Chapter 30
Feed and Feeding in Certification Schemes of Sustainable Aquaculture

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Abstract Certification programs for sustainable or responsible aquaculture have been widely developed. In the framework of IUCN project about sustainable feed in aquaculture, we considered the main existing certification schemes for sustainable aquaculture and analysed the present criteria taken into account for aquafeeds and their ingredients. As certification of sustainable aquaculture is a highly dynamic sector, we tried to identify the main trends in the organization of the certification schemes, and in the way the certification of sustainability for feed and raw materials is defined by the main actors. The growing substitution rate in fish feeds of fish meal and fish oil by other raw materials has widened the issue of fish feed sustainability. Therefore, certification of sustainability for aquafeed will increasingly rely on other certification schemes, issued by agriculture and feed mill sectors, where aquaculture has a limited weight. The present situation and the evolution of certification for sustainable aquaculture raise numerous questions, as their weight on small producers, and the need for a better governance for defining and applying sustainability to aquaculture, with a more balanced weight between public and private sectors.

Keywords Certification · Aquaculture · Feed · Sustainability

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30.1 Introduction: The Project of IUCN About Feed in Sustainable Aquaculture

The IUCN (International Union for Conservation of Nature) is involved *inter alia* in the reflexion about the development of aquaculture. The IUCN has been in charge in 2014–2015 of a project about "Feed for sustainable aquaculture", funded by the French Directorate for Fisheries & Aquaculture. The project is a multi-stakeholder project, as two workshops gathered numerous experts from private and public sectors. The project has been managed by a steering committee including CIPA (interprofessional body for fish culture) and SNIA/SPPA (syndicates of feed producers).

The output of the project is a report presenting the conclusions of the workshops, including chapters on peculiar points (by different authors), and proposing recommendations. One chapter presents the analysis of the certification schemes aiming at sustainable aquaculture, in the specifications they define for feed and feeding in aquaculture farms, and we present here the main findings.

30.1.1 Certification in Aquaculture

Globally, the certification programs concerning fishery and aquaculture products have grown considerably in the past two decades, either by using existing devices in agrifood sector, either, and widely, by inventing some new devices. The goals are to provide a guarantee on compliance with specifications on production (sometimes extended in the value chain, upstream to feed, or downstream to processing and retail), to improve product promotion, and to create a market segmentation.

The certification is defined by ISO[1] as a "the provision by an independent body of written assurance (a certificate) that the product, service or system in question meets specific requirements". Audits performed by an independent, third party and accredited certification body provide the highest guarantee. But note that we also find in aquaculture audits by a "first party", so self-checking its own specifications drawn up by a company or group of companies, and audits by a "second party" of specifications prepared by a customer or NGOs, done by their controllers, and some of these programs based on audits by first or second parties are included in reports on "labels and certifications" in aquaculture (Ababouch Washington 2011). Nevertheless, the third party certification brings the highest level of guarantee.

An additional difficulty in this still new and changing field is a lack of stabilized vocabulary and translations, which is source of errors or misunderstandings. For the remainder of this writing, the word "label" will be considered as "expression of a certification on the product packaging."

[1]ISO: International Organization for Standardization.

In aquaculture, certification schemes (or "quality-initiatives", "quality schemes", "labels") have various goals and a variety of settings: certification of origin (e.g. Protected Designation of Origin -PDO-, Protected Geographical Indication -PGI-, following 1992 EU regulation), certification of a particular quality (e.g."Label Rouge" i.e. the French label for a product of superior quality, "Irish quality Schemes" for several aquaculture species), certification of sustainable or responsible aquaculture (Aquaculture Stewardship Council -ASC-, Best aquaculture Practices of Global Aquaculture Alliance -BAP GAA-, Friend of the Sea -FoS-), certification of organic aquaculture (standards issued by government, as the EU standard, or standards issued by private organizations as Krav, Debio, Naturland, etc.), certification providing guarantees about sanitary quality (specifications of large retailers' groups such as Global-GAP, International Feature Standard -IFS-, British Retail Consortium -BRC-), certification of a national standard by the government or by professional organizations ("Aquaculture of our regions" of the French professional organization CIPA, Thai Quality Shrimp…). However, the specifications can combine various objectives and the creation of a typology by goal is not obvious.

Another typology can be made according to the type of organization initiating the program: a professional aquaculture sector (e.g. FEAP, CIPA, APROMAR…), the public authorities (e.g. organic aquaculture in the EU), some retailers (individually or as a group, e.g. GlobalGAP), some NGOs (e.g. ASC).

This set is difficult to understand because of its abounding and very changing nature. For more information, the interested reader can refer to the bibliography, including reports and information from international organizations (FAO 2011; IUCN 2009; Globefish news and reports). From a producer perspective, particularly in developing countries, the reports underline the difficulty of access to certification programs in the case of highly demanding specifications or because of the cost of audits for producers. So the complexity of the certification process acts as a barrier for small producers, especially in developing countries, except through groupings of small producers, when that organization is accepted by the certification program.

Analysis of this set also highlights the wide variety of certification programs and the difficulty of comparing, with a risk of confusion for the consumer. Interestingly, initiatives are underway to propose a framework for comparison, such as the Global Seafood Sustainability Initiative (GSSI) reported by Globefish (2015).

30.1.2 Certification of Sustainable Aquaculture

The area of certification programs to be considered is not obvious, for the reasons outlined above. In addition, as for sustainability, this criterion may appear secondarily in a program that did not explicitly focus on it, such is the case today of some Label Rouge for salmon.

This review focuses on four certification programs with international scope, which explicitly aim at sustainable or responsible aquaculture: BAP- GAA,

GlobalGAP, FoS and ASC. The analysis focuses on how the food sustainability is taken into account in these four major programs, and provides a brief overview of the specifications for organic aquaculture and the Red Label.

30.1.3 Organic Aquaculture, Label Rouge and Feeding

In the EU, the regulation for organic aquaculture[2] specifies that feed must cover the nutritional needs according to each aquaculture species and according to their stages of development. Marine raw materials must come from sustainable exploitation of fish stocks.[3] Other raw materials must come from organic farming or, for non-agricultural products, be natural products allowed (mentioned in a positive list). Growth promoters and synthetic amino acids are prohibited. Subsequent regulations specify certain points, introducing adjustments to the needs of species or groups.[4]

This brief review shows the spirit of the inclusion of feed in the definition of organic aquaculture in the EU. It also illustrates the existence of periodic changes in this context. Organic aquaculture ("organic aquaculture") globally represents a very diverse set of private and public programs, which analysis is currently underway in the European program ORAQUA (http://www.OrAqua.eu/).

Another important certification for aquaculture in France, the Label Rouge (i.e. Red Label) deserves a mention. It is part of the official French device of Identifying Signs of Quality and Origin, managed by the INAO.[5] This device combines a third party certification (by an accredited certification body) and a guarantee by a public device. The Label Rouge is based on a stndard defining the production conditions for a product of superior quality in its market. There is therefore no question of a priori guarantee of sustainability. However, we note that some Label Rouge in salmon farming mention a sustainability goal on their websites presenting the main points of the specifications (not publicly available in full version). For the Label Rouge Scottish Salmon LA No 33/90, it is mentioned that producers are engaged in a process of sustainability and environmental preservation. The specifications precise that the feed includes exclusively marine raw materials, vegetable

[2]Council Regulation (EC) N° 834/2007 of 28 June 2007 on organic production and labelling or organic products and repealing regulation (EEC) N° 292/91.

[3]As defined in Article 3 of COUNCIL REGULATION (EC) No 2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy.

[4]The COMMISSION REGULATION (EC) No 889/2008 of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control. Le Règlement d'exécution (UE) n° 1358/2014 de la Commission du 18 décembre 2014; and COMMISSION IMPLEMENTING REGULATION (EU) No 836/2014.

[5]INAO: Institut National de la Qualité et de l'Origine = National Institute of origin and quality.

ingredients, vitamins, minerals and carotenoids. For Atlantic salmon Label Rouge LA No 31/05, it is emphasized that the farming is done in a "selected marine farm respecting environment" and the specifications stipulates that feed does not contain any products from land animal or GMOs (in the maximum limit of accidental contamination of 0.9%).

30.2 Presentation of the Four Certification Programs for Sustainable or Responsible Aquaculture, with International Scale

Created since 2000 or even very recently, these programs are based on a third-party certification, and differ by several aspects (see Table 30.1). BAP-GAA and ASC aim explicitly at responsible aquaculture, FoS at sustainable aquaculture, and GlobalGAP has a set of goals that include environmental and social components of sustainability.

It may be noted that these certification programs have different genesis:

- BAP-GAA is a program launched in 2000 by GAA (non-profit organization, or NGO) by stakeholders of the aquaculture sector (scientists, technicians, producers),
- GlobalGAP was created by a consortium of European distributors (GlobalGAP, formerly EurepGAP) for all agriculture and since 2004 includes an application to aquaculture,
- FoS is an NGO that has developed a certification program for sustainable fisheries, then in 2006, for sustainable aquaculture,
- ASC is a non-profit organization or NGO, created in 2010 by WWF and IDH (Dutch Sustainable Trade Initiative) to manage the standards issued from the multi-stakeholders Aquaculture Dialogues launched by WWF.

The procedures of these certifications are also different: ASC, BAP/GAA and FoS are certifications of the type B to C[6] with visible logo by the consumer, while GlobalGAP is of type B to B,[7] not visible to the consumer. They work on their own standards, developed either by species or generically for a set of species or any species, and standards are evolving in content and structure (for example, ASC launched in December 2014 a project to create a common standard, instead of 8 existing standards).

These certifications have different economic importance, but we see very strong growth currently for the number of farms and concerned products, notably for ASC and BAP–GAA. So today there is a strong competition to find farms to be certified, internationally (Table 30.1).

[6]B to C: Business to Consumer.

[7]B to B: Business to Business.

Table 30.1 Main characteristics of four certification programs for responsible or sustainable aquaculture, with international scope

Name and category	Creation year and type	Objectives	Standards for farming and other activities in supply chain	Economic weight (Dec 2015)
BAP of GAA *(NGO)*	(1997) 2000 B to C (logo)	**Responsible** aquaculture (environment, social)	Multi-species Crustacean and Finfish (incl. specific items for shrimp and tilapia), Salmon, Mussel, + Feed + Processing	1028 certified units: 92 hatcheries; 620 farms (Dec 2013: 352; 751 KT); 293 processors (1,.86 MT); 56 feed mills
ASC *(NGO)*	2010 B to C (logo)	**Responsible** aquaculture (environment, social)	Tilapia, Pangasius, Bivalves, Abalone, Salmon, Trout, Shrimp + Chain of Custody (CoC) for processors and retailers	Farms: 207 (Dec. 2014: 123; # 440 KT); CoC: 445 companies; Market: 4462 products (54 countries)
FoS *(NGO)*	2006 B to C (logo)	**Sustainable** aquaculture (environment, social)	Freshwater fishfarming, Marine fishfarming on shore, Shrimp, Mussel + Feed	Farms: # 100
Global G. A. P. *(NGO based on retailers group)*	(1997) 2004 for aquaculture B to B	Food safety, traceability, environment, animal welfare, social	Multi-species + Feed	2 MT, 20 countries (August 2012)

It is also interesting to note that these programs are changing, and tend to harmonize since 2013, with the signing of successive agreements of collaboration and exchange. As for feed in aquaculture, the "ASC Responsible Feed Project" launched by ASC from 2013 to 2015 is a comprehensive work on sustainable aquaculture feed, with a steering committee multi- agencies, and 5 technical working groups involving GAA and GlobalGAP.

30.3 Consideration of Feed in the Standards of Four Certification Programs for Sustainable or Responsible Aquaculture

The analysis of standards of the four certification programs reveals a convergence in objectives: supplies traceable and responsible/sustainable for raw materials, reduction of the use of fish meal and fish oil from dedicated fisheries. The main available features about feed are summarized in Table 30.2.

Table 30.2 Feed and feeding in four certification programs for responsible or sustainable aquaculture, with international scope—analysis of public standards (as available on internet by December 2014)

	BAP/GAA	ASC	FoS	GLOBALG. A.P.
Certification scheme for feed mills, or for feed	Certified according to BAP standard for feed mill, or equivalent	Responsible sourcing of raw materials, complying with international moratories for raw materials and regulation	• Feed certified by FoS, if available for concerned species • Or feed mill certified by IFFO RS	GLOBALG. A. P. Compound Feed Standard
All raw materials	• BAP standards or documents proving responsible sourcing • List of ingredients > 10% obtained from the supplier	Traceability, transparency, responsible sourcing for ingredients		Documents proving sustainability, traceability, transparency
Raw materials from marine origin	• List of ingredients > 1% • Sustainability of wild fisheries producing FM&FO • From June 2015, > 50% FM&FO issued from certified fisheries or by-products from certified fisheries	• Traceability by species & origin, Exclusion: species of IUCN Red List • FM&FO from fisheries certified by program accredited ISEAL (exp MSC): 10% at 3 years, 100% at 5 years. By 5 years: comply with FishSource score	• Trimmings • Anchovy and Pacific mackerel (Peru) • Menhaden (USA) • Sardines and mackerel (Marocco)	Exclusion of species of IUCN Red List, or from IUU fisheries
GMO ingredients	Control of GMO concentration (> 1%) in compound feed	Mention for GMO ingredient > 0,9% in feed	• In FishFeed 2009-3: exclusion of GMO use (limit 0,9% PCR) • Dec. 2014: no mention	

(continued)

Table 30.2 (continued)

	BAP/GAA	ASC	FoS	GLOBALG. A.P.
Soya		Certification RTRS (100% after 5 years)		
Palm oil		Certification RSPO		
Monitoring and indicators	Consumed feed, harvest volumes FCR FI-FO ratio	FFDRm (Fishmeal Forage Fish Dependency Ratio) $\leq$ 1.5 FFDRo (Fish Oil Forage Fish Dependency Ratio) $\leq$ 2.95 or EPA + DHA $\leq$ 9% FCR	FCR	

In the manufacture of feed and for traceability on raw materials, these organizations rely heavily on additional certification programs: specific programs for BAP-GAA and GlobalGAP (program CFM for *Compound Feed Manufacturers*); and for FoS, an own feed certification program or IFFO RS certification program.[8]

For fishmeal and fish oils, ASC ruled out the use of fish or by-products issued from species on the IUCN Red List or from illegal, unreported and unregulated fisheries (IUUF); and requires, within five years after the publication of the ASC concerned standard, that marine raw materials are issued from sources certified under a standard member of the ISEAL.[9] Alliance (example MSC.[10]). Before reaching this goal, supplies of marine raw materials must meet the conditions of sustainability indicators (FishSource scores).[11]

For vegetable raw materials, ASC requires soybeans certified by RTRS (RoundTable on Responsible Soy) and palm oil certified by RSPO (Roundtable for Sustainable Palm Oil).

Regarding the use of potentially GM raw materials, there is no announced exclusion (except for FoS in a 2009 document). It was noted in ASC standards a compulsory declaration of presence for GMO raw materials at a concentration greater than 0.9%, and in GlobalGAP standards, a necessary verification of the presence of GMO material in a concentration greater than 1% in the final feed.

In terms of feeding practices, feed efficiency is sought by all, both for the savings of raw materials and for reducing environmental impact. This concerns in particular

[8]IFFO RS: Global Standard and Certification Program for the Responsible Supply of Fish Meal and Fish Oil.

[9]ISEAL: International Social and Environmental Accreditation and Labelling Alliance.

[10]MSC: Marine Stewardship Council.

[11]FishSource Score: ratio from 1 to 10 characterizing the sustainability of a fishery—see https://www.fishsource.com/.

fish meal and fish oil. Thus, farms are required to do follow-ups of amounts of feed used, and to calculate indicators on the use of fish meal and fish oil or on feed efficiency (Table 30.2).

30.4 Discussion and Perspectives

The analysis of available standards shows the diversity of the means employed by several organizations for displayed similar objectives, but does not allow to fully apprehending it. The opening since 2013 of collaboration between GlobalGAP, ASC and BAP - GAA for a partial pooling on the audit phase, provides details for this comparison. The diagram (Fig. 30.1) of the initial inventory of the criteria for selection of fish meal and fish oil, for the three organizations, shows limited common share (traceability, absence of endangered species from the IUCN Red List, and preferably suppliers with responsible sourcing), but shows also important differences, ASC having the highest requirements.

It is noted that fish meal and fish oil are the only ingredients for which was conducted an important work about sustainability. Conversely, it must question how the raw materials other than fish meal and fish oil, increasingly used in fish

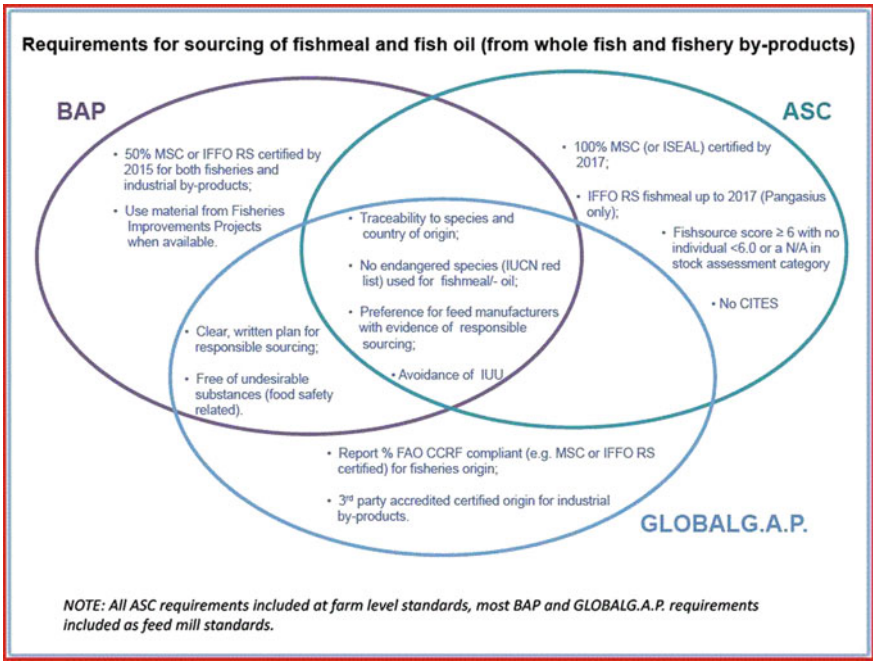

Fig. 30.1 Requirements for sourcing of fishmeal and fish oil for BAP/GAA, ASC & GlobalG.A.P. *Source* Anon (2013)

feed, will be evaluated from the perspective of sustainability. Beyond the need for responsible/sustainable supply, the plant ingredients are not specifically addressed by ASC, which for soybeans and palm oil, uses existing certification schemes in these important sectors. This movement could be developed, including other raw materials to the extent that certification of sustainable sources do exist, which is not the case for most raw materials used in animal feed.

30.5 Conclusion

The rise of certification programs for sustainable or responsible aquaculture is an important phenomenon. As for feed and feeding, the criteria included in the certifications at first focused sustainability of fisheries for fish meal and fish oils. However the increasing use of other raw materials in aquafeed, particularly plant raw materials, greatly expands the range of sectors whose sustainability must be assessed, through the use of existing specific certification programs, when they exist. It thus draws a system of certification programs used for the certification of sustainable aquafeed, bringing aquaculture in a much larger universe, that of animal feed industry and the connected agriculture supply chains, where aquaculture has a minor weight until today.

Through this paper about feed in certification programs for sustainable aquaculture is coming out a highly difficult question: where are the poles of decision for the conditions of aquaculture production, and definition of sustainability?

In addition to the regulatory framework, it appears that certification programs create an additional framework, even if it is voluntary. Internationally, the growing weight of private certification programs coming from Western organizations is widely criticized, particularly for two reasons (Bush et al. 2013):

- even if it is a response to a weak government involvement in the definition and regulation of sustainable aquaculture, today there is an imbalance of power between private and public sectors in the definition of sustainability,
- for Developing Countries, there is a form of interference and the risk of abuse of power, from organizations from Developed Countries.

Moreover, the development of aquaculture certification brings the aquaculture sector to a situation already well-known in the agricultural sector: a growing framing of the act of production by external devices. In particular, we see how the feed for sustainable aquaculture, due to an increasing use of new raw materials, will be dependent on pre-established certifications for these ingredients.

This situation rises also question of governance, at national and international levels, for defining what is feed for sustainable aquaculture, and how standards could be defined in a more balanced way, involving not only private organizations, but actors from aquaculture sector, and public authorities.

References

Anon (2013) Joint statement on requirements for the responsible sourcing of fishmeal and fish oil issued by ASC, GAA and GLOBALG.A.P. pp 2. http://www.asc-aqua.org/index.cfm?act=update.detail&uid=176&lng=1. Accessed 14 Nov 2013

Bush SR, Belton B, Hall D, Vandergeest P, Murray FJ, Ponte S, Oosterveer P, Islam MS, Mol AP, Hatanaka M, Kruijssen F, Ha TT, Little DC, Kusumawati R (2013) Certify sustainable aquaculture? Science 341:1067–1068 (6 Sep 2013)

FAO (2011) Technical guidelines on aquaculture certification. Rome/Roma, FAO, p 122

IUCN (2009). Guide for the Sustainable Development of Mediterranean Aquaculture 3. Aquaculture Responsible Practices and Certification. Gland, Switzerland and Malaga, Spain: IUCN, VI+ pp 70

Washington S, Ababouch L (2011) Private standards and certification in fisheries and aquaculture: current practice and emerging issues. FAO Fish Aquac Tech Paper 553:203 p

http://www.asc-aqua.org/index.cfm?lng=1

http://bap.gaalliance.org/

http://www.globalgap.org/uk_en/for-producers/aquaculture/

http://www.friendofthesea.org/FR/

http://www.saumonecossais.com/fr/saumon-ecossais-label-rouge/une-qualite-exceptionnelle

http://www.paq.fr/galerie/filiere-mer-aquaculture/saumon-atlantique/

http://www.bim.ie/our-services/grow-your-business/farmedfishqualitylabelling/

http://www.globefish.org/homepage.html