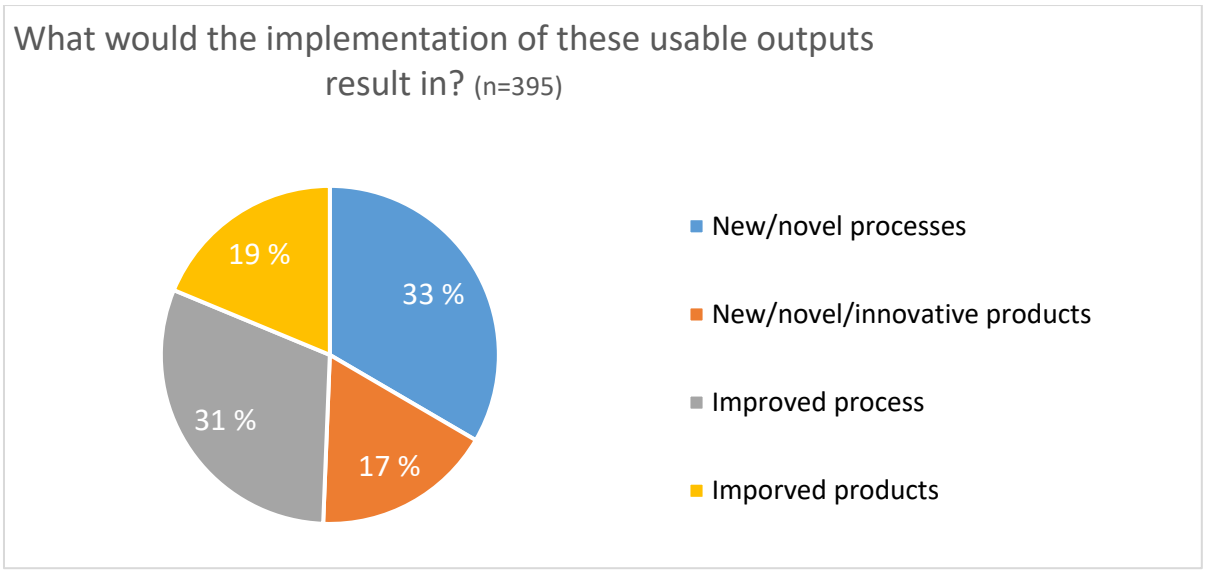


Figure 1: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

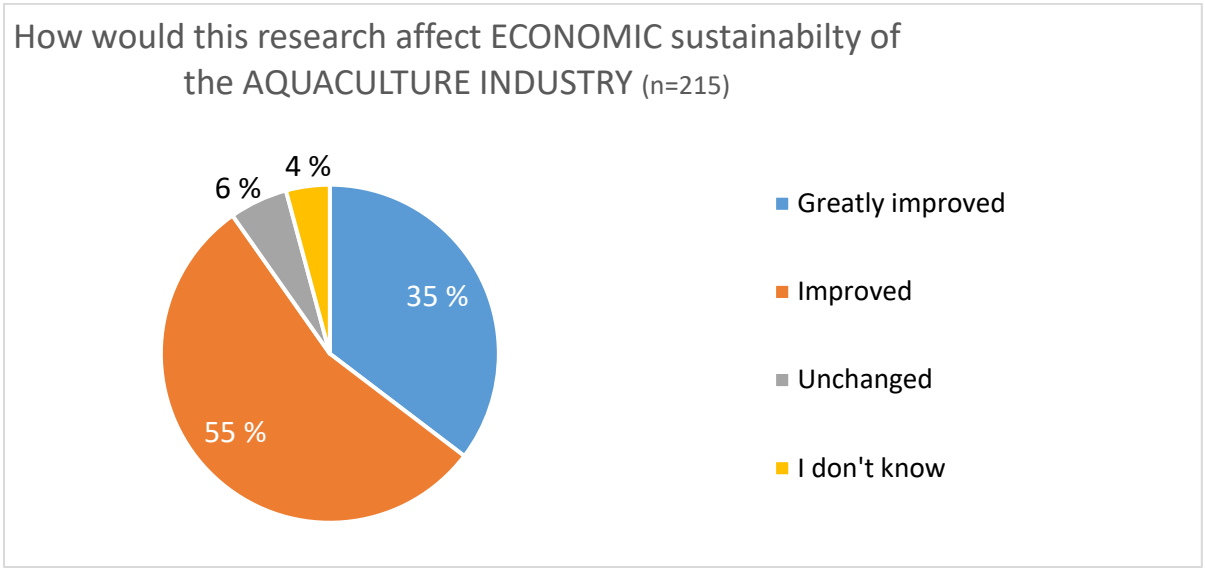


Figure 2: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).

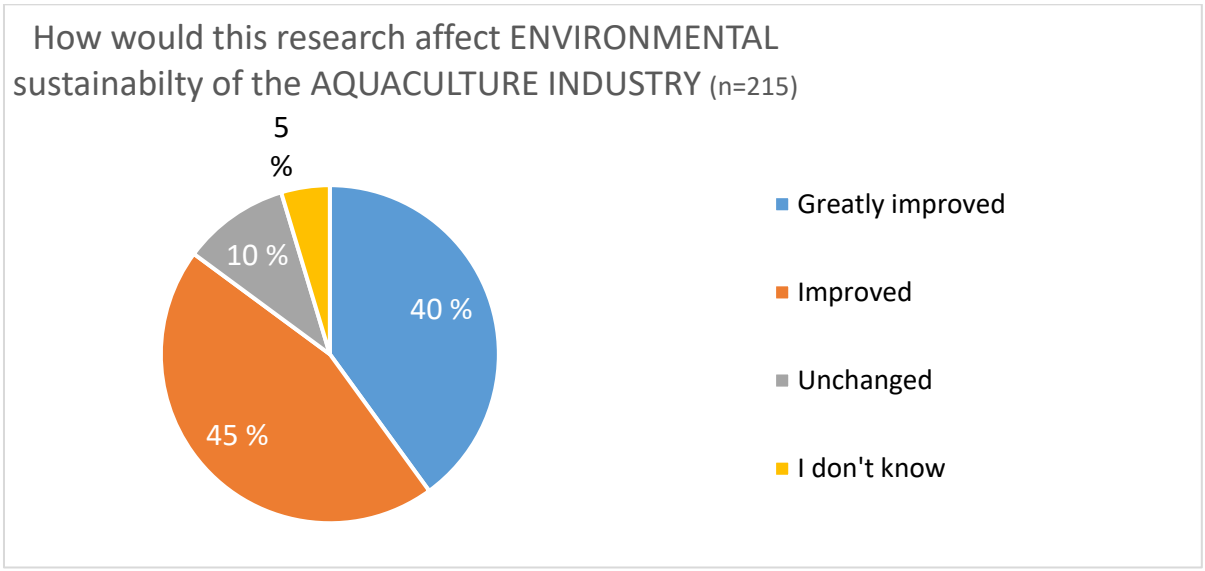


Figure 3: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability (AquaVitae stakeholder survey, to 12 May 2022).

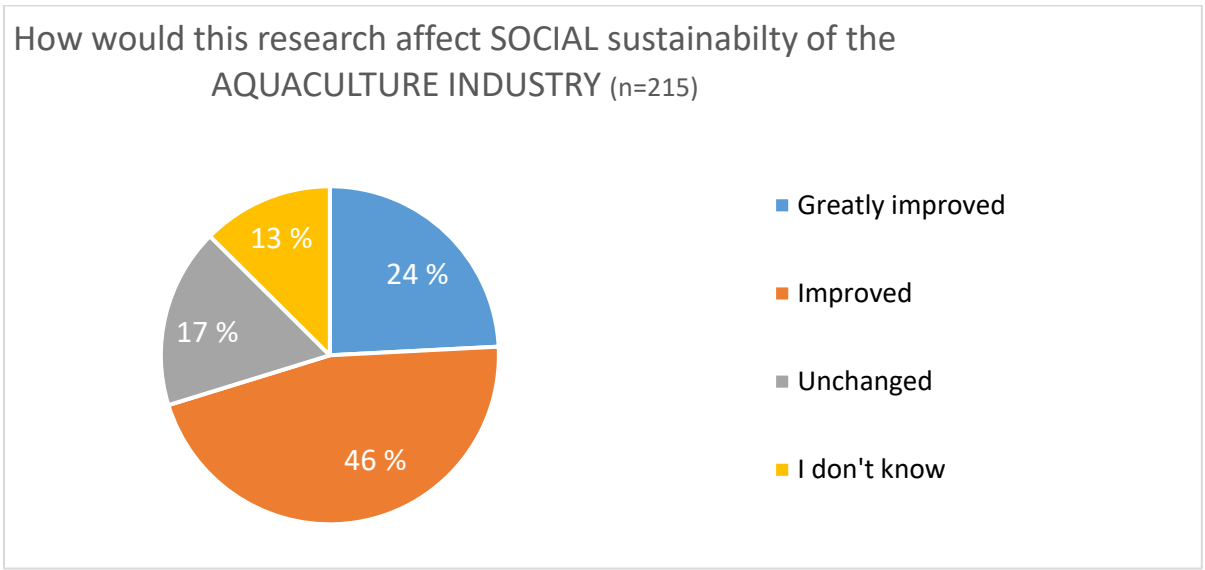


Figure 4: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

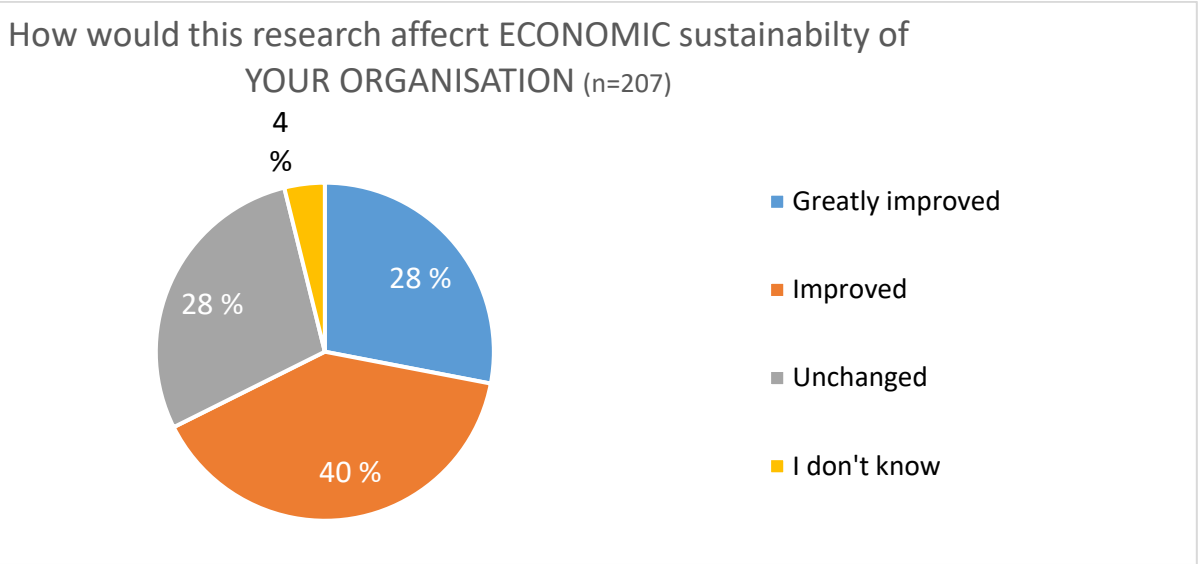


Figure 5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders' organisations (AquaVitae stakeholder survey, to 12 May 2022).

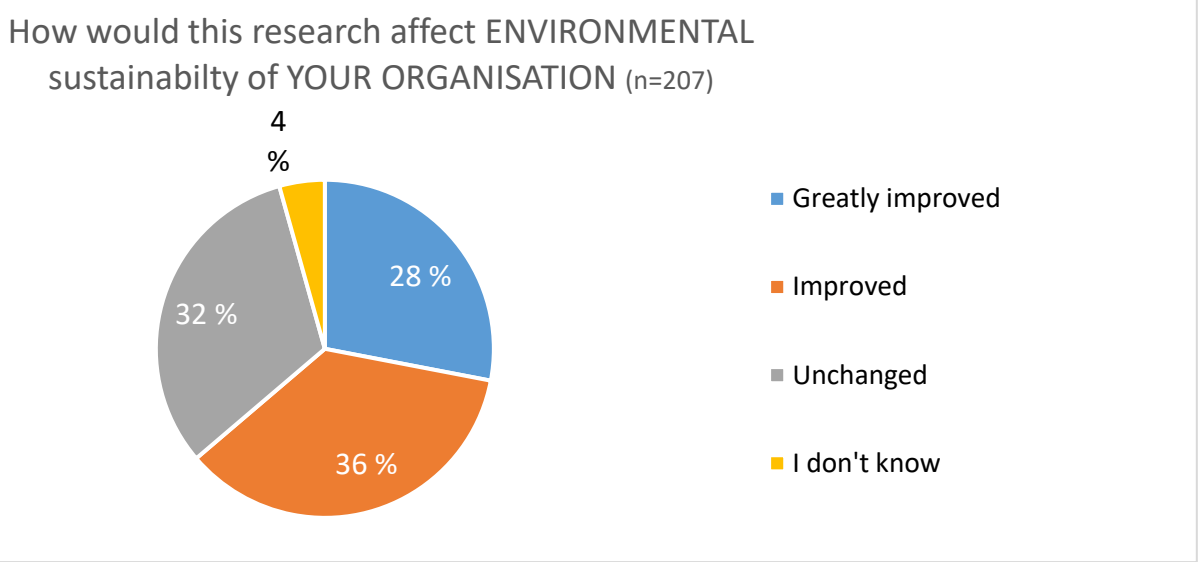


Figure 6: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

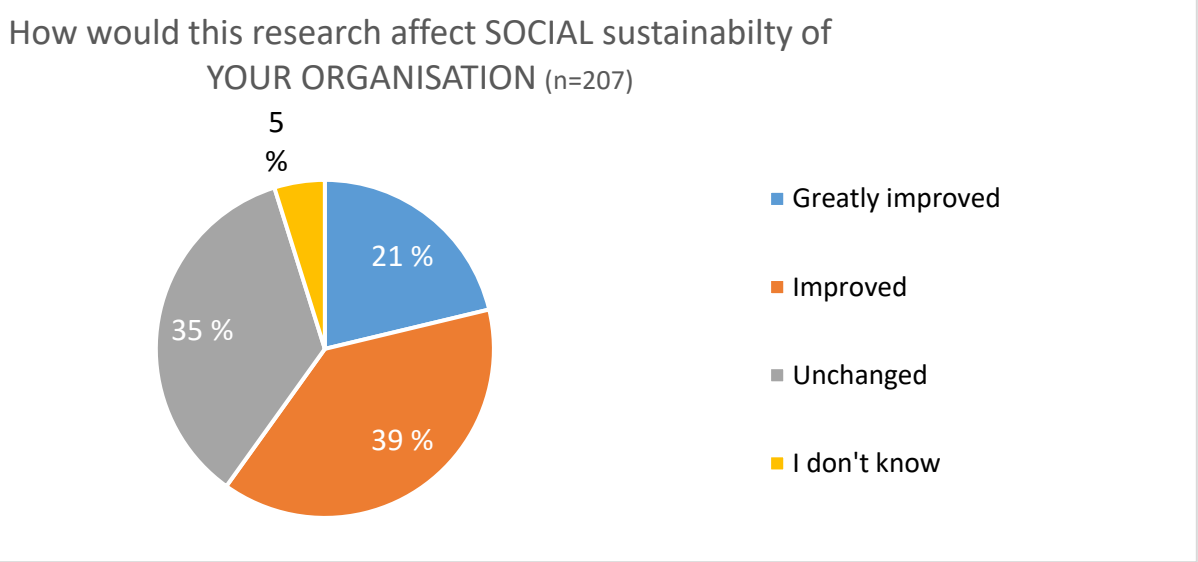


Figure 7 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

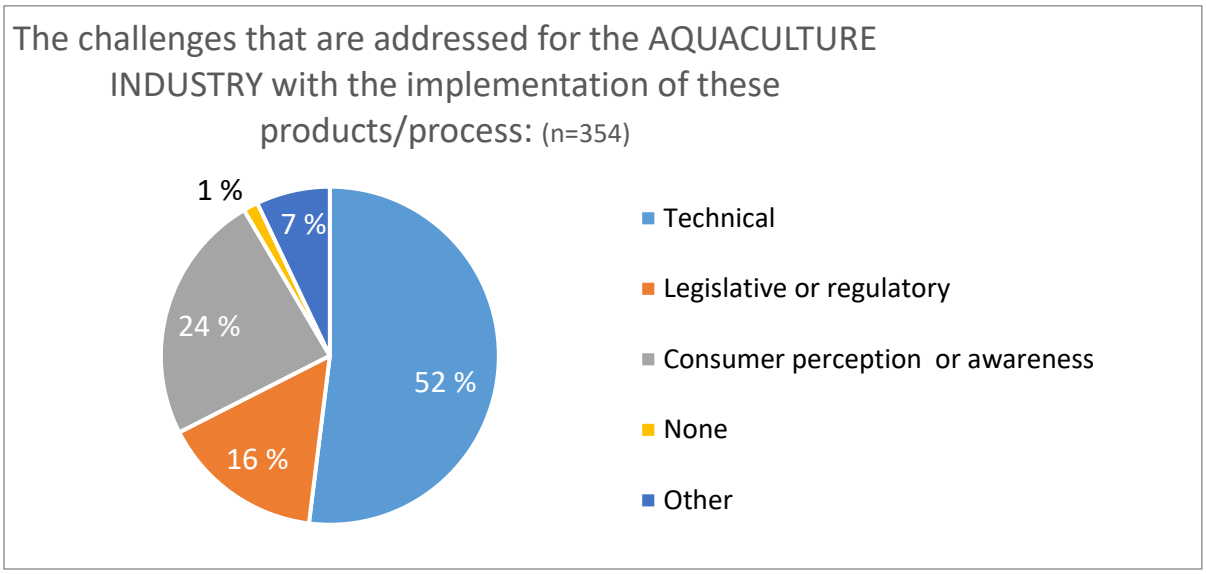


Figure 8: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

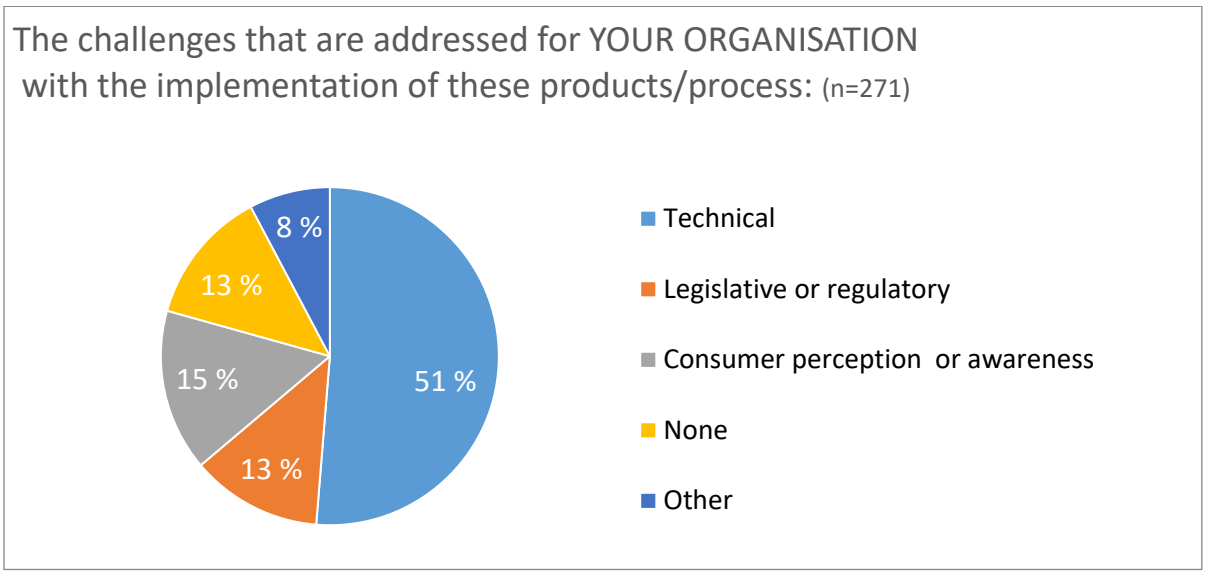


Figure 9: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

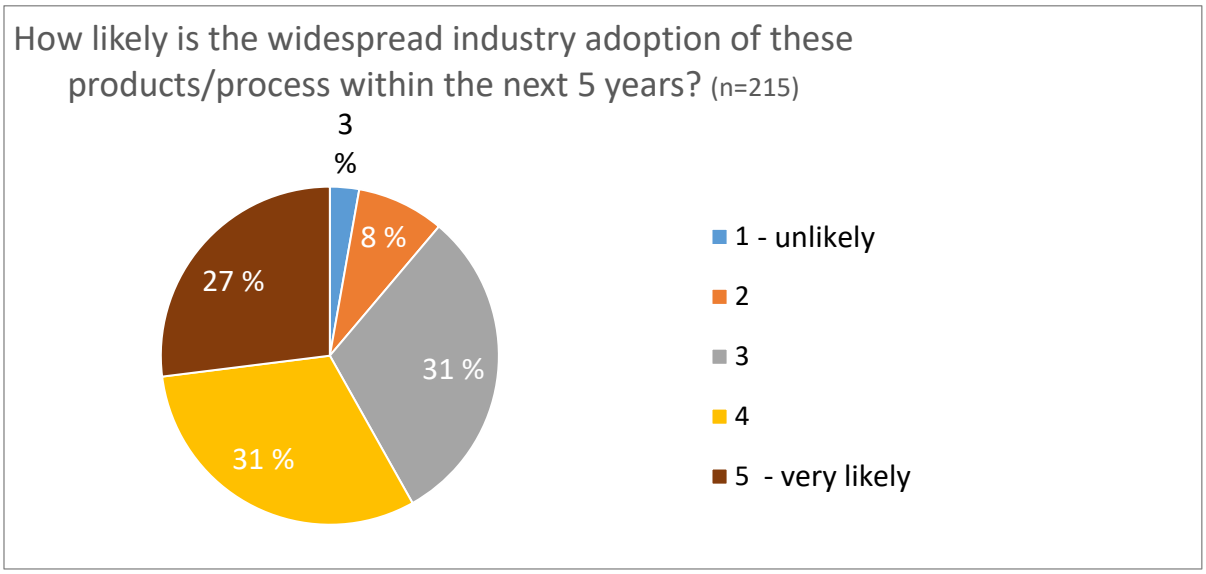


Figure 10: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

CASE STUDY 1 – New algal species

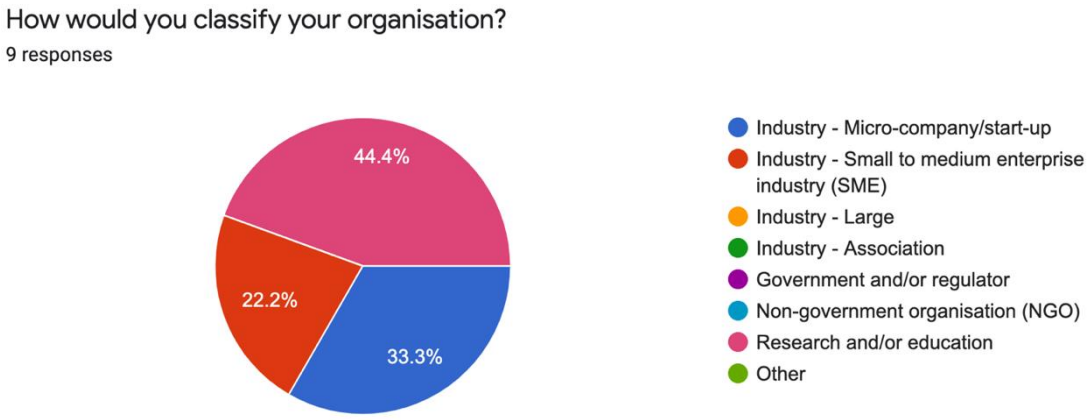


Figure 1.1: Respondent relation to the AquaVitae Project (AquaVitae stakeholder survey, to 12 May 2022).

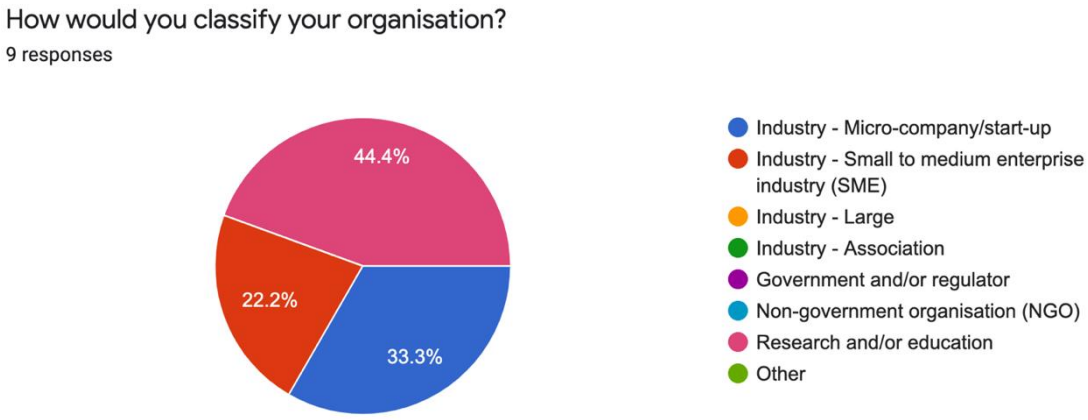


Figure 1.2: Respond's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).

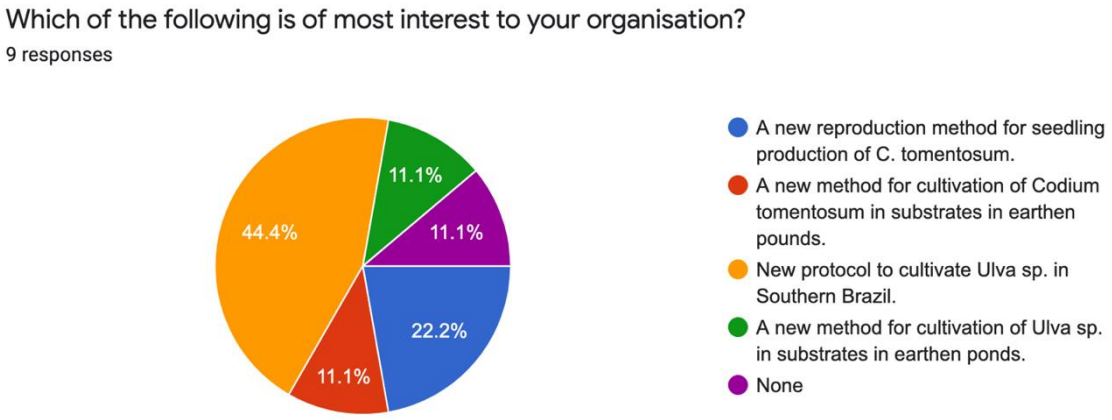


Figure 1.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

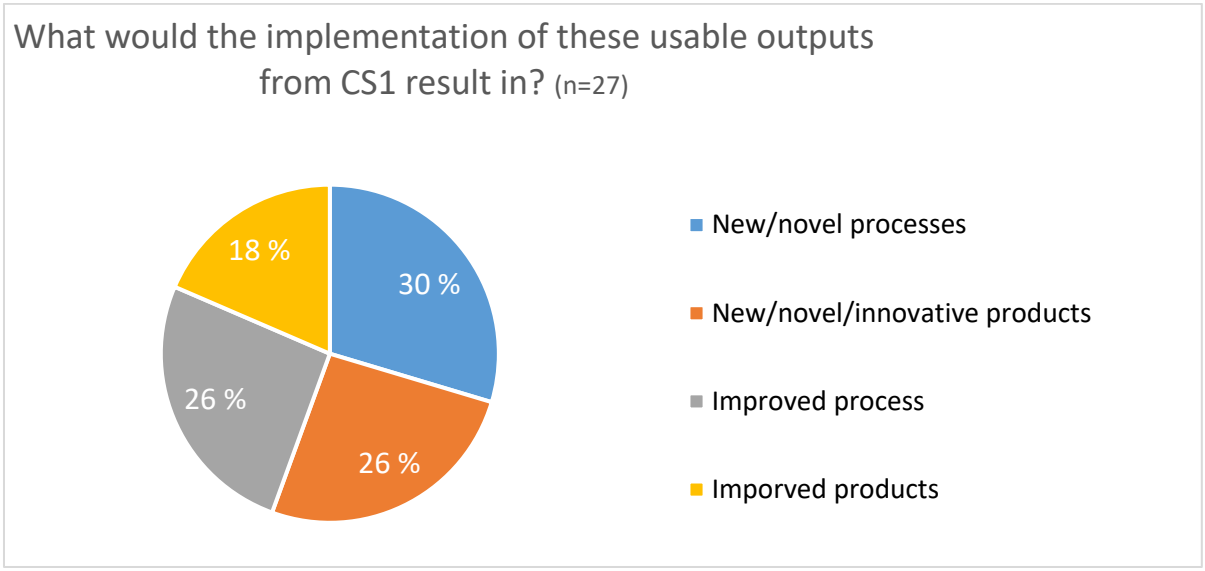


Figure 1.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

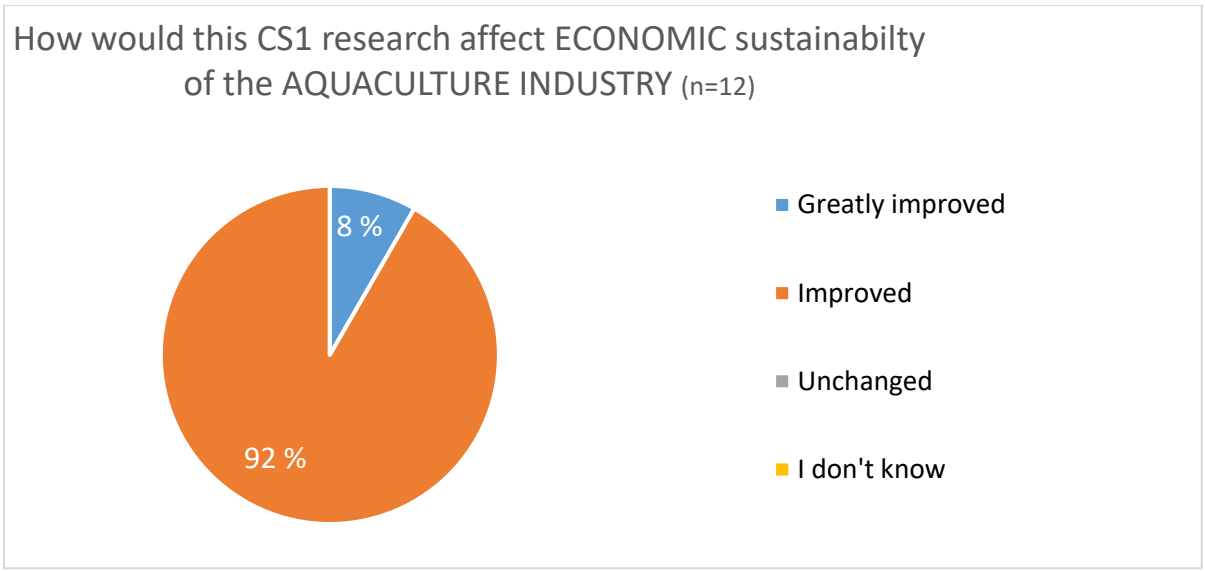


Figure 1.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).

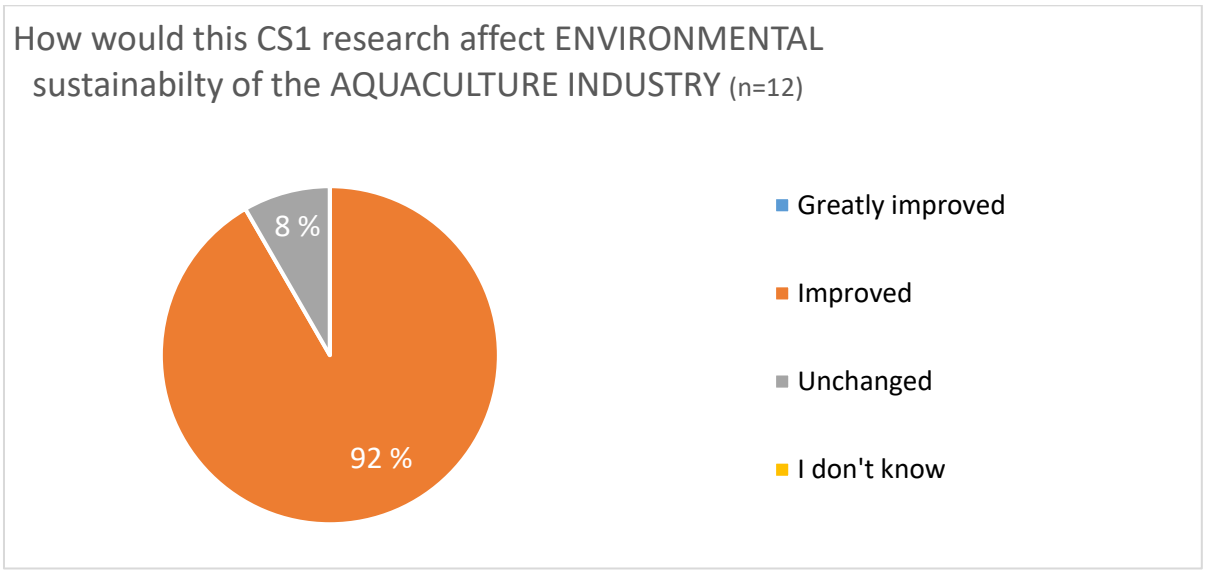


Figure 1.6: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability (AquaVitae stakeholder survey, to 12 May 2022).

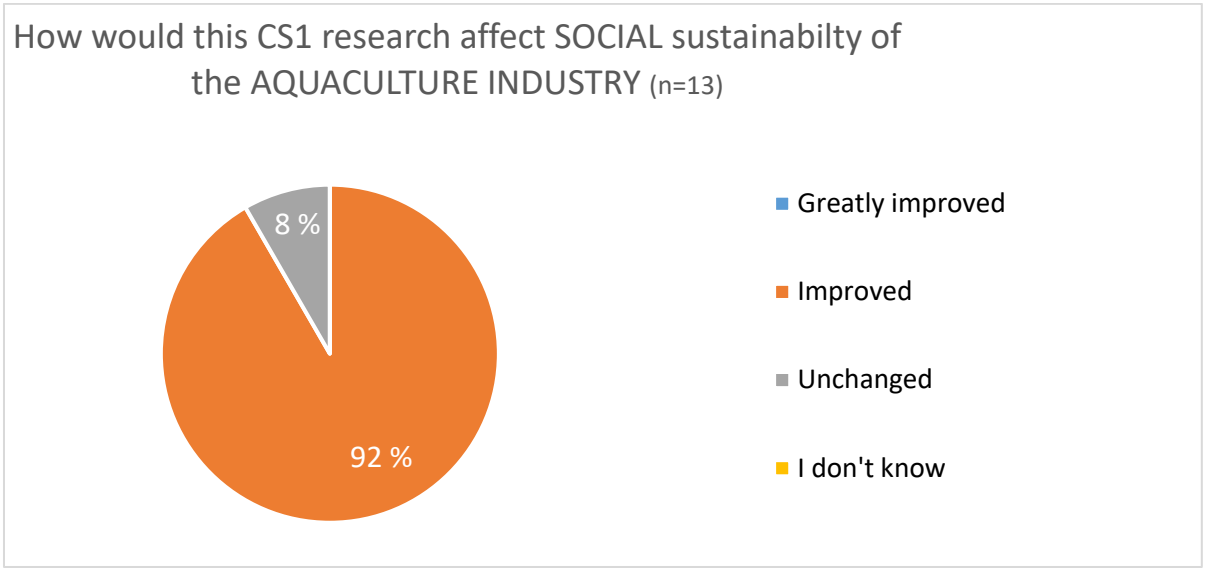


Figure 1.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

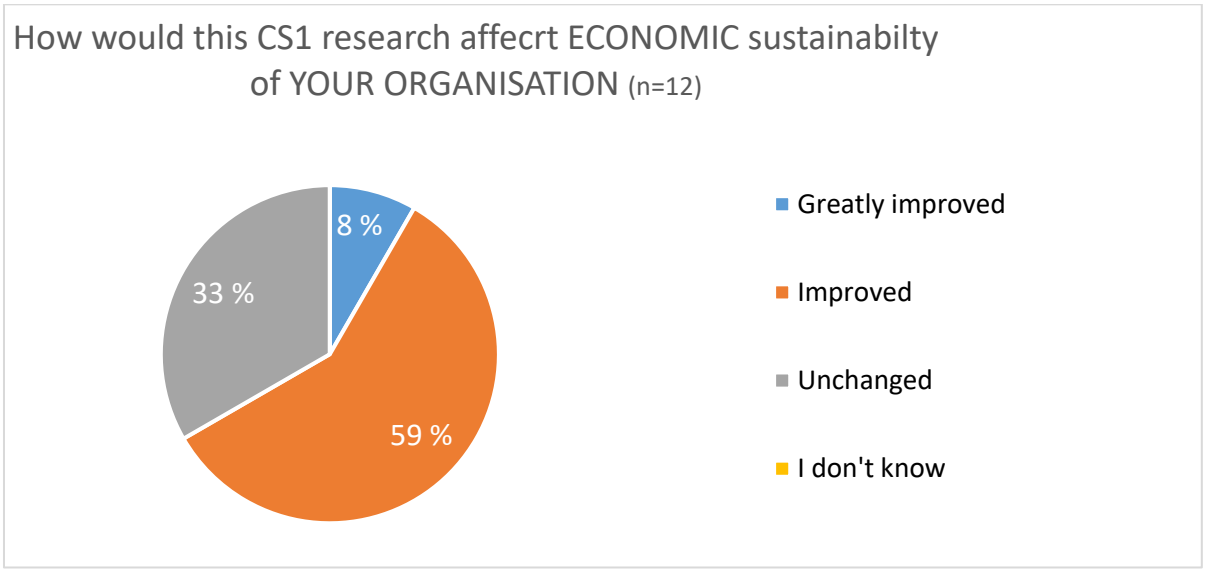


Figure 1.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

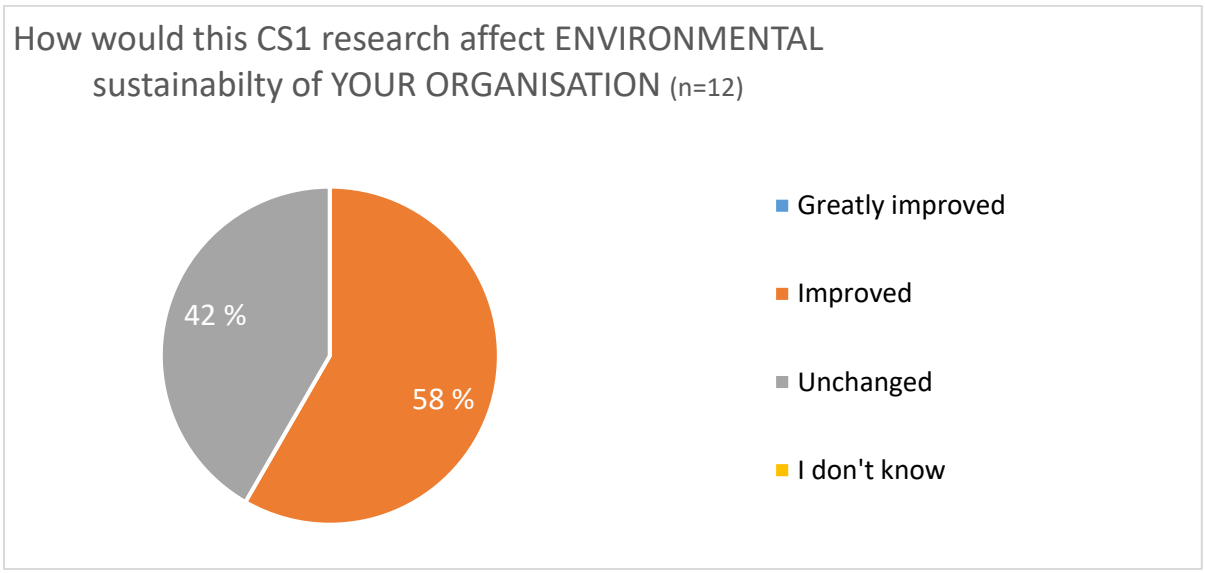


Figure 1.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

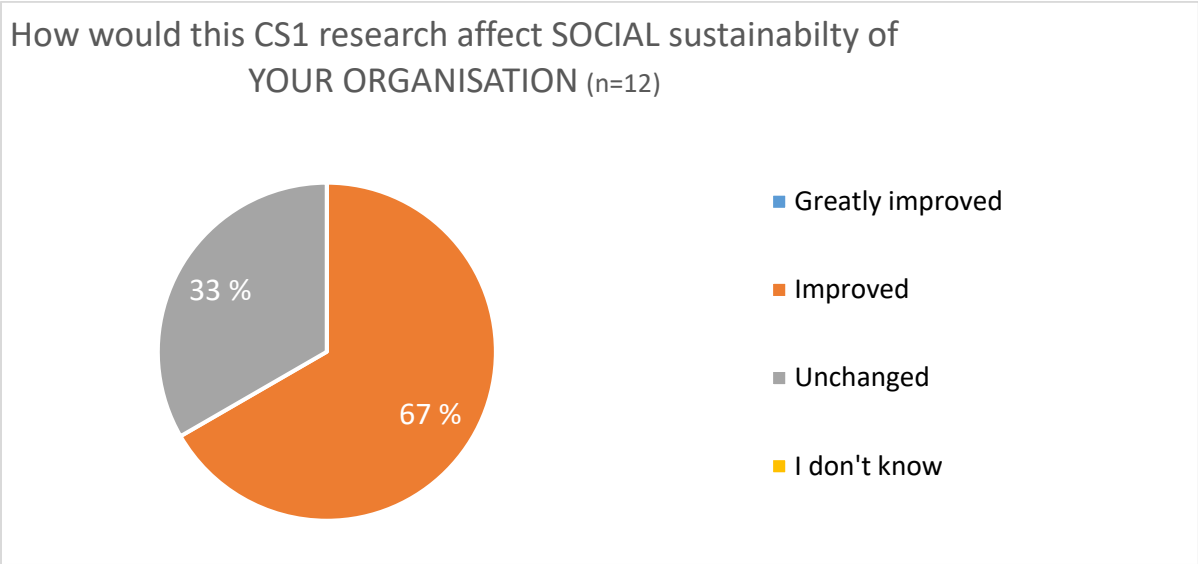


Figure 1.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

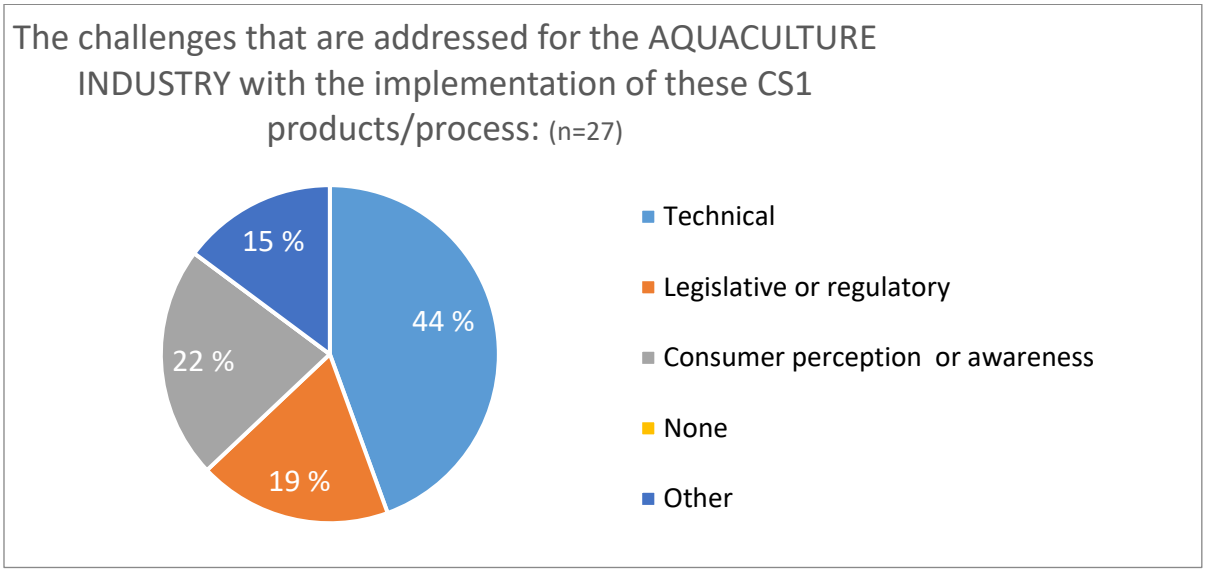


Figure 1.11: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

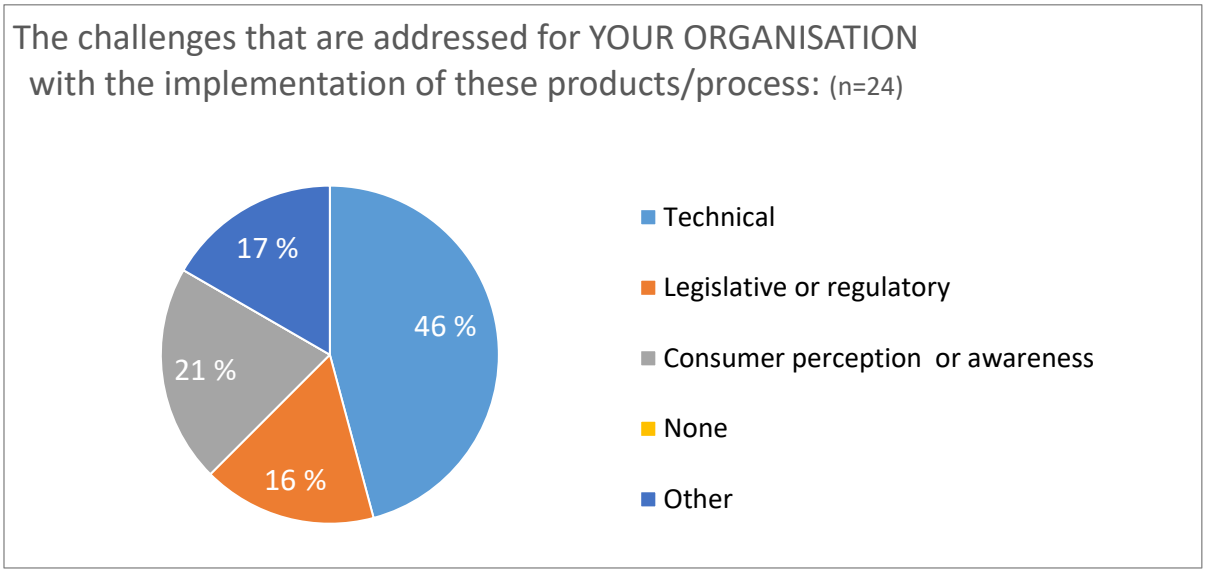


Figure 1.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

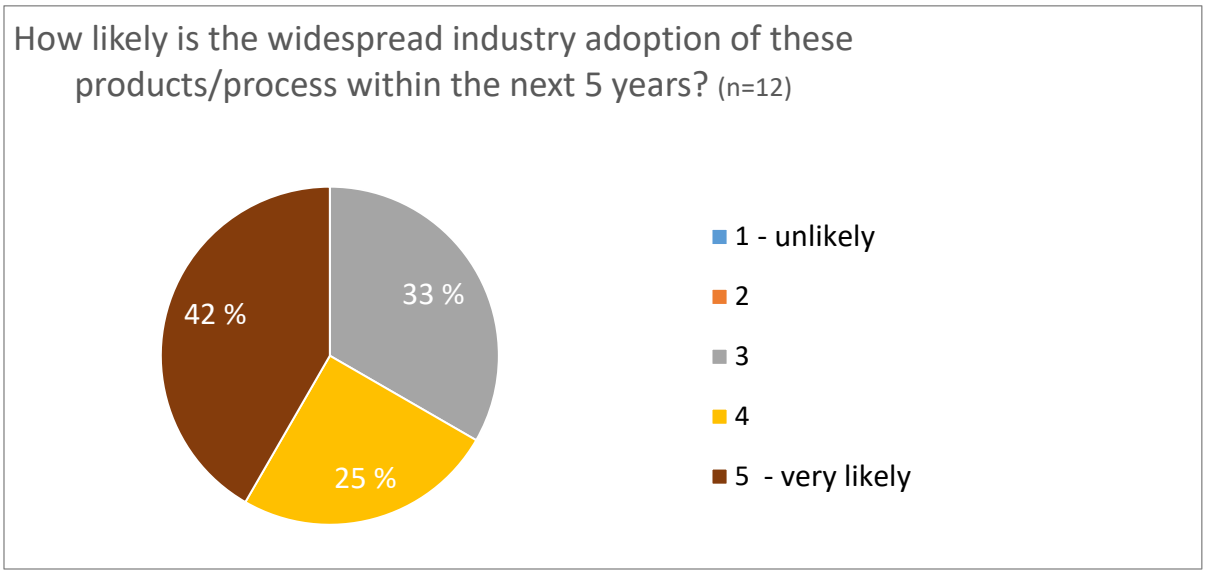


Figure 1.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

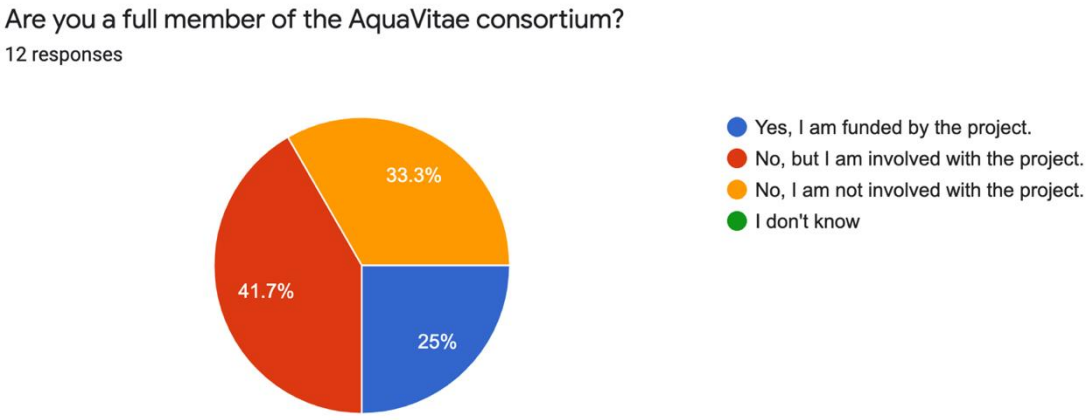


Figure 2.1: Respondent relation to the AquaVitae Project (AquaVitae stakeholder survey, to 12 May 2022).

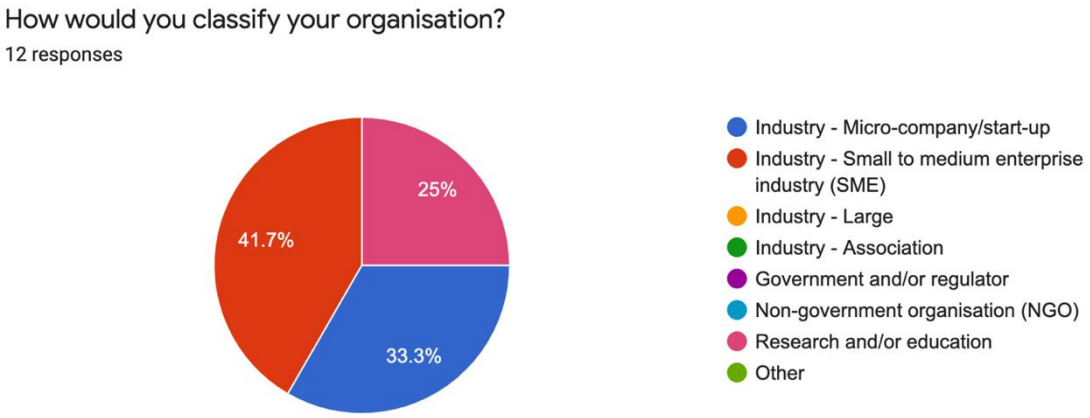


Figure 2.2: Respondent's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).

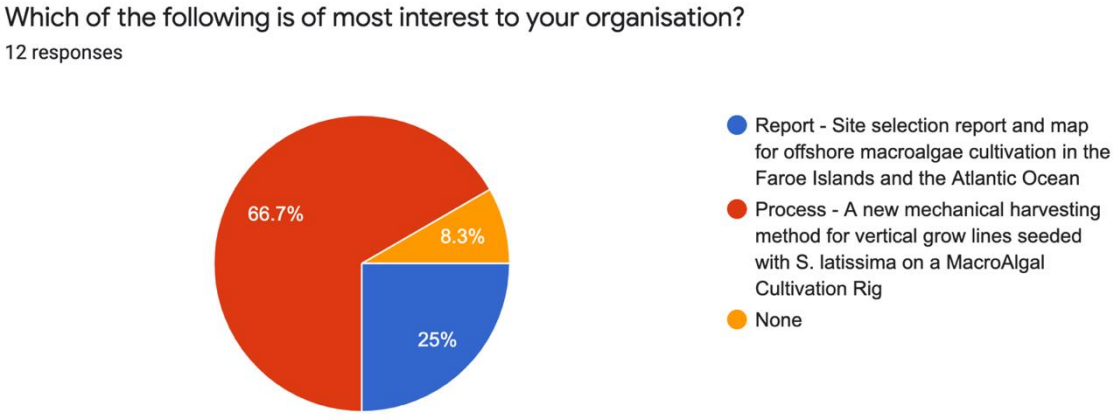


Figure 2.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

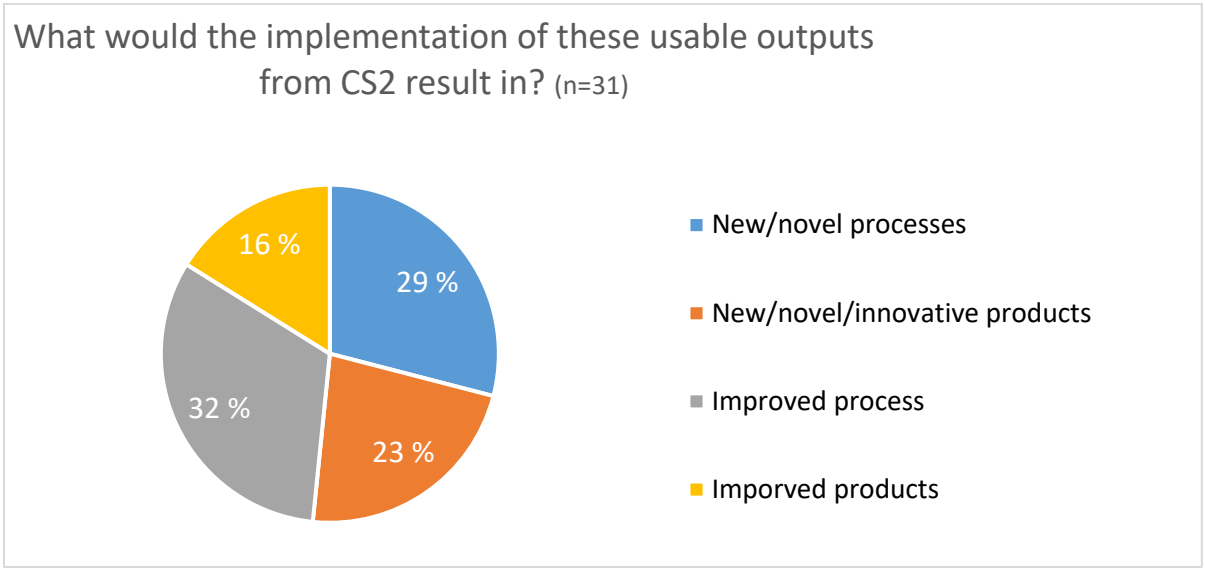


Figure 2.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

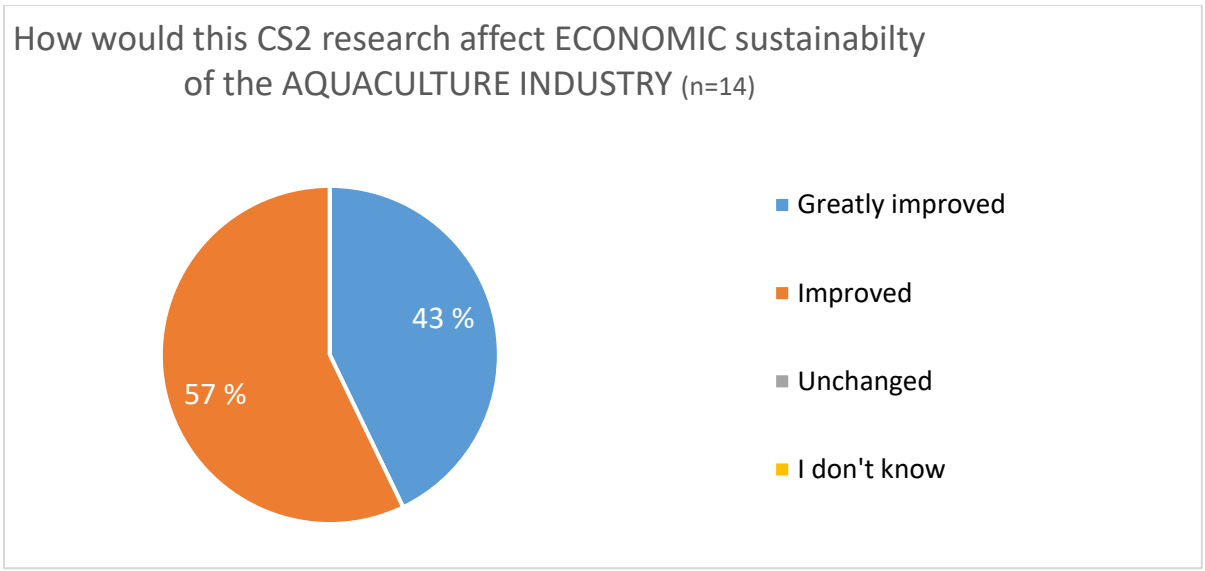


Figure 2.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).

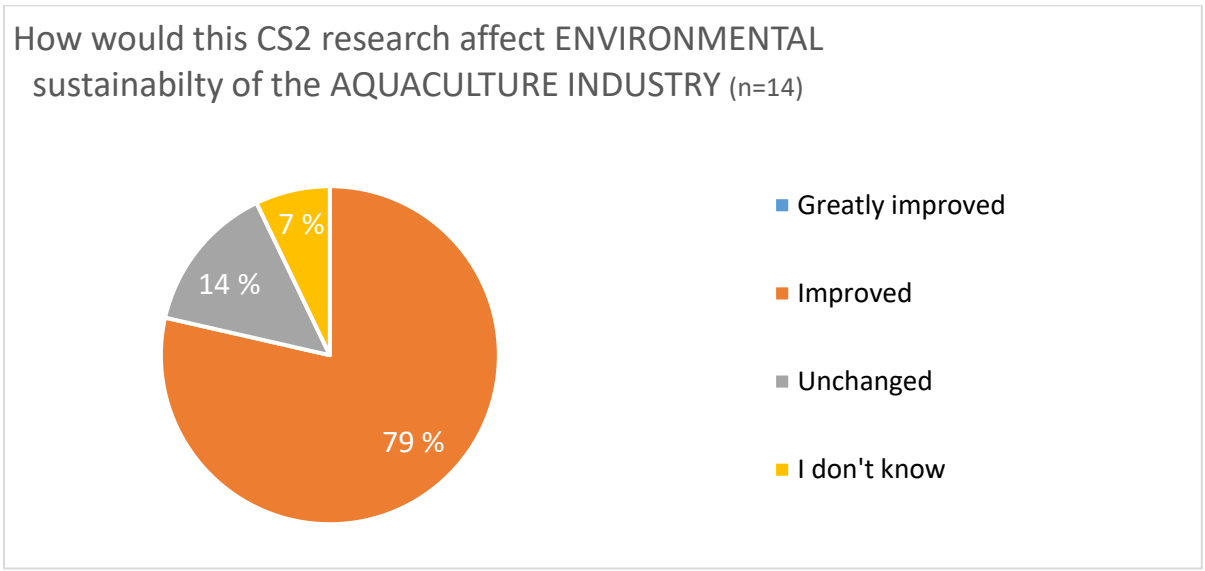


Figure 2.6: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability (AquaVitae stakeholder survey, to 12 May 2022).

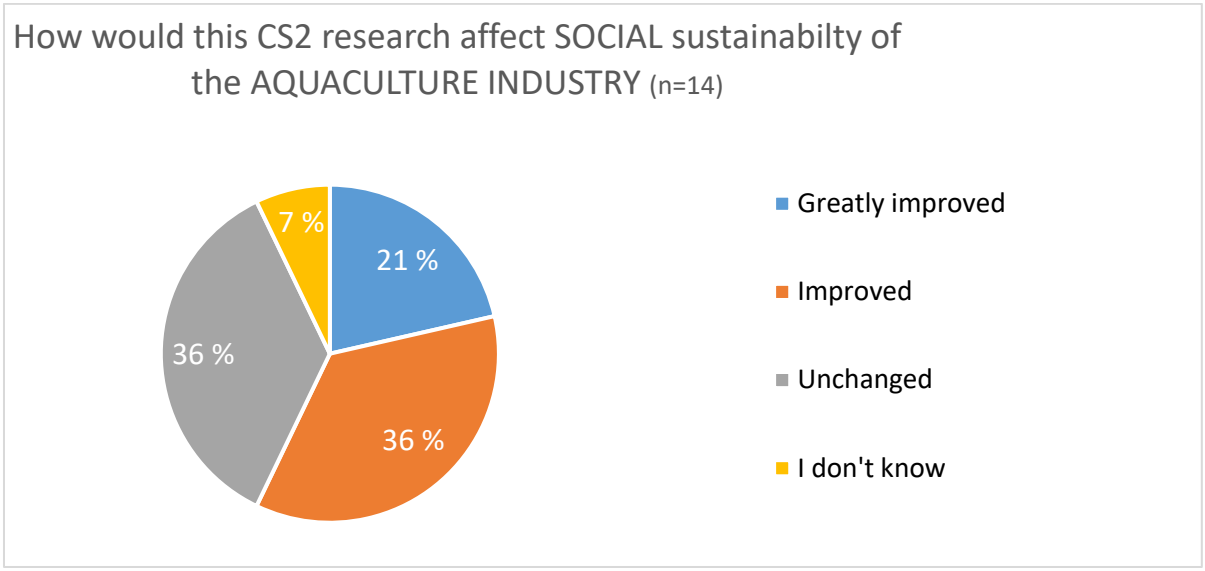


Figure 2.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

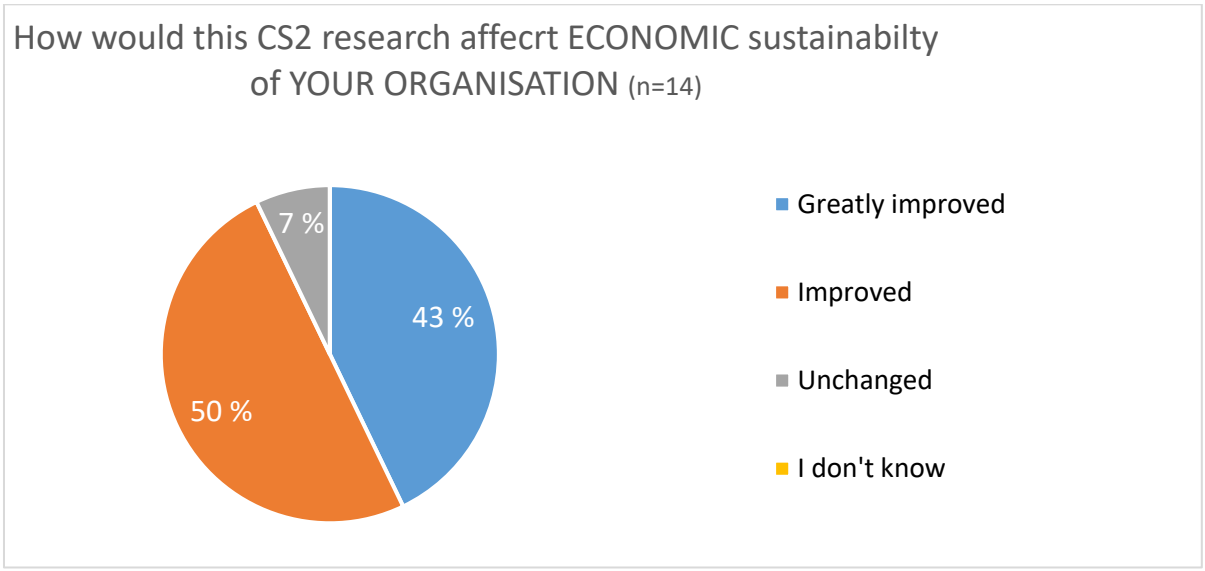


Figure 2.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

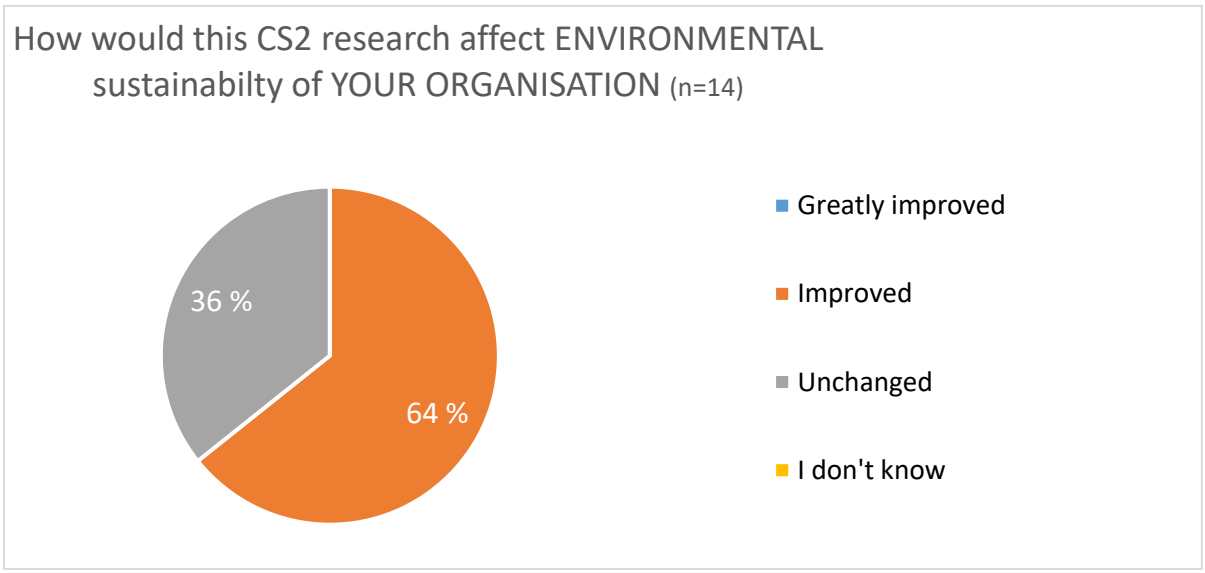


Figure 2.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

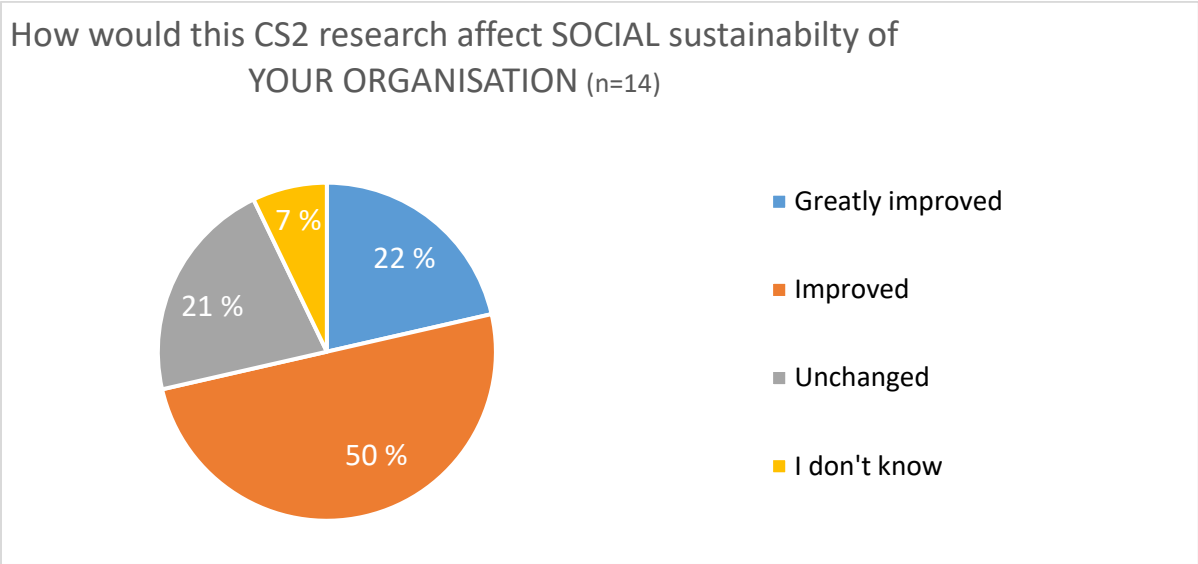


Figure 2.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

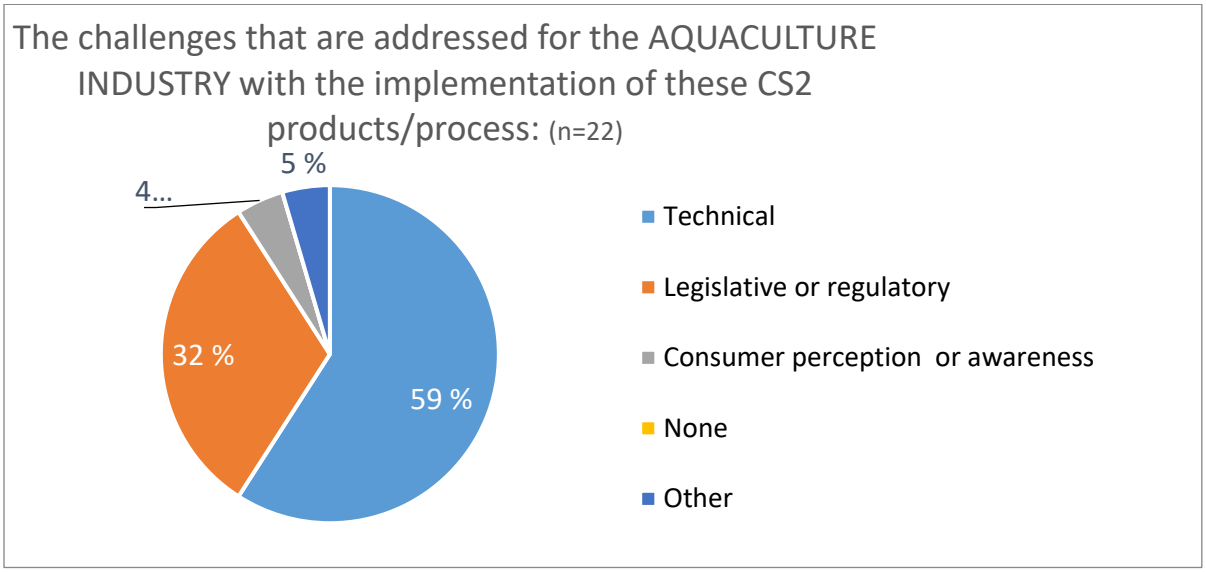


Figure 2.11: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

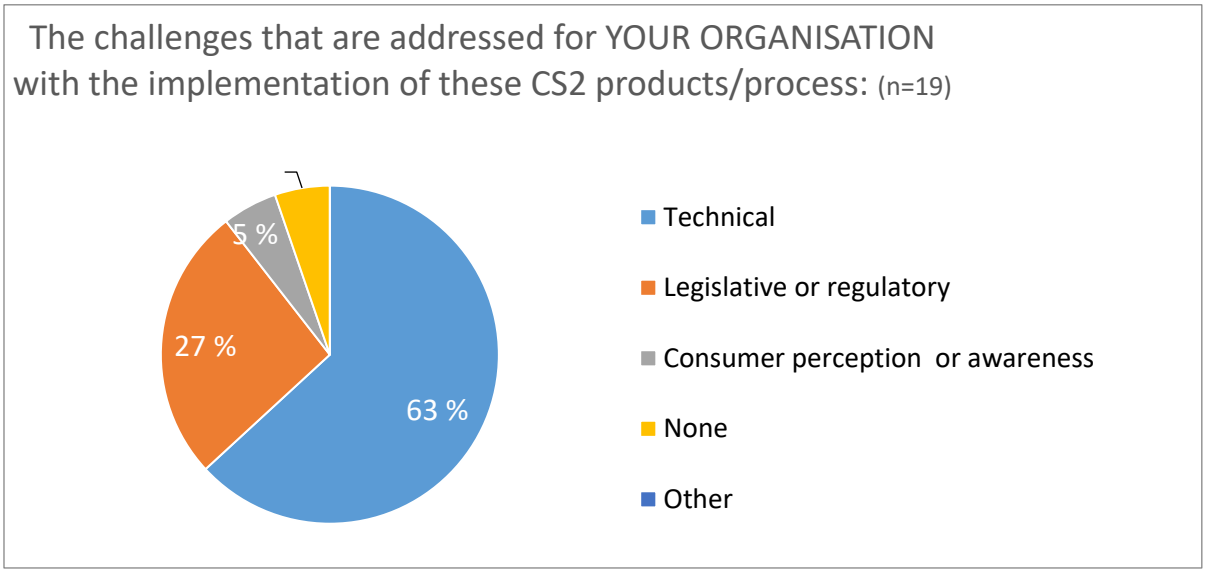


Figure 2.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

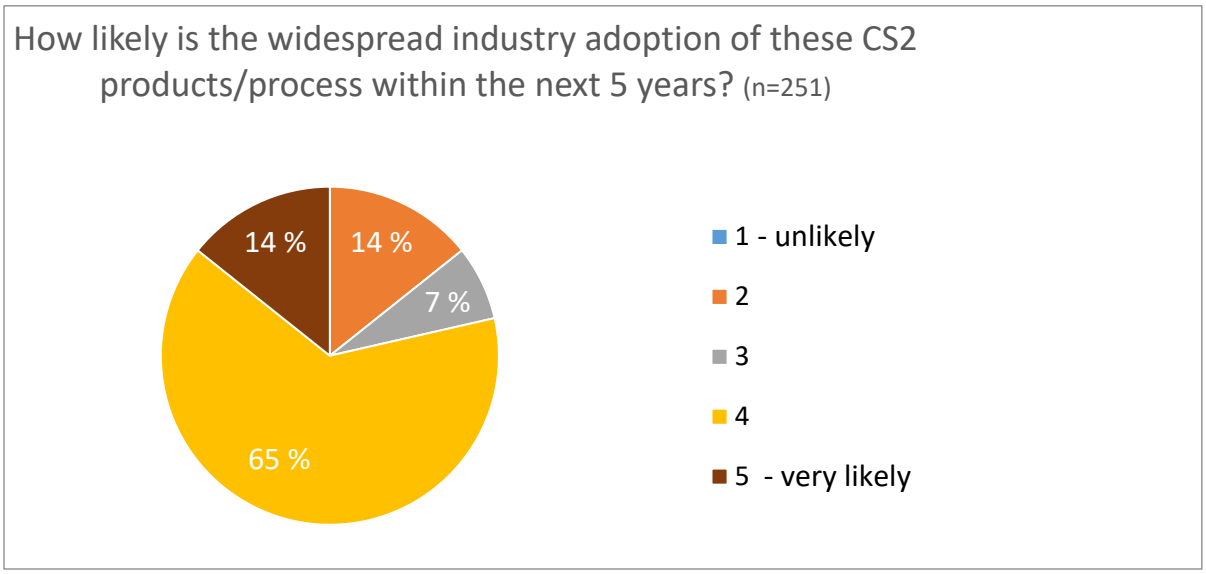


Figure 2.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

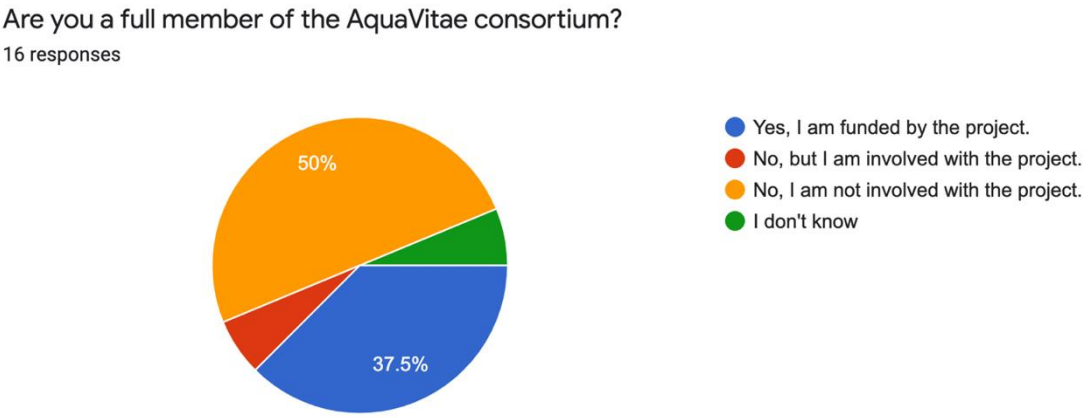


Figure 3.1: Respondent relation to the AquaVitae Project (AquaVitae stakeholder survey, to 12 May 2022).

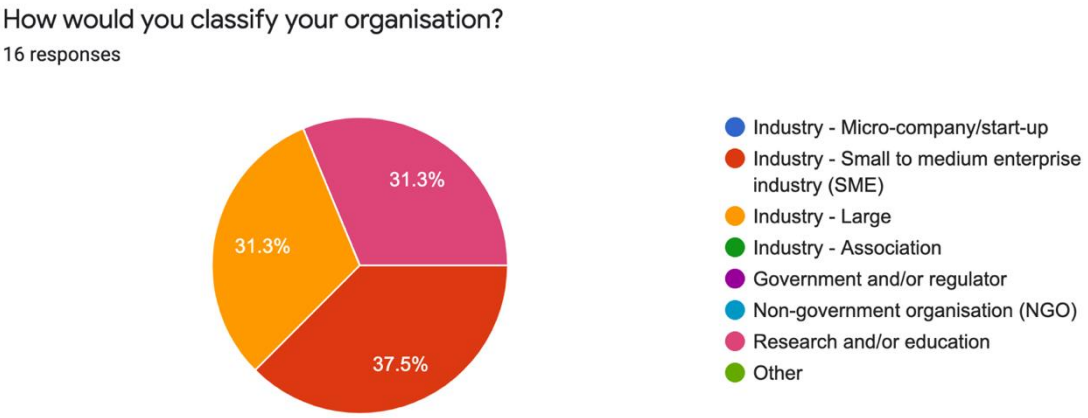


Figure 3.2: Respond's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).

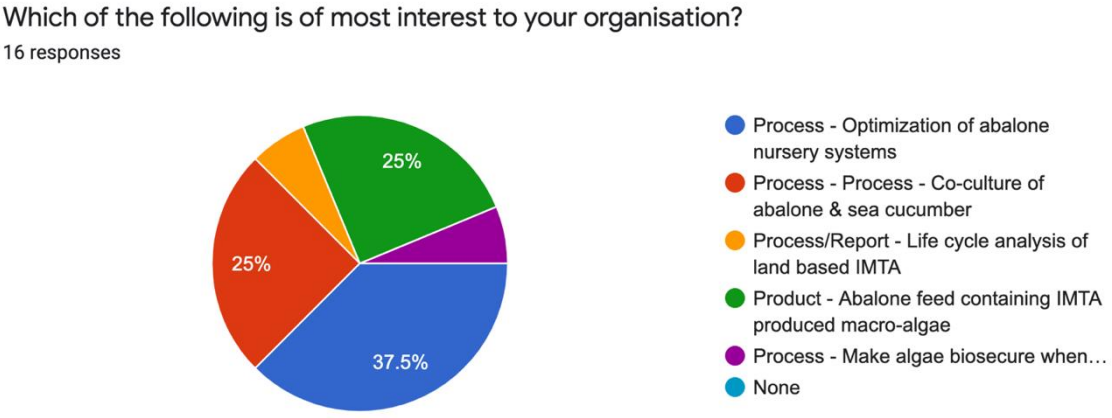


Figure 3.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

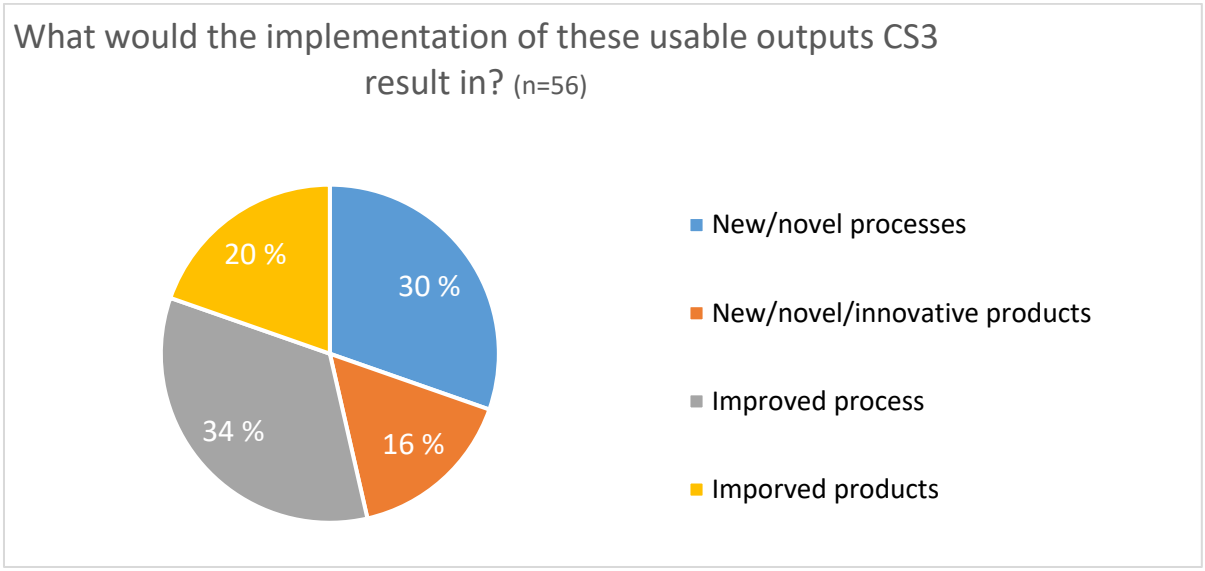


Figure 3.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

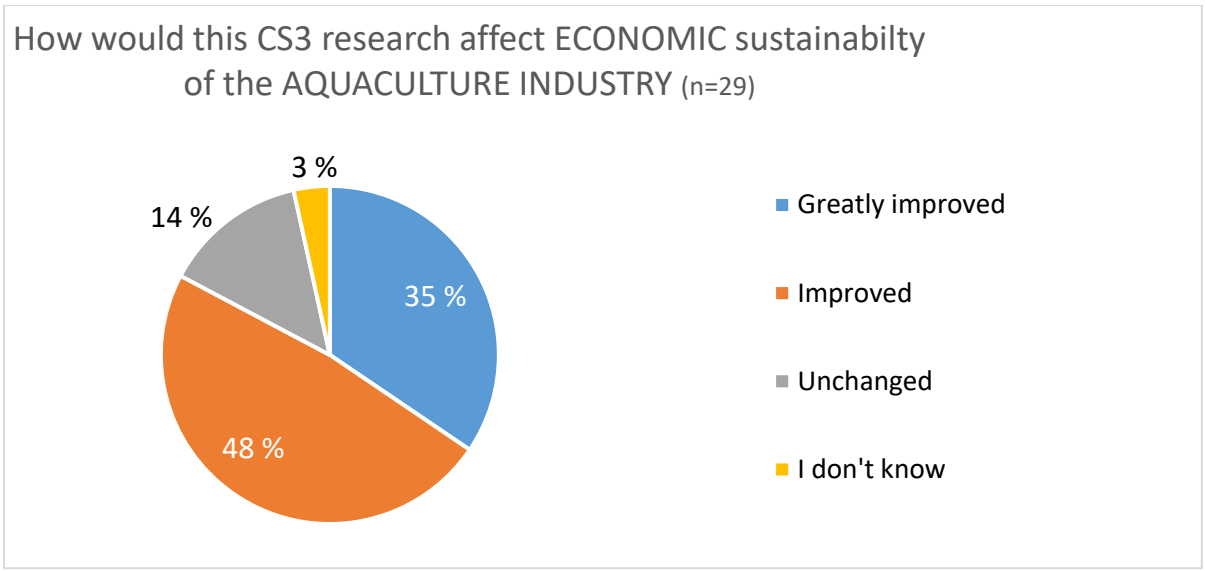
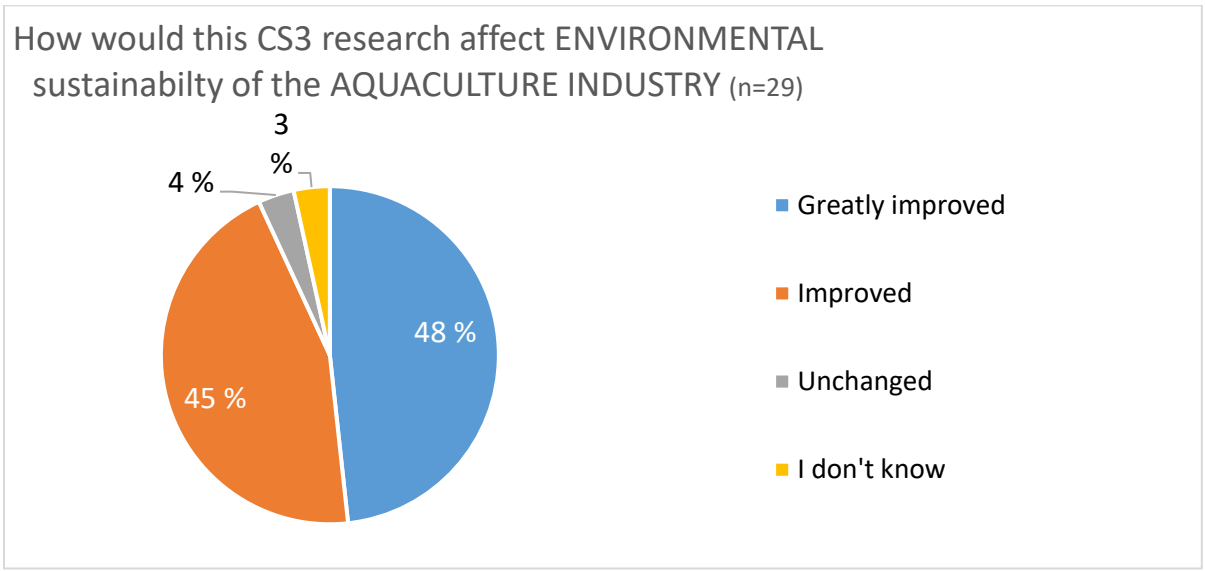


Figure 3.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).



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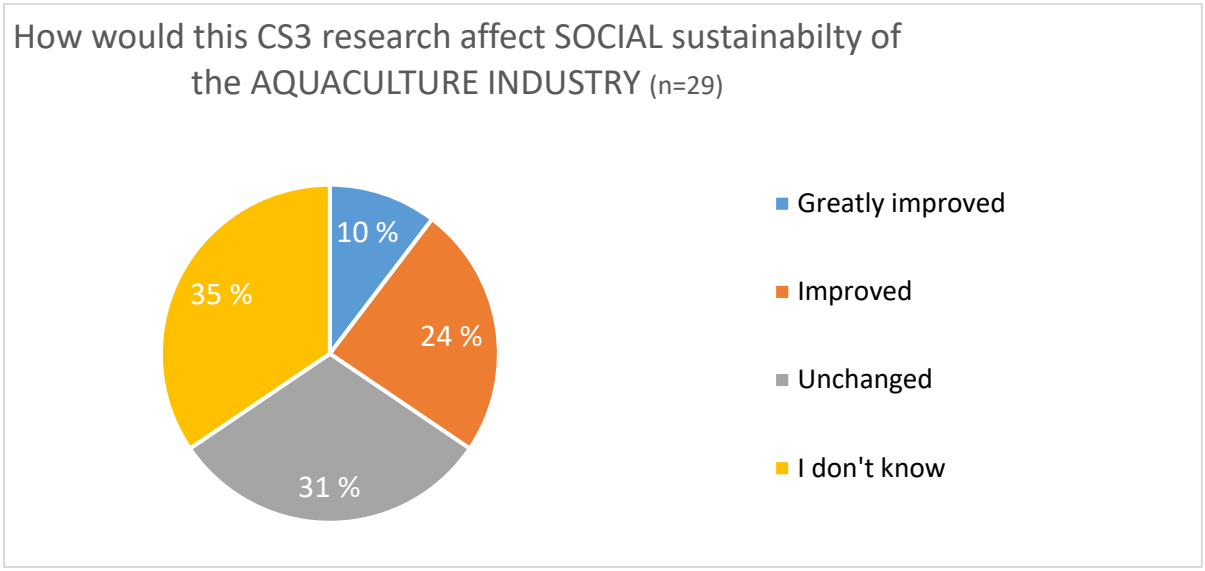


Figure 3.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

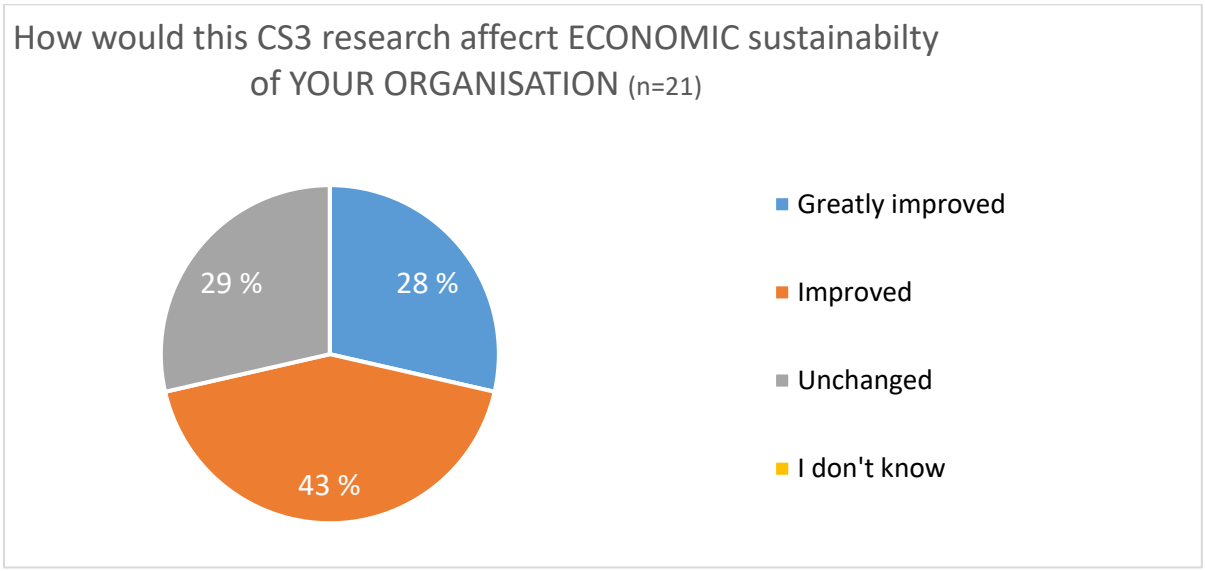


Figure 3.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

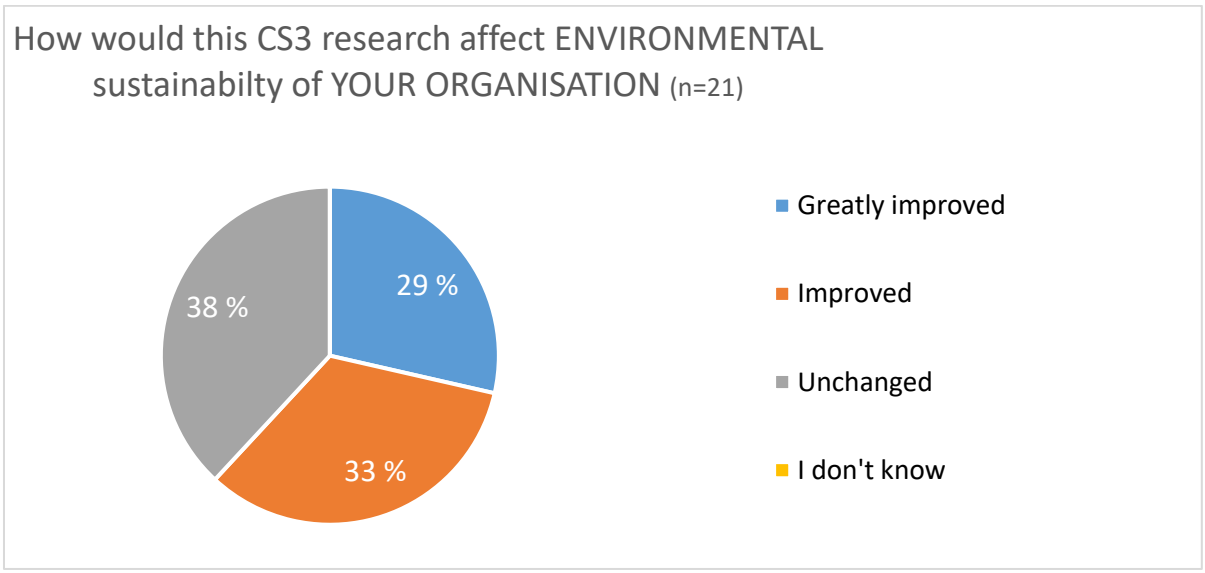


Figure 3.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

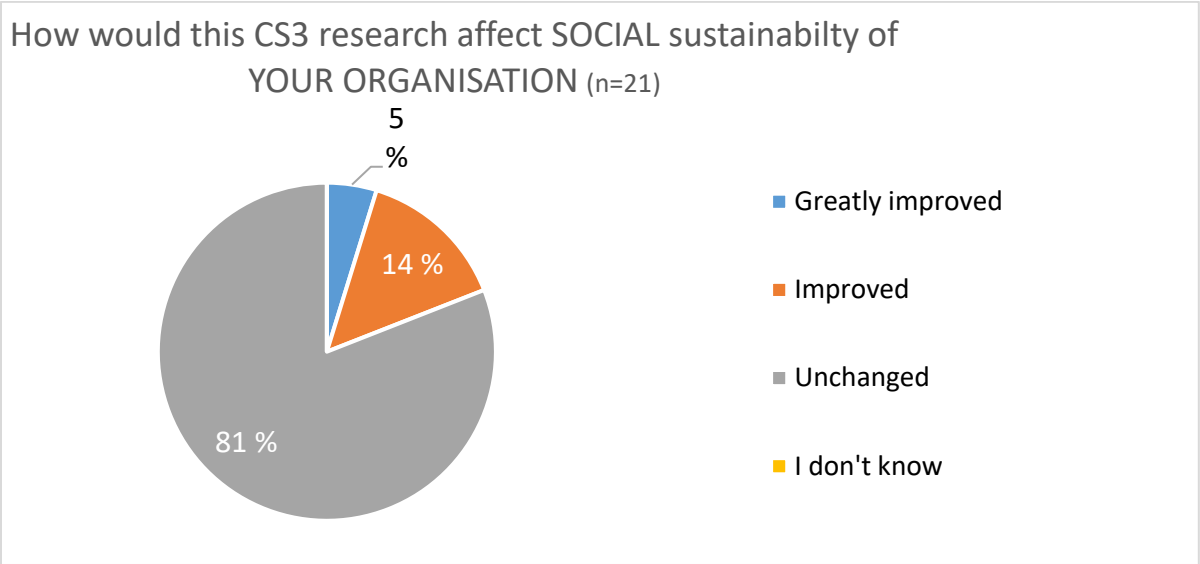


Figure 3.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

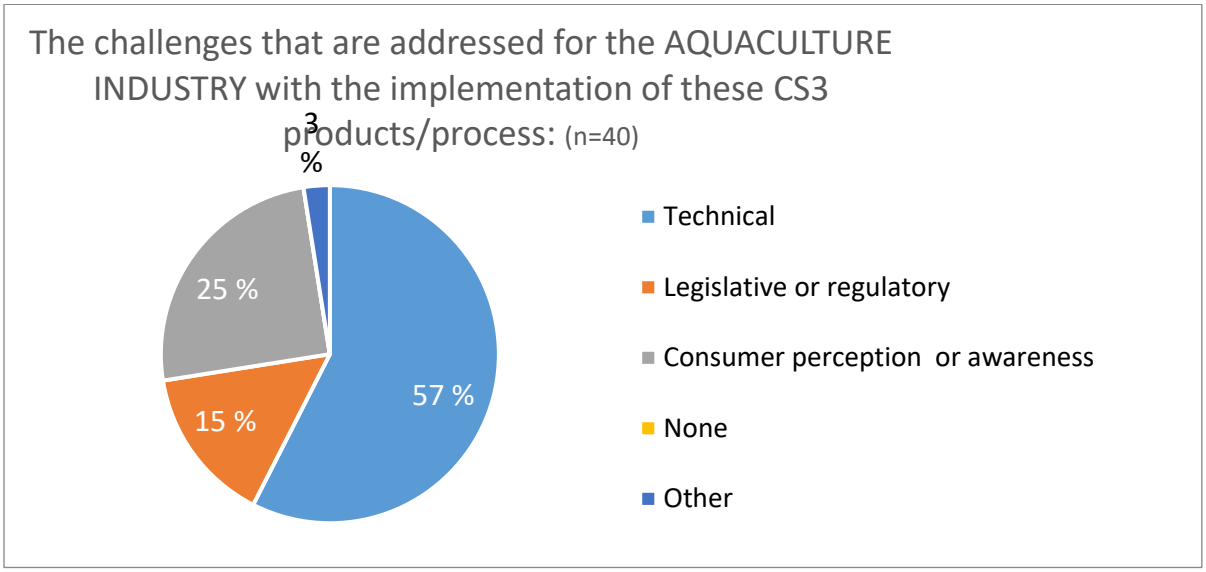


Figure 3.11: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

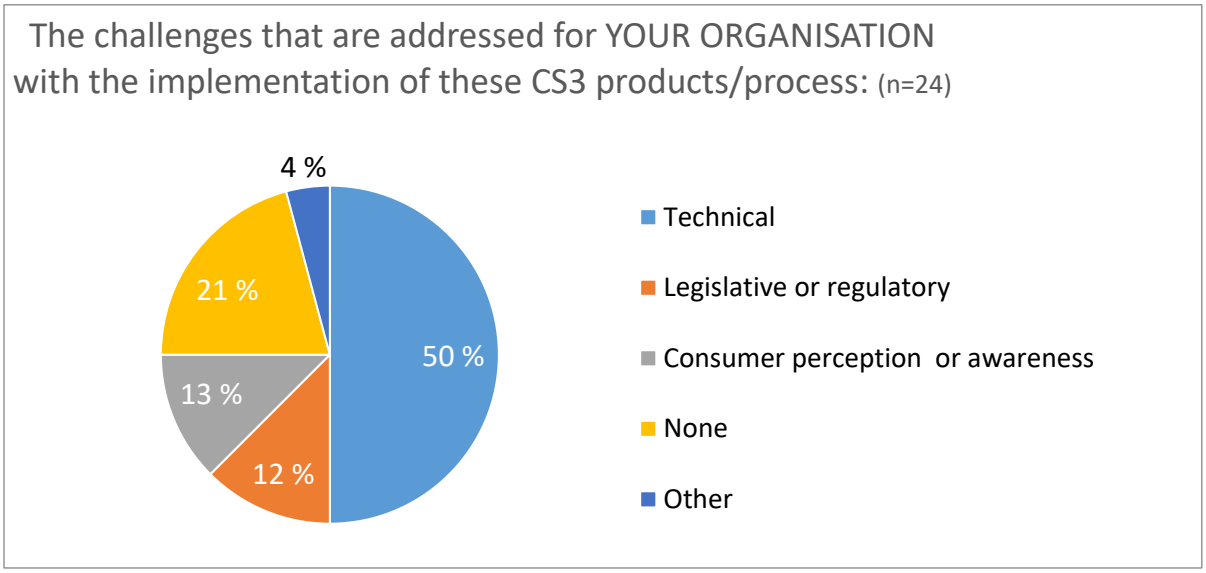


Figure 3.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

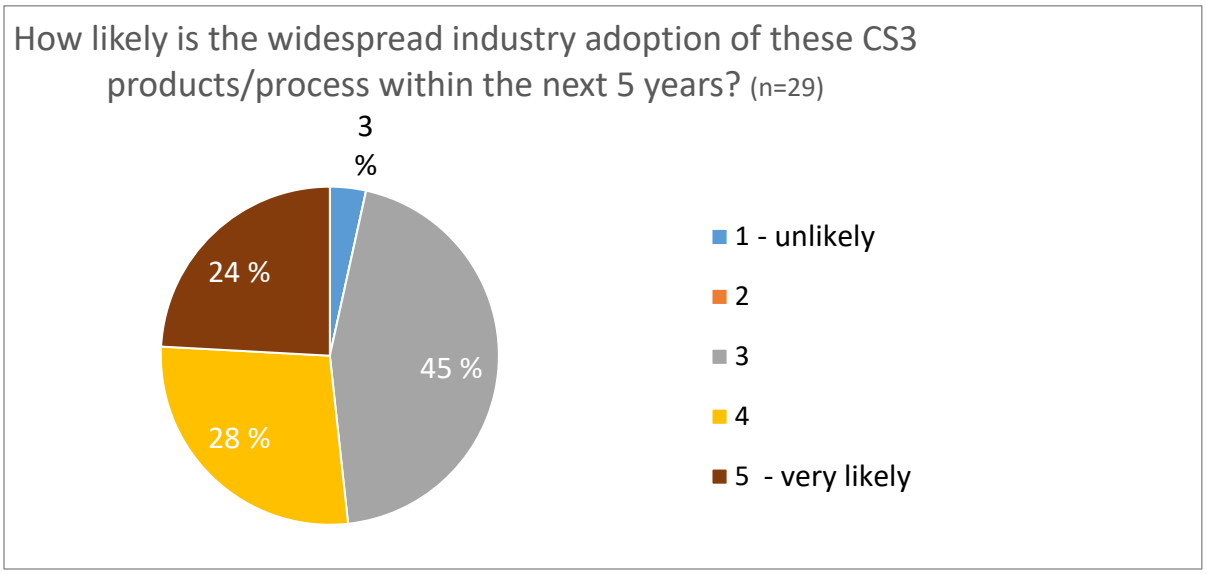


Figure 3.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

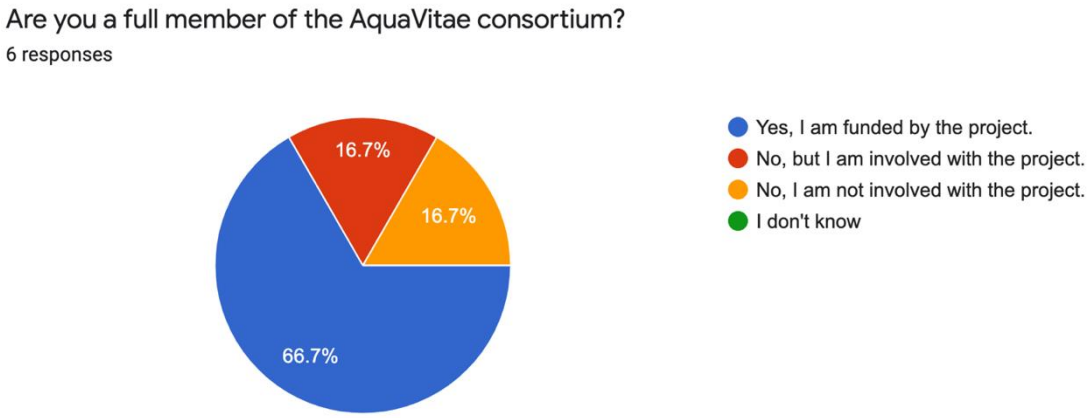


Figure 4.1: Respondent relation to the AquaVitae Project (AquaVitae stakeholder survey, to 12 May 2022).

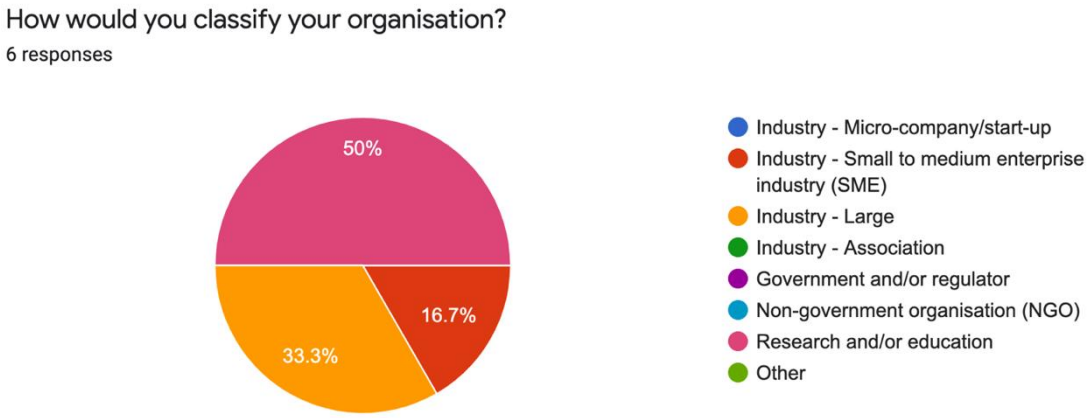


Figure 4.2: Respond's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).

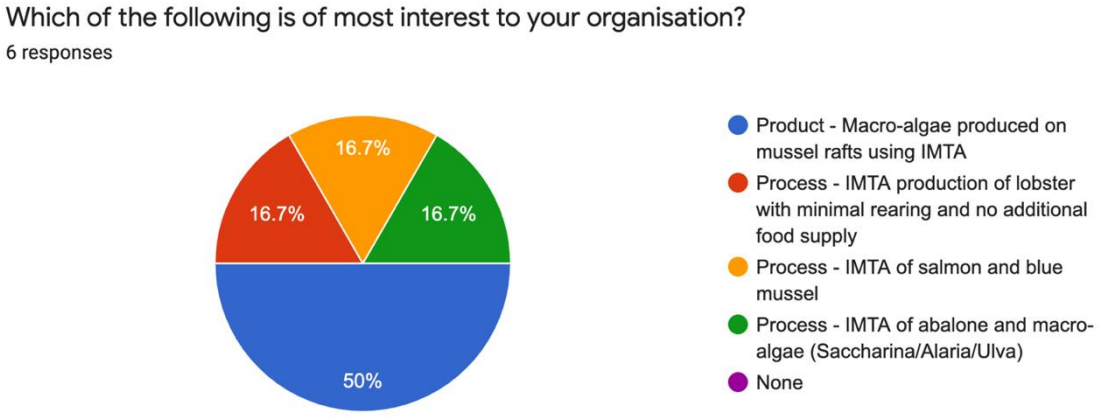


Figure 4.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

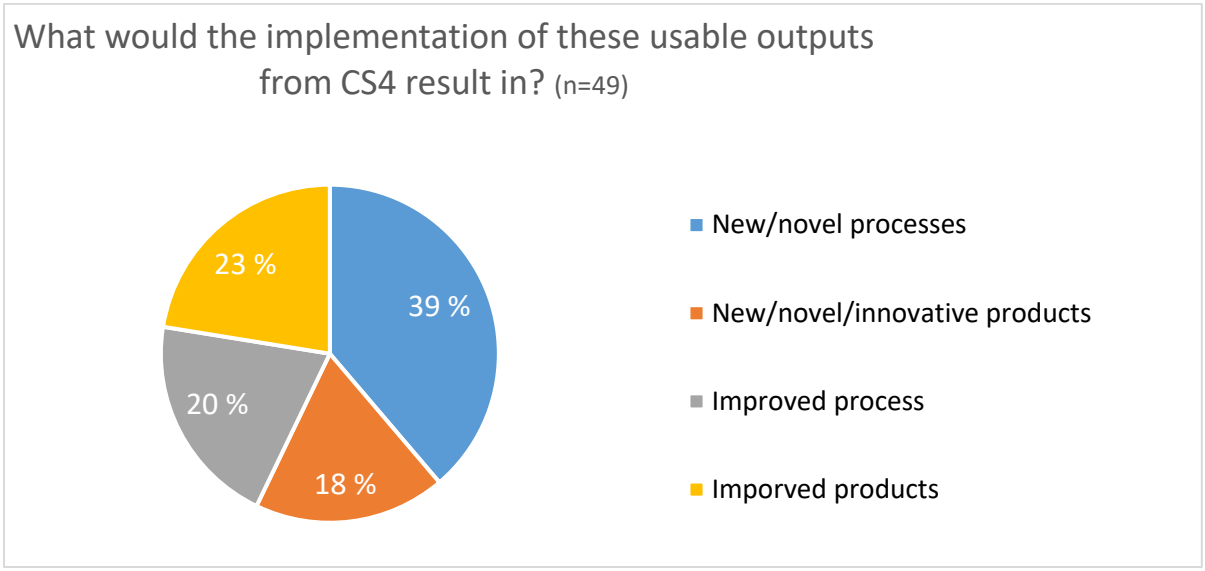


Figure 4.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

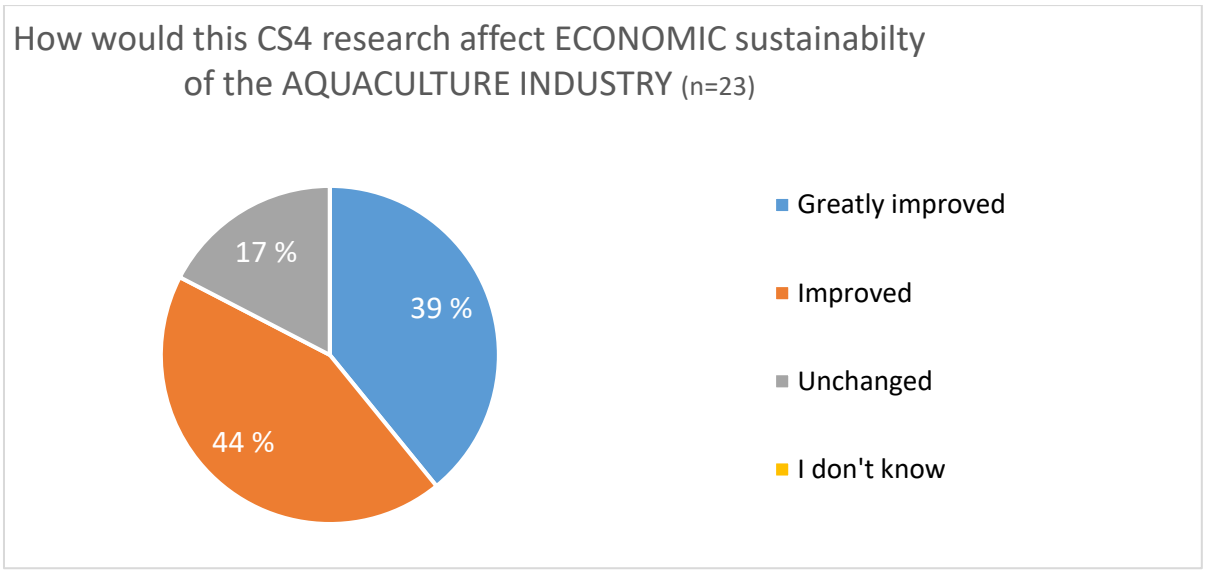


Figure 4.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).

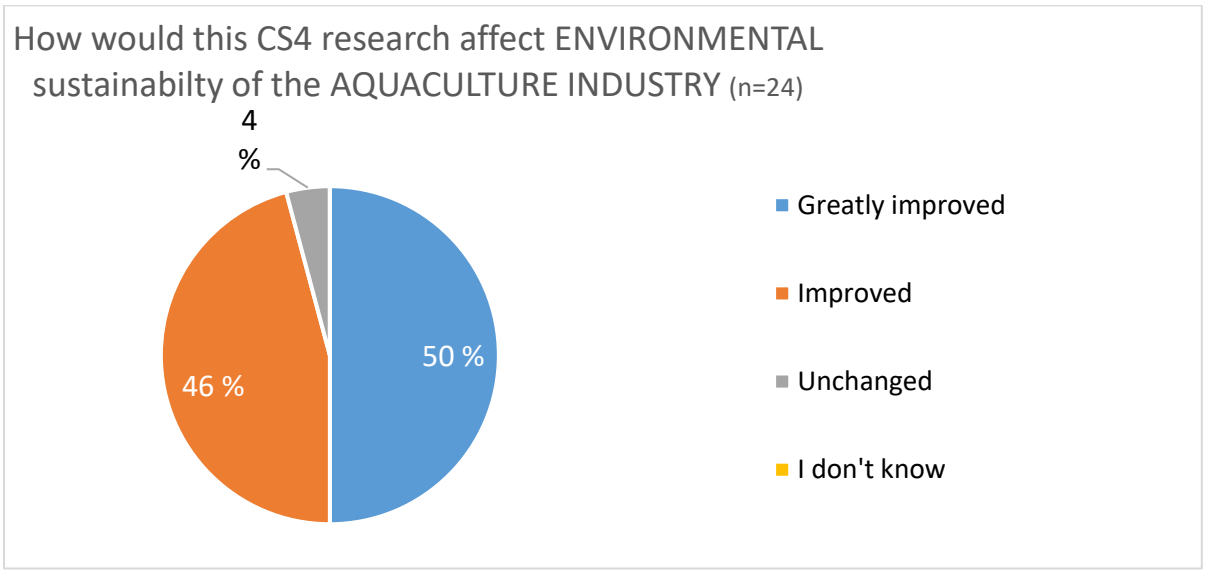


Figure 4.6: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability (AquaVitae stakeholder survey, to 12 May 2022).

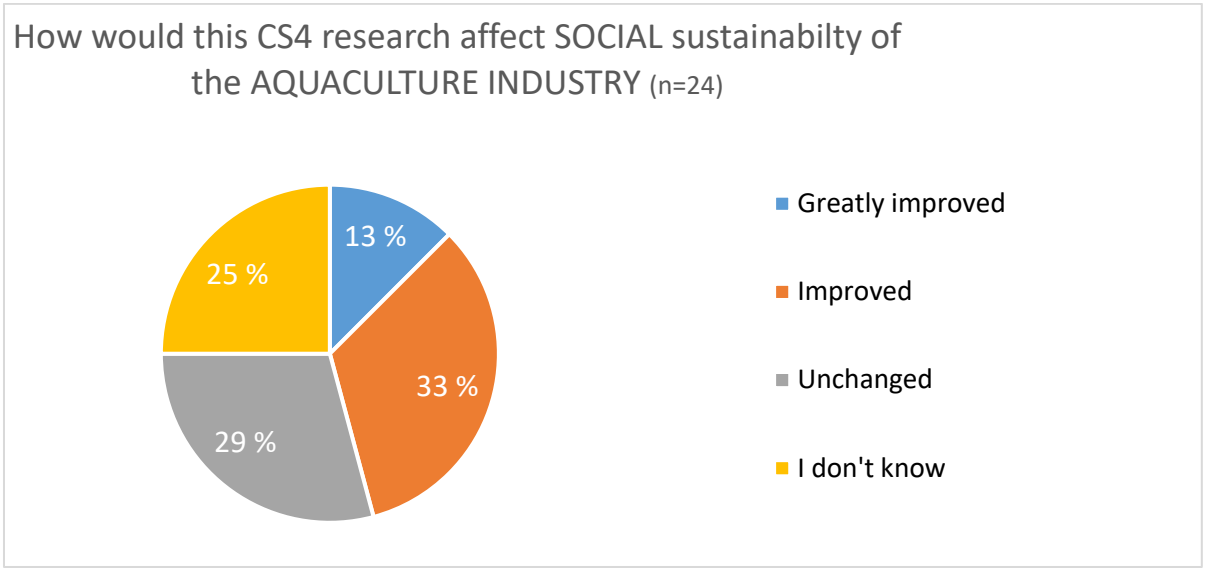


Figure 4.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

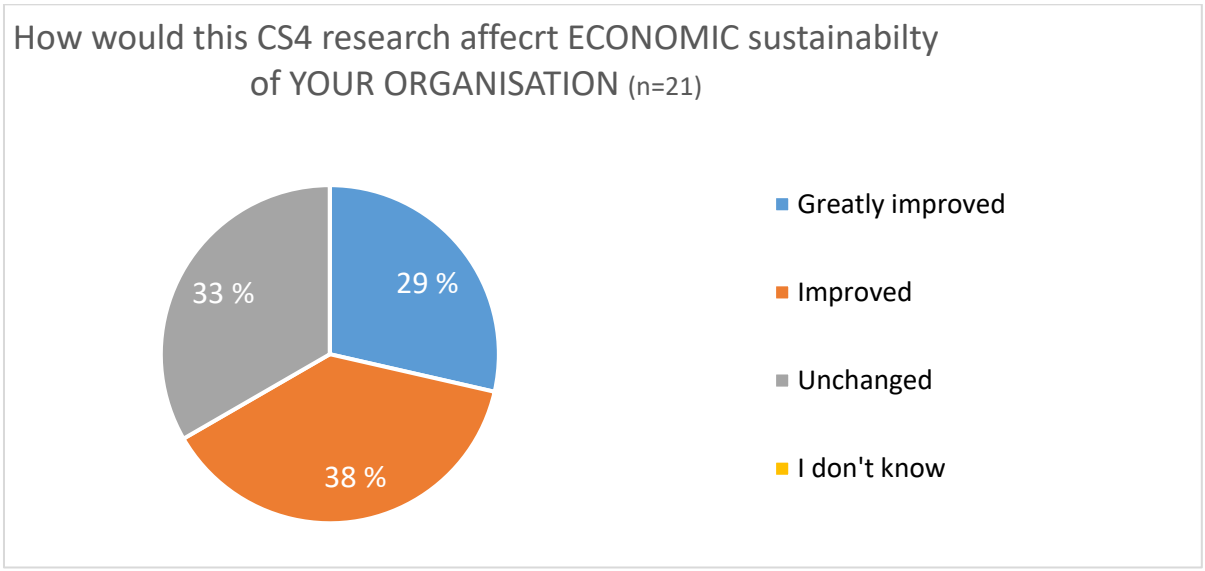


Figure 4.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

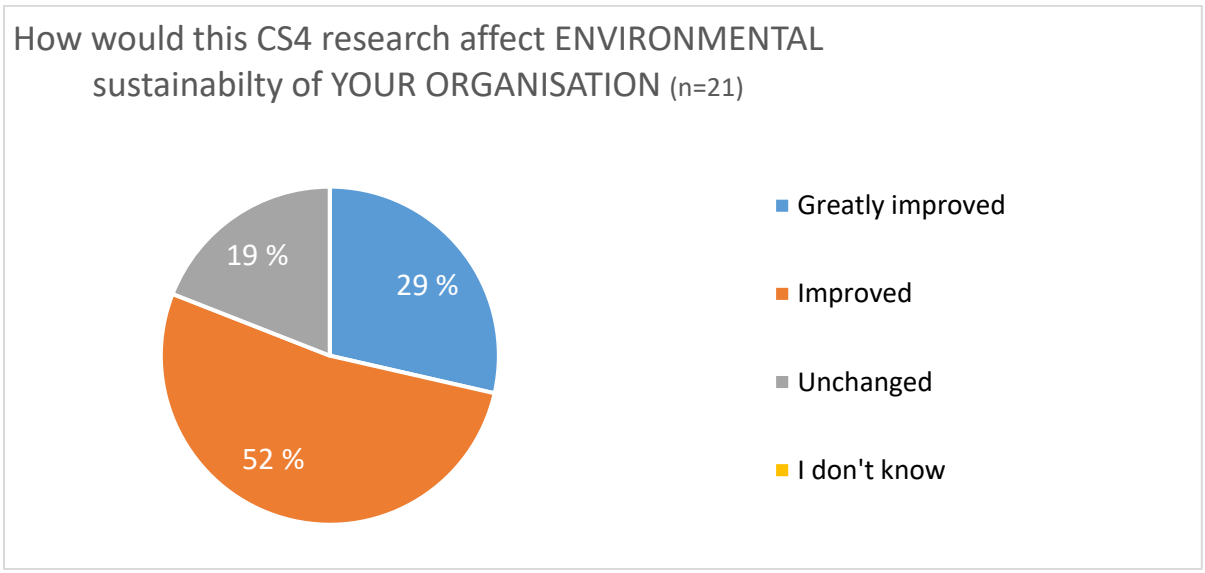


Figure 4.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

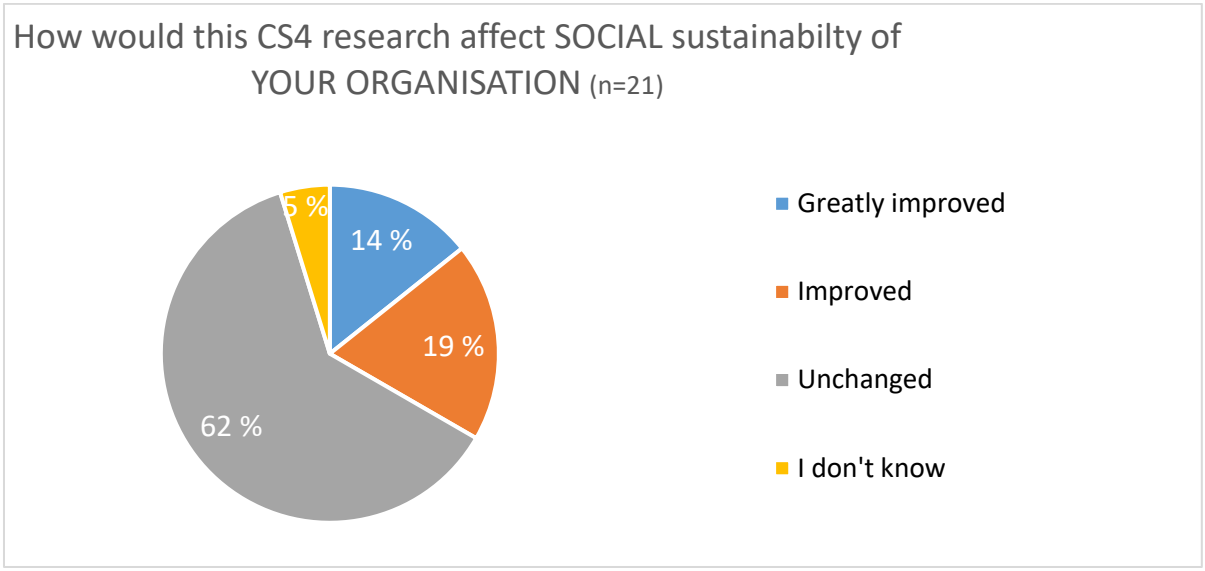


Figure 4.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

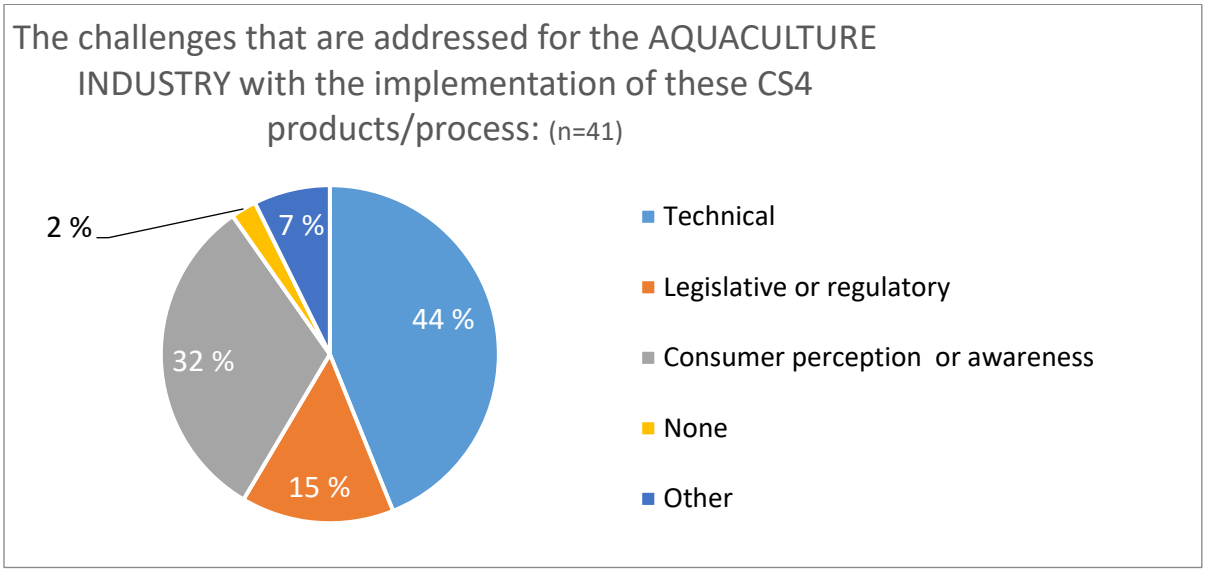


Figure 4.11: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

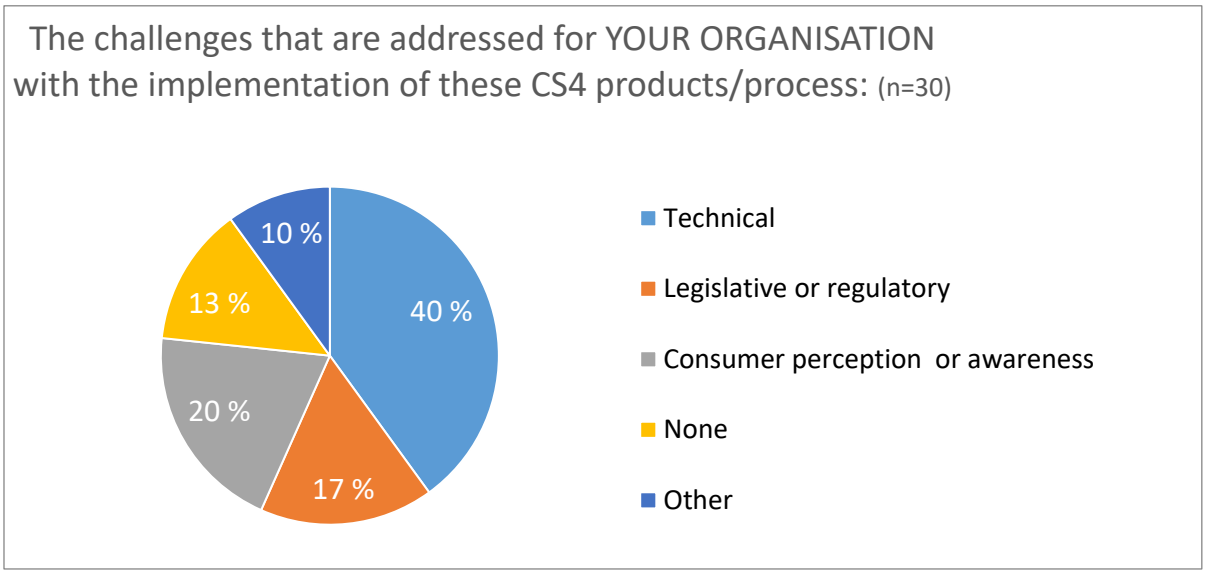


Figure 4.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

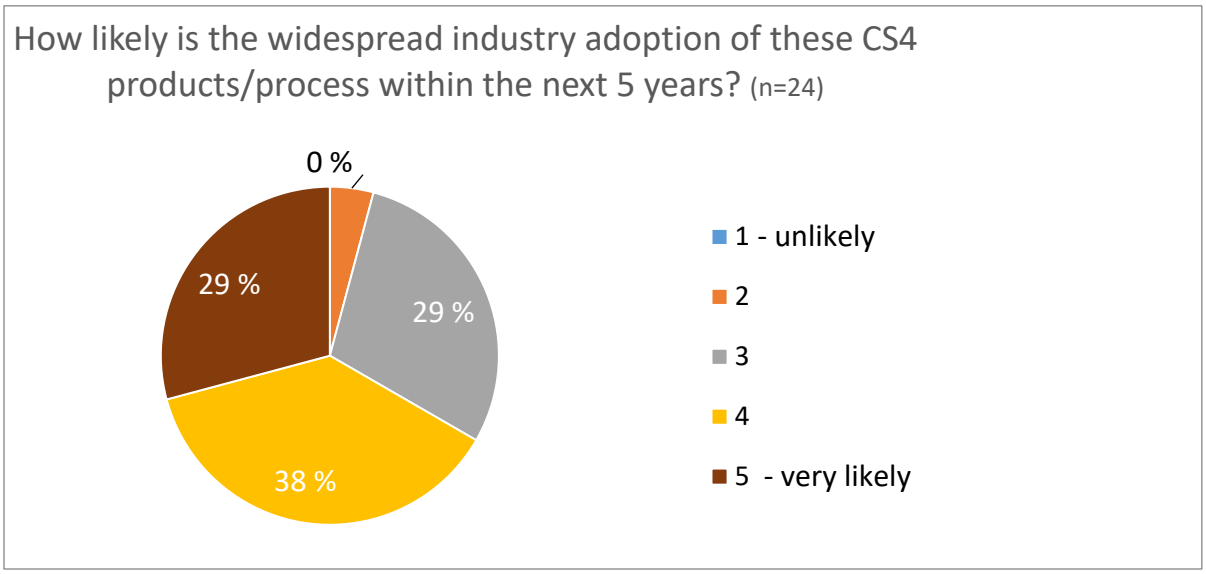


Figure 4.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

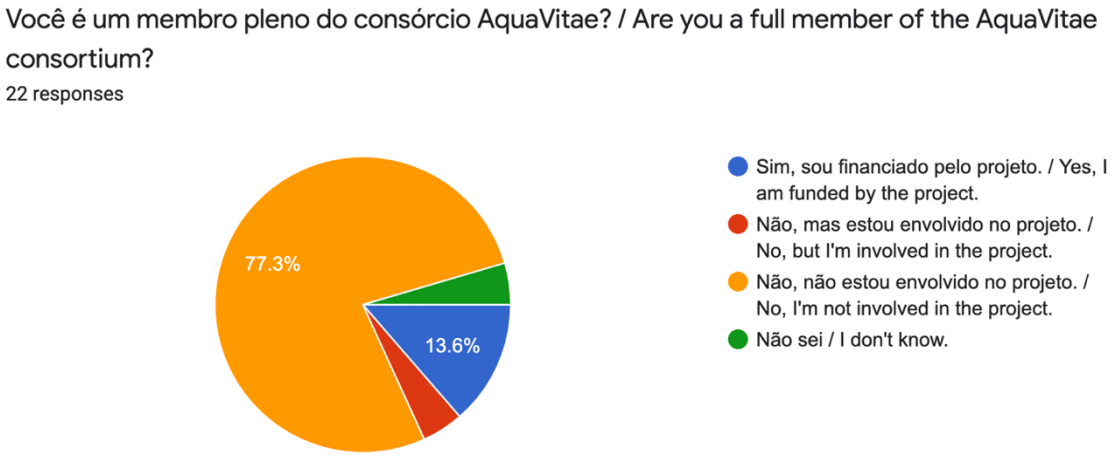


Figure 5.1: Respondent relation to the AquaVitae Project (AquaVitae stakeholder survey, to 12 May 2022).

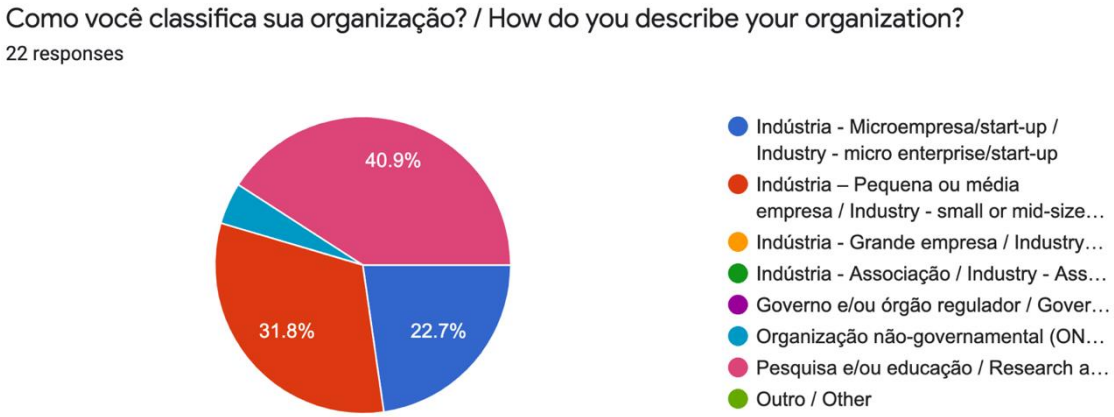


Figure 5.2: Respond's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).

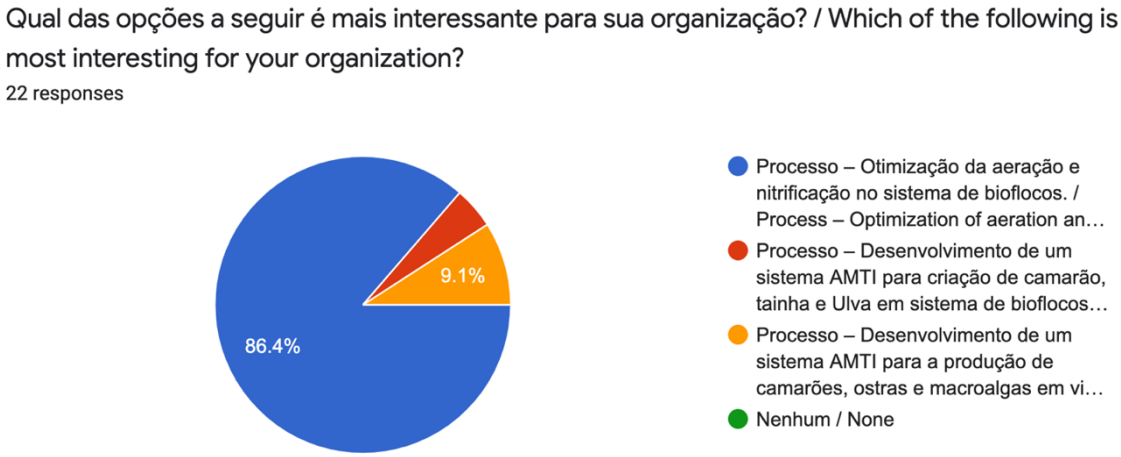


Figure 5.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

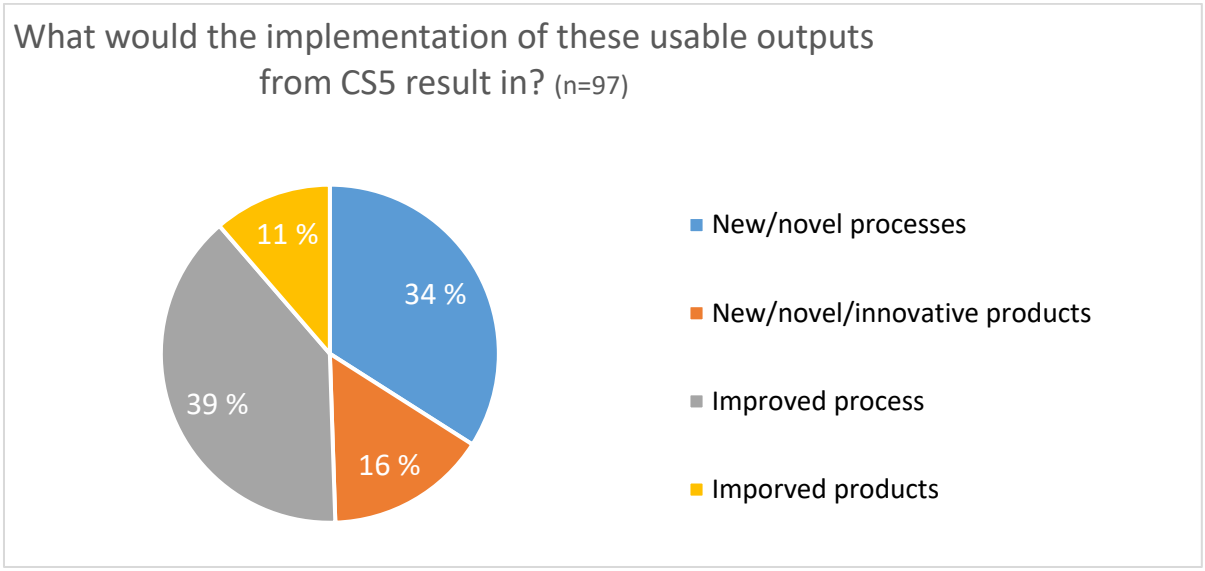


Figure 5.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

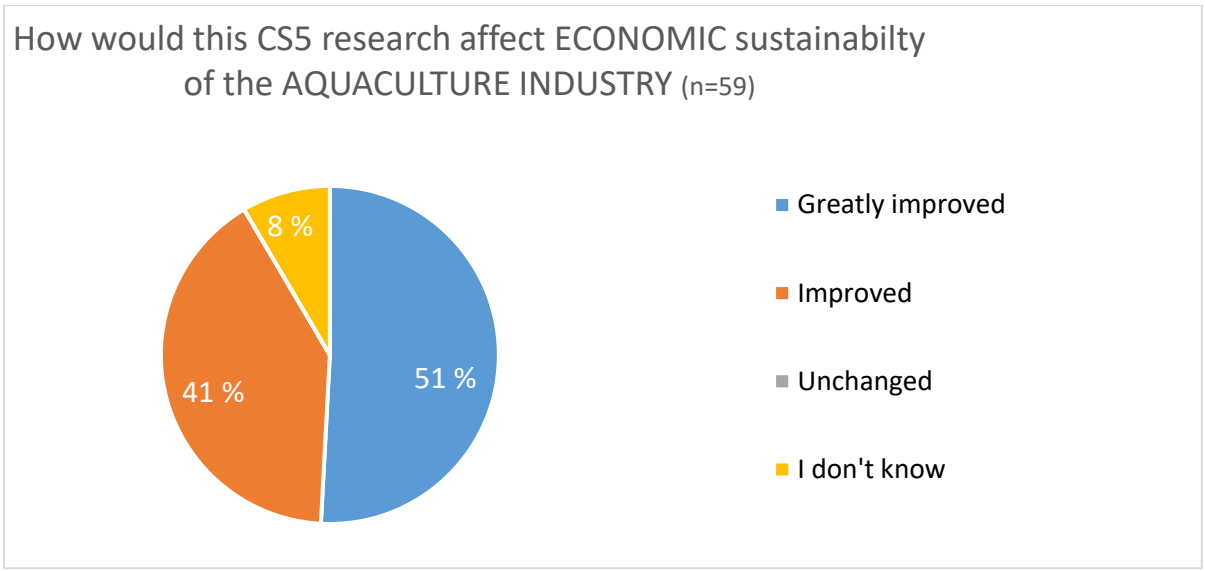


Figure 5.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).

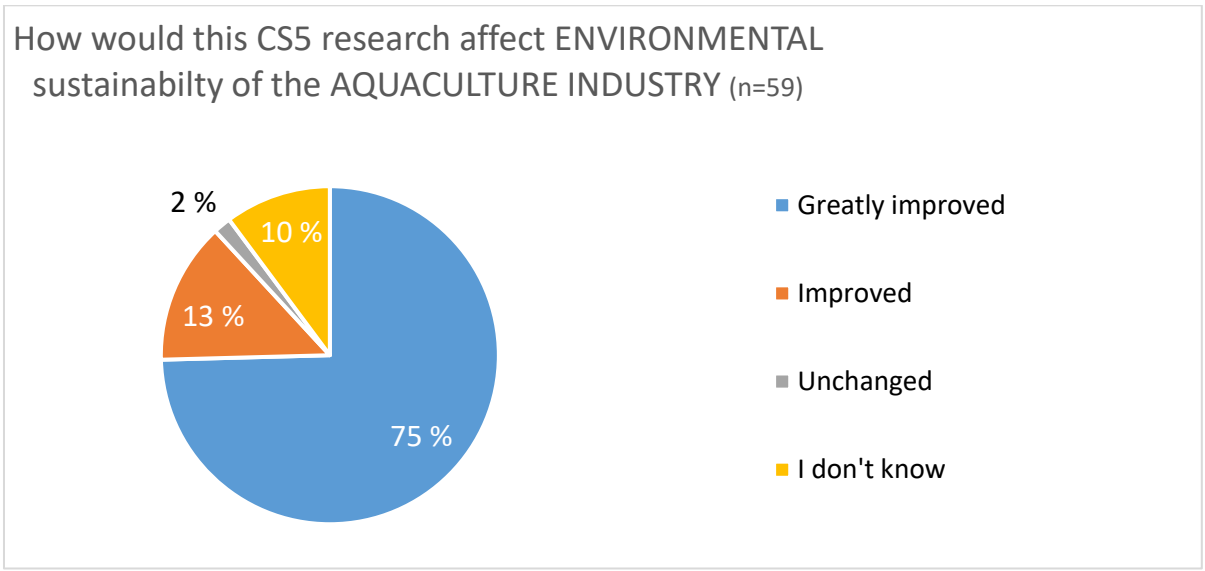


Figure 5.6: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability (AquaVitae stakeholder survey, to 12 May 2022).

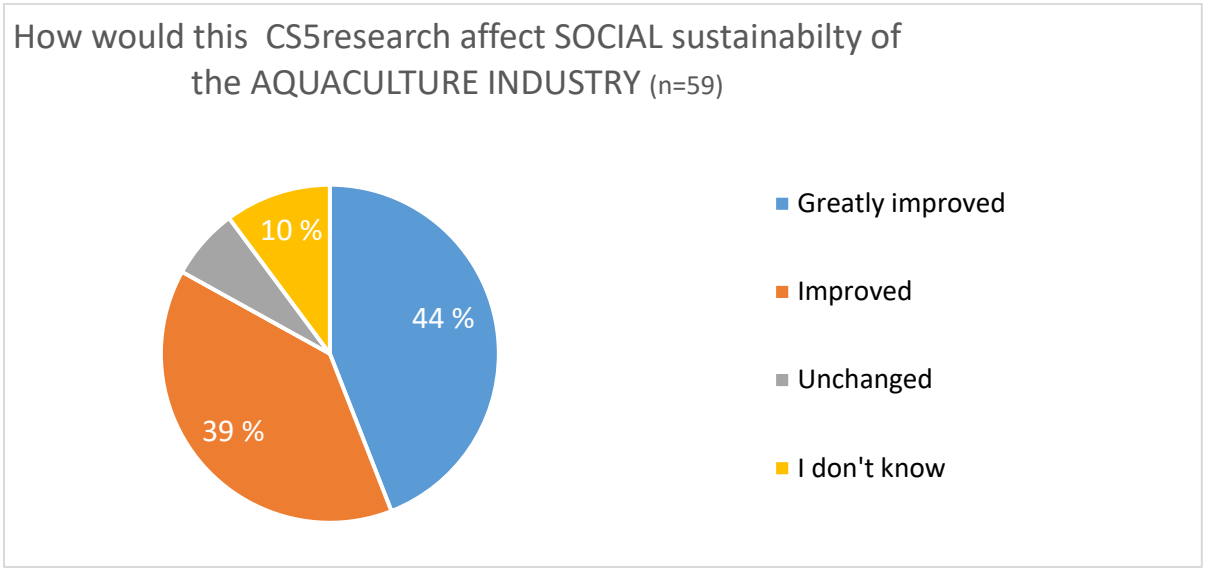


Figure 5.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

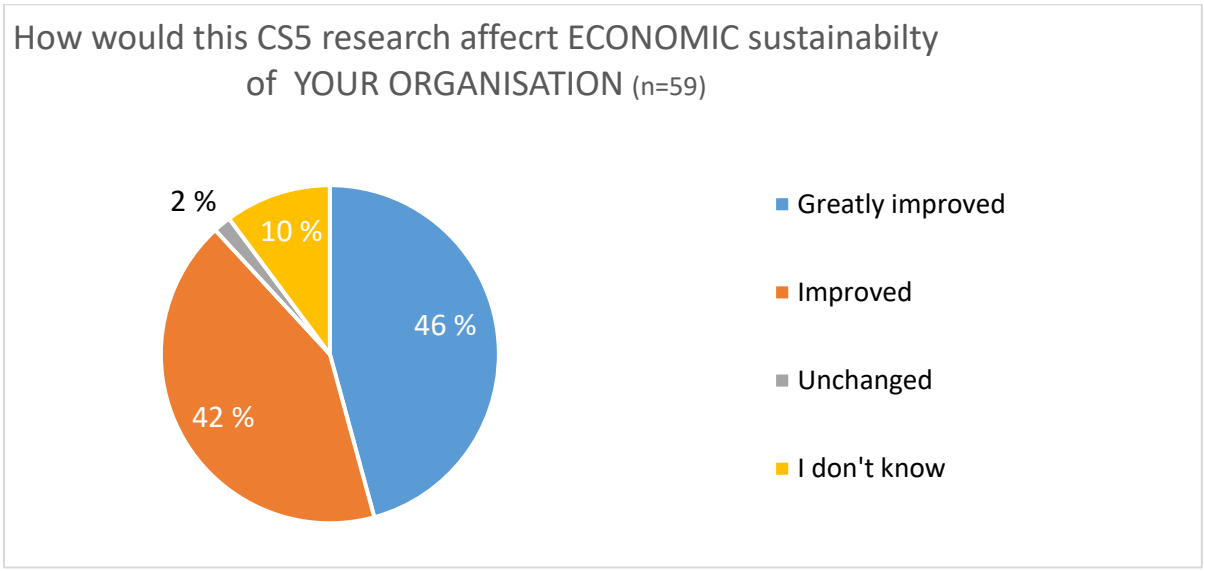


Figure 5.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

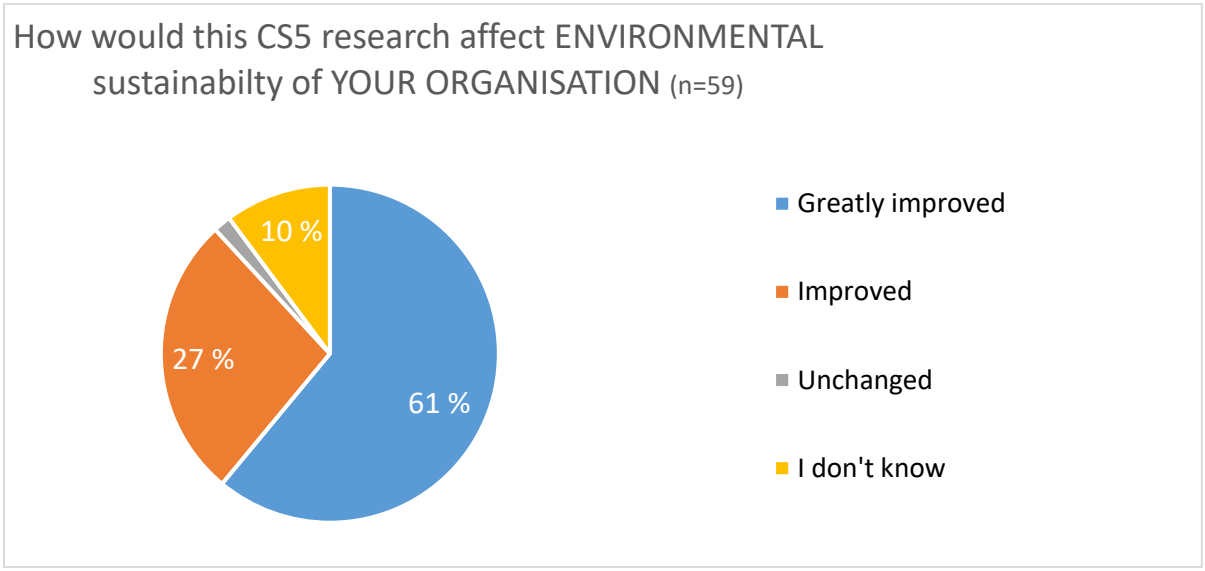


Figure 5.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

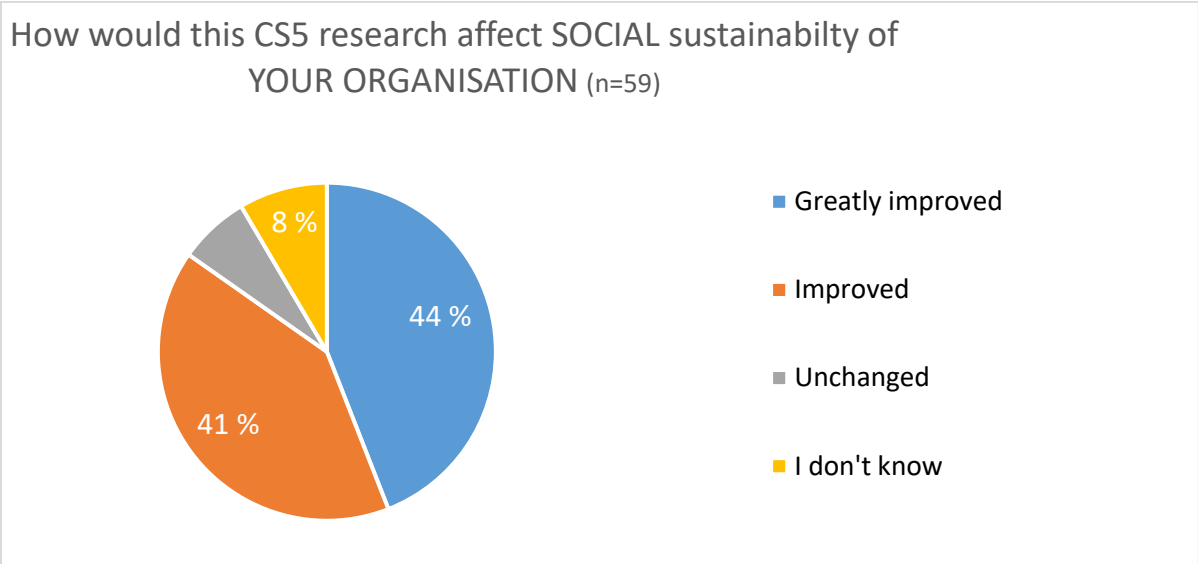
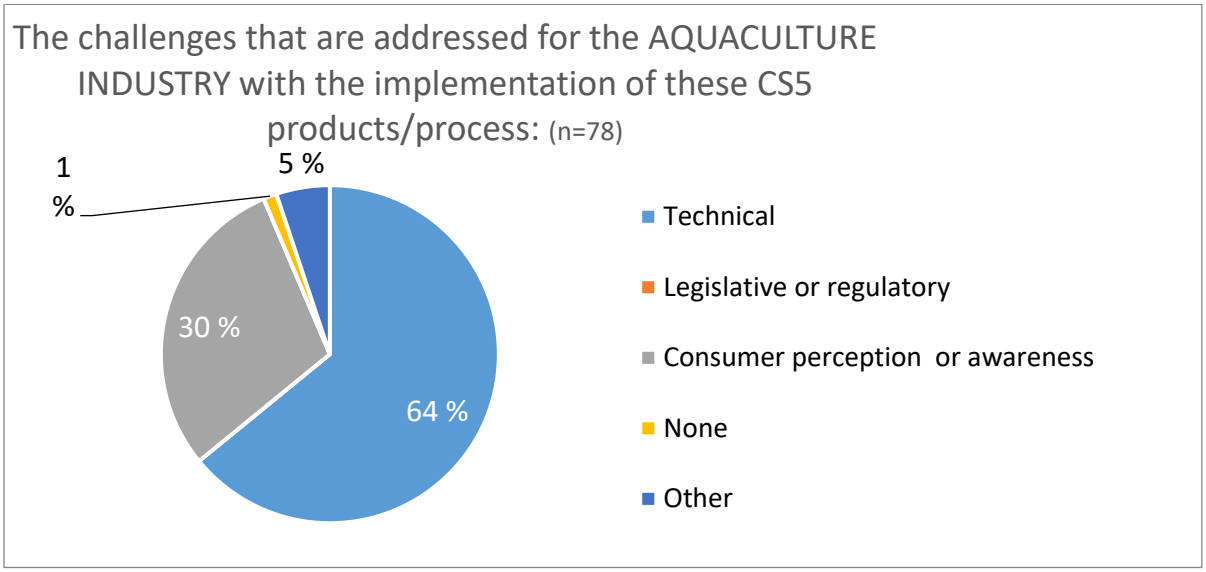


Figure 5.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).



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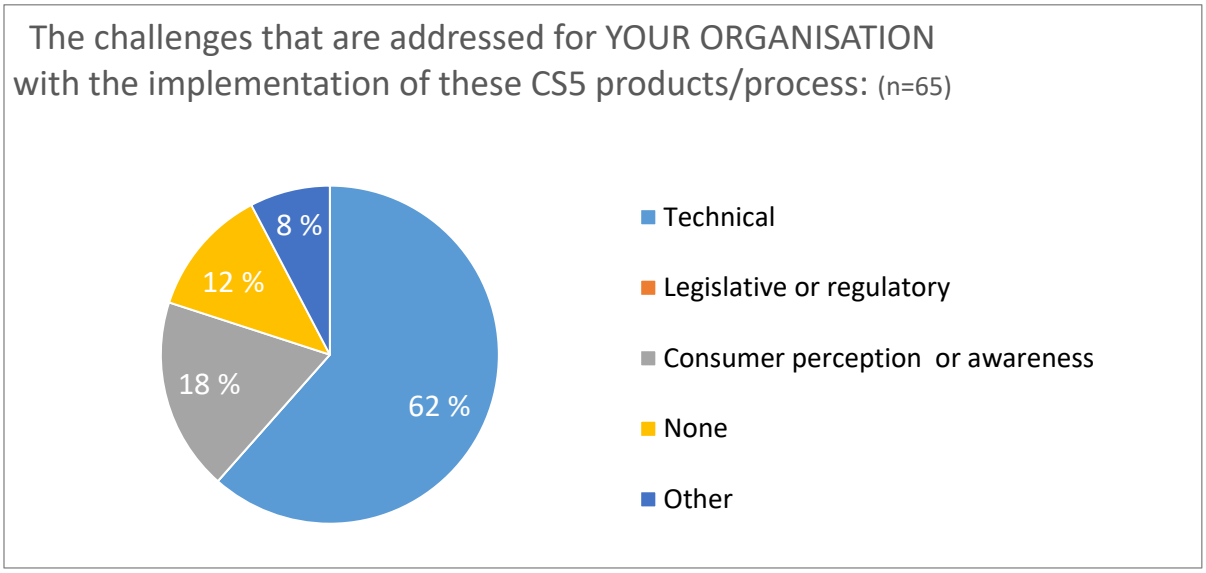


Figure 5.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

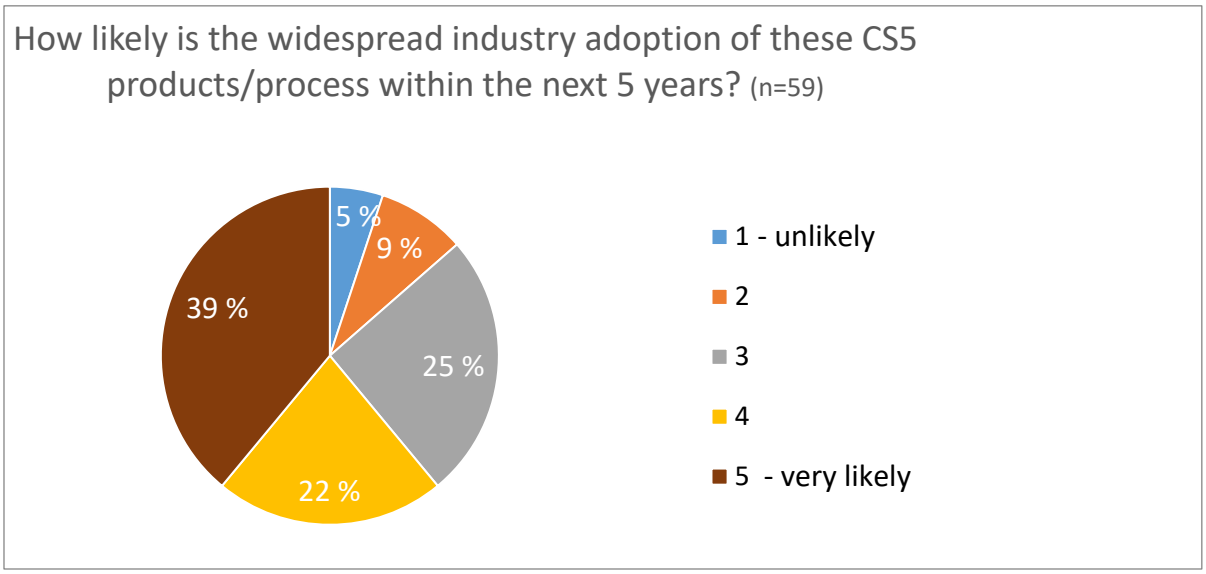
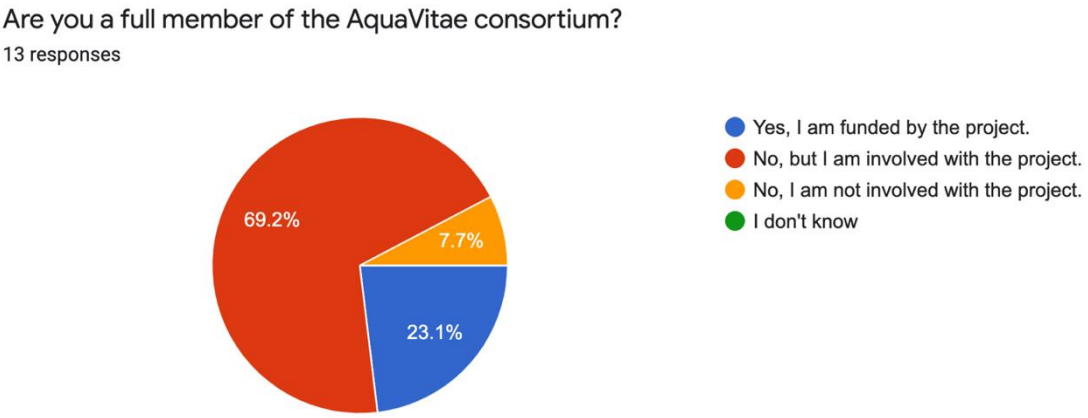


Figure 5.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).



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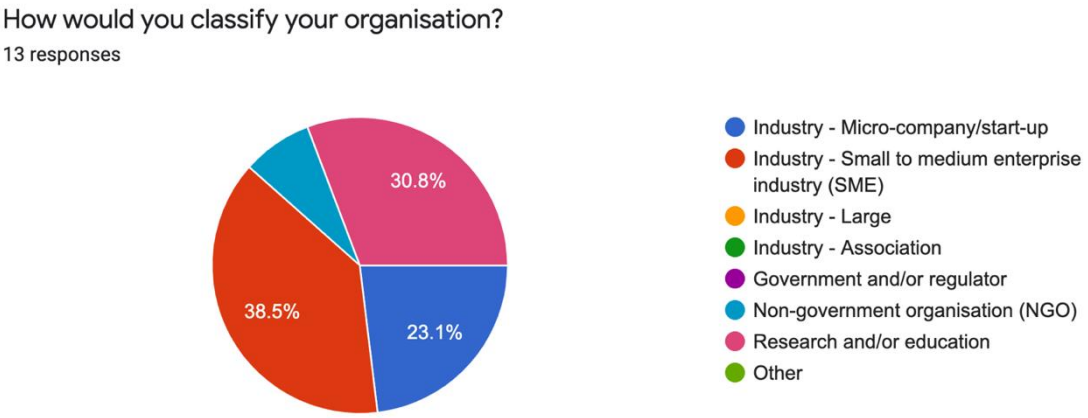


Figure 6.2: Respond's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).

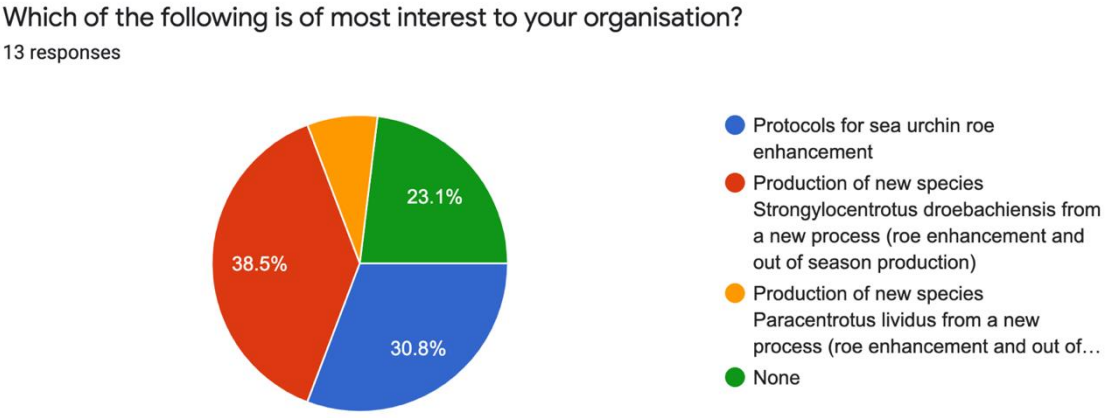


Figure 6.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

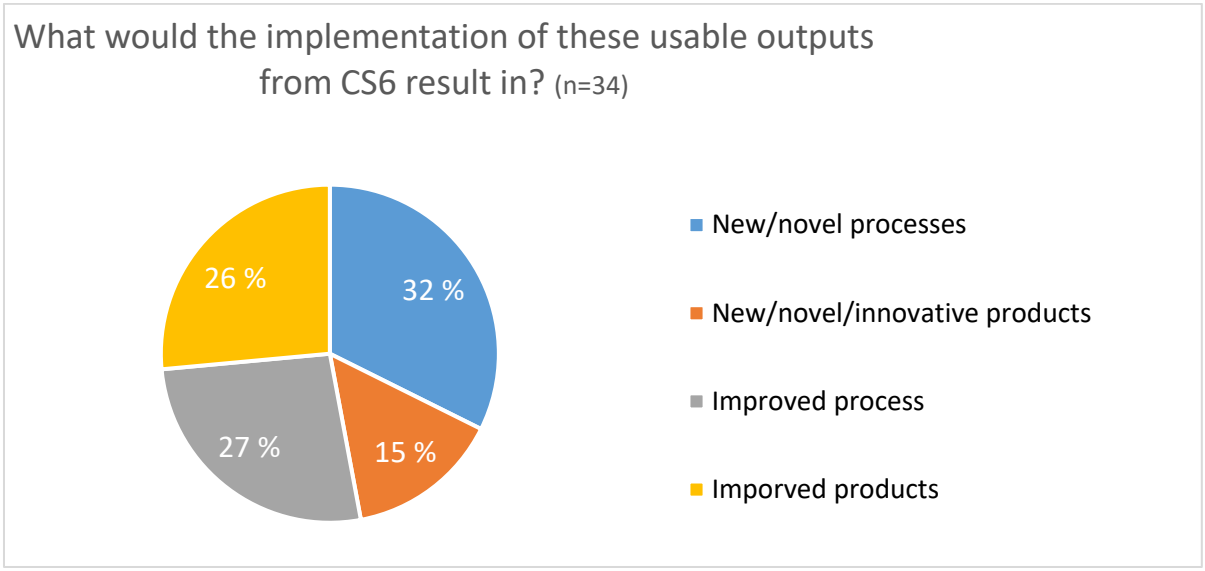


Figure 6.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

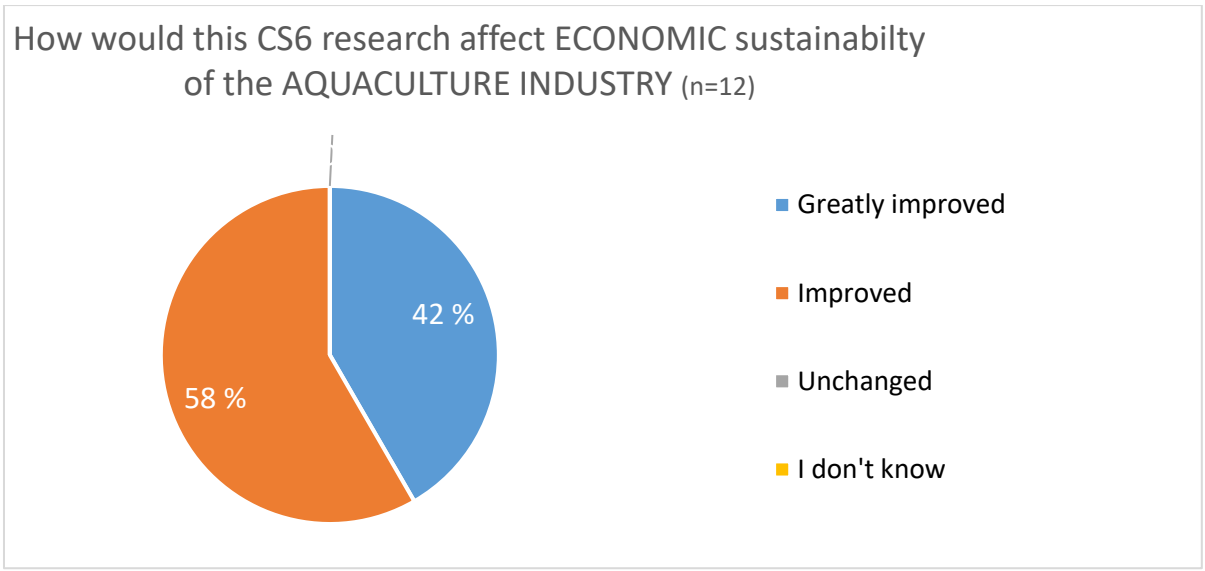
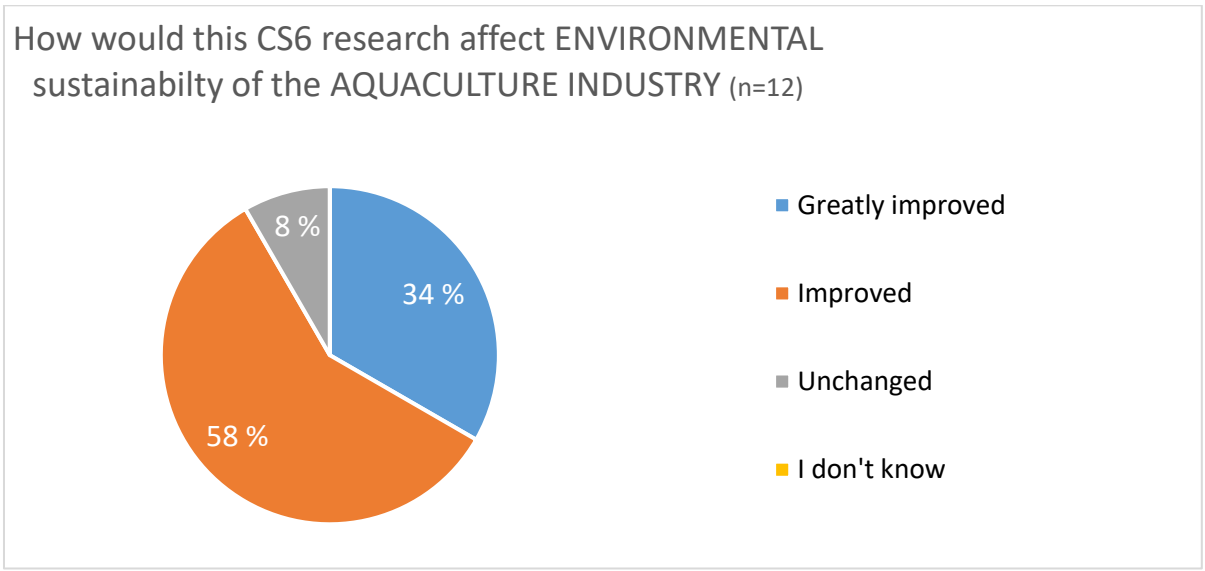


Figure 6.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).



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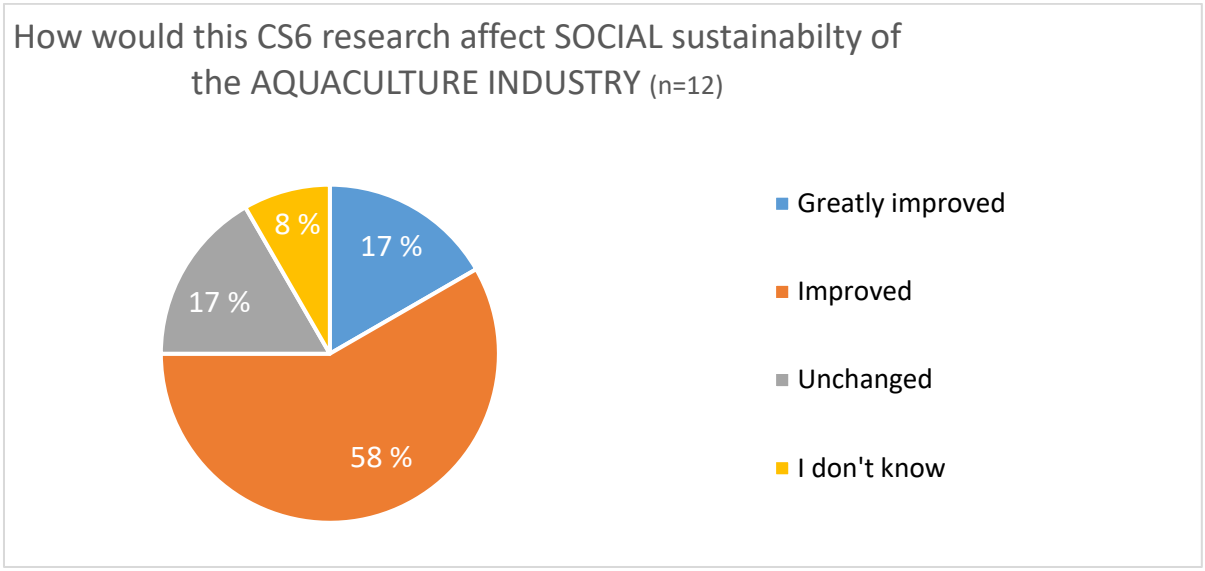


Figure 6.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

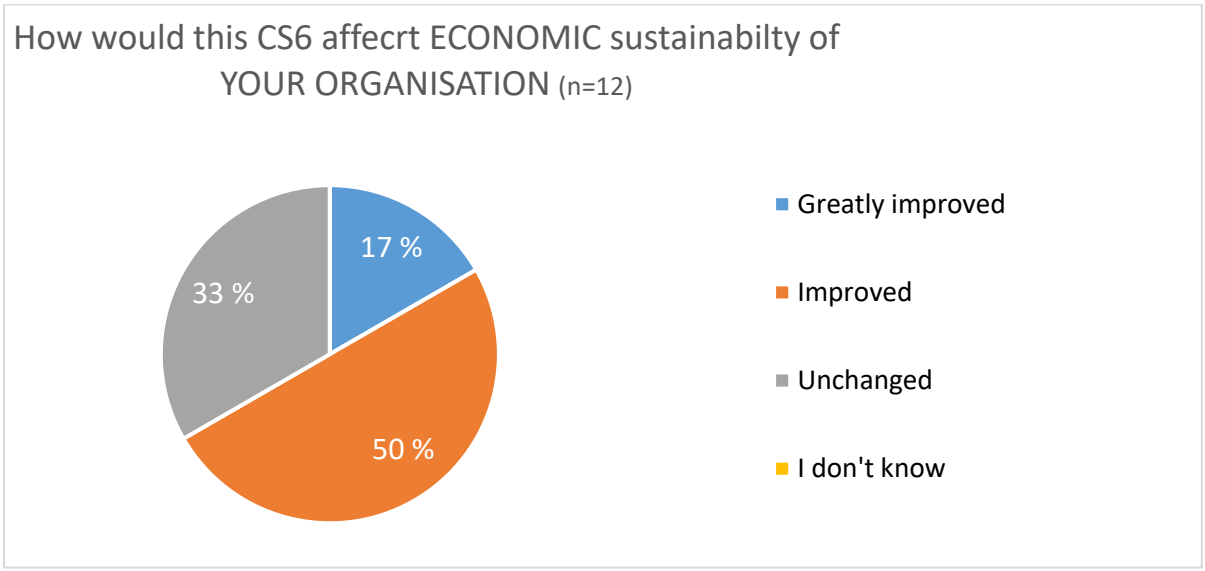


Figure 6.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

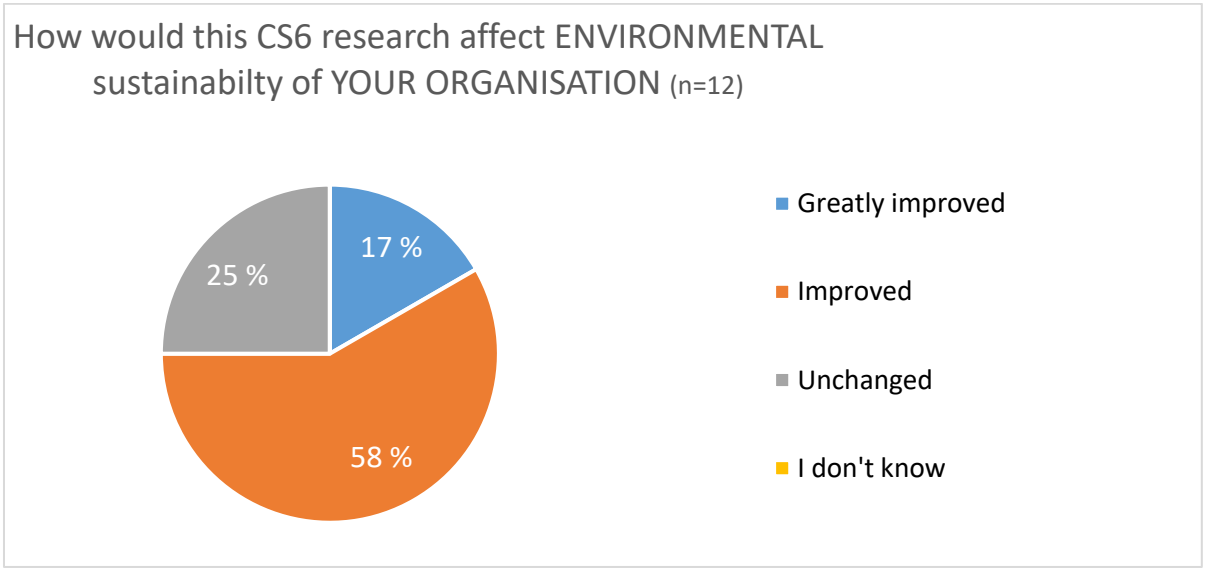


Figure 6.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

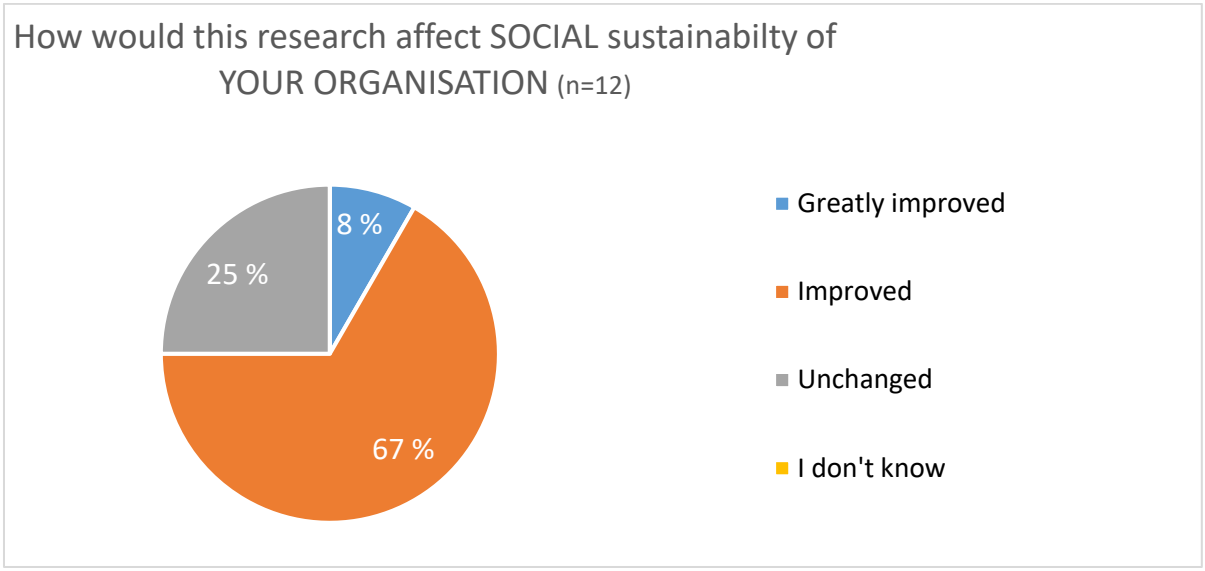
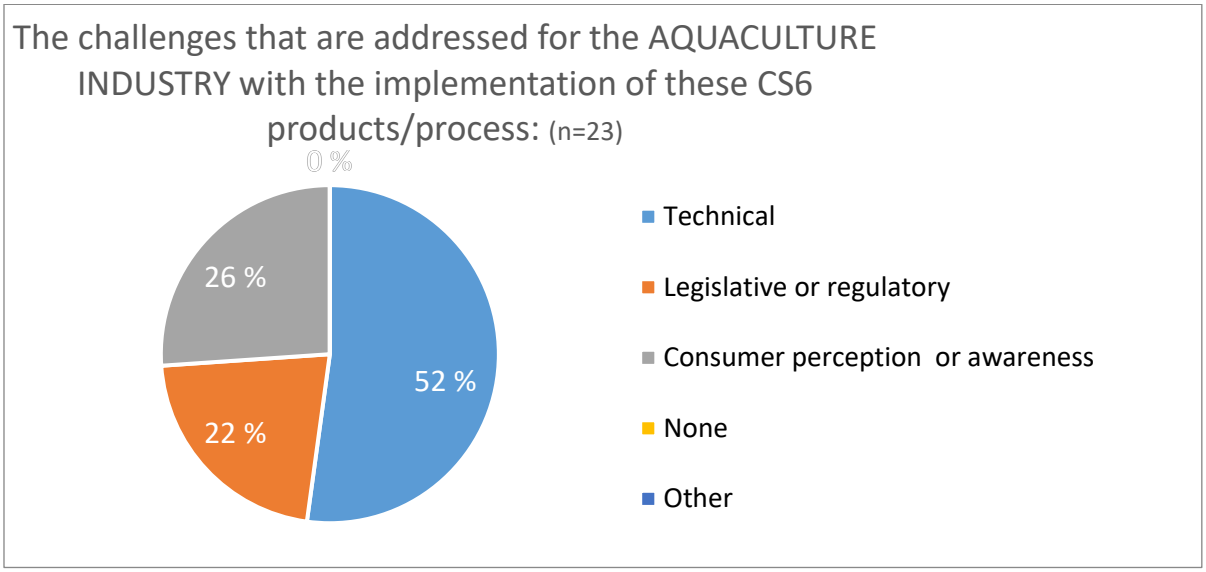


Figure 6.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).



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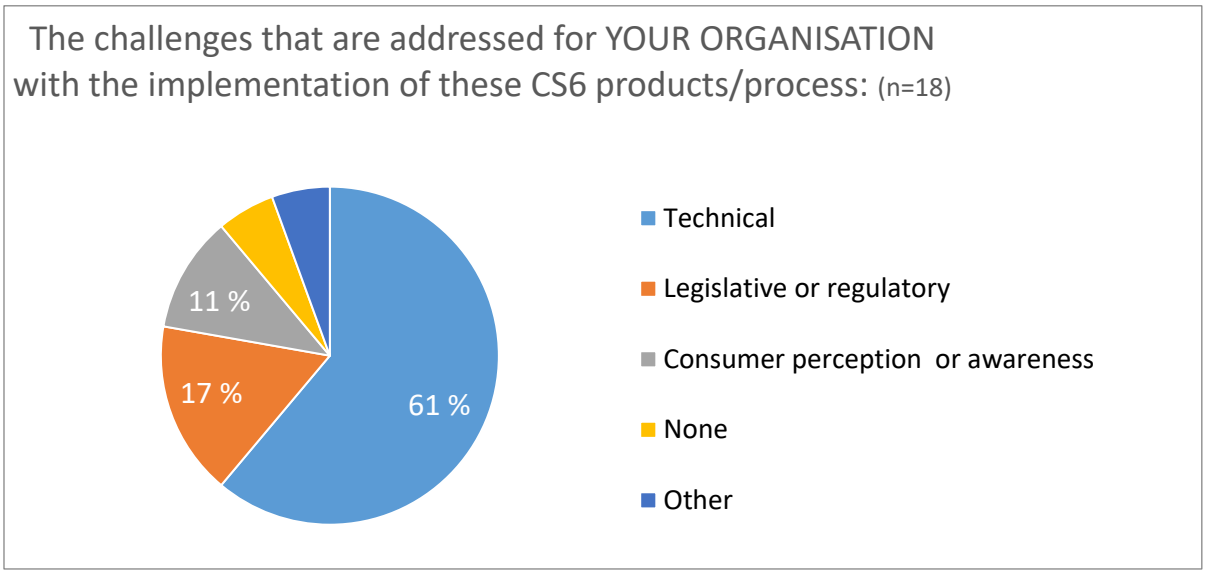

Figure 6.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

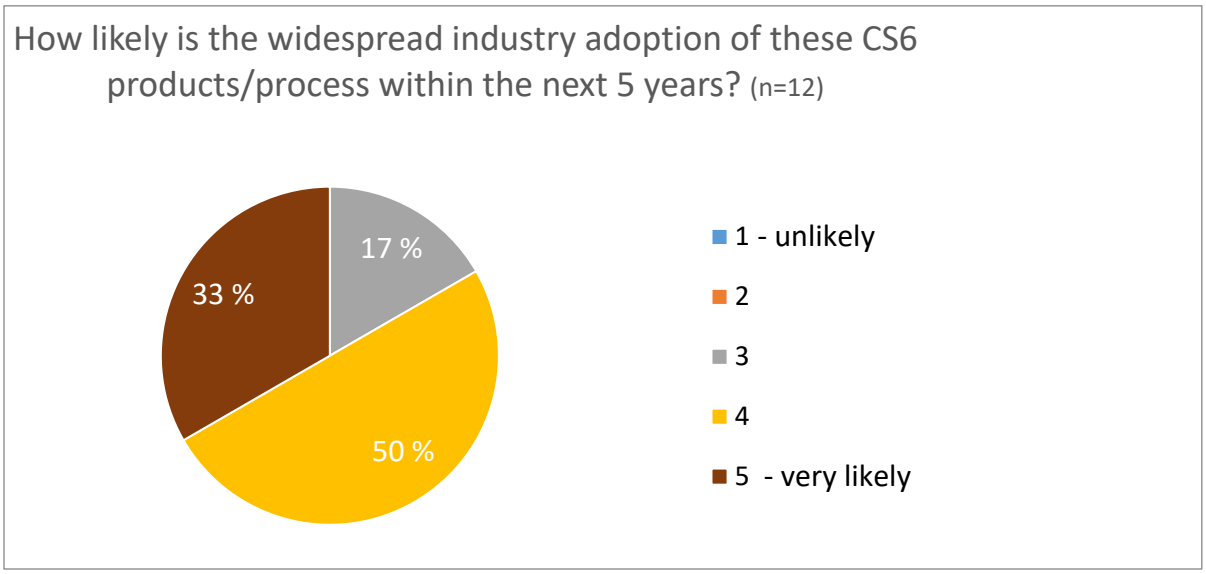

Figure 6.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

N/A (only 2 respondents after those that commented in the joint survey with CS3 and CS4)
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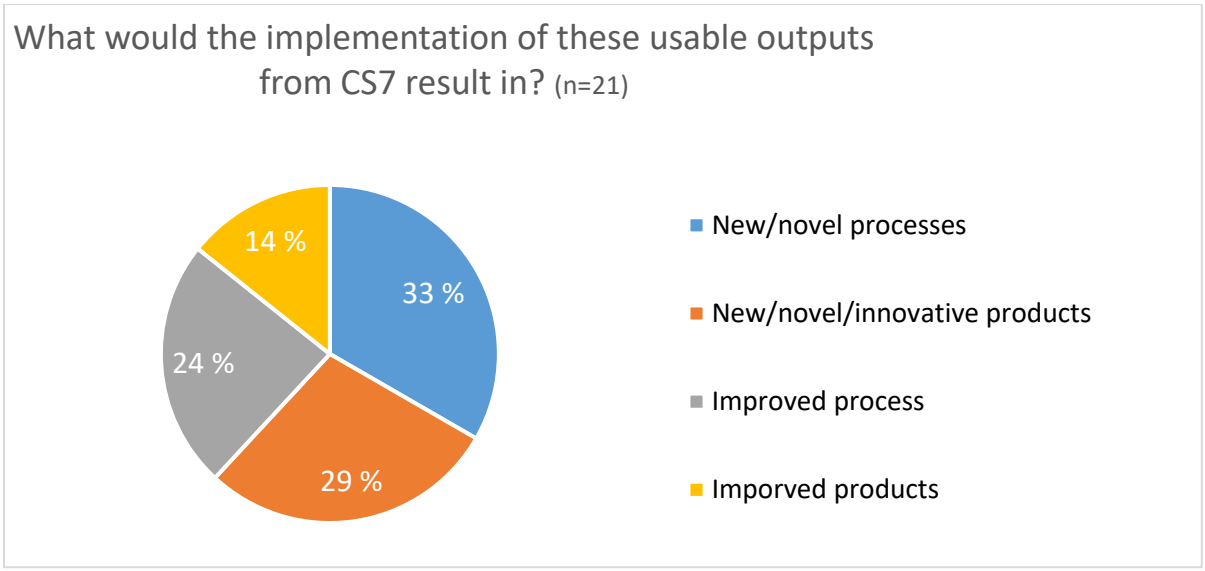

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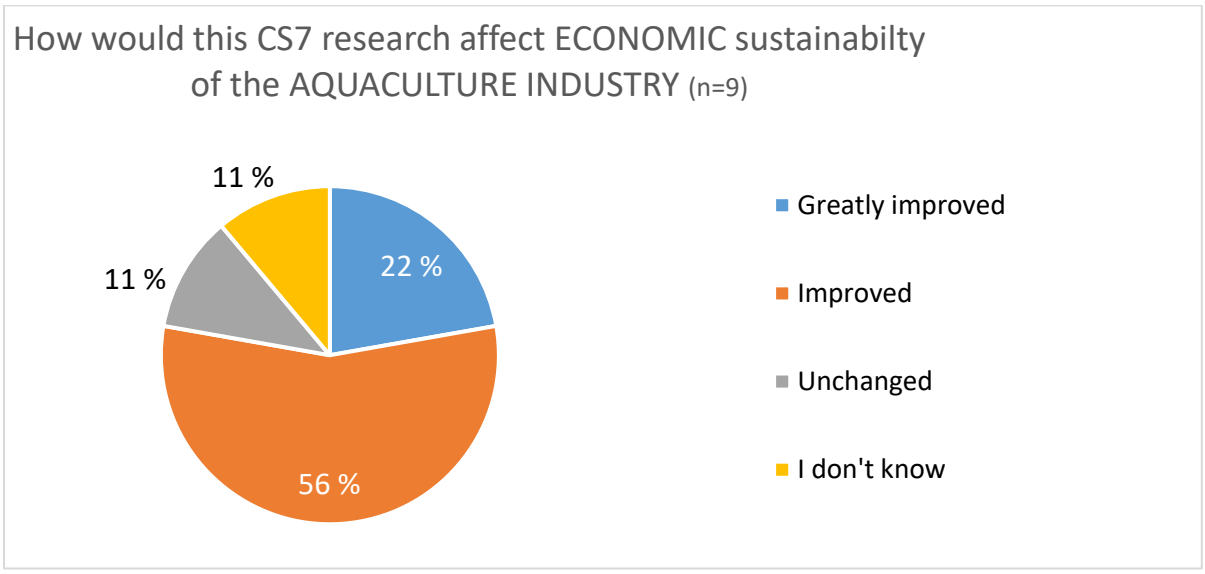

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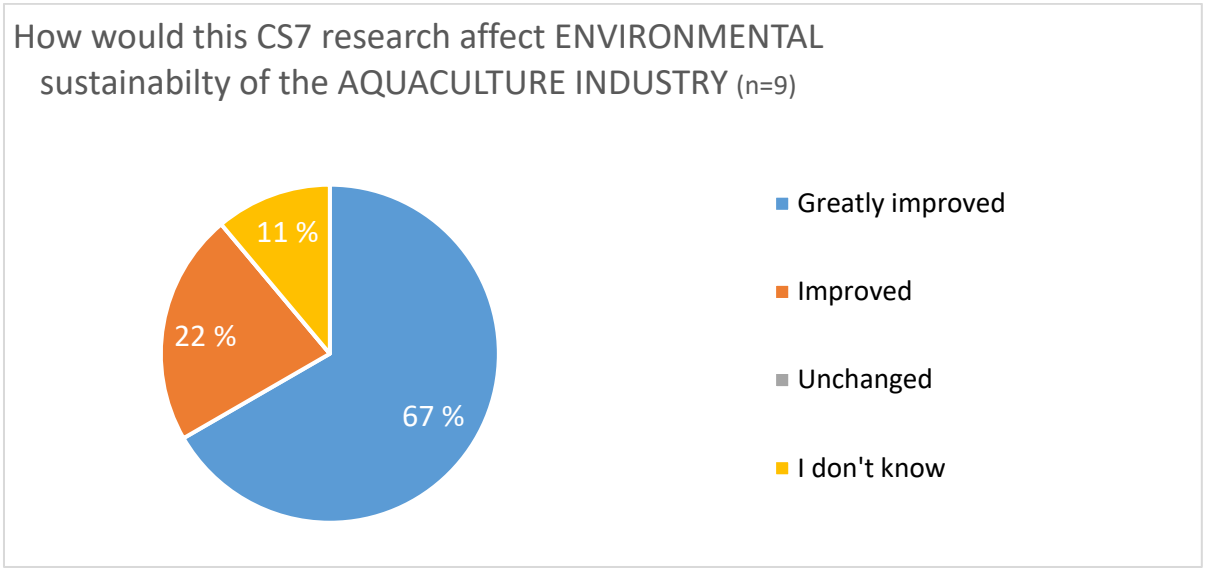

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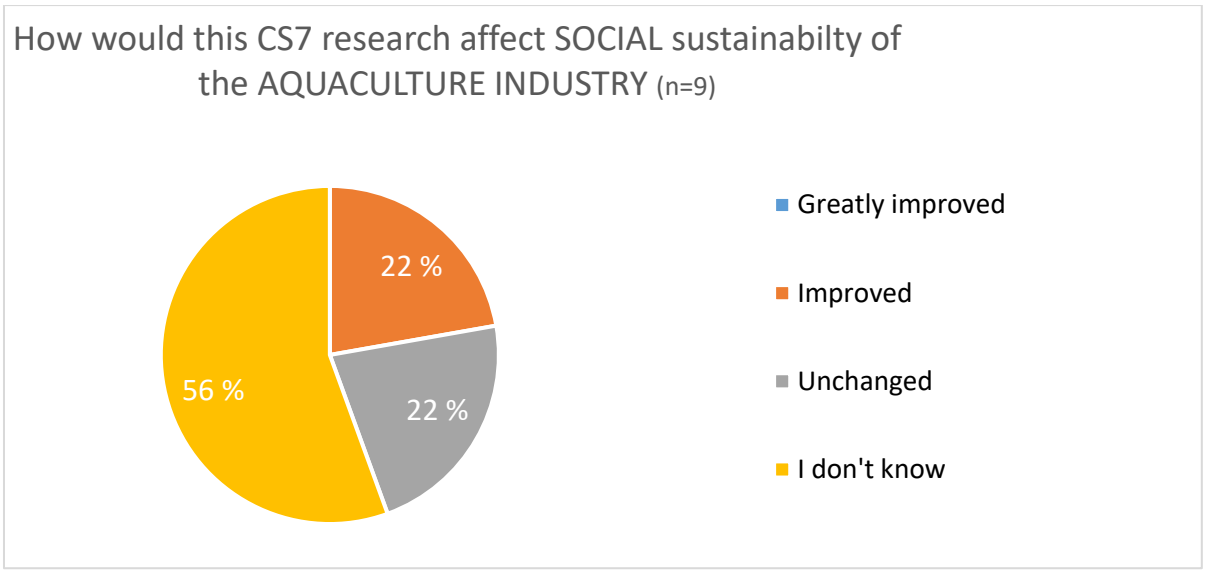

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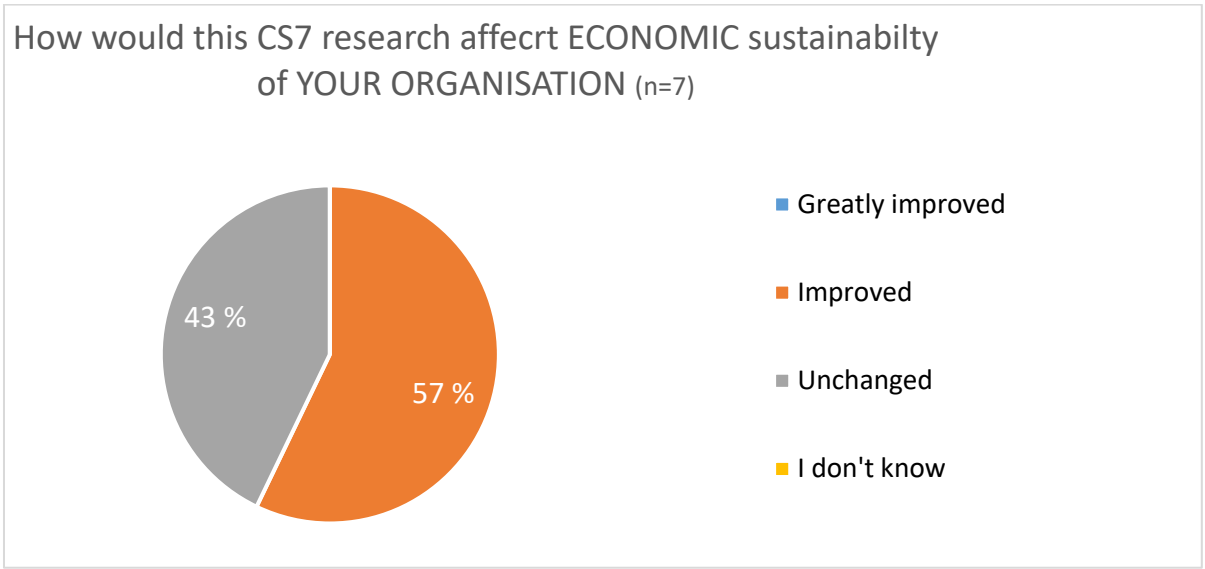

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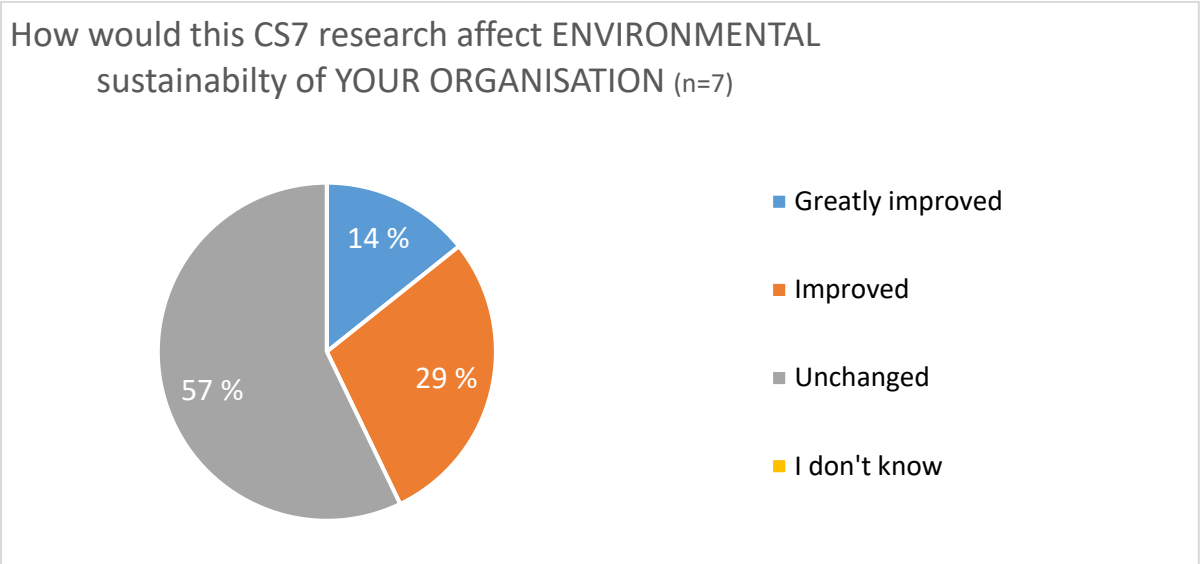

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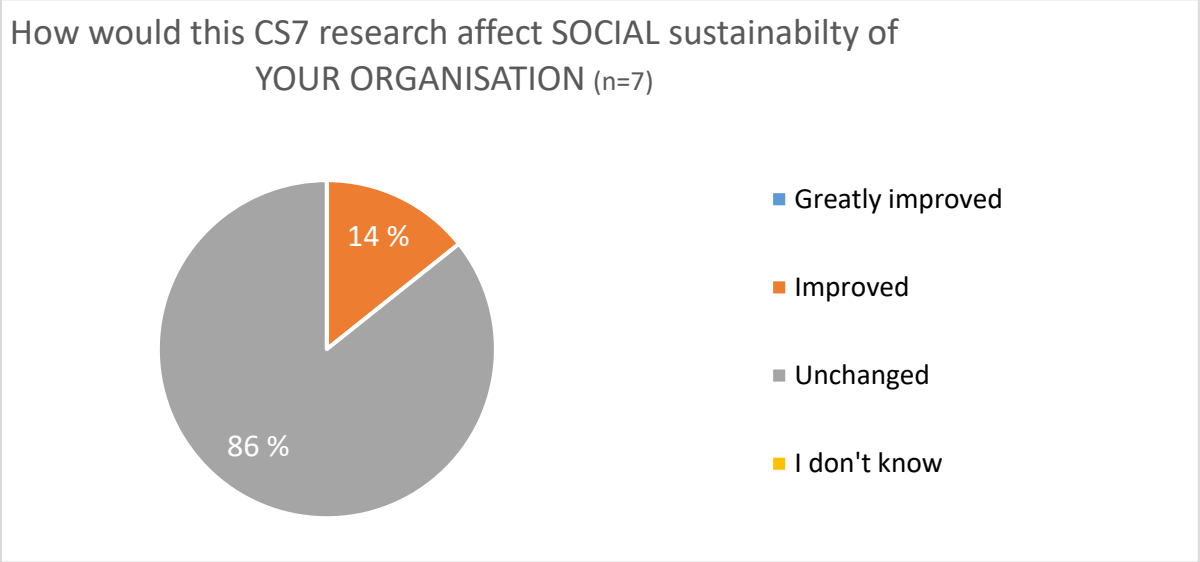

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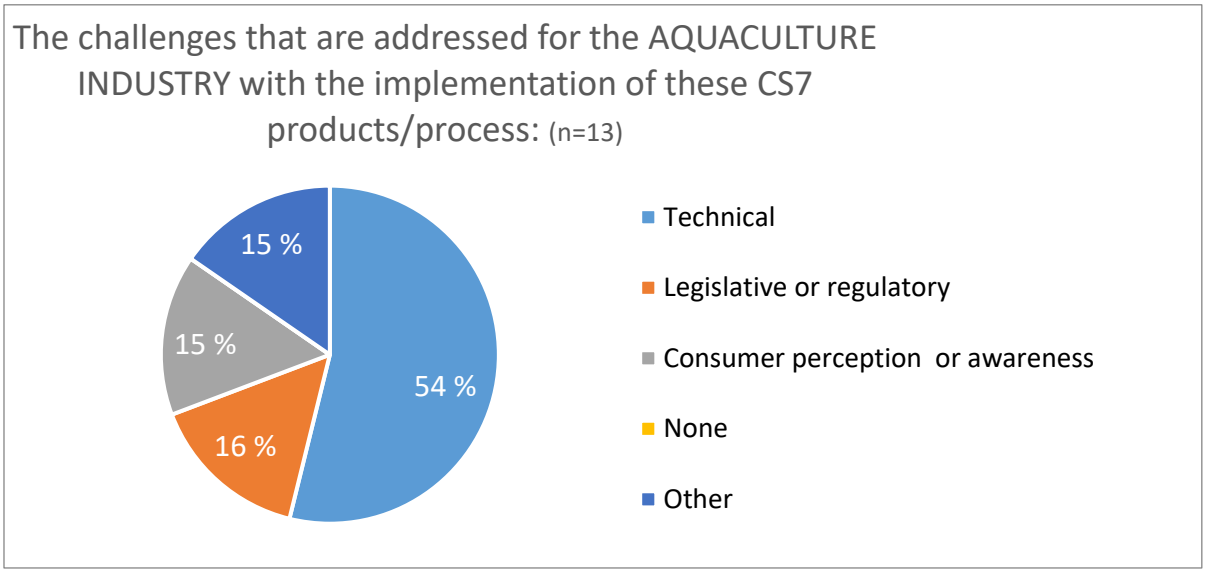

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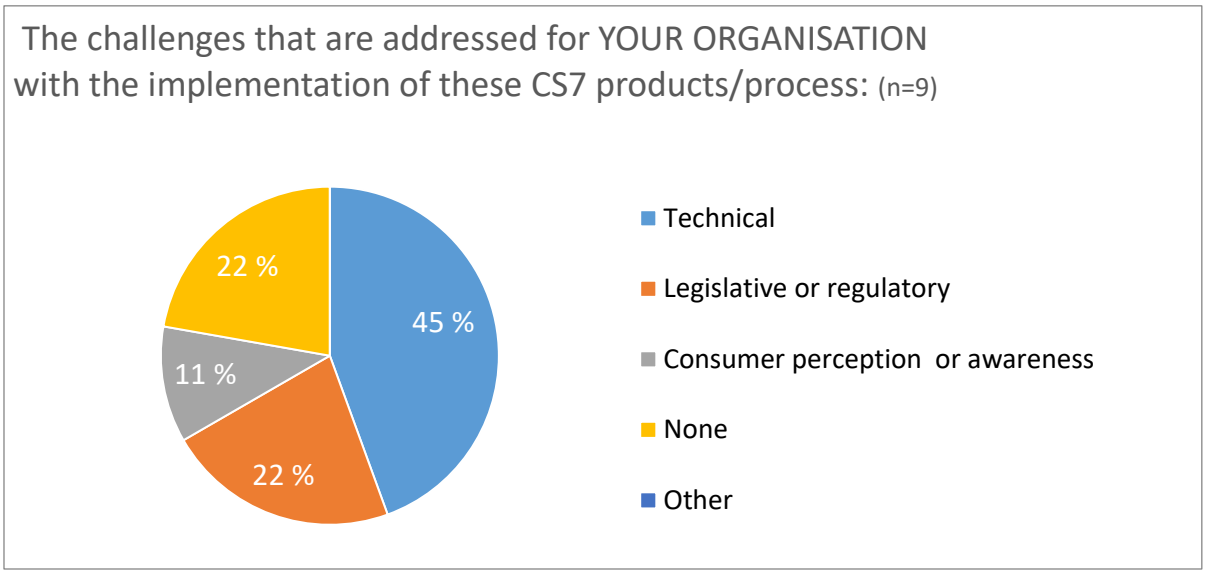

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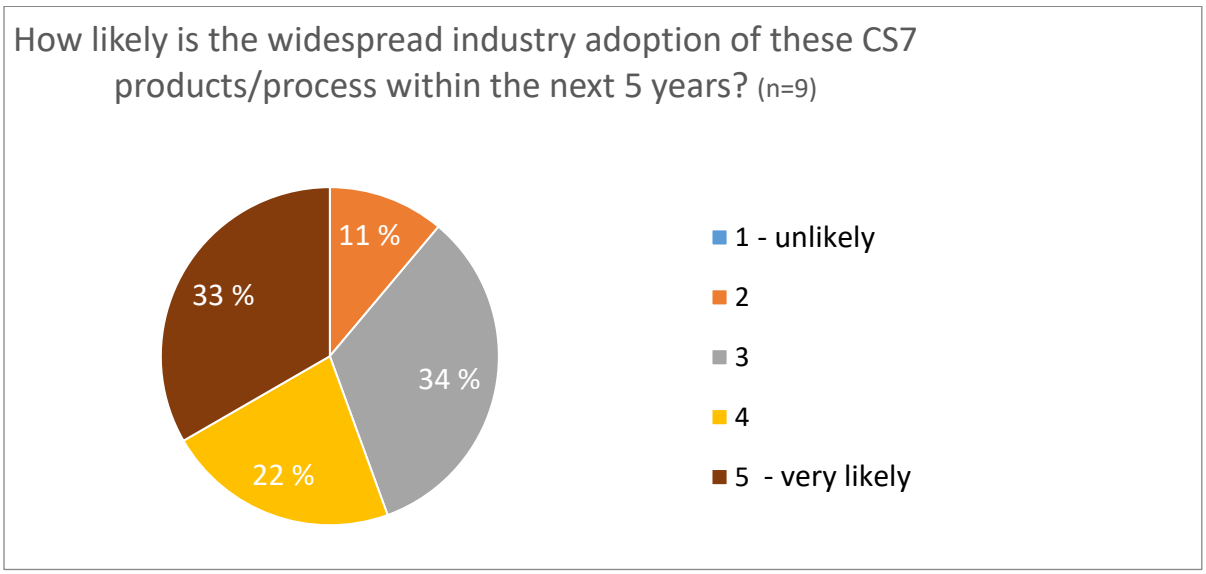

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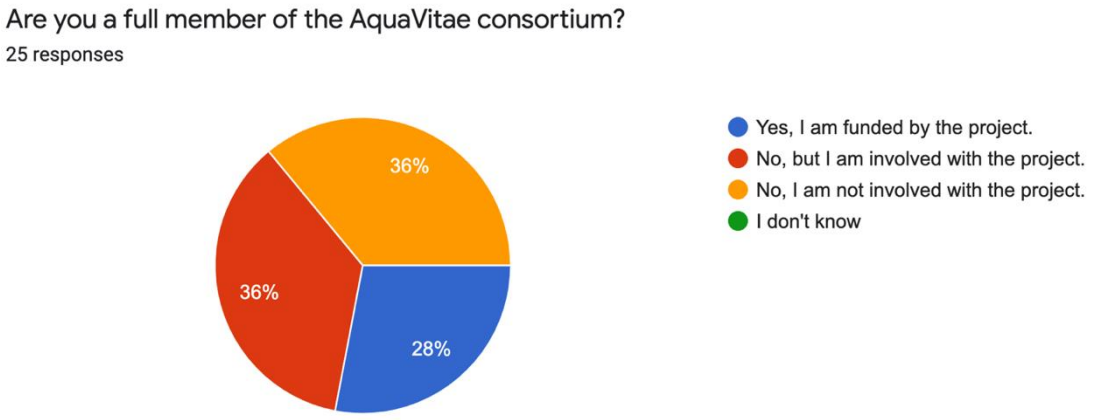

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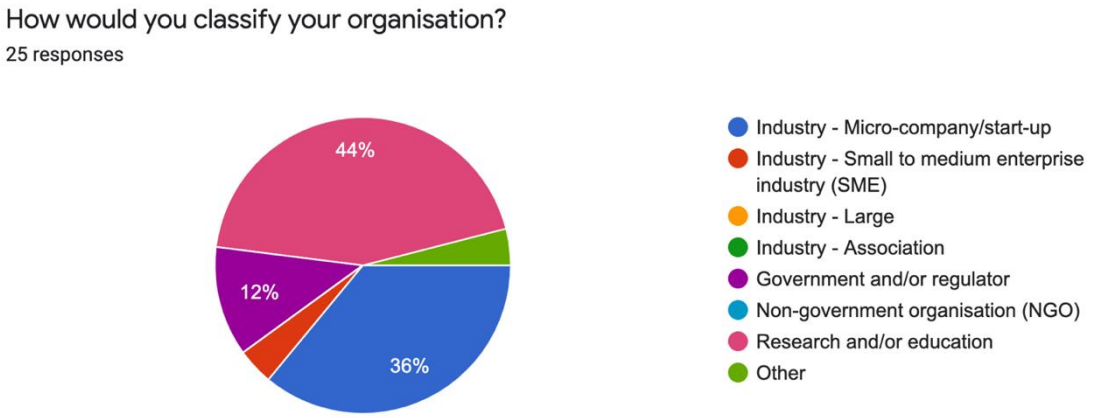
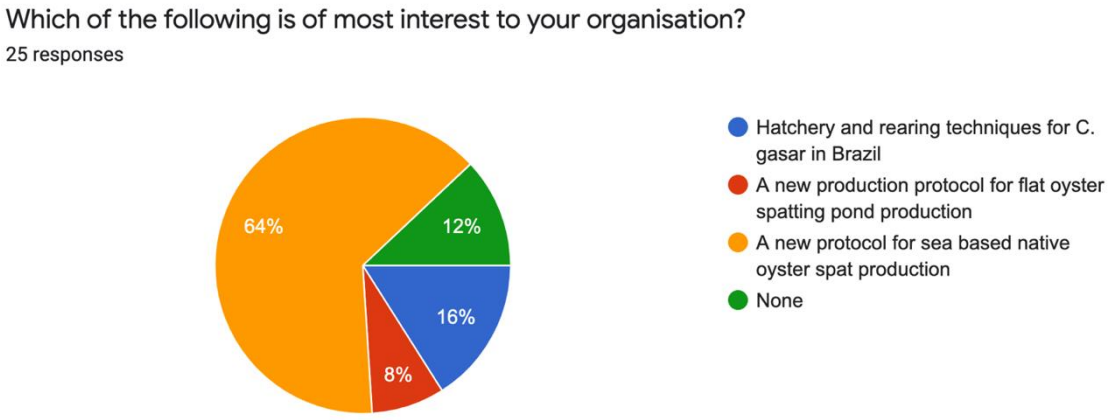


Figure 8.2: Respond's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).



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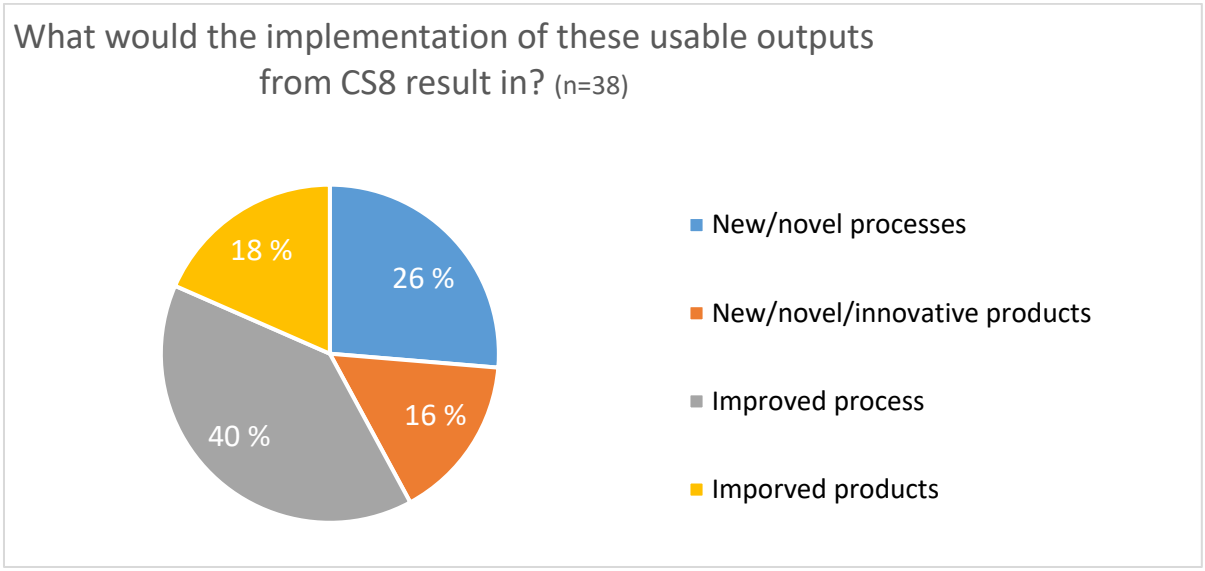

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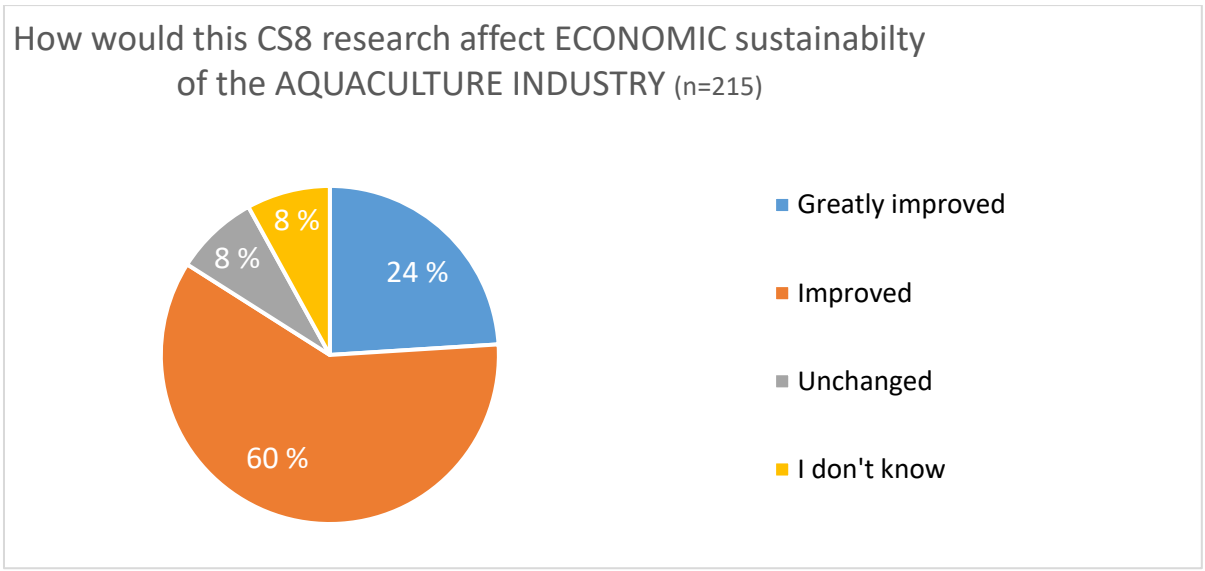

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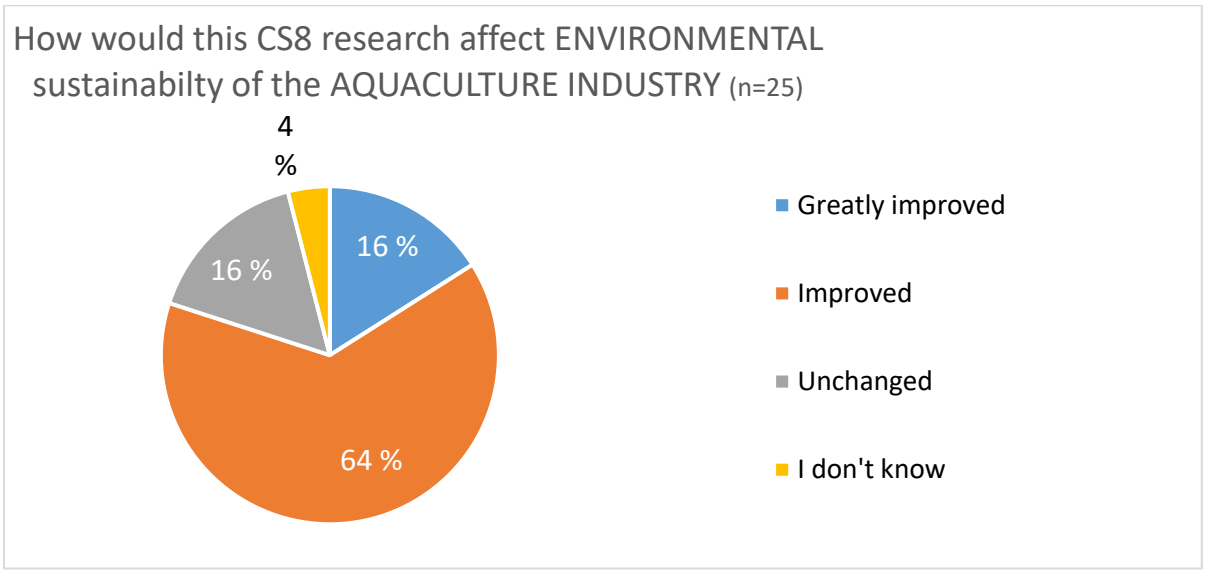

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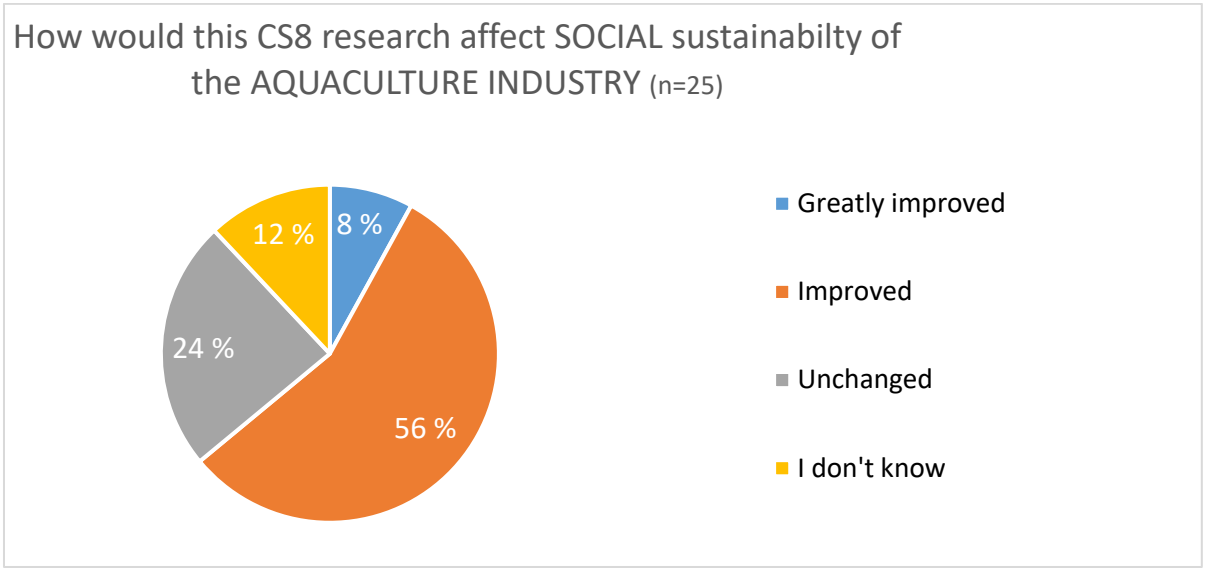

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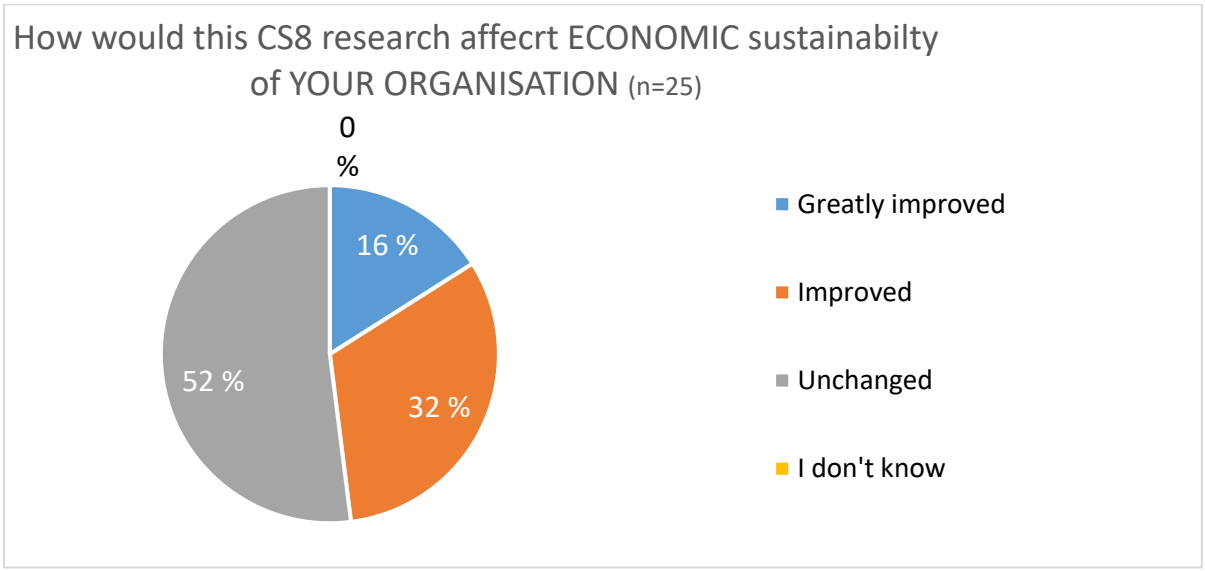

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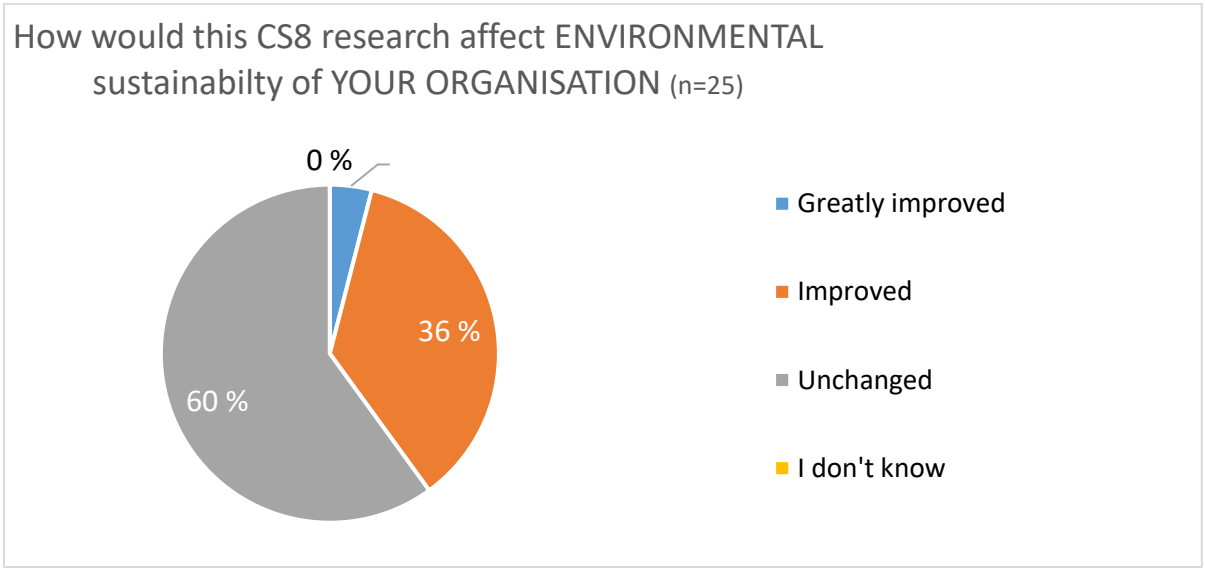

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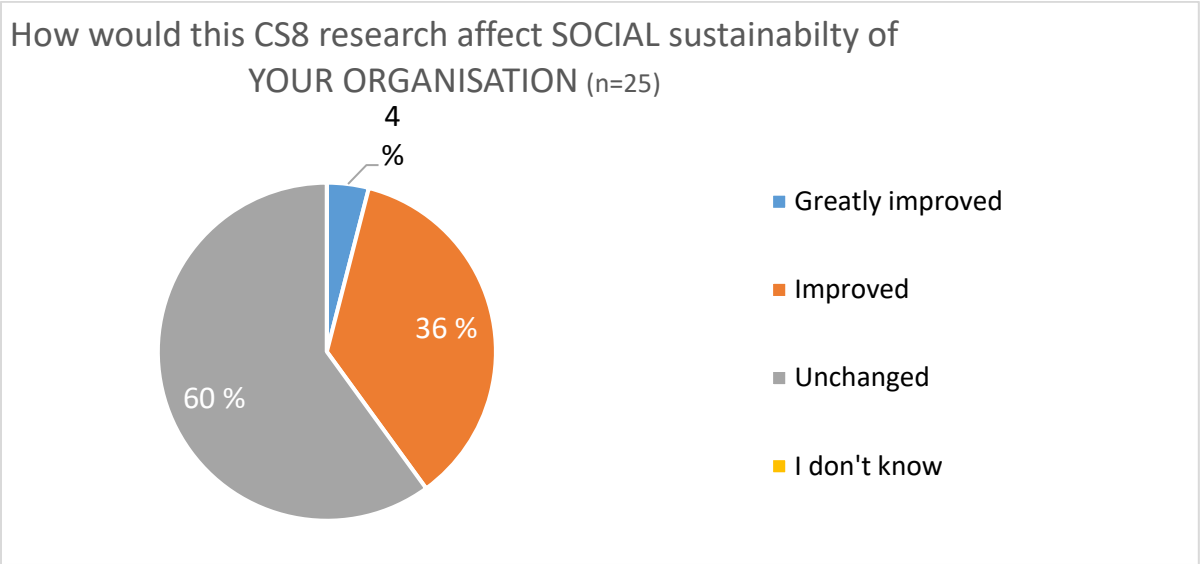

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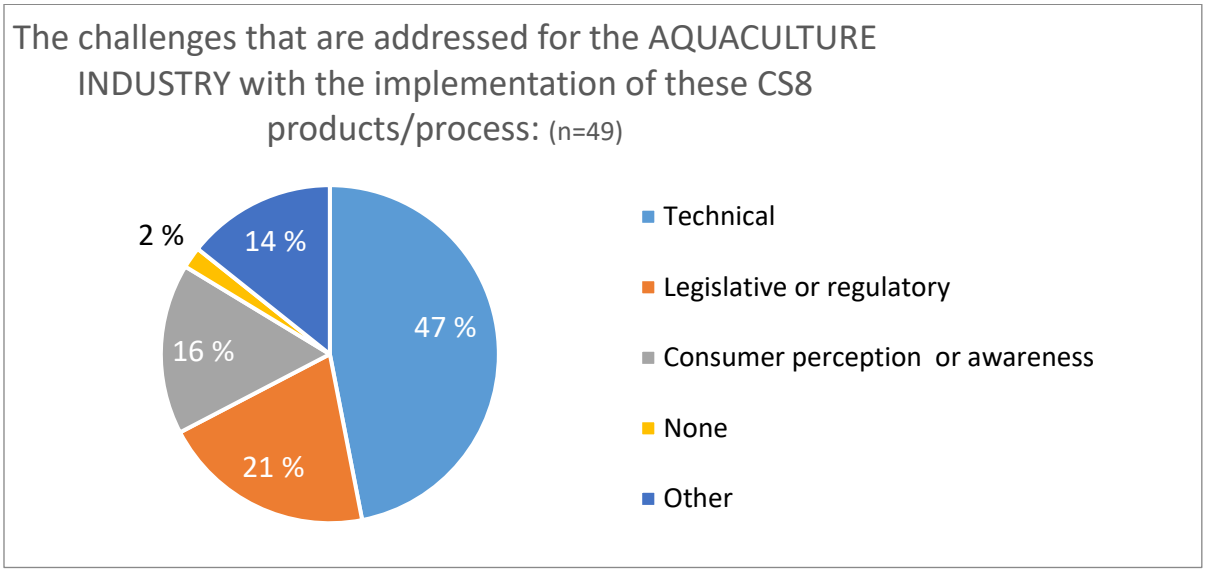

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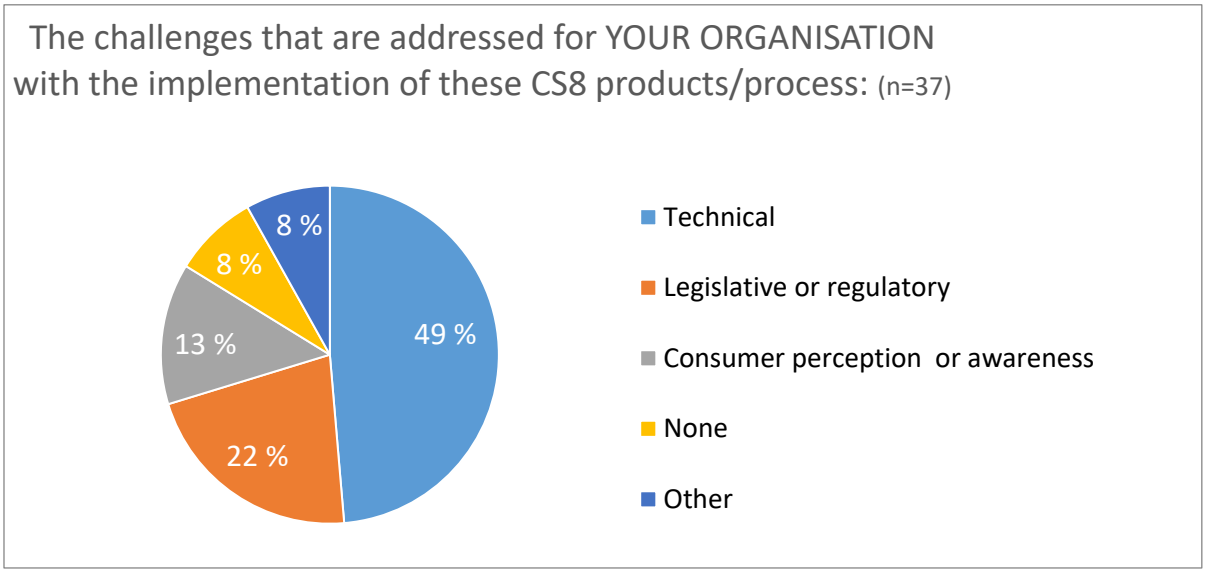

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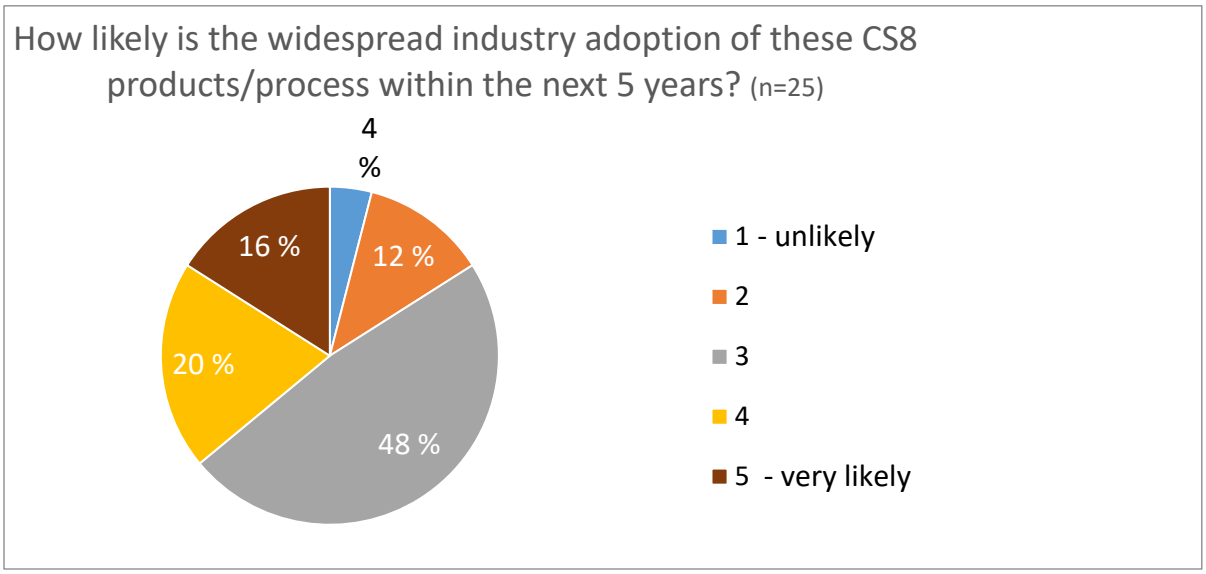

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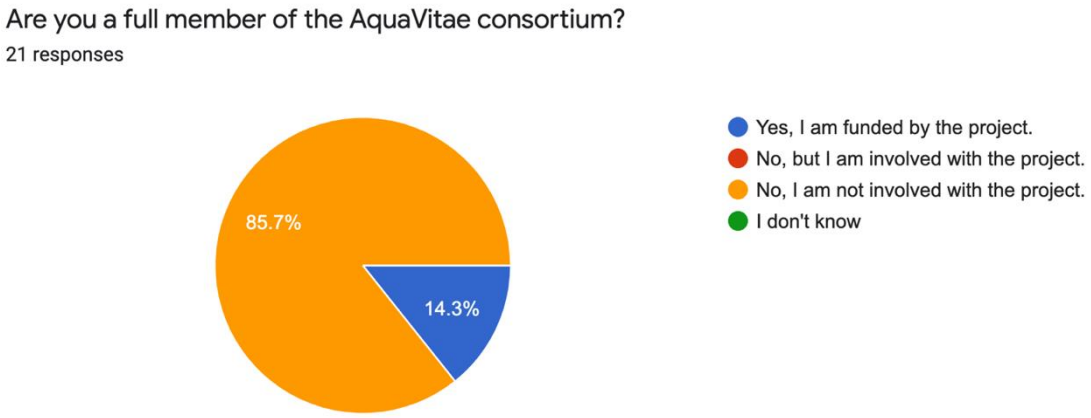

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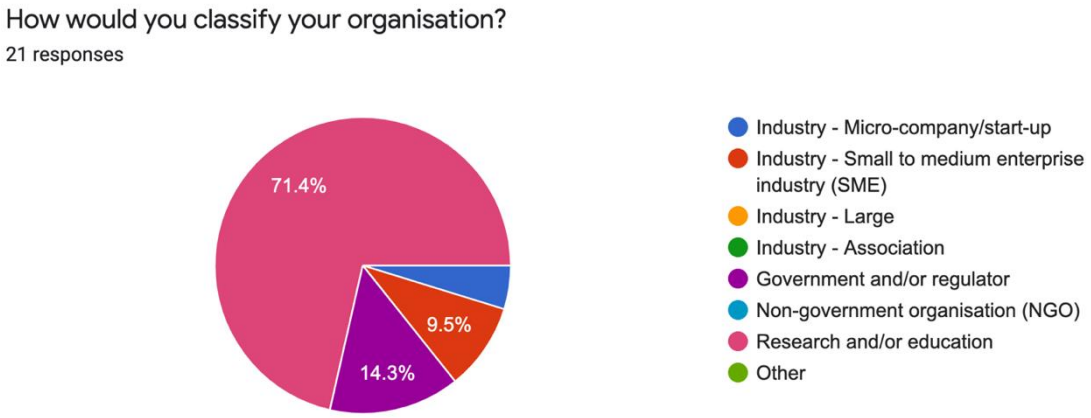

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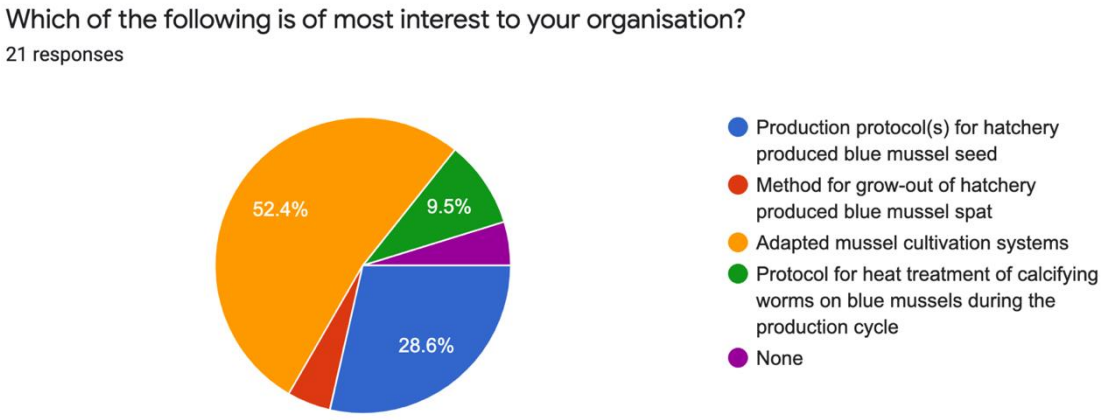


Figure 9.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

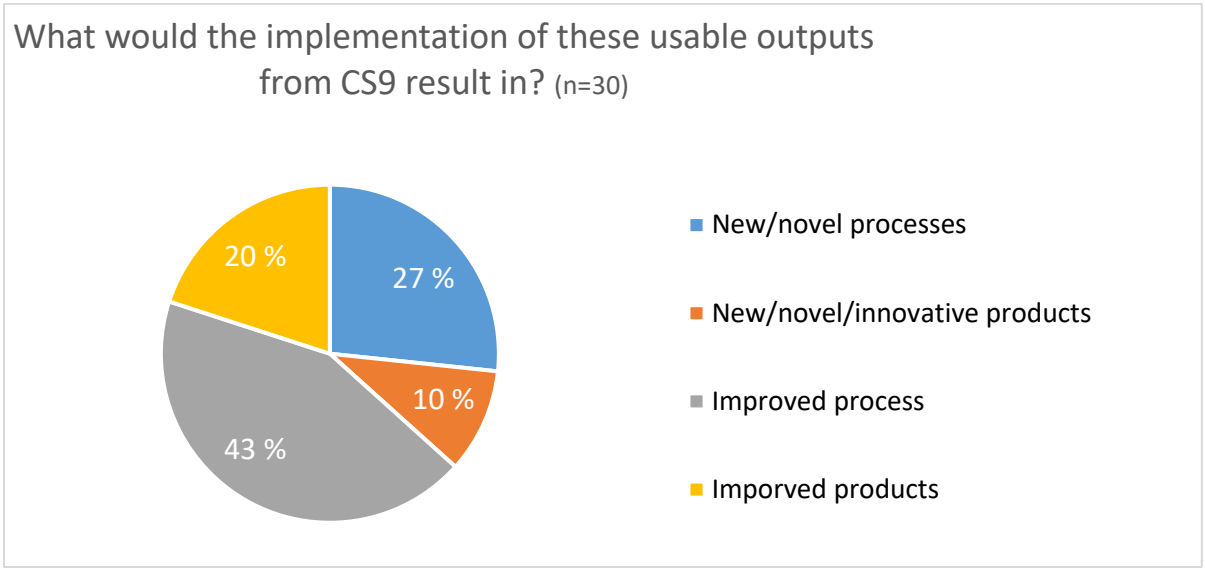


Figure 9.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

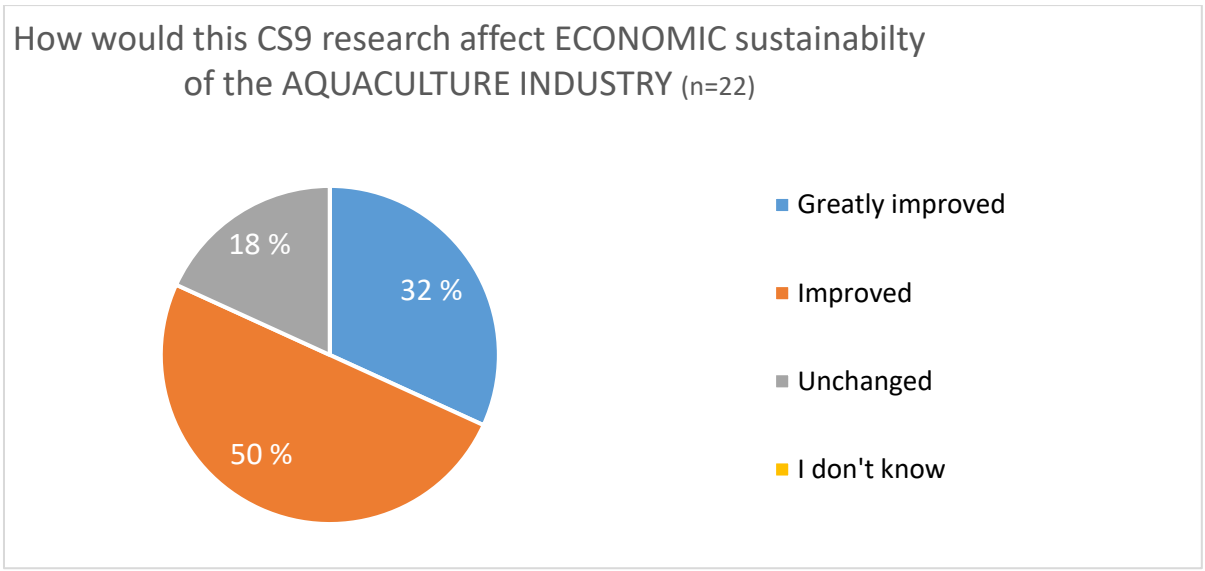
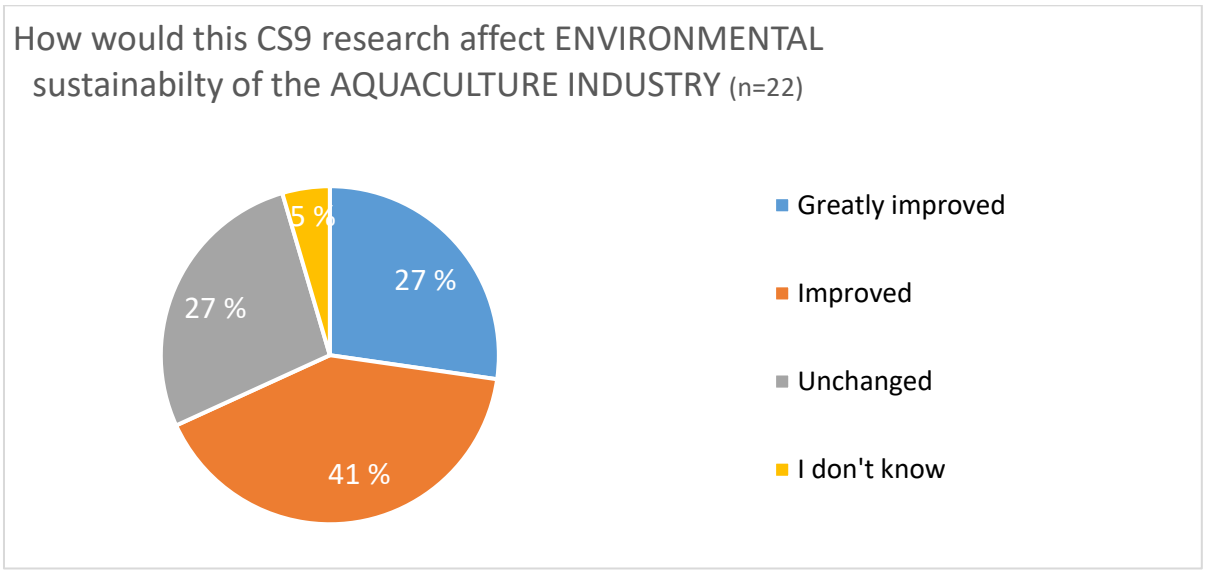


Figure 9.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).



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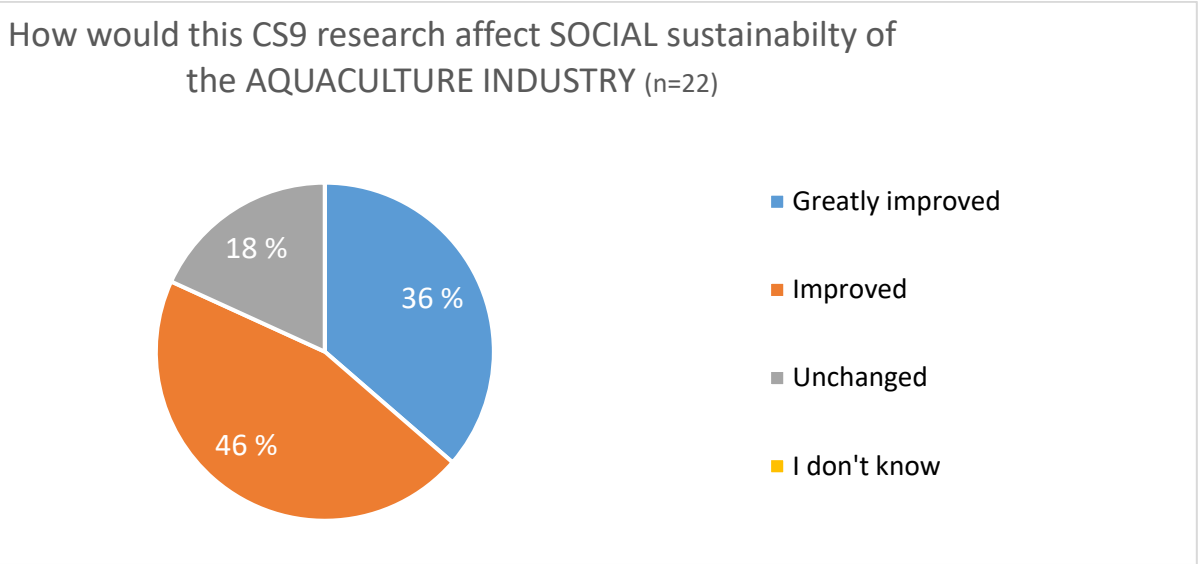


Figure 9.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

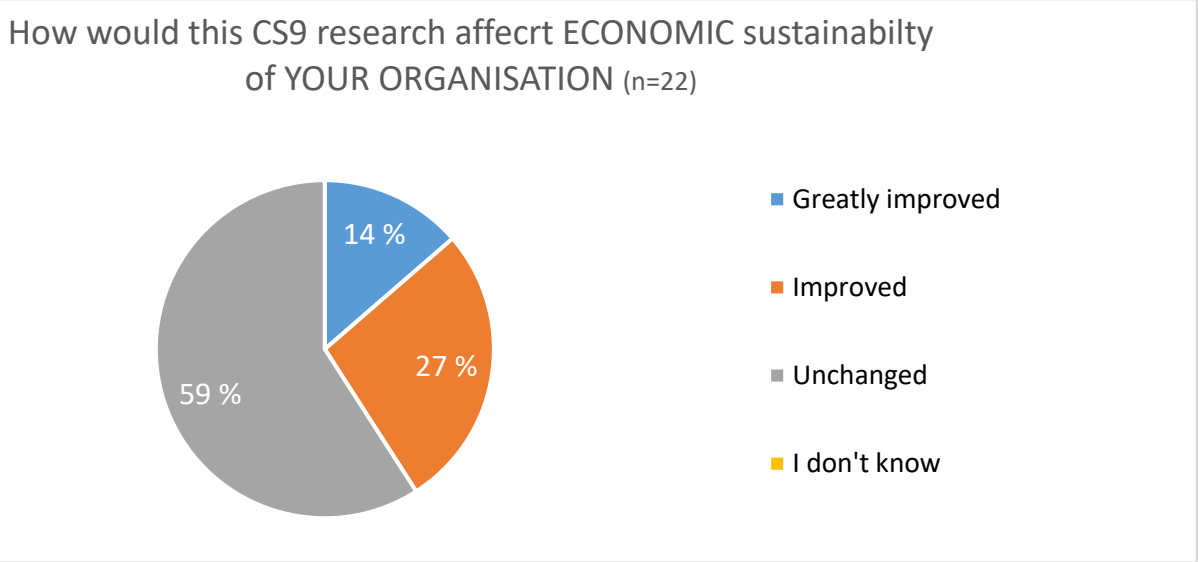


Figure 9.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

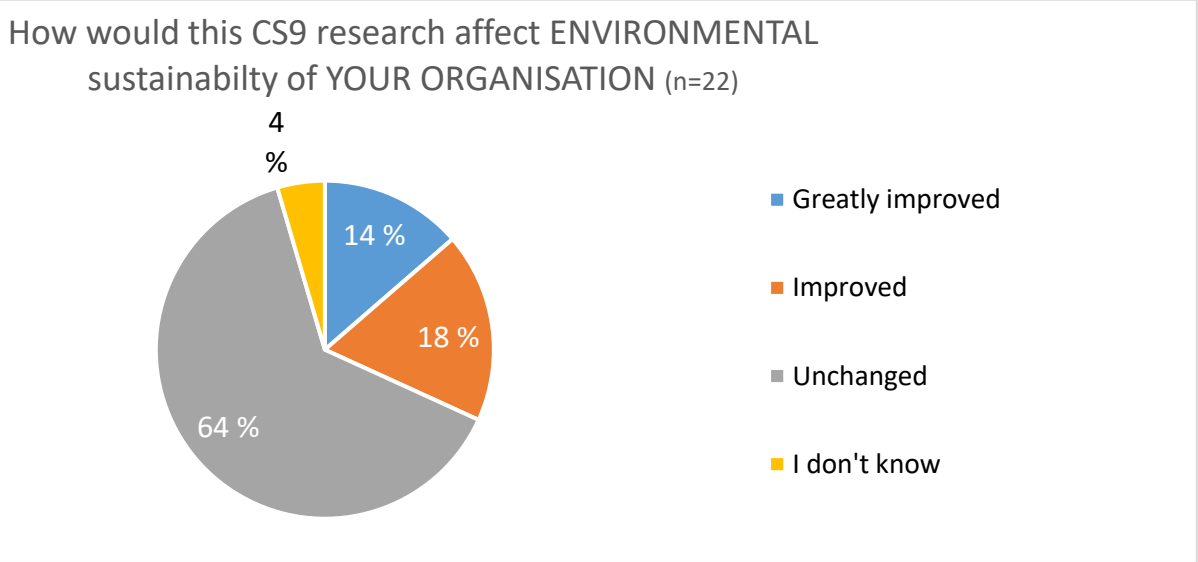


Figure 9.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

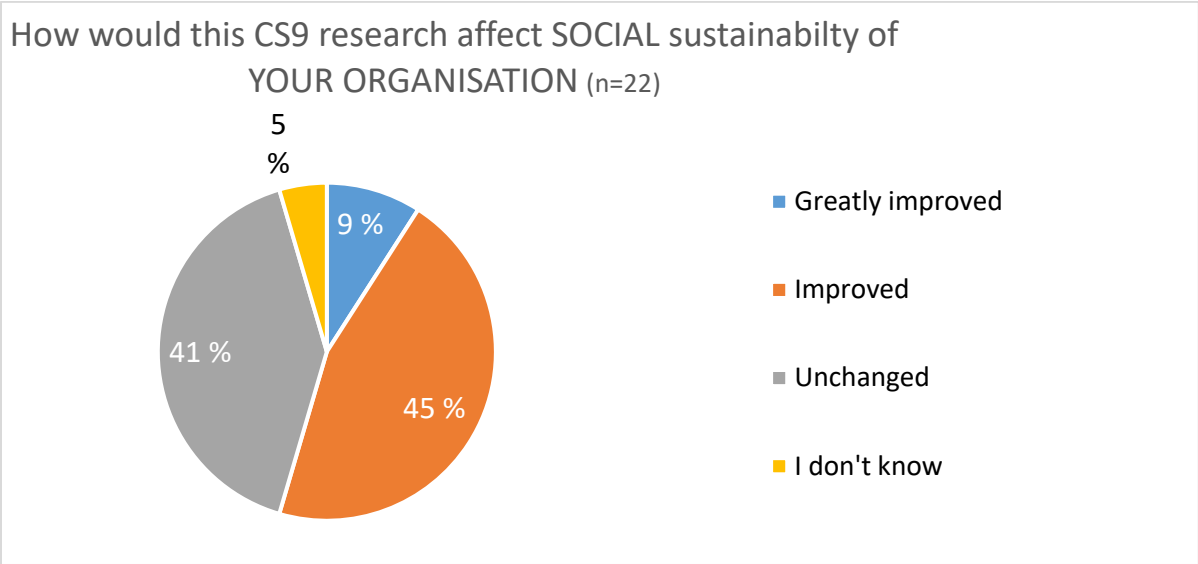


Figure 9.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

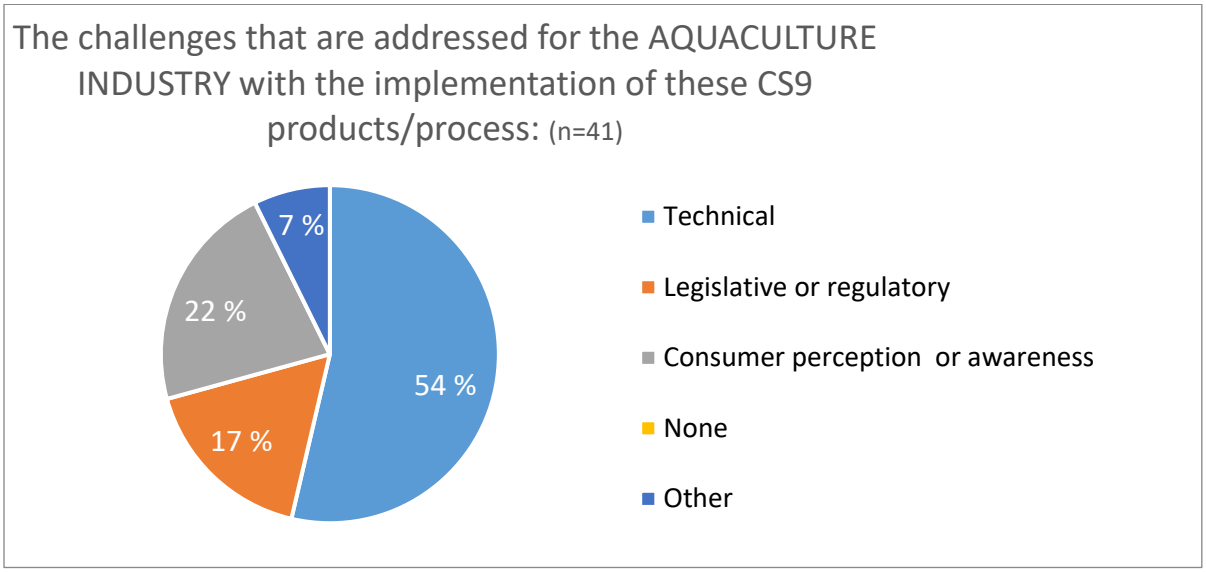


Figure 9.11: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

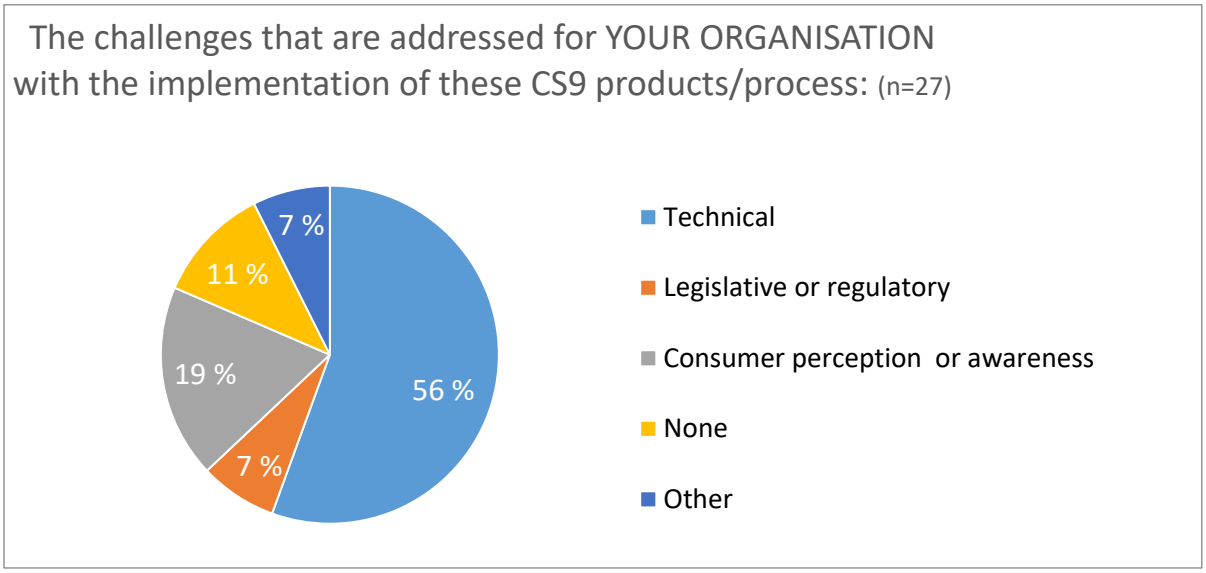


Figure 9.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

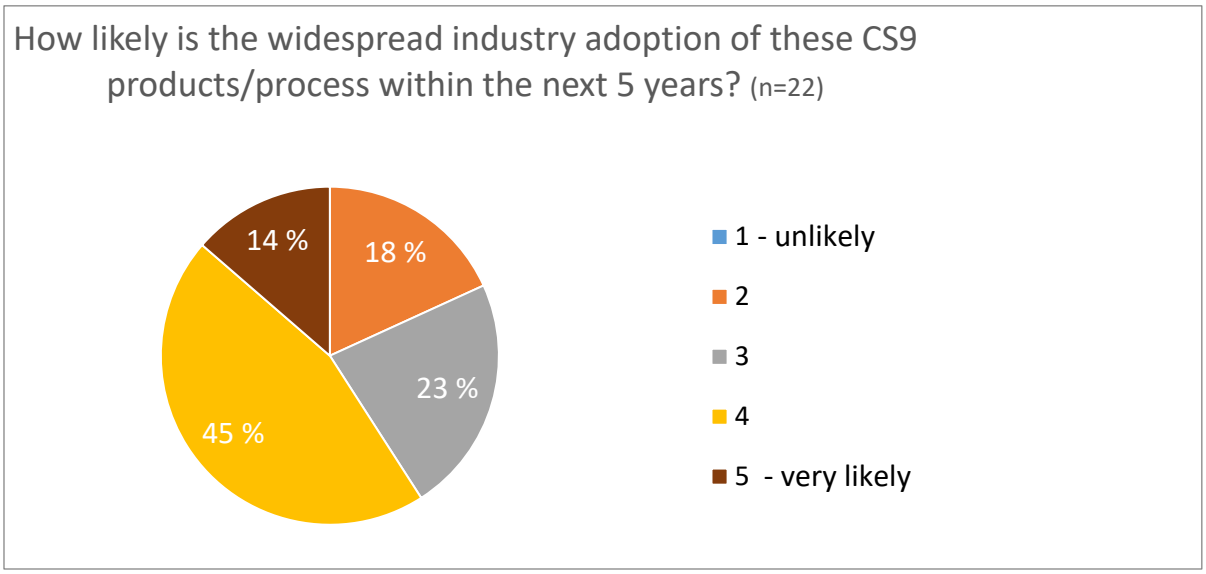


Figure 9.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

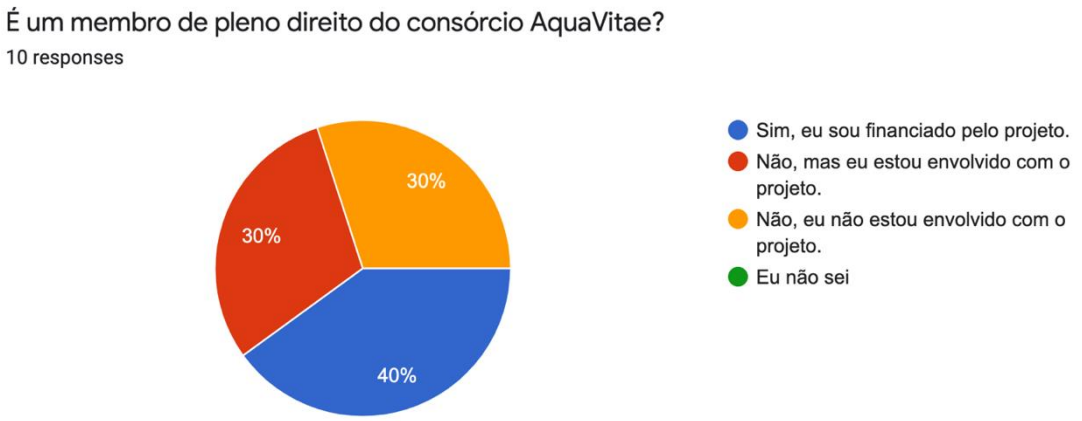


Figure 10.1: Respondent relation to the AquaVitae Project (AquaVitae stakeholder survey, to 12 May 2022).

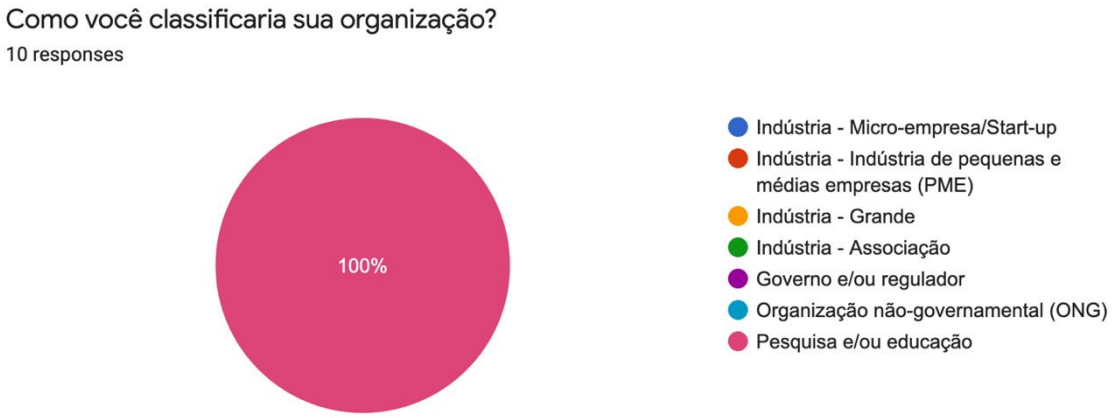


Figure 10.2: Respond's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).

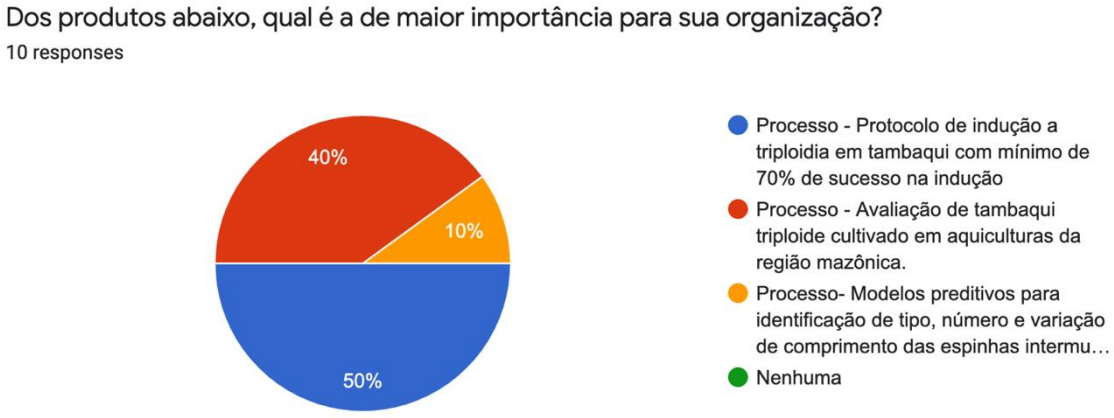


Figure 10.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

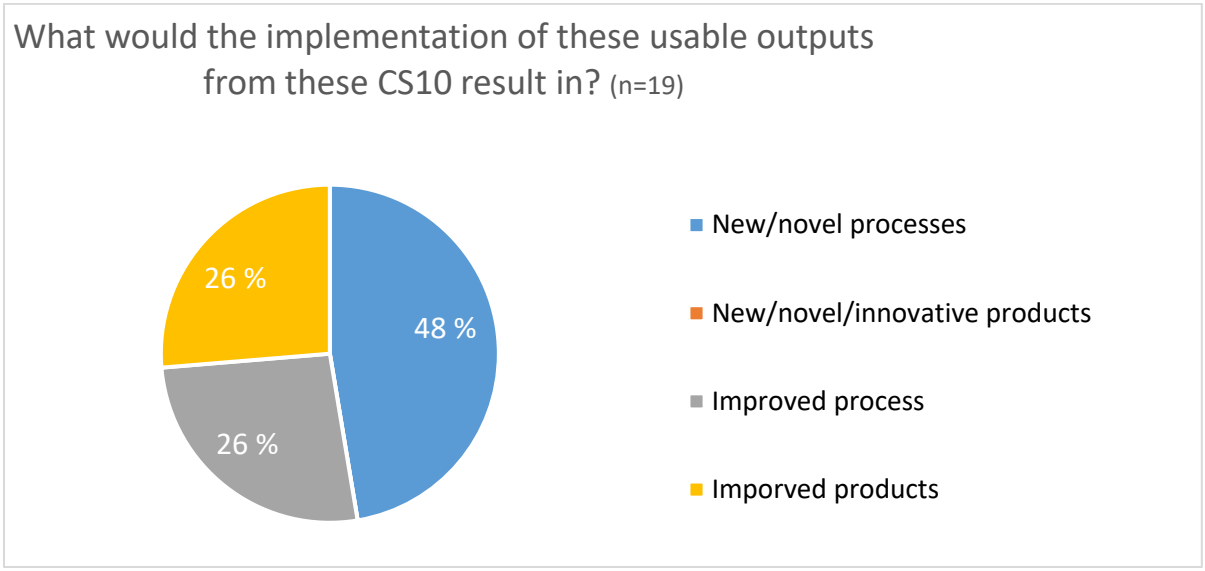


Figure 10.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

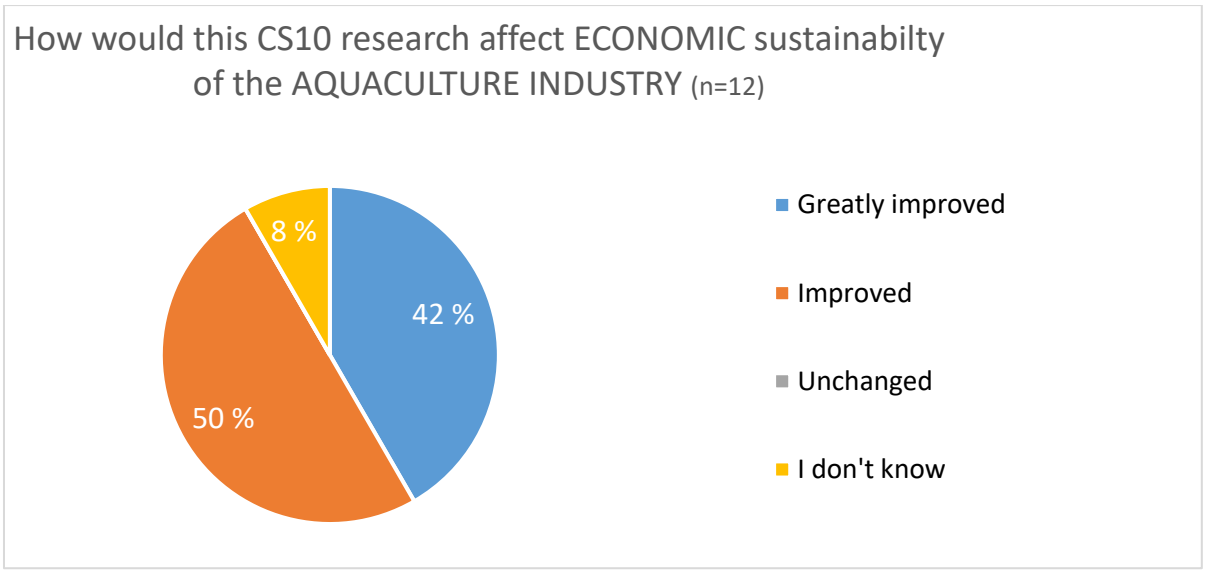
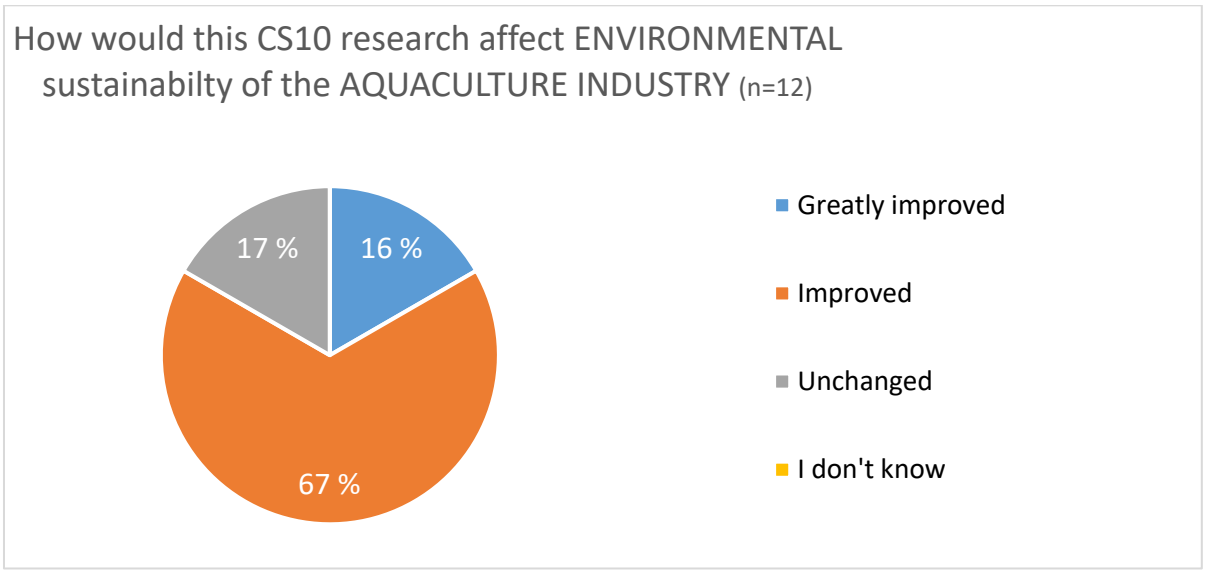


Figure 10.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).



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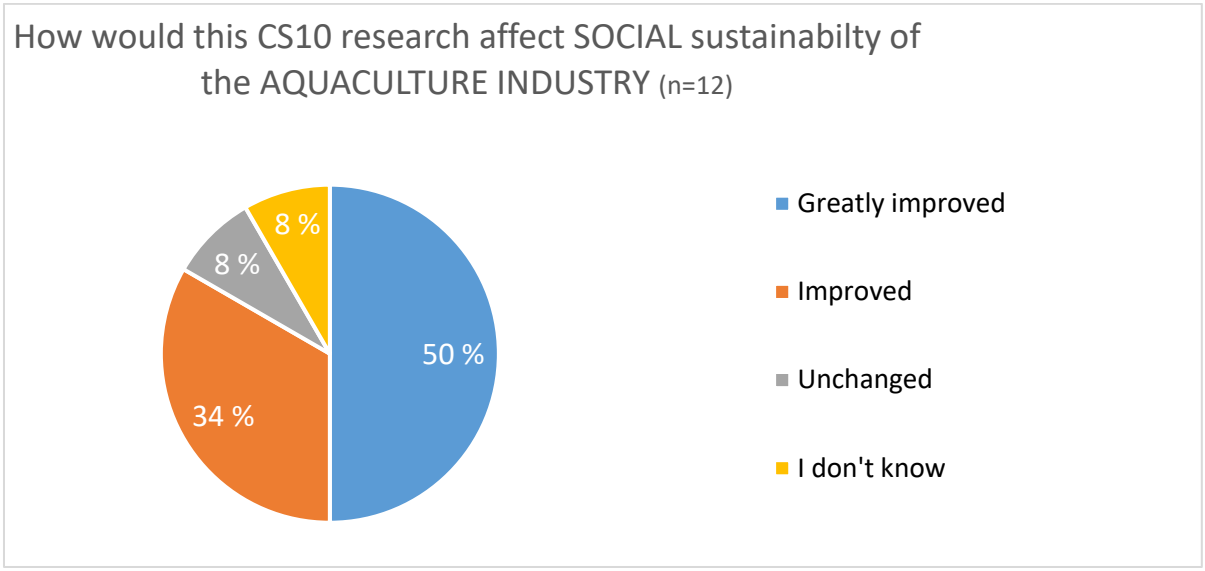


Figure 10.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

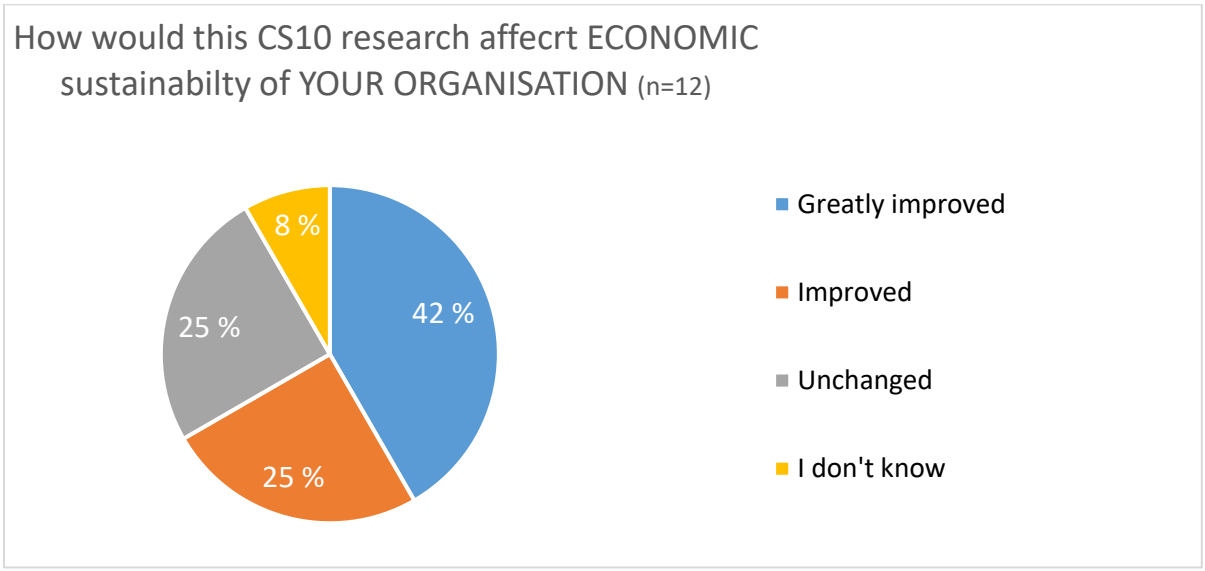


Figure 10.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

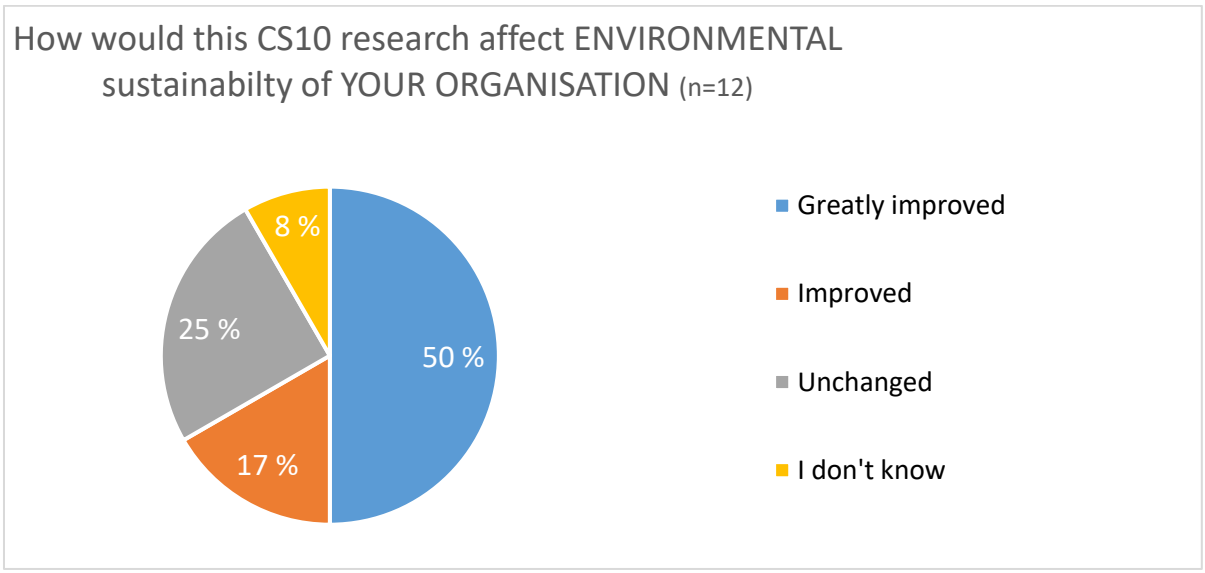


Figure 10.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

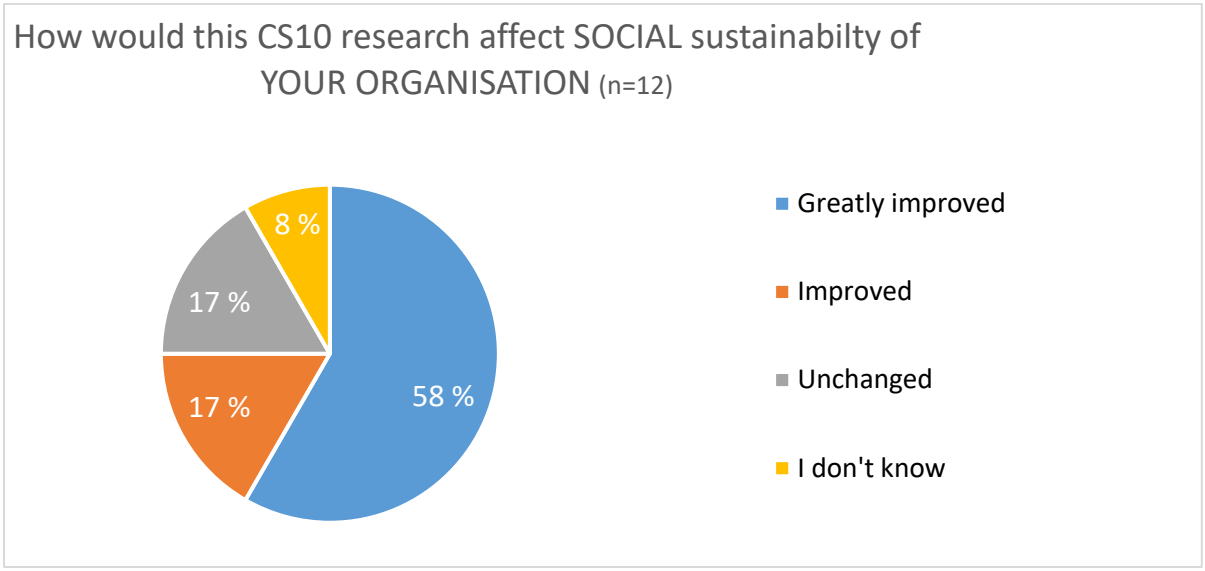


Figure 10.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

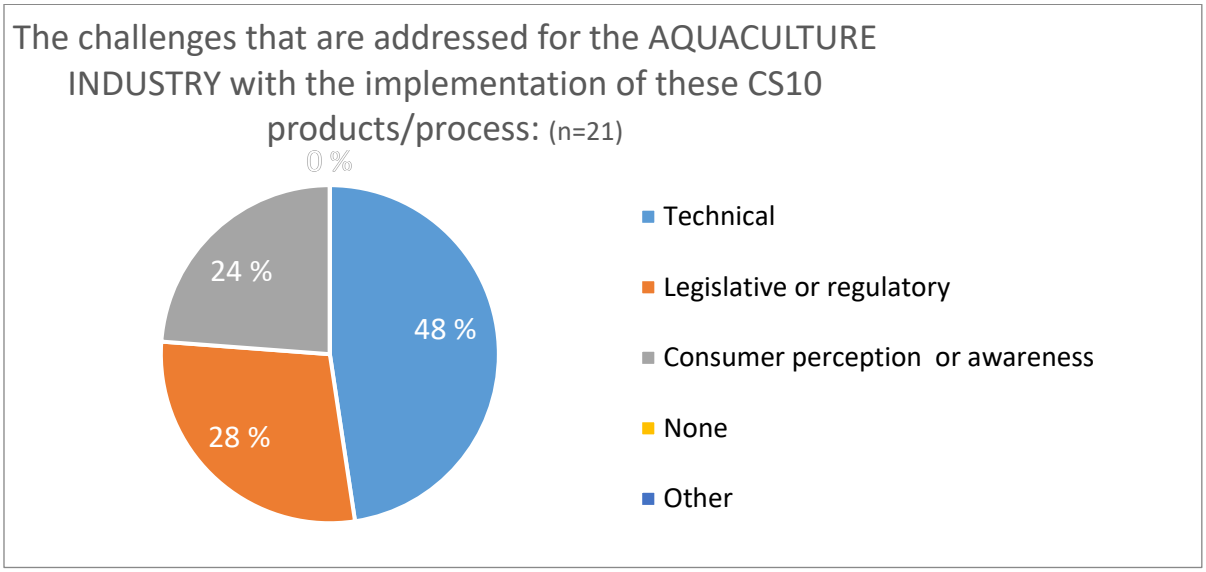


Figure 10.11: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

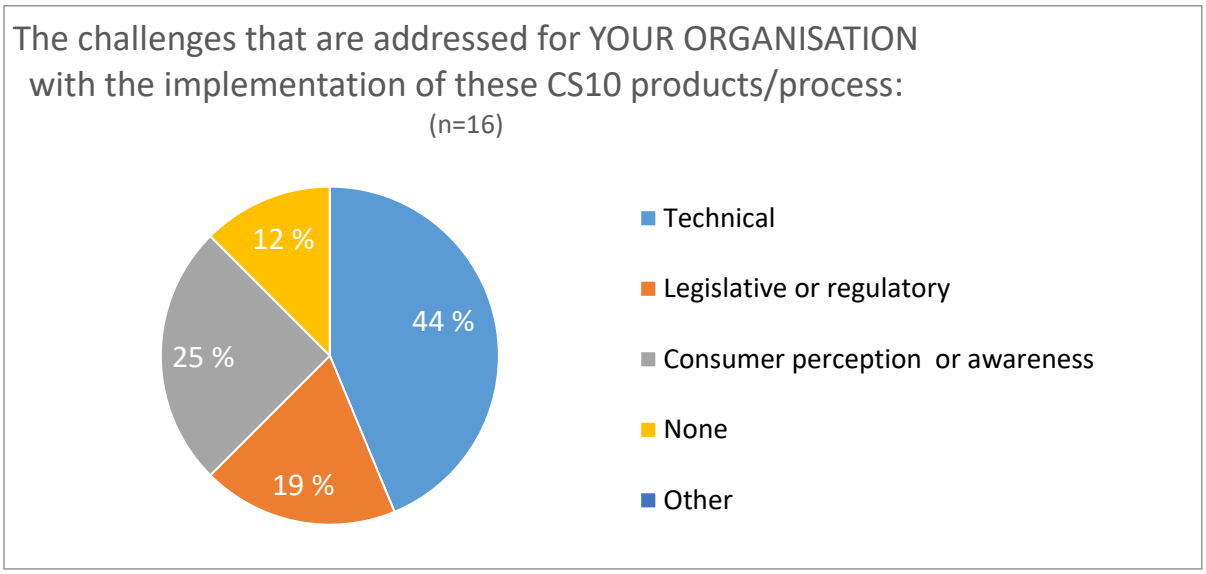


Figure 10.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

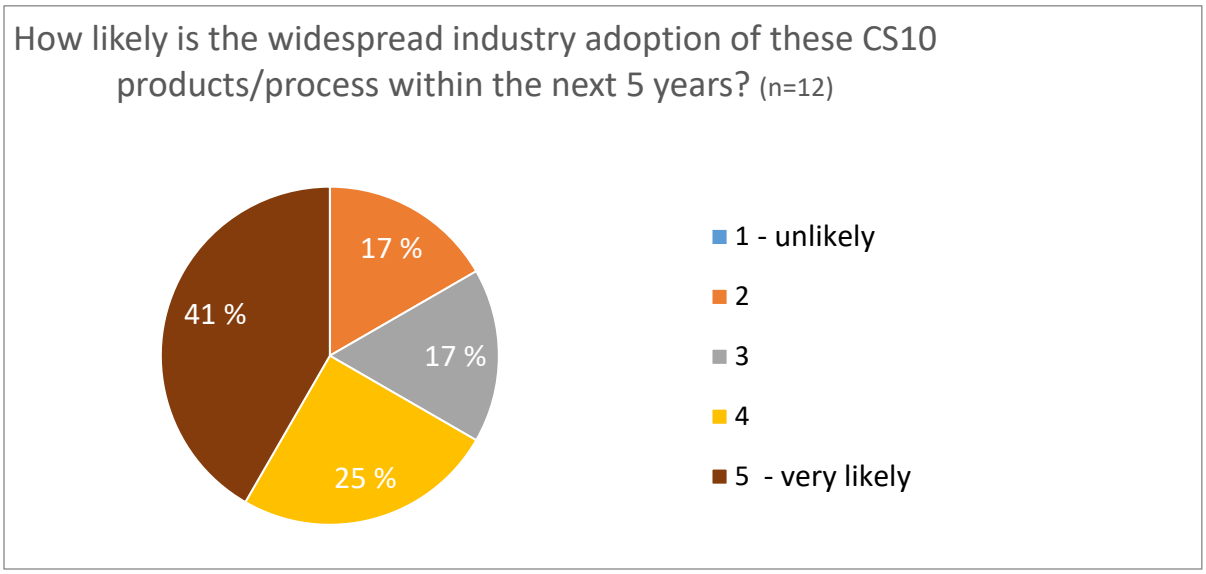


Figure 10.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

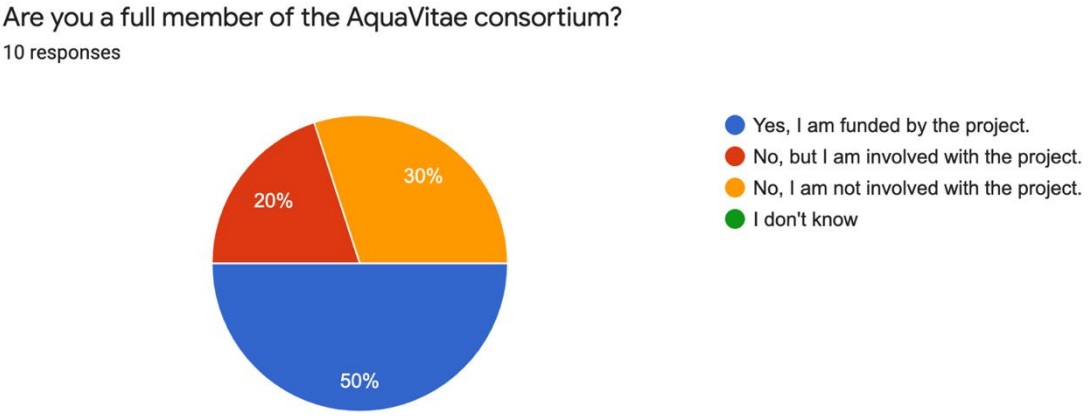


Figure 12.1: Respondent relation to the AquaVitae Project (AquaVitae stakeholder survey, to 12 May 2022).

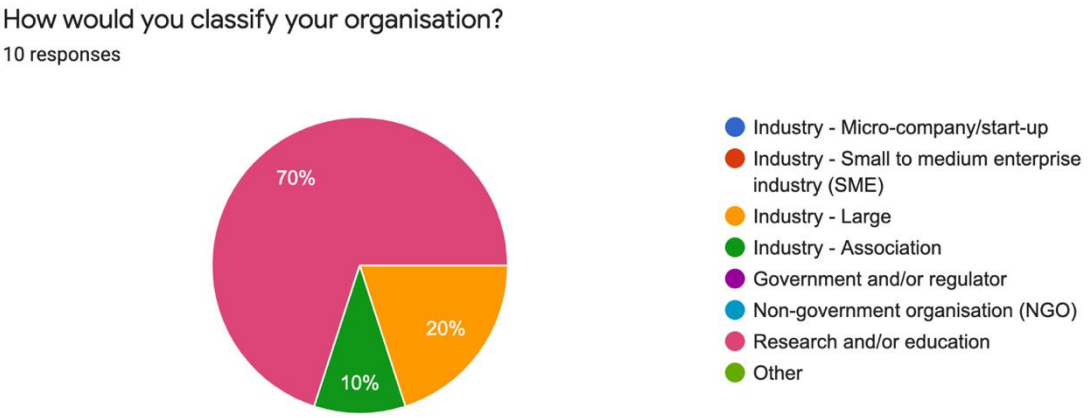


Figure 12.2: Respond's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).

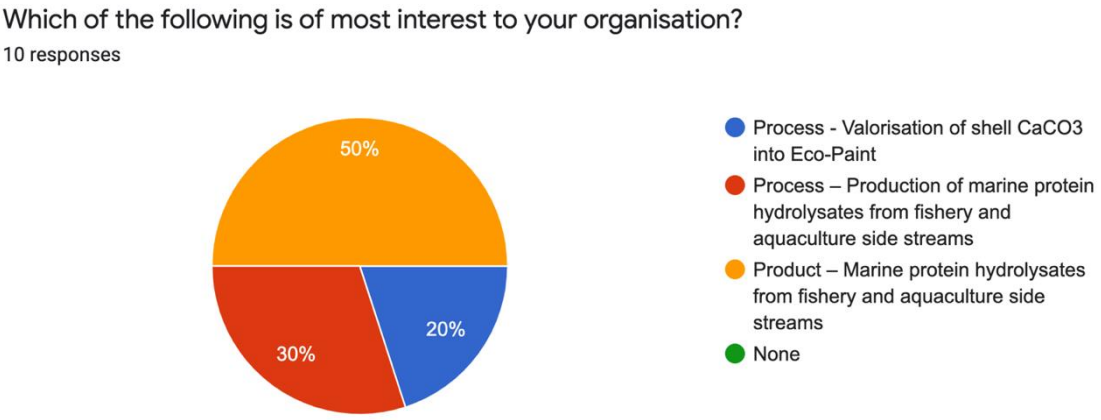


Figure 12.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

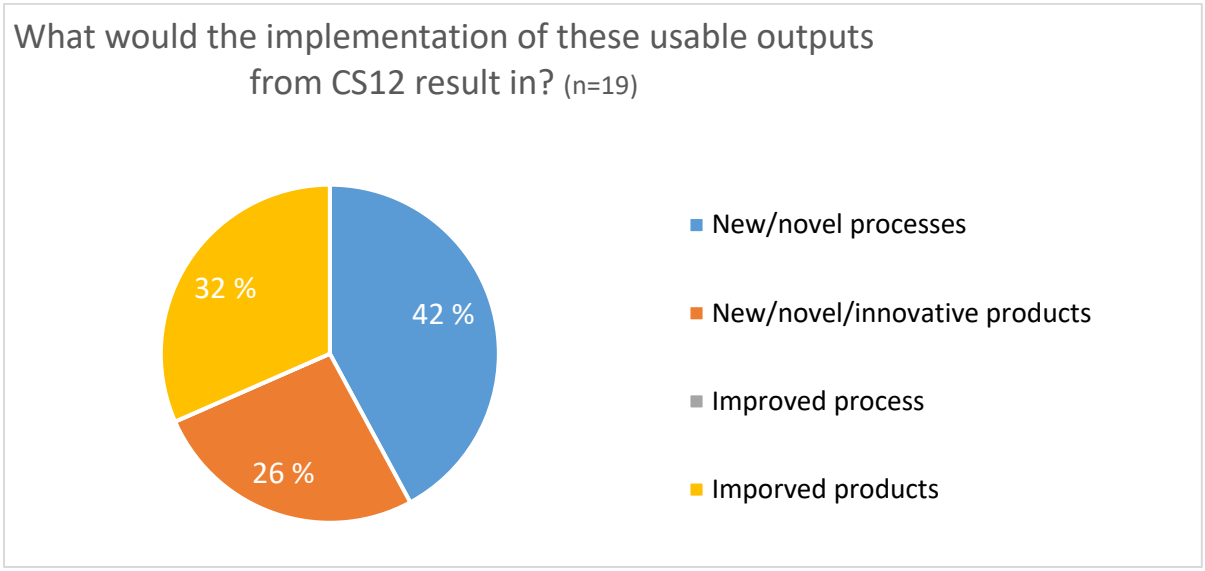


Figure 12.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

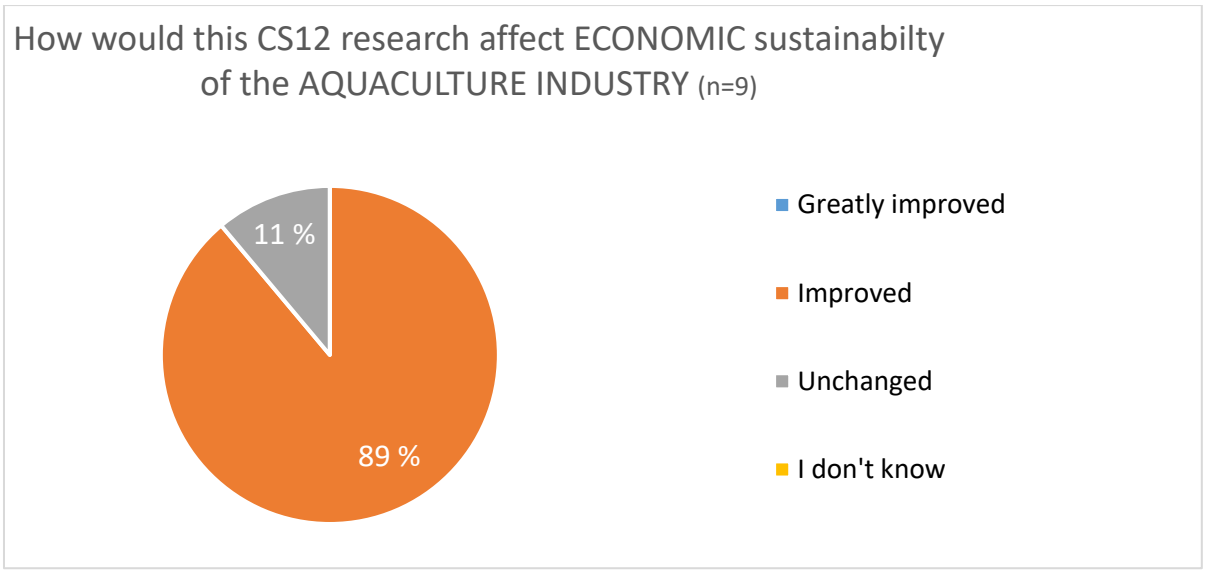


Figure 12.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).

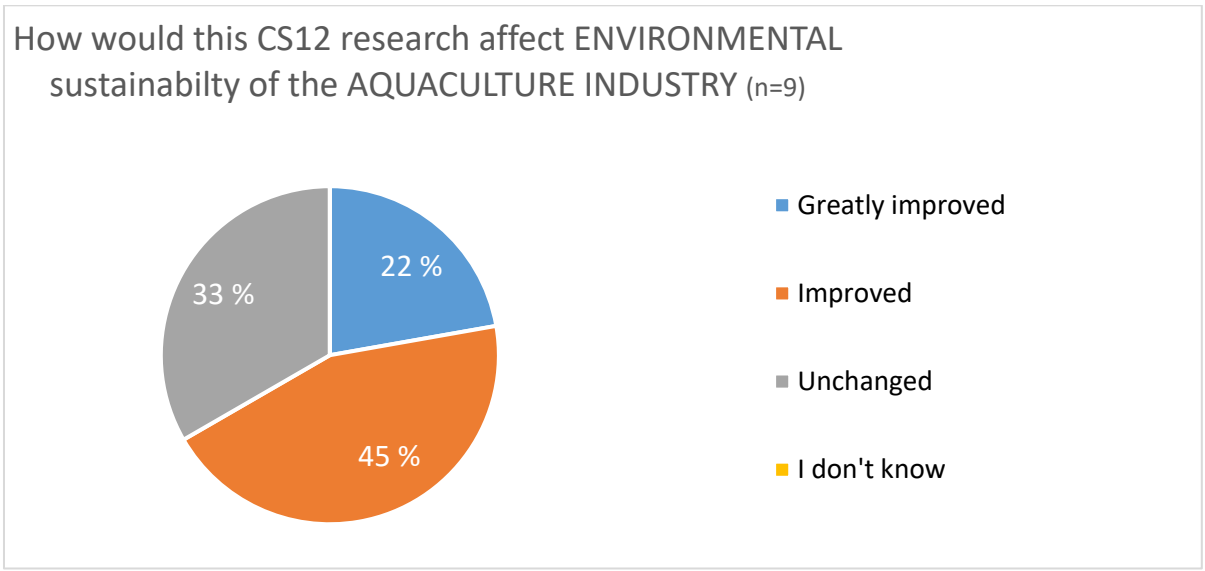


Figure 12.6: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability (AquaVitae stakeholder survey, to 12 May 2022).

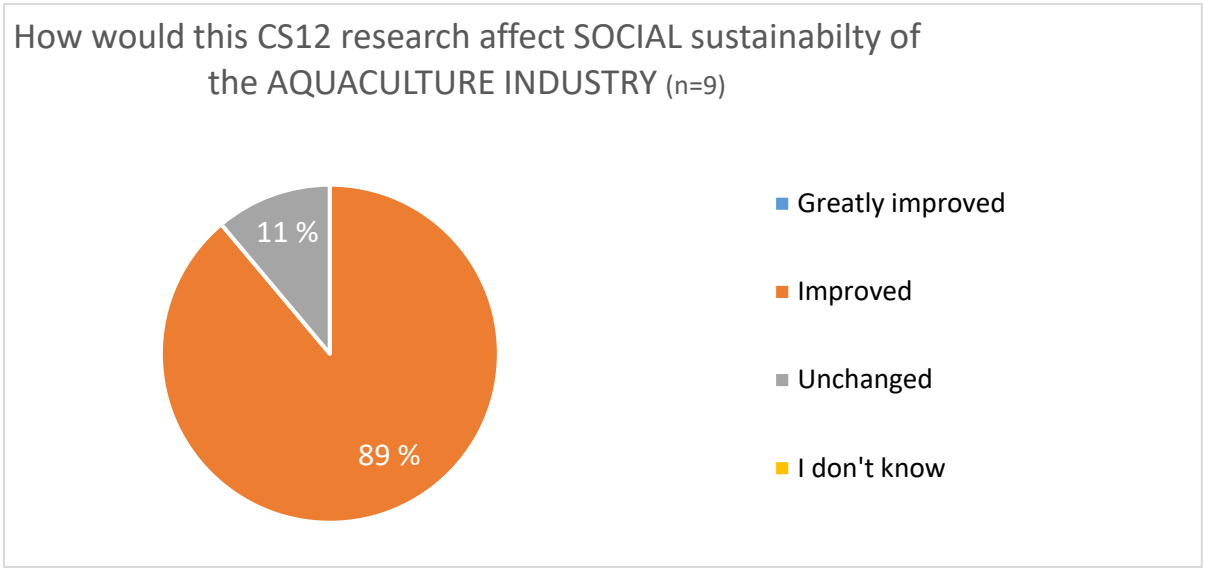


Figure 12.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

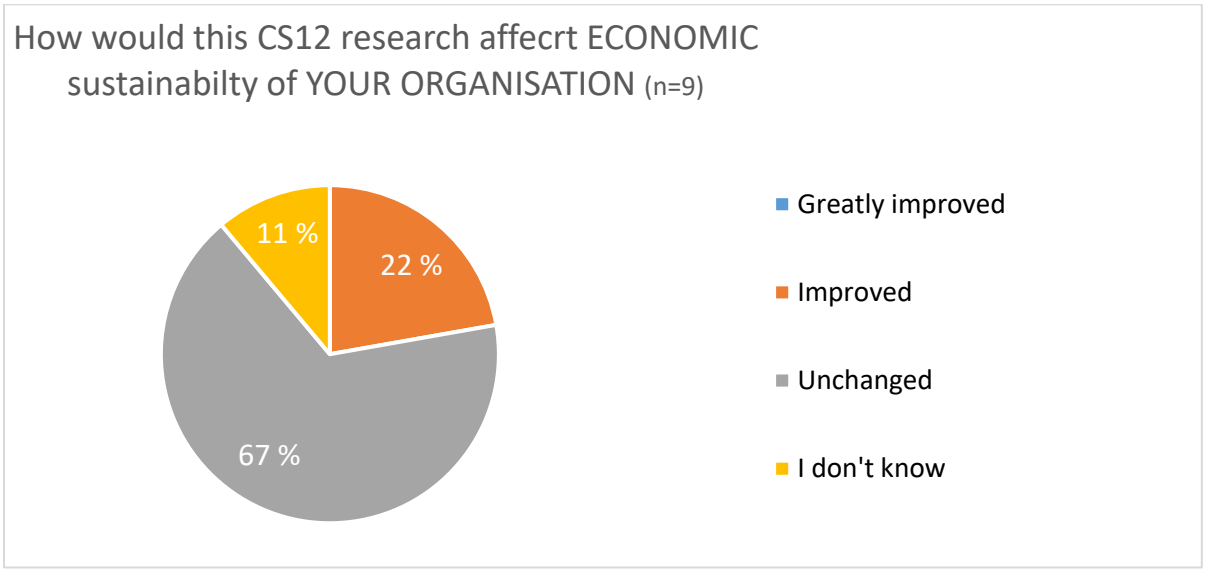


Figure 12.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

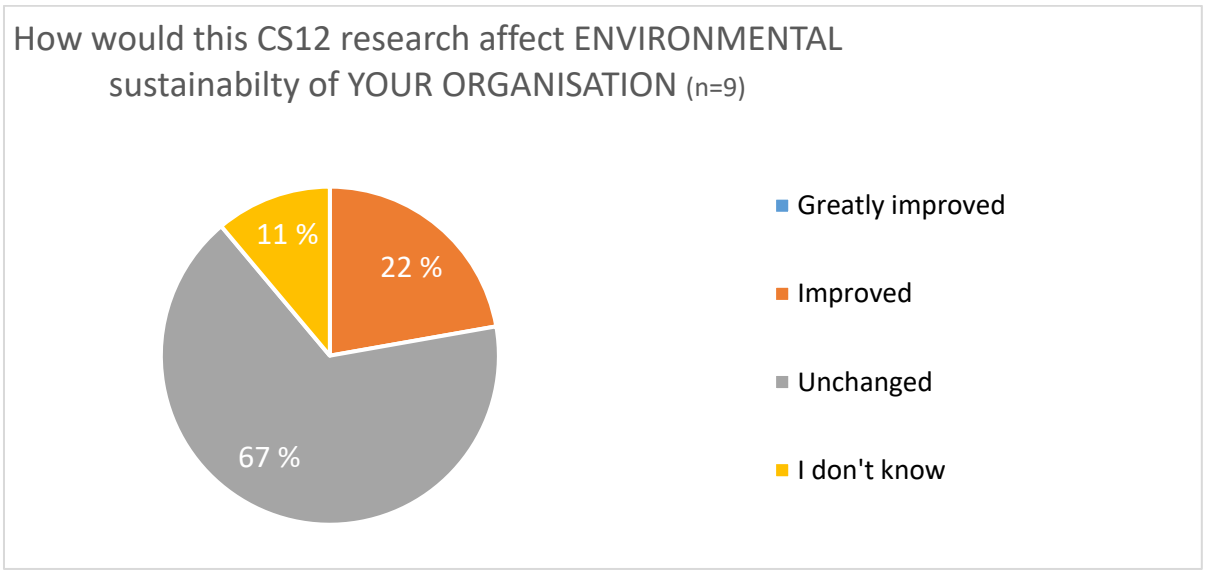


Figure 12.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

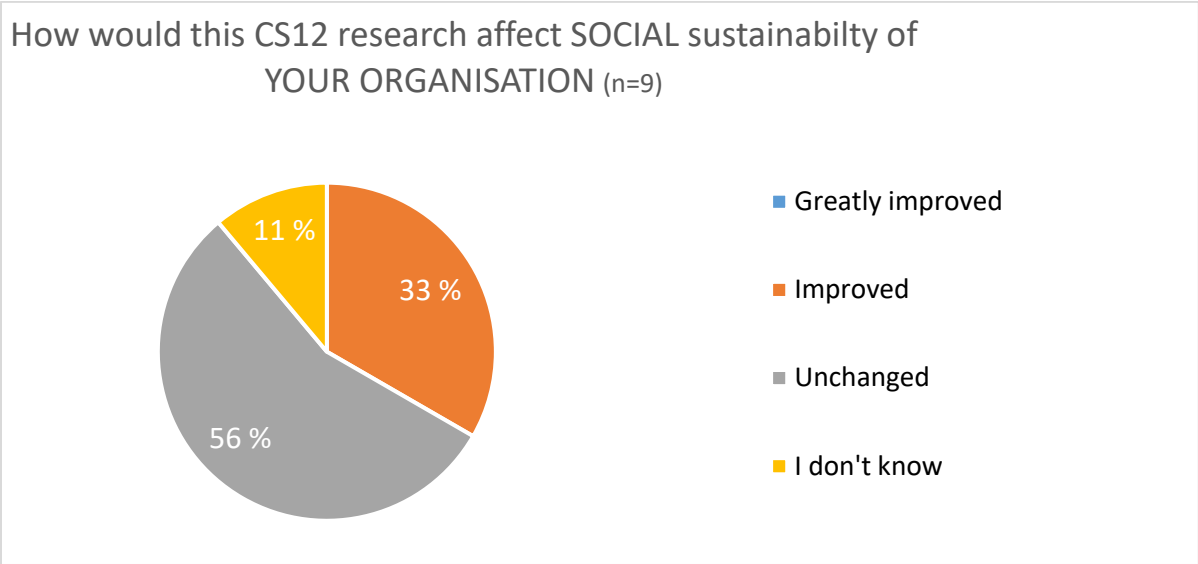


Figure 12.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

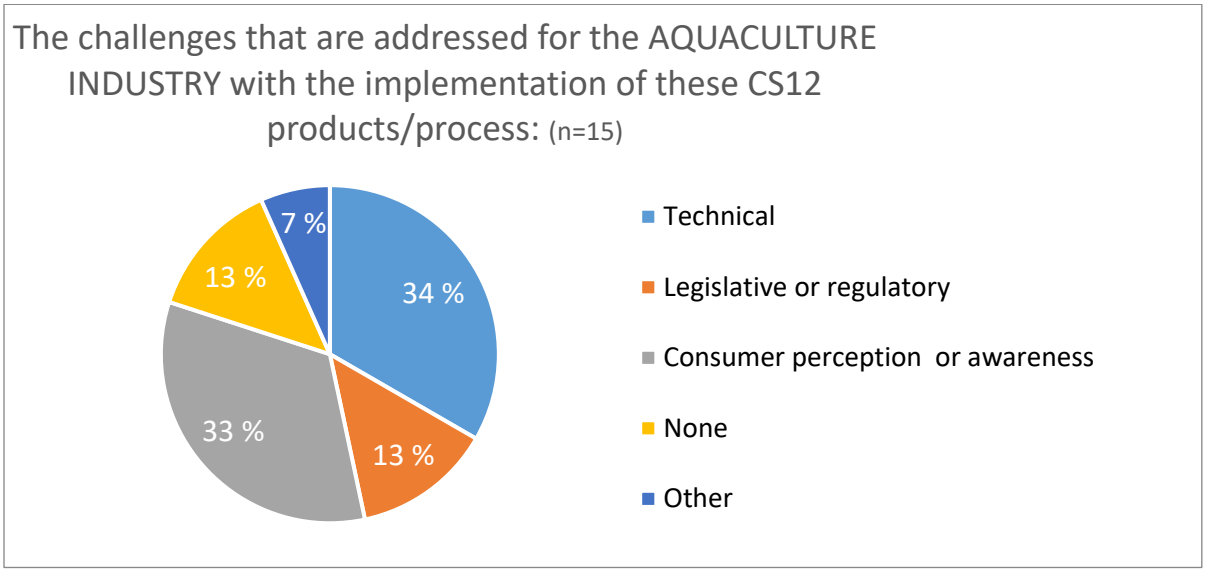


Figure 12.11: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

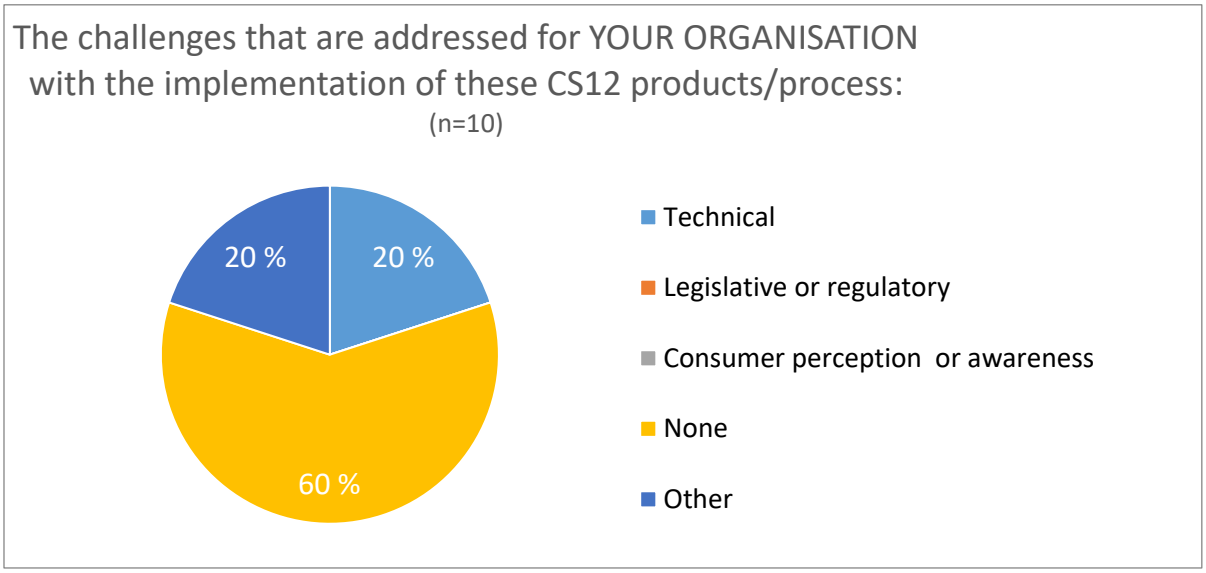


Figure 12.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

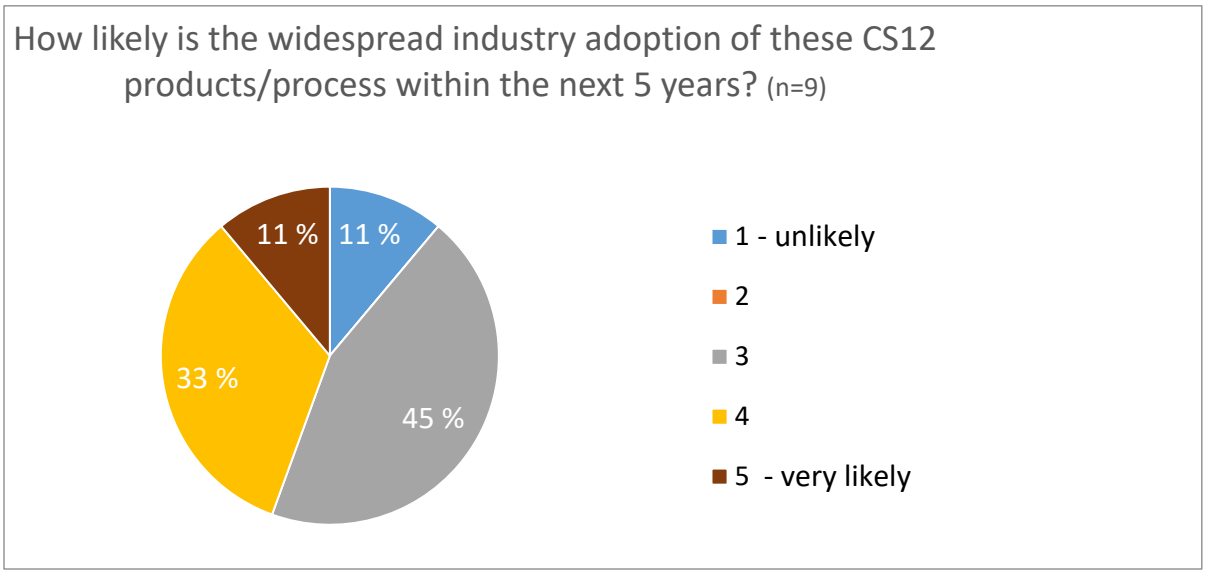


Figure 12.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

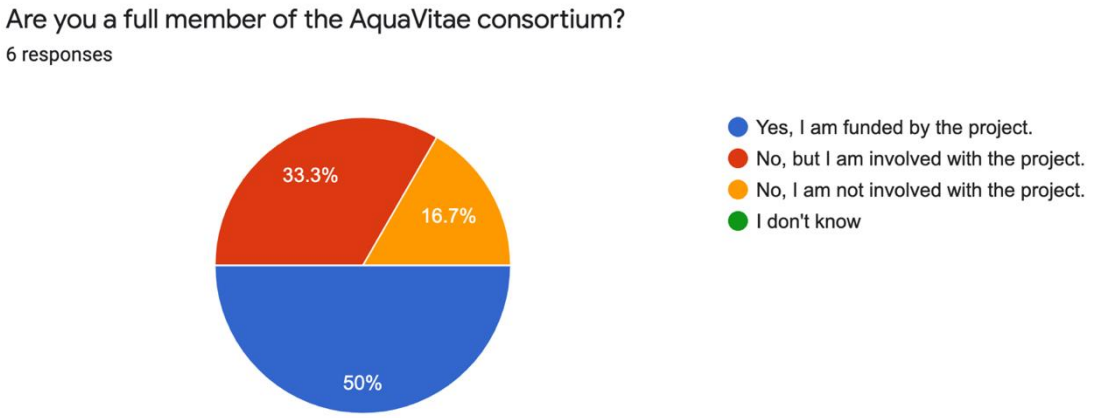


Figure 13.1: Respondent relation to the AquaVitae Project (AquaVitae stakeholder survey, to 12 May 2022).

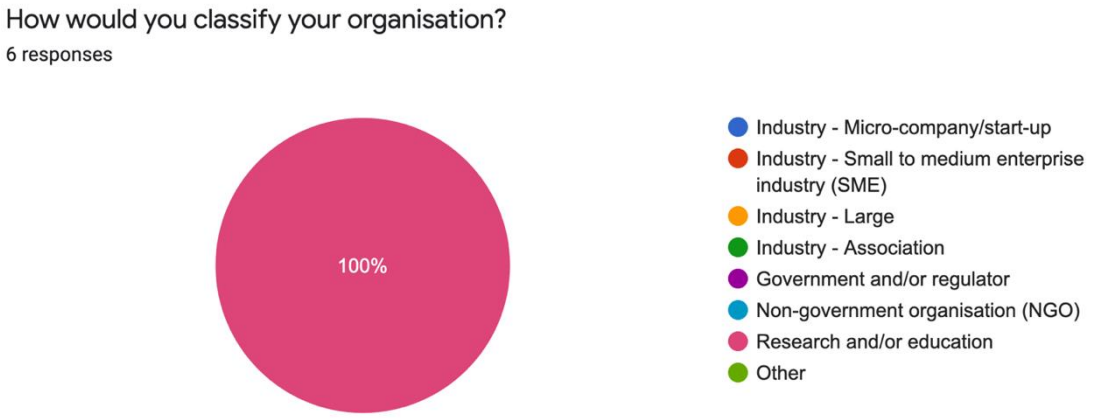


Figure 13.2: Respond's interest in the aquaculture value chain (AquaVitae stakeholder survey, to 12 May 2022).

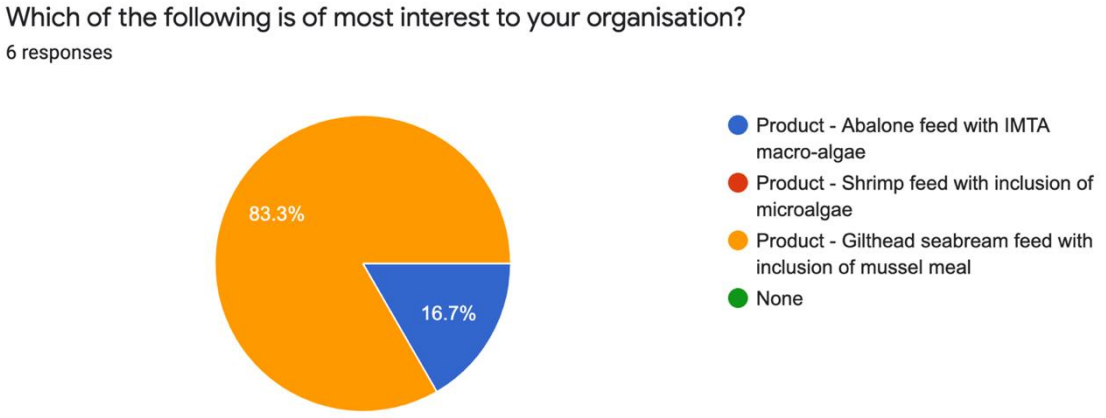


Figure 13.3: Flagship key exploitable results on which this survey was based (AquaVitae stakeholder survey, to 12 May 2022).

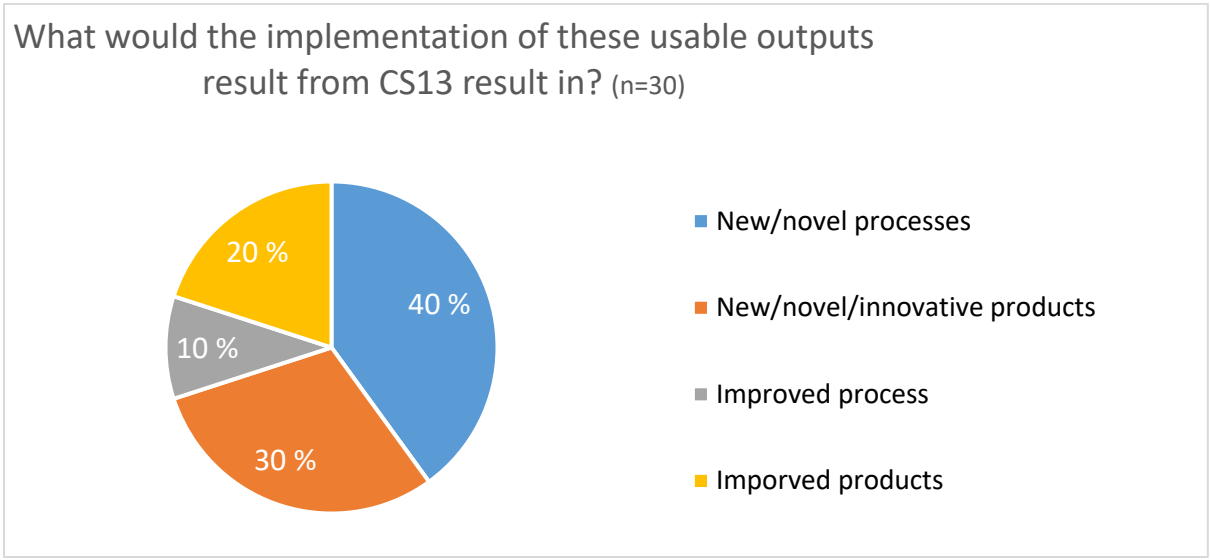


Figure 13.4: Stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022).

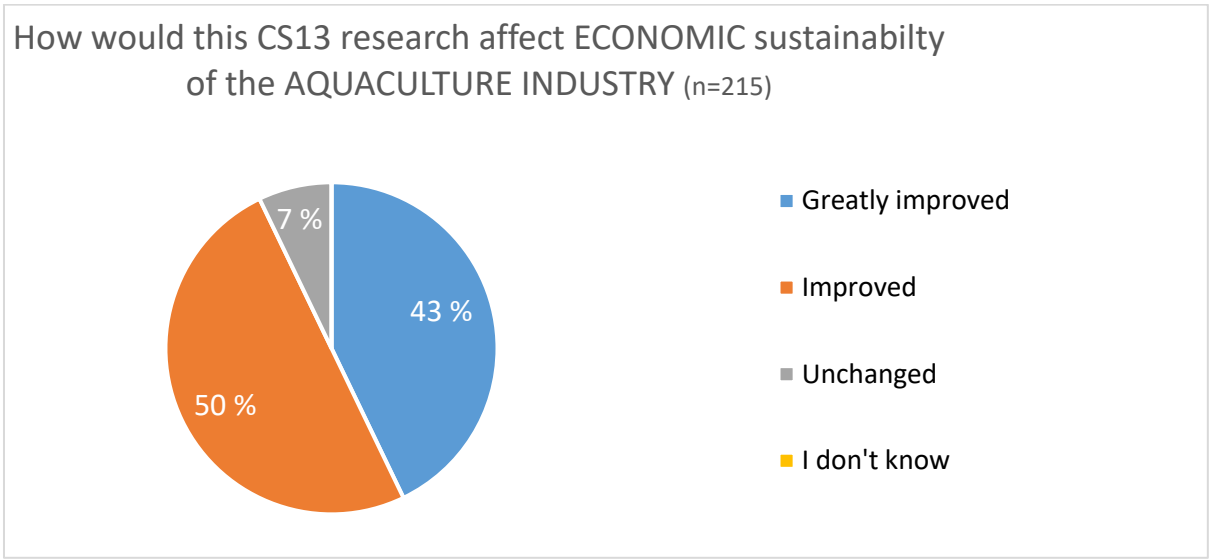
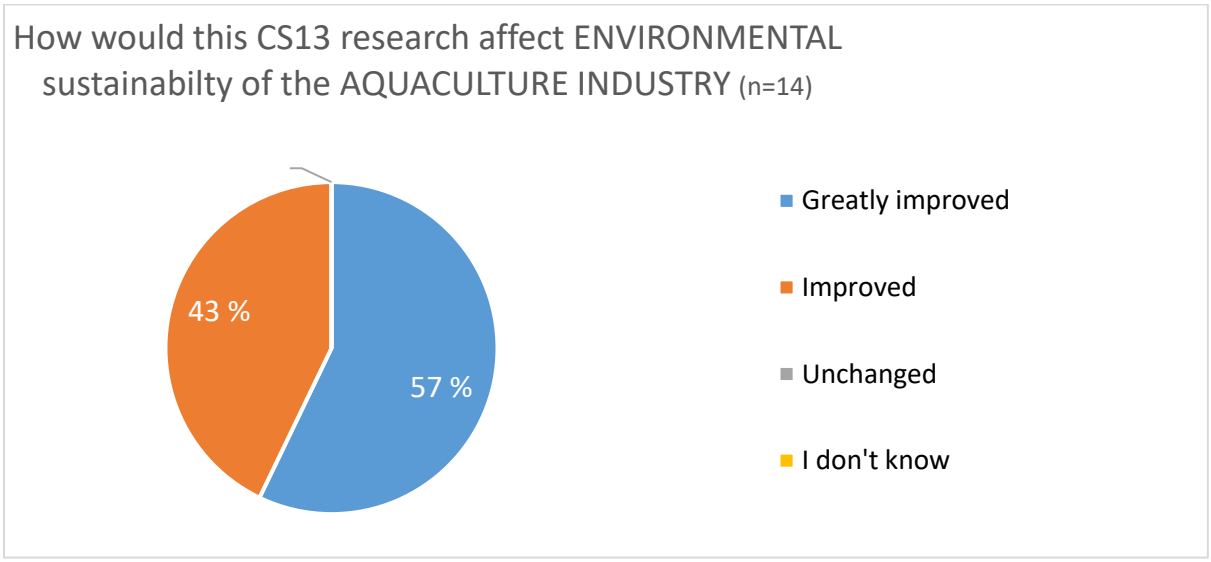


Figure 13.5: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022).



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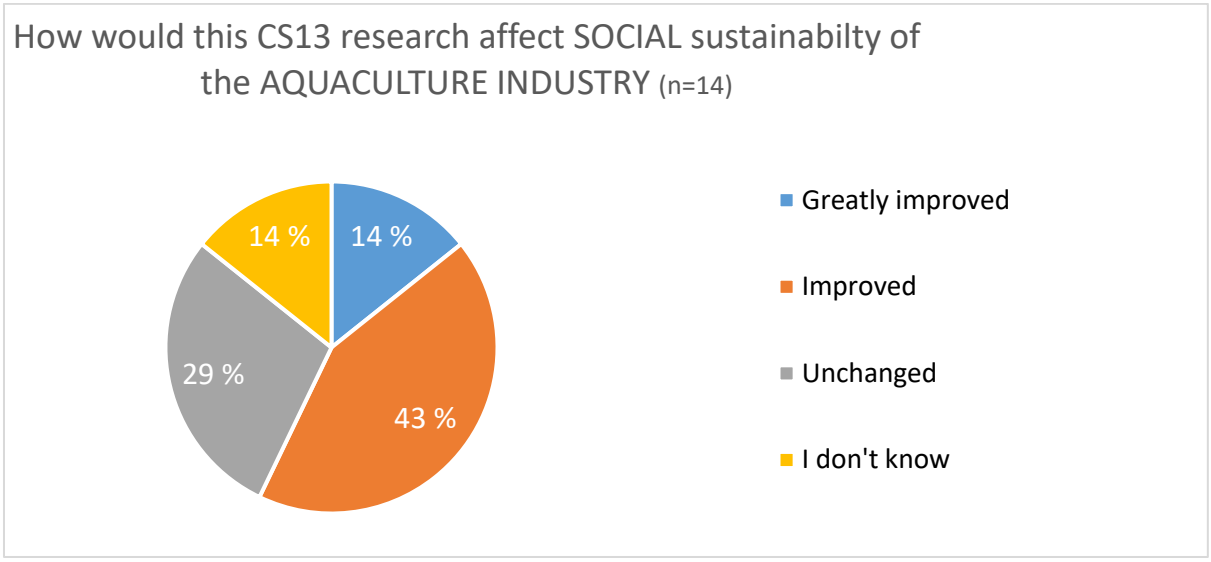


Figure 13.7: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022).

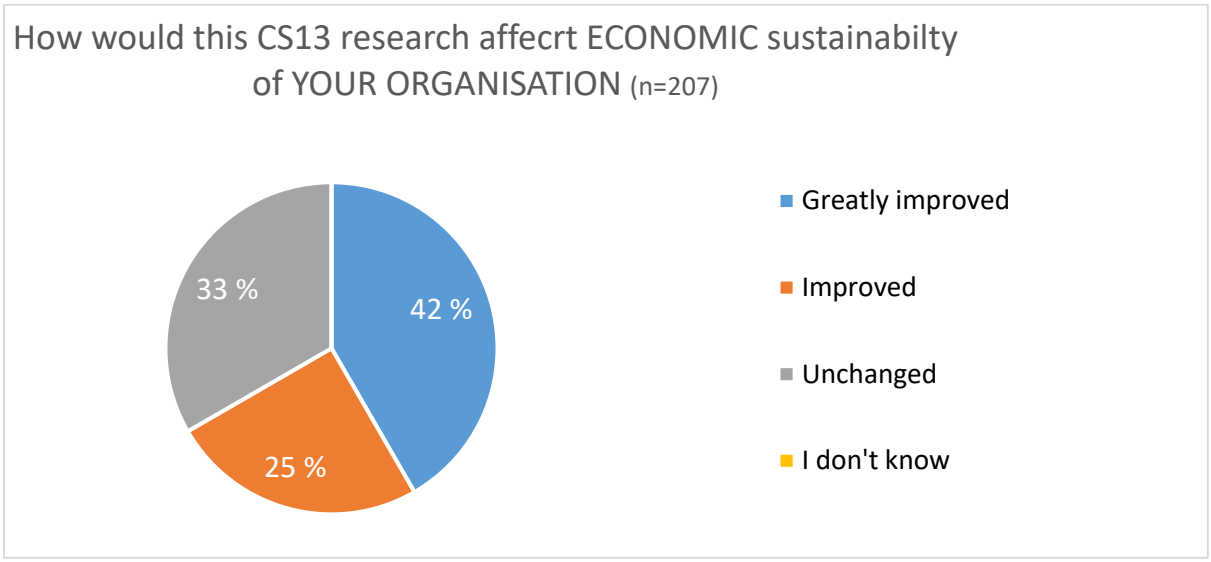


Figure 13.8: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders organisations (AquaVitae stakeholder survey, to 12 May 2022).

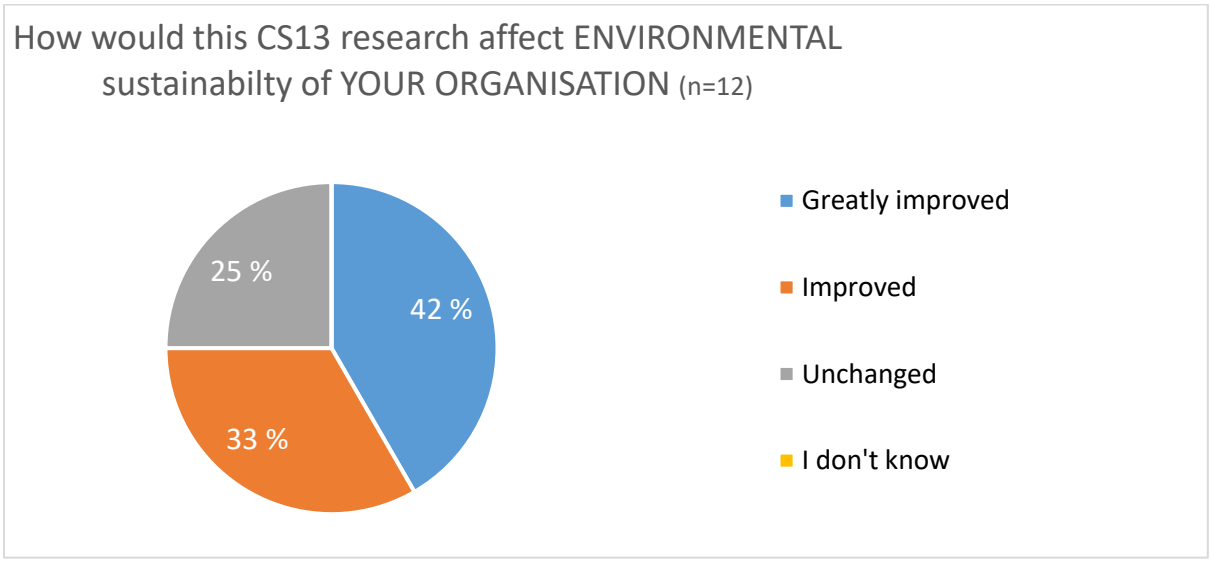


Figure 13.9: Stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

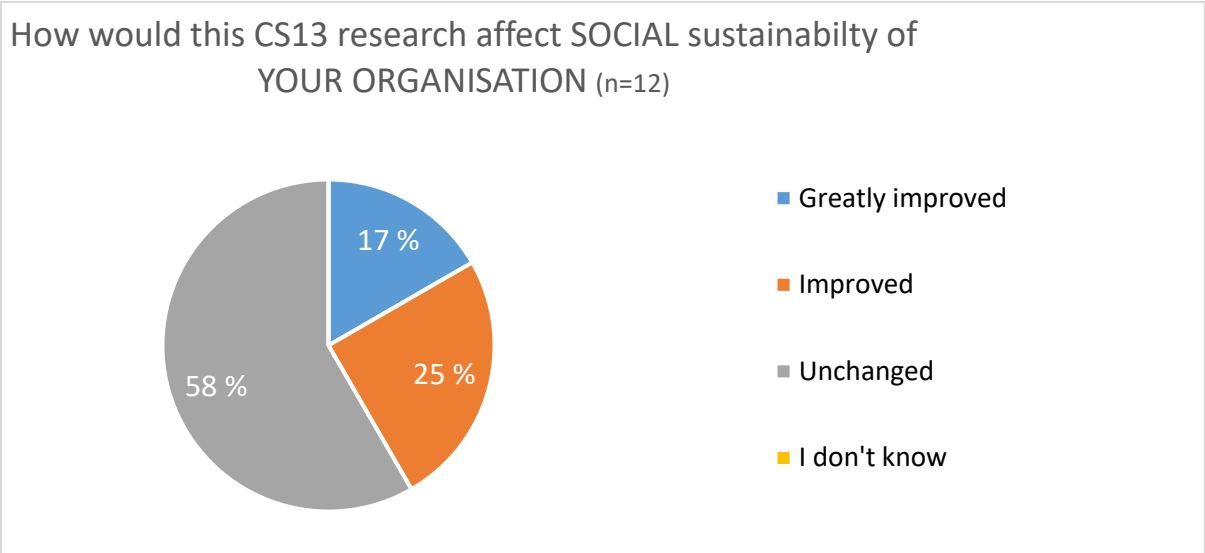


Figure 13.10 Stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022).

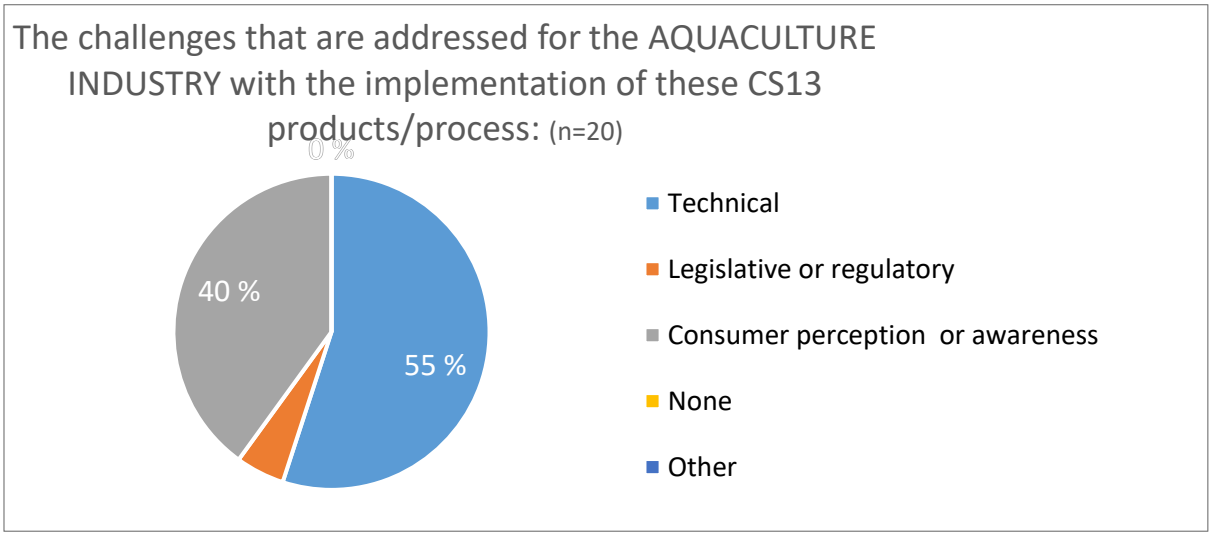


Figure 13.11: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

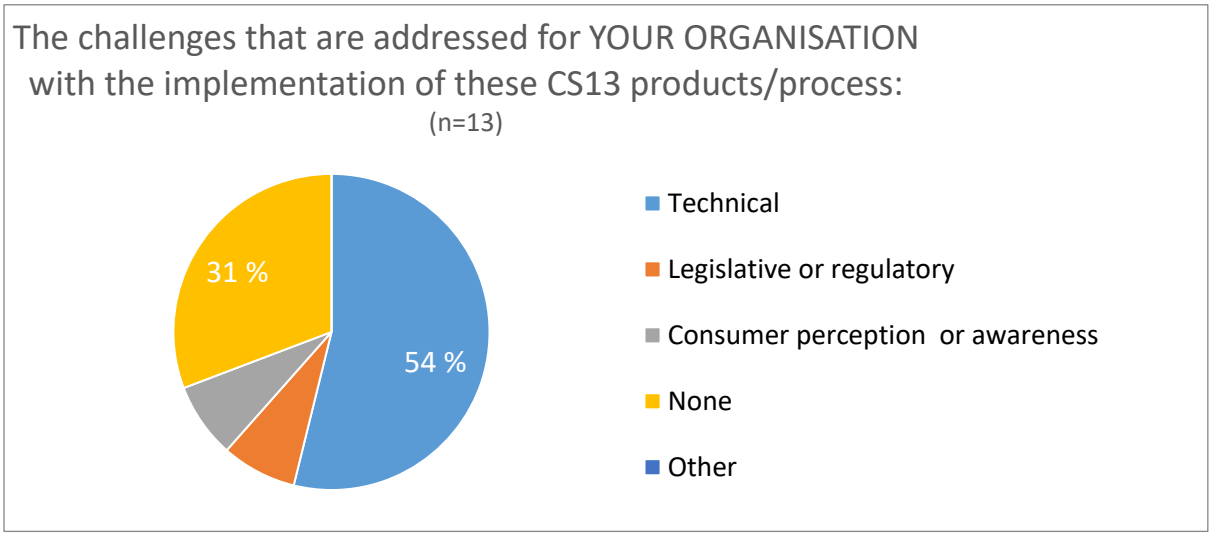


Figure 13.12: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022).

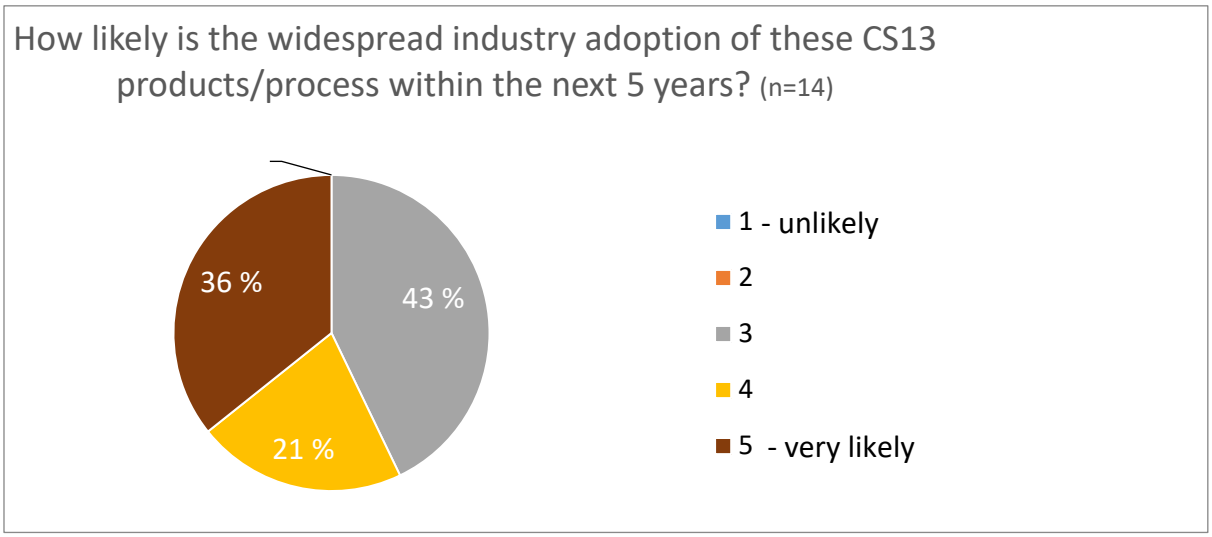
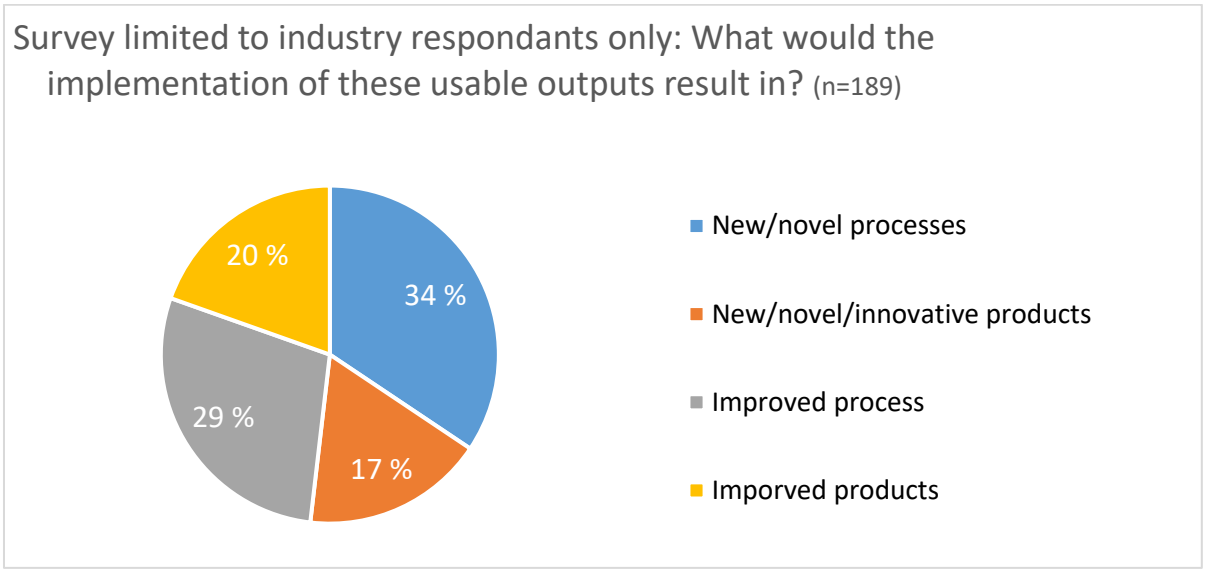


Figure 13.13: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022).

Annex 5 – Industry stakeholders feedback on results from WP1, 2 and 3 (M36)

An analysis of the WP1, 2 and 3 stakeholder feedback, as described in Annex 3, is presented here again, only respondents that were not directly involved in industry were excluded from this analysis. That is, stakeholder feedback from respondents that represent industry associations, micro-company/start-up industries, small to medium enterprises and large industry are presented in Figures 1 to 11. Note that only one industry association participated in the survey; so, these data were included in the combined survey only but it was not possible to generate a separate analysis for industry associations in Figures 1 to 11.



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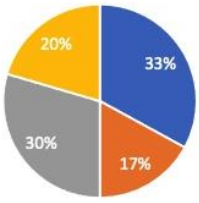
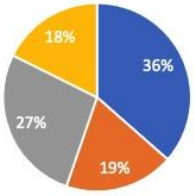
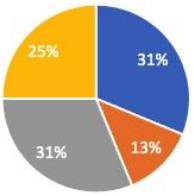
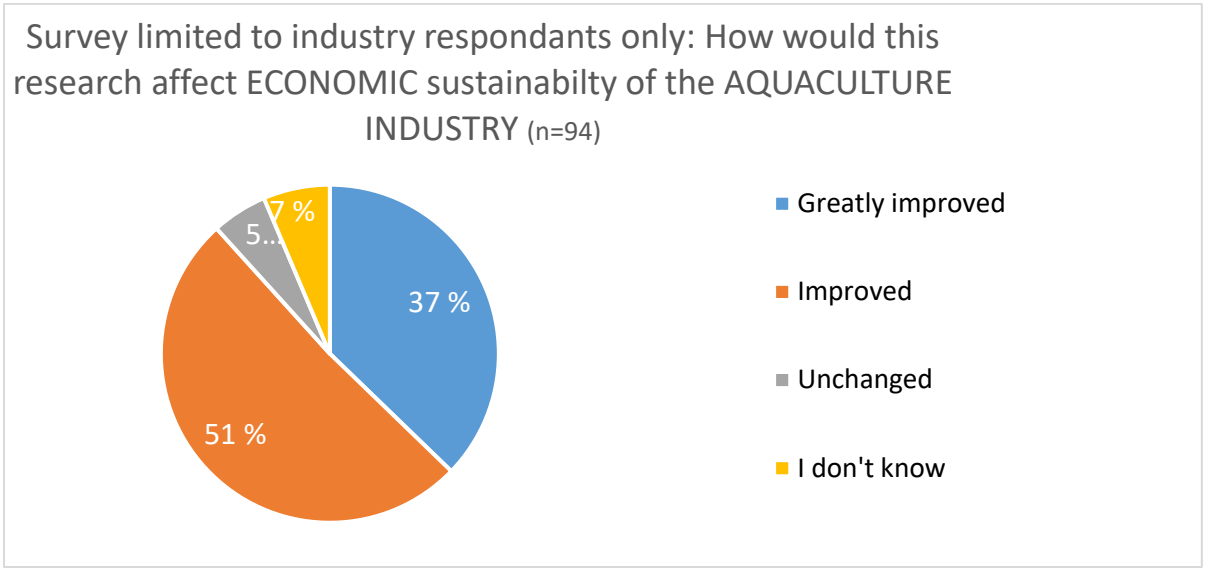






B *C* *D*

Figure 1: Industry stakeholder's expected outcome for 40 of the AquaVitae project's main outputs (AquaVitae stakeholder survey, to 12 May 2022); (A) all industry stakeholders combined; (B) micro or start-up companies (n=88); (C) small to medium size companies (n=85); (D) large industry (n=16).



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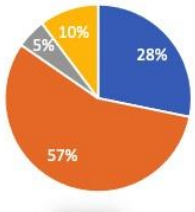
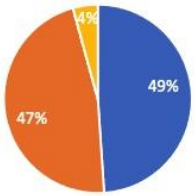
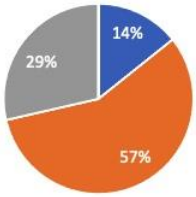
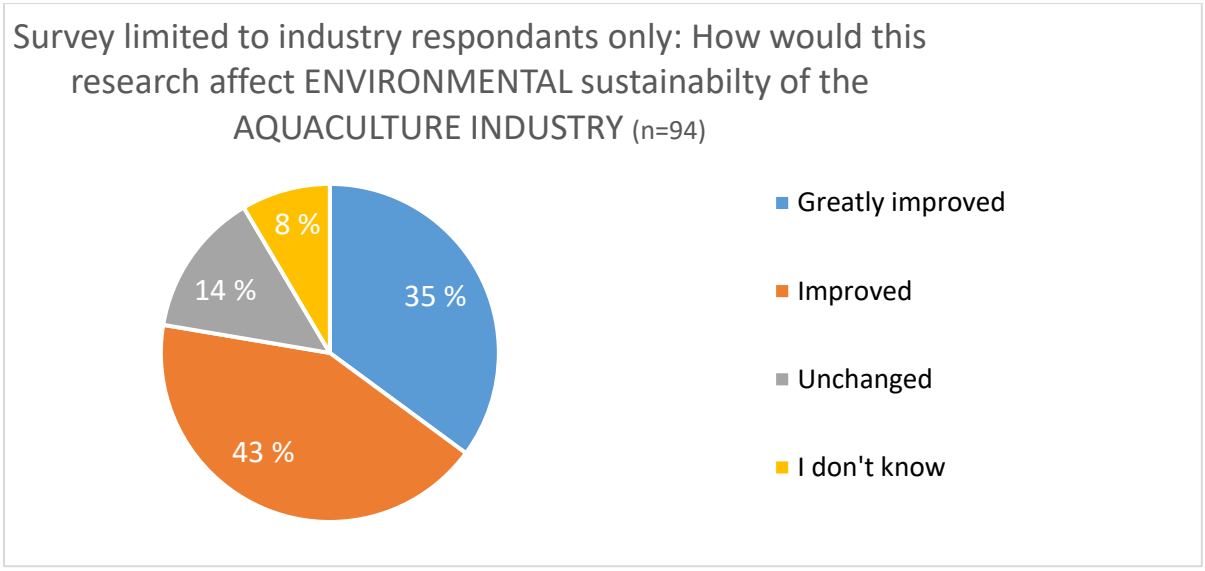






B C D

Figure 2: Industry stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability (AquaVitae stakeholder survey, to 12 May 2022); (A) all industry stakeholders combined; (B) micro or start-up companies (n=39); (C) small to medium size companies (n=47); (D) large industry (n=7).



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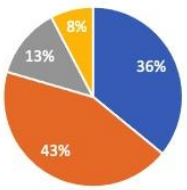
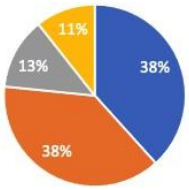
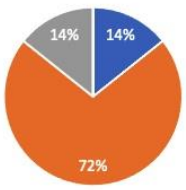
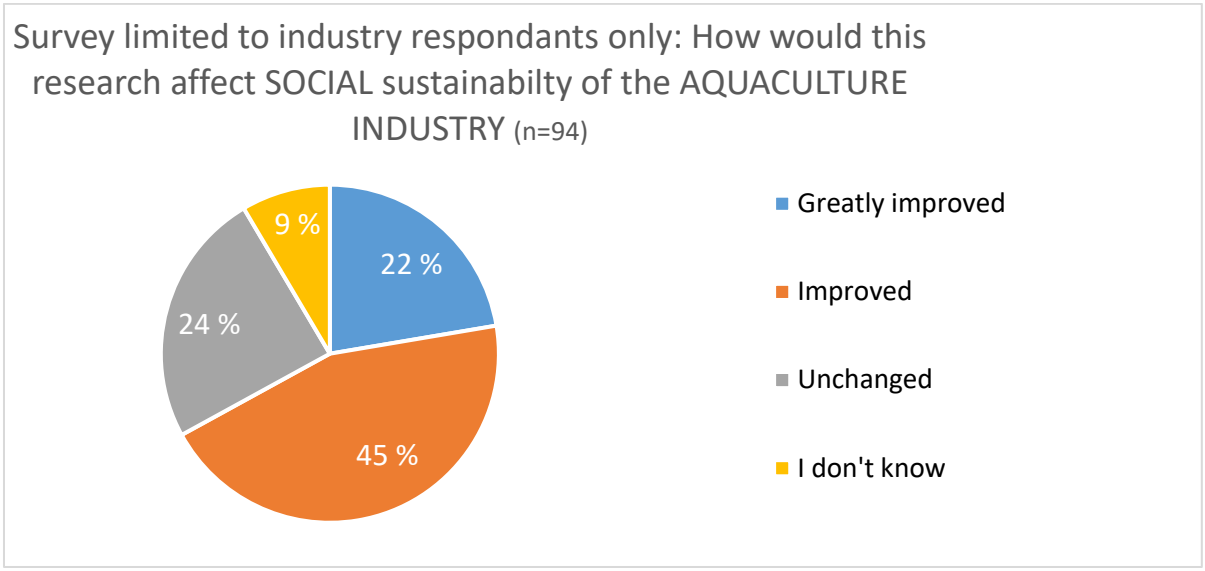






B C D

Figure 3: Industry stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability (AquaVitae stakeholder survey, to 12 May 2022); (A) all industry stakeholders combined; (B) micro or start-up companies (n=39); (C) small to medium size companies (n=47); (D) large industry (n=7).



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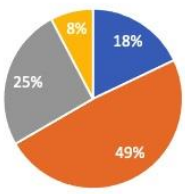
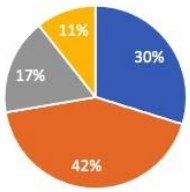
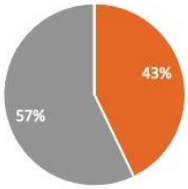
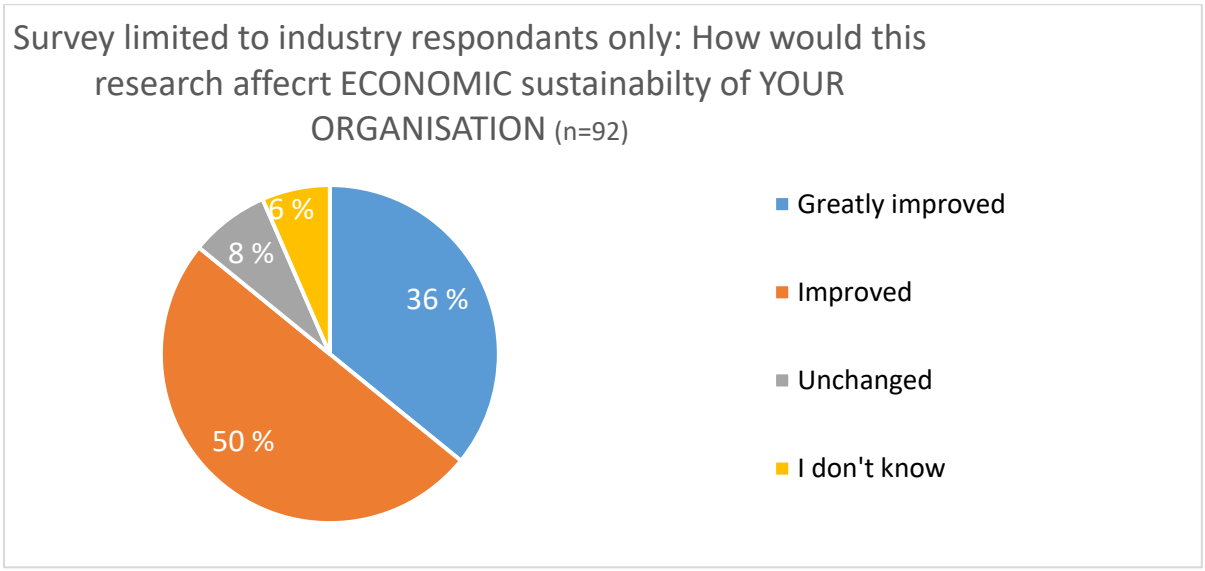






B C D

Figure 4: Industry stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability (AquaVitae stakeholder survey, to 12 May 2022); (A) all industry stakeholders combined; (B) micro or start-up companies (n=39); (C) small to medium size companies (n=47); (D) large industry (n=7).



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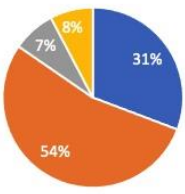
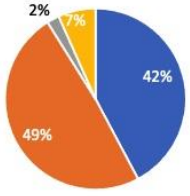
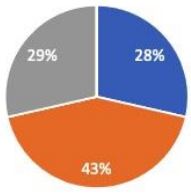
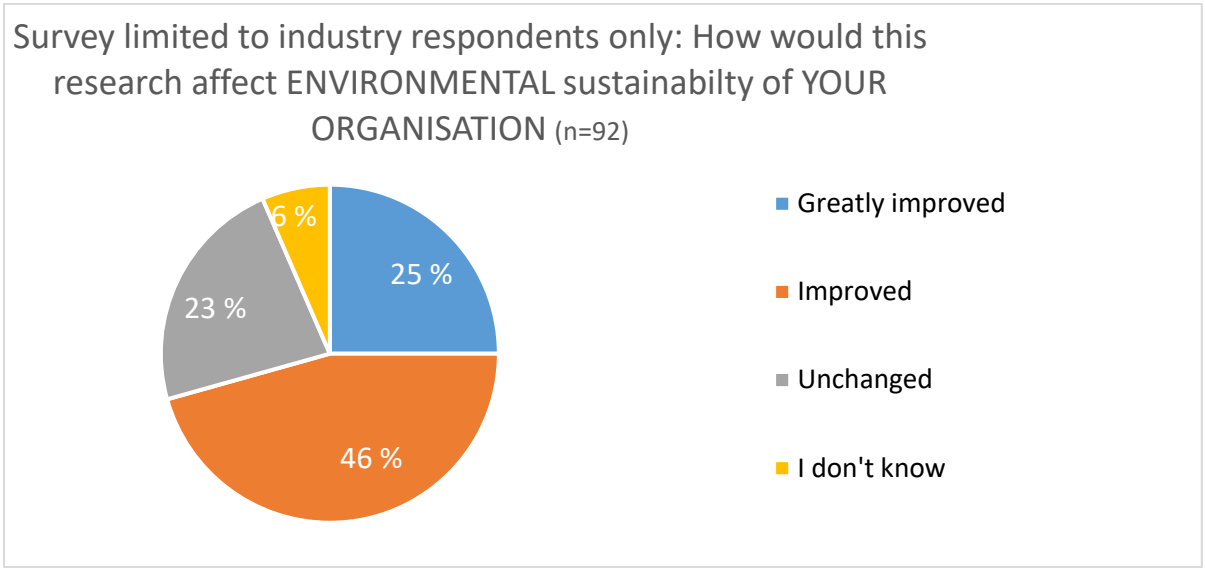






B C D

Figure 5: Industry stakeholder's expectation of the impact that AquaVitae research/innovation will have on economic sustainability on stakeholders' organisations (AquaVitae stakeholder survey, to 12 May 2022); (A) all industry stakeholders combined; (B) micro or start-up companies (n=39); (C) small to medium size companies (n=45); (D) large industry (n=7).



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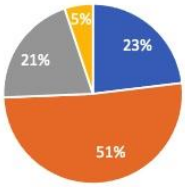
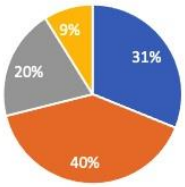
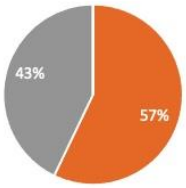
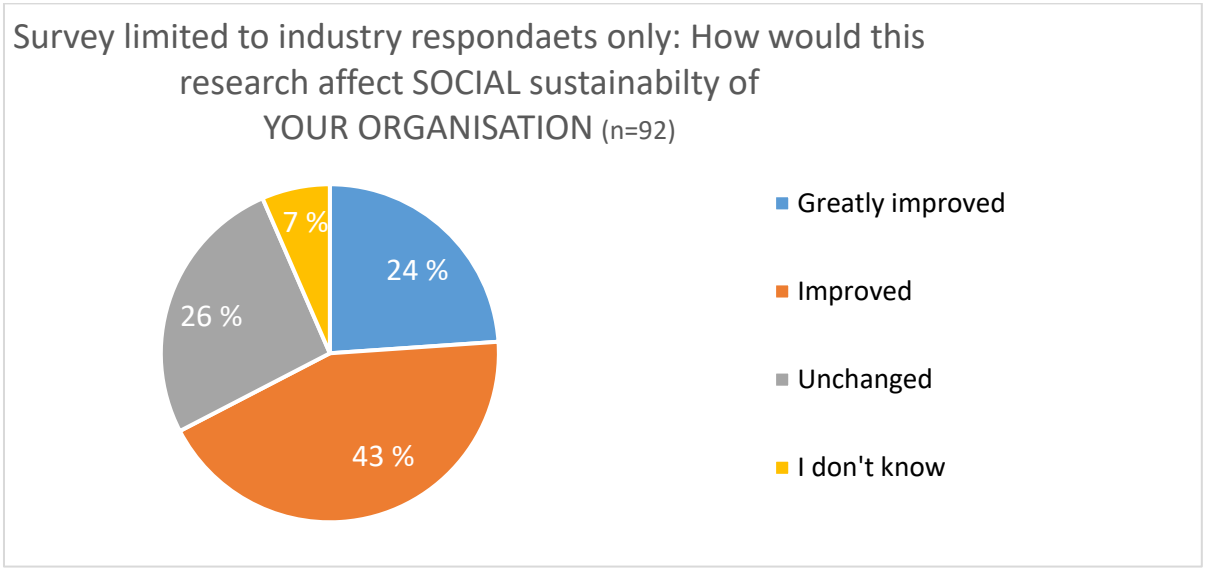






B C D

Figure 6: Industry stakeholder's expectation of the impact that AquaVitae research/innovation will have on environmental sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022); (A) all industry stakeholders combined; (B) micro or start-up companies (n=39); (C) small to medium size companies (n=45); (D) large industry (n=7).



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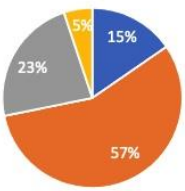
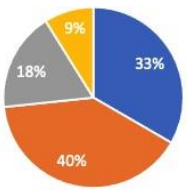
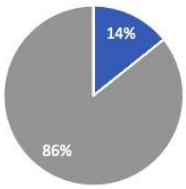
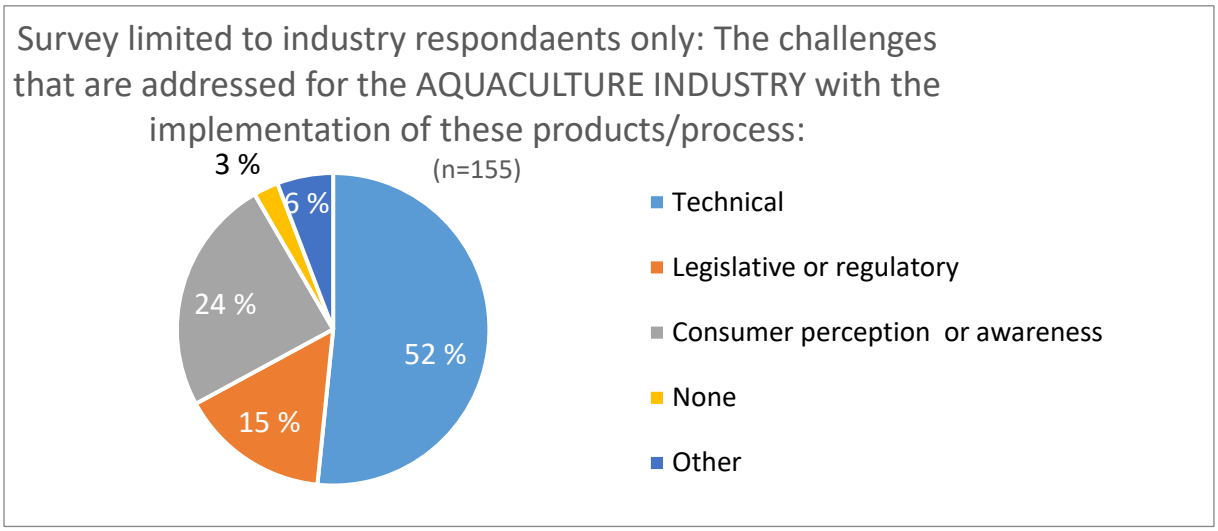






B C D

Figure 7 Industry stakeholder's expectation of the impact that AquaVitae research/innovation will have on social sustainability on stakeholder organisations (AquaVitae stakeholder survey, to 12 May 2022); (A) all industry stakeholders combined; (B) micro or start-up companies (n=39); (C) small to medium size companies (n=45); (D) large industry (n=7).



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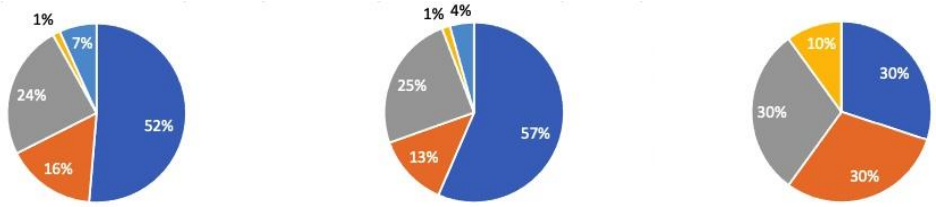
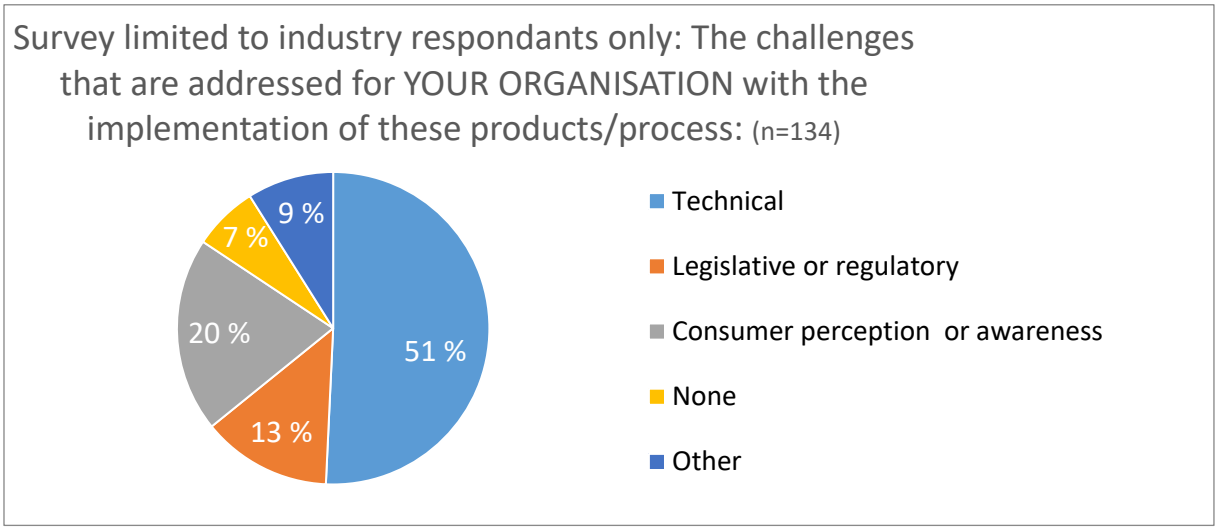


B C D

Figure 8: Challenges in industry that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022) as perceived by industry stakeholders; (A) all industry stakeholders combined; (B) micro or start-up companies (n=74); (C) small to medium size companies (n=69); (D) large industry (n=10).



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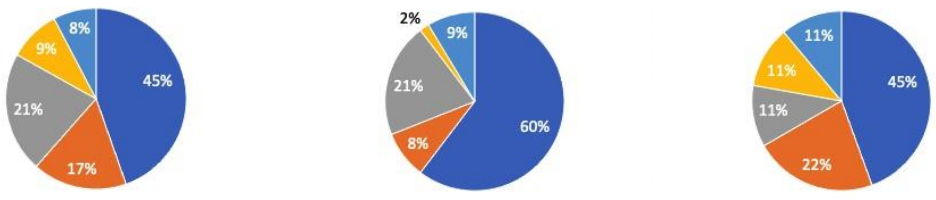
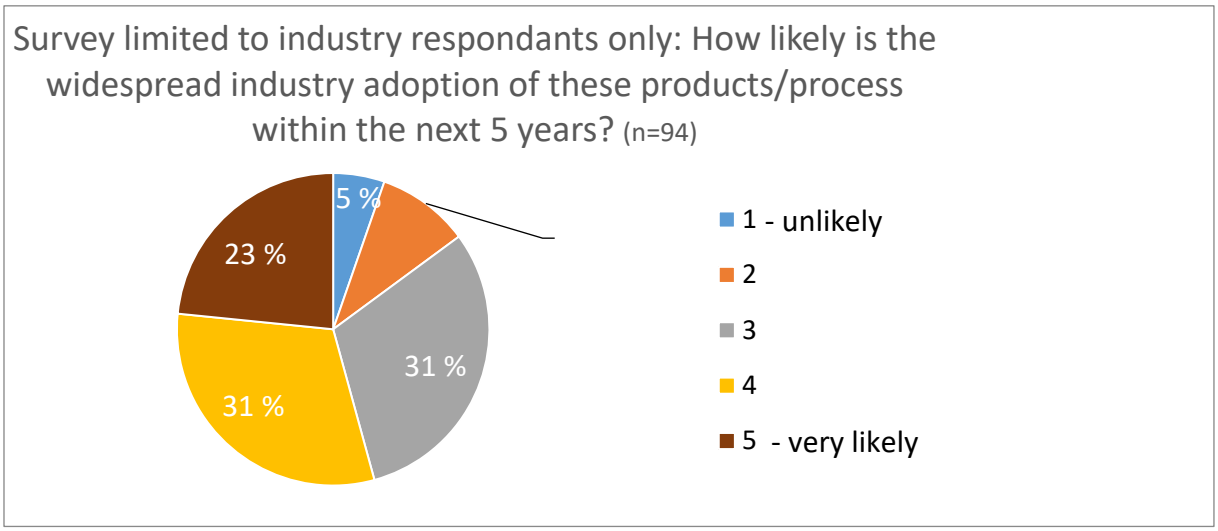


B C D

Figure 9: Challenges in the organisations that will be addressed by the AquaVitae research/innovation (AquaVitae stakeholder survey, to 12 May 2022) as perceived by industry stakeholders); (A) all industry stakeholders combined; (B) micro or start-up companies (n=65); (C) small to medium size companies (n=58); (D) large industry (n=9).



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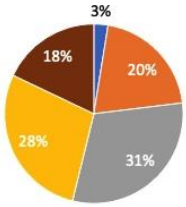
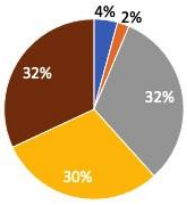
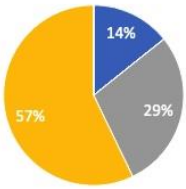
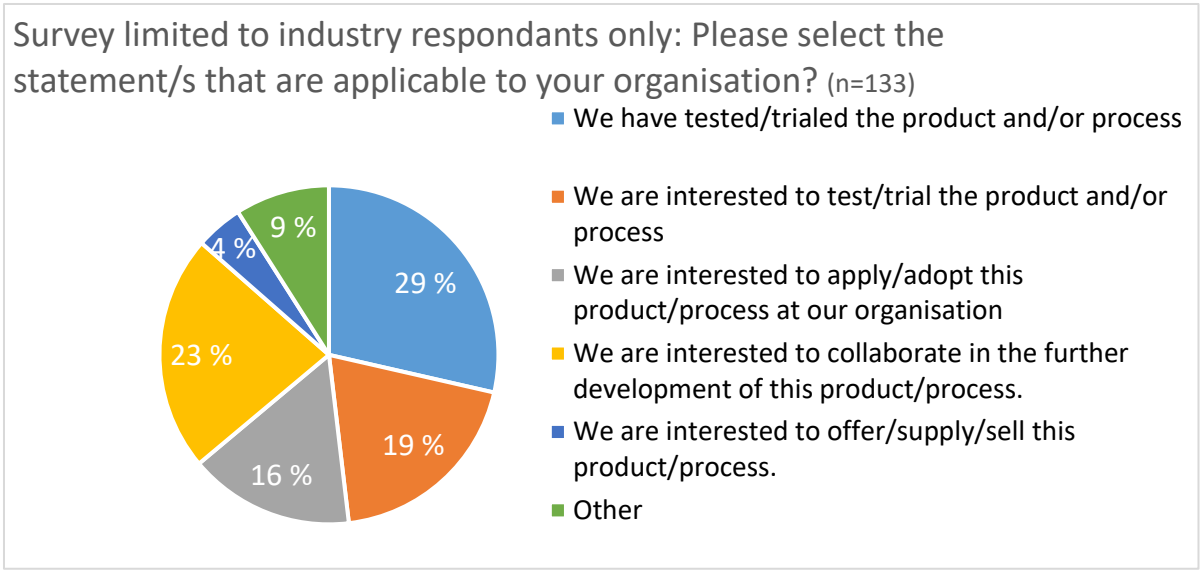






B C D

Figure 10: Adoption of the AquaVitae research/innovation by industry in the next five years (AquaVitae stakeholder survey, to 12 May 2022) in the opinion of by industry stakeholders); (A) all industry stakeholders combined; (B) micro or start-up companies (n=39); (C) small to medium size companies (n=47); (D) large industry (n=7).



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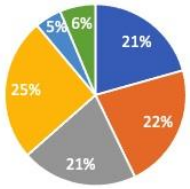

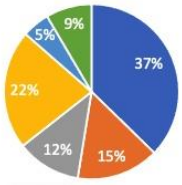

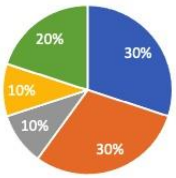

B C D

Figure 11: Industry partner's interest in testing/using the AquaVitae research/innovation developed in WP1, 2 and 3); (A) all industry stakeholders combined; (B) micro or start-up companies (n=63); (C) small to medium size companies (n=59); (D) large industry (n=10).