



FEAP – AQUAINNOVATION QUESTIONNAIRE  
“Innovation requirements in European Aquaculture”

**CSN – INTRAN  
Aquaculture Innovation Network**

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**December 2005**

**Dr. Panos Christofilogiannis  
FEAP Consultant - General Manager AQUARK**

The Questionnaire was drafted by Dr. Panos Christofilogiannis (FEAP consultant, General Manager AQUARK) for the project in June 2005 following the CSN-INTRAN Consortium meeting in Palavas France.

In May 2005 during the 37th Annual General Assembly of FEAP in Hydra island, Greece Dr P. Christofilogiannis presented the project attributes to FEAP member Association participants from 23 countries across Europe as well as to representatives of the Greek Mariculture industry.

The aim of the questionnaire was to evaluate the general views on innovation requirements of the sector. It was circulated through the FEAP secretariat in June 2005 and responses were gathered by the end of November 2005 from the following eight (8) Fish farmers Associations:

- Czech Fish farmers Association
- Scottish Salmon Producers Organisation
- Finnish Fish farmers Association
- Faroe islands fish farmers Association
- Norwegian Fish Farmers Association
- Irish Salmon growers Association
- Iceland Fish farmers Association
- APROMAR (Spanish Association for Marine Fish farming)

For Greece, data were gathered for sea bass and sea bream through the Advisory Committee of the Federation of Greek Maricultures from the following five (5) companies:

- Galaxidi S.A
- Hellenic Fish farming S.A
- Andromeda S.A
- AQUAVET and
- AQUARK



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Reports referred to the following six (6) species:

- Atlantic salmon
- Large Trout
- Portion Trout
- Carp
- Cod
- Sea bass and Sea bream

Five (5) Atlantic Salmon reports originated from Norway, Scotland, Ireland, Iceland and Faroe Islands, three (3) Large trout reports originated from Norway, Finland and Iceland, two (2) Portion trout reports came from Czech Republic and Iceland, two (2) Cod report originated only from Norway and one (1) carp report only from Czech Republic while six (6) Sea bass and sea bream reports originated from Spain and Greece.

The questionnaire represents an initial attempt to evaluate the fish farmers perception on innovation and to record their views on different aspects of their business environment.

The questionnaire was divided in three sections:

The Main section was devoted to record the importance / urgency of innovation through 56 questions. The questionnaire was designed to address eight areas of interest in order to evaluate the level of priority for the fish farmers and to identify this way the fields that require innovative approaches, solutions or policies at company, sectoral, regional, national or EU level.

These 8 thematic areas of interest included:

- Environmental issues (5 fields)
- Administrative issues (4 fields)
- Technical issues (11 fields)
- Fish health management (3 fields)
- Marketing and Trade issues (13 fields)
- Financial issues (6 fields)
- EU policies (4 fields)
- Technology & Information transfer (10 fields)

The second section was a simplified guided SWOT analysis where participants were asked to identify Strengths, Weaknesses, Opportunities and Threats in their Fish farming sector segment.

The third and final section referred to forecasting of production in the next 5 years (2005 – 2010).

Data Statistical Analysis was performed by Mrs. Joanna Tavla, R&D manager of AQUARK using SPSS 9.0 for Windows.



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## **SALMON**

In Salmon Aquaculture the areas that were identified to be of high priority for innovative measures by all (100%) five Fish Farmers Associations included:

- Fish diseases / New pathogens
- Product Quality

Areas of high innovation priority by at least 75% of the Fish Farmers Associations included:

- Water / Site availability
- Legislative measures
- Product traceability
- Sector image / Product image

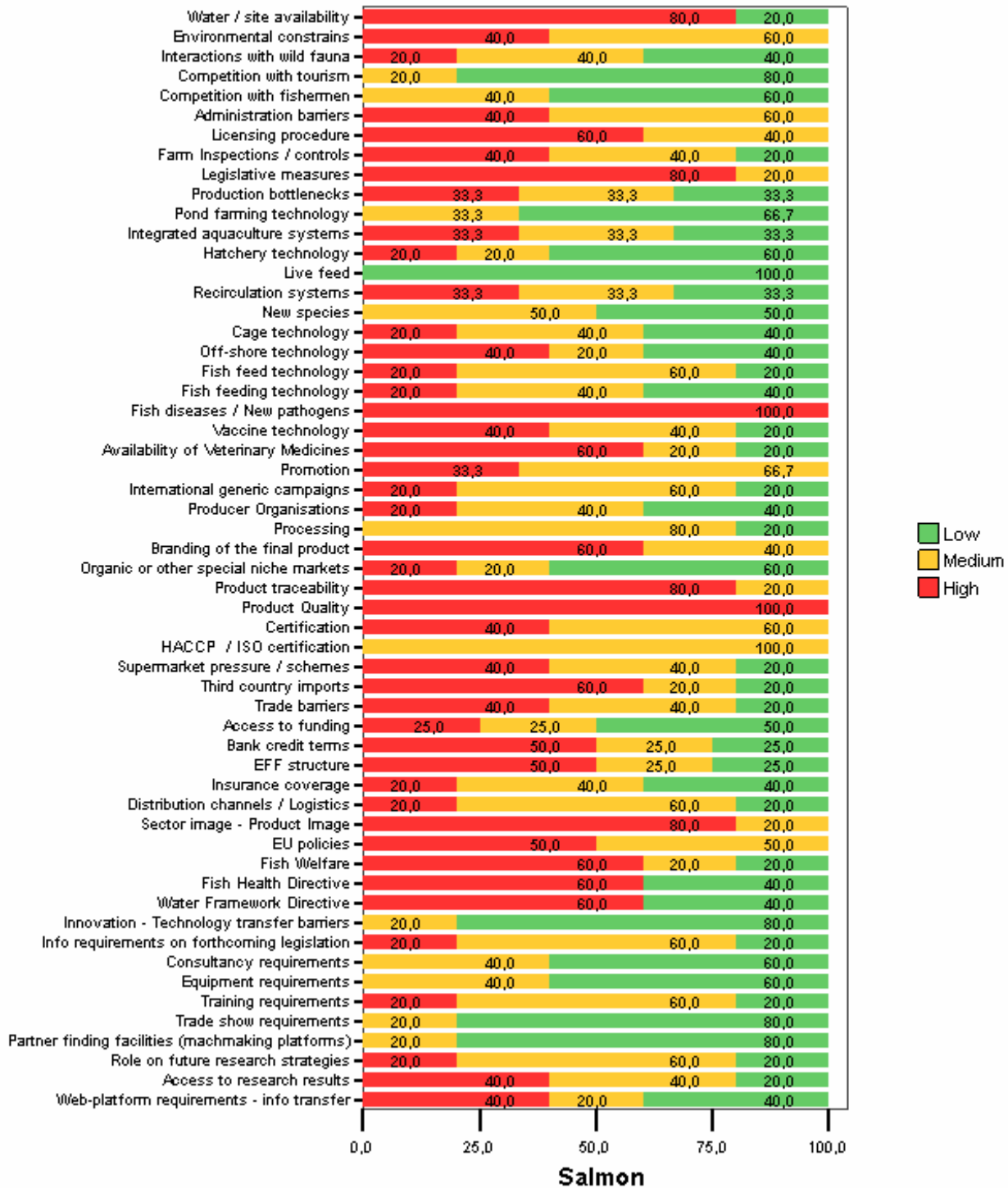
Areas of high priority for innovation by at more than half of the Fish Farmers Associations included:

- Licensing procedures
- Availability of Veterinary Medicines
- Branding of the final product
- Third country imports as well as on
- EU policies like
  - Fish Welfare
  - Fish Health Directive
  - Water Framework Directive

Areas of high priority for innovation by half (50%) of the Fish Farmers Associations included:

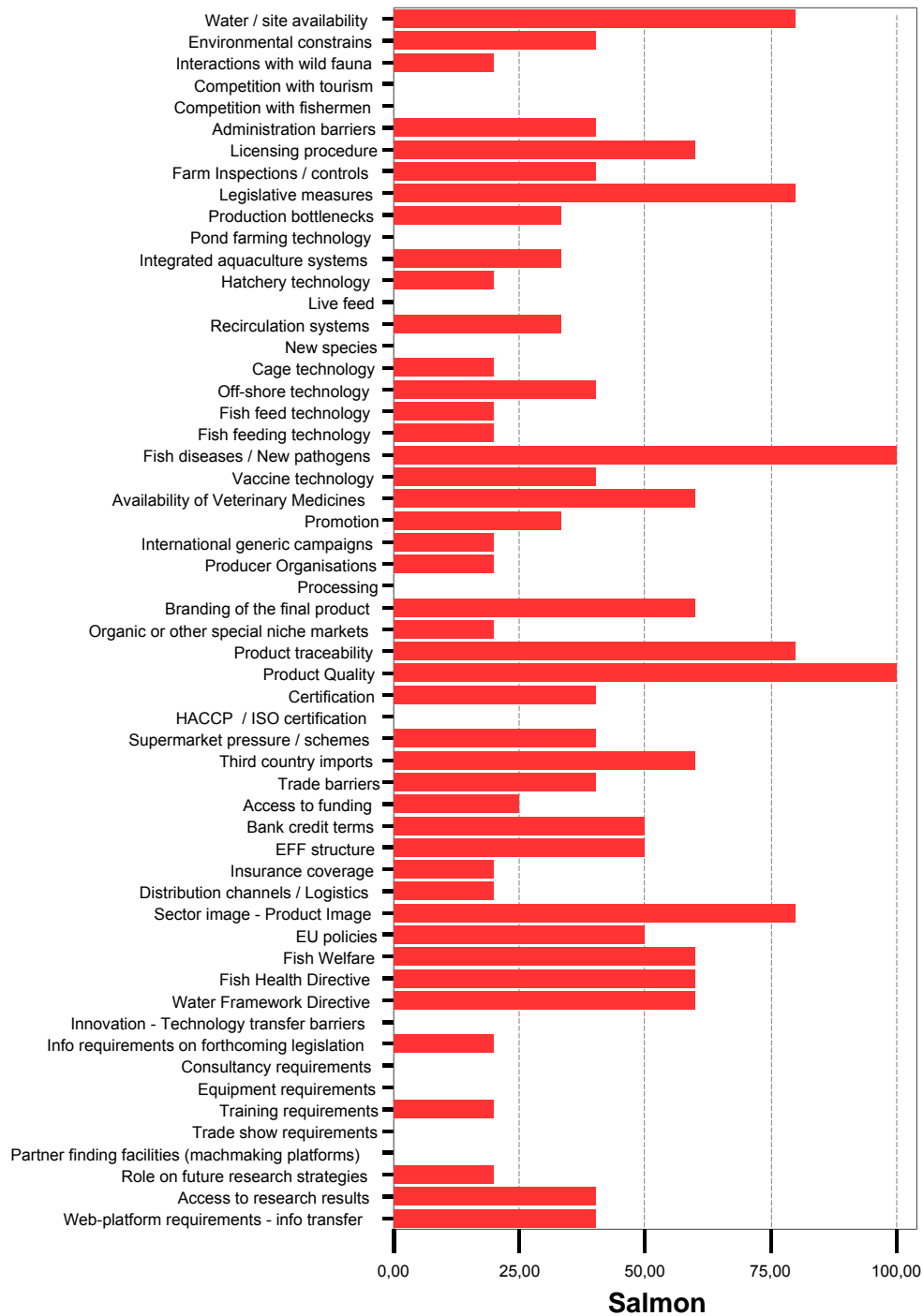
- Bank credit terms
- EFF structure and
- EU policies

### Bar Chart of Salmon farmers questionnaire responses



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**Bar Chart of Salmon farmers questionnaire responses (High Priority)**





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## LARGE TROUT

In Large trout Aquaculture the areas that were identified to be of high priority for innovative measures by all (100%) three Fish Farmers Associations included:

- Production bottlenecks
- Product quality
- Sector Image – Product image
- EU policies and especially on
  - Fish Welfare

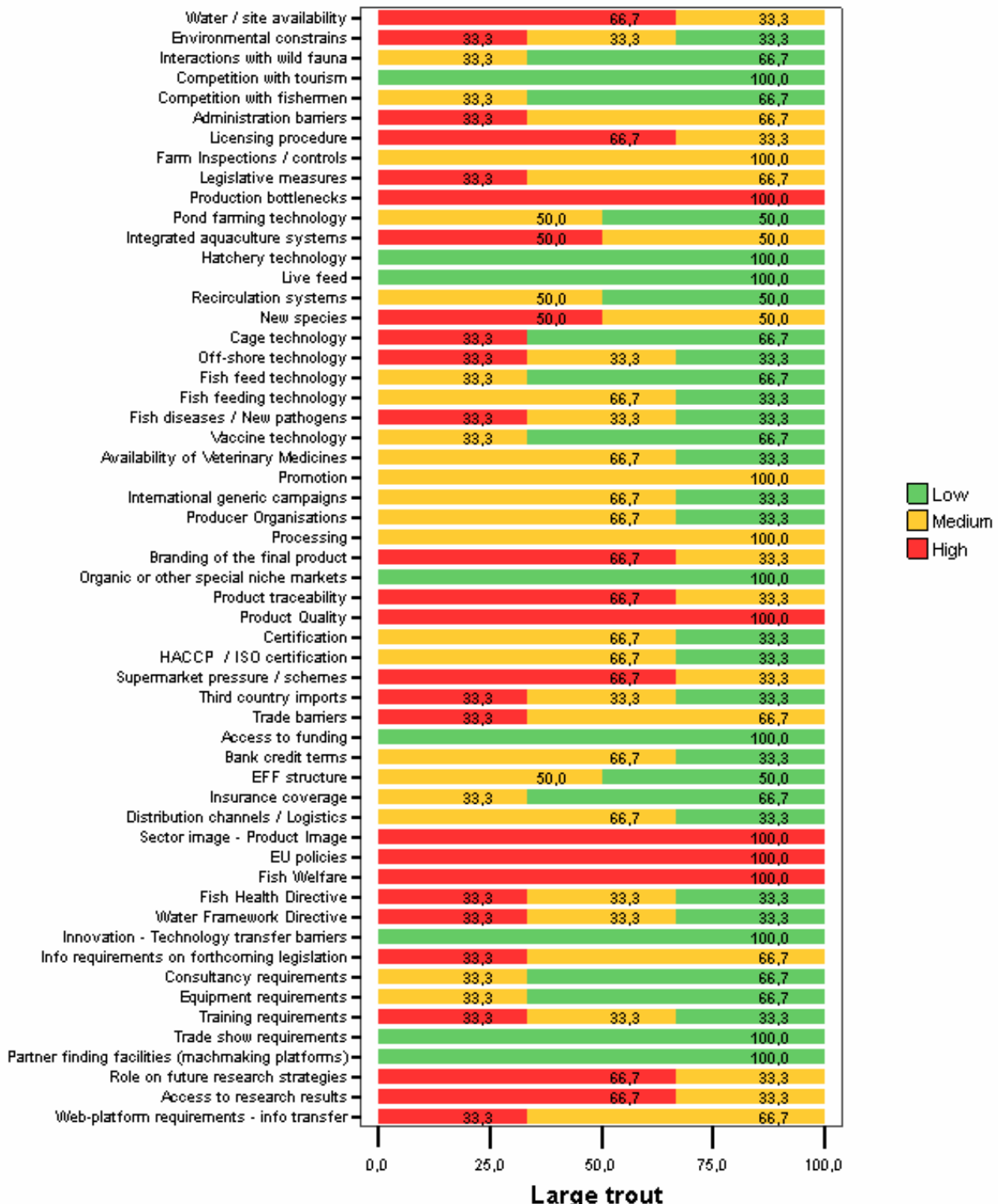
Areas of high priority for innovation by at more than half of the Fish Farmers Associations included:

- Water / site availability
- Licensing Procedure
- Branding of the final product
- Product traceability
- Supermarket pressure / schemes
- Need to play a role on future research strategies and to have
- Access to research results

Areas of high priority for innovation by half (50%) of the Fish Farmers Associations included:

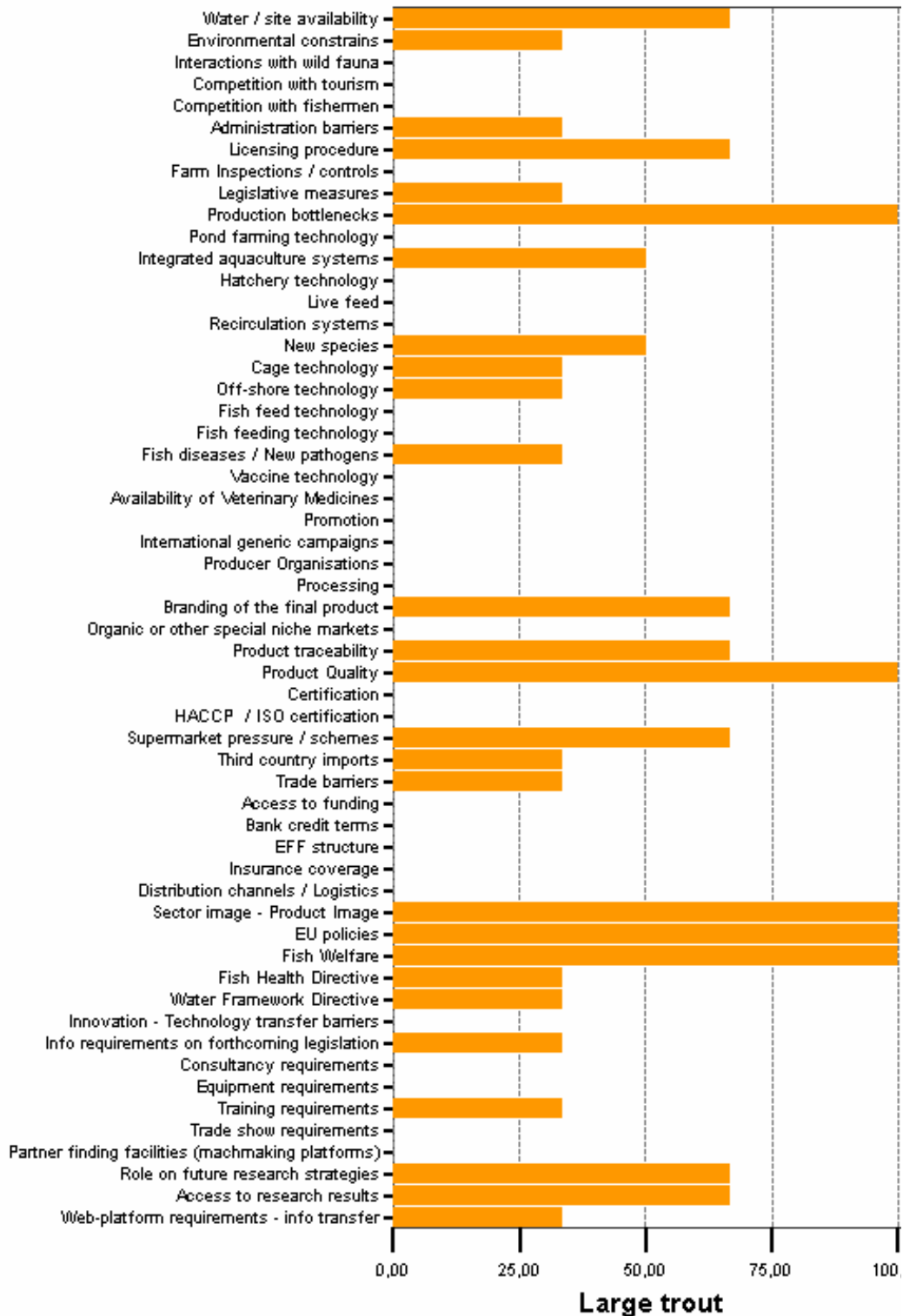
- Integrated aquaculture systems
- New species

### Bar Chart of Large Trout farmers questionnaire responses



Dr. Panos Christoflogiannis  
 (FEAP Consultant - General manager AQUARK)

**Bar Chart of Large Trout farmers questionnaire responses (High priority areas)**





## PORTION TROUT

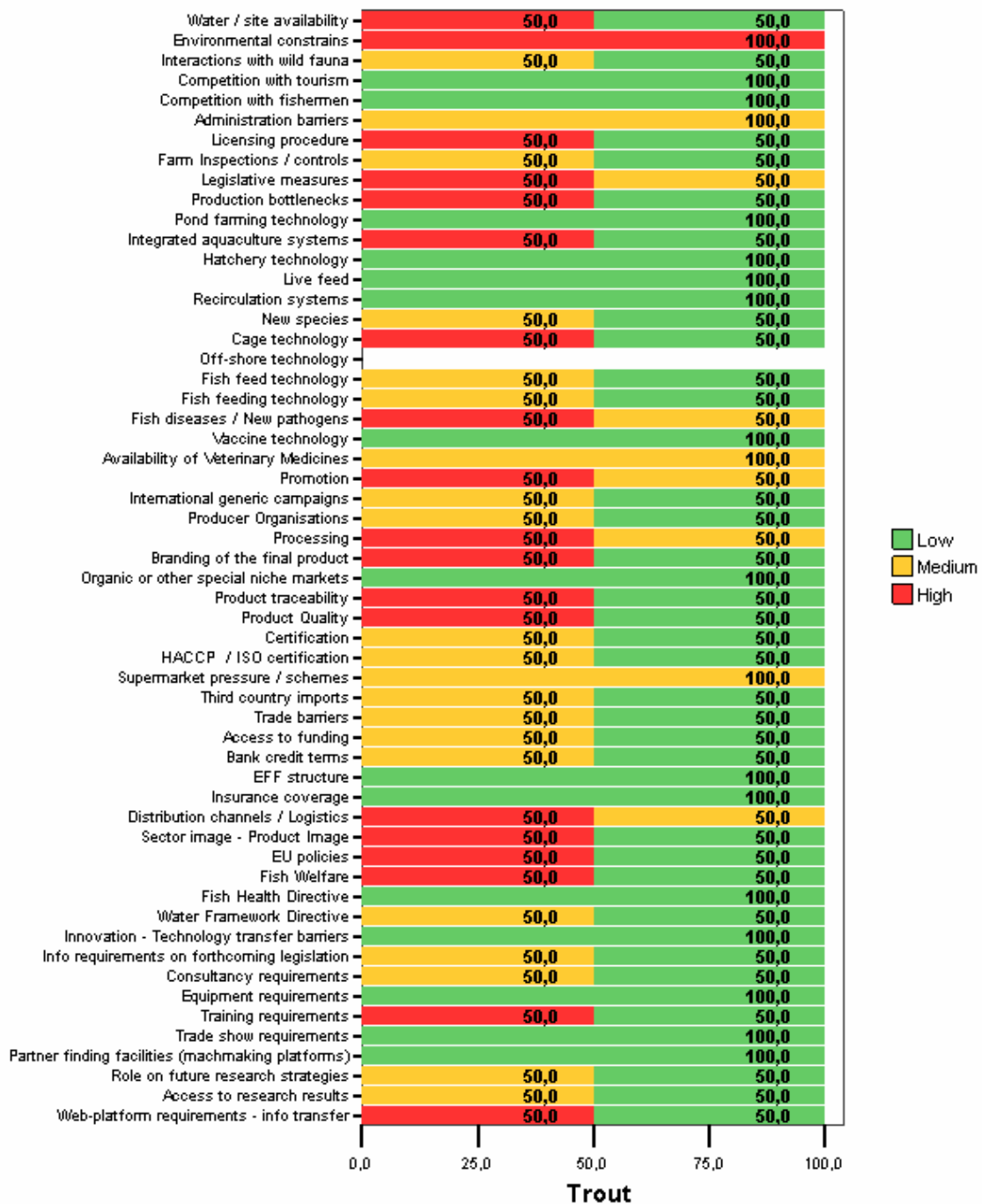
In Portion Trout Aquaculture the areas that were identified to be of high priority for innovation measures by all (100%) two Fish Farmers Associations referred to:

- Environmental constrains

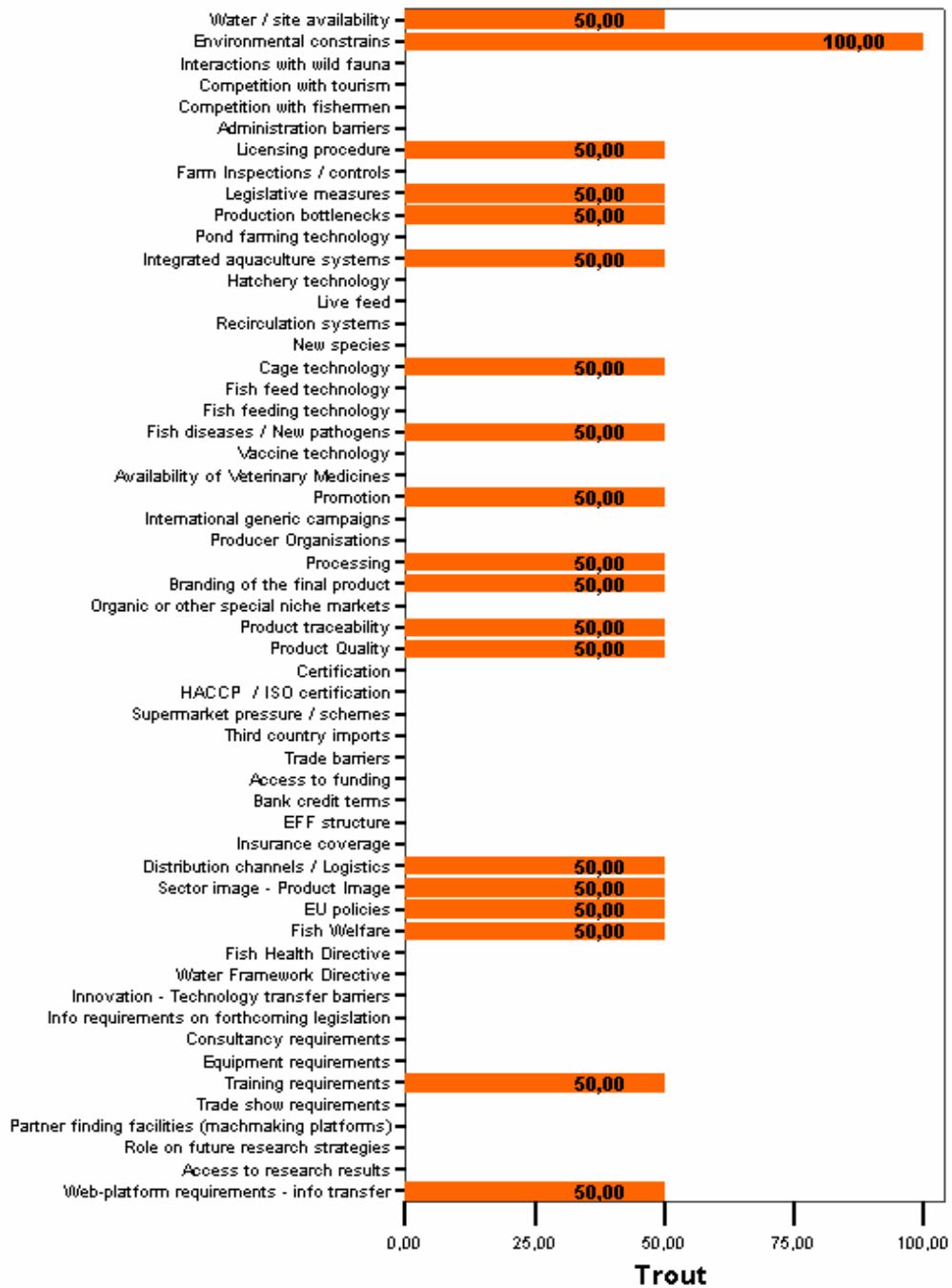
Areas of high priority for innovation by half (50%) of the Fish Farmers Associations included:

- Water /site availability
- Licensing procedures
- Legislative measures
- Production bottlenecks
- Integrated aquaculture systems
- Cage technology
- Fish diseases / New pathogens
  
- Promotion
- Processing
- Branding of the final product
- Product traceability
- Product Quality
- Distribution channels / Logistics
- Sector Image / Product Image
- EU policies like
  - Fish Welfare
- Training requirements
- Web-platforms - Info transfer

### Bar Chart of Portion Trout farmers questionnaire responses



**Bar Chart of Portion trout farmers questionnaire responses  
 (High priority Areas)**





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## **CARP**

In Carp Aquaculture the areas that were identified to be of high priority for innovative measures by the Czech Fish Farmers Association that was the only one to respond were applied and included:

- Environmental constrains
- Promotion
- Processing and
- Distribution channels / Logistics

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**Bar Chart of Carp farmers questionnaire response**



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**Bar Chart of carp farmers questionnaire responses (High priority areas)**





## COD

In Cod Aquaculture the areas that were identified to be of high priority for innovative measures by all (100%) two Fish Farmers Associations included:

- Production bottlenecks
- Integrated Aquaculture Systems
- Cage technology
- Fish Diseases / New pathogens
- Vaccine technology
- Product traceability
- Product quality
- EU policies especially on
  - Fish Welfare

Areas of high priority for innovation by half (50%) of the Fish Farmers Associations included:

- Water / site availability
- Environmental constrains
- Interactions with wild fauna
- Licensing procedures
- Hatchery technology
  
- Live feed
- Recirculation systems
- Off-shore technology
- Fish feed technology
- Fish feeding technology
- Availability of veterinary medicines
- Branding of the final product
- Supermarket pressure / schemes
- Third country imports
- Access to funding
- Bank credit terms
- Sector image – product image
- EU policies like:
  - Fish Health Directive
  - Water framework directive
- Information on forthcoming legislation
- Equipment requirements
- Role on Future research
- Access to Research results
- Web platform requirements and information transfer mechanisms

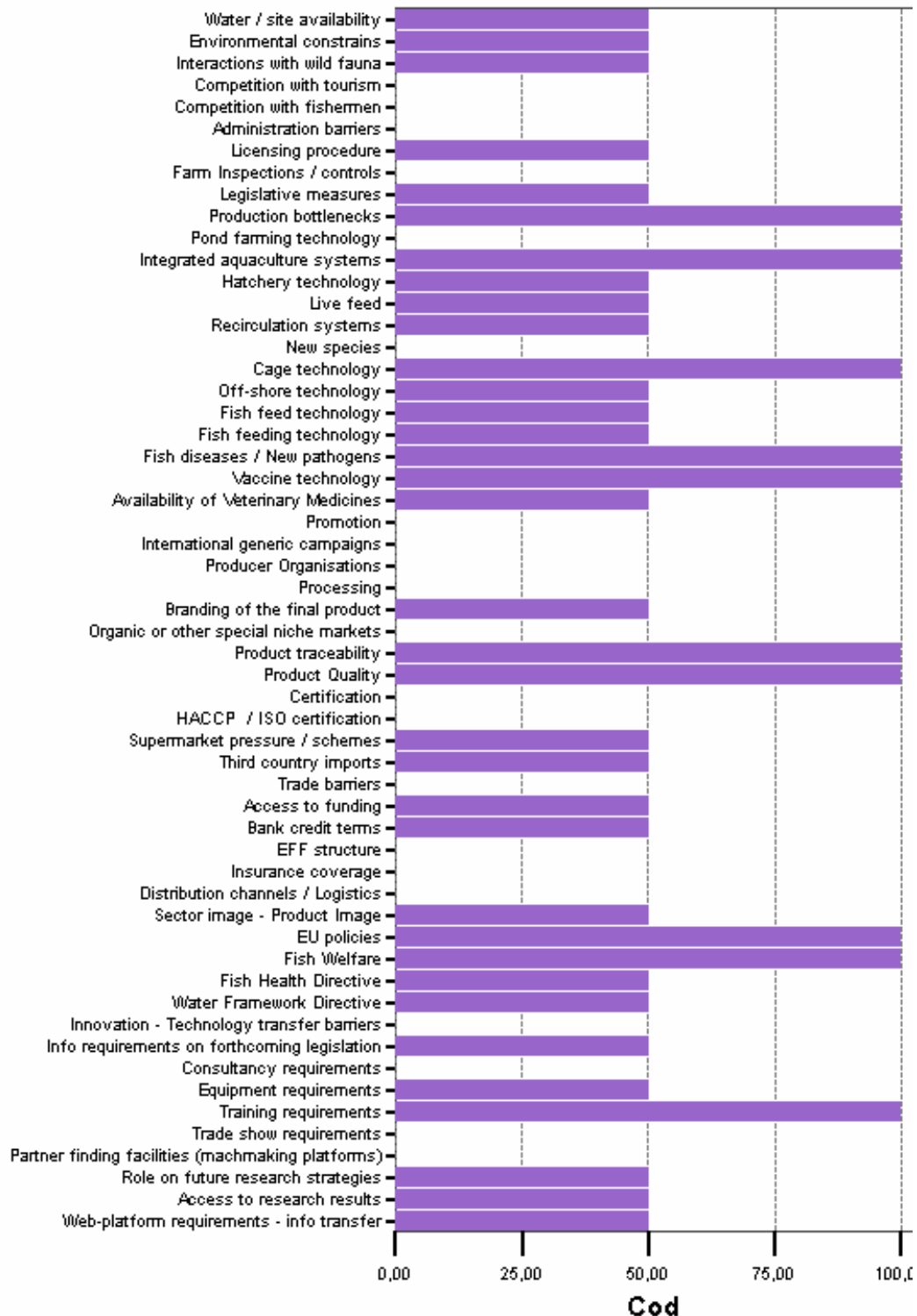
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Bar Chart of Cod farmers questionnaire responses



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**Bar Chart of cad farmers questionnaire responses (High Priority Areas)**





## **SEA BASS and SEA BREEM**

In Sea Bass and Sea Bream Aquaculture the area that was identified to be of high priority for innovative measures by all (100%) six companies / Associations that responded in Spain and Greece was the Availability of Veterinary Medicines.

Areas of high innovation priority by at least 75% of the companies / Associations that responded included:

- Fish Diseases / New pathogens
- Vaccine Technology
- Organic or other special niche markets
- Product quality
- Third country imports
- Role on future research strategies

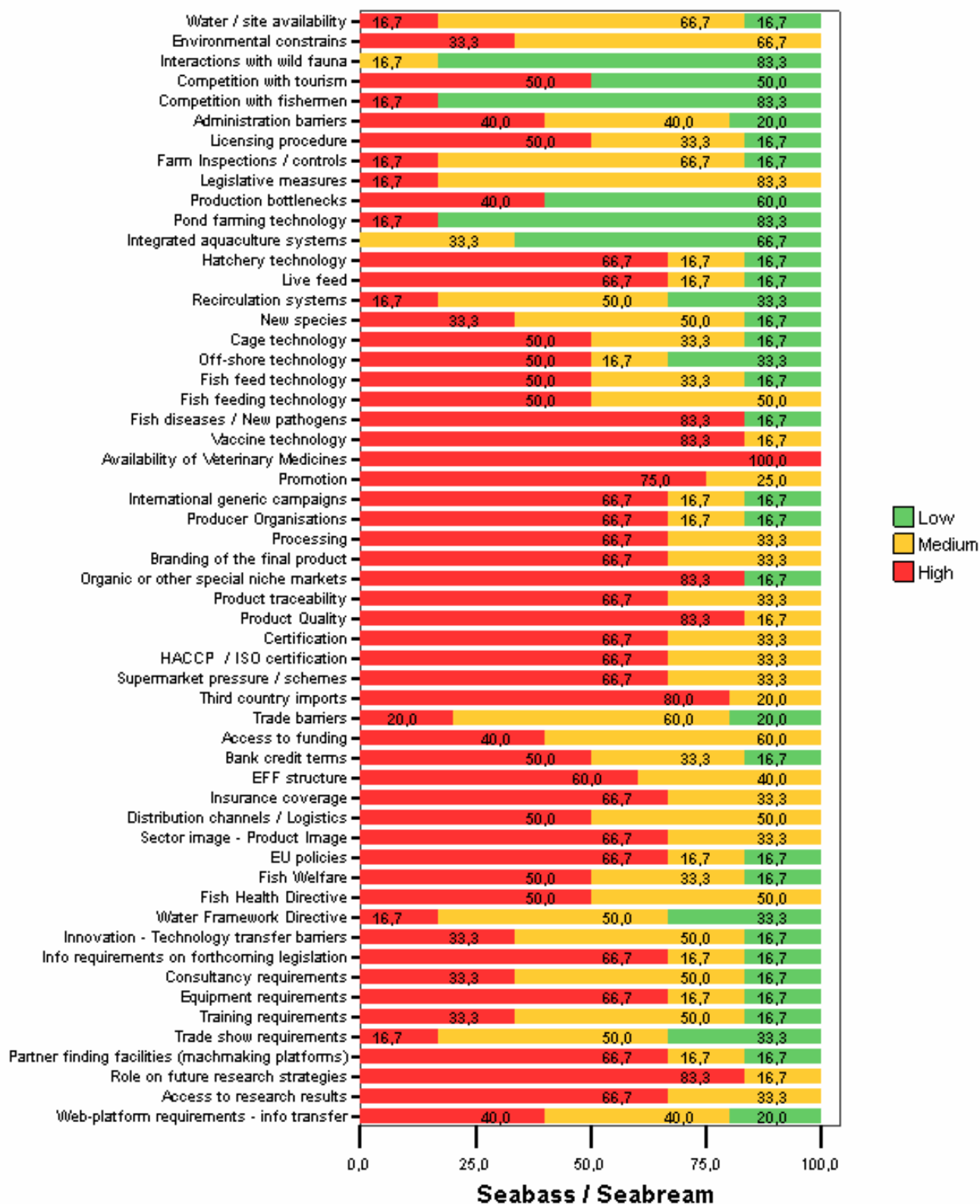
Areas of high priority for innovation by at more than half of the companies / Associations included:

- Hatchery technology
- Live feed
- International generic campaigns
- Producer organizations
- Processing
- Branding of the final product
- Product traceability
- Certification
- HACCP / ISO certification
- Supermarket pressure / schemes
- EFF structure
- Sector Image / Product Image
- EU policies
- Information requirements on forthcoming legislation
- Equipment requirements
- Partner finding facilities (machmaking platforms)
- Access to research results

Areas of high priority for innovation by half (50%) of the companies / Associations included:

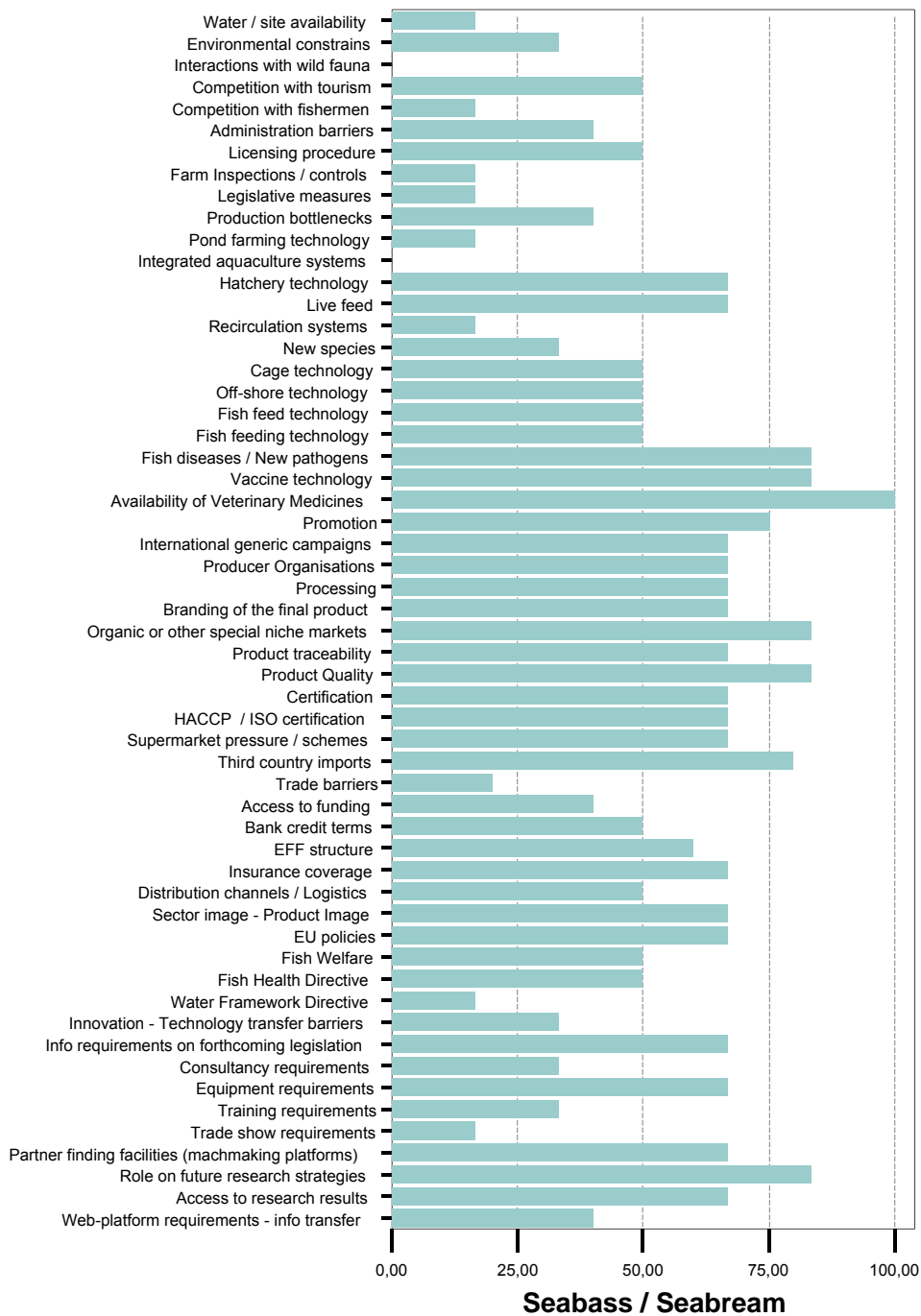
- Competition with tourism
- Licensing procedures
- Cage technology
- Off-shore technology
- Fish feed technology
- Fish feeding technology
- Bank credit terms
- Distribution channels / Logistics
- EU policies like:
  - Fish Welfare
  - Fish Health Directive

**Bar Chart of sea bass and sea bream farmers questionnaire responses**



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**Bar Chart of sea bass and sea bream farmers questionnaire responses  
 (High Priority Areas)**





### **Innovation Areas Priority across Species**

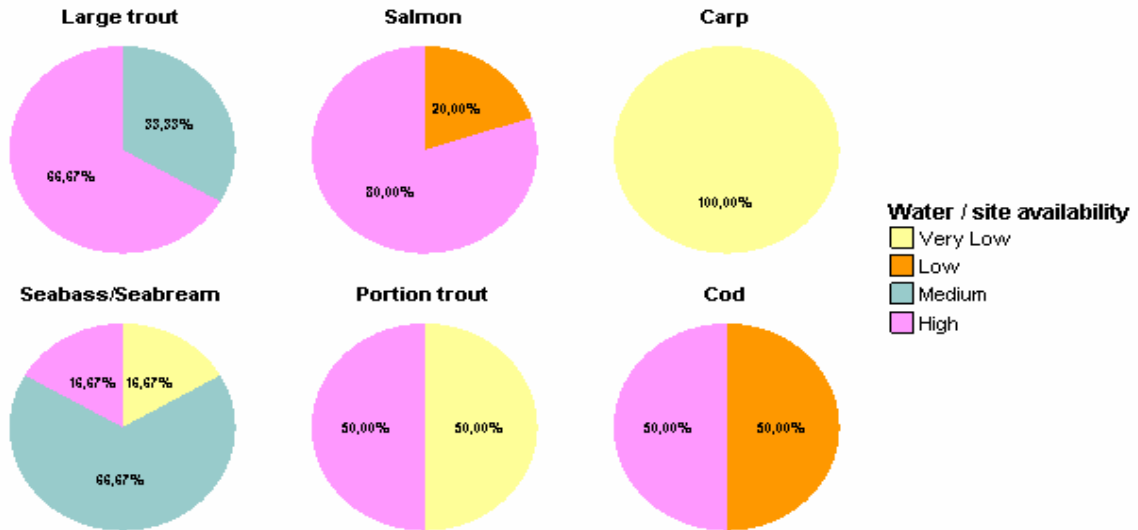
The analysis of innovation priority across species is focused mainly on salmon, large rout and sea bass–sea bream because only two cases were recorded for cod and portion trout and only one for carp. However we include the above species as indicators.

Regarding the second part of the questionnaire, analysis indicated that responses were guided by the examples suggested so it was decided that for valid conclusions to be made a specific analytical and quantifiable SWOT Analysis would be worth performing in the future.

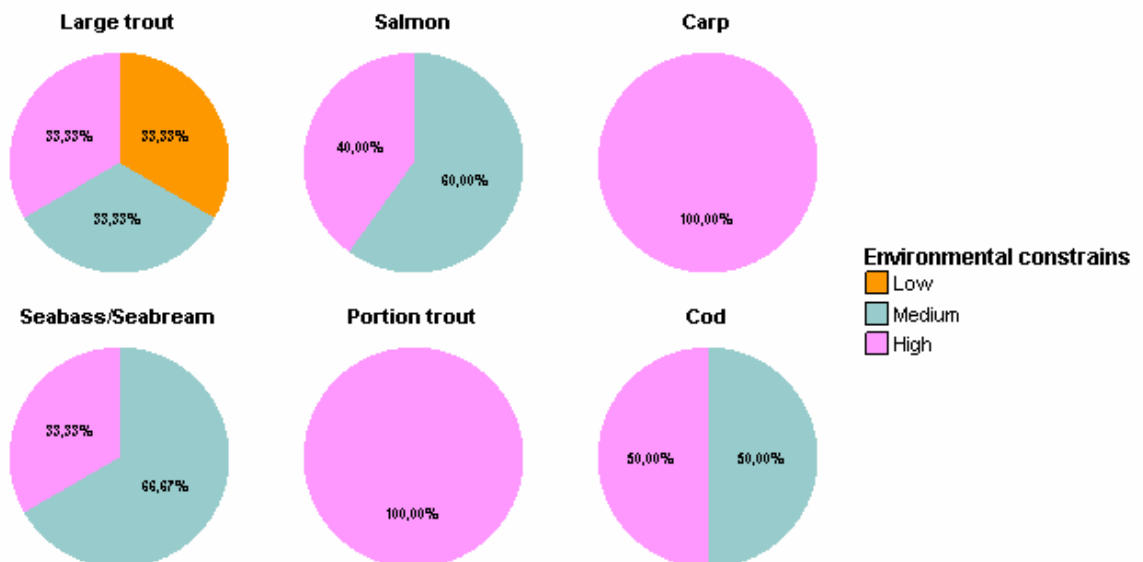
Finally regarding the third part of the questionnaire on production figures, data were scattered and representation of the whole European sector limited so valid conclusions were not possible to be drawn. It would be however beneficial if FEAP could create a database and a annual on forecasted production estimates for the next 3 years that would help farmers plan production more efficiently.

**ENVIRONMENTAL ISSUES**

**Water and site availability** is an area of paramount importance for salmon (80%) and large trout (67%) while seems to be a medium priority for the majority of sea bass- sea bream cases.

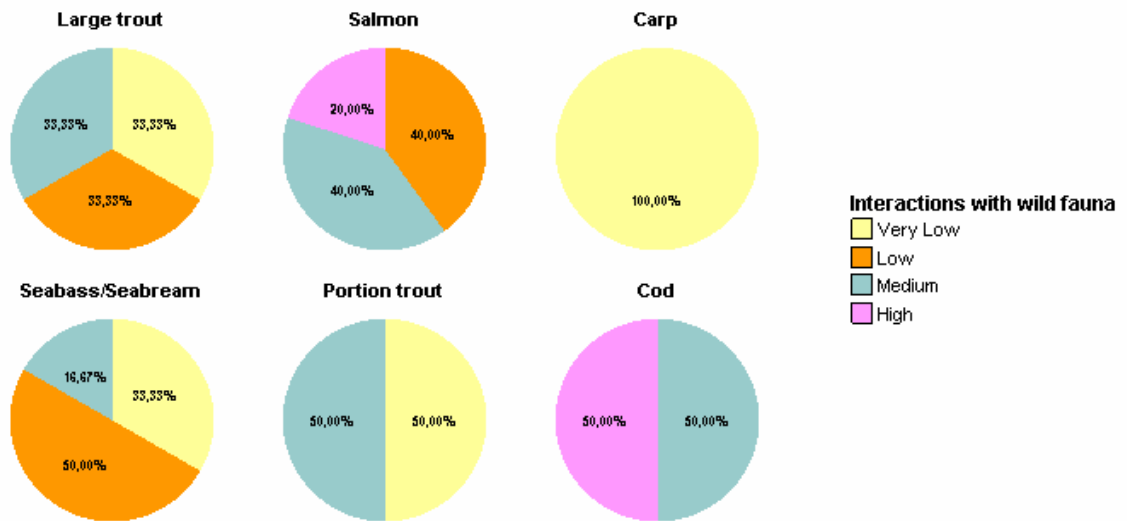


**Environmental constrains** are a medium to high priority for all the European fish farming sector especially for carp, portion trout, cod and salmon.



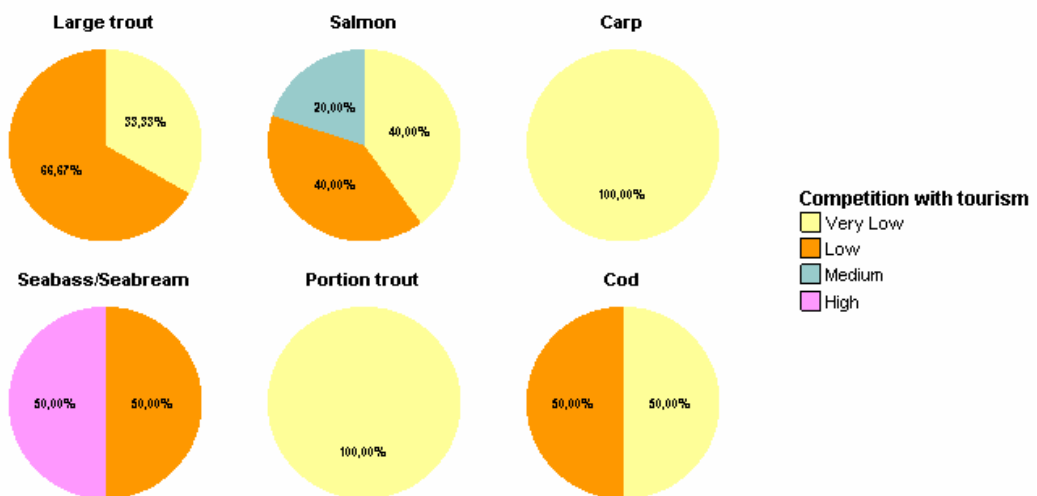
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**Interactions with wild fauna** are of medium and high importance for cod (100%) and salmon farming (60%) while represent a medium importance area (50%) for portion trout and are less important for large trout and sea bass-sea bream.

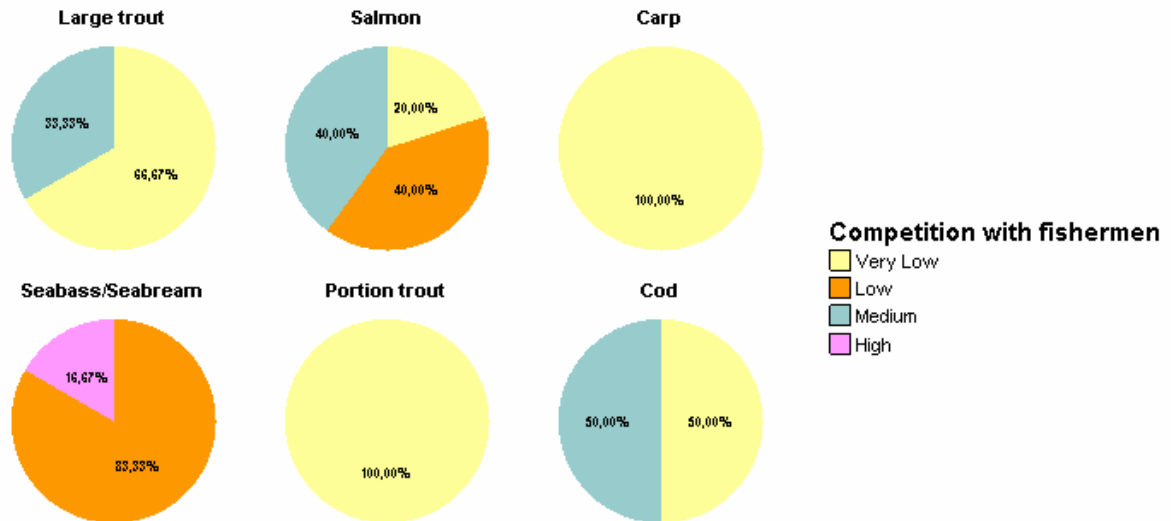


**Competition with other coastal zone users** is important mainly for sea bass – sea bream.

**Competition with tourism** is of high importance only for sea bass-sea bream (50%) while it is only a medium priority for 1 our 5 salmon cases and low or very low priority for everyone else.

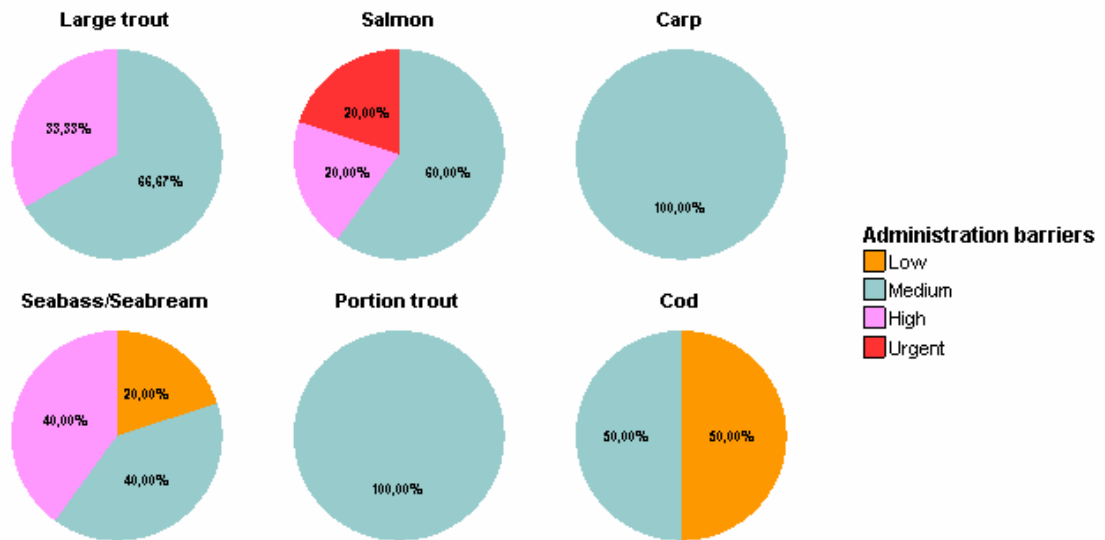


**Competition with fishermen** is of high importance only for a small percentage of sea bass-sea bream cases (17%) while the majority considers this as a low priority area. This is a medium priority for cod (50%), salmon (40%) and large trout (34%).

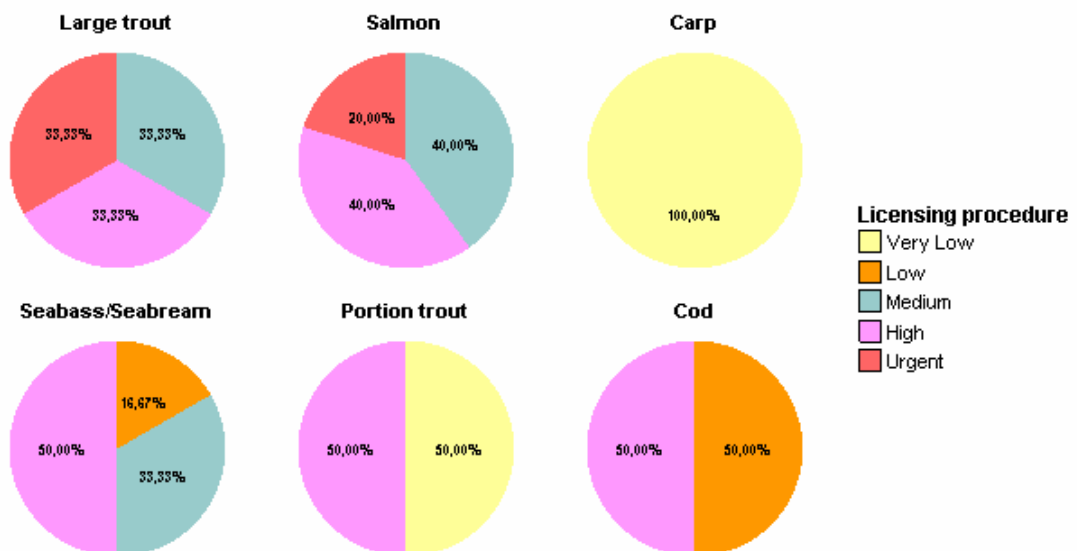


### ADMINISTRATIVE ISSUES

**Administration barriers** represent a medium to urgent priority area for all the European fish farming sector. It was recorded as urgent priority for 20% of the cases of salmon.

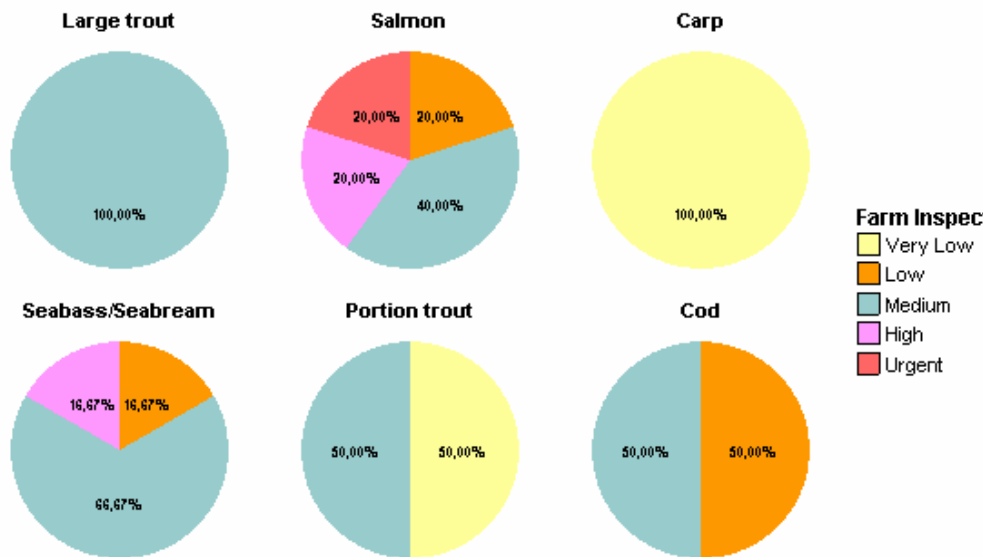


Innovation in **Licensing Procedures** was requested as urgent priority by 34% of large trout and 20% of the salmon producers and was considered of high importance by 50% of the sea bass and sea bream farmers.

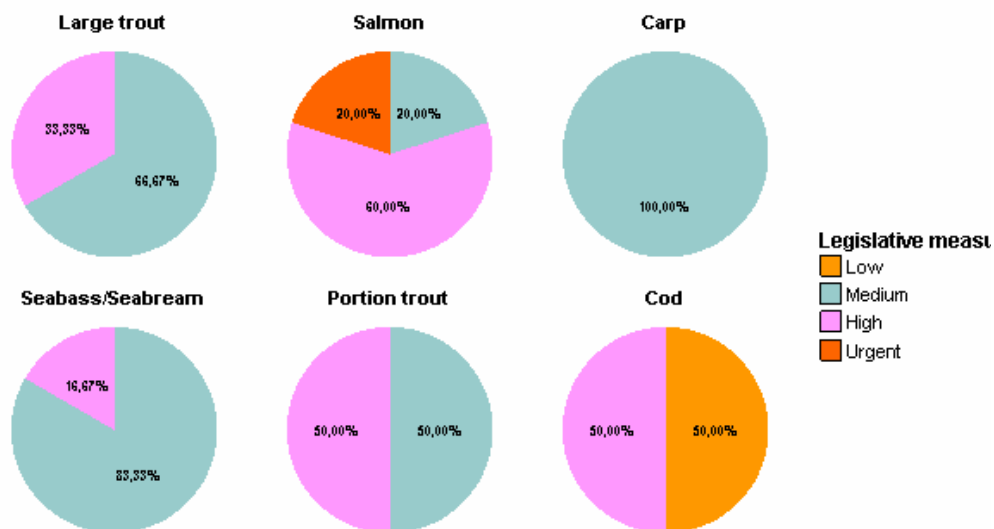


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**Farm inspections and controls** are considered of at least medium priority area by 1of 2 fish farmers for all species except carp. Forty percent of salmon farmers considered this as of high or urgent importance, while 17% of sea bass & sea bream farmers considered farm inspections and controls a high priority.

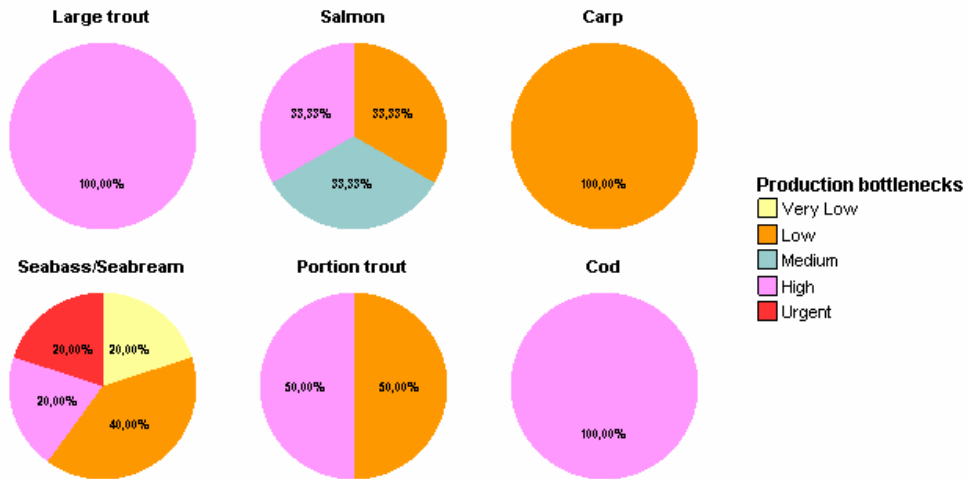


**Legislative measures** are widely considered as a burden for the aquaculture industry. Innovative solutions were requested as an urgent priority by 20% of salmon farmers, while 60% of salmon and 50% of portion trout producers considered the innovation in legislation as high priority.

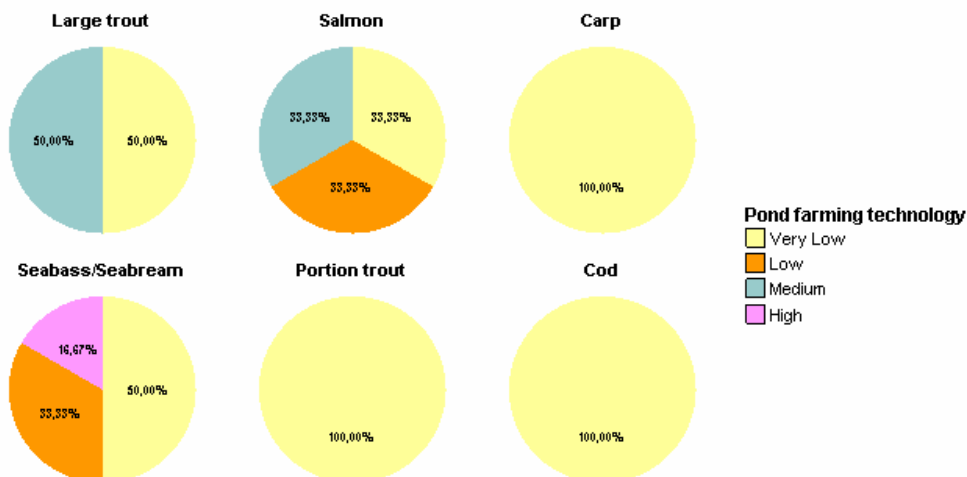


**TECHNICAL ISSUES**

While all the cod and large trout producers consider innovation to overcome **production bottlenecks** as high priority, only 50% of the portion trout producers, 33% of salmon and 20% of sea bass and sea bream producers agree with this. However a confused picture is recorded in the sea bass and sea bream producers response ranking production bottlenecks from urgent to very low priority, probably reflecting low requirements for sea bass and sea bream and higher for new species.

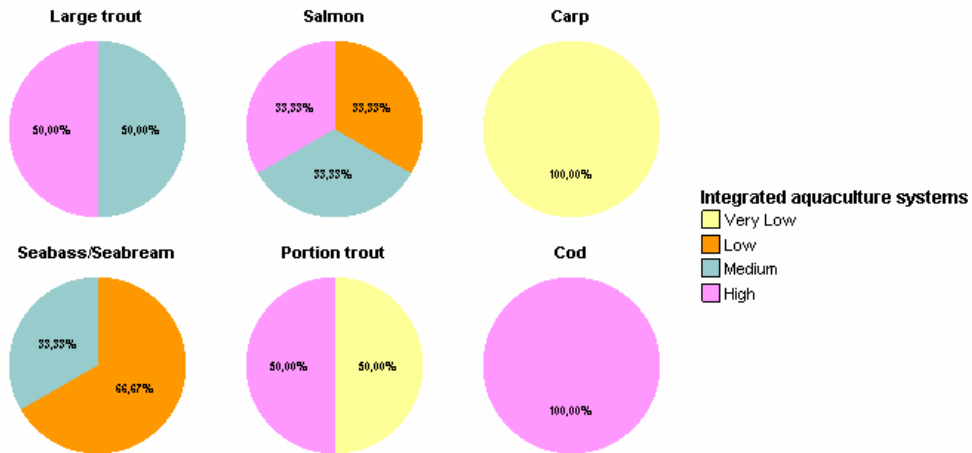


All, except a small percentage (17%) of Sea bass / Sea bream, rated **Pond farming technology** as a low or medium priority.

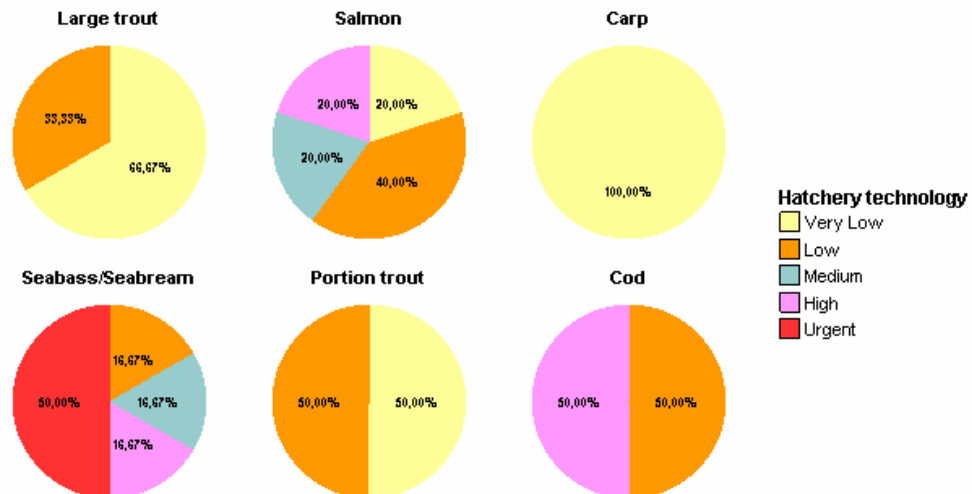


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**Integrated systems** are very important for all cod producers but also to salmon, large trout and portion trout producers not affecting the majority of sea bass and sea bream producers and all the carp producers.

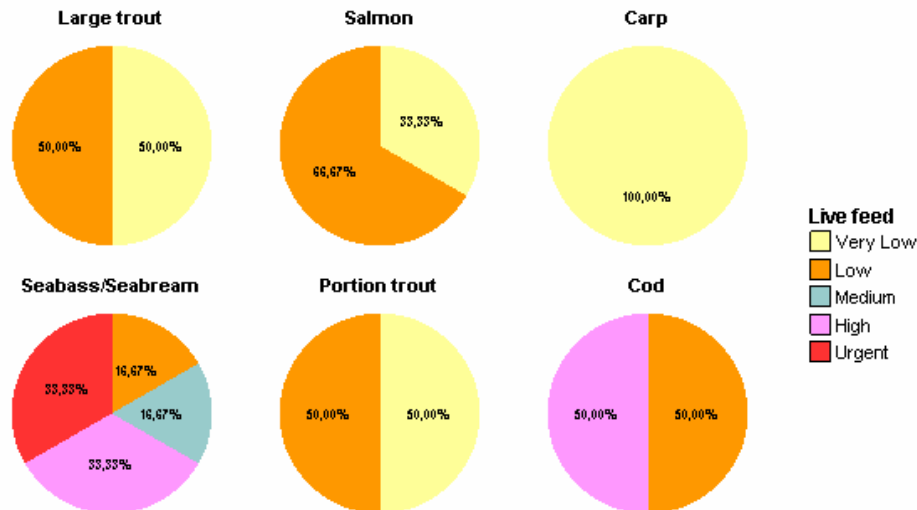


Innovation in **hatchery technology** was considered an urgent priority for 50% of the sea bass and sea bream producers referring mainly to optimization needs. As expected this area was considered a high priority for 50% of the cod farmers and to a lesser extent (20%) by the salmon farmers.

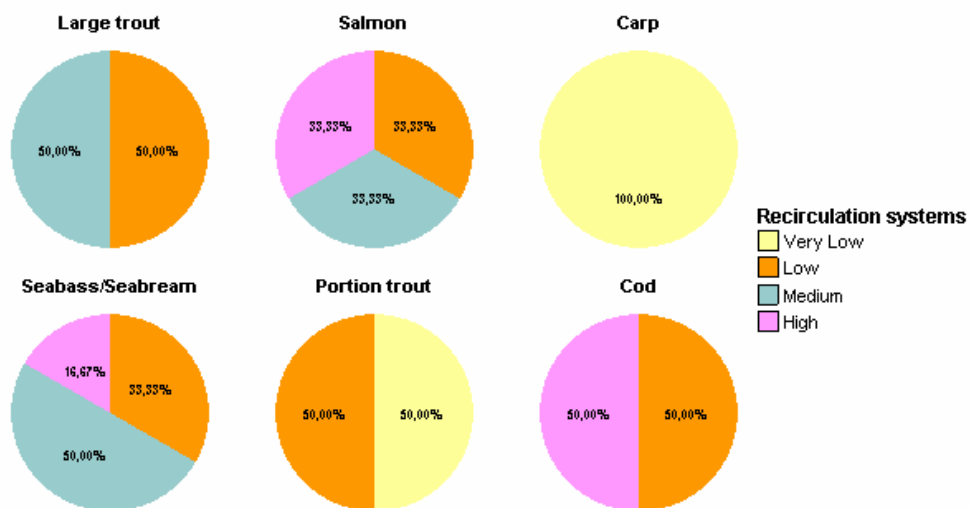


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**Live feed** is a top priority for sea bass and sea bream producers (34% urgent and 34% high priority) but also is very important for new marine species like cod (high priority for 50% of the producers). This area as expected does not represent any priority for salmonidae and cyprinidae due to basic biological needs of the species.

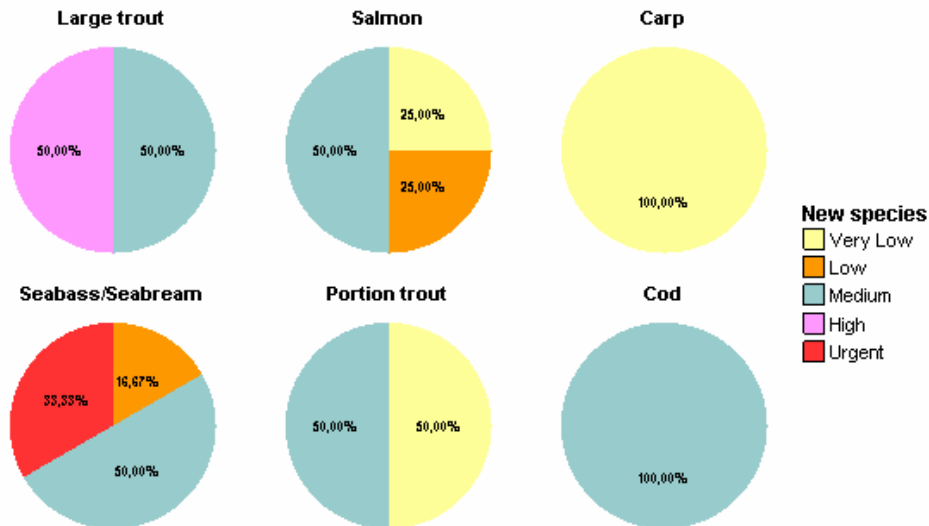


**Recirculation systems** especially in nurseries referred mainly as at least medium priority to the majority of the marine species culture. Furthermore this area was considered a high priority by 50% of the cod, 34% of the salmon and only 17% of the sea bass and sea bream producers.

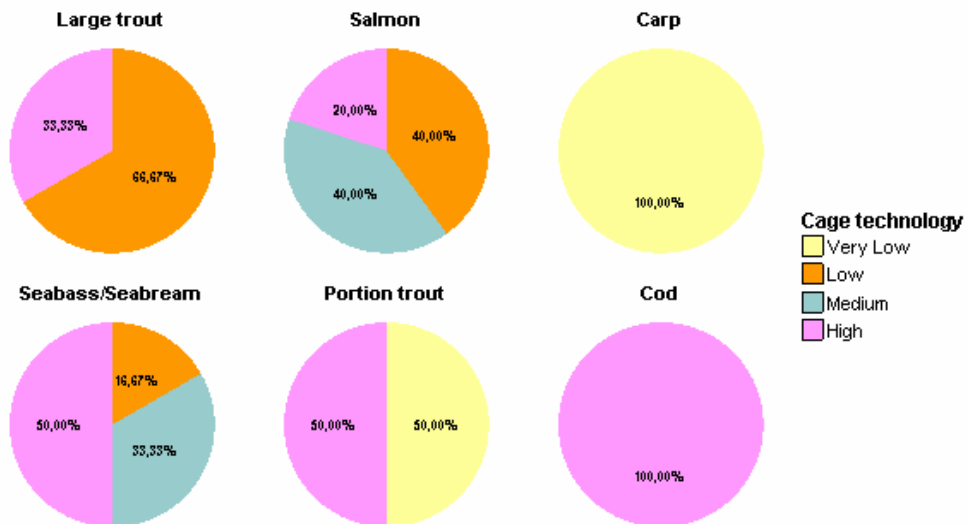


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**New species** are considered as an urgent priority by 34% of the sea bass and sea bream producers that would like to diversify their production, but they are also considered a high priority for 50% of the large trout producers that also evaluate innovative solutions in this area.

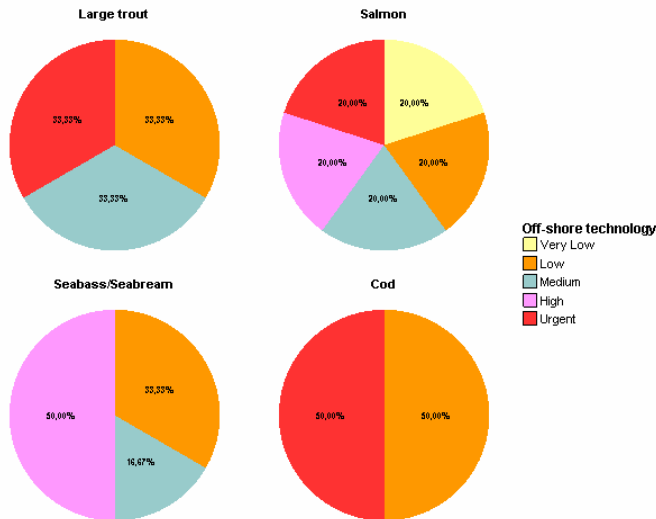


**Cage technology** is considered very important for all cod farmers and high priority for at least 50% of the sea bass and sea bream producers, and to a lesser extent for large trout (34%) and salmon (20%) producers.

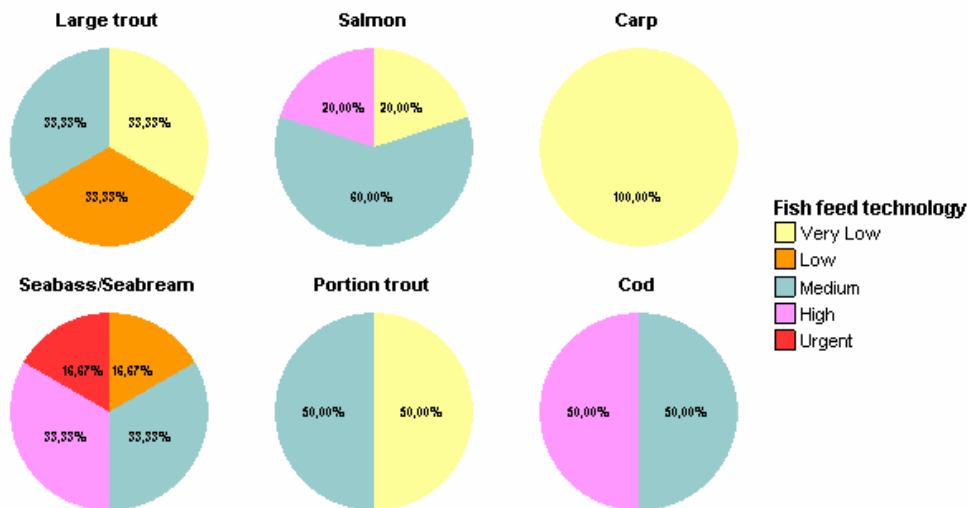


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**Off shore technology** is considered as urgent priority especially in cod farming (50%) but also in large trout (34%) and salmon farming (20%). This technology is considered of high importance by 50% of sea bass and sea bream producers. However salmon producers are totally divided as far as to the importance of this technology for the future of aquaculture.

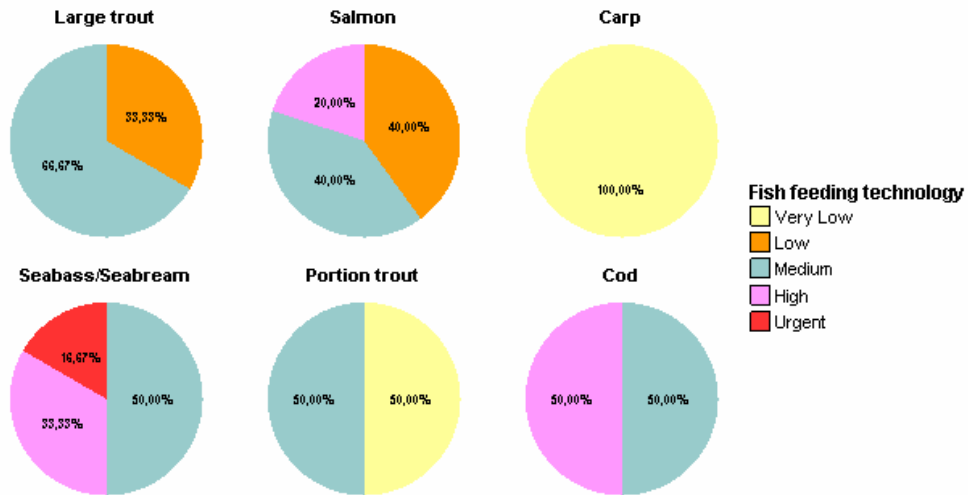


**Fish feed technology** is considered as very important area for sea bass and sea bream producers (17% urgent and 34% high priority) but also for cod (50% high priority) and salmon producers (20% high priority).



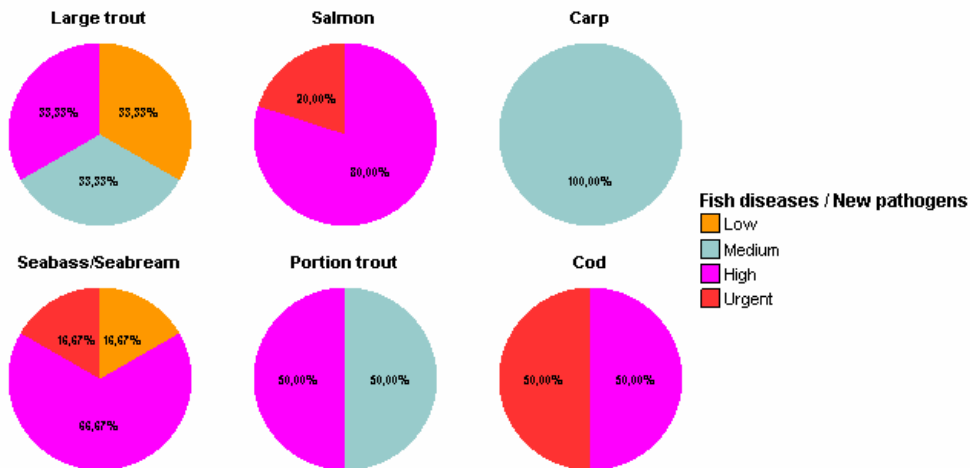
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**Fish feeding Technology** is ranked in similar way like the fish feed technology. The biggest innovation gap is identified in sea bass and sea bream producers and to a lesser extent in cod and salmon farming.

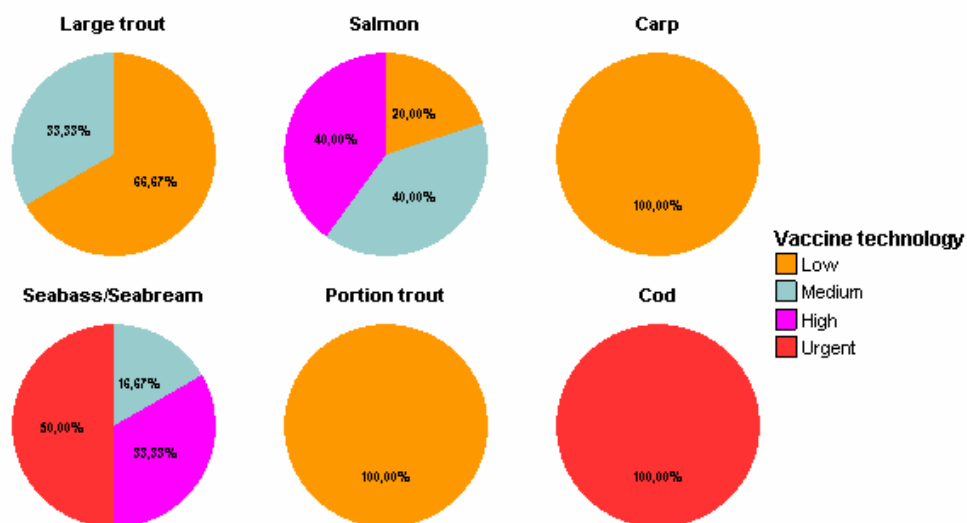


### FISH HEALTH MANAGEMENT

**Fish diseases and fish pathogens** represent a crucial area for innovation for cod and salmon (100% high and urgent priority) as well as in sea bass and sea bream (83% high and urgent priority) and to a lesser extent to portion trout and large trout producers.

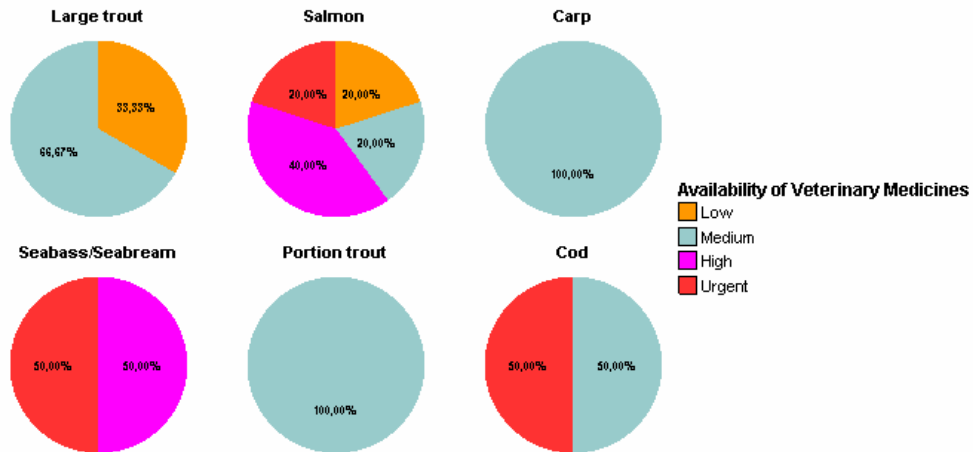


Innovative solutions in **vaccine technology** are urgently required in cod farming (100%) and sea bass and sea bream (50%) and also represent a high priority for 40% of the salmon producers and 33% of the sea bass and sea bream producers. It seems in general that vaccination technology is either poorly accepted or undervalued in trout and especially in carp farming. This strange input for trout farming could be explained by the data origin (Iceland & Czech Republic) because vaccines are routinely applied in trout producing countries (UK, Denmark and Italy).



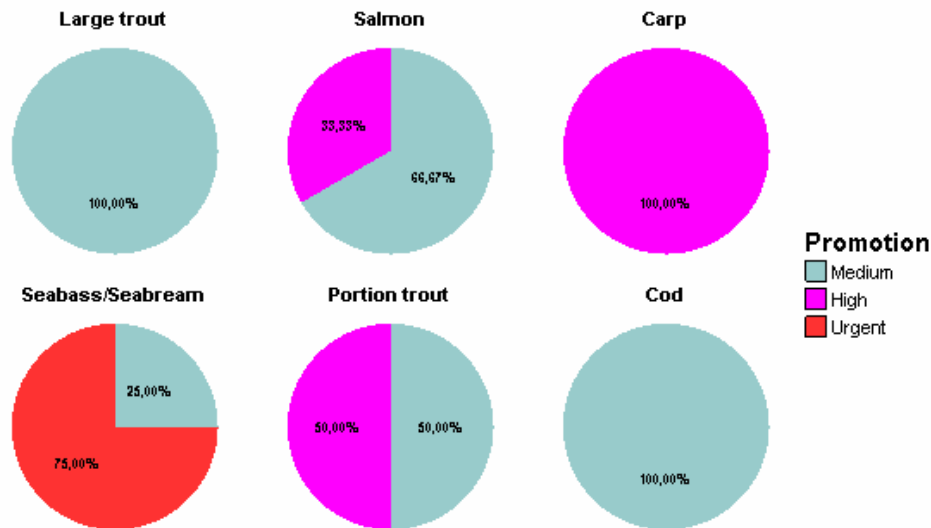
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The **Availability of Veterinary medicines** represents at least a medium priority for the whole sector. It represents an extremely important issue for sea bass and sea bream producers (50% urgent and 50% high priority), but also for cod (50% urgent priority) and salmon farming (20% urgent and 40% high priority).

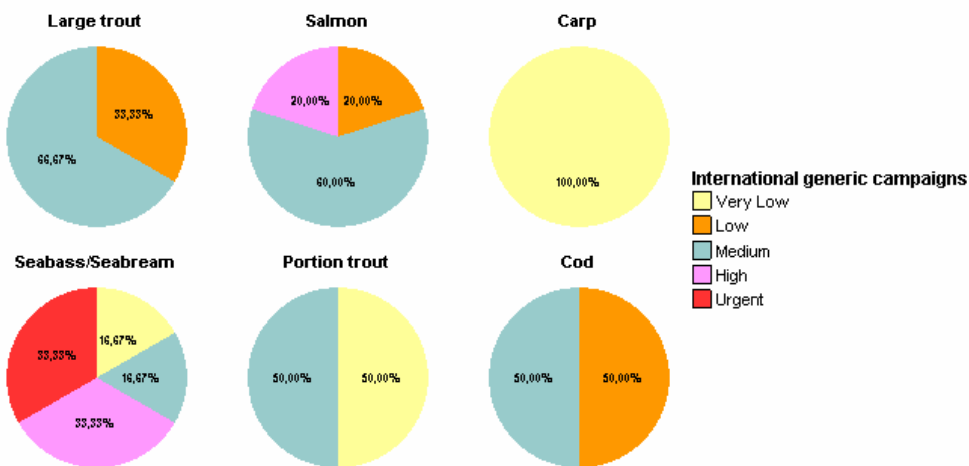


**MARKETING and TRADE ISSUES**

**Promotion** represents an urgent priority for the great majority (75%) of sea bass and sea bream producers while it is also a high priority for all carp producers and the 50% and 33% of Portion trout and Salmon producers respectively.

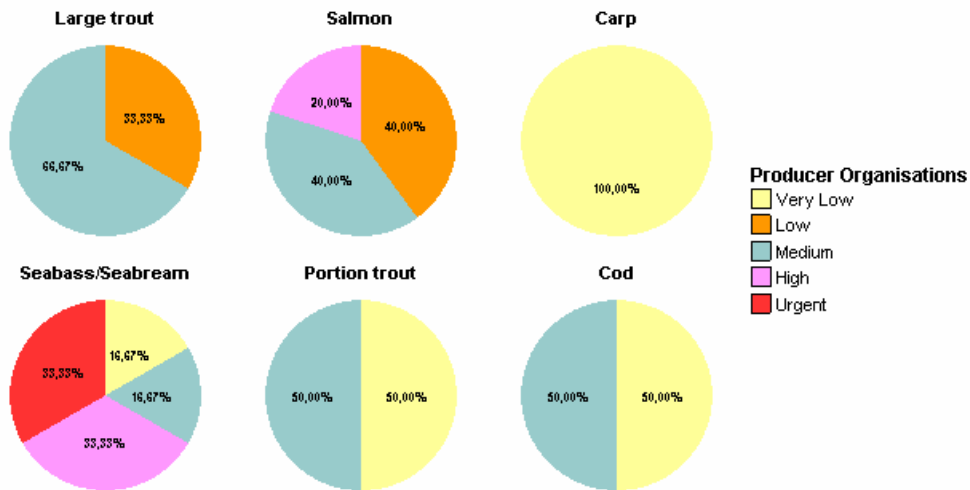


While **International generic campaigns** are considered an urgent and/or a high priority by the majority (67%) of sea bass and sea bream producers and 20% of Salmon producers for all the rest it is considered a medium to low priority.

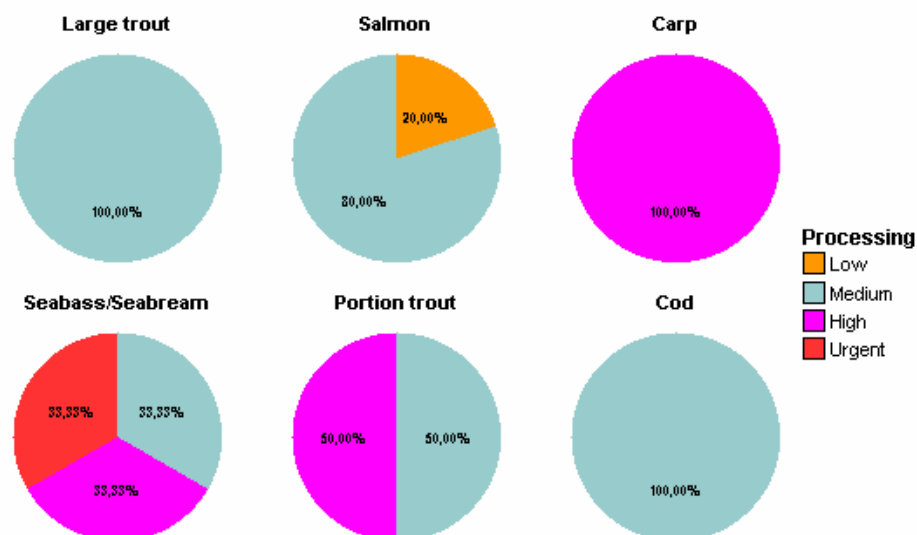


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Likewise **Producers Organisations** are considered an urgent or a high priority by the majority (67%) of sea bass and sea bream producers and 20% of Salmon producers for all the rest it is considered a medium to low priority.

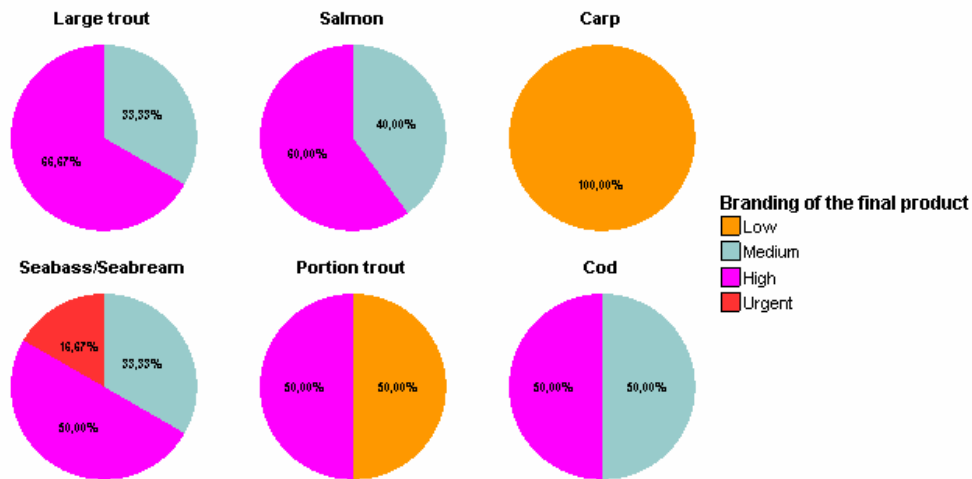


The **processing** of the final product seems to be considered an urgent or a high priority by the majority (67%) of sea bass and sea bream producers, high priority for all carp and 50% of Portion trout producers, while it is mainly a medium priority for the rest probably because in those sectors filleting and processing is already established and it does not represent an innovation area.

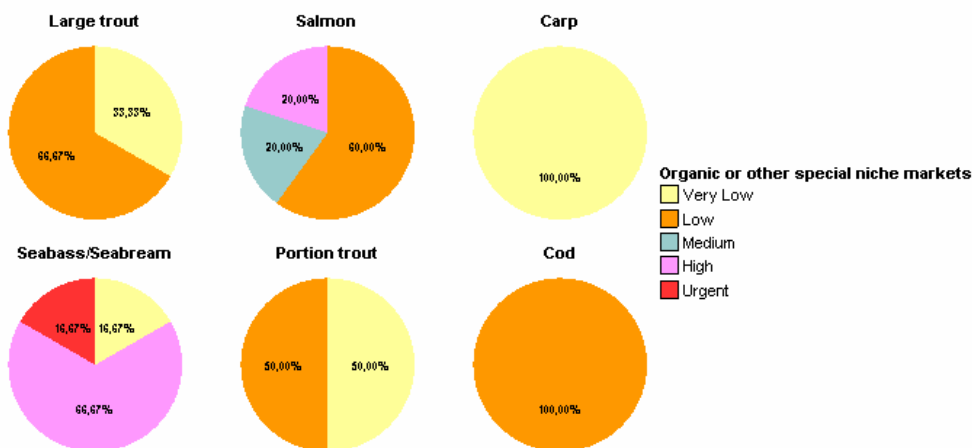


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The **Branding of the final product** is a high priority for the majority of all sectors except for the Carp producers due to the employment of traditional local and regional market outlets

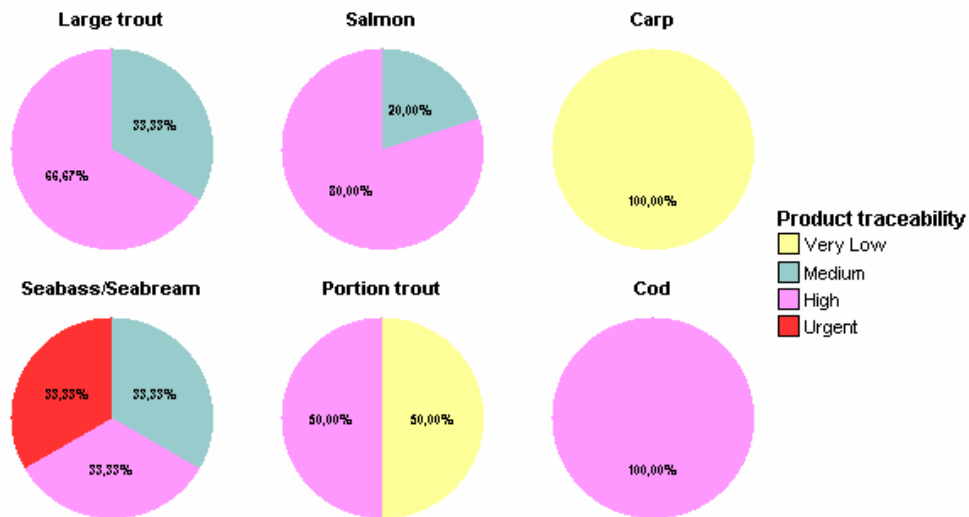


The opening to **Organic or other special niche markets** is only considered an urgent or a high priority by the majority (83%) of sea bass and sea bream producers, indicating the urgent need of the sector to diversify its product, and for only 20% of Salmon producers since those markets have been explored in the past. For all the rest it is considered a low or very low priority and especially for Carp all considered it very low priority since this product’s farming conditions (extensive pond farming) are the nearest alternative to organic aquaculture.

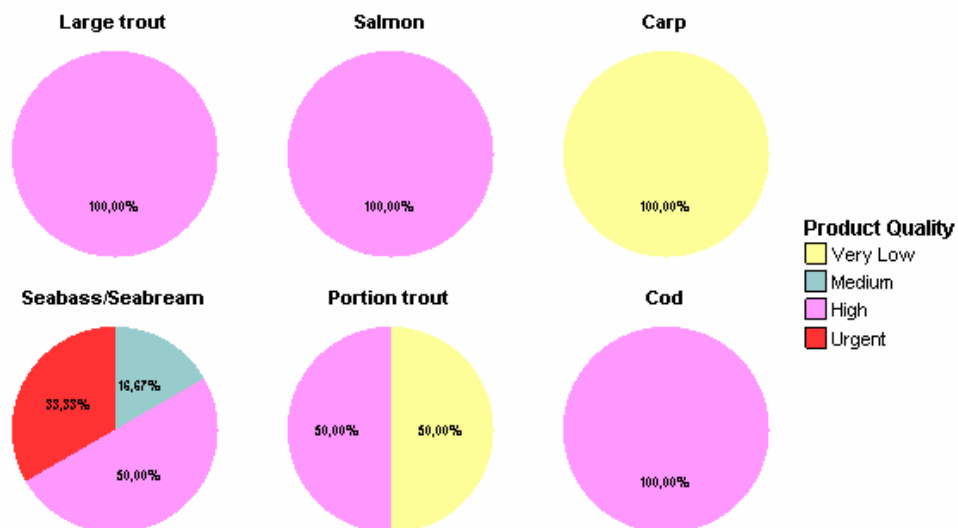


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**Product traceability** represented a high priority by the majority of all sectors except for the Carp producers, where it was rated as a very low priority by all producers because they do not market their products through big super market chains preferring more traditional market outlets.

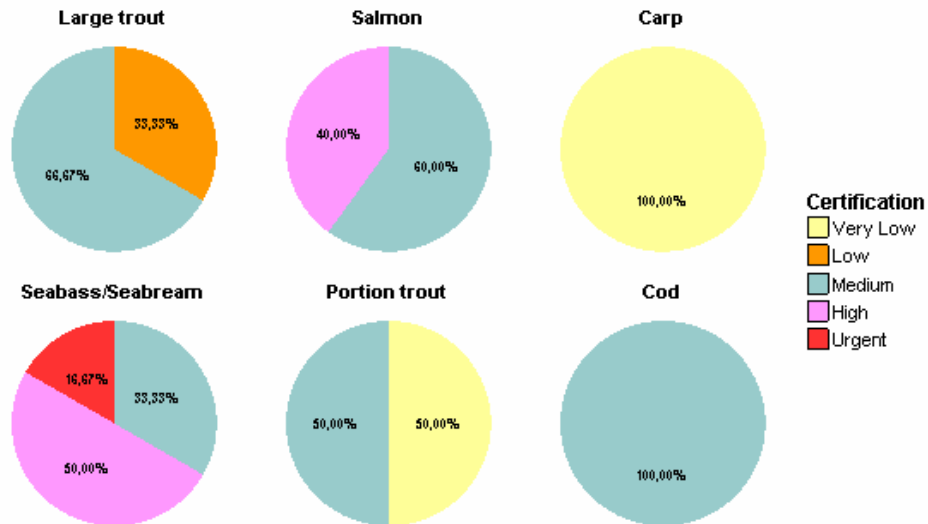


Again **Product Quality** represents a high priority by the majority of all sectors with 33% of Sea bass and Sea bream producers rating it as an urgent priority, except for the Carp producers where it is rated as a very low priority by all due to their confidence in the natural farming conditions.

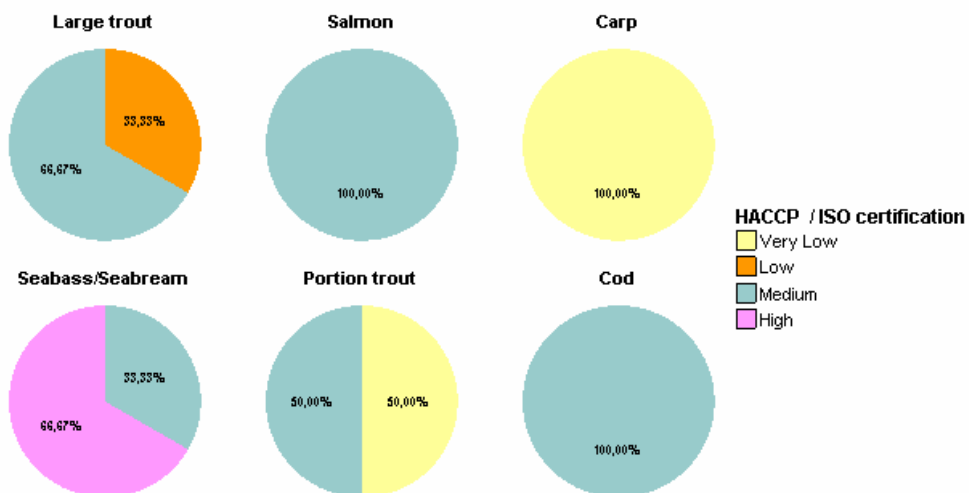


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The **certification** of the final product is considered an urgent or a high priority by the majority (67%) of sea bass and sea bream producers, while it is mainly a medium priority for all the rest except Carp.

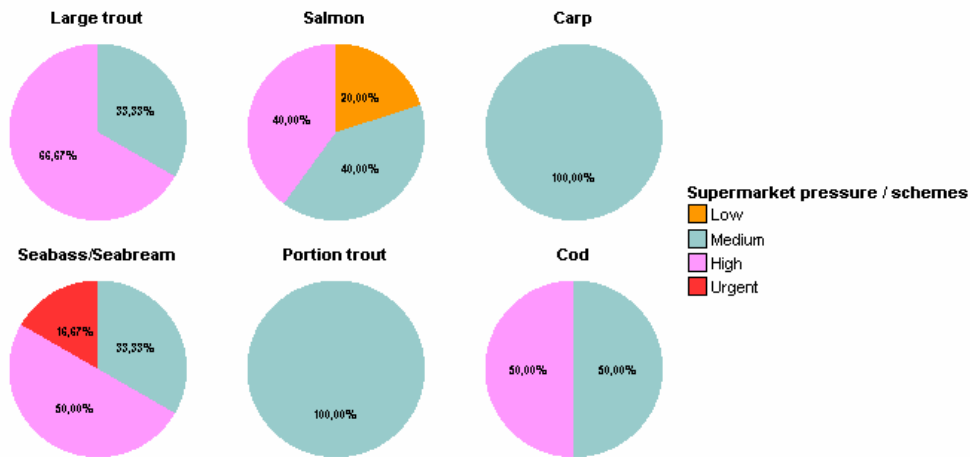


The **HACCP / ISO certification** of the final product is considered a high priority by the majority (67%) of sea bass and sea bream producers only, while it is mainly a medium priority for all the rest (since the majority is already certified) except for Carp producer and 50% of the portion trout producers were it is a very low priority.

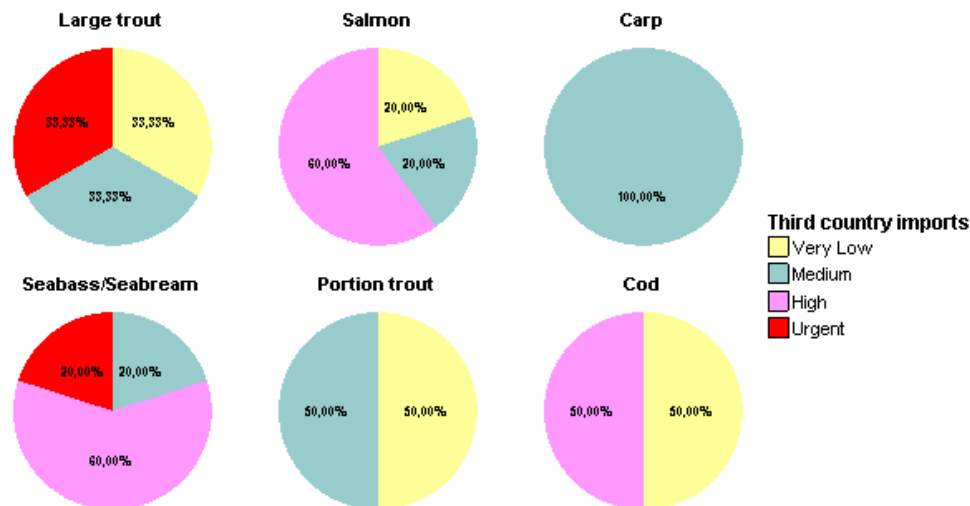


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**Supermarket schemes and market pressure** represent a high priority by the majority of all sectors except for the Carp and Portion trout producers, where it was rated as a medium priority by all indicating that the pressure is stronger in more intensive global forms of aquaculture.

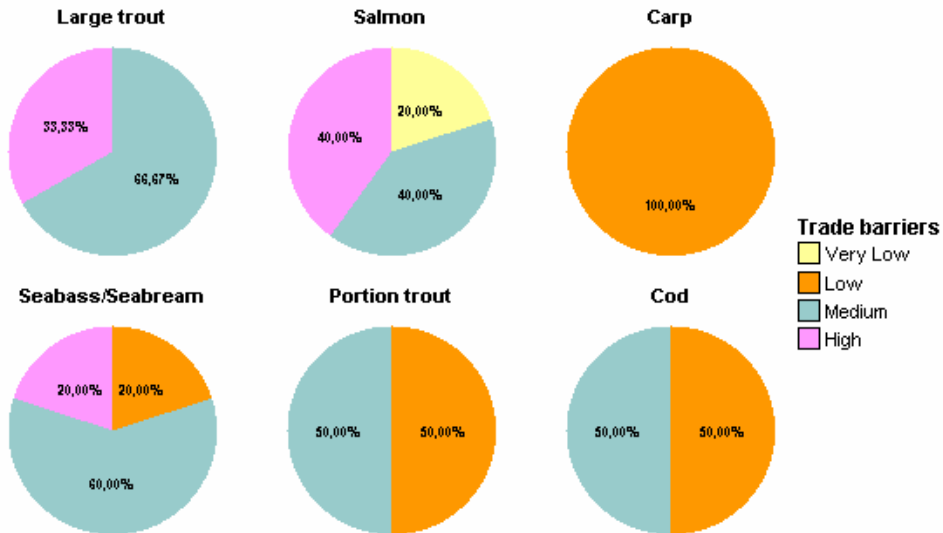


**Third country imports** represented a high or urgent priority by the great majority of Sea bass and Sea bream, Large trout and Salmon producers, since those are global mature industries which are threatened by imports from third countries.



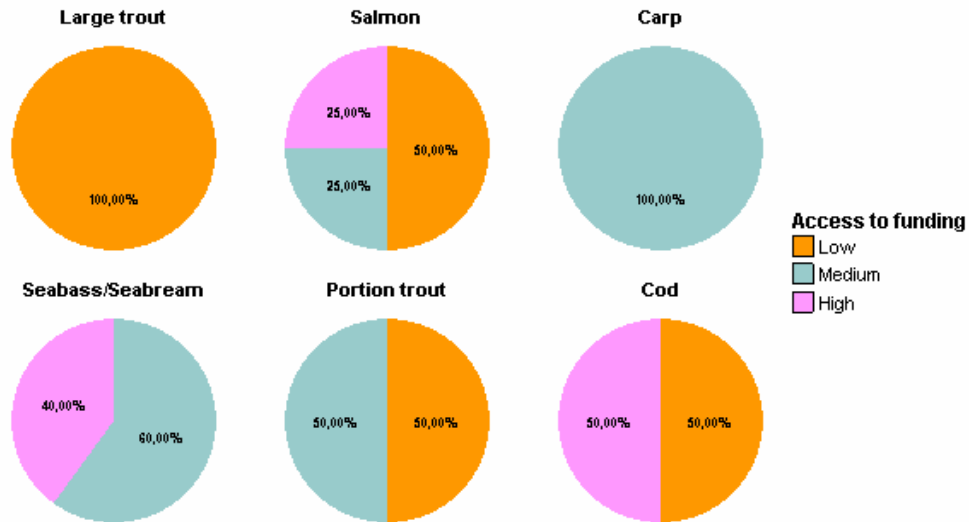
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**Trade barriers** are considered a high priority for the 40% Salmon producers and mainly a medium priority for Large trout and the Sea bass and Sea bream, since those are global and mature industries which are mainly affected by these practices.

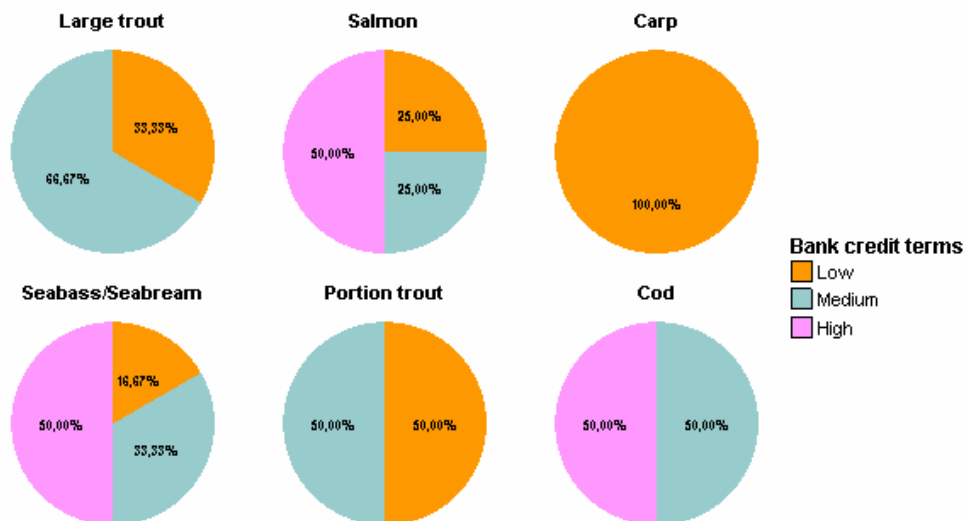


**FINANCIAL ISSUES**

**Access to funding** is considered an important issue of high priority for cod (50%), sea bass and sea bream (40%) as well as for salmon (25%) producers.

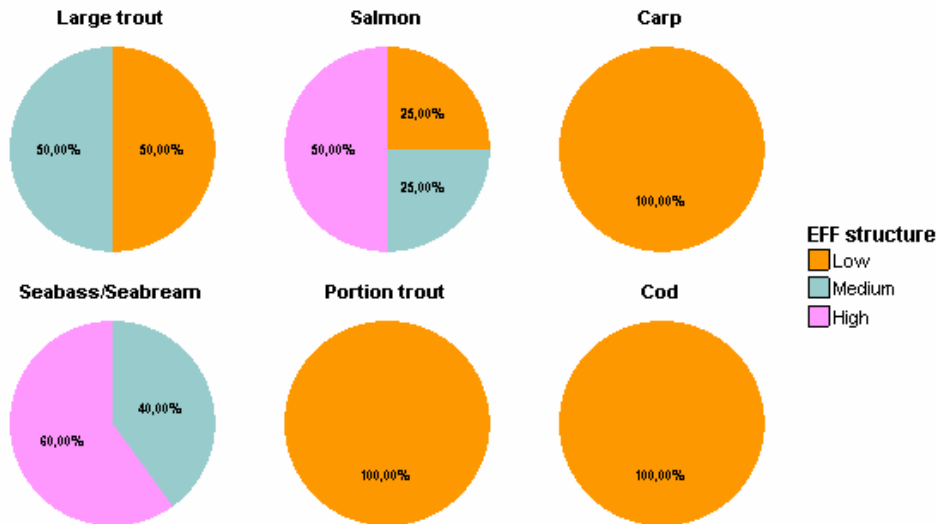


**Bank credit terms** are equally considered high priority area (50%) for salmon, sea bass / sea bream and cod producers.

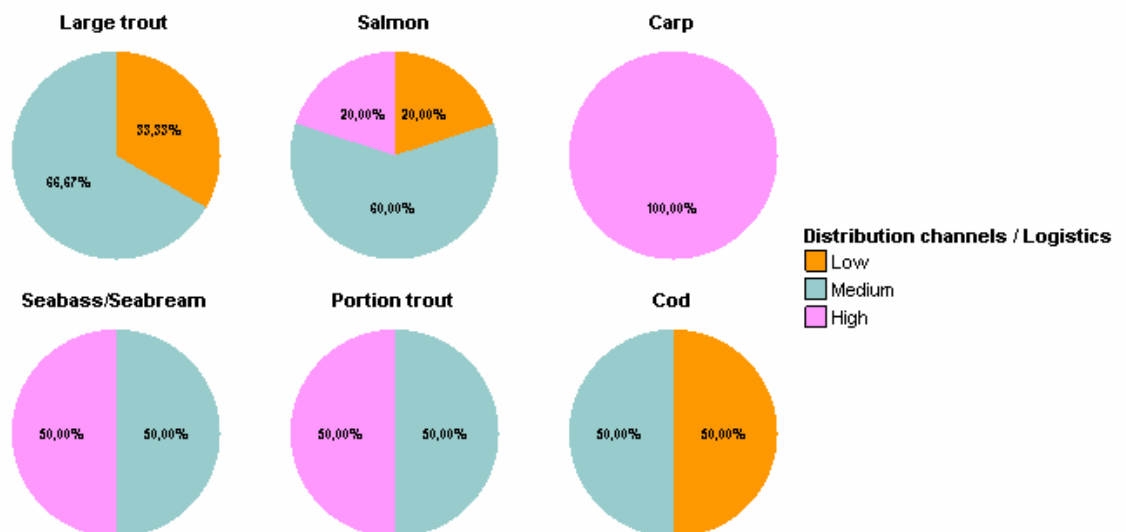


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**EFF structure** is a high priority only for the majority of Sea bass - Sea bream and Salmon producers (60% and 50% respectively).

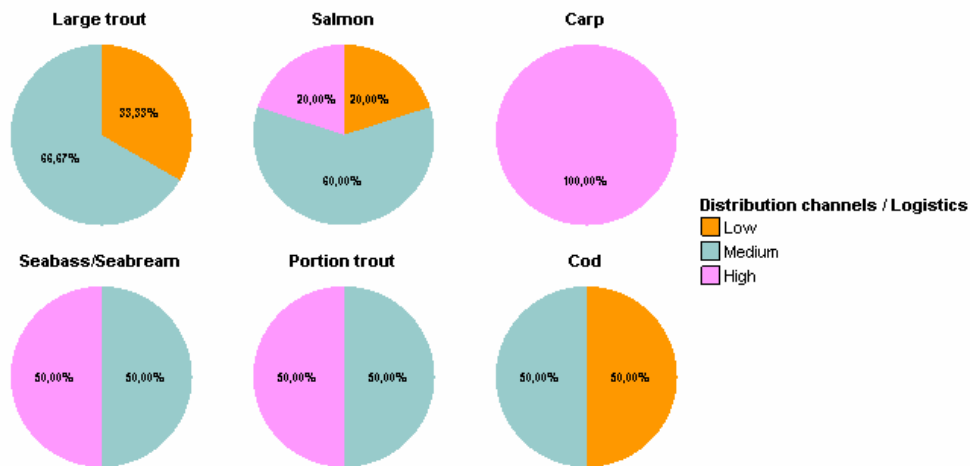


**Insurance coverage** is high priority for 67% of the sea bass and sea bream producers and for 20% of the salmon producers. It is considered as low and medium priority for the rest of the sectors.

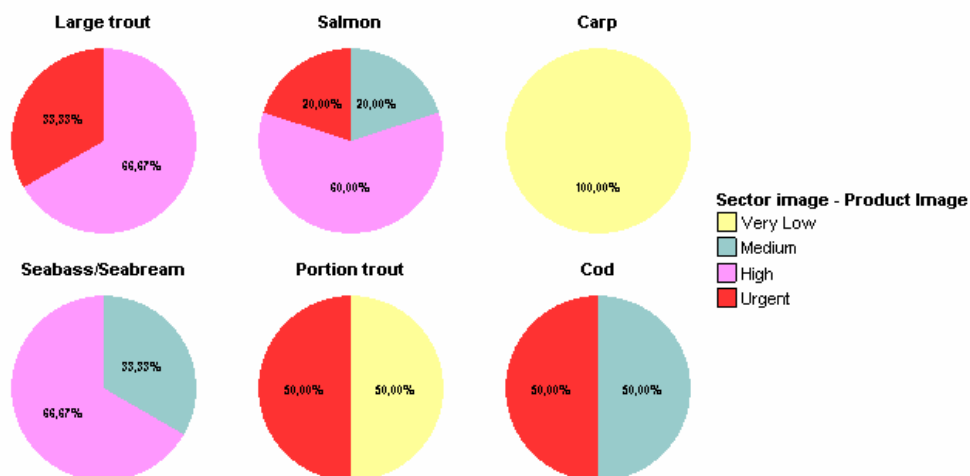


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**Distribution channels and Logistics issues** are considered high priority for all the carp producers and 50% of the Sea bass and sea bream as well as of the portion trout producers. On the other side this area is high priority only for 20% of the salmon producers while is considered a low and medium priority for the large trout producers indicating that the distribution channels are already set for those sectors.

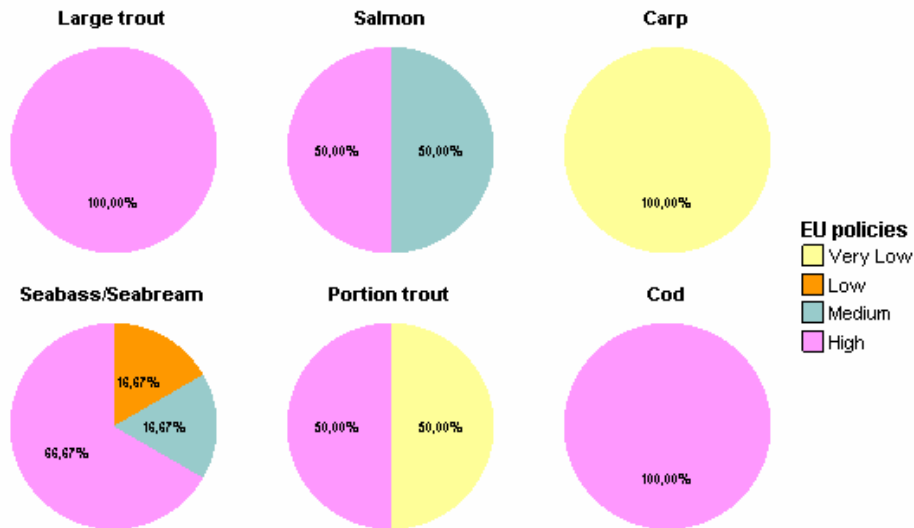


The **sector image** and the **product image** is a high or urgent priority for the majority of all sectors except for the carp, where it is a very low priority for all since their product’s image is good.

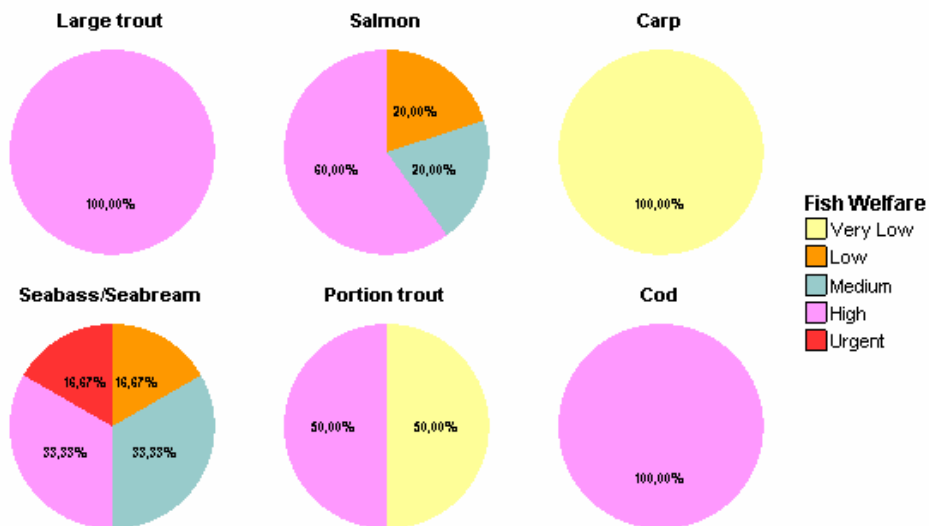


**EU POLICIES**

The **EU Policies** are rated as of high importance from all Cod and Large trout producers and the majority of Sea bass / Sea bream (67%) and Salmon and Portion trout (50%), while it is a very low priority for Carp producers.

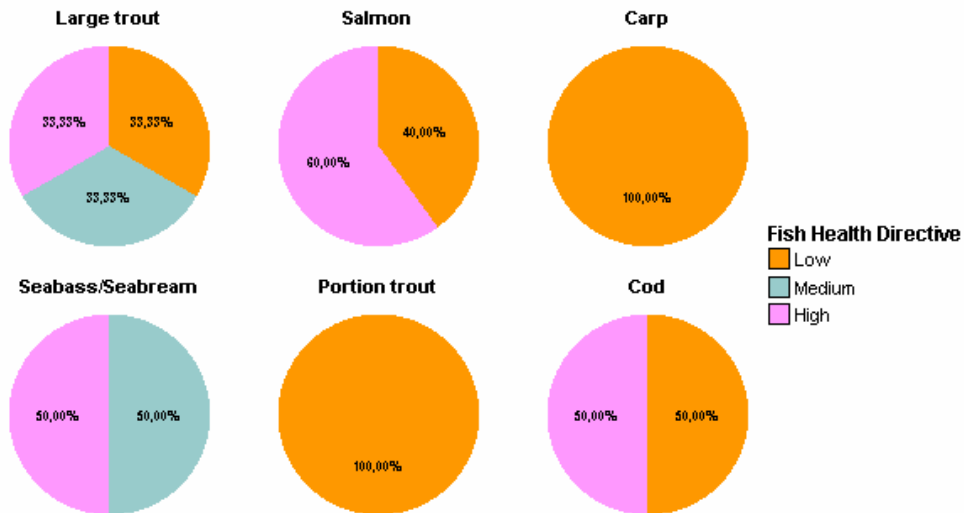


**Fish welfare** is a high priority for the majority of all sectors except carp, since for them it is not an issue since it is not any handling involved.

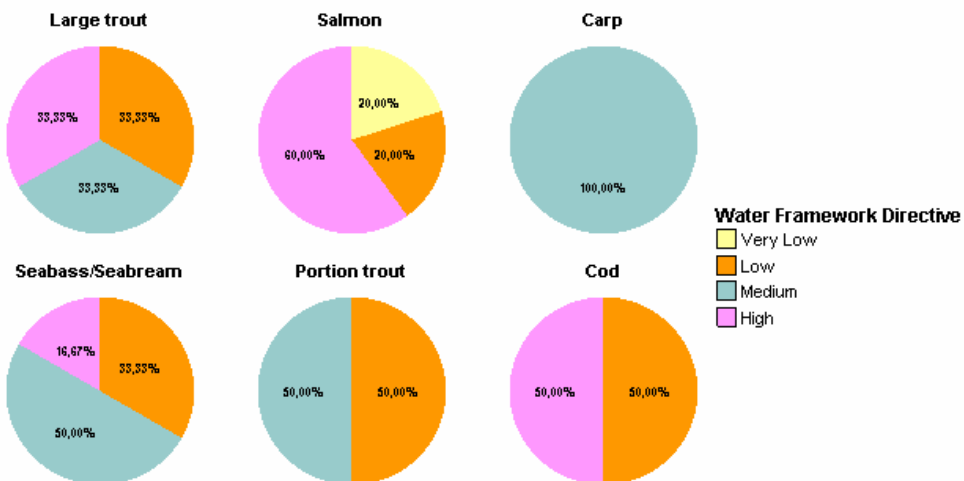


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**Fish Health Directive** is a high priority for the majority of Salmon (60%) and Sea bass / Sea bream and Cod producers (50%).

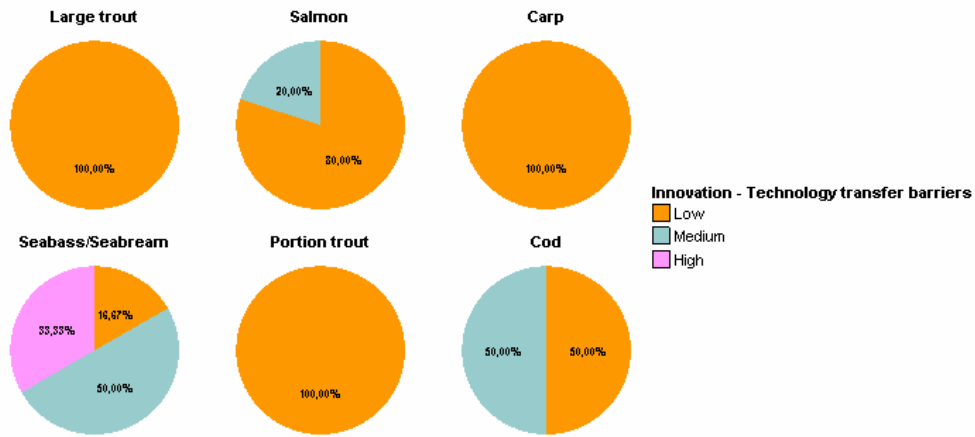


The **Water Framework Directive** is mainly affecting Salmon (60%) and Cod (50%) producers but is high priority for 34% of large trout and 17% of the sea bass and sea bream producers.

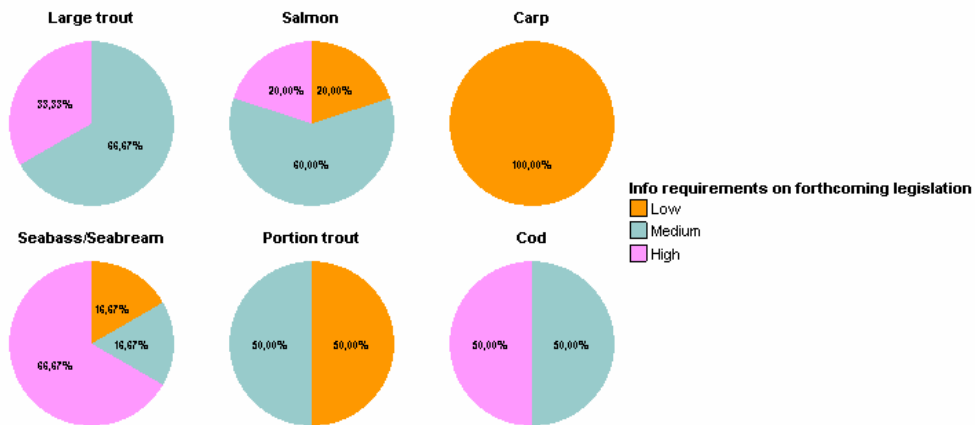


**TECHNOLOGY & INFORMATION TRANSFER**

**Innovation – Technology transfer barriers** seems to be a low to medium priority for all sectors, only 33% of Sea bass / Sea bream producers rate it as a high priority.

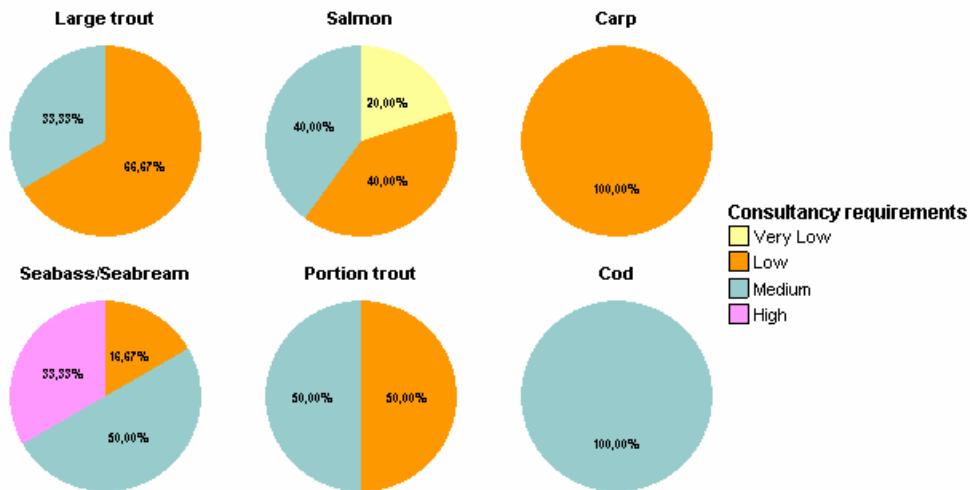


Sea bass / Sea bream (67%) and Cod (50%) growers rate **Information requirements on forthcoming legislation** as a high priority.

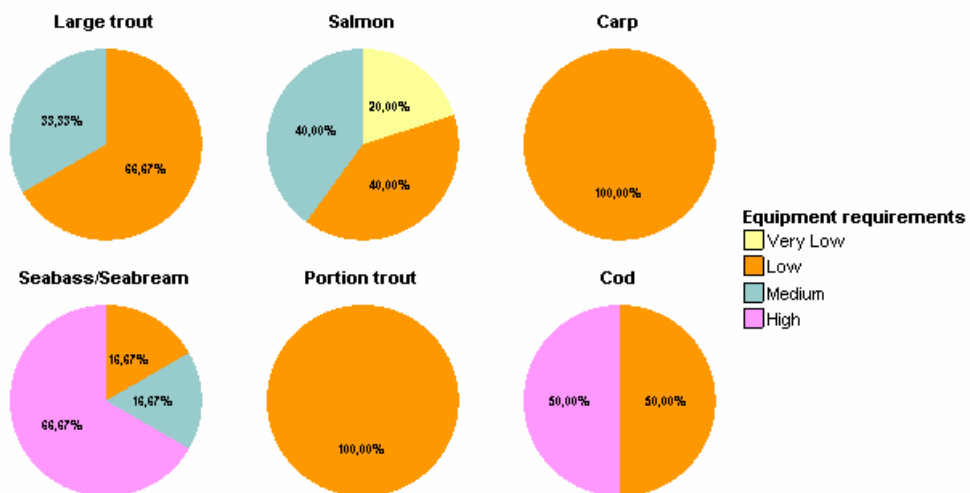


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**Consultancy requirements** are a medium to low priority for the entire sector, while only 33% of Sea bass / Sea bream producers rate it as a high priority.

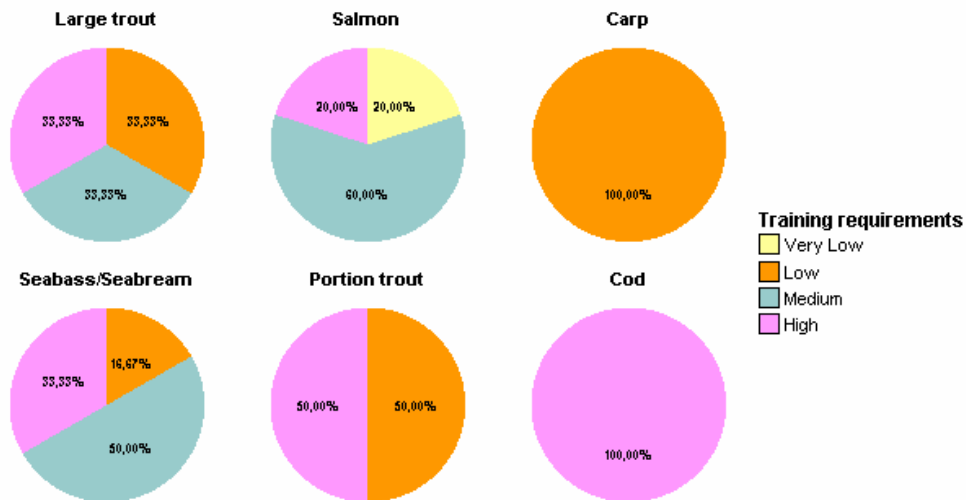


The majority of Sea bass / Sea bream (67%) and Cod (50%) rate **Equipment requirements** as a high priority, for all the others are a low to medium priority.

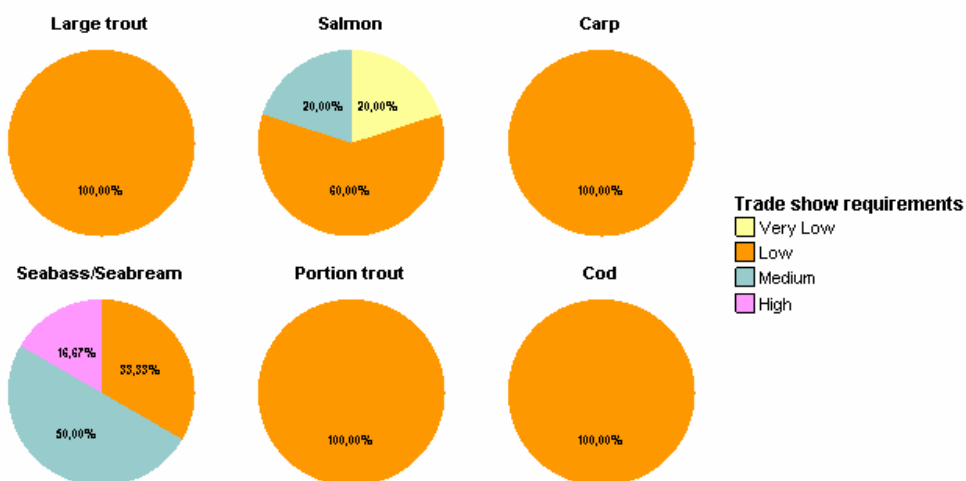


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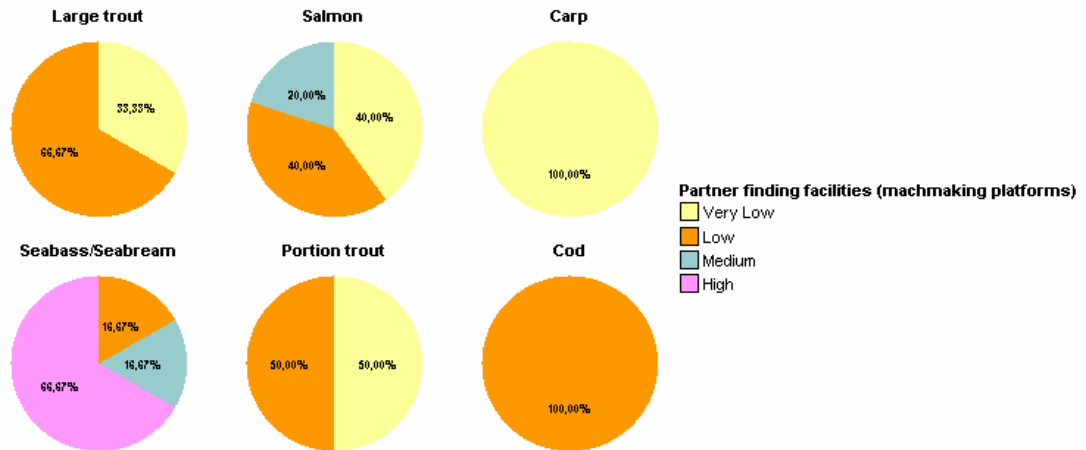
All the cod farmers rate **training** as a high priority while training is very important for 50% of the portion trout producers, 37% of the large trout and the sea bass and sea bream producers and only for 20% of the salmon producers. Carp farmers consider training a low priority.



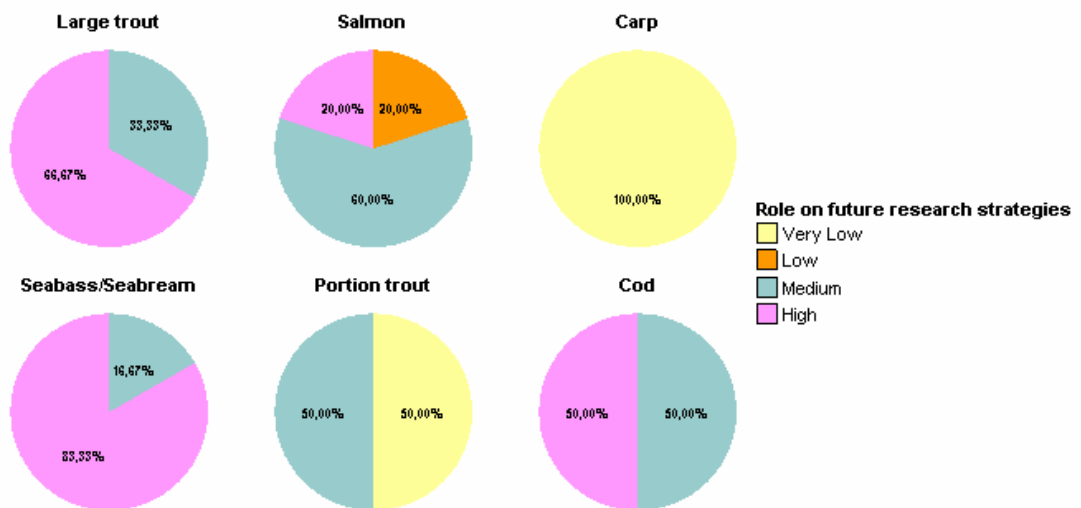
Trade show saturation in the aquaculture sector is quite evident, with all the cod, portion trout, large trout, carp farmers and the majority (60%) of the salmon farmers agreeing that trade shows are low priority. For 77% of sea bass - sea bream farmers on the other hand is a medium or high priority.



**Partner finding facilities (matchmaking platforms)** seems to be important only for sea bass - sea bream farmers, where the majority (67%) rated it as a high priority whereas for the rest is a low to very low priority.

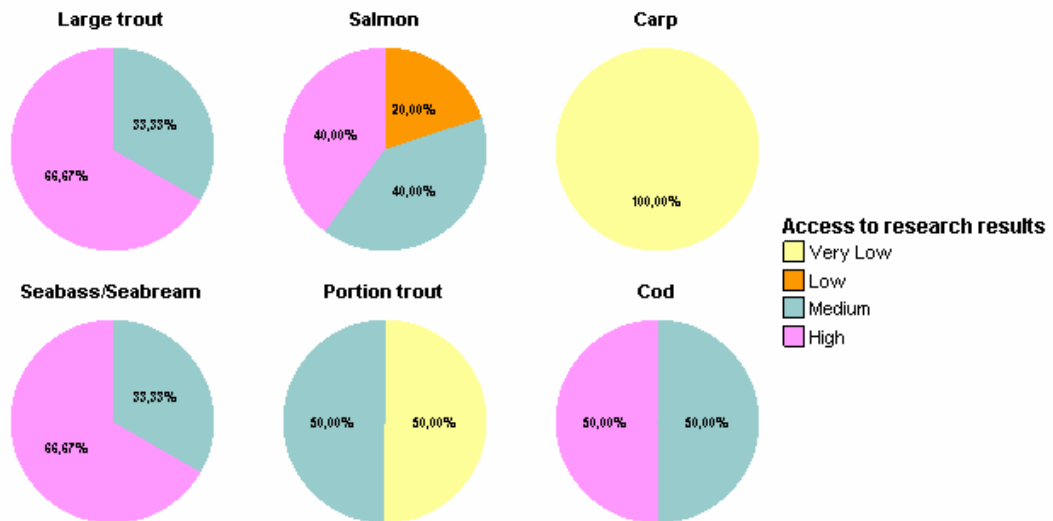


For the majority of sea bass – sea bream (83%), large trout (67%) and cod (50%) producers **future research strategies** are rated as a high priority.

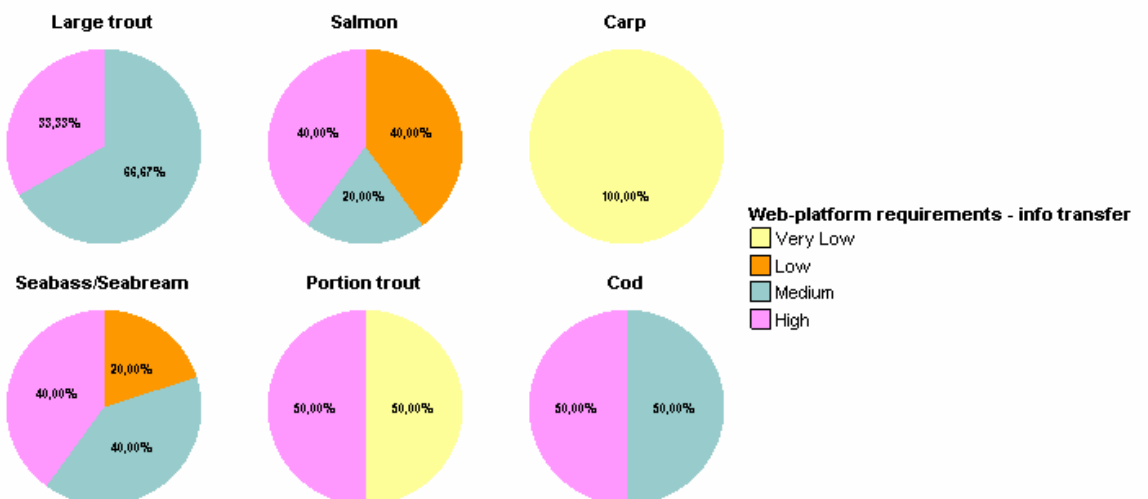


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Similarly, **access to research results** is a high priority for the majority of sea bass – sea bream (67%), large trout (67%) and cod (50%) producers, while it is also important for 40% of salmon producers.



**Web platform requirements** and specific **information transfer** through the web is especially important for the majority (50%) of cod and portion trout producers, while it is also a high priority for 40% of salmon and sea bass – sea bream producers.





## **Conclusions**

Innovation in marketing and trade issues is considered as a paramount requirement by the entire sector. Product quality is very important for Salmon, large trout, cod and sea bass and sea bream producers but Product and sector image is also very important for the large trout producers while product traceability is considered essential for cod and sea bass / sea bream farmers. Finally for the sea bass and sea bream producers Organic and niche markets as well as third country imports are considered significant areas for further consideration.

Technical issues are of major interest for large trout producers (Production bottlenecks) and mainly cod farmers (Production bottlenecks, Integrated Aquaculture Systems, Cage technology).

EU policies especially for fish welfare were considered very important for the sector sustainability by the large trout and cod producers, while technology transfer and especially an urgent need for the sector to finally drive and influence future research was considered essential by the sea bass and sea bream producers.

However the second most important area of interest for all the marine sector except large trout farming following marketing and trade issues is the Fish Health management with Fish diseases / New pathogens to be considered very important in Salmon, cod and sea bass and sea bream culture, innovation in vaccine technology essential for cod and sea bass and sea bream producers and availability of veterinary medicines to be of paramount importance for sea bass and sea bream producers.

In Fresh water aquaculture (Portion trout and Carp) Environmental constraints are considered as a main area that needs urgent attention and innovative solutions, while in carp farming innovation in marketing and trade issues like promotion, processing and distribution channels is considered essential for the sustainability of the sector.

It is quite obvious that different segments of the sector have variable requirements that arise from geographical and species characteristics but also by market structures at a local and international level.

The analysis in this report illustrates mainly the untapped resources seated within FEAP team of experts as well as within Member Associations. Data from the field are extremely important for all relevant companies that are working in or supporting aquaculture industry in Europe as well as on administrators and politicians in order to draft future initiatives.

An annual analysis of these diverse requirements with a larger and more diverse sample in a format of an “AQUATRENDS” report will be able to serve the industry and support the sector’s future sustainability.

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**Acknowledgements**

FEAP would like to thank all Associations and Companies that devoted the time to fill the questionnaire.