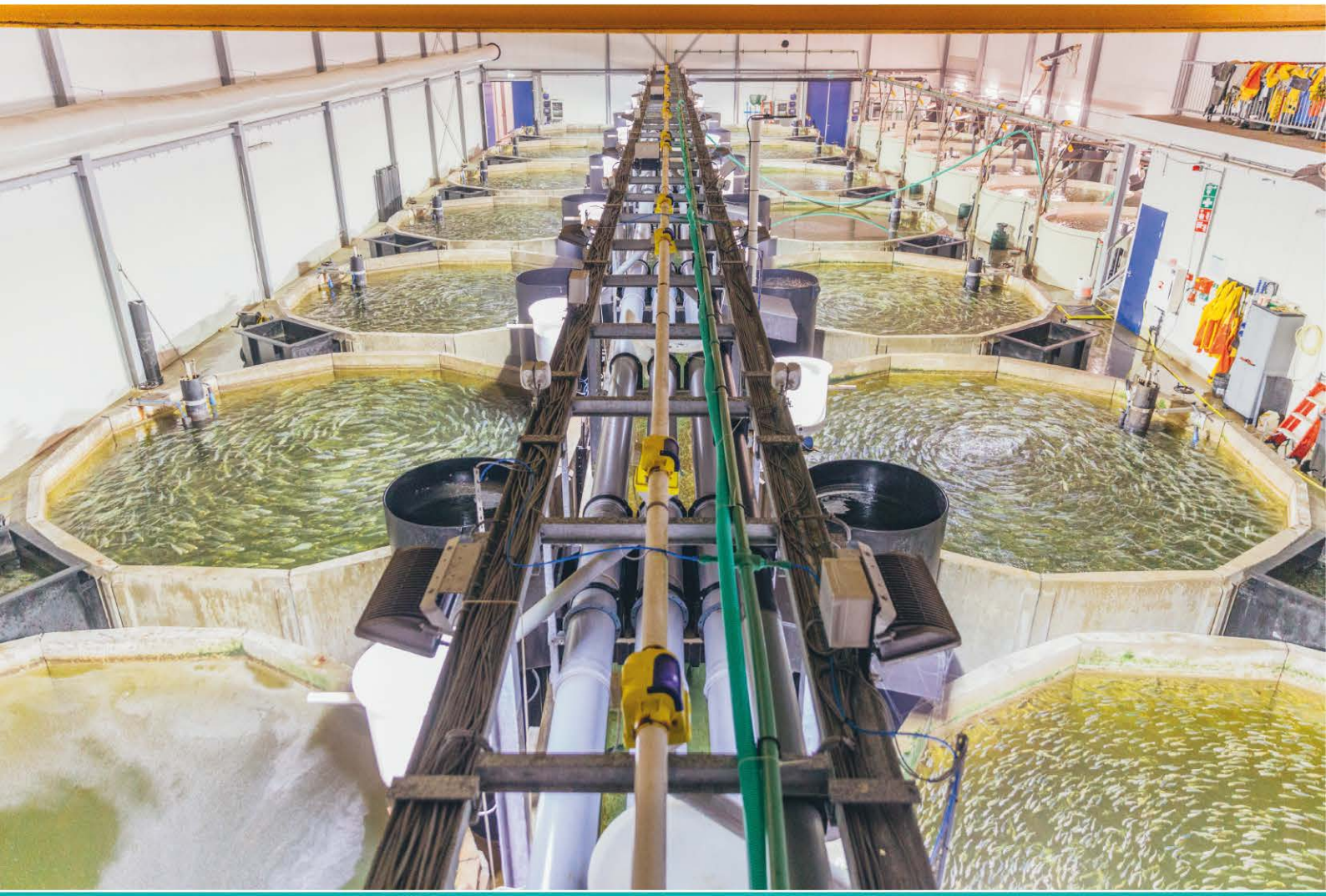
Recirculating Aquaculture Systems (RAS) Module



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Consultation Document

Purpose and Scope of the ASC RAS Module

The aim of this document is to summarise the key environmental and social impacts associated with Recirculating Aquaculture Systems (RAS). RAS farms seeking certification will be certified against the appropriate ASC species standard as well as the ASC RAS module in order to ensure compliance with the ASC vision. The ASC Alignment Project will focus specifically on the impacts of different farming systems. This is thus considered an **interim solution**. The data collected within this interim solution will be fed back into the Alignment Project once available.

Background Information on Recirculating Aquaculture Systems (RAS)

Aquatic organisms can be farmed in open, closed and semi-closed systems. Certification of aquatic products from open and semi-closed systems like sea-cages, ponds or flow-through systems have been the main focus of the ASC standard at the beginning. In recent years the number of recirculating aquaculture systems (RAS) has significantly increased and thus facilitated the need to adapt the ASC standard to incorporate fully closed, highly technical systems.

RAS have been under development for the last forty years with significant improvements especially in terms of water re-use and hence reduced environmental impacts (Timmons and Ebeling, 2007). RAS operate by filtering water in order to reuse it within the same system. It is thus defined as a technology for farming aquatic organisms by reusing the water in the production (Bregnballe, 2015). RAS can be used to farm any aquatic species (fish, crustaceans, bivalves, seaweed) at different levels of intensity. The main resource inputs into RAS are the aquatic species itself, feed, water and electricity/energy. The last two are often used to define different levels of RAS.

One of the main reasons for the development of RAS are the increasing environmental regulations in countries and regions with limited access to both land and water. As water is treated and reused, the overall amount of water needed is significantly lower than for other aquaculture systems. Furthermore, the controlled environment allows for higher stocking densities resulting in lower land use. Different types of recirculation systems are usually defined by their level of recirculation.

Within the ASC RAS Module the definition by Martins et al. (2010) is used to decide whether a farm is defined as RAS or not. Farms defined as Conventional RAS or Innovative RAS according to the definition have to comply with the additional indicators in this document as well as all applicable indicators in the subsequent ASC Standard.

Table 1 Classification of RAS by Martins et al (2010) based on the water exchange per kg feed

Type of System	Water exchange per kg feed
Flow-through	> 50 m^3/ kg feed
Re-use	1 – 50 m^3/ kg feed
Conventional RAS	0.1 – 1 m^3/ kg feed
Innovative RAS/next generation RAS	< 0.1 m^3/ kg feed

RAS Module – Additional Indicators

The following section lists the additional indicators a RAS farm (as defined above) needs to comply to in addition to the species-specific standard, in order to obtain ASC certification. Indicators are taken from existing ASC Standards. The rationale for each indicator as well as additional information can be found within the specific standards.

Requirements related to Water Resource Use (ASC Freshwater Trout Standard Principle 3.1)

Indicator	Requirement
Maximum amount of water that a farm can divert form a natural flowing water body (such as river or stream)	50% of the natural water body's flow immediately above the farm
Amount of diverted water returned to the natural water body	> 90%
All use of underground pumped water has been permitted by the regulatory authorities	Yes
Well depths are tested at least annually and results made publicly available	Yes

Requirements related to Water Discharge (ASC Freshwater Trout Standard Criteria 3.2 and ASC Shrimp Standard Criterion 2.5)

Indicator	Requirement
Maximum total amount of phosphorus released into the aquatic environment* per tonne (t) of fish produced over the previous 12-month period	< 4 kg/t of fish produced *unless specified differently by the species standard*
Minimum oxygen saturation in the outflow, measured continuously (minimum daily)	60%
Macro invertebrate surveys downstream from the farm's effluent discharge demonstrate benthic health that is similar to or better than surveys upstream from the discharge	Yes
Water-quality monitoring matrix completed and submitted to ASC (see Appendix II-B ASC Freshwater Trout Standard v1.2)	Yes
Allowance for discharging saline water to natural freshwater bodies	None

* Farms discharging directly in the sewage system must comply with requirements set by the local authorities and/or treatment plant.

Requirements related to Waste Disposal (ASC Freshwater Trout Standard Criteria 3.2 and ASC Shrimp Standard Criterion 2.5)

Indicator	Requirement
Evidence of implementation of biosolids (sludge) best management practices (BMP)	Yes
Specific conductance or chloride concentration of sediment prior to disposal outside the farm	The specific conductance or chloride concentration values must not exceed those of the soil in the disposal area

Requirements related to Energy Use (ASC Salmon Standard Criterion 4.6 and ASC SSM, TMFF and FF Standards Ind. 4.6.4)

Indicator	Requirement
Presence of records and evidence of all energy consumption on the farm and representing the whole life cycle at sea (as outlines in Appendix V-1 in the ASC Salmon Standard v1.3)	Yes, measured in kilojoule/t fish produced/ production cycle
Records of greenhouse gas (GHG) emissions on farm and evidence of an annual GHG assessment (as outlines in Appendix V-1 in the ASC Salmon Standard v1.3)	Yes
Documentation of GHG emissions of the feed used during the previous production cycle (as outlined in Appendix V-1 ASC Salmon Standard v1.3)	Yes
Evidence of a documented strategy to reduce GHG per unit of production (measured in kilojoule/t fish produced)	Yes, within three years of the initial audit

Species-Specific Requirements for Recording

Species-specific requirements -- especially those linked to the important 'welfare' issue -- are critical especially when it comes to closed, highly technical systems. Since the welfare topic is not yet sufficiently addressed by the ASC standards (*See the ongoing 'Fish Welfare' project*), the gathering and recording of data linked to the indicators below will also potentially enable ASC in the future to set requirements in those areas. This data will be used in the Alignment Project and allow for better informed decisions.

Indicator	Requirement
Minimum stocking density	Records are available
Maximum stocking density	Records are available
Feed Conversion Ratio	Records are available
Protein Retention Efficiency	Records are available
Annual average farm survival rate	Records are available
Handling frequency and methods	Records are available

References

Bregnballe, J., 2015. A Guide to Recirculation Aquaculture, FAO and EUROFISH. https://doi.org/92-5-105177-1

Martins, C.I.M., Eding, E.H., Verdegem, M.C.J., Heinsbroek, L.T.N., Schneider, O., Blancheton, J.P., d'Orbcastel, E.R., Verreth, J.A.J., 2010. New developments in recirculating aquaculture systems in Europe: A perspective on environmental sustainability. Aquac. Eng. 43, 83–93. https://doi.org/10.1016/j.aquaeng.2010.09.002

Timmons, M., Ebeling, J., 2007. Recirculating Aquaculture, 01–007 ed. Cayuga Aqua Ventures, Ithaca.