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Fostering Growth in the Blue Economy by developing an action plan for innovative European aquaculture VET and harmonized qualifications

D2.1 BlueEDU Initial Opinion Study

WP 2 Engagement and demonstrations

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Summary

Overview

This report provides an insight into the initial opinions and attitudes of stakeholders from 9 of the 12-member countries of the Federation of Aquaculture Producers (FEAP) targeted for research and Malta a non-FEAP member. The stakeholders' opinions regarding the aquaculture sector's skills and Vocational Education and Training (VET) have been determined. By design, the survey work and initial enquiry has focused on the future needs of husbandry operatives and site managers working within marine cage farming, the industry's most important finfish producing sector. The target audience contributing to this body of opinion includes industry leaders from national fish producer organizations, and senior managers from aquaculture companies, including the chief executives who attended the FEAP general assembly in May 2017. Subsequently, quantitative surveys have included farm site managers within aquaculture companies, widening the audience considerably. A range of influential industry representative bodies and agencies have also helped to inform the Initial Opinion Study through their contributions to qualitative surveys.

The voice of industry leaders was resounding during the FEAP General assembly in May 2017, with 98% of them believing that a competent work force was essential for aquaculture to progress. Subsequently, quantitative survey work has provided a more detailed insight to industry needs, supported by information gathered in Mid-Norway. Qualitative survey activities in the UK (Scotland) and south-east Europe, including group meetings and structured 'one to one' interviews, have revealed the general attitude of some key stakeholders towards aquaculture VET, and their receptiveness towards supporting the BlueEDU partnership in the completion of its research.

The emerging European aquaculture VET picture

A clear disparity between the aquaculture VET supply in northern and southern Europe has been demonstrated. Well established aquaculture VET is available in some of the leading northern fish producing countries, including Norway and Scotland, whereas in the south, this is generally lacking. The Higher Education (HE) sector and in company, non-formal VET, are the only significant forms of aquaculture education and training currently being relied on. Although generally in a stronger position, significant constraints in the north of Europe have also been revealed. Scotland has lost the full time VET provision that successfully prepared many young people for entry to the industry late last century. The industry is now entirely dependent on a work based Modern Apprenticeship scheme, which is age restricted regarding public funding access, and company staff development programs (non-formal VET). Conversely, in Norway, whilst the VET system serving new entrants through the 'Journeyman Certificate' is thriving, there are indications that it may not have sufficient capacity and flexibility to fully serve the demands of a large influx of unqualified mature entrant's. For many members of the workforce in the north, VET accessibility is a real issue, contributing to an apparent mismatch between VET supply and demand in many localities that will be subject to further investigation. Therefore, it appears that an

increase in the flexibility of VET delivery modes, already under consideration in Norway, could also benefit the other north European countries.

Catalysed to some degree by the issues described above, currently, aquaculture company based training (non-formal VET) is prevalent in both the north and south of Europe, and would appear to be serving the needs of a significant proportion of the workforce. This phenomenon will be explored in more depth during subsequent survey work. Although often comprehensive, well -structured and well resourced, the company bespoke non-formal VET does not usually lead to a Nationally Recognized Qualification (NRQ) which arguably limits its value. The dominance of non-formal VET provided by aquaculture companies to their own staff, appears to be the common denominator that may drive the development of innovative work based VET solutions, to improve the accessibility of pathways to NRQ achievement, in the future. Consequently, many of the existing aquaculture workforce and new entrants, currently unqualified and having difficulty in accessing the mainstream VET supply in the north and south of Europe, would be able to become qualified. The workforce capability would be improved nationally and European aquaculture labour mobility facilitated.

The emerging 'picture' described above will be thoroughly investigated during the second year of BlueEDU, to gain a deeper understanding of those factors influencing aquaculture VET supply and industry demand in each country under investigation. The outcome of this final phase of research will then inform the development of a proposed action plan for European VET innovation and the harmonization of qualifications in aquaculture.

Summary of the main findings

The Initial Opinion Study findings are presented in two parts. Part 1 is a distillation of the views expressed by industry leaders representing 9 of the 12 BlueEDU countries.

Part 2 presents the views from each of the following countries or regions

- Mid-Norway coastal zone salmon farming companies
- Scotland, Ireland and Iceland aquaculture and VET stakeholders
- Eastern European aquaculture and VET stakeholders

The views of Industry leaders and the Mid Norway coastal zone salmon farmers have been derived from an analysis of quantitative surveys. Conversely, qualitative methods have been used to gauge initial opinion in Scotland, Ireland, Iceland and eastern Europe.

1) Industry leaders

The overwhelming majority (98%) of industry leaders attending the FEAP General Assembly in Venice (May 2017) endorsed the premise that a competent workforce is essential for the aquaculture industry to progress. Encouragingly, 78% of those attendees wish to receive a copy of the final report and 58% agreed to assist the BlueEDU data gathering process within their respective organizations, which was reassuring. As many of the FEAP General Assembly attendees were chief executives of large aquaculture producer companies, it is hoped that their advocacy and practical support within their companies will

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increase industry survey completion rates from all levels of the workforce, assisting the aquaculture VET demand analysis.

The full data set and analysis of the results from the FEAP General Assembly in May 2017 is presented in Appendix 1. Some of the most relevant highlights are abstracted and presented below under the main emerging themes.

i) Recruitment

There was a general agreement that companies and farms were highly reliant on local recruitment and many were currently experiencing recruitment problems, especially when trying to fill managerial positions

ii) Staff development

Most felt that due to the rapid development and deployment of new equipment and technologies, continuous updating of staff was most important. The aquaculture subject areas selected as being of highest priority were fish health, aquaculture equipment, environmental monitoring, the use of digital technologies and fish feeding.

iii) Aquaculture VET qualifications

A general lack of access to flexible aquaculture VET courses and qualifications was highlighted. Most believed that good 'knowledge and skills' definitions would be useful to inform VET development. Many go on to confirm that they believe that the assessment process must be reliable, to ensure that qualifications provide an accurate indication of a person's real knowledge and skills.

iv) Aquaculture course delivery modes

Respondents saw value in a range of aquaculture course delivery modes, including; short courses of 1-2 days duration (which were preferred), non-formal in company training and work based training leading to a NRQ. Computer based on line learning systems were preferred over paper based distance learning. However, views on the value of on line learning were widely spread, including some that were negative. This gives an indication of the type of 'blended VET programs' that industry may be receptive to in the future. It also indicates that further investigation in to industry attitudes towards the use of on line learning and learning technology should be undertaken, to determine whether their reservations have been well informed.

This work will include an exploration of work based learners 'learning profiles' and preferences. Their digital skills in relation to the demands of computer based learning will be evaluated, thereby establishing the proportion lacking the skills needed to cope with computer based learning, and the extent of any digital literacy/skills gaps.

2) Initial opinion by region

The most significant findings in each region are described below. The survey work has provided valuable insights to initial opinions, some of which are specific to a region, and others which are shared.

i) Norway

Extensive industry engagement and data collection has been undertaken in the Mid – Norway Trondheim region, the epicenter of Norwegian farmed salmon production.

This revealed that there was widespread industry support for the main national aquaculture NRQ, the Journeyman Certificate, which is undertaken by school leavers and takes 2 years in an Upper Secondary school, followed by 2 years in industry to fully complete. There is a theory exam set at national level at the end of the second year and a practical exam, which involves industry, at the end of the fourth year.

Challenges with recruitment in an environment of rapid growth and technological advance is apparent, and has led to an influx of mature unqualified entrants, many of whom are migrants and predominantly work in fish processing. Whilst the Journeyman Certificate relied on by industry can be accessed by mature, unqualified staff, survey responses indicated that companies may vary regarding their level of commitment to supporting staff to complete the program during their employment.

Other than the Journeyman Certificate, short courses and informal training by experienced staff, who support and train the less experienced, was believed to be important. Short-term capacity or skills shortages are often addressed by outsourcing for skilled labour with the required qualifications, as opposed to committing company resources to staff development internally to help unqualified staff to gain a NRQ. Whether or not this strategy adequately addresses the needs of the growing proportion of the Norwegian workforce currently unqualified, is an issue that will be further investigated.

Unsurprisingly, the managers see technical applied subjects as important, as well as the development of management and cultural awareness. Interestingly, during interviews, some companies have highlighted the importance of capacities such as collaboration, which reflects the way the farming companies themselves are cooperating to solve aquaculture problems, despite being competitors in the same market place. This may be symptomatic of a maturing industry, and it is possible that the same collaborative spirit may be applied to the development of improved formal work based VET delivery systems needed to address the anticipated future recruitment challenges.

However, these ‘green shoots’ will be subjected to a more rigorous investigation, to fully understand the skills, knowledge and competences industry requires, in more detail. This can then be corelated to the VET supply analysis when forming the proposed action plan for VET

ii) Scotland, Ireland and Iceland

Scotland has lost its full time formal aquaculture VET provision that served school leavers and mature learners for many decades from the 1970s, and was delivered by the public sector. This service allowed industry to attract well qualified talent from outside their locality, more readily. Today, the local recruitment of unqualified entrants dominates, alongside in-company non-formal VET provision and the Modern Apprenticeship NRQ, for those who are eligible by age for funding.

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By comparison, Ireland maintains an ongoing interest in work based aquaculture VET, to support workforce development within its relatively small salmon farming sector. In Iceland there is an emerging industry with prospects of rapid expansion through Norwegian investment, but no existing aquaculture VET supply.

iii) South East Europe

Interviews with members of organizations from Greece, Croatia, Malta, Cyprus and Spain have provided some useful insights to the aquaculture VET supply in the Mediterranean region. There is a very limited formal VET supply, and the development of workforce knowledge and skills is dependent on the recruitment of graduate and post graduate specialists to fill the most technical and high-level occupations and in company training (non-formal VET) for husbandry operatives. Except for Malta, there are no NRQs in aquaculture available and alleged VET systemic deficiencies at national level in some countries could inhibit the establishment of provision, despite the growing demand.

A lot of information on the Croatian education system was gathered. Some private sector organisations have indicated that there may be an opportunity to establish a specialist VET provider that can provide a modern aquaculture training facility and VET capacity to serve the needs of the Mediterranean region. This ambitious suggestion will be explored more fully within the second year of BlueEDU during the further analysis of aquaculture VET supply and demand.

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Chapter 1: Overview of study aims and methodology

1.1 Aims of study

The aims of the initial opinion study were twofold; to enroll the support of industry leaders to the data collection process underpinning the VET demand surveys within Work Package 6, and to gather some initial data on aquaculture VET demand and skills needs from a sample of BlueEDU countries cage farming finfish.

A range of qualitative and quantitative survey methodology was deployed. During the first year of the BlueEDU project, the quantitative data collection was focused on the attendees of the FEAP general assembly held in Venice in May 2017 and the aquaculture sector in the Mid-Norway coastal zone.

The qualitative survey work was designed to provide the opportunity for face to face engagement and discussion, to reveal and understand the range of opinions held by industry leaders, industry representative bodies and relevant public agencies regarding workforce development, and to encourage them to support BlueEDU as Associated Partners.

1.2 Target audiences

The target audiences that have been involved to date in each country are summarized in the BlueEDU countries matrix below. Any voids have been shaded out in grey, as the category does not exist. Cells that are blank and have no ticks indicate that information and data is still to be collected for those countries during the second year of BlueEDU.

Table1: BlueEDU research target audiences

Key: Norway (No); Scotland (Sc); Ireland (Ir); Finland (Fi); Faroes (Fa); Iceland (Ice); Greece (Gr); Spain (Sp); France (Fr); Italy (It); Croatia (Cr); Cyprus (Cy)

Target Audiences	No	Sc	Ir	Fi	Ice	Fa	Gr	Sp	Fr	It	Cr	Cy
Producer Organizations	✓	✓	✓				✓	✓	✓	✓	✓	✓
Aquaculture company CEO	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓

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Cage Farm Site Managers	✓											
Aquaculture VET providers	✓	✓	✓									
Public agency stakeholders	✓	✓										
Husbandry operatives												

1.3 Summary of survey methods

A range of methods have been deployed during difference phases of the project and are summarized below:

a) Stakeholder analysis

A stakeholder analysis was conducted at the outset of the project to determine stakeholders in Norway, Scotland and the Mediterranean regions, identifying all organizations with an interest in aquaculture workforce development that may assist BLueEDU.

A stakeholder analysis for each country or region will inform the partnership who the most significant stakeholders are, and which of them are likely to be interested in BlueEDU and could become influential advocates. In summary the technique is as follows:

The first step in Stakeholder Analysis is to identify who your stakeholders are. The next step is to work out their power, influence and interest, so you know who you should focus on. The final step is to develop a good understanding of the most important stakeholders so that you know how they are likely to respond, and so that you can work out how to win their support. This analysis can be recorded on a stakeholder map.

The resulting stakeholder map provides a very useful insight to industry networks, and where and how they are connected to each partners' networks. This analysis can save a lot of wasted time knocking on closed doors, or lobbying enthusiasts that lack influence and cannot positively impact on project outcomes.

b) On line questionnaire based surveys

An online survey tool established by NTNU, based on the open source 'Lime Survey', and capable of supporting data collection in all BlueEDU countries, including those that have poor connectivity to the internet.

c) Rapid response tools

A rapid response tool (EVAL - part of one2act response technology services) was used by Norwegian partners to support interactive data collection within facilitated meetings and group seminars. This approach enabled questions to be discussed and clarified before respondents gave feedback via their own hand-held devices, typically mobile phones.

d) Qualitative surveys

Meetings and interviews including phone calls, to present BlueEDU to stakeholders and stimulate discussion on aquaculture VET demand and the attitude of stakeholders towards aquaculture VET and workforce development. This was to gather information to develop an initial understanding of VET related issues and establish stakeholder support for BlueEDU.

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Chapter 2: Federation of European Aquaculture (FEAP)

2.1 Summary of the results from the FEAP meeting in Venice from May 19th

BlueEDU is an Erasmus Plus Sector Skills Alliance LOT 1 Project, which aims to foster growth in the Blue Economy by developing an action plan for Innovative European Aquaculture VET and harmonized qualifications. A survey was developed to evaluate the opinions of chief executives and producer organisations from the European aquaculture industry. They met during the General Assembly meeting of The Federation of European Aquaculture Producers (FEAP) in Venice, which took place on May 19th, 2017.

This report summarises the opinion survey results based on an analysis of data gathered during the FEAP meeting in Venice. The full data set and detailed interpretation is available in Appendix 1- Page 37). A combination of survey methods was deployed, starting with instant response tools during the meeting followed by the Lime Survey system at the end of the meeting. There were 36 respondents from the following 13 European countries: Croatia, Czech Republic, France, Greece, Hungary, Ireland, Italy, Norway, Poland, Portugal, Spain, Turkey, and UK (Appendix 1-figure 1). The survey system contained 22 questions which are listed below.

98 % of the respondents' highlight that a competent workforce is essential for aquaculture to progress

There were 55% of the participants representing the national producer organizations, while 39% worked in fish producer companies (Appendix1- figure 2). A total of 58% were working as chief executives, while 42% were senior managers (Appendix1- figure 3). Various types of production were represented. In Northern Europe, 12 respondents were from the salmon production sector, whilst 15 represented Sea Bream and Sea Bass production in the Mediterranean region. Inland freshwater production was represented through Trout production (20 respondents) and Carp (5 respondents) as illustrated by Appendix1-figure 4.

Recruitment from local communities is considered important by over 80% of the participants

2.2 The importance of education and training

There were 98% of the respondents' who believed that a competent workforce is essential for aquaculture to progress, indicating that access to appropriate education and training is crucial for industry progress in both the North and South of Europe. In addition, 72% of the respondents point out that the continuous updating of staff knowledge and skills is necessary to keep up with technological improvements. At the same time, the recruitment of staff from local communities is considered important by over 80% of the participants, with 50% strongly agreeing (Appendix1-figure 5).

More than 2 out of 3 persons consider the continuous updating of knowledge and skills to be important to keep up with rapid technical developments

Norway and Scotland have educational systems that offer work based training to aquaculture industry in their countries. Figure 6 shows that companies in the 11 other countries targeted by this survey, find it is difficult to recruit qualified personnel. The central and southern European countries experience this problem most acutely. There are 54% of the respondents mentioning that fish farm staff may not have access to flexible training solutions that radically reduce the need for college attendance during training (Appendix1-figure 9). Again, many of these are from central and southern Europe. In addition, 66% of the respondents highlight, that aquaculture courses must be assessed in such a way that they provide a reliable indication of a persons` knowledge and skill, emphasising the importance of properly regulated aquaculture qualifications. The countries in northern and southern Europe agree regarding this point (Appendix1-figure 11). There is also an indication that both southern and northern Europe believe that companies should train their own farm personnel (Appendix 1-figure 12). There are 56% respondents claiming that the knowledge and skills required by farm personnel and site managers at the company level have been defined. However, 27% of respondents don't know whether definitions exist or not (Appendix 1- figure 13). However, only 31% respondents believe that such definitions exist at the national level, while 36% don't know (Appendix 1 - figure 14).

Most important areas for updated knowledge for staff at the cages:

- **Fish health management (92%)**
- **Fish farm equipment and maintenance (86%)**
- **Aquatic environment and monitoring (84%)**

2.3 Priority subjects and delivery modes

The respondents point out that it is important or very important that the staff at the cages should have updated knowledge in fish feeding (75%), fish health management (92%), fish transportation (72%), fish farm equipment and maintenance (86%), digital technologies (67%), boat operations (50%), aquatic environment and monitoring (84%) and fish harvesting (64%) This is illustrated by Appendix 1- figure 15.

By 2030, the respondents believe that knowledge in the following areas will become more important: fish feeding (58%), fish health management (86%), fish transportation (17%), fish farm equipment and maintenance (44%), digital technologies (69%), boat operations (17%), aquatic environment and monitoring (72%) and fish harvesting (17%) (Appendix 1- figure 16).

The respondents point out that several education and training modes are important or very important for their staff: Informal company training (61%), work based training leading to a qualification (70%), online computer based learning (50%), skills based short courses (77%) and full-time college based courses (45%). It should also be mentioned that 28% have a negative view of online computer based learning solutions (Appendix 1-figure 17).

78% of the respondents want to receive the BlueEDU project results

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2.4 Supporting BlueEDU

Finally, 58% of those attending the meeting in Venice agreed to promote the BLueEDU project to assist the data gathering process, and 78% of the respondents want to receive the BlueEDU project results (Appendix 1- figure 18).

Chapter 3: Mid-Norway coastal zone

3.1 Summary

BlueEDU is an Erasmus Plus Sector Skills Alliance LOT 1 Project (2016-2018), which aims at fostering growth in the Blue Economy by developing an action plan for Innovative European Aquaculture VET and harmonized qualifications. A demonstration, in combination with a group interview and a survey, were developed to evaluate the opinions of managers leading 520 operatives in the fish farming industry in Mid-Norway. The data analysis, graphics and interpretation of results is in Appendix 2 (Page 53)

NTNU and the Guri Kunna aquaculture VET school have collected and gathered information from a representative group of regional mangers within the aquaculture industry in Mid-Norway. The purpose was to investigate and document the situation regarding workforce qualifications and skills, and their influence on recruitment.

This report summarizes the opinion survey results based up on the analysis of data gathered during 5 meetings with 3 large and one medium sized fish farming company. The methods are full described within the main body of this report

The following themes have emerged from the survey and data analysis.

3.1.1 Competence

Results show that the managers consider skills such as work quality, business orientation, proactivity, collaboration and independence to be more important than theoretical knowledge (Appendix 2- figure 2). This shows that whilst industry believe that aquaculture VET programs are important, they must be practical, technically up to date and very applied in their orientation.

3.1.2 Recruitment

Survey results help to identify the key challenges for rural areas in Mid-Norway's coastal zone and revealed that a significant workforce shortage is anticipated by the aquaculture industry. This is a consequence of the recent rapid expansion of aquaculture, leading to rising levels of recruitment. It is also apparent that VET capacity building will be required to support the development of aquaculture VET programs and qualifications that are up to date and accessible to provide for those in the workforce who are currently unqualified so as they have parity with the school leavers who enter via the traditional Journeyman Certificate. However, existing restrictions to aquaculture VET access are overshadowed by the other issues and challenges industry face, which they believe to be more significant. Informal skills development through work experiences is considered important by industry. However, this attitude may change due to the demands of technological advancement and growth, leading more specialization of roles within the work force.

During the next five years the Guri Kunna aquaculture VET school is expected to educate 200 persons who will achieve an aquaculture NRQ in the form of the Journeyman Certificate. During the same period,

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109 people will retire from the fish farming industry, 53 within processing and 56 within farming. As the public VET system takes 4 years to educate and train a school leaver to become a fish farm husbandry operative, this creates a lag in relation to the demand for qualified staff during periods of rapid growth.

In the Mid-Norway survey, 50% of the managers indicated that they cannot anticipate the consequences of an unmet demand for skills in their company, whilst 20% felt that a shortage of qualified employees will constrain the expansion of their company's production and processing capacity.

3.1.3 Future workforce development needs

The survey indicated that 53% of the aquaculture industry relies on the apprenticeship system as their most important strategy for the recruitment of qualified staff. There were 1 out of 3 companies (34%) who preferred to outsource work operations when addressing company skills shortages and capacity limitations. A total of 29% of respondents indicated that this 'outsourcing' strategy was more important than investing in staff development to improve their workforce's competence and NRQ completion. However, there were 27% who believed that investment in their own staff was more important that outsourcing.

It appears that managers see the recruitment of new staff through the apprenticeship system as a relatively easy and safe way forward. However, when it is required, outsourcing is a common 'fall back' strategy today within the farming companies, allowing them to focus on increasing the production of farmed salmon and trout, as opposed to human resource issues. It can be applied to many work operations, and seems to be the second most important approach to increasing the human resource capacity and skill set, when a company lacks staff with the required experience and qualifications.

To raise the competence and qualifications of staff using aquaculture VET programs is the third most important human resource strategy, and is placed at the same level of importance as hiring new qualified personnel.

3.1.4 VET delivery modes

The most important types of vocational education and training programs are perceived to be:

i) aquaculture full time VET, which is part of the "agriculture, fishing and forestry" program (selected by 66% of managers), and the "Technical and Industrial Production" Program (selected by 49% of managers).

ii) External short courses (selected by 50 % of managers) and internal training activities are an important way to increase workforce competence, with experienced staff supporting and training those with less experience, in a relatively informal fashion.

Clearly, VET courses leading to NRQs, are highly sought after in Norway and remain the most significant VET provision. Over 75% of managers' report that their companies support long-term training that leads to a NRQ (Journeyman Certificate) to a large degree, as it provides the knowledge base and basic set of skills that companies rely on for many of their day to day activities. Employees holding the Journeyman

Certificate can work in a range of operations and seasonal activities, making them attractive to employers.

There are 1 out of 3 companies who have devised policies to ensure that their staff undertaking the Journeyman Certificate whilst employed are well supported. The rest of the companies claim that they provide some degree of support. Generally, the companies want their staff to study the Journeyman Certificate, as an integral part of their job.

3.1.5 Aquaculture VET subject priorities

The following subject categories were prioritised by Mid-Norway managers:

v) 75% of the managers selected courses addressing "technical subjects and included continuous applied and integrated practice" This reflects the needs in an industry characterized by rapidly evolving technological developments.

vi) 46% of the managers selected courses leading to a "management, organization and cultural understanding" indicating that the industry has become a more outward looking international operation.

vii) 34% of the managers indicated that digital skills of the employees should be enhanced, which is consistent with the number of managers indicating that digital skills are important. As ICT is applied to control a lot of fish farming equipment and operations, this is unsurprising.

viii) 27% of the managers mention that language training is important. The working language inside the companies is Norwegian, necessitating language training for immigrant staff so as they can speak and read the national language.

3.1.6 The local business environment

i) The results show that the fish farming industry is more inclined to conduct specific applied research tasks as opposed to setting up long term academic research programs involving PhD students from universities.

ii) There were 48% of the companies indicating that they collaborate with other fish farming companies to develop new working practices, despite being competitors in the same marketplace. There is clearly a strong collaborative ethos.

iii) In addition, companies support the aquaculture VET schools by offering students access to practical experience and training involving modern equipment.

3.1.7 External influences

There is an overwhelming consensus that both individual companies and the fish farming industry sector will be influenced by externally imposed changes during the next 3 to 5 years.

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i) The survey data returns show that that the managers perceive that the company will be influenced by new technology more than the fish farming industry.

ii) However, only a minority of managers believe that legislation is a factor driving change at the company level. Their perception is that industry has the main responsibility to respond to new legislation and regulations, as opposed to the companies. This is an interesting viewpoint, as arguably all legislative change eventually filters down the chain to affect company level activities

3.2 Method

In this study the Guri Kunna VET schools conducted group interviews and collected data from 41 managers that lead 520 staff in the aquaculture industry. In the fish farming companies' respondents were site managers, while in the processing companies they were production line-managers.

There are five main areas targeted by the questions in the study:

Area 1. Company basic information

Area 2. The company's competence composition

Area 3. The company's recruitment needs

Area 4. The company's future need for new competence

Area 5. Conditions: locally - nationally – internationally

The following companies have participated in the survey: Salmar, Lerøy Midt, Måsøval Fiskeoppdrett and Marine Harvest.

Collecting basic information about the companies has been attempted by sending an e-form by email to senior executives for the fish farming company (Area 1). Unfortunately, to collect this information with this method did not work for the fish farming companies and the response rate was low.

In the other four main areas (2 to 5), the data has been gathered by using one2act Eval[1], an immediate response system, which has been developed by Norwegian University of Science and Technology (NTNU)

In "conventional" surveys, it is common for questions to be presented via email or phone. Other methods include one to one interviews and online survey systems such as Lime Survey[2], SurveyMonkey[3], QuestBack[4] or other similar systems.

[1] www.one2act.no
[2] www.limesurvey.org
[3] www.surveymonkey.com

The motivation for developing to our methodology is that none of these methods are perfect in terms of efficiency, participation and "accuracy" in the surveys, and here are several issues one should note:

- There is no guarantee that relevant subjects will be reached using the usual methodology for such investigations.
- The relevant subjects might not answer.
- An online survey may potentially reach many respondents, but experience shows that it requires a lot of motivational activity and marketing to get enough responses.

In our survey, we have collaborated with the largest actors in the Mid-Norway region. We have selected to combine group interviews together with immediate response technology to mitigate several of the shortcomings of the other methods. These group interviews are conducted at one of the company's regular meeting arenas and the target group has been middle managers in the companies that then respond to the survey based on their knowledge of the competence of their subordinates. Central to our method is that we conduct dialogue with the group before and immediately after the answer itself. Each group interview including the collection of data, lasted up to 60 minutes. Our theory is that a greater opportunity to reveal and correct misunderstandings and differences in interpretation of the questions is provided. Sometimes, the answers to the questions can reveal the need for additional questions, which is possible using this method.

3.2.1 One2act EVAL System

One2act EVAL is a quick evaluation system that uses respondents' own internet enabled devices (smartphones, tablets, laptops and other standard web browsing capable devices) to respond to surveys and evaluation questionnaires. The system was designed to be used in educational settings, but it is quite generic, and the application scope is much larger. In a typical scenario, the presenter uses EVAL teacher client to define the questions, control various aspects of the response collection and to access the results while the respondents use a web app to connect to the service and reply to the answers posed by the teacher. In the current version there are three types of supported questions: multiple choice questions which may or may not have a specified correct answer, rating or Likert questions with scales from two to seven alternatives and open text questions.

Each evaluation or survey questionnaire gets a session code upon uploading onto the server. The session code is used to allow the students to easily connect to the set of questions.

The answers are immediately aggregated making instant feedback possible and discussion based on the responses. Thus, the presenter can dismiss misunderstandings and misconceptions and adapt the discussion according to feedback from the respondents.

Depending on the situation it is possible to run a re-vote on several questions or ask additional ad-hoc questions.

[4] www.questback.com

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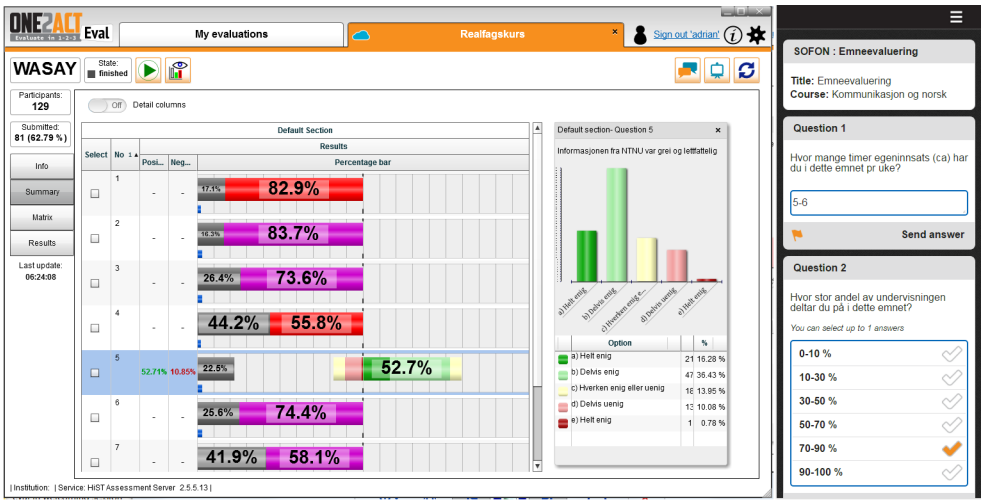
EVAL is part of one2act response technology services. At the core of the system there is a server that hosts the central database and provides the interfaces suitable for specific use-cases. The server communicates with the clients using REST interfaces.

Feil! Finner ikke referansekilden. User interfaces of the teacher and the student clients of EVAL system: Screenshots



3.2.2 One2act EVAL teacher client

The presenter can use the EVAL software to create, control and monitor sessions. Each session has associated a set of questions that can be of various types.

EVAL teacher client is an application developed in Flex and ActionScript and it runs on the Adobe Air runtime. The application provides several perspectives that are suitable for the typical tasks of the user.

Among the perspectives provided by the user interface there are:

- Session management perspective – allows the user to manage and control multiple sessions
- Editor perspective – allows the creation and uploading of the questionnaires
- Monitoring perspective – allows the teacher to see the results as soon as they are sent by the students
- Presenter perspective – facilitates discussion with the students about the results through visualizations that are suitable to be displayed to all participants.

3.2.3 The one2act student client

The student client is a web app written in HTML and JavaScript that communicates via Ajax with the REST API provided by the server. The one2act student client is compatible with all modern browsers that consistently make use of current web standards.

Using the one2act web app, the respondents can join sessions that were prepared by the presenter and respond to the questions. If the presenter allows it, they can choose to participate anonymously.

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Chapter 4: Qualitative Surveys

4.1 Summary

An initial stakeholder analysis has informed the qualitative survey work undertaken in Scotland, Ireland, and the Mediterranean region. A range of techniques, including one to one meetings, phone based interviews and some group activity has provided useful information on the initial opinion of stakeholders regarding aquaculture VET supply and demand and related workforce development issues.

Information has been collected from several relevant actors from the Mediterranean aquaculture industry in the following countries; Croatia, Cyprus Greece, Malta and Spain. Discussions have been conducted with a wide range of stakeholders, including the leading Croatian producer, Cromaris, the Department of Aquaculture from University of Dubrovnik, Andromeda in Greece and the Aqua Bio Tech Group a leading aquaculture supply company from Mediterranean area. Although Malta are not FEAP members, they do have a small cage farming industry and have been included. They are centrally placed in the Mediterranean region geographically and have one of the few college VET providers in the region, Malta's College of Arts, Science and Technology (MCAST).

There are a small number of large companies that dominate the production in the region, including two in Croatia and three in Greece. However, most fish farms are family owned and are part time activities. The fish produced are sold to markets local to the farms and to the hotels trade, and commonly, the aquaculture industry does not target overseas export markets. There were concerns expressed by some that the 'infrastructure' in the region is generally insufficient to support the aquaculture industry effectively. In addition, the Mediterranean region has very little formal aquaculture VET and has become dependent on European funded projects to some of its aquaculture workforce development activities. This is radically different from countries in Northern Europe, such as Norway and the United Kingdom (Scotland), where there is an established set of aquaculture programs within a mature national VET system.

Therefore, it may be possible for a partnership of several countries in the Mediterranean region to cumulate sufficient demand to justify the development of an aquaculture VET supply hub and joint VET program. Although speculative at this stage, this may be possible through some form of private/public sector joint investment initiative.

The Mediterranean countries discussed here have all established VET systems which typically start at the secondary level of education and can lead to further specialization and education at either post-secondary or tertiary level. Croatia and Cyprus have a tertiary level VET system, whilst Greece is dominated by general education at tertiary level. In Greece the higher level vocational education is offered at the post-secondary level and if certain conditions are satisfied, allows further education at the tertiary level.

The initial stakeholder analyses that underpinned much of this qualitative work in northern and southern Europe are available with this Initial Opinion Survey as separate appendices as word files.

4.2 Scotland

Indicative qualitative survey work has been undertaken with key Scottish stakeholders, including some aquaculture companies (producer and technology), VET providers, public agencies and representative bodies. This work will be used to guide the completion of a comprehensive VET demand and supply analysis in collaboration with the Skills Committee of the Scottish Industry Lead Group (ILG) 2030 during the first quarter of 2018.

4.2.1 Industry

The Scottish aquaculture industry is dominated by the production of Atlantic salmon and the sector produced 162,000 Tonnes in 2016, second only to Norway in northern Europe. There has been a trend towards the recruitment of local coastal zone inhabitants in response to the growth of production this century. There are strong business links between Norwegian and Scottish salmon faming companies and in some cases Scottish businesses are Norwegian owned, providing a great opportunity for collaboration in workforce development and as well as technical development.

4.2.2 VET supply and demand

Some producer companies have developed comprehensive in company training programs (non-formal VET, however, this training does not provide a direct pathway to NRQs. Latterly, the publicly funded Modern Apprenticeship has been undertaken by growing numbers of 16-24-year-old work based learners eligible for funding. The many mature entrants not eligible for funded work based VET must rely on in company training schemes. Although often providing useful company specific knowledge and skills development, they do not provide an NRQ pathway, and therefore the learners remain unqualified and less mobile within the national and European workforce, as a result.

The qualitative survey work has indicated significant support for a revitalization of Scottish Aquaculture VET, a view particularly prevalent amongst industry leaders. This led to the commissioning of an independent national survey in to the skills and education needed to properly support the development of the entire aquaculture supply chain. Surprisingly, a series of formal written requests from the lead partner to selected Scottish stakeholders with workforce development within their remit, inviting them to assist BlueEDU as an Associated Partner, drew no offers of support, disappointingly.

4.2.3 BlueEDU research (Year 2)

Latterly, the Skills Committee of the ILG 2030 have agreed to share quantitative survey information on VET supply and demand in Scotland. Therefore, the extensive stakeholder analysis and qualitative survey work undertaken to date will provide a sound foundation for positive collaboration with the ILG 2030 Skills Committee during 2018. This will lead to the completion of a comprehensive quantitative analysis of aquaculture VET supply and demand for Scotland.

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4.3 Ireland

4.3.1 Industry

Ireland produces approximately 15,000 tonnes of Atlantic salmon per annum. The growth of the industry is constrained by the sub-optimal farming conditions of many coastal locations, and conflicts of interest with the valuable migratory salmonid sport fisheries on the Irish West coast. The largest company is Marine Harvest who are very independent of national VET providers regarding their company workforce development. A modest growth in salmon output and staff recruitment is expected during 2018, and this may further strengthen the interest in BlueEDU and innovative aquaculture VET development.

4.3.2 VET supply and demand

There is a National Framework for Qualifications under Qualifications for Ireland (QFI) and their VET system is Learning outcome based, and comparable in principle to the Scottish Qualifications Authority (SQA). Aquaculture VET qualifications have been designed at a range of levels for attendance and work based delivery, and Irelands seafood development agency, 'Bord Iascaigh Mhara' (BIM) and the Education Training Boards (ETB), have been the main providers.

BIM has offered aquaculture courses at QQI level 3 to level 6. The courses are offered on a modular basis beginning with a foundation in fish farming methods for new entrants, progressing to training for experienced farmers, to improve their skills and knowledge of aquaculture techniques.

Informal discussions with the Irish Farmers Association (IFA) and the Education Training Board (ETB) revealed a legacy of coastal community skills development and an ongoing interest in the development of their Aquaculture VET system and resources.

4.3.3 BlueEDU research (Year 2)

Structured interviews will be undertaken in May 2018 in Ireland with industry leaders and senior managers, VET providers and other relevant stakeholders to gather data on industry needs and evaluate their capacity for innovative aquaculture VET development. Access to on line surveys will be offered to companies, to gather quantitative data on aquaculture VET supply and demand to compliment the structures interviews

4.4 Iceland

4.4.1 Industry

In Iceland there are 5 aquaculture companies; Arctic Fish (Norway Roayl Salmon, 50%), Arnalax (Salmar, Norway), Laxar Fiskeldi (Måsøval, Norway), Fiskeldi Aistfjorda and Ice Fish Farm (Midt-Norsk Havbruk, Norway). The farming conditions are similar to Finnmark, Norway. The development of VET is about to start due to the large increase of the production anticipated, as four farming companies from Norway bought four of the five Icelandic companies during the winter 2016-17. They have defined ambitious

goals for the growth of the industry. Norway Royal Salmon believes the production may increase from 12.500 tons (2017) to 80-100.000 tons (annually), surpassing the Pharos.

4.4.2 VET supply and demand

Currently, there are no aquaculture VET Schools. However, the department of Aquaculture and Fish Biology at Hólar University College in Sauðárkrókur, Iceland, are the leading aquaculture training organization, and as they have the aquaculture expertise, they may have an interest in the development of new aquaculture VET frameworks

4.4.3 BlueEDU research (Year 2)

Qualitative survey techniques will be utilized to further investigate the nature of VET demand in Iceland in relation to recruitment and workforce development plans within the emerging salmon farming sector. In addition, the receptiveness of industry Iceland's industry leaders to collaboration with Norway and Scotland will be established. Both countries that could help Iceland to fast track their aquaculture VET development in line with industry recruitment and workforce development plans.

South East Europe

4.5 Croatia

Croatia's coastal areas and inland waters have good conditions for aquaculture development, including a sea surface of 31,067 km², 1,242 islands, islets, totaling 6,278 km of coastline. In 2015, the total number of aquaculture production sites was 420, including both marine (373 farms) and freshwater (47 farms). The farms are mostly small and micro scale enterprises, with family-owned farms prevalent.

4.5.1 Industry

Croatia pioneered commercial marine aquaculture with one of the first and largest hatcheries for European Sea Bass in the early 1980s. Marine aquaculture includes farming of finfish and shellfish. Finfish farming involves a closed farming cycle (except for Atlantic bluefin tuna), where the first phases take place in a hatchery, before moving young stock to floating cages at sea. The largest collection of farms for white fish and tuna is found in Zadar region.

By contrast, Cromaris is one of the leading Croatian aquaculture company, specializing in the cultivation and processing of native species of white fish with specific emphasis on sea bass, sea bream and shellfish. In 2016 the company produced 6,888 tons and they employed more than 300 people.

They are one of two large aquaculture companies in Croatia, and major recent investments place the company among the most technologically advanced in sea bass and sea bream growing and processing sector in the Mediterranean area. Those investments have been focused on the development of sustainable aquaculture with minimal impact on the environment.

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The company has seven farms, two of which are in Istria (northern Adriatic), and five in Zadar's area (central Adriatic). Today Cromaris is the leading Croatian and the world's number ten sea bass and bream producer. Italy is their most important market, which led to the establishment of an Italian Cromaris company in March 2013. Cromaris Italia srl is the exclusive importer of Cromaris product for the Italian market and is owned by Cromaris.

4.5.2 VET supply and demand

The educational system in Croatia lacks any formal aquaculture VET education, despite aquaculture being a major industry. Therefore, aquaculture companies need to train their staff themselves and entirely rely on this form of non-formal VET, currently.

The vocational education system in the Republic of Croatia, in the school year of 2015/2016, included 114 341 students attending 304 vocational schools. The vocational education and training system typically leads to lower and secondary level school qualifications.

Vocational educational programs at tertiary level (specialist professional studies) can sometimes offer progression to master's level, which is often referred to as post-secondary vocational education and training programs. Both young learners and adults are eligible. These programs provide an extension of the education of those who graduate from lower level VET programs. Access to tertiary education is possible but conditional on satisfactory results in the state organized "matura" exams.

A Higher Education specialization in aquaculture (bachelor and master level) exists, but interest in it is declining, despite relative industry growth and apparent support from the ministry. The only university aquaculture program is available at the University of Dubrovnik. The students in Dubrovnik are challenged by the economic impact of intensive tourism which inflates the cost of living. Some stakeholders allege that relevant education is not seen as a key priority by the policy makers for encouraging the growth of aquaculture production

The apparent unpopularity of Science Technology Engineering and Maths (STEM) specializations adds to the challenge, as well as the constant loss of skilled and educated people who emigrate, due to the lack of incentives to stay in their home country.

4.5.3 BlueEDU research (Year 2)

The second year of BlueEDU research will establish the level of interest in the development of a VET supply in Croatia and/or the Mediterranean region, that could lead to the development of accessible NRQs in aquaculture for Croatian learners. Further qualitative survey techniques and structured interviews will be used for this purpose. In the event of support from an aquaculture company CEO, quantitative surveys on VET skills needs and VET demand will also be undertaken, once reassurance of staff cooperation has been gained.

4.6 Malta

4.6.1 Industry

Malta is not currently a FEAP member, but has a small cage farming sector producing mainly Sea Bream and Sea Bass, but is reliant on the hatcheries of other Mediterranean countries for its fingerling supply. In addition, there is a Tuna fattening sector reliant on wild caught stock and experimental work ongoing with new emerging farmed species, including Amberjack and Meagre. The farmed output was a little under 6,000 Tonnes in 2015.

There are some significant aquaculture companies based in Malta. This is exemplified by the Aqua Bio Tech Group, an aquaculture supply company. It is strategically located in Malta, the geographical centre of the Mediterranean, although operating globally with clients and projects in over fifty-five countries. The company undertakes a variety of aquaculture, fisheries and aquatic environmental projects through its regional offices and selected partners throughout the world. Most of the company's work is related to the marine or aquatic environment, including aquaculture developments, project feasibility assessments, finance acquisition, project management, technology sourcing and technical support and training.

The company has grown to become one of the largest dedicated independent aquaculture consulting companies operating on a global scale. They have clients and projects in over forty-five countries and forty qualified staff with a wealth of experience and expertise covering all aspects of aquaculture planning, feasibility, development and operation.

4.6.2 VET supply and demand

The only public-sector college in Malta, Malta's College for Arts, Science and Technology (MCAST) provides Aquaculture VET to Maltese learners, who are mainly school leavers under 25 years old. They can undertake a two-year Diploma in Fish Management, which includes three sectors, Aquaculture, Fisheries and Aquatics (Ornamental Fish). MCAST have links with government regulatory fishery departments as well as the commercial aquaculture and fishery sector, enabling their learners to get work experience and employment on completion of their Diploma.

The Technical Director of the Aqua Bio Tech Group offered some observations regarding aquaculture VET in many of the EU countries in the southern part of Europe

- Schools and universities often lack facilities for offering practical oriented aquaculture training, in specialisms such as fish welfare and fish health. This requires access to laboratories, but many rely on access to training facilities which they do not own and are sometimes remote.
- In Malta there is close cooperation between ministries as decision makers and industry, thus securing policy support to industry. However, ABT experience that there is variation in policy support inside the countries in southern Europe, and between them.
- The ABT Group experiences that aquaculture VET is not well paid in the Mediterranean area. People and staff that have a passion for what they do, often drive development of the aquaculture industry.

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- In the south of Europe, the typical attitude is to protect knowledge and skills, so as competitors can't access it.

In addition, the following was alleged:

- Malta lacks a vocational education and training (VET) system for marine industry, including aquaculture. There is no marine college offering such training today. There are discussions ongoing to set up a private college system which could provide VET access in the Mediterranean region, potentially.

- Malta applies the US system for National Qualification Framework to some degree.

These last two points were surprising, as they illustrated a lack of recognition of MCAST and its Fish Management Diploma. In addition, the MCAST VET system has been derived from the UK BTEC system and has not been influenced by the United States.

4.6.3 BlueEDU research (Year 2)

The reasons for these discrepancies described in 3.5.2 will be investigated though further qualitative survey techniques. As Malta is not a FEAP member it will not be expected to support the distribution and completion of on line surveys to establish skills needs and VET demand.

4.7 Greece

4.7.1 Industry

In Greece there are 3 large companies at national level and approximately 250 family owned businesses. Since 2008 the production has dropped from 140,000 tonnes down to approximately 100,000 tonnes. There is an acute shortage of capital limiting access to modern equipment due to the low rates of investment, and growth. Competition with tourism is inhibiting the expansion of farm sites and a similar situation exists to that found in the Croatian coastal zone.

4.7.2 VET supply and demand

Greece lacks an aquaculture VET supply and the larger companies have developed internal proprietary systems to train and prepare their new recruits. Some aquaculture industry support companies are showing an interest in the development of a formalized VET supply that can utilize mobile ICT devices for learning content delivery. This hand-held technology is currently used for farm record keeping and fish production management, but could be further developed to support flexible and accessible farm based learning.

The national VET system starts with upper secondary level and students starting are typically 15 years old. There are higher level VET education programs which are included in so called post-secondary

education and they last 2-3 years. Access to the tertiary level of education, including general education programs for bachelor, masters and PhD, is conditional on the results of the national exams.

Secondary level education includes:

- School based VET 3-year long program with work based learning component of more than 25% (this program combines VET with general education and allows access to tertiary education)
- A 2-year apprenticeship program with work based learning component of over 80%

Post-secondary level of education includes VET programs between 1 and 3 years long and include:

- High level professional programs
- 1-year Apprenticeship with 100% work based learning
- Post-secondary VET programs with a work based learning component of more than 20%

The high professional VET programs allow further continuation of education through tertiary level programs. All VET programs offer options for fulltime, part-time and distance education.

During an interview with the CEO of on large aquaculture company in Greece, they mentioned that corruption was a concern in Greek society. They alleged that it is challenging for the aquaculture industry to take any kind of VET qualifications seriously, as it is too easy to buy them. To overcome this problem, it was suggested that an aquaculture VET system in Greece could be based up on a reputable quality assured awarding body, outside Greece. That would, according to the CEO, be the only realistic way of establishing and organizing an aquaculture VET system that aquaculture industry in Greece could trust.

4.7.3 BlueEDU research (Year 2)

The second year of BlueEDU research will establish the level of interest in the development of a VET supply in Greece and/or the Mediterranean region, that would make accessible and trusted NRQs in aquaculture available. Further qualitative survey techniques and structured interviews will be used for this purpose. In the event of support from aquaculture company CEOs, quantitative surveys on skills needs and VET demand will be undertaken in their company, once reassurance of staff cooperation has been gained.

4.8 Cyprus

4.8.1 Industry

Cyprus is in the Levantine Basin (Eastern Mediterranean) characterized by increased salinity and temperature when compared to the other basins of the Mediterranean Sea. Its waters are of a low - nutrient status and low in primary productivity, making them ideal for producing marine species. Although initiated many years ago, aquaculture has recently expanded through offshore cage farm installations.

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In the 'Multi National Plan for the Sustainable production of Aquaculture' [8] there was a commitment made to modestly increase the national production of an annual harvest, composed mostly of Sea Bream and Sea Bass (99%), from 5,339 to 6,332 Tonnes, between 2013 and 2023.

4.8.2 VET supply and demand

Cyprus has no specialized aquaculture VET schools or programs.

In a section of the 'Multi National Plan for the Sustainable production of Aquaculture' titled 'Response to the Strategic Guidelines' under the heading - 'enhancing competitiveness, there is no mention of workforce development, education or training. There is a reference made to 'reinforcement of personnel and networking activities' which may have some linkage to workforce development. This implies that aquaculture VET has not been recognized as important to aquaculture development at national level.

The national VET system is organized as follows:

- Secondary education – is split in to lower secondary (3 years) and upper secondary (3 years) and VET programs start with students who are typically 14 years old in lower secondary level.
- Tertiary education includes general education programs for bachelor (4 years), masters (1-2 years) and PhD (3-4 years)

The vocational education and training system [7] in Cyprus is organized as follows:

Secondary level:

- Lower secondary level
  - 1 year apprenticeship
- Upper secondary level
  - 3 year school based program including work based learning and combining VET with general education. This track also allows access to tertiary education with options for fulltime, part-time and distance education.
  - 3 year apprenticeship with about 70% work based learning component

Post-secondary level:

- 1-2 years specialized programs including work based learning

Tertiary level:

- Higher professional programs of 2-3 years

4.8.3 BlueEDU research (Year 2)

The second year of BlueEDU research will establish the level of interest in the development of a VET supply in the Mediterranean region, that make reliable and trusted NRQs in aquaculture available to

learners in Cyprus. Further qualitative survey techniques and structured interviews will be used for this purpose, when engaging further with industry. In the event of support being offered from an aquaculture company CEO, quantitative surveys on skills needs and VET demand will be undertaken in their company.

4.9 Spain

Spain has a long aquaculture tradition, farming a diverse range of aquatic species, including 6 species of finfish, shrimps, shellfish (Abolone) and sea weed. The country has a long-established industry organization (APPROMAR), which has represented the interests of the Spanish Association of Marine Farmers for over 30 years. Industry representatives have been proactive regarding aquaculture workforce development, through national initiatives and the leadership of significant European projects involving Mediterranean partners.

4.9.1 Industry

Following several years of stagnation, the aquaculture industry started to grow again from 2015. The main finfish species farmed in marine cages is Sea Bass, with 17,376 Tonnes produced in 2014, as compared with only 172 Tonnes of Sea Bream. In 2014, there were 1,864 direct jobs in marine aquaculture, and Spain is the third ranked Member State of the European Union regarding its total national aquaculture production, after the United Kingdom and Greece.

As an association of producers, as well as representing members views within aquaculture policy making at European level, APPROMAR has a keen interest in workforce development. It has referred to the importance of training to provides the skills and qualifications needed to professionalize the Spanish aquaculture workforce. In addition, APROMAR has invested time in identifying the skills needs and training required to provide staff the learning that they need.

4.9.2 VET Supply and Demand

There is no formal aquaculture VET supply in Spain, however, a mature national VET system does exist. Large scale aquaculture companies have their own non-formal VET system and specific courses for their husbandry operatives.

There is no equivalent provision within the Public System. Regional communities are autonomous regarding the non-essential aspects of the general VET system. Although they have responsibilities for the general VET supply, they must work within a national regulatory VET framework. Consequently, they have executive and administrative powers to manage the education system in their own territory. All general VET programs leading to certificates and diplomas are unitized. Whether acquired in the mainstream general VET system, or through the validation of non-formal learning, Units are individually assessed and certificated and may be accumulated towards a full National Qualification.

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According to one source Spain has had National Occupational Standards in aquaculture for many years, largely developed by 'Centro Technoligico del Mar – CETMAR, but adopted nationally. In addition, there have been some notable European project initiatives, including the Erasmus+ funded 'Healthy Fish' Strategic partnership led by APPROAMR. The aim was to develop a *"Standardized Training Program at European level for the aquaculture sector"* [9] This includes training modules for what is described as 'the qualification of the professionals'. It also includes digital learning resources presented via a Moodle Virtual Learning Environment (VLE), required to train staff in fish health and welfare and what is described as 'the physical/chemical control of fish'. However, during discussions with representatives, it appears that they wish to progress further with the development of formal VET provision, working with the strong network of Mediterranean partners established during the 3-year healthy fish project, including; Italian, Turkish, Croatian, and Spanish partners.

4.9.3 BlueEDU research (Year 2)

There will be further qualitative survey work through structured interview, to establish how occupational standards developed by CETMAR have been applied to the development of non-formal VET delivered in companies and by the autonomous regional communities in Spain.

Discussions with an industry representative within a structured interview, have revealed a strong interest in supporting BlueEDU and its research aims. It was suggested that the 'Healthy Fish project partners may be called upon to assist the research effort, which could lead to data gathering within several significant European countries, including Spain, Croatia, Italy and Turkey.

Representatives of APROMAR will be engaged in discussion regarding the ambition Spain appears to have regarding the development of formal VET in partnership with the southern and north European countries subject to BlueEDU research

Chapter 5: Conclusions and implications to future research

At the outset, aquaculture industry leaders were united in their view regarding the importance of a competent aquaculture workforce for the industry to progress. In addition, they noted that most companies have difficulty recruiting staff with the knowledge, skills, competences and qualifications appropriate to their role, particularly when trying to fill managerial positions.

Recruitment in response to industry growth and expansion of the cage farming sector is very dependent on drawing applications from a pool of local coastal zone inhabitants. Although often mature and with some transferable knowledge and skills, many lack the experience and qualifications needed. The rapid development of aquaculture technology and techniques further exasperates this problem.

5.1 Conclusions

5.1.1 Work based VET and NRQs

Whilst some countries in northern Europe have well established formal aquaculture VET systems which have served them well, they also depend on local recruits of all ages, and often face similar challenges to

southern Europe, regarding the accessibility of their VET supply to many work based learners. Both regions need to offer their mature entrants access to a high-quality work-based VET system that can provide a pathway to NRQs. The north may have more to build on, including mature national VET systems and a legacy of both long duration attendance based and work based NRQs, but never the less, there is much that could be improved. The second year of BlueEDU will explore the VET demand and supply in more depth, leading to proposals for the development of collaborative innovative aquaculture VET solutions and harmonization of NRQs.

5.1.2 Collaborative VET development

It can be difficult for VET providers to solve VET supply problems independently, due to significant time constraints. It is safe to assume that the development of innovative VET solutions (courses, qualifications and resources) would be easier through collaboration than independent activity, so long as productive VET provider partnerships can be formed. Progress is also dependent on the willingness of aquaculture companies to form a framework of 'shared occupational standards' in the most important subject areas to inform VET capacity building. There are some positive signs of an emerging collaborative culture, as companies already work together to solve technical problems, despite being competitors in the market place for farmed fish. By adopting a similar collaborative approach in partnership with their VET providers, the workforce development challenge that the industry share could be addressed more effectively.

5.1.3 Addressing the aquaculture VET challenge in the Mediterranean region

There is a high dependency on non-formal VET in the form of in company training in both northern Europe and the Mediterranean region. However, the latter has no formal aquaculture VET legacy to build on, putting them at a distinct disadvantage. This is not insurmountable, and the first step, muted by some stakeholders, may be the establishment of a Mediterranean aquaculture VET provider with up to date aquaculture training facilities and expertise to act as the VET supply hub for the region. The development and delivery of both long duration full time and work based VET leading to respected RNQs could then be supported. Subsequently, from this secure base, the harmonization of European Aquaculture VET qualifications, and collaborative VET development could flourish between the north and south east of Europe, based on common occupational standards, once developed.

5.2 Completion of BlueEDU research

This Initial Opinion Study has raised the BlueEDU Sector Skills Alliance profile, increasing the aquaculture industry and other stakeholders' awareness of the project. It will guide the completion of the VET supply and demand analysis within all 12 FEAP member countries during year two of BlueEDU, and other countries in the Mediterranean region, including Malta, who are cage farming finfish. Subsequent research will rely heavily on structured interviews and group seminars, to maximize engagement and the interactive exploration of ideas, supported by on line surveys containing an appropriate balance of common and regionally-specific questions.

The detailed stakeholder analysis undertaken for each country or region has identified key organizations and individuals pre-disposed towards assisting the BlueEDU effort, documenting their motivation and

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contact details. The reasons BlueEDU is of interest are defined, making it easier to gain their cooperation through a planned approach by the partner, or stakeholder, selected as the most likely to be influential.

This next phase of activity will be supported by the industry leaders who offered their assistance at the FEAP General Assembly in May 2017. They will be contacted by FEAP to request their organization's assistance with information and data collection.

Through these methods, and the consistent application of the BlueEDU Communication Strategy, industry and VET providers will be engaged, leading to detailed information gathering, including those BlueEDU countries unable to partake in this Initial Opinion Study. The husbandry operatives within the workforce will also be encouraged to provide their opinions, including their attitude towards learning, through taking part in on-line VET demand surveys. This will help to confirm attitudes towards different VET delivery modes at all occupational levels within the industry.

Some of key areas of activity and enquiry for those countries subject to the research effort are described below, clearly identifying where a more in-depth insight to VET demand and supply is required.

5.2.1 VET demand

i) Engaging with major north European multi-national salmon producing companies willing to work together to form a shared framework of occupational standards (expressed as Learning Outcomes), in high priority topics, to underpin future collaborative VET development. This work will be supported by the establishment of a 'Labour Skills Foresight Committee', facilitated by BlueEDU partners.

ii) Determining the impact of new and emerging aquaculture technologies on the specific knowledge, skills requirements and priorities of future cage farm husbandry operatives and site managers.

iii) Confirming the receptiveness of manager and their learner, both husbandry operatives and site managers, to different VET delivery modes. Innovative work based VET delivery approaches will be demonstrated to industry, to enable then to make an informed view of VET innovation and its value to their company and work based learners.

iv) Establishing the digital literacy and confidence of work based learners, both husbandry operatives and site managers, to determine their receptiveness and readiness for more innovative VET delivery modes. This will be done through a combination of online survey questions and group seminars, following innovative VET demonstrations.

v) Establishing the demand for an Aquaculture VET provider in southern Europe, with the capacity and capability to provide long duration full time and work based VET, leading to the attainment of respected NRQs.

5.2.2 VET supply

i) Establishing the VET development skill-set of VET providers, with an emphasis on work based delivery modes and the application of learning technologies within VET delivery.

ii) Determining the receptiveness of VET providers towards collaborative VET development and the development of innovative VET solutions, collectively.

iii) Determining the reliability of existing aquaculture VET assessment processes, including quality assurance systems and practices, to determine the reliability of aquaculture qualifications currently.

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Appendix 1 - Results from FEAP General Assembly Meeting

Table of figures

Survey results

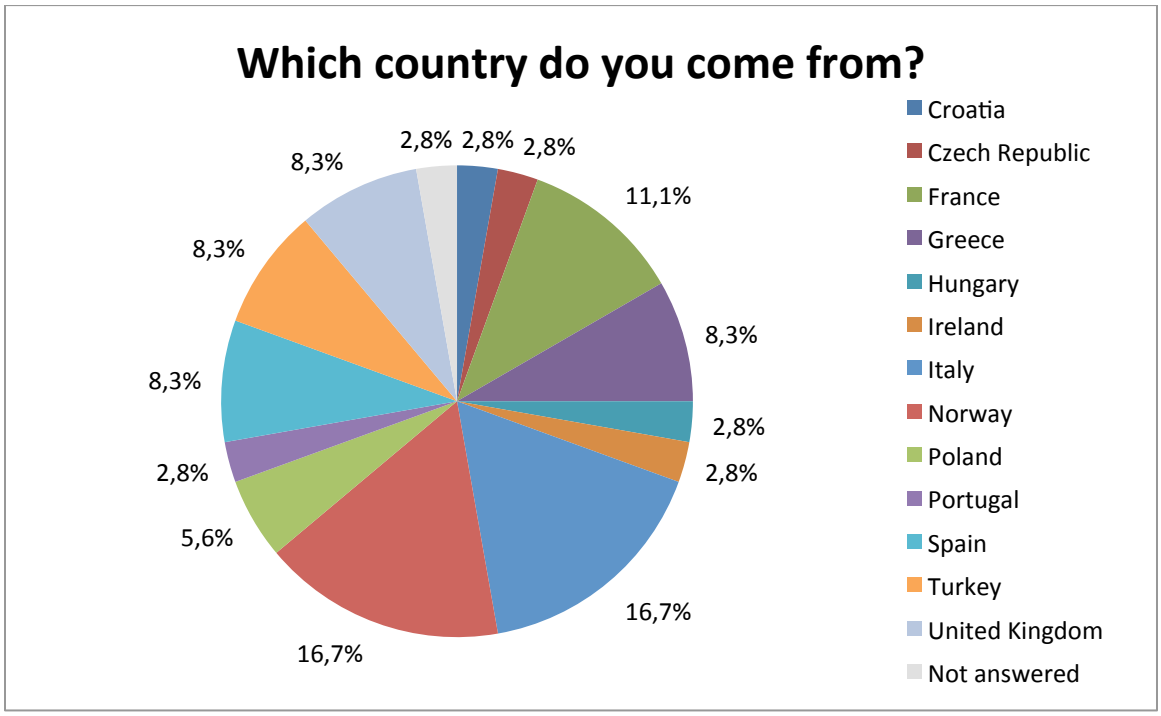

Figure 1: Country distribution of the participants in the meeting

Industry representatives from 13 countries have participated in the meeting (figure 1).

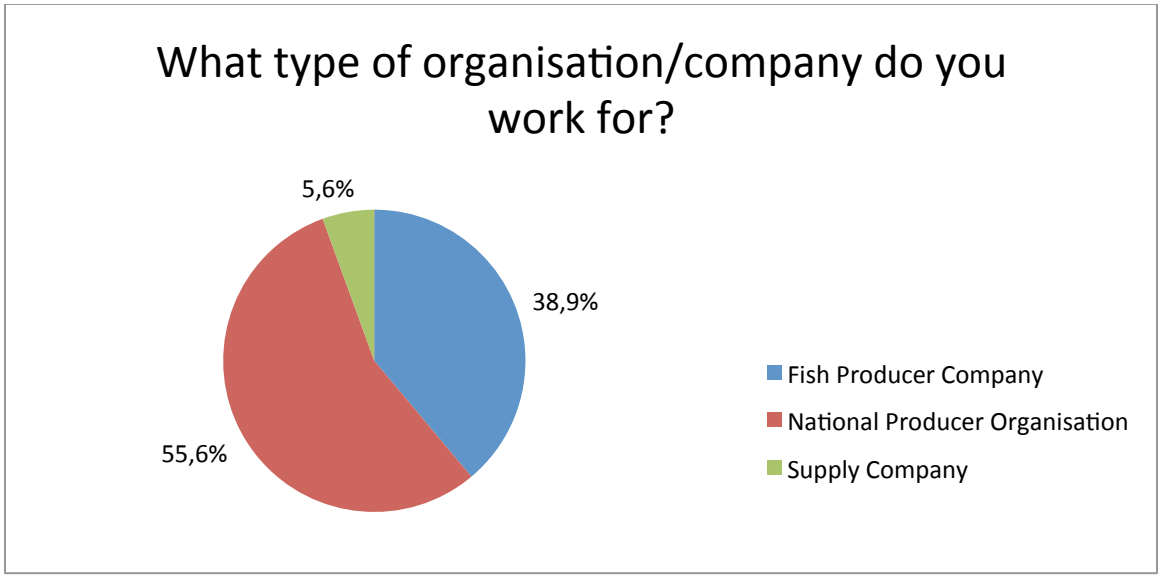

Figure 2: Distribution of participants by their affiliation

Over half of the participants work for a National Producer Organisation (figure 2).

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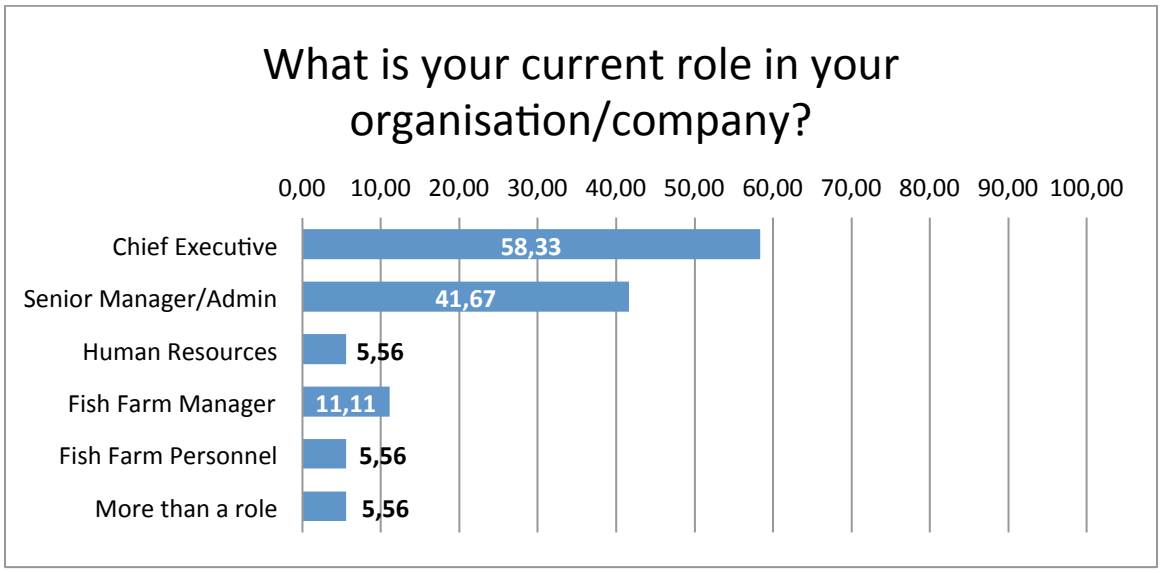

Figure 3: Distribution of participants by role in their organization. Values are given in percentages.

Most of the participants have roles in higher management positions (figure 3). Participants were allowed to select more than one role. Percentages are calculated to reference to the total number of respondents.

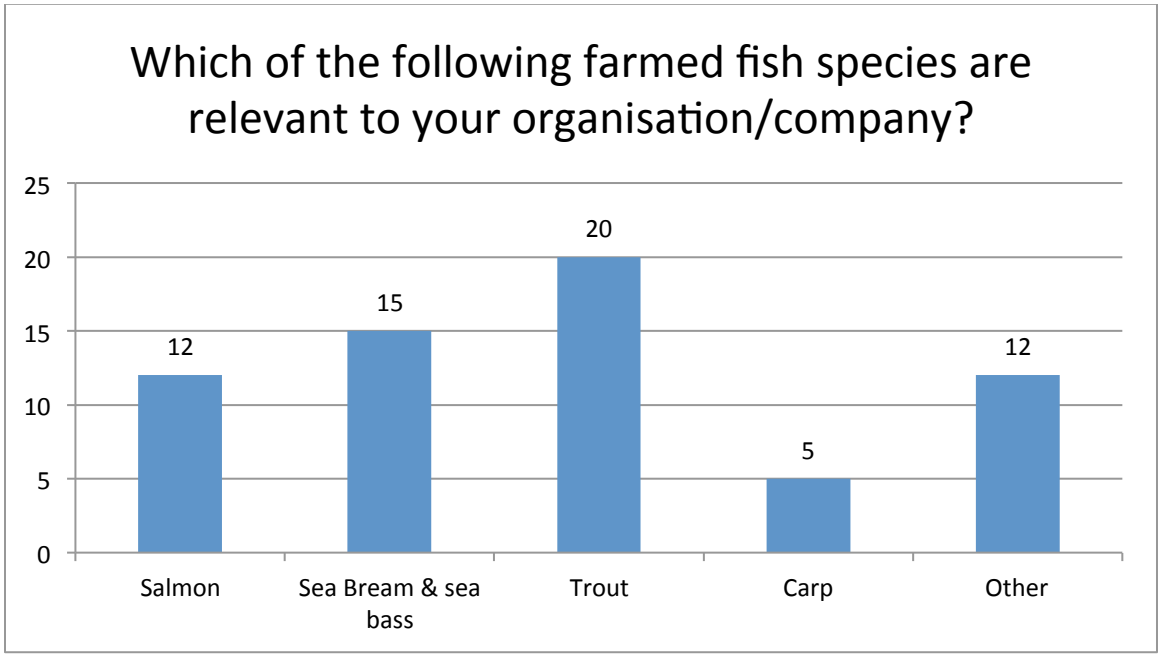

Figure 4: Distribution of relevant fish species

Over half of the participants have indicated trout as a relevant species to be produced in their company (figure 4).

The neutral middle point "Neither agree nor disagree" is set to 0%. The negative and strongly negative answers are stacked towards the left, while the positive and strongly positive towards the right. This means that the neutral bar is equally distributed between positive and negative sides.

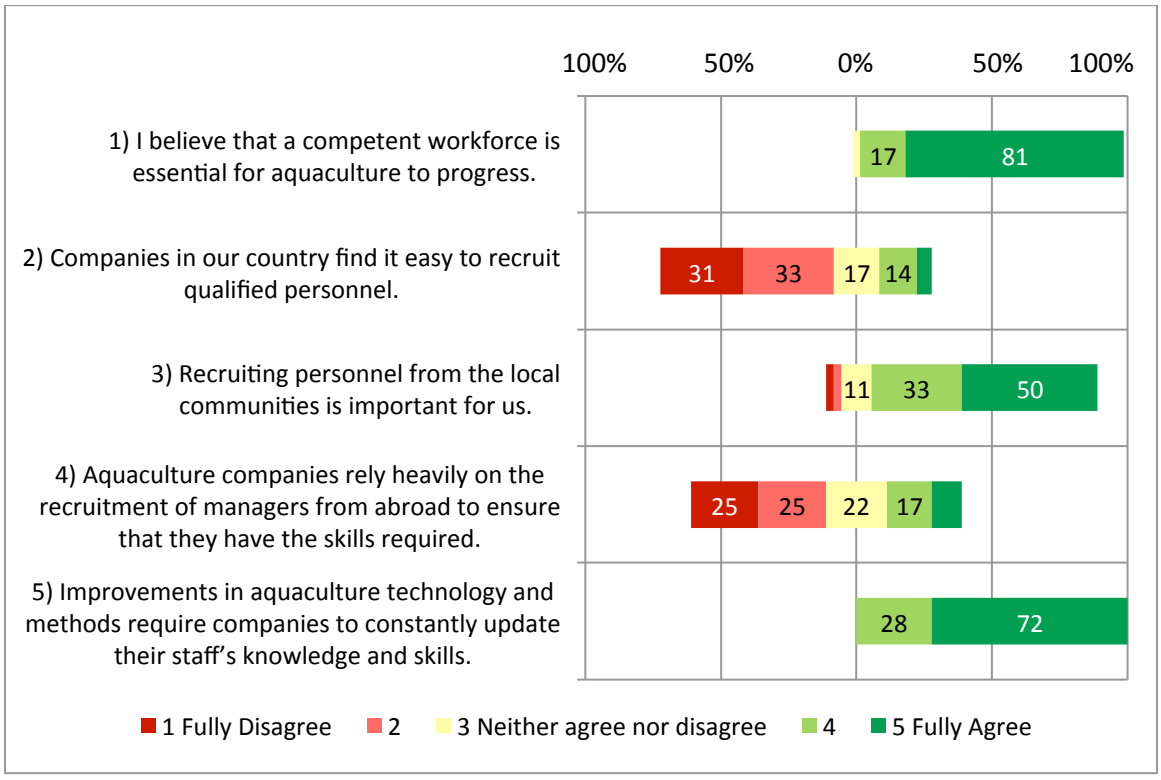

Figure 5: Several statements related to recruitment and workforce education

The results above show that appropriate education and training (figure 5, 1st statement) is paramount for industry progress according to over 98% of the respondents (with 81% strongly agreeing). In addition, 72% of the respondents point out (figure 5, 5th statement) that continuous updating of the staff's knowledge and skills is necessary to keep up with technological improvements. The recruitment of staff from local communities (figure 5, 3rd statement) is considered important by over 80% of the participants, with 50% strongly agreeing.

The 2nd and 4th statements from figure 5 require further investigation: The countries attending (figure 1), are grouped together in the following way:

North (marine cage based): Norway, Iceland, Finland, Denmark, United Kingdom, Ireland

South (marine cage based): France*, Spain, Italy, Croatia, Greece, Cyprus, Portugal, Turkey

Inland: Hungary, Czech Republic, Poland, France*

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*France has both marine cage based and inland farming so it has been included in both groups.

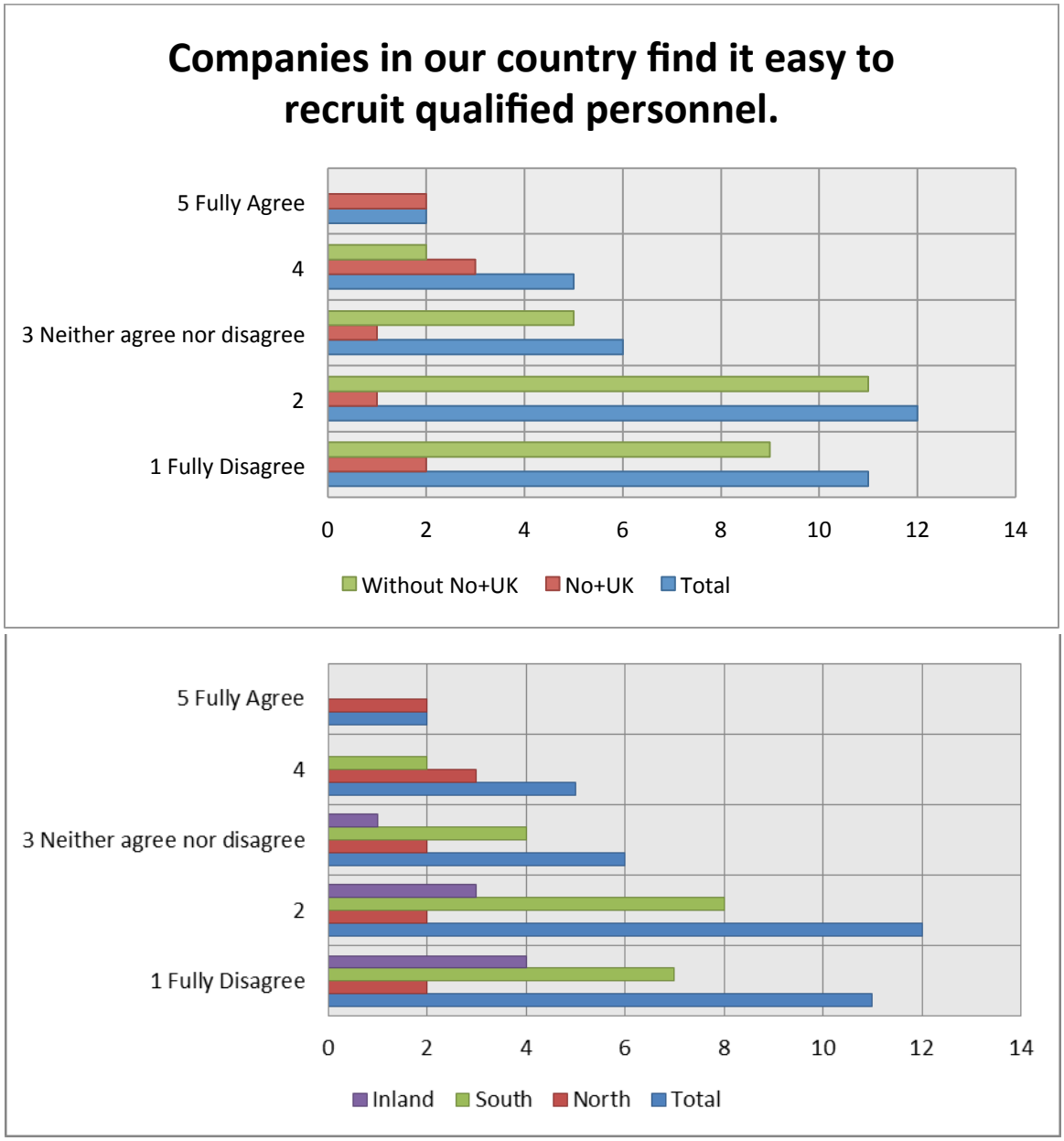

Figure 6: Comparative charts for figure 5, 2nd statement
(top: Norway and UK vs remaining countries; bottom: south vs north vs inland)

The answers indicate that it is challenging to recruit qualified personnel both in north, south and inland (figure 6).

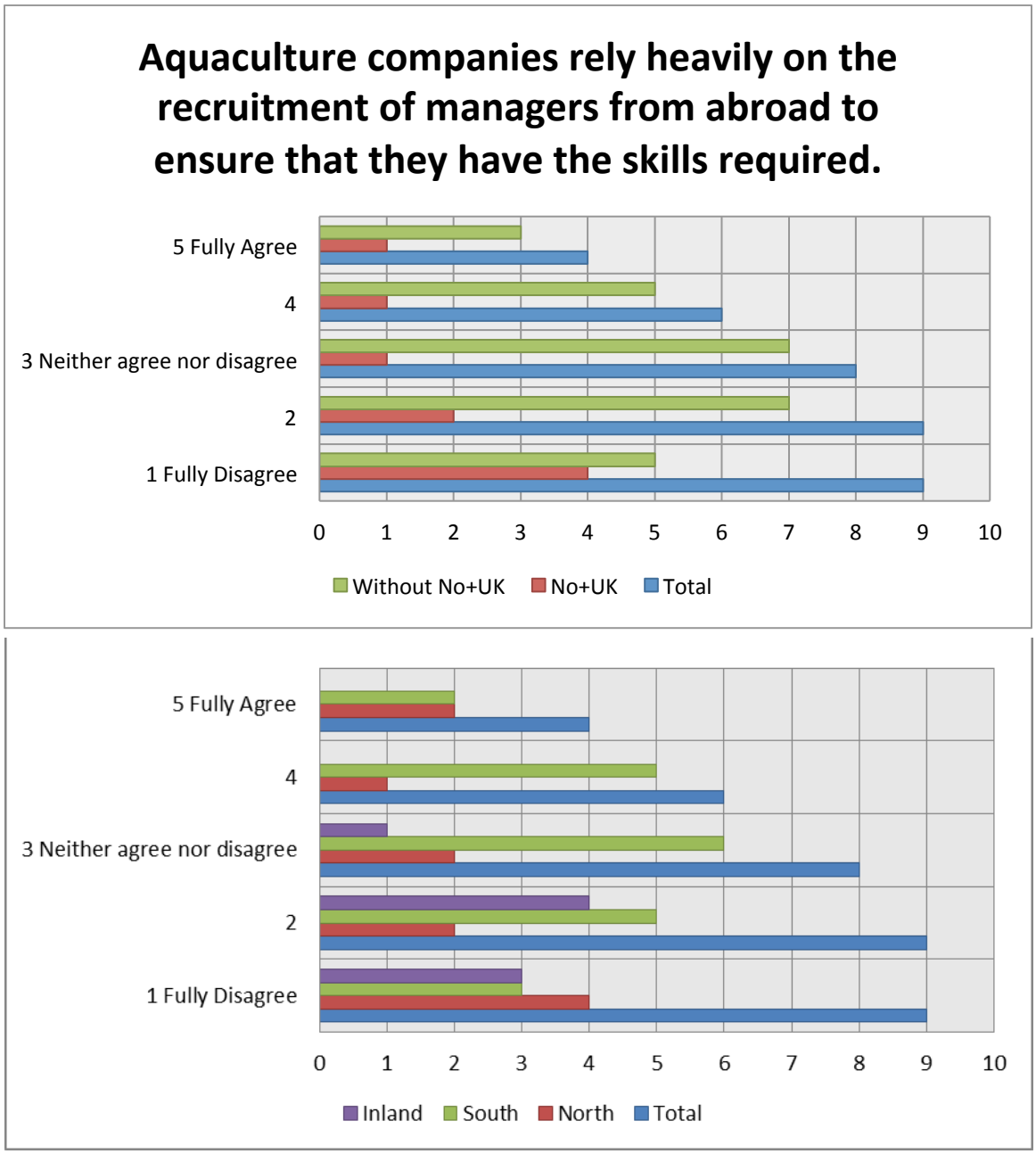

Figure 7: Comparative charts for figure 5, 4th statement
(top: Norway and UK vs remaining countries; bottom: south vs north vs inland)

There is a tendency of more disagreement for "inland" group vs the others in relation to recruitment of managers from abroad. (Figure 7)

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The figure below shows the distributions of the replies from 9 questions using a divergent stacked bar chart approach. The missing answers are represented as a grey bar aligned to the rightmost part of the chart for easier comparison.

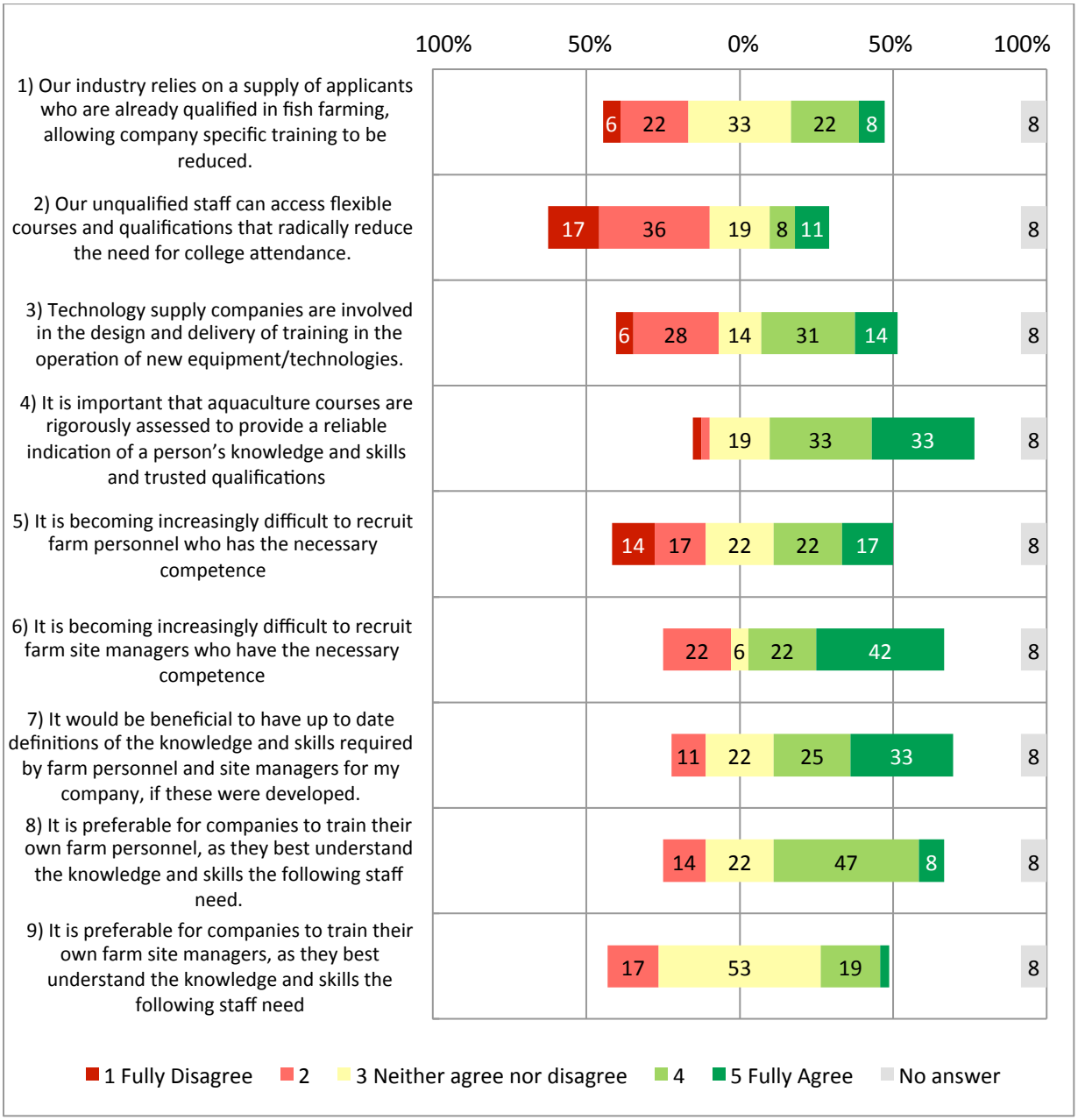

Figure 8: Statements related to workforce education and recruitment

64% of the respondents agree (42% strongly agreeing) that it is increasingly difficult to recruit farm site managers with the necessary competence (figure 8, 6th statement). 58% of the participants agree (33% strongly) that it would be beneficial to have updated definitions of knowledge and skills for farm personnel and site managers (figure 8, 7th statement).

From the statements in figure 8, the 2nd, the 3rd, the 4th and the 8th need further investigation. In the following charts we grouped the answers in the same way as mentioned previously.

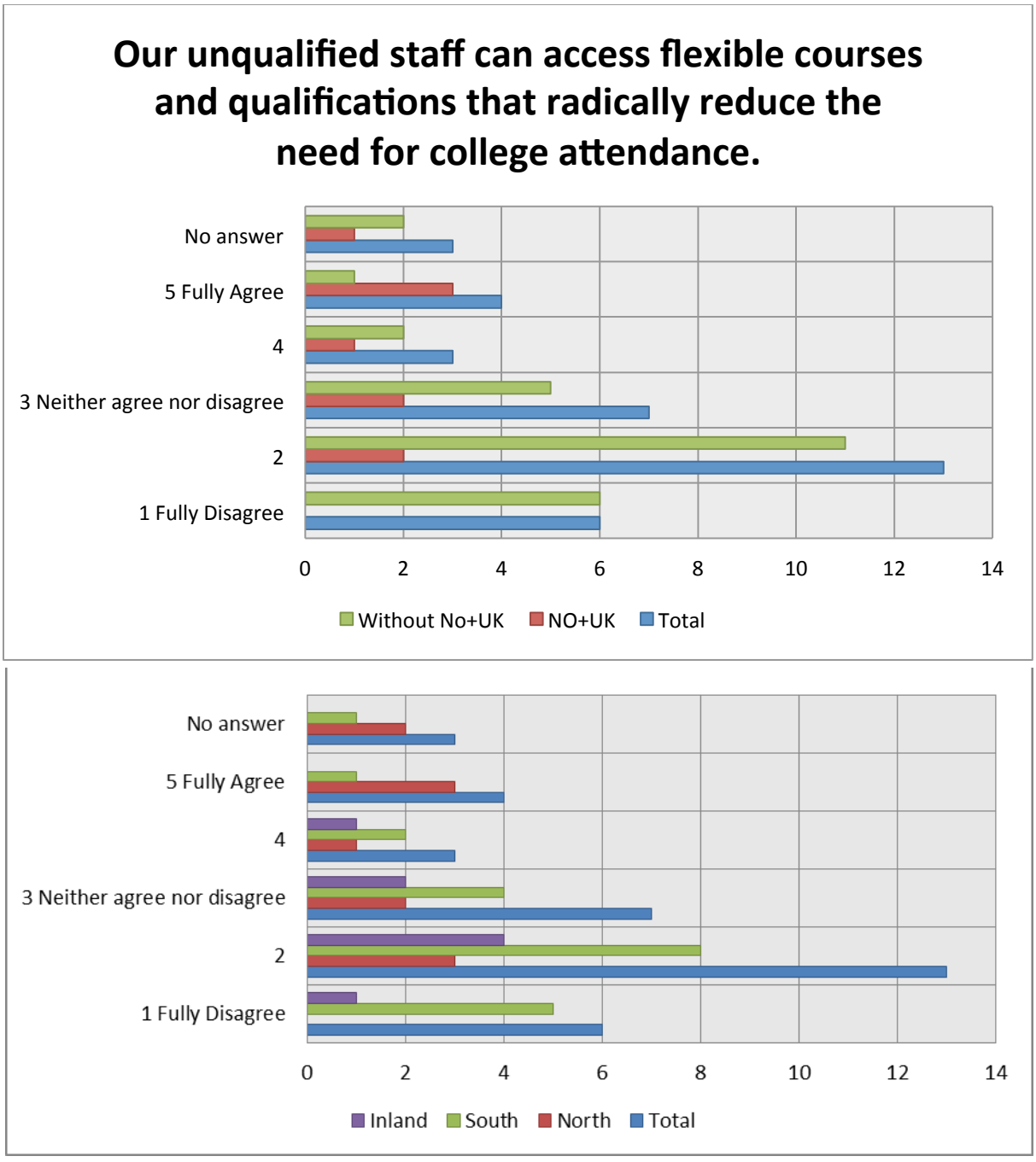

Figure 9: Comparative charts for figure 8, 2nd statement
(top: Norway and UK vs remaining countries; bottom: south vs north vs inland)

There is slightly better access to courses and qualifications in north especially in Norway and UK while the situation in the south is the opposite (figure 9).

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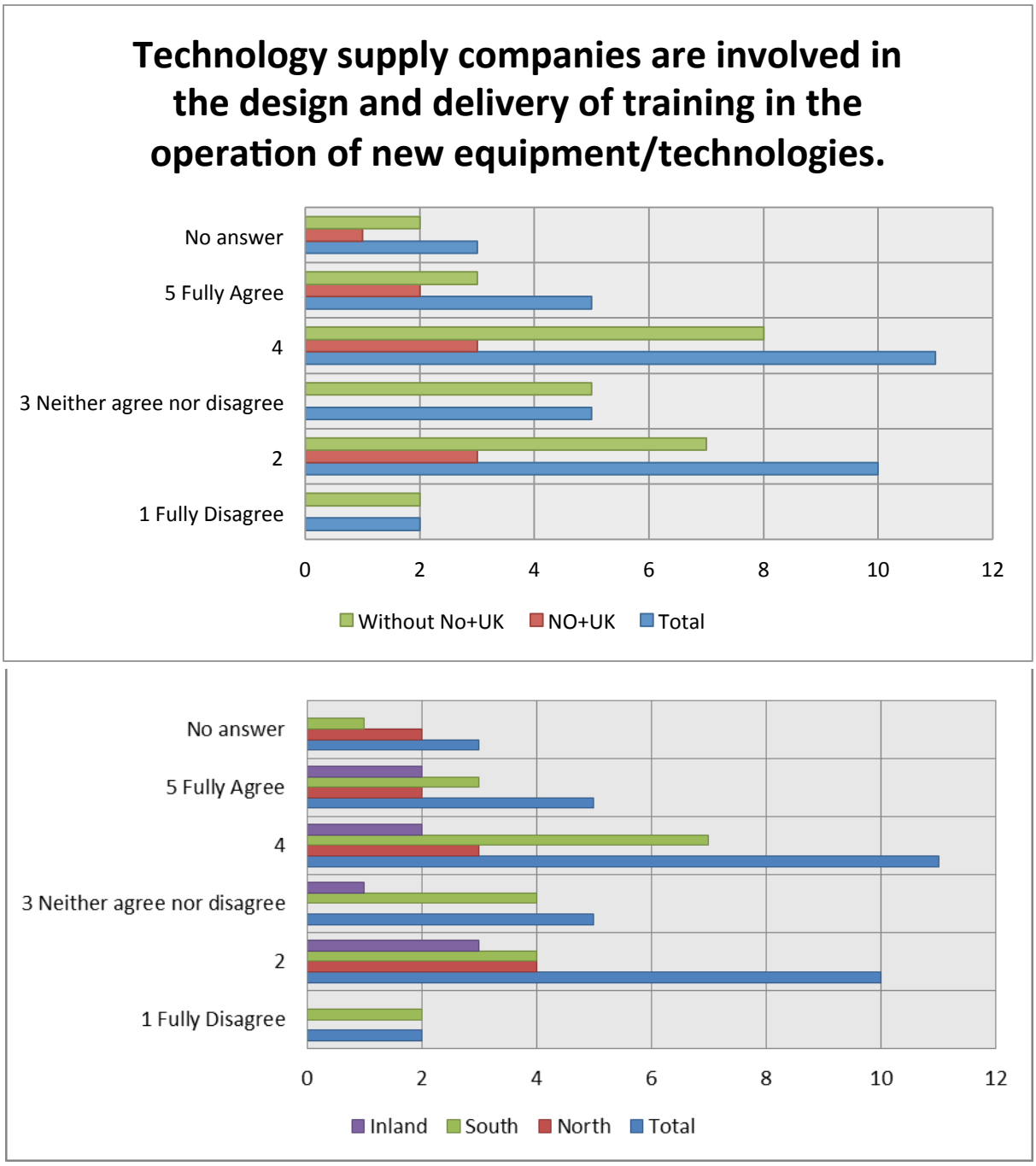

Figure 10: Comparative charts for figure 8, 3rd statement
(top: Norway and UK vs remaining countries; bottom: south vs north vs inland)

The involvement of the technology supply companies is heterogeneous as there is no clear tendency in the answers. Probably there could be variations between regions and the various supply companies (figure 10).

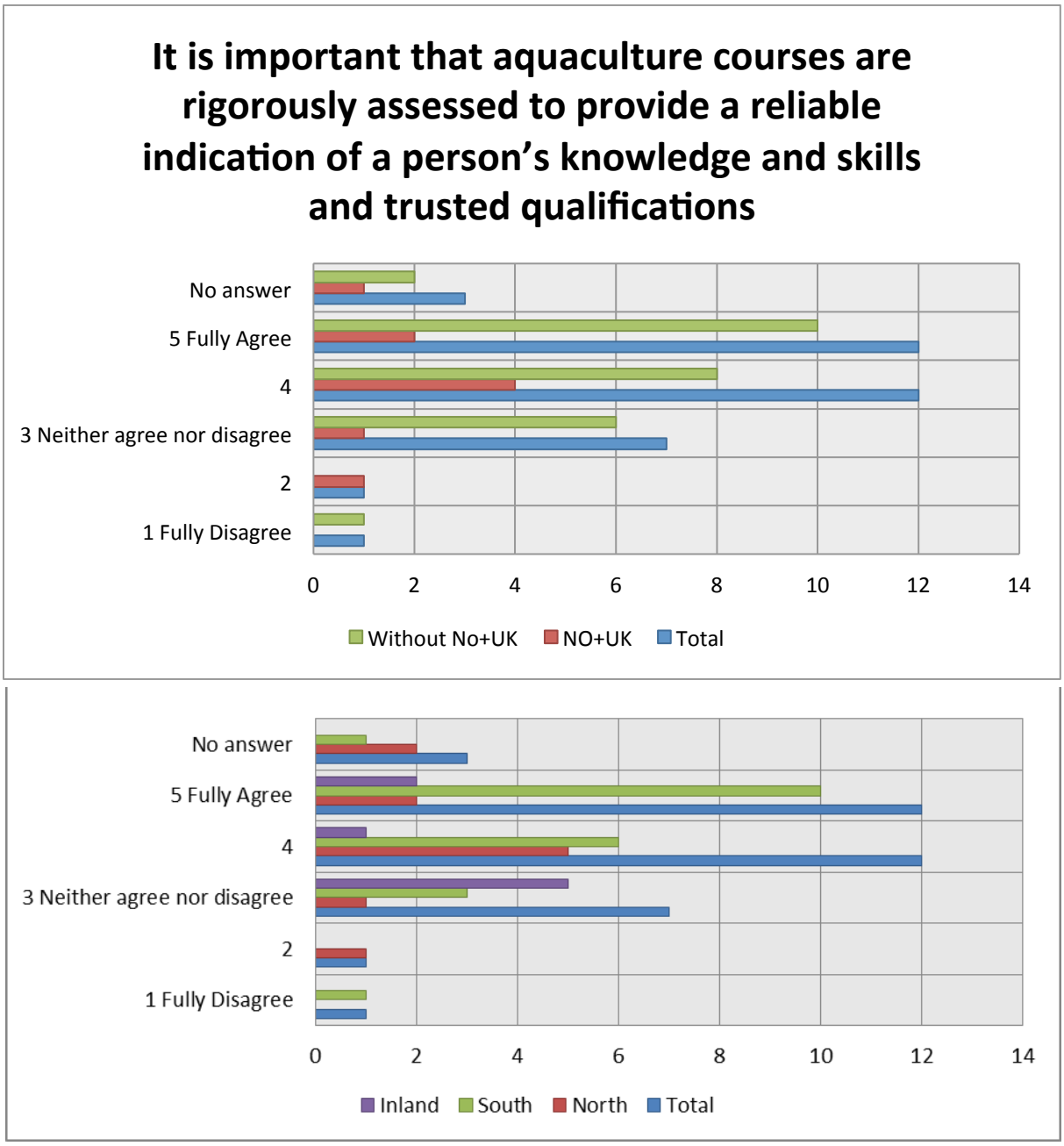

Figure 11: Comparative charts for figure 8, 4th statement
(top: Norway and UK vs remaining countries; bottom: south vs north vs inland)

Assessment in the blue sector is an important activity all over Europe, independently of the species farmed (figure 11).

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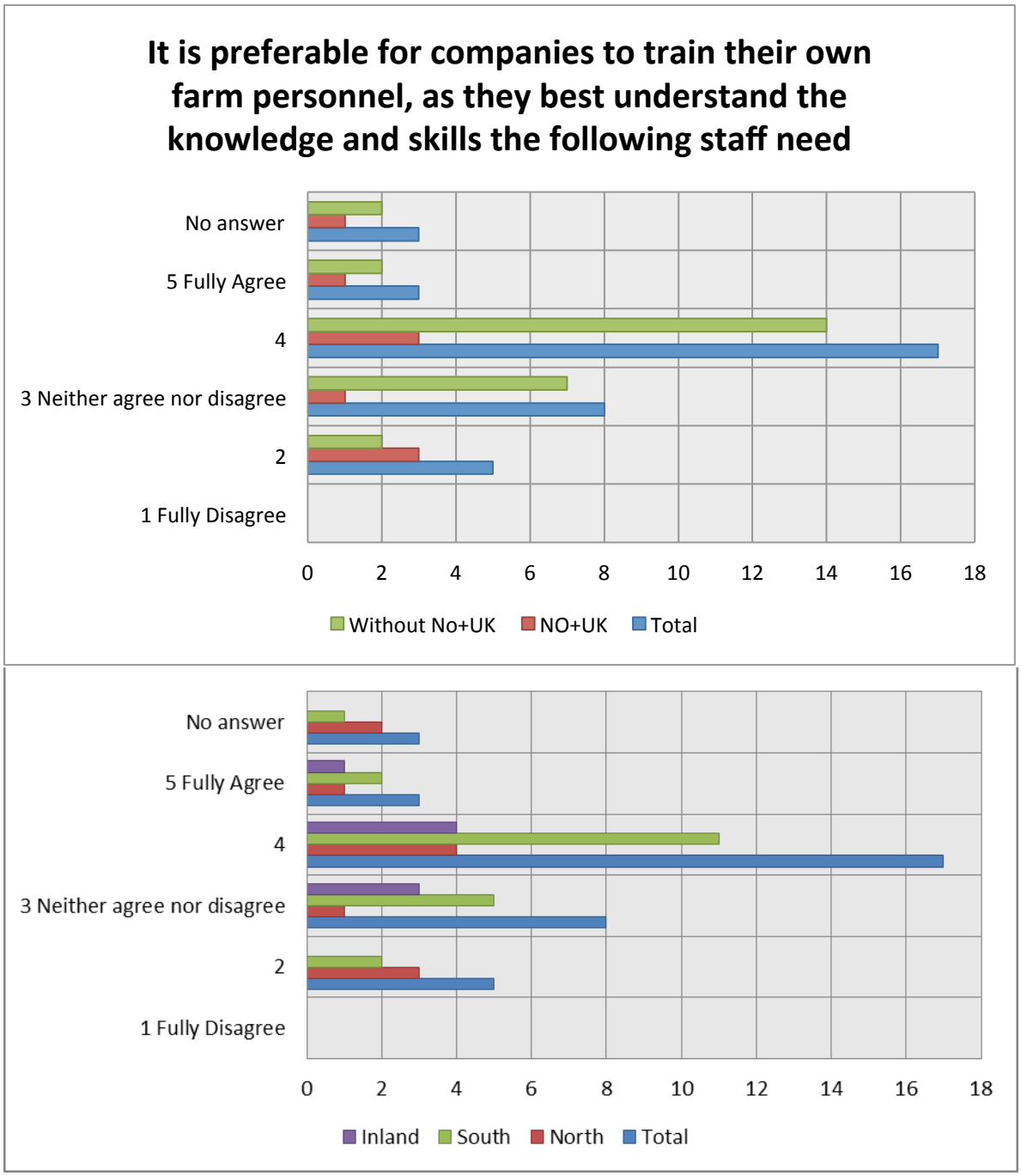

Figure 12: Comparative charts for figure 8, 8th statement
(top: Norway and UK vs remaining countries; bottom: south vs north vs inland)

The respondents mildly agree that it is preferable to train the farm personnel inside the company independently of the species farmed (figure 12).

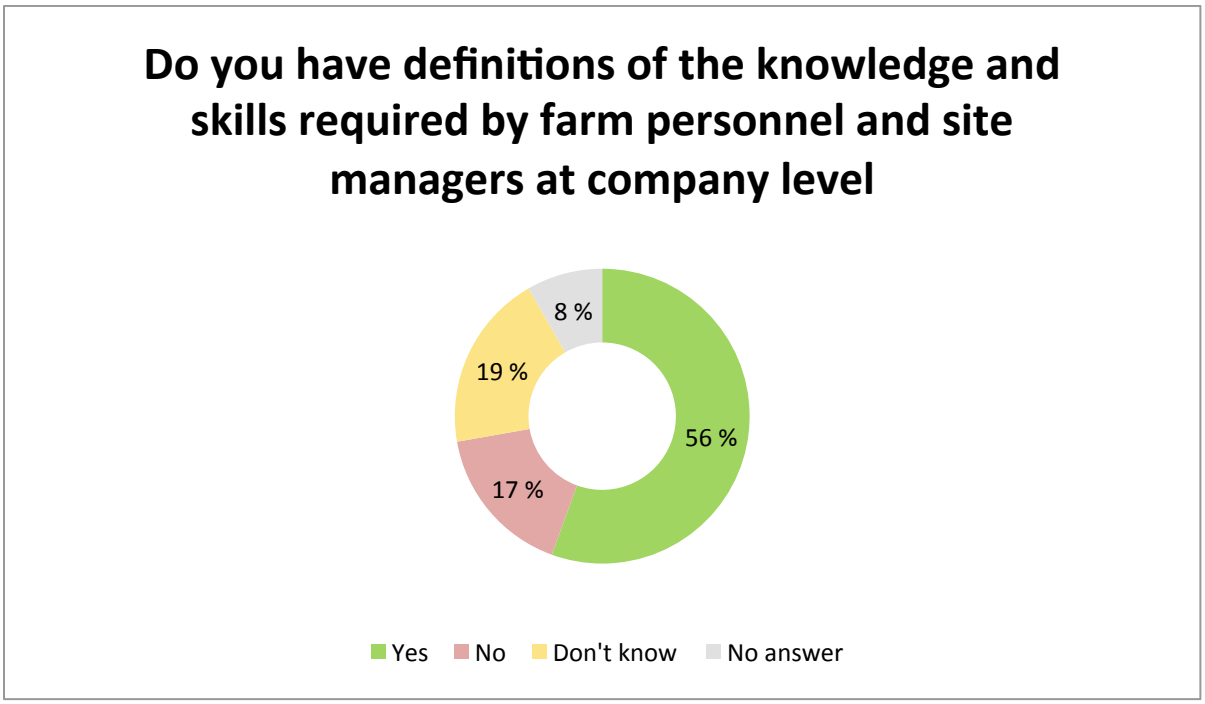

Figure 13: Availability of definitions for knowledge and skills at company level

56% percent of the participants have definitions for the knowledge and skills at company level.

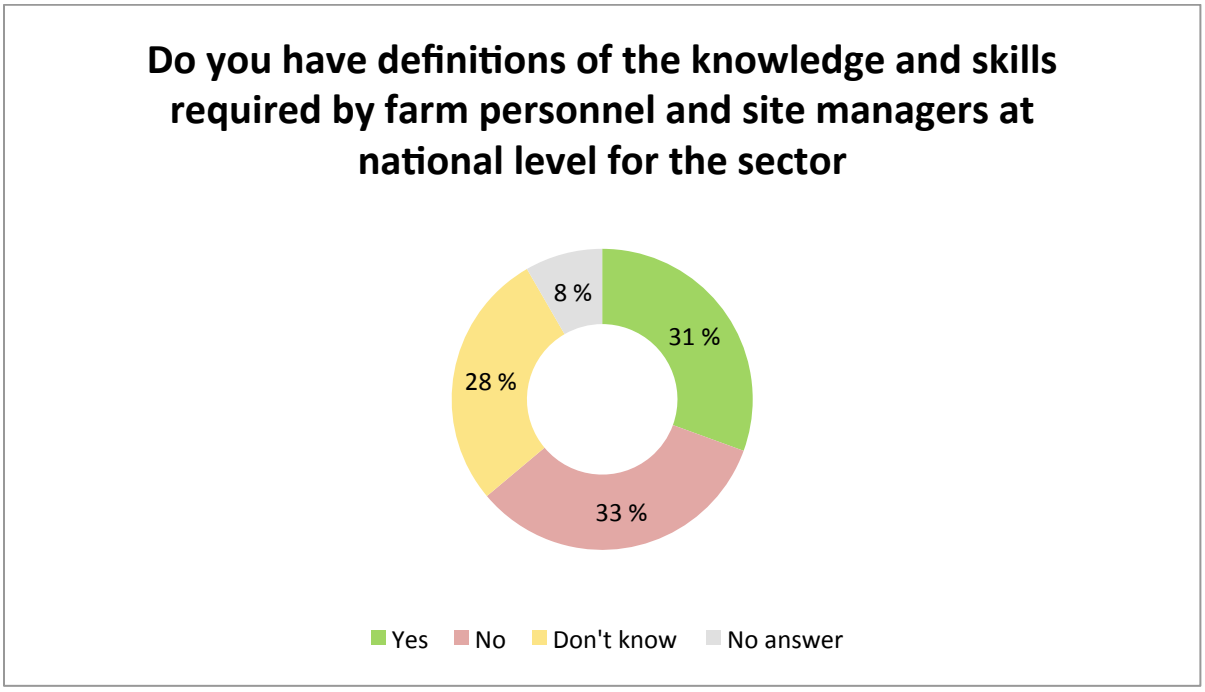

Figure 14: Availability of definitions for knowledge and skills at national level

Only 31% of the participants indicated that national level definitions are available. 36% of the participants do not know or they do not answer.

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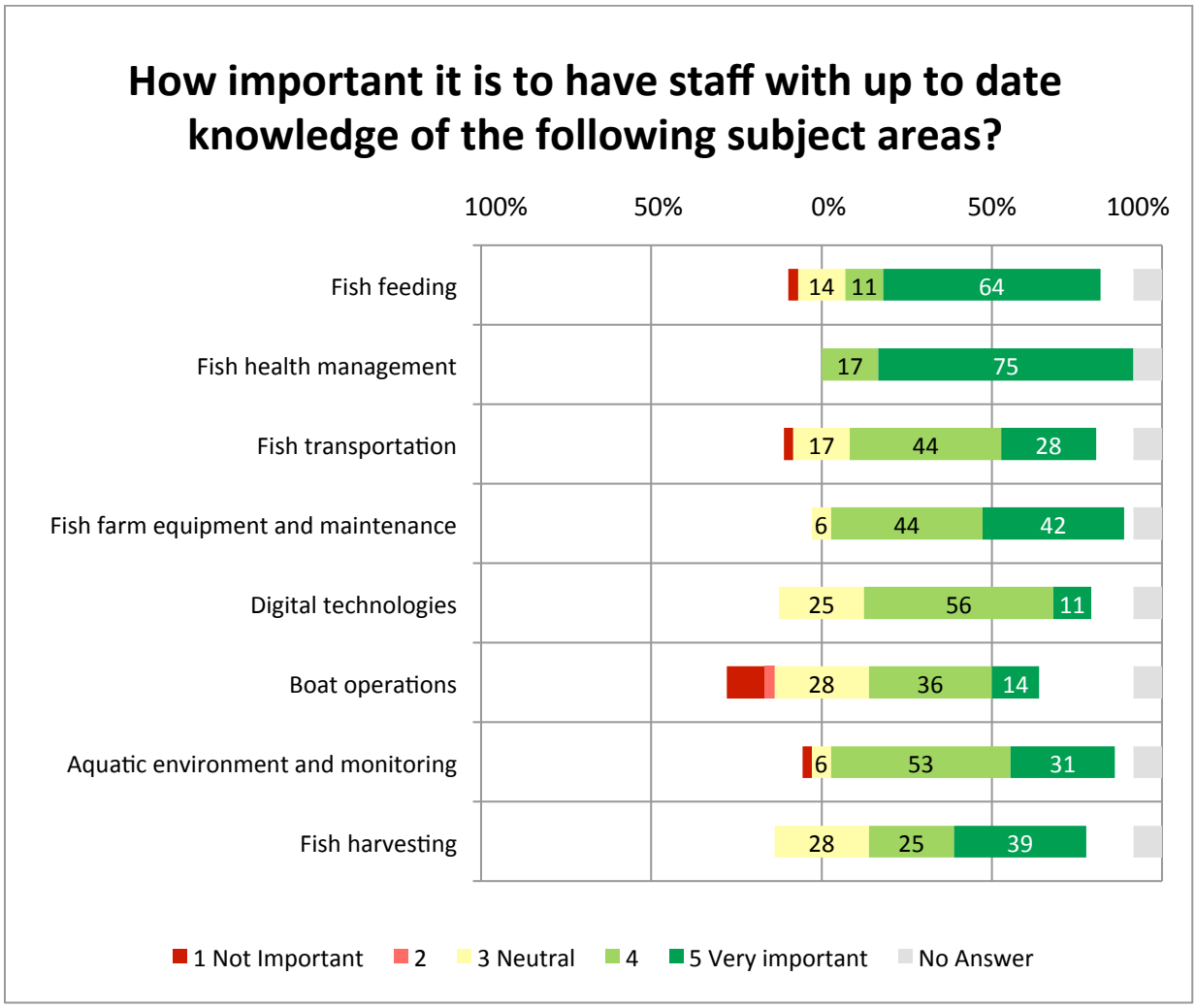

Figure 15: Importance of knowledge areas for staff

Fish health management is overwhelmingly seen as very important knowledge area followed by fish feeding in terms of strong agreement from participants (figure 15).

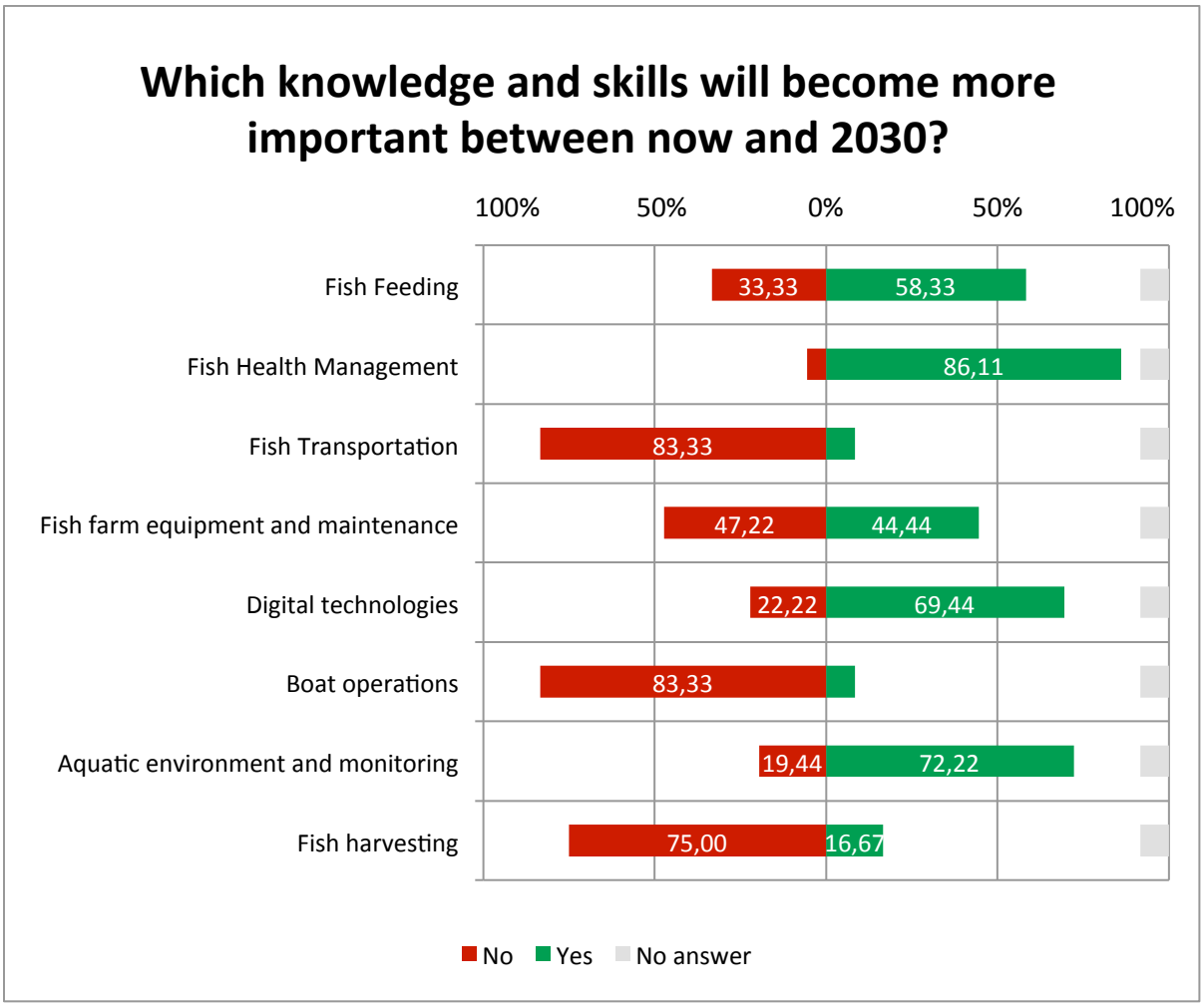

Figure 16: Importance of knowledge areas in the future

The following subject areas will increase in importance in the future according to respondents, including: Fish health management (86%), aquatic environment and monitoring (72%) and digital technologies (over 69%) Conversely, respondents indicated that some subjects will become less important, including: fish transportation (83%), boat operations (83%) and fish harvesting (75%) as illustrated by figure 16.

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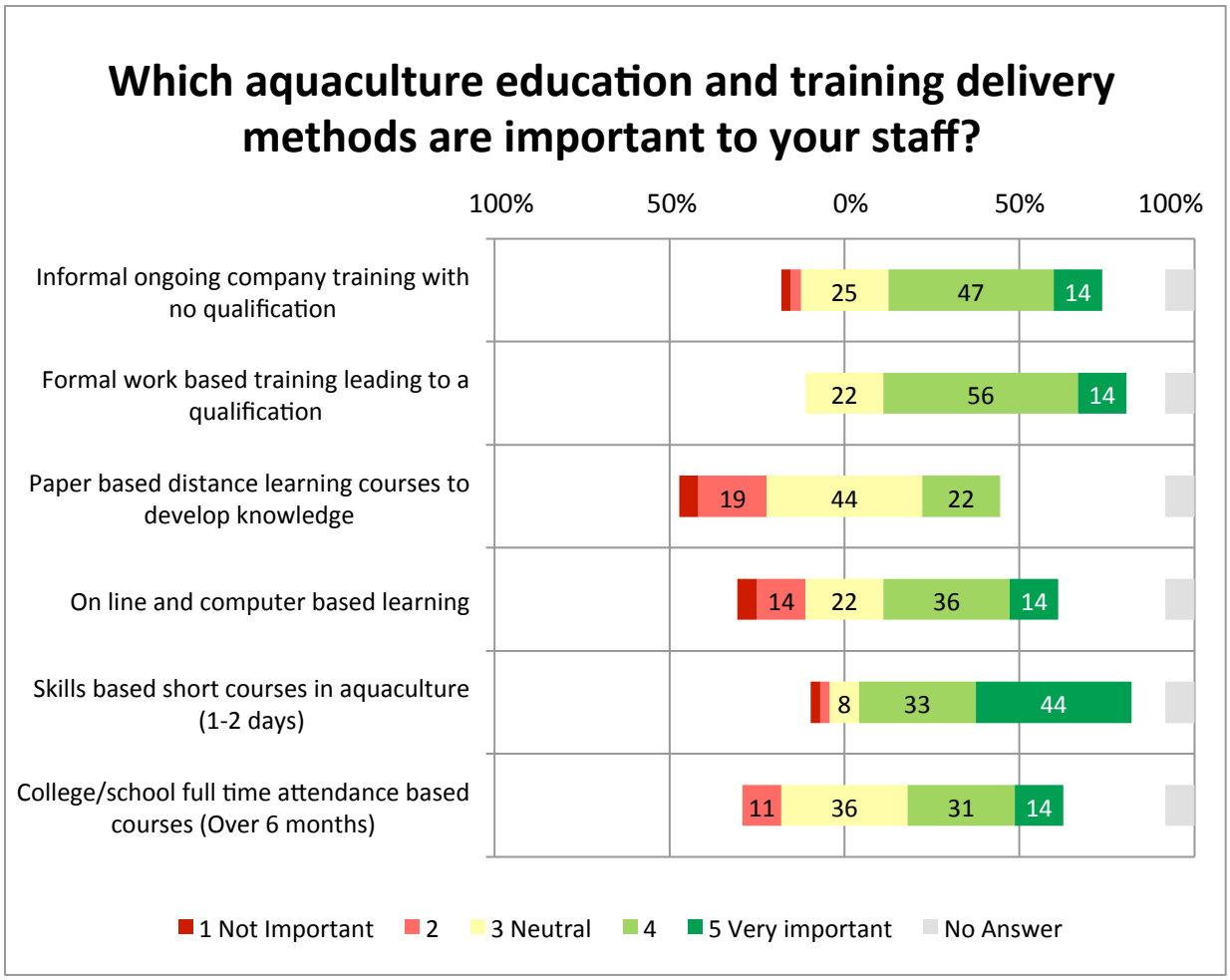

Figure 17: Distributions for education and training delivery methods

Most important education and training delivery method in the view of our respondents is through skills based short courses – 77% consider it important or very important (44% deeming it very important) as illustrated by figure 17. There are 70% of the respondents (including 14% strongly agreeing) that work based training which leads to a qualification has value, whilst 61% (with 14% strongly agreeing) see value in non-formal company training. For online and computer based training there is a high spread in the answers with no clear agreement.

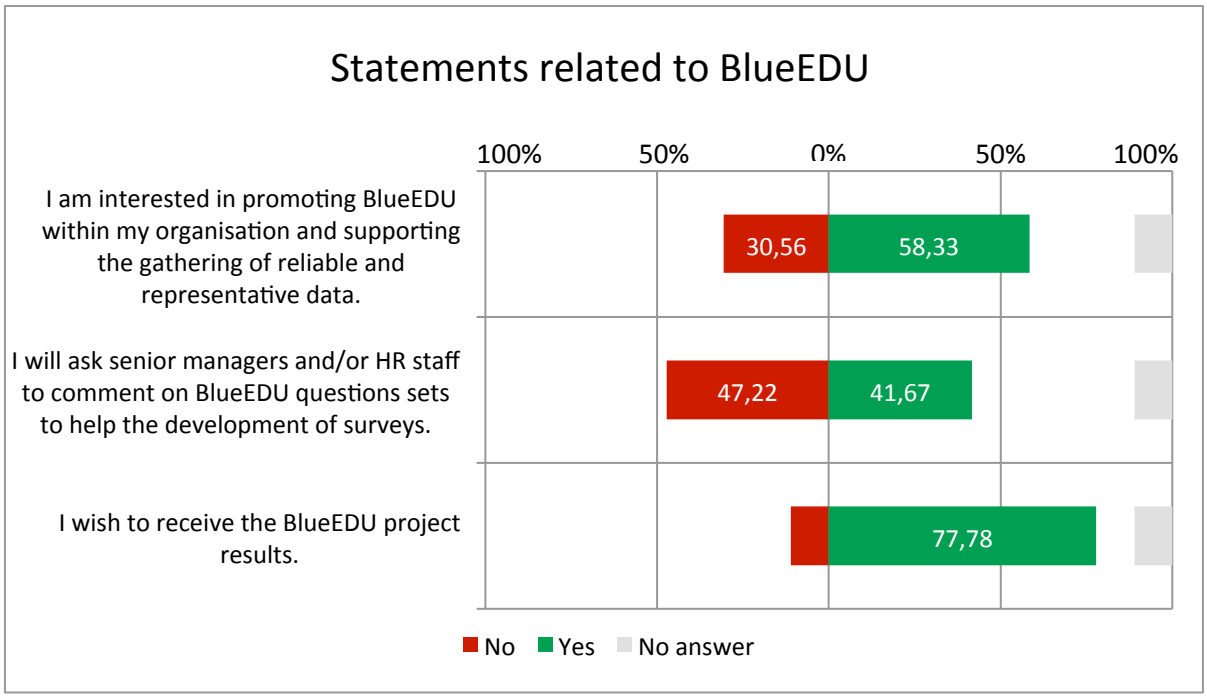

Figure 18: Participants willingness to support the project

There are 58 % of the participants willing to promote the project in their organization while over 77% desire to be kept up to date with project results. This includes 41% of the participants who are willing to actively help in the development of the next surveys by asking relevant staff in their organization to give feedback on the question sets.

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Appendix 2 - Results from Mid Norway Aquaculture Industry Surveys

Group interviews with managers leading 520 staff in the fish farming industry

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Area 2: The Company's Competence Composition

The second area of questioning dealt with the company competence profile and the skills of the workforce.

The set of questions refers to 20 skills and they have been grouped in 8 categories:

2.1. Work quality
2.2. Business orientation
2.3. Proactivity
2.4. Collaboration
2.5. Independence
2.6. Learning
2.7. Digital literacy
2.8. Communication

The managers were required to indicate how important a skill was for employees and managers using the following scale: to a small degree, to some degree, to a large degree, I don't know, not relevant. Figure 19 shows the results aggregated in categories and ordered by the degree of importance.

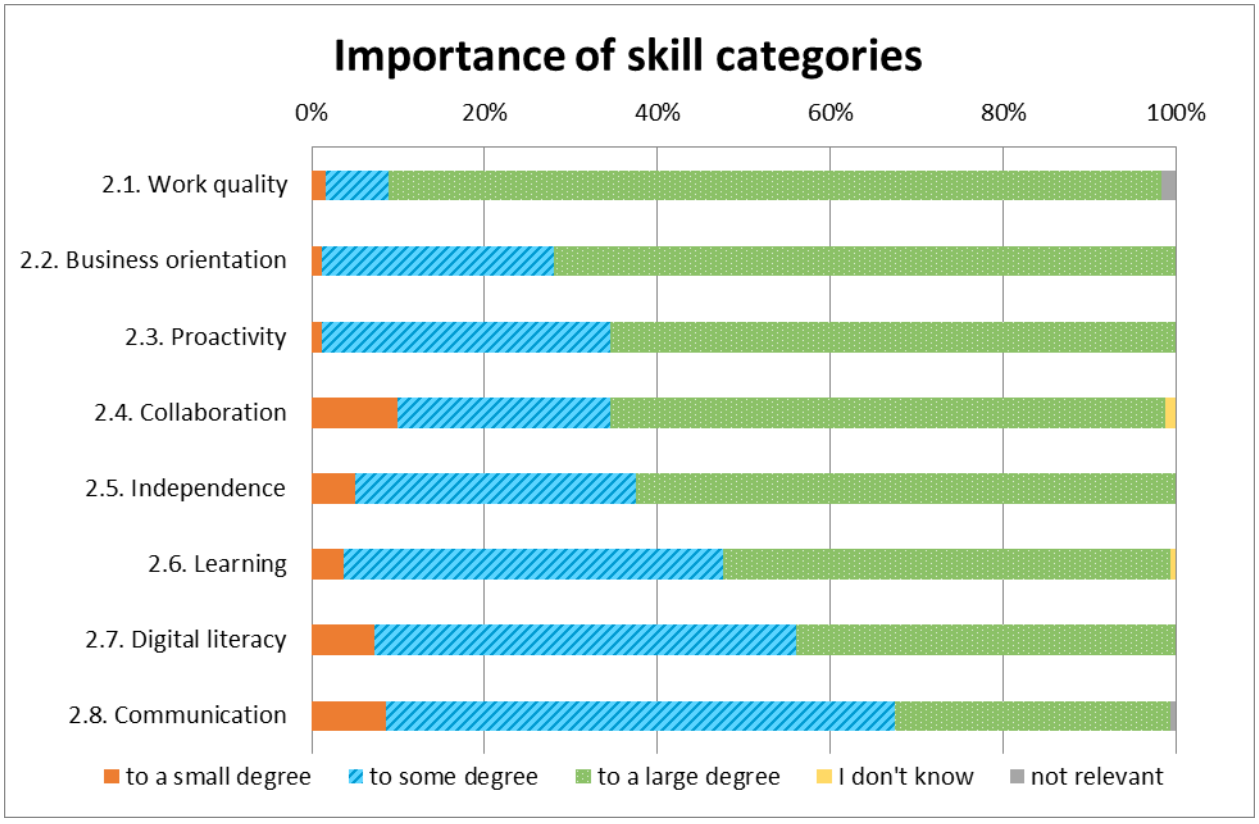

Figure 19: Importance of skill categories

The top most important categories are “work quality” (2.1.) and “business orientation” (2.2.). Almost 90% of the managers consider skills in the “work quality” category very important and over 70% of them consider skills in “business orientation” category to be very important. Over 60 % of the managers consider skills in the categories “proactivity” (2.3.), “collaboration” (2.4.) and “independence” (2.5.) to be important,

These answers indicate that the employees and managers need to be very well prepared and knowledgeable of their craft. Moreover, they need to be able to work both independently and in collaboration with others and they must be able to take initiative and be proactive. The reason is that the fish farming industry is challenged by new problems that must be solved daily.

2.1. Work quality

The “work quality” category included the following statements:

2.1.1. know well the actual craftsmanship
2.1.2. can work safely (avoid accidents)
2.1.3. has professional pride

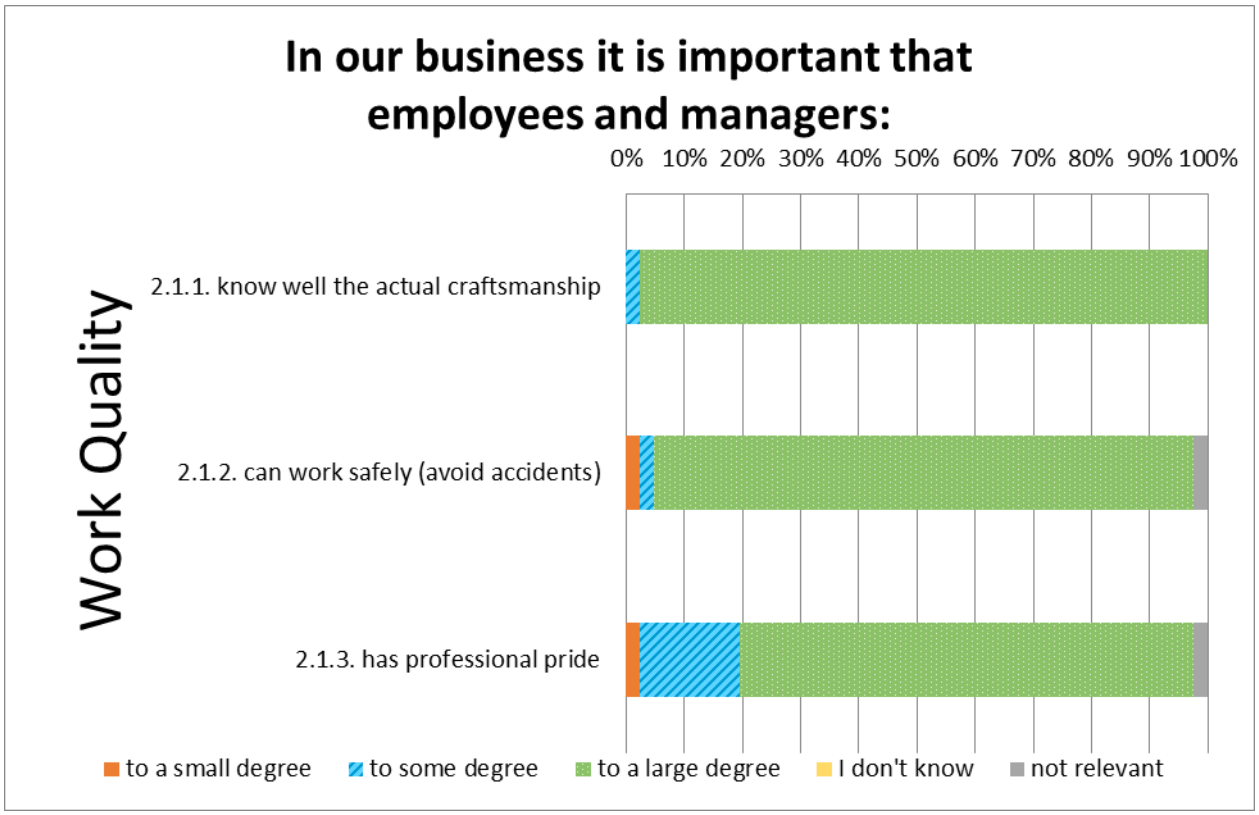

Figure 20: Work quality skills category

The craftsmanship and the safety are considered paramount elements required in the skillset of the workforce. 78% of the managers consider professional pride as an important element.

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The consequence of the results depicted in the first two bars (2.1.1. and 2.1.2.) for vocational education and training (VET) practices, is that a workplace based learning approach should be applied.

If VET is going to target, address and include professional pride, then that must be done by establishing a close partnership between the companies and the VET schools. It will be challenging to just apply VET as a stand-alone tool to target this area.

2.2. Business Orientation

In the "business orientation" category, the following statements were included:

2.2.1. is loyal to the company/organization
2.2.2. have a good understanding of the business beyond his/her own work

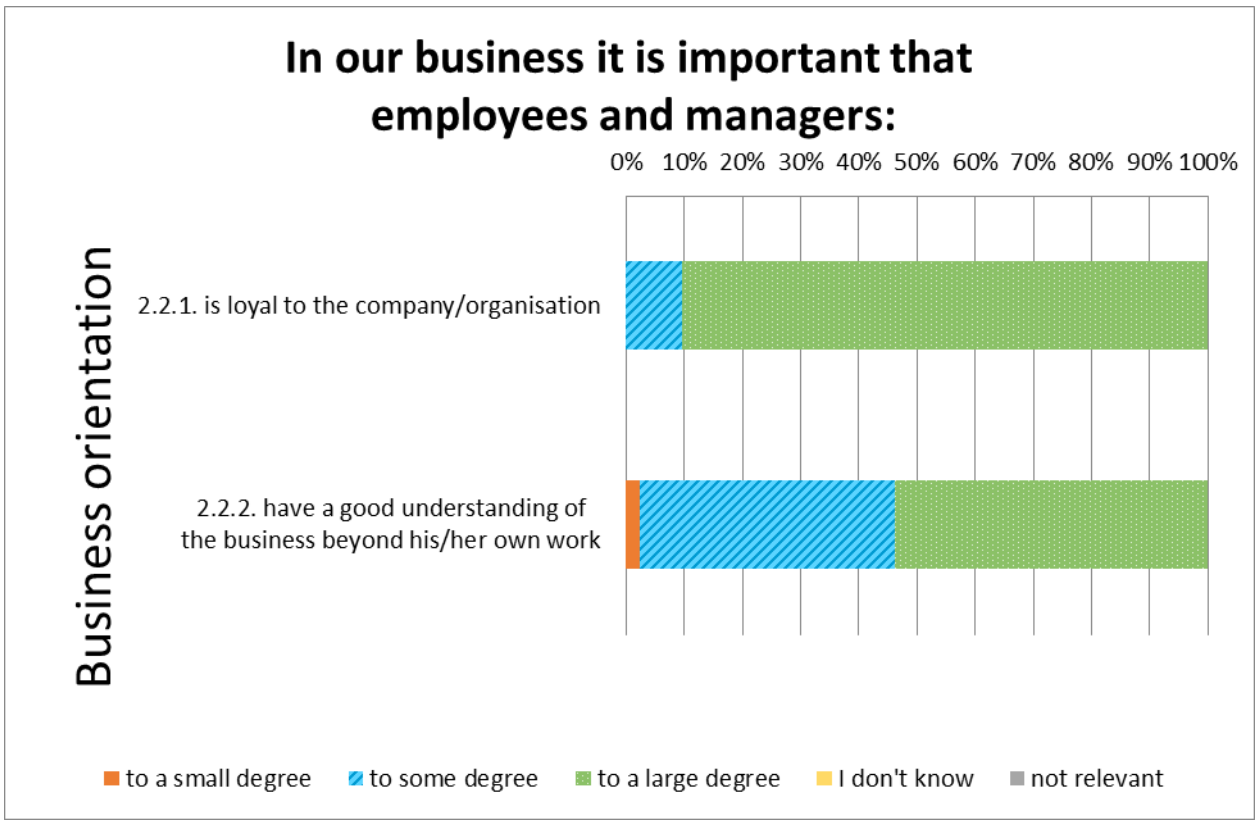

Figure 21: Business orientation skills category

Loyalty towards the organization is considered to be very important by 90% of the managers. Slightly more than half of the managers consider it is very important to have a wider perspective in the understanding of the production in the fish farming company. At the marine cages, staff works in teams. Each person in the team specializes in one or several job activities. However, at the same time each person should know the most important components in the job operations that the colleague is specializing on. In this way, work and job operations may go on if staff is absent from work. A modern VET program may underline and highlight the dependency between different production stages and work operations.

2.3. Proactivity

In the "proactivity" category were included the following statements:

2.3.1. can see what work is needed to be done without asking anyone

2.3.2. can come up with ideas and propose changes

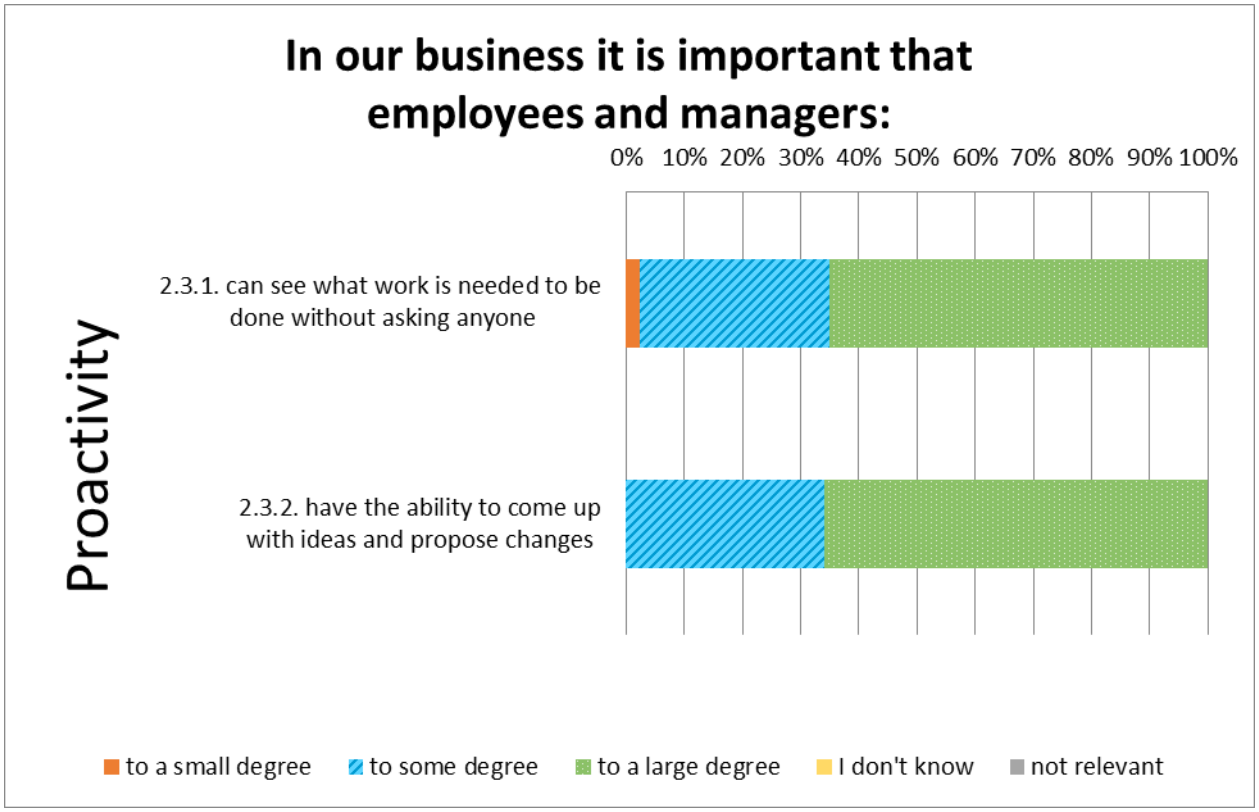

Figure 22: Proactivity skills category

65% of the managers consider that it is very important that the employees can recognize and solve production problems independently, and with a colleague. The same high percentage considers that it is very important to be able to actively contribute with ideas and propose changes intended to improve the situation or solve problems.

Such skills can be trained in targeted courses, but currently they are not part of the Journeyman Certificate in Norway. This will require training from experts outside of the traditional VET system.

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2.4. Collaboration

In the "collaboration" category the following statements were included:

2.4.1. collaborate well with others

2.4.2. can work with colleagues from different countries

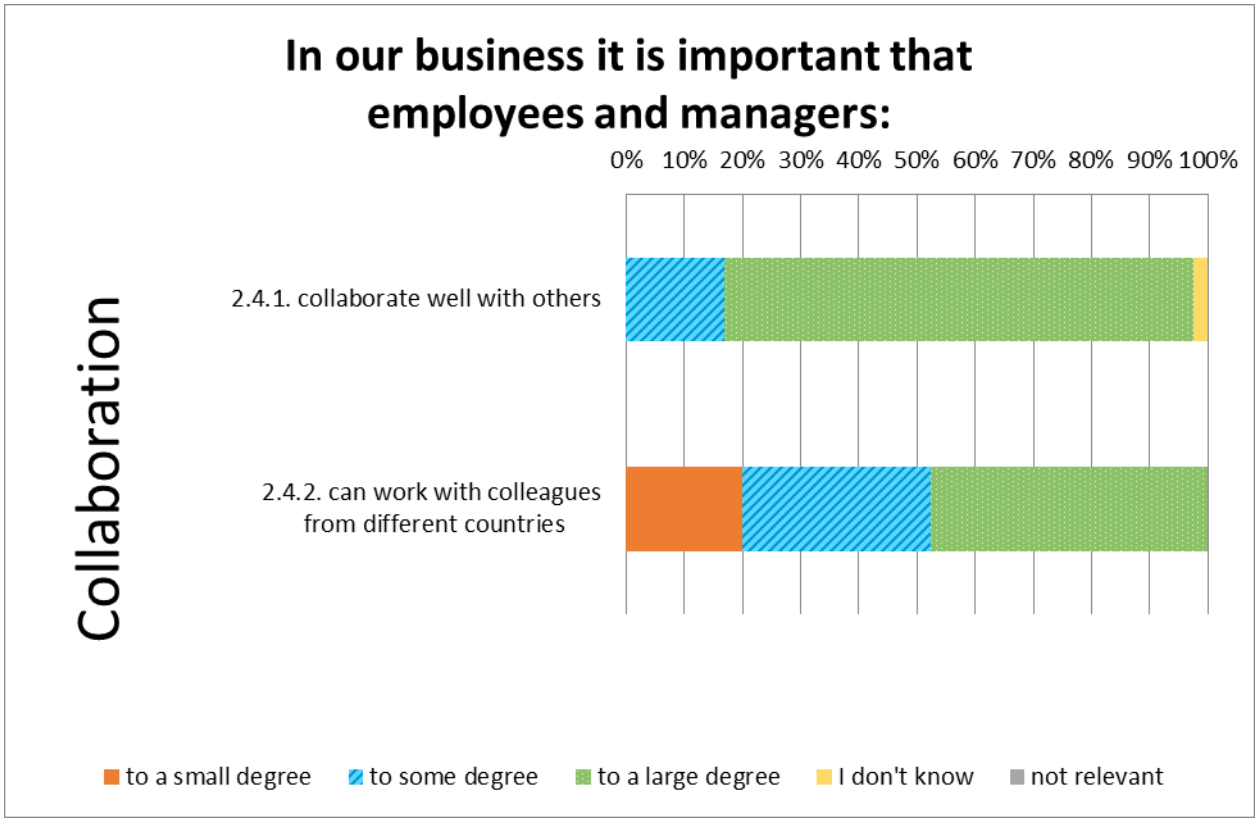

Figure 23: Collaboration skills category

Collaboration is a very important aspect as indicated by 80% of the managers. The second statement in the category referred to collaboration with colleagues from other countries and 80% of the managers considered this to be important (46% very important, 34% some importance). In Norwegian aquaculture the workforce is quite diverse especially in the processing sector, whereby the second statement reflect this fact.

This data shows that VET courses should be organized in such a way that they strengthen collaboration between different productions teams in the same company so as they transfer knowledge between each other. Additionally, this will help building a common understanding of the business and the production processes. Further investigation should consider the usefulness of setting up collaboration activities between companies in the same sector, such that this may support transfer of knowledge and experiences to improve the production.

2.5. Independence

In the "independence" category the following statements were included:

2.5.1. can plan their workday on their own

2.5.2. can coordinate with others

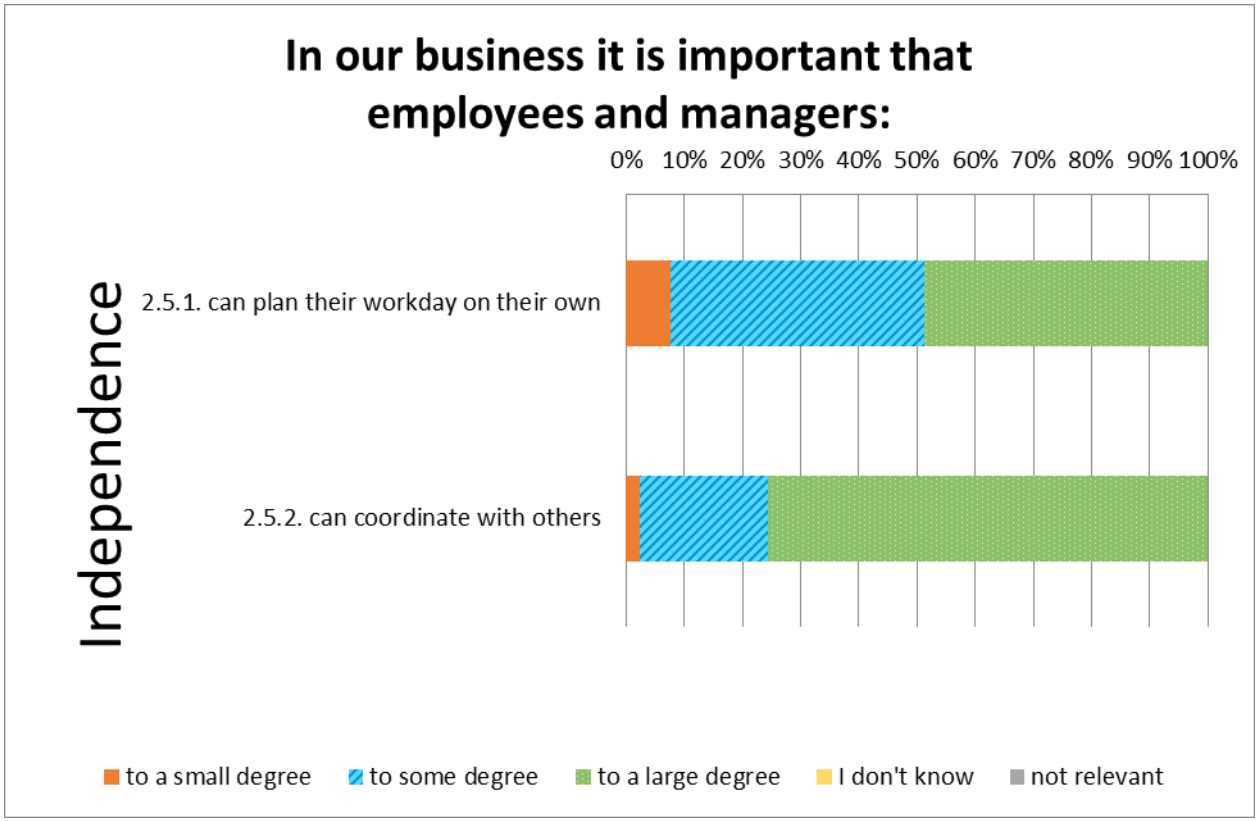

Figure 24: Independence skills category

75% of the managers consider it very important for the employees to coordinate with others in the workplace. Approximately half of the managers consider that it is very important for employees to be able to plan their own workday. The results need further investigation, as there are significant differences between farming and processing work, such as the degree to which they can control their own working schedule?

Planning and coordinating with others are an important part of the journeyman certificate training. The results show that this must be kept and improved in the future VET programs.

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2.6. Learning

In the "learning" category the following statements were included:

2.6.1. have an interest for learning and self-development
2.6.2. have the ability to contribute to changes and innovation work
2.6.3. have interest to teach others
2.6.4. can read and understand advanced instructions and manuals

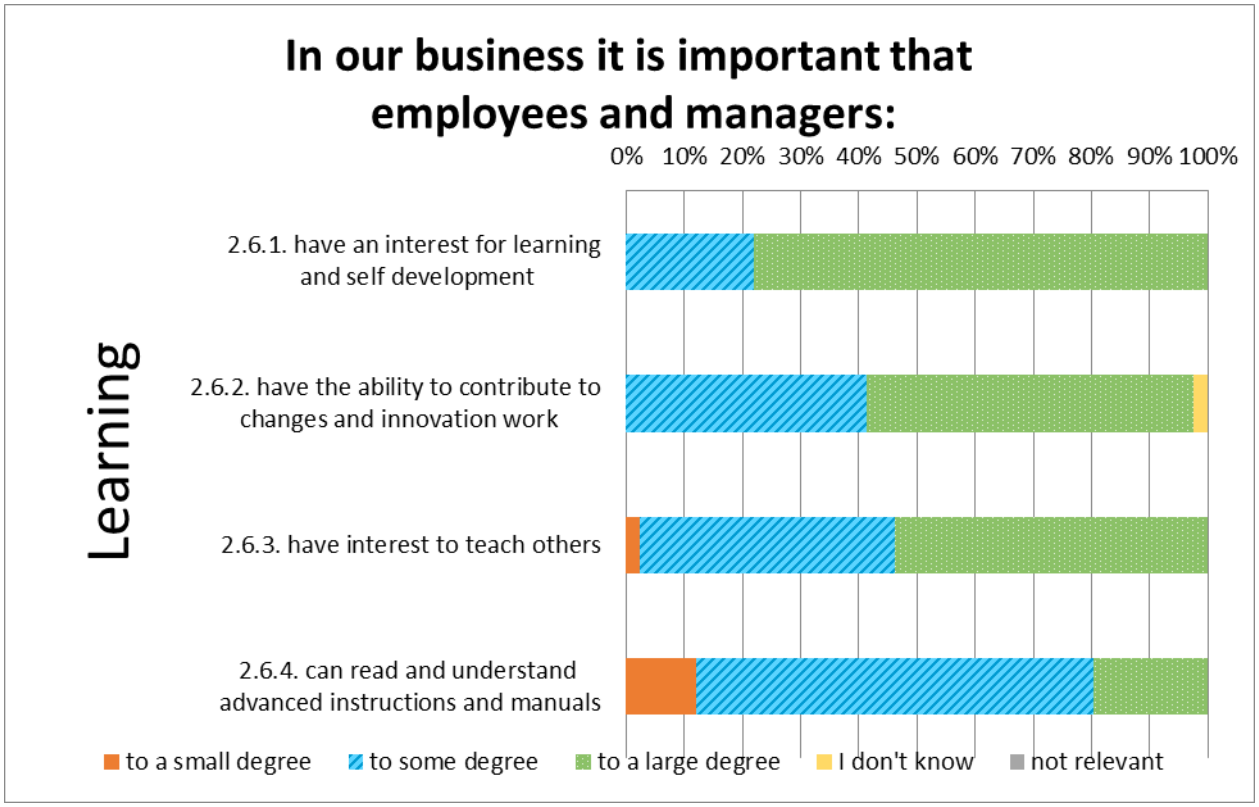

Figure 25: Learning skills category

The aquaculture industry is a fast developing due to technological innovations. Employees need to be motivated to continuous update their knowledge and skills. 78% of the managers consider as very important that employees have an interest in learning and self-development. Over half of them also consider very important that employees have an interest in supervision and teaching other staff.

The first bar (2.6.1.) shows that the stuff must be able to follow up and specialize in various new working areas, for instance boat operations, ICT or treatment of cleaner fish etc. A modern VET system should be able to provide a wide aquaculture education, stimulating industry to afterwards offer specialist training through specialized VET courses thus supporting staff self-development and the continuous learning of new skills.

The information in the bars (2.6.2 and 2.6.3) may affect the methods that are applied in a modern VET system. By including relevant tasks and activities, they may support and enhance application of work operations that are related to innovation process as well as group work related activities where

experienced staff helps teaching the less experienced staff. Such training must be developed together with the companies involved.

2.7. Digital Literacy

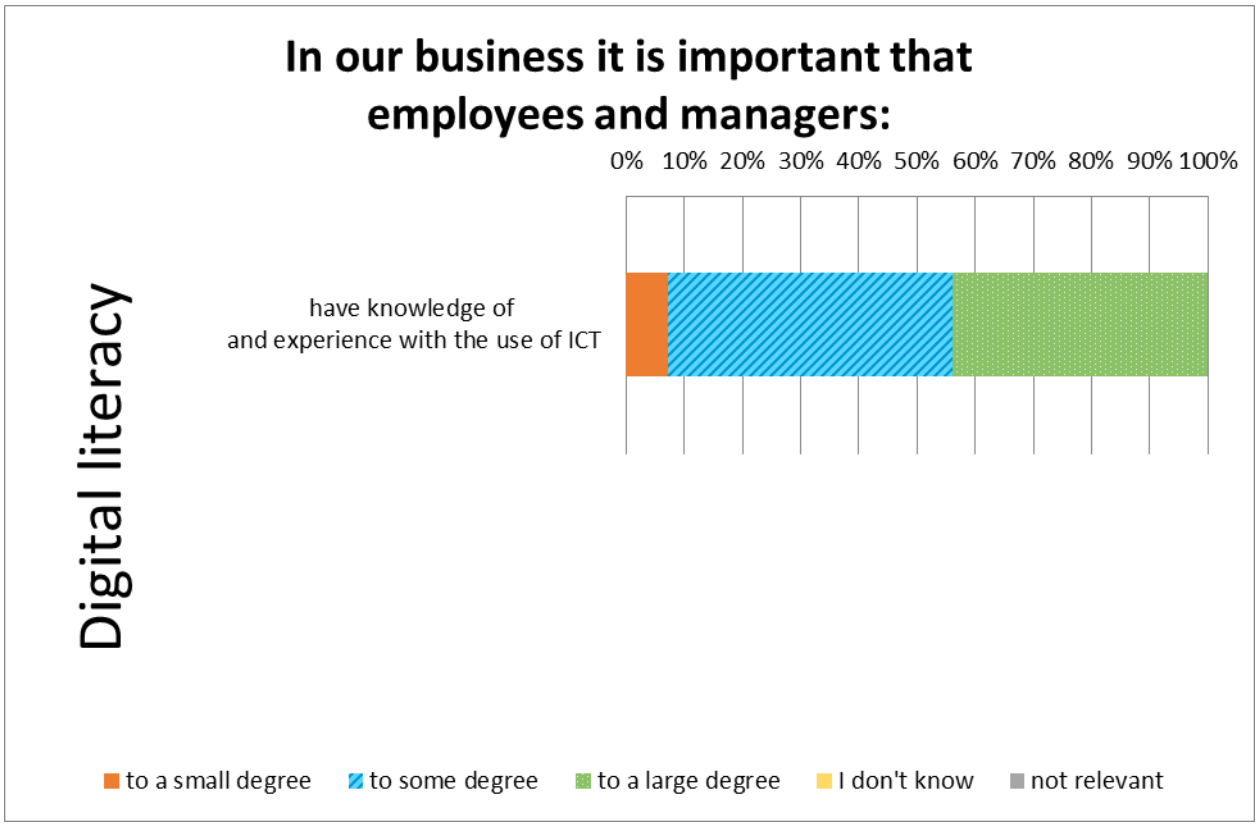

Figure 26: Digital literacy skills

44% of the managers consider as very important to have knowledge of and experience with the use of ICT. 49% of the managers consider this to be important to some degree.

These results show that improved ICT skills are not among the highest priorities within the aquaculture industry. They show that it is enough for the fish farming industry to have access to a limited number of staff that has the required ICT competences and skills. Such knowledge may probable be offered through specialist courses.

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2.8. Communication

In the "learning" category was included the following statements:

2.8.1. takes frequent contact with their immediate leader
2.8.2. are good at communicating orally
2.8.3. are good at communicating in writing
2.8.4. can communicate in several languages

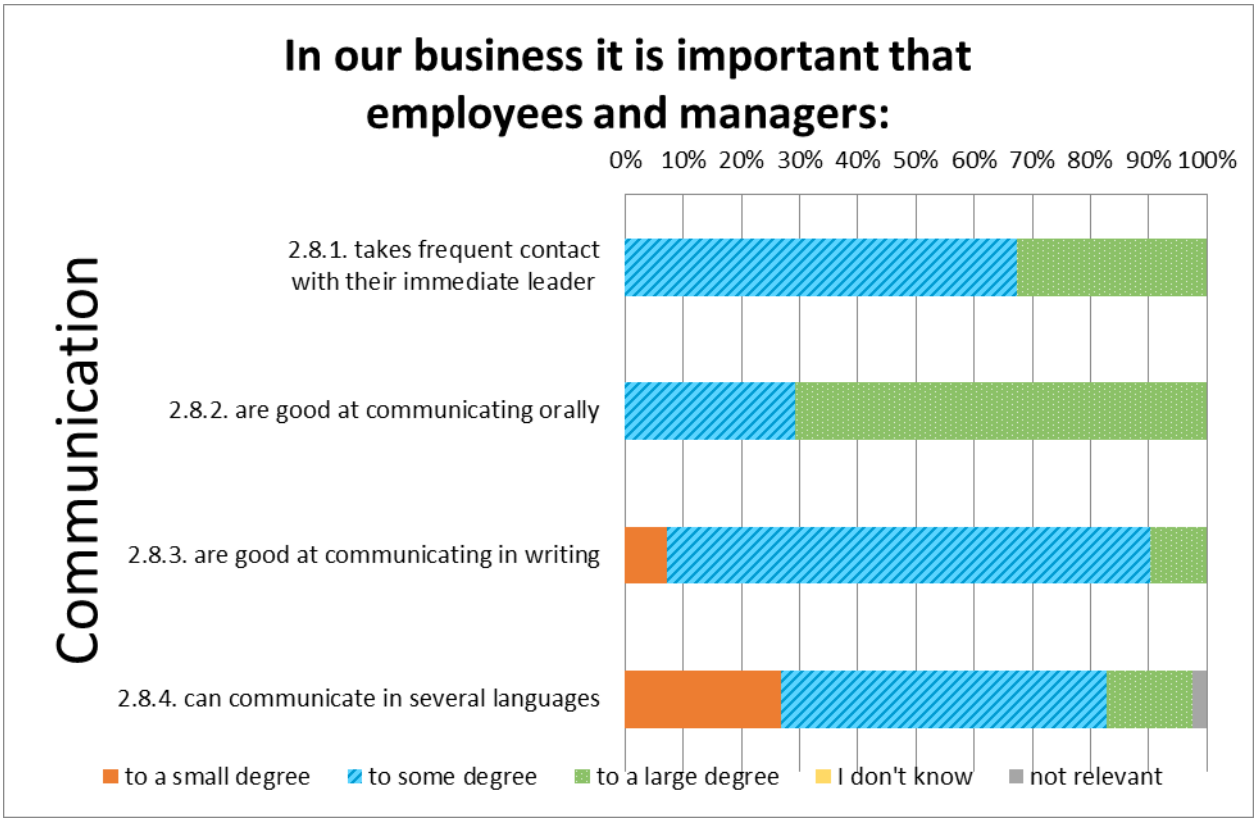

Figure 27: Communication skills category

The results show that oral communication is significantly more important than written communication. 70% of the managers consider oral communication to very important within the fish farming industry, while only 10% consider written communication as very important.

Frequent contact with their leader is considered to be very important by over 30% of the managers, a result that is also reflected in the accent put on the independence and proactivity.

The results indicate that the industry considers that the oral communication is more important than the written communication. However, in the VET school system in Norway writing is considered important. For instance, at the theoretical journeyman certificate exam, the students often need to develop a written production plan. Thus, this is an indication of a gap between what the VET school system considers to be important and what the fish farming industry highlights as important.

In the geographical area of Mid-Norway there are a lot of labor immigrants, which speak between 30-40 different languages. Despite of this the industry expects that the working language should be Norwegian, whereby they expect that it is not necessary to communicate in any other foreign language. However, is this realistic to achieve within a modern VET course where many people might need to communicate in what for them is a foreign language?

In the current system it is required to complete the journeyman certificate exam in Norwegian. Therefore, to achieve this the candidates must master the Norwegian language quite well at a working level.

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Area 3: The company's recruitment needs

This chapter offers data related to the recruitment needs in the fish farming companies in Mid-Norway, and many factors in society that influence the recruitment processes of new staff. Although not directly linked to how to organize aquaculture VET courses, this data helps to identify key challenges for rural areas in the coastal zone. It does however illustrate the typical challenges that coastal rural areas face, helping us to better understand why it is important to deliver improved aquaculture VET courses to unqualified aquaculture employees.

Aquaculture company's short-term recruitment needs and reasons for refusal of job offers, are targeted in the first question:

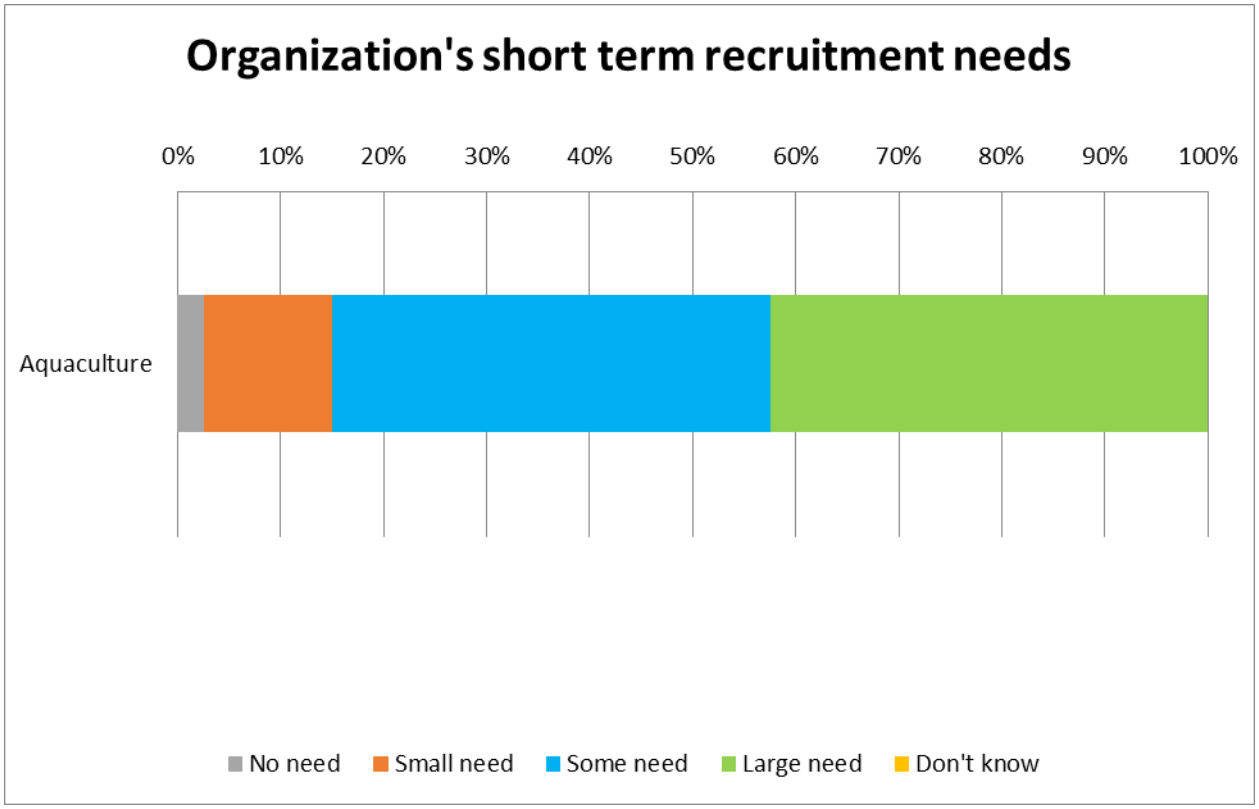

Figure 28: Short term recruitment needs

42.5% of the managers indicate that on short term their organization has a large need to recruit more people and another 42.5% have some need to recruit more people.

These results show that there is a significant shortage of workforce within the aquaculture industry today. This is a consequence of the fast expansion in the aquaculture industry during the recent years, whereby it has been necessary to recruit many more people to work in the fish-farming sector. Thus, VET activities as for example short specialist courses, must be offered more frequent compared to some years ago. Indeed, capacity building must support modern aquaculture VET programs to catch up and provide aquaculture qualifications to those who lack them.

3.1. Reasons to refuse job offers

The next statements aimed at investigating which are the reasons the companies' job offers are refused. The reasons have been categorized as follows:

3.1.1. Competition with other companies
3.1.2. Local job market
3.1.3. Education and training
3.1.4. Society related issues

3.1.1. Competition with other companies

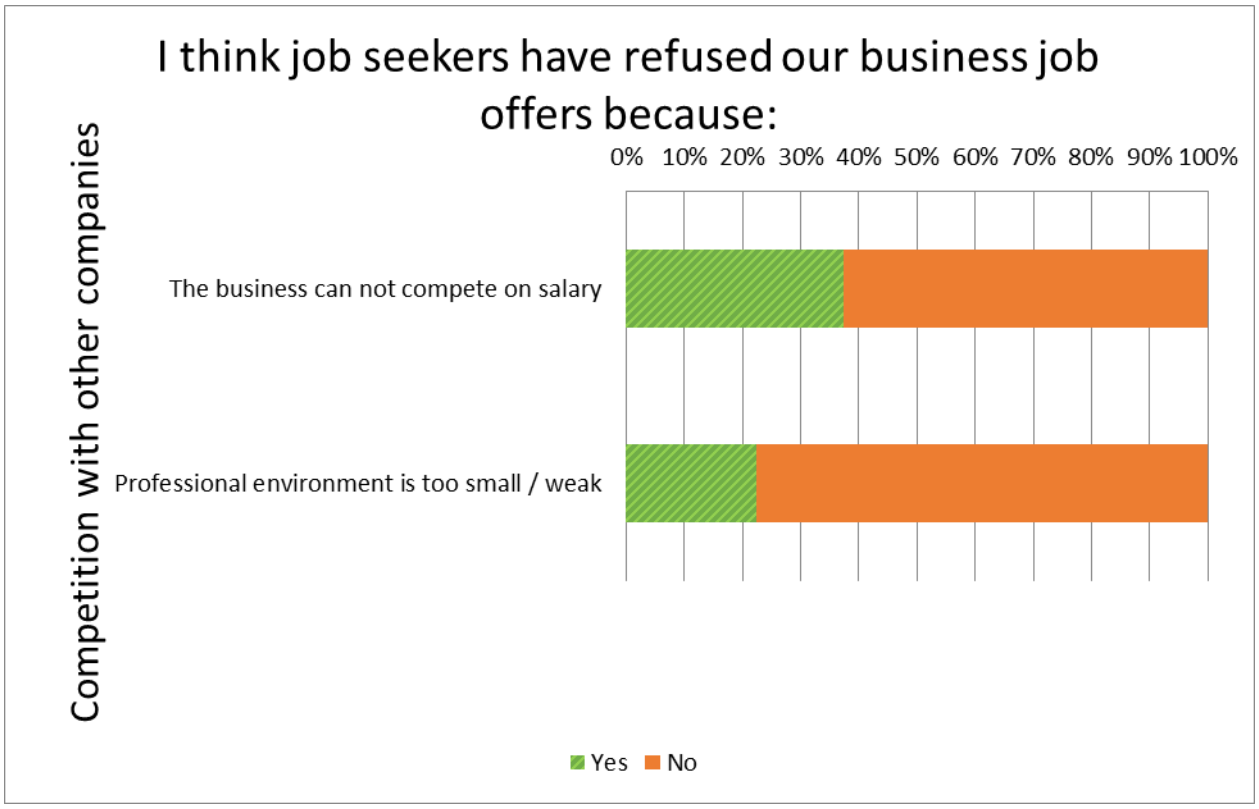

Figure 29: Job offer refusal – competition with other companies

A third of the managers have indicated lack of competitiveness with regards to salary as a reason to refuse job offers. One out of five indicate that the professional environment is too small or week as a reason.

Many of the managers work in the largest, global, fish farming companies established in Norway. The lack of competitiveness with regards to the level of salary needs to be further investigated, since the salaries for those working at the marine cages are high in these companies. For the processing part of

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the largest companies, the recruitment methods vary a lot. One of the companies recruits new staff by themselves, while the others use specialized recruitment companies.

3.1.2. Local job market

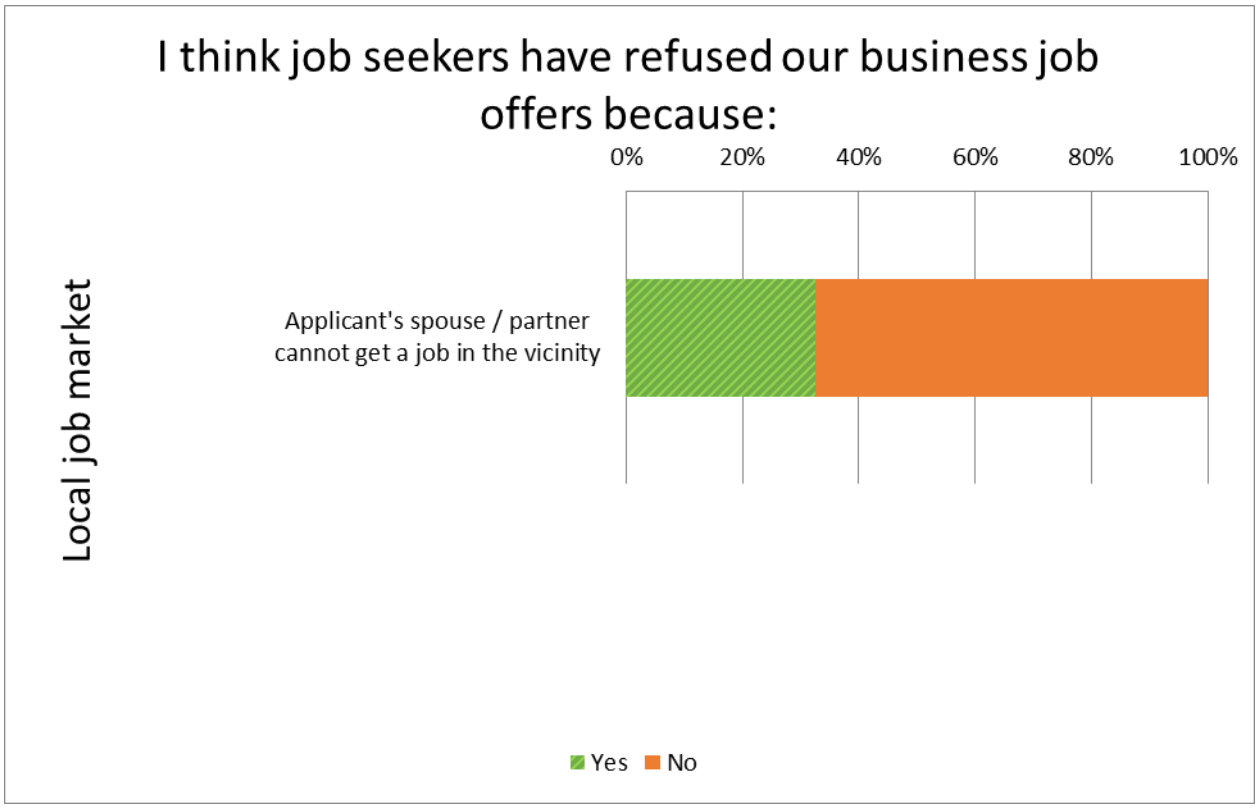

Figure 30: Job offer refusal – local job market

The aquaculture industry related production and processing operations take place in rural areas that are in the coastal zone. A quarter of the managers mention the lack of job opportunities for spouse or partner as a reason to refuse the job offers in the aquaculture sector. The fish farming industry dominates in these rural areas and there are limited opportunities to get jobs in other sectors, e.g. the public administration in the municipalities.

Aquaculture VET courses cannot offer solutions to this challenge. It is, however, important to remember that aquaculture VET courses may strengthen the economy in the existing VET schools. Then these schools may get an opportunity to offer other types of VET programs in other areas. Thus, if the fish farming companies support the existing VET schools through aquaculture VET training, this may indirectly strengthen the capacity to offer VET training to other target groups that may want to work and live in the rural areas. Typical examples are education of health care workers, or people working with business administration.

3.1.3. Education and training

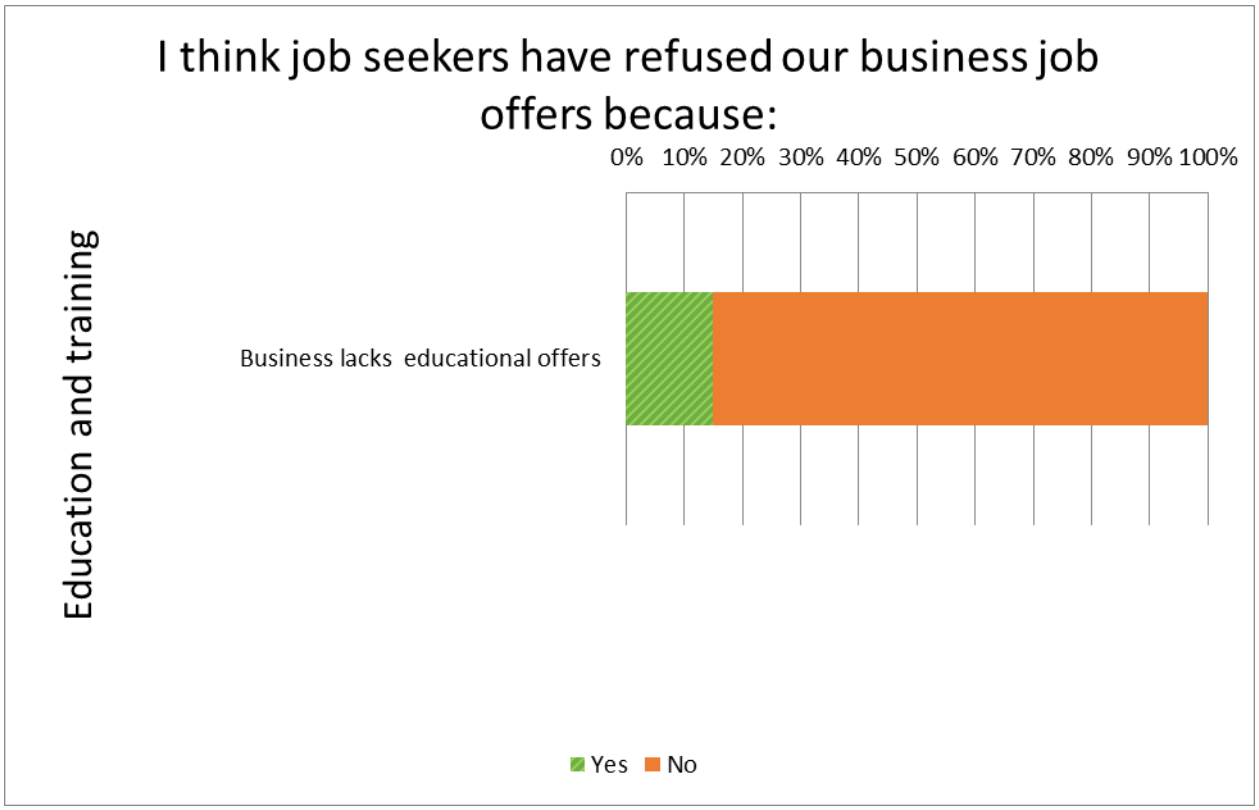

Figure 31: Job offer refusal due to lack of education and training

Approximately 15% of the managers' report that lack of educational offers within the company as a potential reason for refusing a job offer.

Our data shows that lack of access to aquaculture VET courses is perceived by the fish farming companies to be a relatively unimportant challenge. In 2014, a study made by SINTEF[5], showed that every second person in a Norwegian fish farming company lacked qualifications (Reference 1). In addition, SINTEF documented that skills based up on own work experiences were still supposed to be important during the next upcoming years in the fish farming industry. This attitude has not changed during the last three years.

[5] Stiftelsen for industriell og teknisk forskning (The Foundation for Scientific and Industrial Research) – is one of the largest independent research organizations in Europe and it has its main offices located in Trondheim, Norway.

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3.1.4. Society related issues

Figure 32: Job offer refusal – society related issues

36.6% of the managers consider the lack of housing as a reason for job offer refusal and 61% indicate as a reason the poor public transport services.

Fish farming industry cannot resolve these issues. These are complex problems that require involvement and cooperation between municipalities, county as well as private constructions companies.

It is still important to remember that current aquaculture VET practices in Mid-Norway often requires transportation of staff to the VET schools. This is an expensive solution for the companies. There are few or no alternative solutions regarding public transportation due to natural constrains like fjords, mountains, valleys, access to ferries and periods with bad weather. In the future, however, aquaculture VET courses may be more accessible and affordable if modern and flexible VET solutions included some e-learning.

3.2. Retirement

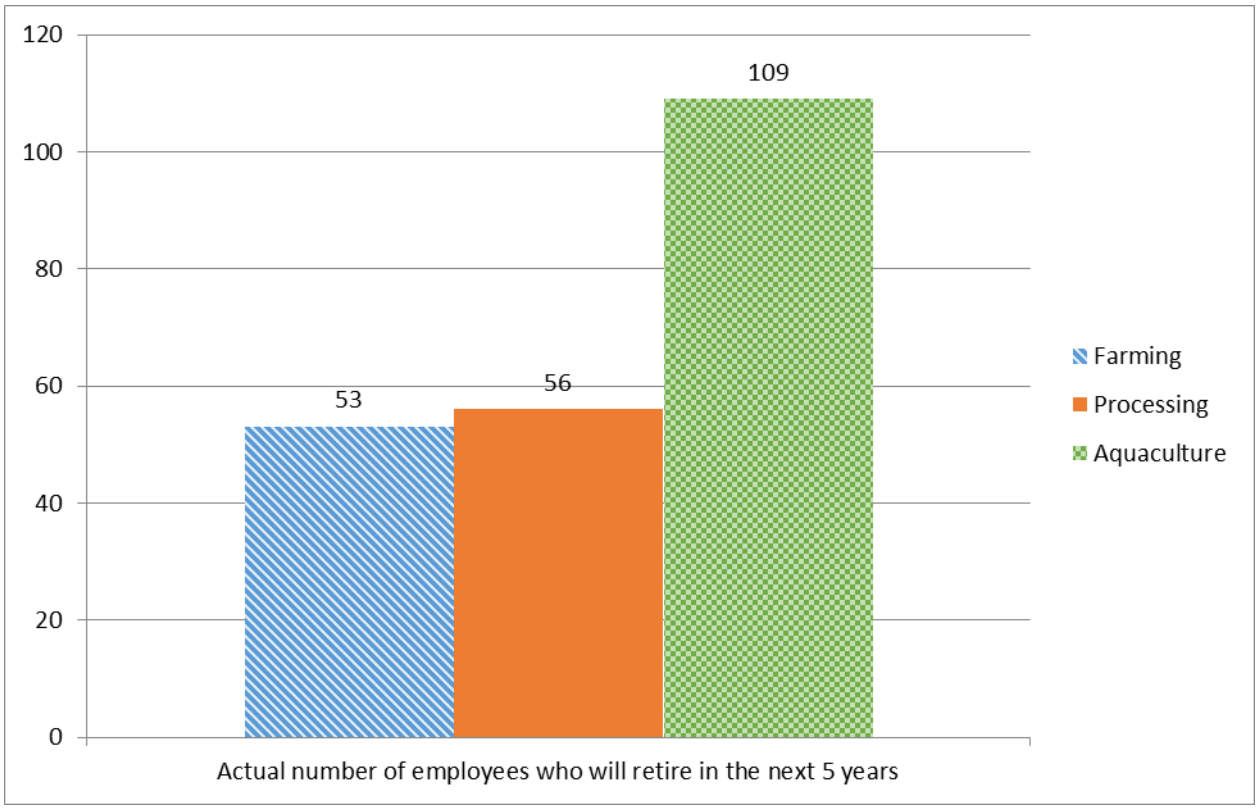

Figure 33: Number of personnel scheduled for retiring in the next 5 years

The Guri Kunna aquaculture VET school at Frøya, Mid-Norway, produces approximately 40 skilled workers per year. During the next 5 years they expect to educate approximately 200 persons with aquaculture qualifications. 27% of those students will be needed just to replace the farming staff that is going to retire (109 persons). The rest of the 144 students will be available on the working market to replace the people leaving due to various reasons (e.g. changing careers) and for the new recruitment positions if the industry is going to keep on growing and expanding. Some of them may also be recruited by the processing industry, though the majority of the processing industry workers are recruited from abroad.

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3.3. Shortage of skilled workforce and potential effects

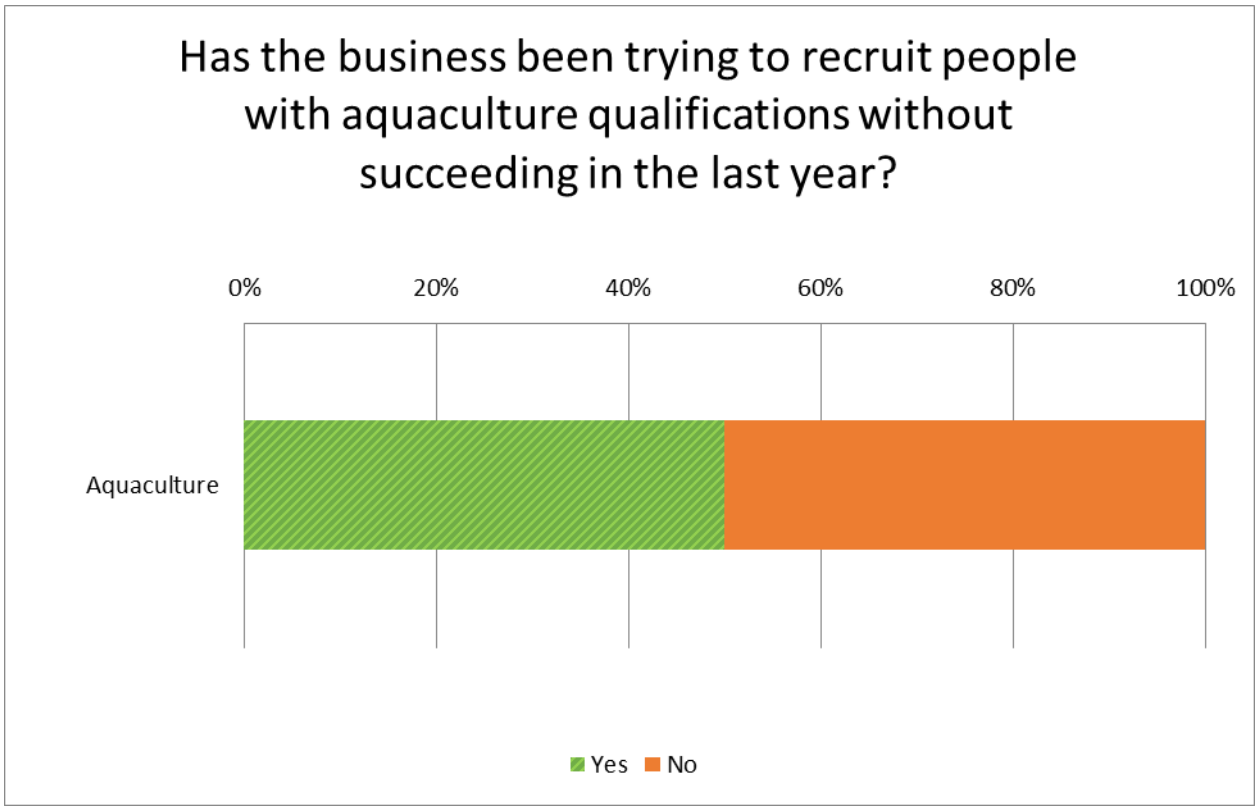

Figure 34: Failed recruitment of people with the desired skills

Half of the managers reported that their company tried without success to recruit people with aquaculture qualifications. The current aquaculture based VET school system is not able to produce the required amount of staff having the appropriate aquaculture qualifications, which today is required by the growing fish farming industry. It takes 4 years to educate a person with appropriate aquaculture qualifications, whereby there will be lag in the public educational system when the industry grows fast. There are also other factors that might influence these, e.g. the number of personnel within industry that have got their aquaculture qualifications, whereby potentially further investigation is needed.

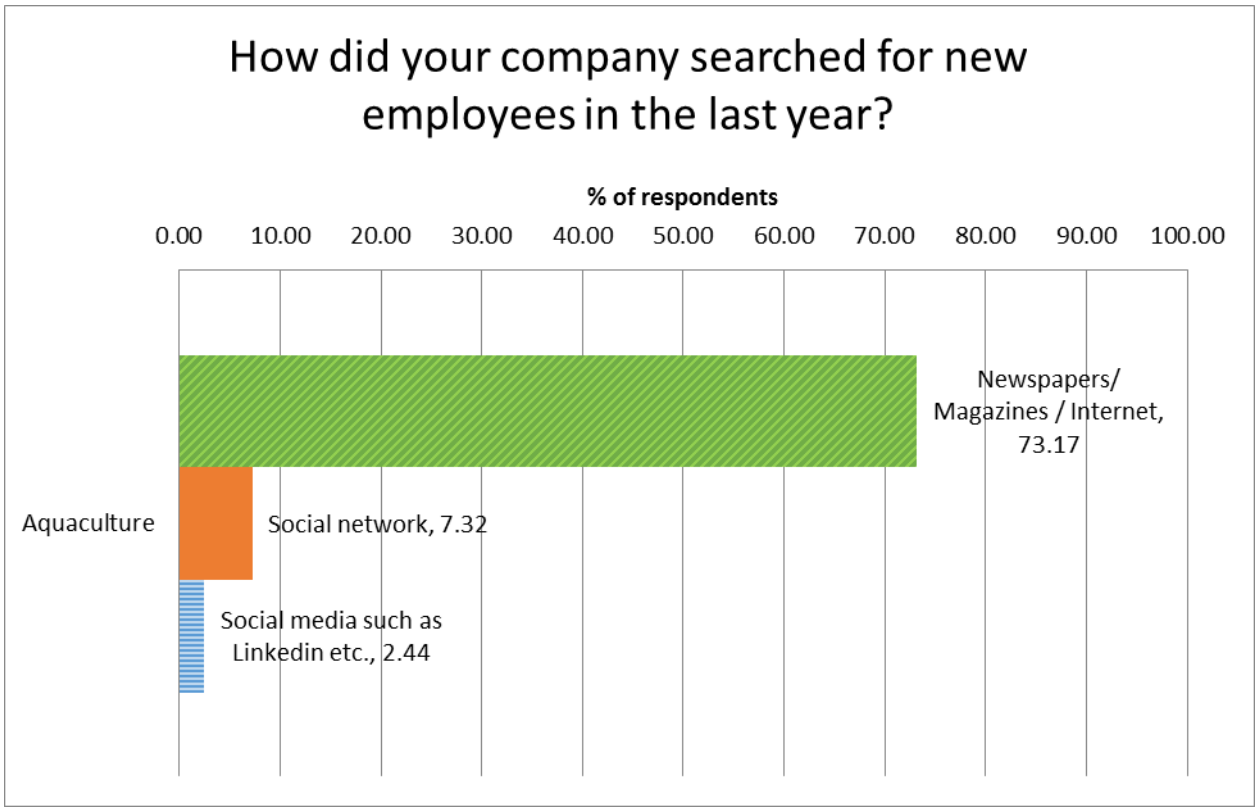

Figure 35: Methods to advertise new job positions

The aquaculture industry applies traditional channels when recruiting new personnel. They apply job advertisements in printed or online media. Only 2.5 % of the managers apply social media, while 7,4% tries to apply social networks.

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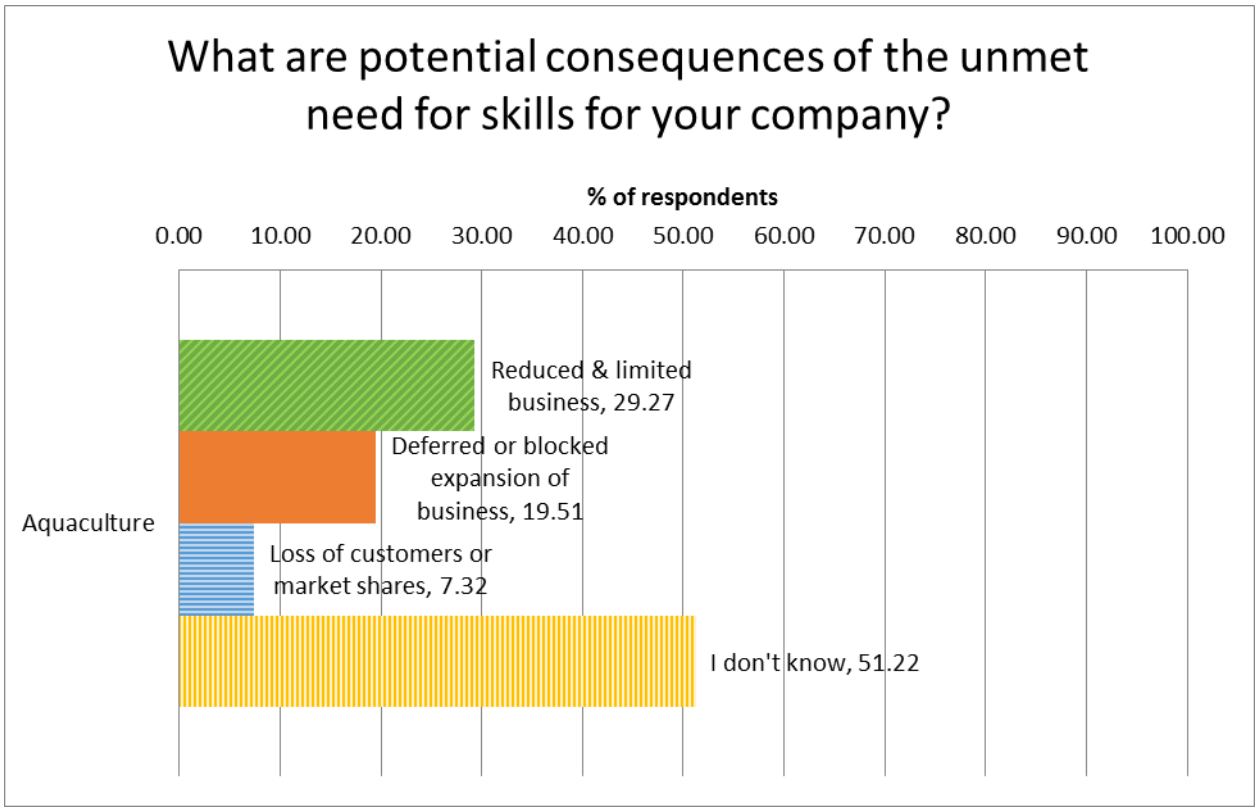

Figure 36: Effects of the shortage of skilled workforce

Over half of the managers abstain from indicating specific effects, as this is a quite complex issue. However, about a third of them indicate that the consequences will be reduced and limited production and processing activities. 1 out of 5 managers replies that the shortage of employees with aquaculture qualifications will hinder or reduce the expansion of the production and processing capacities in their company. Only about 7% indicate that this can lead to loss of customers and/or market shares. Access to a modern aquaculture VET system that may educate personnel from industry, while they are in full job, is needed for the fish farming industry to keep growing. It is a key issue for 20% of the managers to get access to staff with appropriate aquaculture qualifications.

Area 4: The company's future need for new competence

How does the fish farming companies' select their strategy for recruitment of staff that has got recognized aquaculture qualifications?

4.1. Recruitment strategy

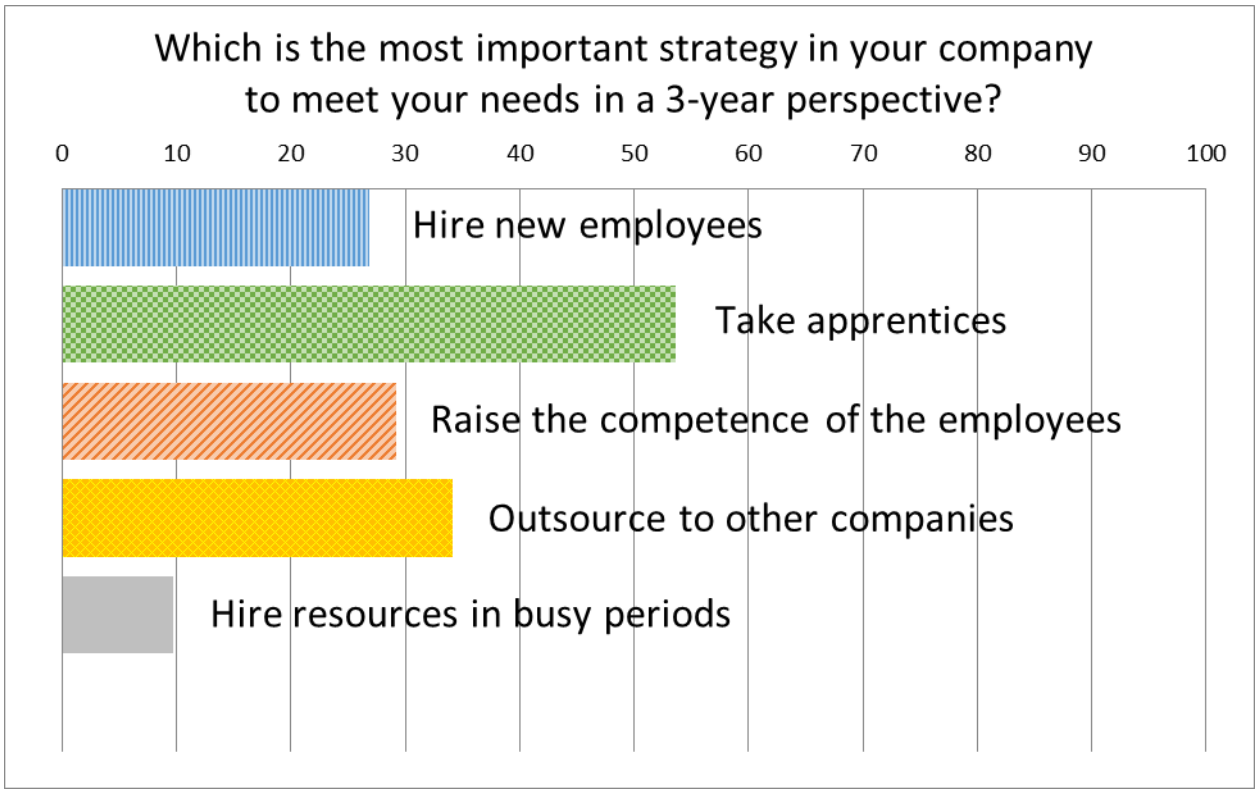

Figure 37: Aquaculture companies' recruitment strategies

Figure 20 displays the recruitment strategies that the fish farming companies apply. The managers' report that 53% of the aquaculture industry applies the apprenticeship system as their most important strategy for recruitment of a workforce that has got their aquaculture qualifications. 1 out of 3 companies (34%) prefer to outsource work operations as their second most important strategy. This is even more important than raising the competence of their employees (29%) such that they get documented aquaculture qualifications, or hiring new employees (27%).

To recruit new staff through the apprenticeship system is an easy and safe operation. It often starts by letting students during their first 2 years at the VET school, get some weeks with practice in the companies. If this works well, the students are offered a contract as apprentice for a period of 2 years. After passing the practical exam, they may start working as for instance husbandry staff.

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Outsourcing is today a well-known strategy within the farming companies, which prefer to specialize on increasing their production of farmed salmon and trout. They apply it on many work operations, whereby it seems to be applicable as their second most important recruitment strategy, when they lack personnel with qualifications.

To raise the competence of their staff through aquaculture VET programs is the third most important strategy for recruitment of personnel with aquaculture qualifications. The importance of this strategy is at the same level as hiring new personnel.

By modernizing the aquaculture VET program there is a potential of raising the importance of the third most important recruitment strategy that is applied today.

4.2. Required Types of Vocational Education and Training

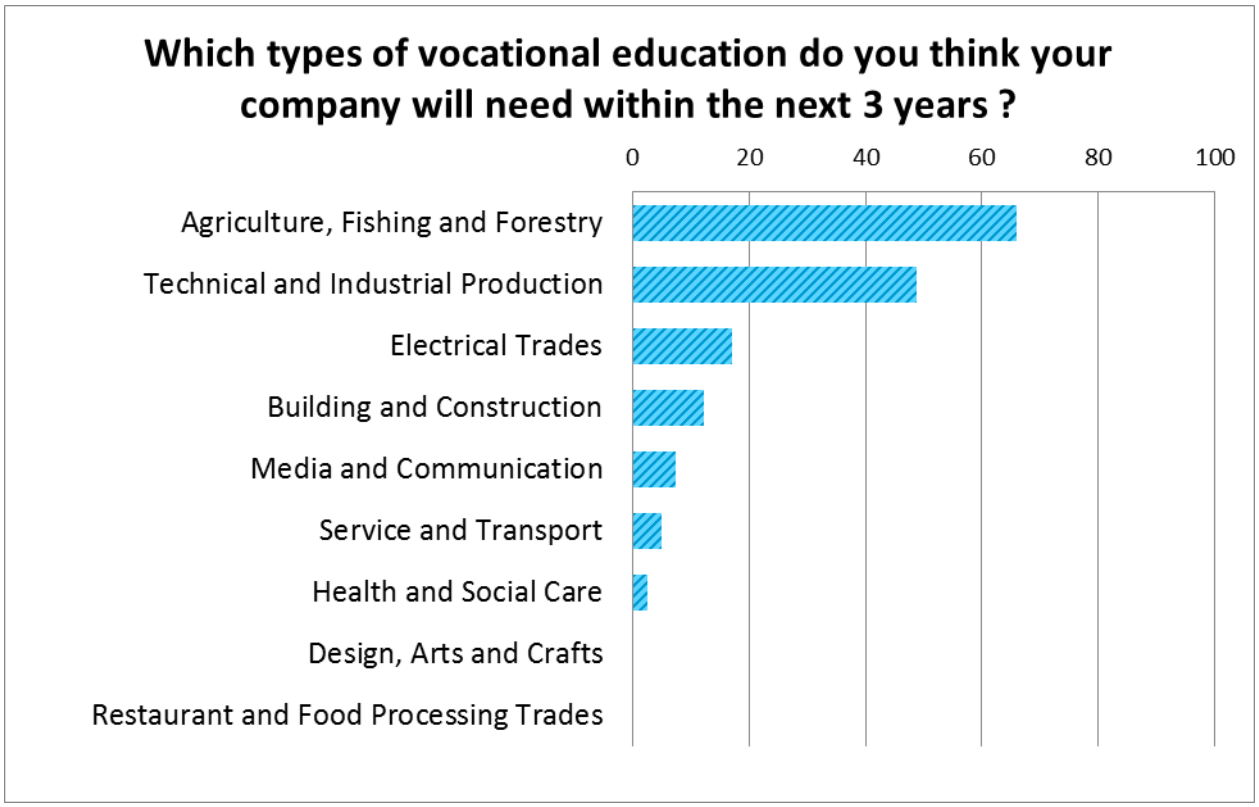

Figure 38: There are 9 VET programs in Norway. The graph shows which competences that aquaculture companies need during the next 3 years measured in percentage.

The two most important types of vocational education and training programs are aquaculture, which is part of the “agriculture, fishing and forestry” program (selected by 66% of the managers), and the “technical and industrial production” program selected by 49% of the managers.

To modernize the methods and tools applied within the aquaculture VET program, will help supporting these recruitment needs.

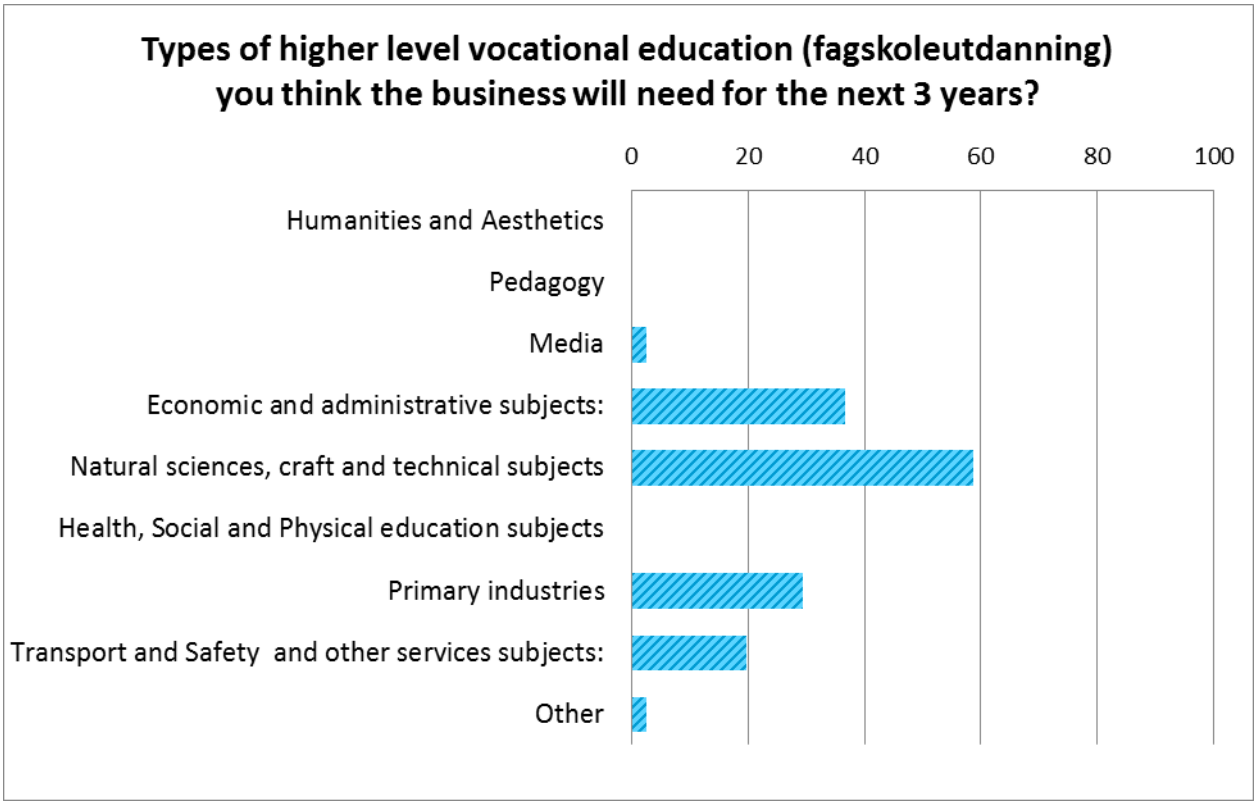

Figure 39: The needed types of higher-level vocational education ("fagskoleutdanning" in Norwegian) measured in percentage

"Fagskoleutdanning" is a level between the traditional VET programs and university education. Higher-level vocational education is requested by the aquaculture industry in 4 main areas: craft and technical knowledge, economy and administration, primary industries and transport and safety. These skills are not directly linked to aquaculture knowledge and skills. These types of personnel will typically offer supporting activities during the production and processing working activities.

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4.3. Types of training activities

4.3.1. Short Term Training

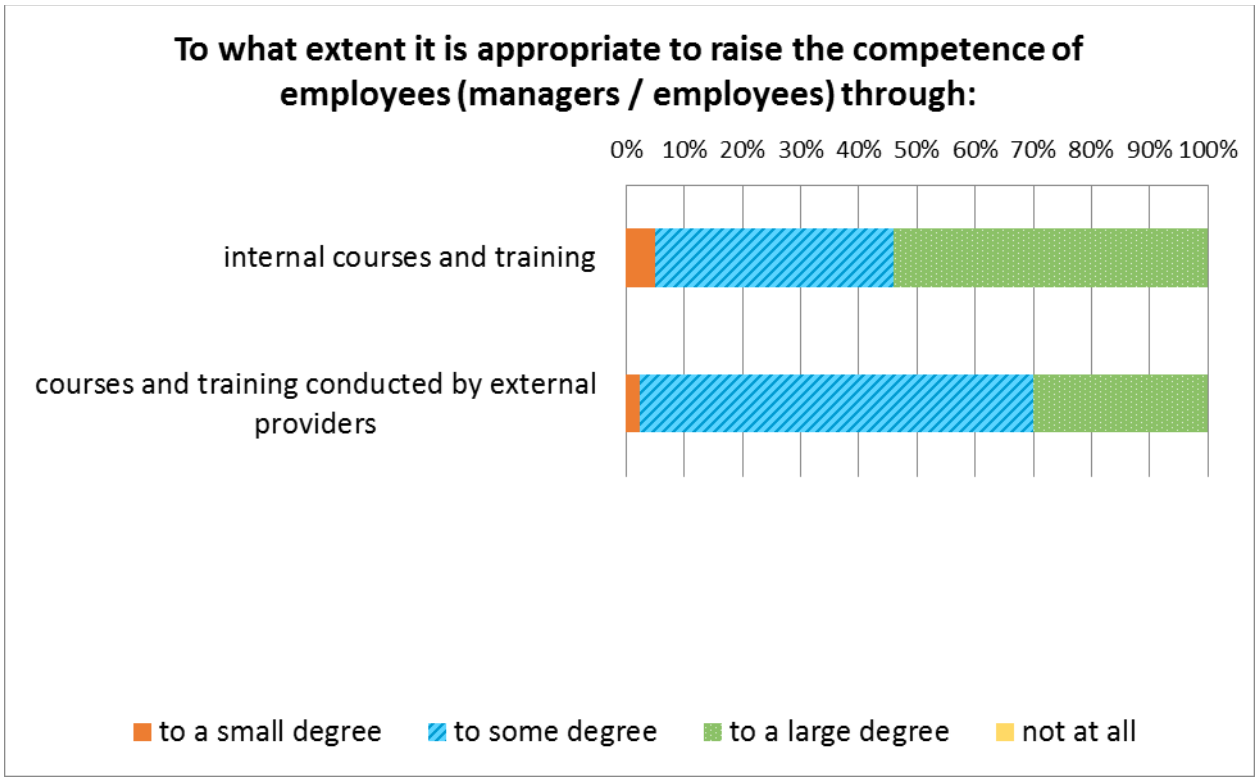

Figure 40: Needs for short term training activities

Short courses must often be provided based up on a legislation process. One or several of the 3 directorates that are regulating bodies in Norway, have regulated the fish farming industry market by making certain courses compulsory. Such courses could be from one to a few days long. Typical examples are driver licenses for boats, operating cranes, fish welfare courses etc.

For short time training activities, are internal courses and training an important mean of increasing the competence of the workforce as selected by over half of the managers. Experienced staff will support and train the staff that has less experience. 30% of the managers select external courses and training from external providers as the most important area, while 2 out of 3 prefer to engage external providers “now and then”.

4.3.2. Long Term Training

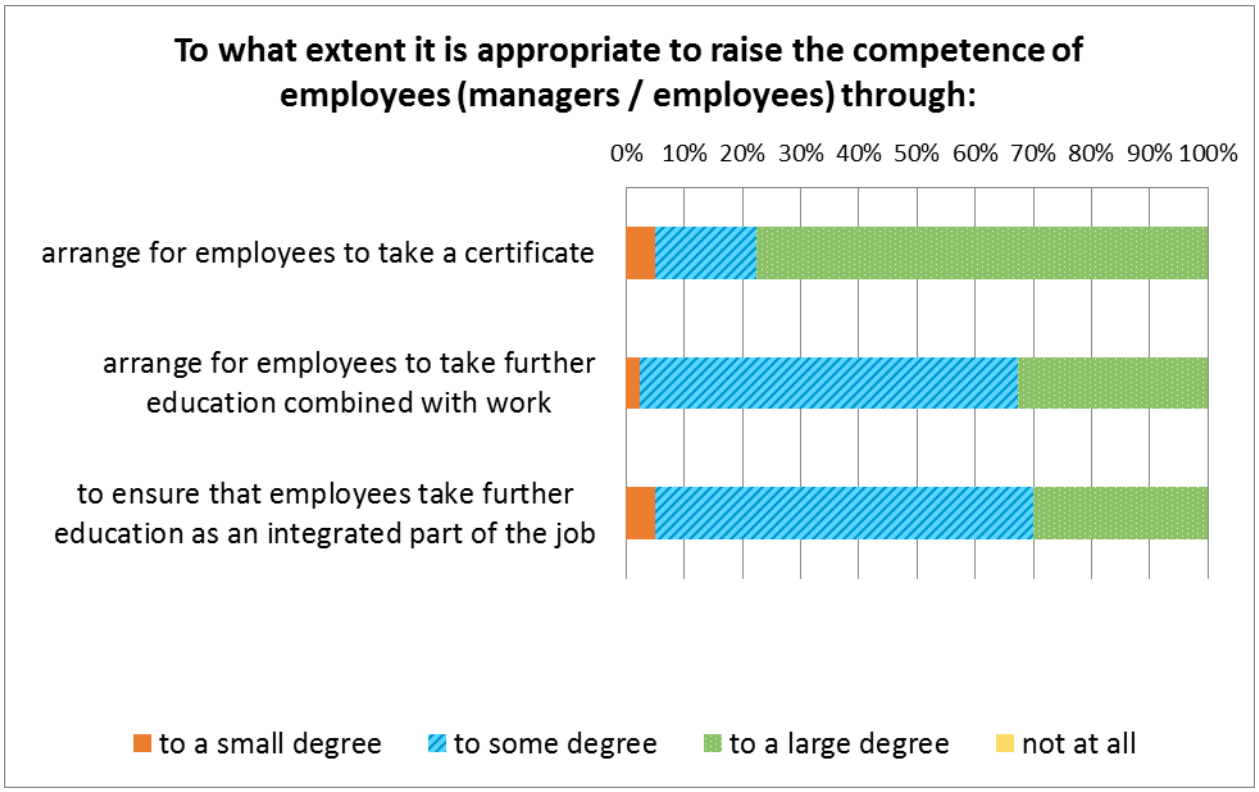

Figure 41: Needs for long term training activities

VET courses offered to industry that leads to national recognized qualifications, have a strong position in the industry market in Norway. More than 75% of the managers claim that their companies to a large degree support long-term training leading to a national recognized journeyman certificate. It provides a wide scope of basic set of skills on which companies can rely for a broad range of their working activities. Candidates that have got this journeyman aquaculture certificate may work in several types of work operations and activities within the fish farms, making them attractive for companies where the activities to some extent follow the season. The quietest time is the winter period from January to March.

1 out of 3 companies makes to a large degree arrangement at the company level such that their staff may take a journeyman certificate when they are in full job. The rest of the companies claim that they do it to some degree. The last graph shows that the companies want their staff to study to a journeyman certificate as an integrated part of their job.

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4.4. Areas Which Require Improvement of Skills

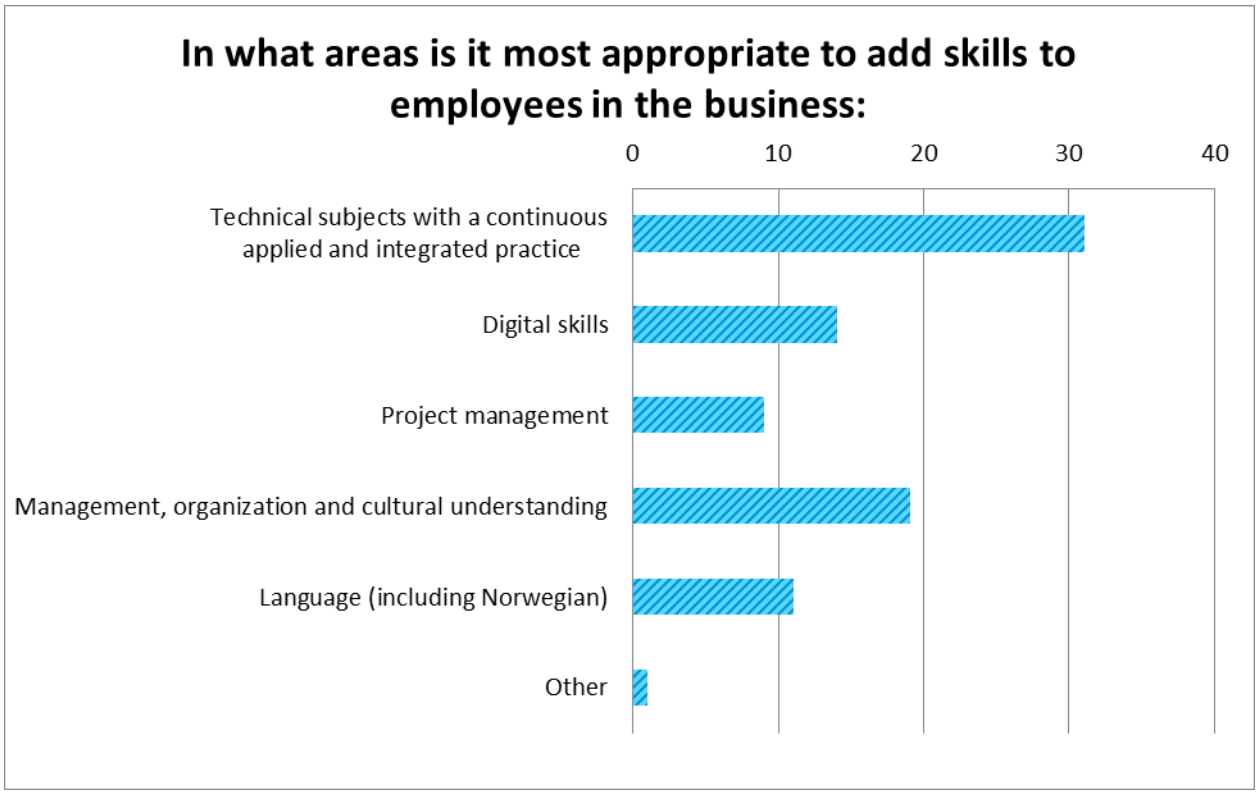

Figure 42: Areas which require improvement of skills of the employees

31 out of 41 managers (75%) report that courses addressing "Technical subjects with a continuous applied and integrated practice" are the most important ones. This reflects the needs in an industry characterized by fast technological developments. This is followed by courses leading to a "management, organization and cultural understanding" as the second most important area, selected by 19 out of 41 managers (46%), reflecting that the industry has become an international actor. For instance, on a daily basis the industry has to handle logistics involving a large number of lorries and staff from many different countries work together at the processing plants to produce the salmon or trout's. 14 of the 41 managers (34%) report that the digital skills of the employees should be enhanced, which is consistent with the number of managers indicating that digital skills are important (section 2.7.). The reason is that ICT is applied to control and operate a lot of the fish farming equipment and operations. 11 of the 41 managers (27%) mention that language training is important. The working language inside the companies is Norwegian, whereby the foreign staff needs to get trained to speak and read that language. 9 out of 41 managers (22%) mention that project management is an important area.

4.5. Types of Engineering Education Needed

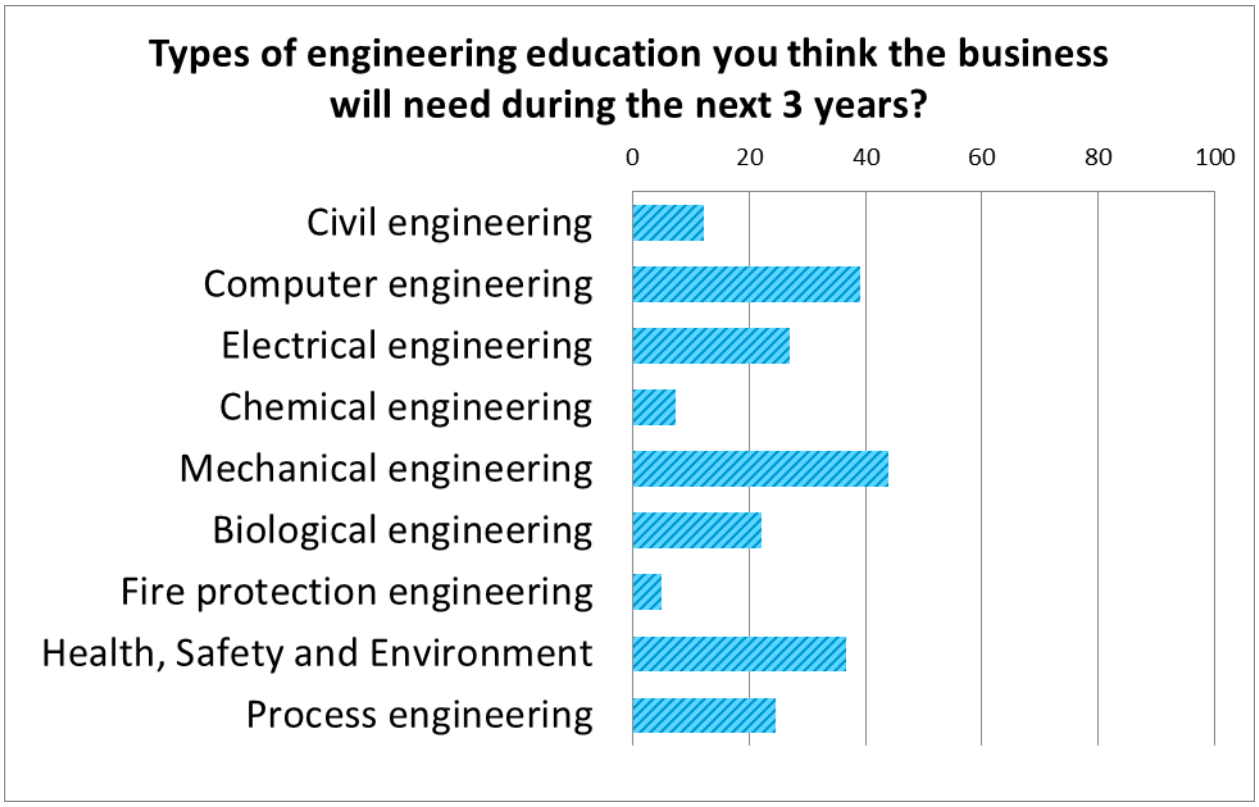

Figure 43: Types of engineering education needed during the next 3 years

The fish farming industry need a broad spectrum of engineers during the next 3 years. The three most important areas are mechanical and computer engineering, and Health, Safety and Environment. Computer engineering is important due to digitalization of production processes. Mechanical engineering is ranked on top, since new types of farms are going to be developed during the next years to handle the challenging sea lice problem.

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4.6. Collaboration With Other Relevant Actors

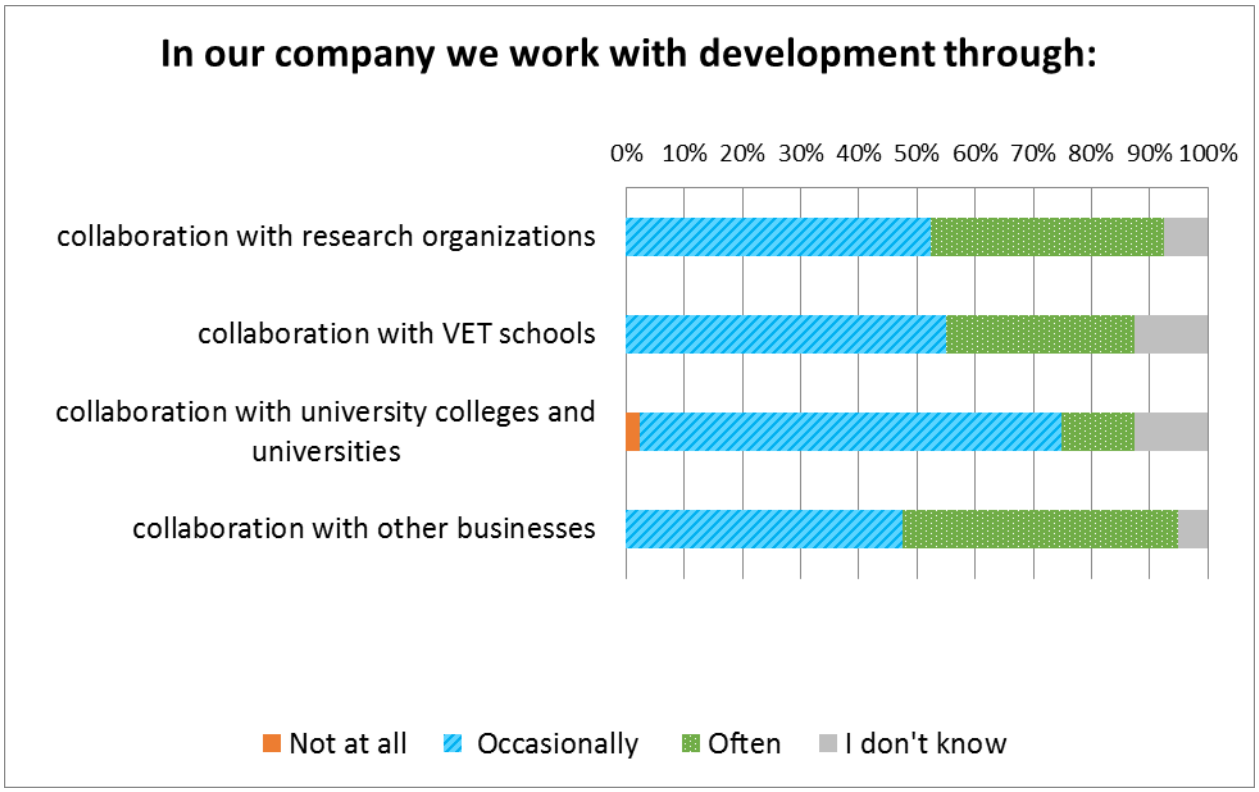

Figure 44: Development through collaboration with other relevant actors

Collaboration and cooperation has been an important factor for the development for fish farming industry in Norway. 40 % of the fish farming companies often cooperate with applied research organizations like for instance SINTEF, in order to pilot innovative solutions. 1 out of 3 companies often cooperate with high schools offering VET training within aquaculture. This includes offering practice for the aquaculture students. However, only 12,5 % often collaborates with universities to carry out basic research activities. This shows that the fish farming industry is much stronger on carrying out applied research tasks compared to setting up long term research programs involving PhD students from universities. 48% of the companies mention that they collaborate with other fish farming companies to carry out developments, despite that they are competitors on the same market when selling their fish.

Thus, the in-company development in fish farming industry in Mid-Norway is driven by strong collaboration between companies and the research environment. The companies choose to collaborate with each other even though they are competing on the same market when selling their products. In addition, they support the aquaculture VET schools by offering students access to practice and training involving modern equipment.

New aquaculture VET programs may support this by addressing the importance of development at several levels, including formal and informal meeting places where staff in the fish farming companies meets teachers and students as often as possible. This includes for instance offering practice to students and let students train on work operations they will meet when they start working in the companies.

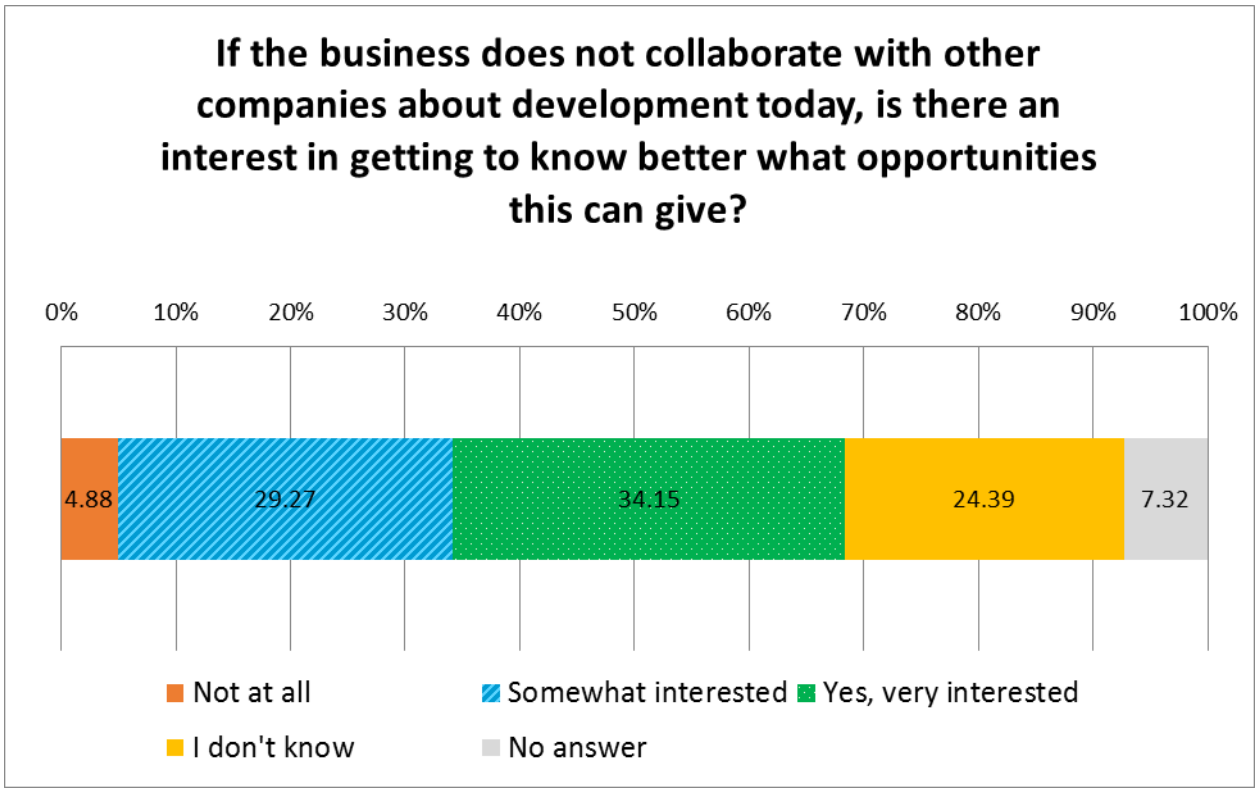

Figure 45: Interest in collaboration with companies

One out of three companies is very interested in collaboration with other companies, while almost the same share is somewhat interested. This shows that the managers still believe there is still a potential for improving the collaboration among the fish farming companies, despite Figure 27 shows that there is already an extensive collaboration ongoing.

A modernized aquaculture VET program could be designed to help facilitating new types of collaboration within the fish farming industry. The potential is large, when 63% reports that they are very interested or somewhat interested. A new aquaculture pilot could be designed to stimulate collaboration, by applying tasks and cases where people from different companies may work together in order to figure out the solutions to the problems or investigate common challenges for development.

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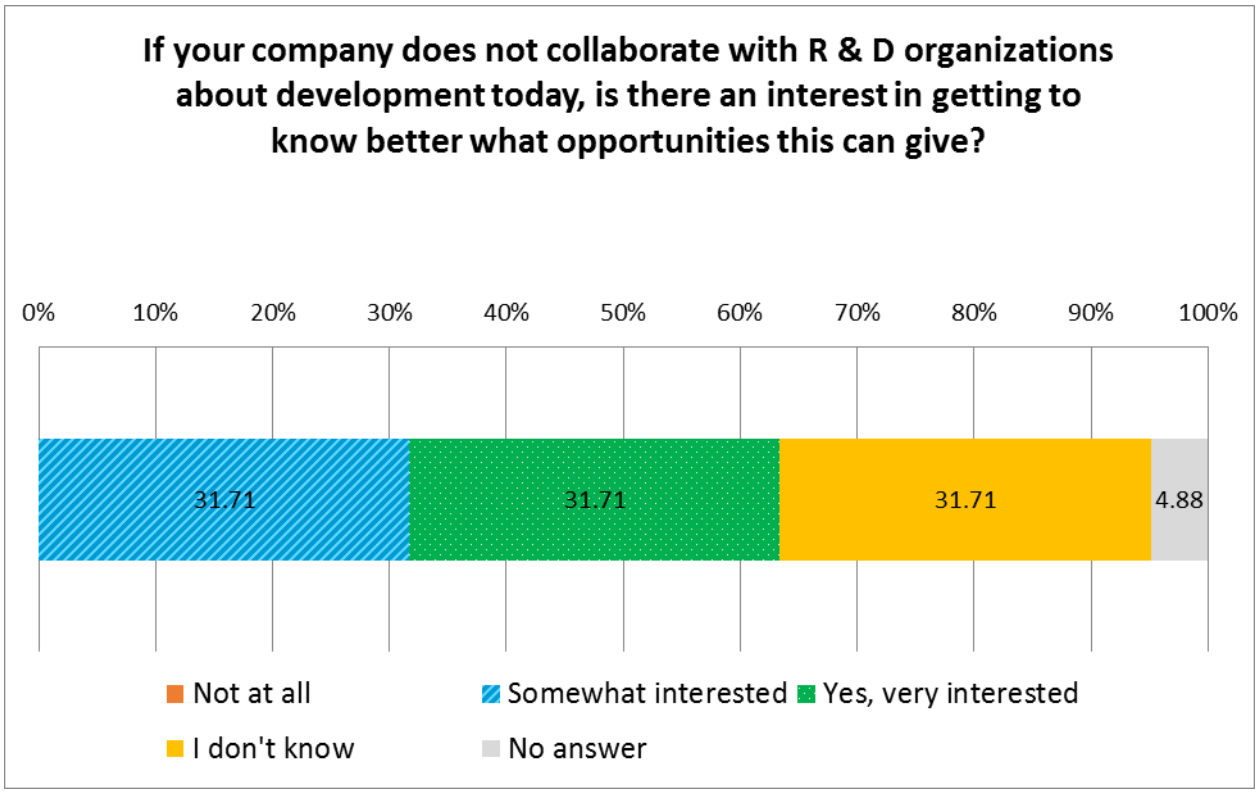

Figure 46: Interest in collaboration with research and development

The managers in the fish farming companies are very interested in getting information and new opportunities for establishing new collaboration with R&D institutions. 32% are very interested, while the same number of managers is somewhat interested. Figure 27 showed that 40% of the companies already had ongoing research collaboration with research organizations. However, those working at the manager level out on the farms or in the processing factories, mentioned that these processes could have been enhanced further. This indicates that there are many unresolved issues, task, problems at a regional and local level etc. within the aquaculture industry that needs to be solved by R&D.

Fish farming industry in Norway is still a young industry, starting approximately 40 years ago. Older and more mature industries in Norway invest a higher share of their turnover in research, compared to the fish farming industry. New aquaculture VET programs may try to address the importance of investing in R&D in order to get progress in research and development within the industry.

Area 5: Conditions: locally - nationally – internationally

The last area of questioning refers to factors that might influence the company or the industry during a horizon of 3 to 5 years.

5.1. Conditions Influencing the Company

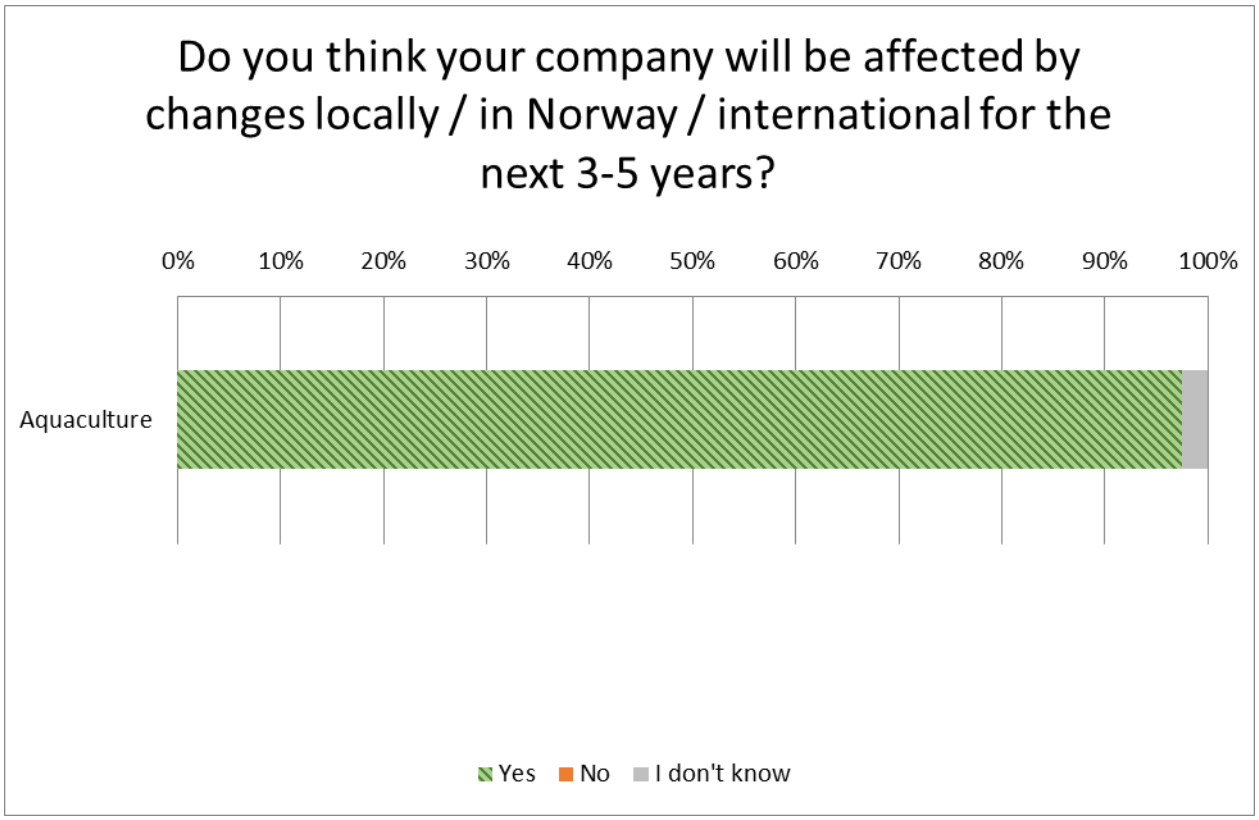

Figure 47: Perceived influence upon fish farming company

There is an overwhelming agreement that each company will be influenced by external changes during the next 3 to 5 years. The companies expect that the production and processing of farmed fish will change during this period due to technical development and legislations etc.

New aquaculture VET programs will be challenged by these changes. It will be necessary to update parts of such training programs frequently.

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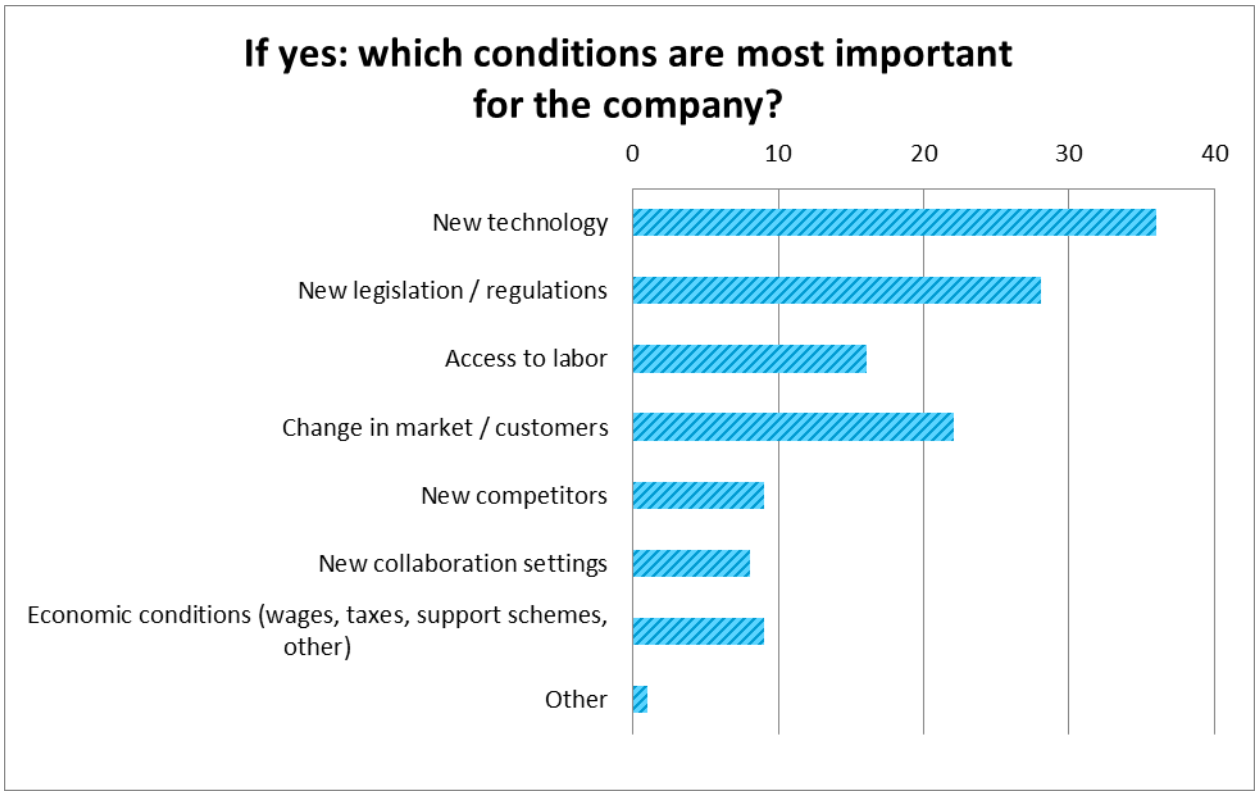

Figure 48: Factors influencing company on short term

The most important factors influencing a company, as pointed out by the managers, are access to new technology; changes including new legislations, changes in the external market and access to labor forces (88%, 68%, 54% and 39% respectively). One single manager mentioned as an additional new factor the "management authorities" and the regulations they may define.

For a modern aquaculture VET course program, the consequences are that it must continuously update the content such that it reflects the technology that the farming companies apply. Since production of digital content and learning material are expensive, one way could be to develop some material in each country and then share it between the countries cage farming salmon.

A modern aquaculture VET course program must include the latest updated national regulations. It may be tricky to share those between several countries, unless the European Commission harmonizes them. Such a program will, however, directly contribute to increasing the access to labor that has national recognized aquaculture qualifications.

5.2. Conditions Influencing the Industry

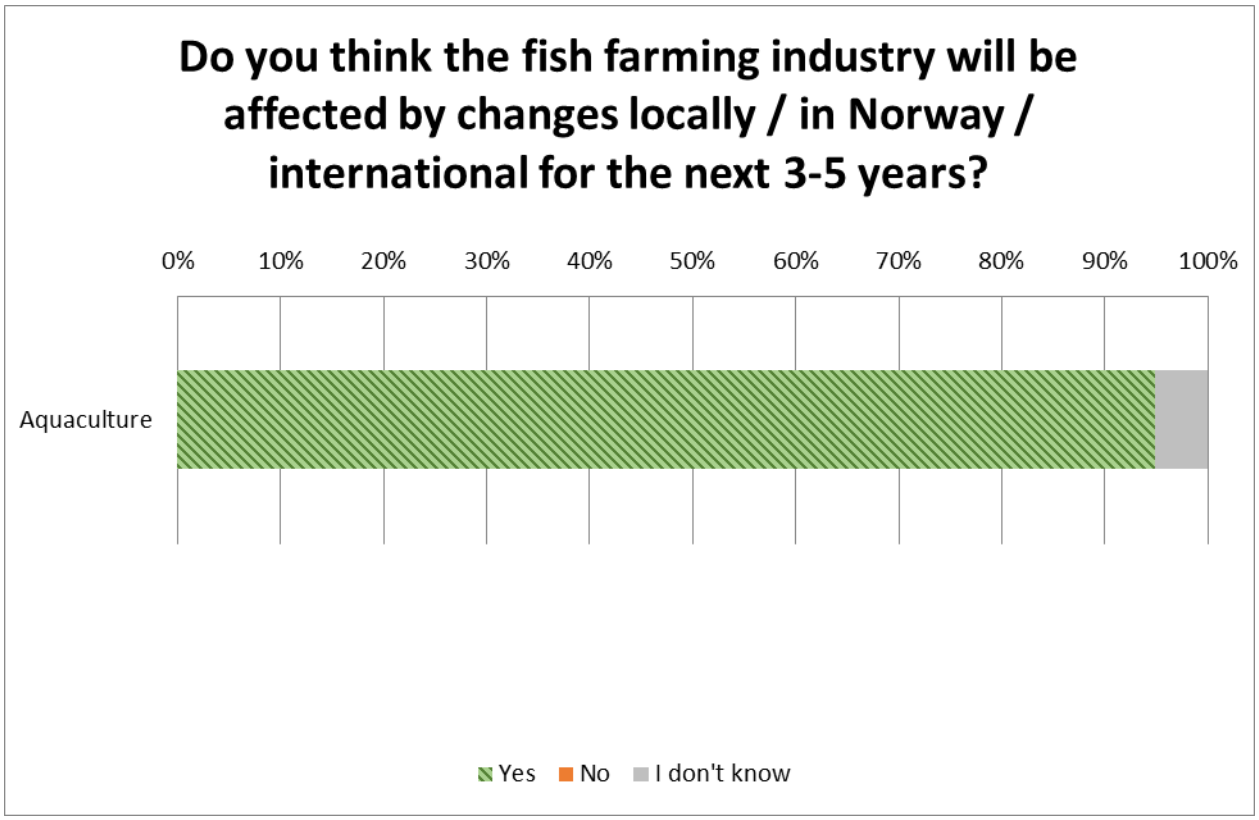

Figure 49: Perceived influence upon aquaculture industry

There is overwhelming agreement that the fish farming industry sector will be influenced by external changes during the next 3 to 5 years. The response rate is at the same level as it was for the fish farming companies in figure 30.

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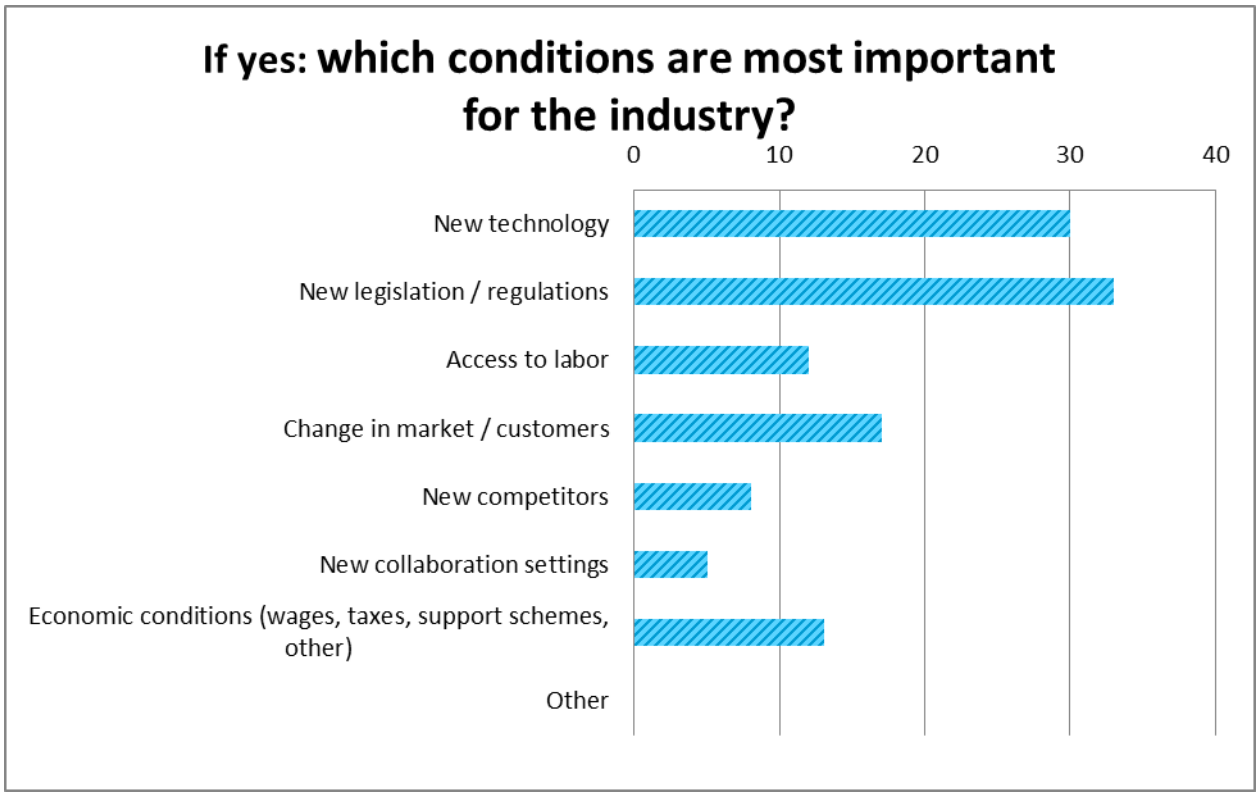

Figure 50: Factors influencing industry on short term

The factors, which can generate change in the aquaculture industry, are somewhat similar in the distribution to the ones regarding the companies in figure 31. The most important factor is now seen to be legislation followed by technology and then changes in market/customers and access to labor (80.5%, 73%, 41.5% and 30% respectively).

Since legislations and regulations are considered to be the most important factor for the industry, modern aquaculture VET courses should provide in depth knowledge about these aspects.

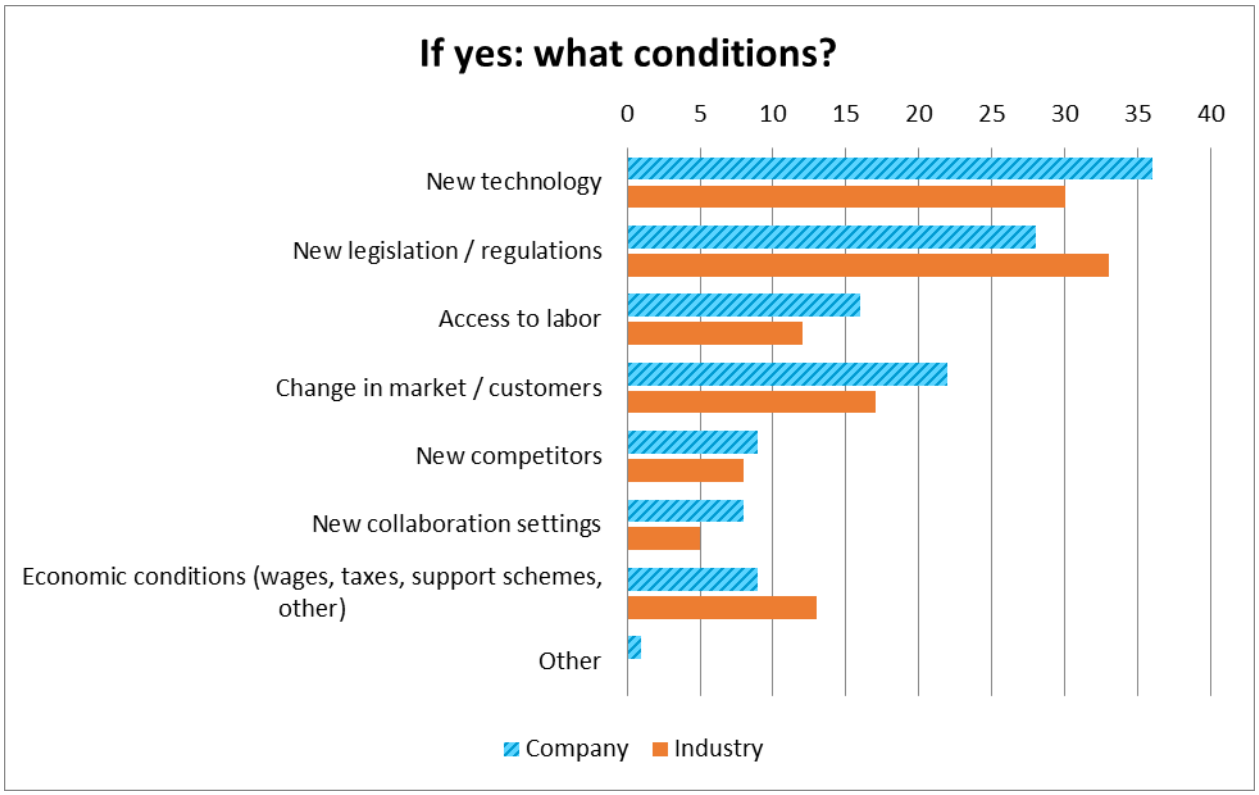

Figure 51: Factors influencing the company / industry side by side

If we compare the data in the same table, figure 34, we notice that the managers perceive that the company will be influenced by new technology more than the fish farming industry itself. However, they perceive the opposite with respect to new legislation and regulations. That is, a smaller number of managers believe that legislation is a factor of change in company than the industry.

For a modern aquaculture VET program, the consequences may be that is necessary to offer adapted training to various types of stakeholders, e.g. fish husbandry or site managers. This training, however, may be delivered with eLearning.

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References Appendix 2

1. *Kartlegging av behov for kompetanse og arbeidskraft i sjømatnæringen*, SINTEF report, 6.8.2014, ISBN 978-82-12-05757-7