



Benchmarking Study

Certification Programmes for Aquaculture

Environmental Impacts, Social Issues
and Animal Welfare



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Environmental Impacts, Social Issues and Animal Welfare

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Preamble:

World Wildlife Fund Experiences in Aquaculture Certification

World Wildlife Fund's (WWF) interest in aquaculture began in 1994 with a study comparing the impacts of shrimp aquaculture and shrimp trawling to determine which system of producing shrimp was better. The study concluded that, while both systems had serious environmental impacts, shrimp aquaculture had better practices and technology in place for making production more viable. At that time, WWF decided to focus its attention on identifying and disseminating information on more sustainable shrimp aquaculture practices.

In 1999, the WWF, the Network of Aquaculture Centres in Asia-Pacific (NACA), the World Bank, the Food and Agriculture Organisation of the United Nations (FAO) and the United Nations Environment Programme created the *Shrimp Farming and the Environment Consortium* to support research on the industry's impacts; identify areas of disagreement or little data; document Better Management Practices (BMPs) that reduced shrimp aquaculture's on-farm or cumulative impacts; and build consensus around the key impacts as well as ways to reduce them. This award-winning work is still generally accepted as the most up to date and credible body of information about the shrimp aquaculture industry.

As part of this work, WWF undertook a side-by-side comparison of different shrimp aquaculture certification programmes. Since none were found to be credible, Dr. Jason Clay and Dr. Claude Boyd, working on behalf of the consortium, drafted principles, criteria, indicators and ranges of performance levels (e.g. standards) for better shrimp aquaculture. These were posted electronically on the NACA website and vetted globally by numerous and varied stakeholders. A modified version of principles and criteria were then formally accepted and published in 2006 by the FAO and NACA.

For the past decade, WWF has been working on a range of aquaculture issues in priority areas worldwide, focusing on the culture of shrimp, salmon, catfish, tilapia, pangasius, trout, and molluscs (including oysters, clams, mussels, abalone and scallops). At the same time, WWF has become much more interested in certification as a tool to provide incentives for improving aquaculture production globally.

WWF has a long history of developing certification programmes for different industries (e.g. Forest Stewardship Council, Marine Stewardship Council, Marine Aquarium Council and Protected Harvest). Credible certification programmes should be created by multi-stakeholder groups, built on a consensus on key impacts, identify and support the adoption or adaptation of BMPs that measurably reduce key environmental and social impacts, determine globally acceptable performance levels, and improve performance in an industry.

Despite the existence of at least 30 aquaculture certification programmes, innumerable suppliers and retailers have approached WWF to develop more credible standards. That is why WWF is the catalyst for the Aquaculture Dialogues, a series of species-specific dialogues aimed at developing measurable, performance-based standards for certifying aquaculture products. Dialogue participants include representatives from the aquaculture industry, academia, NGOs and government agencies. Standards for up to 12 species are expected to be completed in 2008 and 2009. The dialogues have shaped WWF's position on aquaculture development and on the credibility and effectiveness of aquaculture certification programmes.

WWF has identified numerous shortcomings, constraints and challenges with existing certification programmes that need to be addressed if they are to help the sector achieve long-term sustainability. The lessons learned provide the framework for this study.

Terms and Definitions

The following terms and definitions are applicable in this study's context:

| | |
|-----------------------------------|--|
| Accreditation | Formal recognition of the competence of a calibration, testing, inspection or certification service to carry out specific tests or conformity assessments according to internationally specified requirements. [ISO/IEC Guide 2:1996]. |
| Better Management Practices (BMP) | Practices that are considered to be the most practical means currently available for solving a specific problem. In the realm of aquaculture BMPs refer to practices that can be applied for the prevention of natural resource and eco-system related problems (e.g. water pollution and soil deterioration). |
| Bio-Security | A health plan or measures designed to protect a population from transmissible infectious disease. |
| Certification | A procedure by which a third party gives written assurance that a product, process or service conforms to pre-specified requirements [ISO/IEC Guide 2:1996]. |
| Certification Programme | A system of rules, regulations, procedures and management for carrying out certification, including the standard against which it is being assessed and certified. |
| Chain of Custody | Path taken by raw materials, processed materials and finished products from the primary producer to the end consumer, including all successive stages of farming, harvesting, processing, transformation, manufacturing, storage and distribution. |
| Conformity Assessment | Systematic examination to verify whether a product, process or service satisfies predetermined requirements. The requirements may be specified in legal ordinances, standards and manufacturer's documentation or by some other means. |
| Food Safety | Assurance that food will not cause harm to the consumer when it is prepared and/or consumed according to its intended use. |
| Food Quality | All the features and characteristics of a product that bear on its ability to satisfy stated or implied needs. |
| GMO | Genetically Modified Organism: An organism that has been transformed by the insertion of one or more isolated gene sequence(s). Often, but not always, the gene sequence has been derived from a different species than that of the recipient. [FAO Glossary of Biotechnology for Food and Agriculture]. |

| | |
|---|--|
| Inspection | Examination of a product, service, process or installation to determine its conformance to specific or – on the basis of expert assessment – general requirements. [ISO/IEC Guide 2:1996]. |
| Label | Symbol or label that can be put on product indicating that the product or the process to make the product comply with the standards and that this compliance has been certified. Use of a label is usually owned by the standard-setting body. A label may be used in communication between business operators (business-to-business label) or to end consumers (business-to-consumer label). |
| Processes and Production Methods (PPMs) | The way in which products or services are manufactured, produced and/or processed or the way in which natural resources are extracted or harvested. PPM's can have two types of social and environmental impacts. A process or a production method can affect the characteristics of a product so that the product itself may have an impact when it is consumed or used (product-related PPM's). Alternatively, the process or the production method can have a social or environmental impact during the production, harvesting or extraction stage that does not have a discernible impact on the product or service (non-product related PPM's). |
| Standard | Document that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method. [Annex 1 WTO TBT Agreement]. A standard may be subject to a certification programme. |
| Standard Holding Body | Governmental or private entity / body that operationally runs a standard's certification programme. |
| Standard Creation Body | Governmental or private entity / body that is developing and setting-up a standard which may be the subject of a certification programme. |
| Traceability | Ability to track the movement of a food product through specific stages of production, processing and distribution along the product's supply-chain. |
| Third Party | Person or body that is recognised as being independent of the parties involved, as concerns the issues in question [ISO/IEC Guide 2:1996]. |

Executive Summary

Aquaculture is the world's fastest growing sector within the food industry. Within the past two decades, the volume of aquaculture products has increased approximately 10 percent per annum. This tremendous growth has been accompanied by numerous negative social and environmental impacts – real and perceived – that could threaten the long-term development of the sector if not minimised or reduced.

In response to the growing public awareness of the negative impacts of modern aquaculture development, an increasing number of market-oriented certification schemes for aquaculture products are being developed and established. The basic concept behind such product labelling schemes is to provide economic incentives to producers and the industry to adopt more sustainable production practices while safeguarding or enhancing access to consumer markets.

The programmes also are in response to the fact that many of the main importing nations' retail markets are demanding more sustainably produced seafood, therefore exerting pressure on the industry to adopt more sustainable production practices.

Despite this interest, one crucial question remains to be answered in each certification programme: To what extent does a given programme effectively deliver benefits being communicated to the markets? If certification programmes – as market-based means to facilitate sustainable development of aquaculture – shall really deliver environmental, social and economic benefits, they must be developed and operated under certain aspects and criteria.

In this study, WWF has identified four main areas of concern which must be addressed by any certification programme aiming to influence the long-term sustainability of the aquaculture industry. These areas are: *Environmental issues, social issues, animal welfare and health and standard development and verification procedures.*

Relevant certification programmes for aquaculture products destined to European markets have been analysed and benchmarked against the stringent criteria defined.

The study's results reveal that most of the analysed standards have significant shortcomings and lack an effective and credible regulatory framework. Shortcomings include:

- No performance-based metrics and indicators for effluent discharges and other key environmental factors, such as efficient use of energy, water, feed and land
- Insufficient coverage of key issues, such as sustainable sources for fishmeal used in the diet, use of GMO products, prevention of escapes, introduction of non-native species, bio-security measures, prevention of disease and protection of sensitive habitats and local wildlife
- Insufficient coverage of social issues, such as basic labour rights, community land rights and access to natural resources
- Limited openness of standard governance and multi-stakeholder participation in standard development
- Lack of meaningful measurable and verifiable criteria addressing the key areas of concern
- Lack of independency of the standard creating, standard holding, inspection and certification bodies
- Lack of corrective measures and sanction procedures and lack of chain of custody certification

None of the standards analysed is in full compliance with the criteria stated and defined by WWF, showing that there is a lot of room for improvement and further adaptation of regulatory frameworks of aquaculture certification programmes.

1. Introduction

1.1 Modern Aquaculture Development

The growing crisis of the world fishery sector, due to over-fishing and the decline of a majority of economically important fish stocks, has led to tremendous increases over the past few decades in the production of seafood in culture systems. In fact, annual aquaculture production has grown an average of 9 percent since 1970, while wild capture production has remained relatively stable since the 1990s. Aquaculture is the fastest growing food sector today. Aquaculture is expected to account for more than 40 percent of global fisheries production by 2020.

There are various scenarios for future seafood production. One indicates that aquaculture will overtake captured food fish production (excluding production going for fishmeal or oil) by 2020. Other projections suggest 2030. However, there is no doubt that aquaculture production will expand in importance. Aquaculture has the potential to supplement decreasing production volumes from wild-catch fisheries, feed the world's growing population and take pressure off over-exploited aquatic resources.

Another benefit of aquaculture is that it produces protein more efficiently than terrestrial animal operations, as fish do not require the same levels of energy to maintain or move their bodies. The quality of aquatic proteins also has several competitive advantages over terrestrial animal proteins.

However, many of today's aquaculture practices do not help to ease the wild fisheries crises. Some can even exacerbate existing problems or even create new threats to the environment and local livelihoods. This is why we need an aquaculture certification programme that minimises the environmental and social impacts of aquaculture.

1.2 Common Environmental and Social Impacts

Modern aquaculture is becoming an industrial means of food production and can lead to detrimental impacts on the environment and affected communities. While impacts can vary by species, production system, and even within a species or production system, the major environmental and social problems related to modern aquaculture development are:

- Inappropriate site selection, construction and operation of small- and large-scale aquaculture operations can lead to detrimental environmental impacts, such as water and soil deterioration and pollution, disturbance and/or destruction of aquatic and terrestrial habitats, introduction of alien species and disease outbreaks.
- The emerging trend towards the production of high-value carnivorous fish and crustaceans is often associated with a net loss of aquatic protein resources, due to the higher trophic level of the species being cultivated. For example, the cultivation of carnivorous species - such as salmon, trout, sea bass, sea bream, cod, turbot, some shrimp, cobia and other high value species - requires considerable volumes of fishmeal and fish oil for aquaculture feed. This increases pressure on wild fish populations.
- Some aquaculture activities use high amounts of energy and natural resources, such as water, land and soil. Excessive use of natural resources can lead to conflicts amongst local stakeholders, especially where water and land resources are scarce.
- Large-scale, industrial aquaculture activities in developing countries can be accompanied by social conflicts with local stakeholders and communities that are negatively affected by such operations without receiving any benefits from them.
- Aquaculture facilities can employ a large number of workers on farms and in processing plants, potentially placing labour practices and worker rights under public scrutiny.

1.3 Key Environmental and Social Impacts of Species

Through the WWF-initiated Aquaculture Dialogues, stakeholders from the aquaculture industry, academics, input providers, NGOs, and others are identifying the key impacts of aquaculture and developing standards for reducing or minimising those impacts.

The following table lists the species that are the focus of the dialogues, as well as the key perceived environmental and social impacts related to each species.¹

The comparison shows that major environmental impacts have been identified primarily for carnivorous fish and crustacean species. Filter feeders, omnivorous or herbivorous species and plants generally show a lower likelihood of impacts.

| Key Perceived Impacts | Species and Species Groups | | | | | | | | | | | | |
|-----------------------|----------------------------|--------|--------|-------|---------|---------|-----------|---------|----------|---------|-------|---------|---------|
| | Tuna | Shrimp | Salmon | Trout | Catfish | Tilapia | Pangasius | Abalone | Scallops | Oysters | Clams | Mussels | Seaweed |
| Antibiotic Use | M | H | H | H | M | M | H | M | NA | NA | NA | NA | NA |
| Benthic Biodiversity | H | L | M | M | L | M | H | L | M | M | M | M | L |
| Chemical Use | L | H | M | H | H | L | H | M | L | L | L | L | L |
| Contaminants * | H | L | H | M | L | L | H | M | M | M | M | M | L |
| Disease Transfer | H | H | H | L | L | L | H | M | L | H | L | L | L |
| Escapees ** | M | M | H | H | H | H | H | M | M | H | L | M | L |
| Fish meal/oil Use | H | H | H | H | M | M | M | M | NA | NA | NA | NA | NA |
| Habitat Impacts | L | H | L | H | H | H | M | M | M | M | M | M | L |
| Water Use/Pollution | H | H | M | H | M | H | H | L | L | L | L | L | NA |
| Mortality Removal | L | L | M | M | H | H | M | L | L | L | L | L | NA |
| Predator Control | L | M | M | H | H | H | L | H | H | M | H | M | L |
| Source of Seeds | H | M | L | L | L | L | L | L | L | M | M | M | L |
| User Conflicts | M | H | M | L | L | M | M | L | M | M | M | M | M |
| Water Use/Pollution | H | H | M | H | M | H | H | L | L | L | L | L | NA |

Relative Importance Levels: L=Low; M=Medium; H=High; NA=Not Applicable

* Contaminants in finished products

** Escapees: Genetic and invasive Effects

¹ WWF Aquaculture Dialogues: Adapted from: Boyd, McNevin, Clay and Johnson, 2005 "Certification Issues for Some Common Aquaculture Species, *Reviews in Fisheries Science*, 13:231-279. Updated October 2007 to reflect discussions at the WWF Aquaculture Dialogues.

1.4 Industry's Response and Challenges Ahead

WWF recognises the benefits that aquaculture offers the developing world, such as protein supply, income generation and employment. There are tremendous opportunities to work with the private sector throughout the value chain to measurably reduce the most significant negative impacts and use scarce natural resources (e.g., feed, water and habitat) more efficiently. Growing consumer demand for aquaculture products and confusion about the impacts of production suggest that now is the time to identify and address the key environmental and social impacts.

Over the past few years, numerous efforts have been made by government and industry leaders to improve the sustainability of aquaculture and to reduce the most detrimental production practices.

In many countries, policies and regulations requiring aquaculture producers to comply with more stringent mitigation and protection measures have been put in place. Also, significant advances have been made in the aquaculture sector to improve the management of farming systems, resulting in reduced environmental impacts and improved efficiency. Often, such improvements also enhance economic viability.

Less than a decade ago, it would have been unheard of to see representatives from the aquaculture industry and NGOs sitting at the same table identifying and agreeing on key impacts as well as strategies to address them. Today, many aquaculture businesses are proactively seeking out NGOs to help them address impacts and identify and understand the implications of better, more responsible practices to reduce them.

More and more, the private sector is aware of its need to change its behaviour or risk losing access to key markets. Many businesses are pursuing eco-label and certification programmes, not from the perspective of price premiums, but for market access. In short, environmentally responsible aquaculture is morphing from niche market penetration to mainstream market access.

1.5 Aquaculture Certification

In addition to the development and implementation of policies and regulations for sustainable aquaculture development, there is a trend towards market-based incentives for Better Management Practices through aquaculture certification programmes.

Rising public concern about harmful and unsustainable aquaculture practices has led NGOs, civil society organisations and the aquaculture industry to develop and implement numerous certification systems for better management practices that focus on more sustainable production by minimising negative impacts of aquaculture operations on natural resources and local communities while increasing acceptance of products on international markets.

The idea behind such certification programmes is to address key impacts of the production process and to prove compliance of a product or production process with the respective certification or eco-label programme while at the same time enhancing market access and marketability of products.

Issues of concern for some certification Programmes often are related to the quality and food safety of products, and/or to environmental and social issues. This depends on the specific focus and targeted clients and markets of a given certification programme.

Certification programmes are either promoted and operated on a business-to-business level to demonstrate compliance with specific standards within the industry and the market partners themselves, or they are aimed directly at the consumer at the point of sale by labelling the product as being produced under certain conditions and/or meeting specific expectations with regards product quality.

The seafood market has been inundated with aquaculture certification programmes. Such Programmes are likely stimulated by a number of factors, but one common factor is the need of producers to adopt better practices and communicate them so that they can access new markets.

Other reasons for product certification are market access, potential economic benefits and possibilities for product diversification. Also there might be a need to communicate that the quality of aquaculture products is superior to that of wild-caught fish.

Today's existing aquaculture certification programmes differ widely in scope and focus. Whereas some programmes focus on one issue, others encompass a broader range of criteria. The most common sets of criteria are product quality and food safety, environment, social and animal welfare issues.

In addition, many retailers have developed their own proprietary certification schemes in an effort to promote responsible procurement policies and reduce liability concerning public perception of specific environmental or social welfare concerns.

1.6 How to Ensure Certification Programmes are Effective

Whether or to what extent a certification programme addresses a given issue of concern is not always easy to assess. Also, there might be open questions on the credibility and the effectiveness by which a standard's guidelines are assessed for compliance on an operational level.

There are also basic differences between product and process certification programmes. Organic food products, for example, tend to follow process certification programmes because having an organic label does not necessarily mean that the food product is safe. Rather, the label means that the product was processed in a certain manner.

Product labels are different. They make claims about the actual product. As with all product labelling programmes, there is a risk that certification programmes do not meet the claims or create false expectations for the consumer by communicating product characteristics that are not/or are only partly addressed by a standard's regulatory and compliance assessment framework.

However, it is not clear that compliance with either process or product standards automatically leads to reduced impacts. The impacts of a certification programme must be measured and monitored regularly.

For most programmes, it is assumed that the adoption of Better Management Practices will improve results. Unfortunately, this hypothesis has not been tested. WWF believes that defining improved performance levels and minimum acceptable performance levels should be an integral part of credible certification programmes.

Similarly, in WWF's work on standards, WWF does not accept that any key impacts can be ignored because an industry or stakeholder group decided not to work on them. By extension, certification programmes that do not address any of the key issues - environment, social, animal welfare or governance issues - cannot be credible either.

In the case of a certification programme focusing on environmental issues, for example, this means that, in the absence of a meaningful and efficient regulatory and compliance assessment framework, the environmental value that is communicated to consumers is not credible. In such programmes, it is not clear whether the adoption of better practices has actually resulted in reduced impacts when compared to baseline data either for the production unit in question or the industry.

If a product-based certification programme is intended to improve production by market mechanisms (e.g. reduce key environmental impacts), the programme must credibly address the key impacts of producing a given species and ensure that those impacts are reduced.

The identification of key impacts, acceptable performance levels and credible compliance and regulatory frameworks is especially important for eco- and social labelling programmes where reduced impacts are implicit. Because such programmes may have little or no discernible impact on the finished product (non-product related process and production methods) they must prove performance to be credible.

With a food safety certification programme, compliance would be expected to result in improved product quality, reduced pathogenic microbes or other toxic substances and, perhaps, in improved shelf life. The finished product can be tested by any market player. By contrast, the non-deforestation of mangroves for shrimp farming or child labour practices cannot be measured or assessed in the finished product.

With process-based certification programmes, market players and consumers have very limited means for assessing whether a company is complying with a standard. They fully depend on a standard's regulatory and conformity assessment system. Consumer support of a particular eco-label must be based on trust because proof of compliance is virtually impossible for consumers to ascertain directly.

1.7 Objectives and Scope of the Study

This study's objectives are to analyse the most prominent and widely accepted aquaculture standards with regards environmental, social and animal welfare issues and identify those standards that are meeting internationally acknowledged criteria with regards more sustainable aquaculture production.

The study benchmarks selected standards against criteria that encompass a set of practices in aquaculture production that are generally considered more sustainable. It also evaluates whether and to what extent a given certification programme adequately addresses the relevant issues.

In addition to environmental, social and animal welfare issues, the study examines the *standards' governance and compliance assessment procedures*, which establish the essential core of any credible and efficient certification programme.

The study's results will be used by WWF to encourage the development of more sustainable aquaculture production systems. The results will also guide WWF's partnerships and direct cooperation throughout the value chain from producers to consumers.

Based on the findings of the study, recommendations can be given to market players for their future procurement strategies. In addition, risks and opportunities for improvement can be presented and discussed with standard setting bodies interested in improving their performance by measurably reducing the greatest environmental, social and animal welfare impacts.

1.8 Subject of the Study

The standards that are reviewed in this study have been selected due to their importance and potential impact in European markets as well as to their scope of certification for species with the most impacts.

Since most of the widely acknowledged negative environmental impacts of aquaculture are related to the farming of carnivorous fish and crustaceans, this study focuses on these two species groups. The study does not analyse standards that are specifically addressing the culture of *molluscs* and *aquatic plants/algae*. Both of these aquaculture sectors have significantly lower environmental impacts.

This study focuses on the *environmental, social and animal welfare* related standards of different certification programmes; it does not specifically cover issues of *food safety* and *product quality*, although these criteria are of equal importance to the sector's future and overall sustainability.

2. Aquaculture Standards

2.1 Scope of today's Certification Programmes

As with certification programmes for many food and non-food consumer goods industries, certification programmes available to the aquaculture industry differ widely in their scope and objectives.

Whether a certification programme encompasses environmental, social and/or animal welfare issues depends mainly on the focus, interests and background of the stakeholders involved in creating the certification programme. For example, industry-related standards may focus on facilitation and promotion of business-to-business operations and, therefore, will often address issues such as food safety and food quality. Programmes created by NGOs, however, tend to address specific environmental, social or animal welfare issues.

Certification programmes available to the aquaculture industry focus on the following issues:

- Food Safety: Proper food health and safety measures
- Food Quality: Product quality characteristics
- Environment: Environmentally sound production processes
- Social Responsibility: Social accountability within the production process
- Animal Welfare: Issues related to animal welfare and health

2.2 Codes of Conduct and Good Aquaculture Practices

Several governmental or NGO entities are addressing the issue of sustainable aquaculture development by defining a conditional framework, as well as practices and procedures for more environmentally sound and socially responsible aquaculture operations. The resulting guidance frameworks are often summarised and referred to as Codes of Conduct (CoC), Good Aquaculture Practices (GAP) or Better Management Practices (BMP).

Each of these approaches serves the aquaculture industry and national regulation bodies by recommending better and more sustainable practices. Also, they are often referred to as producers' or industry associations' guidance tools in countries that lack regulations or the ability to monitor and enforce environmental and social standards.

Generally, CoCs, GAPs and BMPs are voluntary and followed by many individual operators. They, therefore, often are not implemented or subject to independent third-party verification and enforcement procedures. However, they may serve as the basis for the development of specific certification programmes that need to be followed by producers seeking product certification or that enable them to participate in certain producer's associations.

Increasingly, codes and practices are equated with performance and are seen by many as a proxy for a standard or a standard in their own right. However, codes and practices are means to an end (i.e., acceptable performance levels rather than an indicator of performance itself). It, therefore, is important not to confuse means with ends.

The following table lists some of the most prominent basic aquaculture principles and CoCs that have been developed during the past few years to better facilitate sustainable aquaculture development. Some of the listed programmes have been further developed into aquaculture certification programmes.

Table 1: Examples of Aquaculture Principles and Codes of Conducts that have been developed in recent years. The table lists the organisations involved in the development and outlines the principal scopes of the programmes.

| Title | Subject |
|---|--|
| Code of Conduct for Responsible Fisheries FAO | General Code of Conduct containing provisions on sustainable aquaculture development, adopted by the 28 th session of the Food and Agriculture Organisation of the United Nations (FAO) in 1995. This FAO-CoC is considered to be the international fundamental framework for development of sustainable aquaculture standards. |
| Code of Good Practice Global Aquaculture Alliance | This Code of Good Practice was developed in 1999 by the Global Aquaculture Alliance (GAA) based on the FAO Code of Conduct. It has been further developed in recent years and today serves as the basis for the Good Aquaculture Practices (GAP) certification scheme of the Aquaculture Certification Council (ACC). |
| Code of Conduct for European Aquaculture Federation of European Aquaculture Producers | CoC developed by FEAP (Federation of European Aquaculture Producers). The primary goal of this CoC is to promote the responsible development and management of a viable European aquaculture sector in order to assure a high standard of quality food production while respecting environmental considerations and consumers' demands. |
| International Principles for Responsible Shrimp Farming FAO, NACA, UNEP, WWF, World Bank | International Guidance Principles developed by the <i>Shrimp Farming and the Environment Consortium</i> , which consists of the Food and Agriculture Organisation of the United Nations (FAO), the Network of Aquaculture Centres in Asia-Pacific (NACA), the United Nations Environmental Programme (UNEP), the World Bank and the World Wildlife Fund (WWF). The purpose of these principles is to define principles for management for shrimp farming that provide guidance on the implementation of the <i>FAO Code of Conduct for Responsible Fisheries</i> in the shrimp aquaculture sector. |
| Code of Good Environmental Practices Fundación Chile | This code of good practices was developed and issued by the Fundación Chile in 2003. The scope and objectives of this code are to provide a framework for the sustainable development of farming of <i>Salmonids</i> (Salmon and Trout) in Chile. This code has been used by INTESAL and Salmon Chile to develop the SIGES standard for Chilean Salmon. |
| Code of Practice for Australian Prawn Farmers Australian Prawn Farmers Association | This Code of Practice has been prepared by the Australian Prawn Farmers Association (APFA) and was developed with the input of existing Australian prawn farmers based on their current practices for the environmentally sound production of shrimps in Australia. The code's proposed use of both settlement and recirculation systems have today been largely adopted by the majority of the industry. The code today serves as an internal guideline for all Australian Prawn farmers. It is not propagated as a standard on markets. |

2.3 Conventional Aquaculture Standards

Conventional, *non-organic* certification programmes have been developed in recent years and are adopted by the industry in different sectors. These certification programmes are mainly based on CoCs, GAPs and BMPs. They should, therefore, provide a broad basis for the implementation of environmentally sound practices in aquaculture operations. However, they address environmental and social criteria in very different ways and on different scales and levels.

Most conventional aquaculture certification programmes have only been introduced recently and some of them are not yet fully established. Generally, they have been well-received by the markets.

Conventional aquaculture certification programmes may either serve as standards being promoted and communicated on a business-to-business level (e.g., between the producer and the trader or retailer) or as a consumer label that is used on the finished product at the point of sale.

2.4 Organic Aquaculture Standards

Organic aquaculture certification programmes have recently been developed by several private and governmental organic standardisation bodies and farming organisations in Europe, Australia and New Zealand. Organic aquaculture is based on most of the same principles as organic agriculture and, therefore, addresses the production and husbandry of aquatic animals in environmentally sound cultivation systems by promoting practices that minimise negative impacts on the aquatic environment.

In comparison to *conventional* certification programmes that provide a *broad* basis for the implementation of sound practices, organic aquaculture up to now has been considered to be more of a *niche* production model. Given the increased consumer demand for naturally produced food and harmonisation of organic standards worldwide, organic aquaculture may proliferate in the future to considerable market shares.

All available organic certification programmes are used as consumer labels directly identifying the finished product at the point of sale as an organically farmed and certified product.

2.5 Food-Quality Certification Programmes

There are certification and labelling programmes for aquaculture products on the European market that mainly encompass food quality criteria. Such labelling programmes help guarantee that products fulfil stringent quality standards. They are used on a business-to-business level and to promote the high quality of products to consumers.

For aquaculture products, such quality-oriented certification programmes address product food safety, hygiene measures, freshness, colour, size, texture, taste and other qualitative traits. They often do not (or only superficially) encompass environmental or social criteria for the aquaculture production process.

3. Benchmarking Criteria and Methodology of the Study

3.1 Criteria for Benchmarking

As it has already been mentioned in the introductory section (1.8), this study's focus is to analyse and benchmark the standards' performance with regards *environmental*, *social* and *animal welfare* issues. Issues concerning *food safety*, *product hygiene* and *product quality* are not included in the benchmarking criteria of this study and are therefore not discussed.

The basis of the benchmarking study is a detailed list of specific criteria that has been drawn up in close collaboration with several WWF national offices in Europe and the US, other independent conservation organisations as well as international researchers and experts for sustainable aquaculture. For a detailed list of institutions contributing to the definition of benchmarking criteria, refer to Annex B (References for Definition of Benchmarking Criteria).

The applied criteria and indicators for sustainability are in accordance with prior and/or ongoing scientific sustainability assessments within the aquaculture industry. In addition, they are based on international consensus and recommendations for sustainable aquaculture operations. The benchmarking criteria encompass the key issues in relation to the sustainability of aquaculture including social and ethical issues that are associated with this sector.

However, it is important to note that this study's focus is on European markets, market players and consumers. Any benchmarking criteria are likely to be somewhat subjective. This is the nature of this type of work – especially with regards ethical values – and therefore such issues may be approached differently in other places.

The following section provides an overview of the criteria that have been considered and used as indicators of sustainability for this benchmarking process. For every criterion and indicator a short explanation is given with regards its relevancy. A more detailed version of the benchmarking tool is provided in Annex A.

3.1.1 Environmental Issues

| Criterion | Indicator | Justification / References |
|-------------------------------|---|--|
| Energy Efficiency | Total Energy Use per Volume of Production (e.g. kWh/tonne) | The efficiency by which process energy (electricity, fuel and heat) is converted into finished production is a suitable and reliable indicator for sustainable use of energy. Energy efficiency is also relevant for climate protection. |
| Source of Energy | Use of renewable energy and limitation for non-renewable energy sources | The source and type of energy used in the process is of relevance with regards the overall ecological impact of an operation. Non-renewable energies shall be limited and if possible replaced by renewable energies. |
| Air-Freight for Shipment | Use of non-aviation means of transportation and preference for highly efficient systems such as sea freight | Air-Freight of finished products significantly reduces overall energy-efficiency of production and leads to significant emissions of climate-relevant gases. |
| Efficiency of Feed Conversion | Feed Conversion Efficiency (FCE) or alternatively Feed Conversion Ratio (FCR) | Aquaculture of fish and crustaceans, specifically of carnivorous species, often result in a net-loss of aquatic animal protein. Reduction in fish meal use and high efficiency in feed use are important criteria for sustainable aquaculture. |

| Criterion | Indicator | Justification / References |
|--|---|--|
| Source of Fish-Meal and Fish-Oil | Ecological sound procurement source of Fish-Meal and Fish-Oil | The use of fishmeal and -oil in aquaculture as feed ingredients may directly lead to further depletion pressure on marine resources. Most of the fishmeal used in today's aquaculture originates from industrial fishmeal-fisheries or detrimental by-catch practices. |
| Source of other Feed Ingredients | No use of feed ingredients that are produced by environmentally detrimental practices | Other feed ingredients, specifically such intending to substitute fish-meal and -oil (e.g. Soy-Beans) may be produced by environmentally detrimental practices (e.g. large scale deforestation of rain forests). |
| Depletion of Freshwater | Efficiency of water use and type of freshwater sources | Freshwater is a key-resource in aquaculture and is considered worldwide to be one of the most essential natural resources. Aquaculture should not lead to long term depletion of local freshwater bodies or be subject to local water use conflicts. |
| Deterioration of Freshwater by Salinisation | Prevention measures against salinisation | The farming of marine species in terrestrial freshwater habitats may lead to serious deterioration and salinisation of freshwater bodies and soil by infiltration of saline water. |
| Disturbance of Hydrology | Appropriate site selection, design, construction and operation of land-based aquaculture farms | Inappropriate design, construction and operation of land-based aquaculture sites may adversely affect local hydrology and lead to long term disturbance of natural water bodies (surface and groundwater). |
| Land use | Legal, appropriate and efficient use of land taking into account the carrying capacity of a given area for aquaculture activities | Unplanned, inappropriate and illegal use of land for aquaculture operations may lead to a deterioration of land, land abandonment and multiple land use conflicts. |
| Disturbance and Deterioration of Soil | Appropriate site selection, design, engineering, construction and operation of land-based aquaculture farms | Inappropriate farm design and planning, construction and operation may lead to serious soil disturbance and deterioration (e.g. erosion, disturbance of soil integrity, salinisation). |
| Habitat Sensitivity and Habitat Conversion | Exclusion and restrictions for aquaculture operations in highly sensitive habitats. Minimisation of detrimental habitat conversion | Potential negative impacts of aquaculture operations strongly depend on site-specific ecological sensitivity of habitats. Habitat damage shall be prevented in the realm of any aquaculture operation. |
| Deforestation | No deforestation of sensitive habitats for aquaculture operations | Large scale deforestation of sensitive areas (e.g. Mangroves) for installation of aquaculture operations leads to significant disruption of the ecosystems function and local biodiversity loss. |
| Discharge of Effluents | Measures to prevent and minimise discharge of organic matter and nutrients. Performance-based metrics for acceptable discharge of effluents | Discharge of farm effluents such as organic matter (solid and dissolved) and nutrients (N+P) cause ecological hazards such as eutrophication, anoxia, benthic habitat disruption and general decrease of water quality in the surrounding water bodies. |
| Use, Handling and Discharge of Chemicals and Hazardous Goods | Restrictions for toxic and persistent chemicals and measures for proper handling, use and discharge of hazardous goods and chemicals | Discharge and/or improper handling of hazardous goods (e.g. chemicals, fuels, lubricants and fertilizers) may lead to multiple detrimental effects through bio-concentration / bio-accumulation affecting ecosystems, worker health and finished product quality. |
| Introduction of New Species | Restrictions for (new) introduction of non-native species. Preferable use of indigenous species | The introduction of new, non-native species is associated with multiple potential large scale risks for ecosystems. |
| Spreading of Pathogens and Parasites into the Wild | Prevention measures and minimisation of spreading of disease and parasites | Through intensive farming activities, pathogenic organisms and parasites can be spread out into the environment and harm wild populations of farmed species (e.g. Sea Lice, Viral Diseases). |

| Criterion | Indicator | Justification / References |
|--|---|--|
| Escape of cultured Species into the Wild | Prevention measures and minimisation of escapes of cultured species into the wild | Cultured species genetically differ from their wild relatives being present in the cultivating habitat. Escaped cultured species may genetically interfere with wild populations threatening long term survival and genetic diversity. |
| GMO as cultivated Species | No GMO as cultured species in aquaculture | Genetically modified organisms (GMO) used in aquaculture as cultivating species can escape into the wild and may lead to serious multiple ecological hazards. |
| GMO in Feed from Agricultural Crops | No GMO agricultural feed-stuffs for aquaculture feed | Genetically modified organisms (GMO) used as agricultural crops may lead to serious multiple ecological hazards. |
| Brood Stock and Seedlings | Minimisation of dependency on wild brood stocks. Use of domesticated brood stock. No harmful extraction methods | Sourcing of brood stock / juveniles in the wild can seriously harm the ecosystem if (a) the species is over-fished / endangered or (b) a harmful extraction method is used (e.g. destructive fishing gear) or (c) if extraction volumes exceeds carrying capacity. |
| General Impacts on local Wildlife | Prevention and minimisation measures for negative impacts on local wildlife | Aquaculture might have negative impacts on wildlife such as reduction of foraging grounds, disruption of migratory routes and spawning areas, acoustic deterrents, entanglements in nets or cages, regular shooting of birds and/or mammals. |

3.1.2 Social Issues

| Criterion | Indicator | Justification / References |
|--|--|--|
| Labour Rights | Compliance with basic internationally acknowledged labour rights and standards | Sustainable aquaculture must encompass social responsibility. International labour rights must be recognised (forced labour, child labour, worker safety and health, discrimination, discipline, working hours, freedom of association, wages). |
| Land Conflicts and Land Rights | Existing community rights and land tenure must be recognised and respected. Conflicts shall be prevented and minimised by consultation and resolution procedures | Illegal / inappropriate land tenure for aquaculture operations may displace local communities that depend on land for cultivation of crops to sustain their livelihoods, often leading to social conflicts. |
| Access to natural Resources and Resource Rights | Access of communities to natural resources must not be prevented. Communities' resource rights must be recognised | Local communities depending on subsistence activities may lose access to vital resources for their livelihoods (e.g. water bodies, wetlands, agricultural land or forests) through aquaculture facility and installations. |
| Economic Benefits of Smallholders and Access to Certification Programmes | Smallholders' access to certification programmes must be allowed and improved. Economic benefits of aquaculture shall be mutually beneficial for all stake-holders and communities | In many areas aquaculture is a traditional activity involving many smallholders. Sustainability does encompass economic profitability and viability and therefore aquaculture certification must also allow smallholder participation and economic benefits. |

3.1.3 Animal Welfare and Health Issues

| Criterion | Indicator | Justification / References |
|--|--|--|
| Husbandry System and Handling Procedures | Species-specific and adapted husbandry systems. Stress prevention and minimising strategies in the production process | Husbandry systems that do not allow natural expression of species behaviour may lead to higher stress, aggressive behaviour, susceptibility to diseases and mortalities. Excessive handling practices may also induce stress and lead to diseases. |
| Stocking Densities | Stocking densities / performance metrics related to species-specific behaviour, stress-reduction, health and local environmental conditions | Excessive, non-species and non-local environment adapted stocking densities may lead to increased stress levels and higher incidence of disease, threatening animal welfare and sustainability of aquaculture. |
| Slaughtering | Appropriate methods and proceedings for killing | Inappropriate killing methods increase stress of animals, reduce product quality and may result in decreasing consumer acceptance. |
| Disease Prevention and Bio-security | Appropriate disease prevention, bio-security measures and an integrated health management plan at all production stages are essential elements | Disease outbreaks can be minimised by appropriate site selection, planning, installation and operation procedures and professional health management during operation. Bio-security measures should be installed for transportation (e.g. quarantine). |
| Treatment and Medication | Appropriate, legal and professional treatment of diseases | Sick and ill animals need to be treated professionally without harming the cultured stock, endangering the surrounding ecosystems or threatening food safety of the finished product. |
| Use of Antibiotics | Legal use of Antibiotics. No prophylactic use. For treatment of disease only. No use of Antibiotics as growth promoters in feed | Inappropriate use of antibiotics in aquaculture may lead to discharge into the environment, leading to a build-up of microbial resistances. Antibiotics may be present in finished products threatening consumer health / marketability. |

3.1.4 Standards Development and Verification Procedures

| Criterion | Indicator | Justification / References |
|--|--|--|
| Procedures for Standard Development and Review Process | Documentation of standard development procedures. Applies to regular standard's review process also | Documented procedures for the process under which a standard is developed shall form the basis of all activities of a standard-setting organisation. |
| Stakeholder Involvement, Consultation and Public Review Process | Multi-stakeholder involvement and consultation process. Regular public review process | The development process of a standard's regulatory framework should be based on a meaningful multi-stakeholder and consultation process, also including a public review process allowing different interest groups to participate within the process. |
| Openness of Governance | Open governance board for various stakeholders and interest groups. Transparent to the public | Governance of the standard setting body should be open and transparent in order to allow equal participation of various stakeholder and interest groups on the standards strategic and operational procedures. |
| Complaint Resolution during Development and Reviews | Implementation of a complaint resolution mechanism into the standard's development and review procedures | The standards development procedures shall contain a complaint resolution mechanism for the impartial handling of any procedural complaints that may occur during the process of a new development of a standard or during the regular review process. |
| Independency of standard creation body and standard holding body | Firewall between standard creation body and standard holding body | An entity that is operatively managing a certification programme should not be directly in charge of the creation and development process of the referring standard. |

| Criterion | Indicator | Justification / References |
|--|---|--|
| Definition and Formulation of Criteria and Performance Metrics | Performance-based metrics for key criteria, rather than descriptive and process oriented | A standard shall be defined and expressed in terms of a combination of process-, management- and performance-criteria, rather than be mainly descriptive. Environmental key criteria must be metric-based and measurable. |
| Effectiveness, Relevancy and Verifiability | Relevant and verifiable criteria complemented by objective indicators and benchmarks for improvements | Standard criteria shall effectively contribute to achieving the stated objectives. These criteria therefore should be of relevancy and a standard should provide indicators and benchmarks for constant improvement and effective verifiability. |
| Accessibility and Applicability | Open access to standard. Broad applicability of criteria. Suitability for small-scale producers in developing countries. Adaptability to various local conditions | Application to, and participation in a certification programme shall be broad and open to all potential applicants. Specific attention should be paid to enabling the participation of small-scale producers in developing countries. |
| Inspection Bodies | Third party inspection body. Accreditation of Inspection Bodies (ISO/IEC 17020:1998) | Inspections shall be conducted by independent and officially accredited third party bodies. Inspection bodies directly linked / accredited by the standard holding body itself are not credible and may be biased. |
| Certification Bodies | Third party certification body. Accreditation of Bodies operating Certification of Products (ISO Guide 65/EN 45011:1998) | Certification of products / operations should be conducted by independent third party and officially accredited certification bodies (CB). |
| Inspection Procedures | Regular inspection frequency (min. annually) on an unannounced basis | Inspections should be conducted on a regular basis and not be pre-arranged with the operators / operations subject to inspection. Effective and credible inspections check for compliance on randomly chosen time/date. |
| Corrective Measures | Corrective measures and procedures. Complaint resolution process | Producers and farming operations deliberately not following the standards guidelines are threatening the standards credibility, public acceptance and quality / food safety of the product. |
| Complaint Resolution during Assessment | Opportunity for comments and complaints by different stakeholders directly affected by the operation | Clients of a certification programme as well as different stakeholders directly affected by the operation under certification should have the opportunity for issuing complaints or offering formal comments during the certification process. |
| Subject of Certification Programme | All relevant steps of aquaculture production and processing are covered by the standard and subject to inspection and certification | An environmental / social aquaculture certification programme shall cover all relevant steps of the production process where environmental and social impacts may occur. |
| Chain of Custody | Chain of Custody Certification (CoC) for all operators along the supply chain | A certification programme shall establish a system of guarantee to ensure that certified products will not be mixed with non-certified products or otherwise be manipulated along the supply chain to the end consumer. |

3.2 Benchmarking Methodology

3.2.1 Benchmarking System

The benchmarking study analyses whether and to what extent a given standard addresses the relevant and defined issues of concern (3.1.). Each standard has been individually analysed and benchmarked against the criteria defined by means of a numerical rating and matching system.

The outcome of the analysis shows how well a standard performs and measures up to the benchmark defined – delivering an indicator for the matching level of a standard with the defined benchmark criteria.

3.2.2 Score for assessed Criteria

The *Score* reflects the matching level of a standards-specific criterion against the defined benchmarking criterion. There are four different score levels along a numerical scale from 0 – 3.

For each single criterion a *Maximum Score* of 3 can be achieved by a specific standard:

| Matching Level | Definitions | Score |
|----------------|--|-------|
| Full | <ul style="list-style-type: none">- Standard fully covers the defined criterion- The criterion is addressed in full compliance with the defined benchmark by the standard's regulatory framework | 3 |
| Medium | <ul style="list-style-type: none">- Standard does meet the defined criterion, but has some shortfalls- The criterion is addressed still sufficiently by the standard's regulatory framework | 2 |
| Low | <ul style="list-style-type: none">- Standard only basically meets the defined criterion and has serious shortfalls / lacks essential regulation- The criterion is addressed insufficiently by the standard's regulatory framework | 1 |
| None | <ul style="list-style-type: none">- Standard does not meet the defined criterion- The criterion is not subject to the standard's regulatory framework | 0 |

The total of all maximum scores result in the *Total Maximum Score* for each Category and Sub-Category within the benchmarking criteria. The level of the total maximum score of each category and sub-category is no indicator for the overall importance of the referring category or sub-category.

| Category | Sub-Category | Maximum Score |
|---|--|---------------|
| A. Environmental Issues | Energy | 9 |
| | Feed | 9 |
| | Water | 9 |
| | Land and Soil | 6 |
| | Ecosystem and Biodiversity | 33 |
| | Total Maximum Score A | 66 |
| B. Social Issues | Labour | 3 |
| | Community Impact and Livelihoods | 9 |
| | Total Maximum Score B | 12 |
| C. Animal Welfare and Health Issues | Animal Welfare | 9 |
| | Disease, Prevention and Medication | 9 |
| | Total Maximum Score C | 18 |
| D. Standard Development & Verification Procedures | Development, Governance and Criteria | 21 |
| | Conformity Assessment and Verification | 15 |
| | Standard Subject and Chain of Custody | 6 |
| | Total Maximum Score D | 42 |

3.2.3 Non-Applicable Criteria and Applicable Score (AS)

The benchmarking study's criteria have been developed to evaluate a variety of different aquaculture standards and systems. The criteria thus encompass different cultivation systems for fish and crustaceans and also relate to different production areas and environments where these species are produced. The wide geographic and technical variability of aquaculture operations and systems makes it impossible to benchmark various standards for different species against exactly the same criteria.

Therefore prior to the benchmarking exercise, each standard has been analysed for encompassing benchmarking criteria that do not apply to the standard's subject and therefore are of no relevancy.

Such *non-applicable criteria* would, - if not taken into account accordingly-, result in an unjustifiable lower total benchmarking score. For each standard therefore, non-applicable criteria have been identified and marked as *n/a*. (non-applicable) in the concerning benchmarking tool.

Non-applicable criteria have been identified in following situations:

- Energy efficiency measures in standards addressing only extensive, low-input aquaculture with no use of process energy such as electricity, gas, oil or heat
- Regulations on air-freight of finished products in standards addressing only domestic production and marketing (no air freight taking place)
- Deterioration of freshwater by salinisation in standards only addressing inland aquaculture in countries with no possibility for farming marine species in inland scenarios
- Regulation of feed conversion efficiency (FCE) for fishmeal and fish-oil in standards not allowing the use of feed containing fishmeal or fish-oil or exclusively relying on natural productivity of ponds (no external feeding)

- Criteria of land use and soil protection in standards addressing only marine open water-based aquaculture such as the cultivation of finfish in net pens and floating cages
- Terrestrial eco-system criteria in standards concerning only marine finfish aquaculture and thus not involving land-based activities (e.g. deforestation of mangroves or primary forests for land-based pond aquaculture operations)
- Criteria for efficient use of freshwater in standards concerning only marine culture systems with no use of freshwater

In order to correctly address non-applicable criteria, for each standard an *Applicable Score (AS)* has been calculated:

$$AS = \text{Total Maximum Score} - \text{Maximum Score of all non-applicable Criteria}$$

3.2.4 Relative Score (RS)

The benchmarking score of the analysis was then calculated and expressed as a percentage of the *Applicable Score (AS)* resulting in the *Relative Score (RS)*.

$$RS \text{ in } \% = \frac{\text{Resulting Score}}{\text{Applicable Score}} * 100$$

The *Relative Score (RS)* reflects the matching level of the standards' guidelines with regards the environmental, social, animal welfare and standard system criteria that have been defined as the benchmark by WWF in the realm of this study (Example 1).

Example 1: Calculation of the Relative Score of the Sub-Category Energy

| Energy | Score | AS | RS |
|-----------------------------|-------|----|-----|
| Energy Efficiency | 3 | 3 | |
| Source of Energy | 2 | 3 | |
| Air-Freight for Shipment | 1 | 3 | |
| Total Energy | 6 | 9 | 67% |
| RS in % = 6 / 9 * 100 = 67% | | | |

The Relative Score (RS) of each main category has been calculated as the average of all sub-categories. This implies that the relative importance of each sub-category within a given main category has been defined as equal (Example 2).

Example 2: Calculation of the Total Relative Score of the Main Category Environmental Issues

| Environmental Issues | Score | AS | RS |
|---|-------|----|-----|
| Energy | 6 | 9 | 67% |
| Feed | 2 | 9 | 22% |
| Water | 3 | 9 | 33% |
| Land and Soil | 3 | 6 | 50% |
| Ecosystem and Biodiversity | 15 | 30 | 50% |
| Total RS Environmental Issues | | | 44% |
| RS in % = (67%+22%+33%+50%+50%) / 5 = 44% | | | |

The *Relative Score (RS)* has then been used as the final numerical figure for describing results in relation to each single category and sub-category of criteria (e.g. Category: Environmental Issues; Subcategory: Energy).

There has been no overall calculation of results encompassing all four categories, since this would necessarily involve weighing criteria against each other (e.g. importance of environmental issues vs. social issues).

3.3 Dialogue with Standard Setting Bodies

The benchmarking study has been conducted in an open and transparent way and communication with the standards' setting bodies. Each standard organisation has been informed about the study's focus and scope prior to the analysis and the benchmarking results have been openly shared with the standards organisations for open discussion and comments.

The scoring of each standard is based on the best available information as well as the interpretation of the standards' contents by the authors of the study. Since the evaluation of written materials is, by nature, a subjective affair, the authors did pay considerable attention to establishing an open dialogue with the standard setting bodies in order to exchange interpretations and to avoid misunderstandings and misconceptions.

The standards setting bodies were thus enabled to openly and critically comment on and discuss the system of benchmarking and the criteria applied – and they could make comments and suggestions with regards the interpretation of their standard's principles and criteria.

3.4 Basis for Appraisal by WWF

In order to provide objective measures for basing recommendations, three different recommendation levels for all categories and sub-categories have been defined. The matching scores refer to the definitions provided in section 3.2.2.

| Compliance Level | Definitions | Calculation |
|------------------------------------|--|--|
| High Better Choice | Relative Score (RS) of a given category must reach at least 83% | <ul style="list-style-type: none"> - 50% of all criteria must be met by full matching level (Matching Score 3) - 50% of all criteria must be met by medium matching level (Matching Score 2) |
| Medium Needs Improvement | Relative Score (RS) of a given category must reach at least 50 % | <ul style="list-style-type: none"> - 50% of all criteria must be met by medium matching level (Matching Score 2) - 50% of all criteria must be met by low matching level (Matching Score 1) |
| Low Serious Shortfalls | Relative Score (RS) of a given category is below 50 % | <ul style="list-style-type: none"> - 50% of all criteria are met by low matching level (Matching Score 1) - 50% of all criteria are not met at all (Matching Score 0) |

4. Selected Aquaculture Standards for Benchmarking

4.1 Selection of Standards for Benchmarking

To carry out the study, not all available standards have been selected for the benchmarking analysis. The following main conditions and criteria have been applied to select the standards for benchmarking:

- The standards' market range and market acceptance: The study focuses on addressing European markets and consumers. Therefore, mainly European-operated or EU market-oriented standards and certification programmes with strong market presence in the EU have been selected for benchmarking.
- The standards' transparency: Standards whose guidelines and criteria were not open to the public or standard bodies that did not share information on their regulations for this study, could not be selected for benchmarking due to lack of transparency.
- The standards' subject of certification: Standards that do not specifically or sufficiently address environmental, social or animal welfare criteria could not be selected for appropriate benchmarking (although such standards may promote and communicate environmental, social and animal welfare issues).

Standards that have been evaluated as potential candidates for the study, but have not been selected due to one or several of the aforementioned reasons are listed in this Chapter, Section 4.3.

The following section introduces the standards that have been selected for the benchmarking analysis. The standards have been categorised according to their subject of certification (species) or production method (conventional versus organic aquaculture).

4.2 Selected Standards

4.2.1 General Certification Programmes for Aquaculture



Aquaculture Certification Council (ACC)

International

Aquaculture Certification Council, Inc. is a nongovernmental body established to certify social, environmental and food safety standards at aquaculture facilities throughout the world. This non-profit, non-member public benefit corporation applies the Global Aquaculture Alliance (GAA) Best Aquaculture Practices standards (BAP) in a certification system that combines site inspections and effluent sampling with sanitary controls, therapeutic controls and traceability.

The Global Aquaculture Alliance (GAA) has been formed by the aquaculture industry, predominantly by the shrimp sector, to promote sustainable aquaculture practices throughout the world. It has developed a Code of Good Practice for marine shrimp farming which has been used as the basis for GAA's Best Aquaculture Practice (BAP) for shrimp. The Global Aquaculture Alliance is currently developing additional standards for other species (fish) that may be included in the BAP-Certification programme.

The Aquaculture Certification Council (ACC) currently certifies GAA's BAP-Programme for shrimp hatcheries, farms and processing plants. Inspections and audits of farms and processing plants are conducted by independent inspectors who are trained and approved by the ACC.

Since their introduction on international markets, the BAP standards used by the ACC have been experiencing growing acceptance by seafood market players, predominantly in the US, but also in European markets. To date, a total of 20 shrimp hatcheries, 36 farms and 54 processing operators worldwide have been certified by the ACC.

| | |
|--|---|
| | <p>The Aquaculture Certification Council (ACC) is mainly a business-to-business tool but the ACC label is increasingly visible and promoted on finished product packaging.</p> |
| Certified Species: | <ul style="list-style-type: none"> - Black Tiger Shrimp (<i>Penaeus monodon</i>) - Pacific White Shrimp (<i>Penaeus vannamei</i>) - Giant Freshwater Prawn (<i>Macrobrachium rosenbergii</i>) |
| In Preparation: | <ul style="list-style-type: none"> - Atlantic Salmon (<i>Salmo salar</i>) - Channel Catfish (<i>Ictalurus punctatus</i>) - Pangasius (<i>Pangasius hypophtalamus</i>) - Tilapia (<i>Oreochromis spp.</i>) - Processing plant standards |
| GLOBALG.A.P. GLOBALGAP Integrated Aquaculture Assurance International | <p>GLOBALGAP, formerly known as EUREPGAP, is a private sector body that sets voluntary standards for the certification of food products around the globe. EUREPGAP started in 1997 as an initiative by retailers belonging to the Euro-Retailer Produce Working Group (EUREP). Today GLOBALGAP is an equal partnership of producers and retailers which want to establish certification standards and procedures for Good Agricultural / Aquaculture Practices (GAP). GLOBALGAP management and normative documents are hosted and owned by FoodPLUS GmbH, a non-profit industry owned and governed organisation.</p> <p>GLOBALGAP provides standards and framework for the independent, recognised third party certification of farm production processes based on EN45011 or ISO/IEC Guide 65. Feed operators and farms are being certified when they reach a certain level of compliance with established GAP set out in the GLOBALGAP normative documents.</p> <p>The GLOBALGAP <i>Integrated Aquaculture Assurance Standard</i> is based on the GLOBALGAP Integrated Farm Assurance Standard (for agriculture) and has the modular composition which enables farmers to combine multiple products into one single audit. The aim is to ensure integrity, transparency and harmonisation of global aquaculture standards. The standard includes issues such as worker health, safety and welfare, environmental and animal welfare.</p> <p>GLOBALGAP is a pre-farm gate standard that covers the whole agricultural or aquaculture production process, including production of feed and juveniles / seedlings in hatcheries.</p> <p>The GLOBALGAP standards are assessed on three different levels of compliance: Major Must, Minor Must and Recommended. For certification purposes compliance of the applicable control point must be obtained from 100% of the Major Musts and from 95% of the Minor Musts. All control points are compulsory to be audited by the GLOBALGAP approved Certification Bodies.</p> <p>GLOBALGAP may recognise other certification programmes as being equal to GLOBALGAP. Therefore, scheme owners may apply to FoodPLUS for GLOBALGAP recognition through an internal benchmarking process.</p> <p>GLOBALGAP is well established for agricultural goods amongst European retailers and wholesalers. The integrated aquaculture standard for Salmonid Species, which was introduced in 2004, has been well received. To date, a total of 60 aquaculture farms and operators have been certified.</p> <p>GLOBALGAP is a business-to-business tool / certification system and is therefore not directly visible to the end consumer.</p> |
| Certified Species: | <ul style="list-style-type: none"> - Atlantic Salmon (<i>Salmo salar</i>) - Rainbow Trout (<i>Oncorhynchus mykiss</i>) |
| In Preparation: | <ul style="list-style-type: none"> - Pangasius (<i>Pangasius hypophtalamus</i>) - Black Tiger Shrimp (<i>Penaeus monodon</i>) - Pacific White Shrimp (<i>Penaeus vannamei</i>) - Giant Freshwater Prawn (<i>Macrobrachium rosenbergii</i>) |



Friend of the Sea International

Friend of the Sea is an Italy-based fisheries and aquaculture certification scheme promoted by the Earth Island Institute, an international independent and not-for-profit humanitarian and environmental organisation. Friend of the Sea's mission is to promote sustainable fisheries and aquaculture practices through the labelling and promoting of sustainable products on the markets.

Friend of the Sea is one of the few international certification schemes applying both for wild fisheries and aquaculture. The aquaculture certification scheme has been developed by FOS by involving industry stakeholders as well as NGO's and scientific bodies.

The certification is based on compliance assessment against FOS's criteria for sustainable aquaculture (Approval Criteria for sustainable Aquaculture) which aim to provide a regulatory framework in accordance with the same main criteria of organic aquaculture standards.

FOS has currently over 12 different species and products certified, most of which are sold in European or US retail chains under private labels.

For aquaculture products, the newly-revised FOS aquaculture standard (Version 15.4.2007) requires certification by organic standards by the end of 2008. However, FOS does not indicate on which organic standard the certification shall be established.

Certified Species:

- Atlantic Halibut (*Hippoglossus hippoglossus*)
- Atlantic Salmon (*Salmo salar*)
- Atlantic Cod (*Gadus morhua*)
- Clams (*Venerupis pullastra*)
- European Sea Bass (*Dicentrarchus labrax*)
- Gilthead Sea Bream (*Pagrus auratus*)
- Stripped Bass (*Morone spp.*)
- Sturgeon and Caviar (*Acipenser spp.*)
- Rainbow Trout (*Oncorhynchus mykiss*)
- Turbot (*Psetta maxima*)

4.2.2 Specific Certification Programmes for Fish

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|  | <p>The Code of Good Practice (CoGP) has been developed by the Scottish Finfish Aquaculture Working Group. The code has been developed by involving a wide range of interested stakeholder groups including governmental bodies, research institutions, NGO's, retail and industry groups.</p> |
| <p>Code of Good Practice (CoGP)</p> <p>Scottish Finfish Aquaculture</p> <p>Scotland</p> | <p>The CoGP covers all finfish aquaculture species, grown in a variety of systems and includes hatchery, farming and processing. The code comprehensively sets out the standards that all farmers must demonstrate in order to apply for membership of the Scottish Salmon Producers' Organisation (SSPO). Other Scottish finfish aquaculture trade bodies have similar policy positions. By defining more than 300 specific compliance points in the CoGP - plus additional sub-points in many cases - the CoGP covers all aspects of good practice in finfish aquaculture.</p> <p>Compliance with the Code is independently audited by UKAS-approved inspection services. A certification body accredited to UKAS has been appointed to ensure parity and consistency between inspections and audits, and also to facilitate the collation of audit reports. The CoGP shall be an evolving document, designed to embrace new developments and new science so that it becomes established as a credible, robust and modern reflection of good aquaculture practice.</p> <p>The CoGP came into being at the beginning of 2006. Today the SSPO represents over 95% of Scottish farmed salmon production. The CoGP standards have been well accepted by the market. The main markets for certified products are the UK and continental Europe, especially France.</p> <p>Although the Code of Good Practice for Scottish Finfish Aquaculture (CoGP) is the entry point for membership of the Scottish Salmon Producers' Organisation, Product Certification Programmes for <i>Tartan Quality Mark Salmon</i>, <i>Label Rouge Scottish Salmon</i> and <i>Protected Geographic Indicator (PGI) Scottish Farmed Salmon</i>, awarded by the European Commission, continue to be available to the industry.</p> |
| <p>Certified Species:</p> | <ul style="list-style-type: none"> - Atlantic Salmon (<i>Salmo salar</i>) - Rainbow Trout (<i>Oncorhynchus mykiss</i>) - Arctic Charr (<i>Salvelinus alpinus</i>) |
|  | <p>The Tartan Quality mark is a recognised symbol assuring retailers and consumers that the salmon is Scottish and that the production processes have been rigorously and independently inspected at every stage.</p> <p>All Tartan Quality Mark certified products are produced in compliance with the CoGP for Scottish Finfish Aquaculture. The Tartan Quality Mark is mainly used in the UK market.</p> |
| <p>Tartan Quality Mark for Scottish Salmon</p> <p>Scotland</p> | <p>Certified Species:</p> <ul style="list-style-type: none"> - Atlantic Salmon (<i>Salmo salar</i>) |



SIGES Salmon Chile

Chile

The SIGES standard for Chilean Salmon has been developed and is today managed by INTESAL, the institute for salmon technology in Chile. The SIGES standard was developed in 2003 on behalf of Salmon Chile, the Chilean Salmon producers association.

The SIGES standard is basically a certifiable Integrated Management System consisting of a set of verifiable codes of conduct and standards ensuring compliance with applicable legal regulations, product quality and food safety, safe production process as well as environmentally sound and socially responsible production.

Each company and operator seeking certification has to implement its individual management system according to the SIGES requirements in order to verify compliance with all legal regulations applicable and a set of Best Practices focusing on the production process, food safety, occupational safety and health and environmentally sound production.

The SIGES-Salmon Chile certification is not a product certification. It certifies compliance of the companies' internal management systems.

The SIGES standard encompasses all stages of the production and value-adding chain. The standard's guidelines are stated in the Manual of Regulations and Best Practices. For the SIGES certification programme, a company must conduct three different stages, the last being the final audit followed by certification by an independent and officially accredited certifying body.

To date, no company has been certified yet, but the first companies are expected to be certified in 2007. A total of 24 salmon farming companies, encompassing over 370 aquaculture farms and 24 processing plants are in the process of the SIGES certification and approval scheme.

Certified Species:

- None (First certified salmon products expected in 2007)

4.2.3 Specific Certification Programmes for Shrimp

ABCC

BRAZILIAN SHRIMP FARMERS ASSOCIATION



Shrimp Quality Guarantee ABCC

Brazil

The Brazilian Association of Shrimp Producers (ABCC) developed and first released its Code of Conduct and Good Practices for the Brazilian shrimp sector in 2003.

The scope of the programme covers food safety and product quality, worker health and safety as well as environmental and social issues related to the Brazilian shrimp industry.


The code of conduct has been developed by the ABCC and is based on the *FAO Code of Conduct for responsible Fisheries*, as well as on the *International Principles for Responsible Shrimp Farming* (see section 2.2. of this study).

The code constitutes a voluntary basis for implementation of Better Management Practices within the Brazilian shrimp farming industry, and also provides a regulatory framework and standard guidelines for a certification programme referred to as the *Shrimp Quality Guarantee*.

The programme encompasses all relevant stages of shrimp production and includes feed-mills, hatcheries, farming operations and the processing industry. It is subject to independent third party assessment and certification by accredited bodies.

Due to the current economic crisis of the Brazilian shrimp sector, the implementation of the programme has experienced a backlash and many players in the industry have postponed concrete actions towards audits and certification. Nevertheless, the ABCC has never stopped its efforts of promoting the programme and has been training industry technicians over the past three years in order to raise awareness on the importance of adopting best aquaculture practises.

In 2006, the ABCC established a partnership with the Brazilian Technological Institute (ITEP) to up-grade its shrimp quality assurance and certification programme to a higher level, based on experiences in the Brazilian fruit production sector in the realm of approval for GLOBALGAP.

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| | <p>The new ABBC programme is referred to as PICC (Integrated Shrimp Production). It was officially launched in June 2007 and will be based on the ABCC's code of conduct and best aquaculture practices as well as on newly-developed regulations according to US and EU food safety and sanitation issues as well as broad stakeholder inputs from sources such as the FAO, the WWF and EUREPGAP.</p> |
| Certified Species: | <p>- Pacific White Shrimp (<i>Penaeus vannamei</i>)</p> |
|  <p>Thai Quality Shrimp</p> <p>Thailand</p> <p>CoC Certified Thai Shrimp</p> | <p>The Thai Quality shrimp programme has been developed over the past 10 years by the Thai Department of Fisheries (DOF) in collaboration and with the support of various international organisations such as the World Bank. The DOF has been introducing several Programmes and activities to ensure food safety and sustainability of Thai shrimp.</p> <p>The national programme is based on two main pillars, the Good Aquaculture Practice Programme (GAP) and the Code of Conduct for responsible shrimp farming (CoC).</p> <p>The GAP-programme mainly focuses on food safety and implements good practices at the hatchery and farm level to ensure that products are fresh and do not contain residues of chemicals and antibiotics nor microbial contaminants. The GAP-programme is regarded as the basis for Thai Quality Shrimp and has been implemented on more than 60% of all shrimp farms and hatcheries.</p> <p>The Code of Conduct for responsible aquaculture (CoC) encompasses guidelines which cope with the entire production chain including feed-mills, hatcheries, farms and processors.</p> <p>The Thai CoC-Programme is based on the <i>FAO Code of Conduct for responsible Fisheries</i> as well as on the <i>International Principles for Responsible Shrimp Farming</i> (see section 2.2. of this study). The CoC-Guideline is divided into two sections for hatcheries and farms, each containing 11 criteria that need to be met by hatcheries and farms applying for certification.</p> <p>The criteria being checked in the CoC-Programme include site selection, farm management, stocking densities, feed, health, medication, effluents, proper harvesting and transportation, farmers' organisation, data collection as well as social responsibilities.</p> <p>Under the CoC-programme for the Thai shrimp industry, the DOF has developed several demonstration projects and today the programme encompasses more than 1,000 farms, 300 of which are currently certified and labelled by the Thai CoC-Label.</p> <p>Both the GAP- and the CoC-programme are operatively managed, inspected and certified by the Thai Department of Fisheries (DOF).</p> |
| Certified Species: | <p>- Black Tiger Shrimp (<i>Penaeus monodon</i>)</p> <p>- Pacific White Shrimp (<i>Penaeus vannamei</i>)</p> <p>- Giant Freshwater Prawn (<i>Macrobrachium rosenbergii</i>)</p> |

4.2.4 Organic Aquaculture Certification Programmes

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|  <p>Agriculture Biologique (AB)</p> <p>France</p> | <p>Agriculture Biologique (AB) is the national French consumer label for organic food products. AB standards for organic production are being developed and issued by the French Ministry of Agriculture and Fisheries. AB Bio standards are inspected and certified by different independent and accredited certifying bodies.</p> <p>The French organic aquaculture standard was developed in 2001 with the support of an external expert commission encompassing different stakeholders from the industry and aquaculture-related expert bodies. Today there are 8 French aquaculture operations certified by AB. AB certified products are mainly marketed in France, also increasingly in other European countries.</p> |
| <p>Certified Species:</p> | <ul style="list-style-type: none"> - Atlantic Salmon (<i>Salmo salar</i>) - Arctic Charr (<i>Salvelinus alpinus</i>) - Carp (<i>Cyprinus carpio</i>) - European Sea Bass (<i>Dicentrarchus labrax</i>) - Gilthead Sea Bream (<i>Pagrus auratus</i>) - Rainbow Trout (<i>Oncorhynchus mykiss</i>) - Black Tiger Shrimp (<i>Penaeus monodon</i>) |
|  <p>Bio Austria</p> <p>Austria</p> | <p>Bio Austria is the Association of Austrian Organic Farmers and Farmers Cooperatives. It is a joint and membership-based body for Austria's organic movement which is partnering with its cooperation partners for the development of organic markets in Austria.</p> <p>Bio Austria's standard for aquaculture was developed in 1995 and since then the first products - mainly Carp and Trout - have been certified and marketed. The Bio Austria aquaculture standards are applicable for the culture of herbivorous fish as well as for carnivorous species in Austrian operations only.</p> <p>Bio Austria-certified products are primarily marketed in Austria, where the standard is well received by consumers. In 2006 there were a total of 32 aquaculture farms certified by Bio Austria.</p> |
| <p>Certified Species:</p> | <ul style="list-style-type: none"> - Carp (<i>Cyprinus carpio</i>) - Rainbow Trout (<i>Oncorhynchus mykiss</i>) |
|  <p>Bio Suisse</p> <p>Switzerland</p> | <p>Bio Suisse is the Association of Swiss Organic Farmers. Guidelines for organic aquaculture were developed in 2000 and since 2001 the first products (trout) have been on the market. Bio Suisse standards encompass the production of all sort of finfish. For crustaceans and molluscs Bio Suisse refers to partner organisations such as Naturland which are individually assessed for compliance.</p> <p>Bio Suisse certified products are mainly marketed in Switzerland where the label is well received by the consumers and market players. In 2006, a total of 8 fish farms in Switzerland and 22 farms and projects in other countries were certified by Bio Suisse.</p> |
| <p>Certified Species:</p> | <ul style="list-style-type: none"> - Atlantic Salmon (<i>Salmo salar</i>) - Atlantic Cod (<i>Gadus morhua</i>) - Black Tiger Shrimp (<i>Penaeus monodon</i>) - Carp (<i>Cyprinus carpio</i>) - European Sea Bass (<i>Dicentrarchus labrax</i>) - Gilthead Sea Bream (<i>Pagrus auratus</i>) - Pangasius (<i>Pangasius hypophtalamus</i>) - Pacific White Shrimp (<i>Penaeus vannamei</i>) - Rainbow Trout (<i>Oncorhynchus mykiss</i>) - Tilapia (<i>Oreochromis spp.</i>) |



Bioland

Germany

Bioland is considered to be Germany's largest organic farming association in terms of German organic farms members and acreage. Bioland develops and issues organic standards and certifies and facilitates the marketing of organic products. The Bioland standard encompasses specific guidelines for pond culture of fish focusing on the culture of carps in Germany and other European countries. In the field of organic aquaculture Bioland has considerably less international impact than its main competitor Naturland, which certifies the majority of foreign countries' organic aquaculture projects destined for the German and other European markets.

The Bioland aquaculture standard was developed in 1995. In 2006, a total of 6 fish farms in Germany were certified by Bioland. To date, no farms in other countries have been subject to certification.

Certified Species:

- Carp (*Cyprinus carpio*)



Bio Gro

New Zealand

BioGro is New Zealand's leading organic certification agency. BioGro is a not-for-profit organic producer and consumer organisation, actively working to grow organics in New Zealand. BioGro provides professional auditing and certification services on a national level.

BioGro developed its standard for organic aquaculture in 2002 and has since then established it for the farming of finfish, bivalves and crustaceans. Today, there are 3 certified New Zealand Farms and aquaculture operations. The main market for BioGro aquaculture products is domestic.

Certified Species:

- No information available



Debio

Norway

Debio is a membership-based Norwegian organic organisation. Debio performs auditing and certification assignments in fields lying both within and beyond the scope of the definitions of organic production. Most of Debio's services encompass the inspection and certification of organic production. Debio has developed joint standards for organic farming of salmonids, perch and cod, in cooperation with the Swedish inspection body KRAV and other European inspection bodies. There is mutual recognition between Debio and KRAV for certified products.

The Debio organic standard is well accepted by Scandinavian consumers. At present, Debio has certified 3 aquaculture operations, Salmon (1), Trout (1) and Cod (1). The main markets for these products are Norway, Sweden, UK and Germany.

Certified Species:

- Atlantic Salmon (*Salmo salar*)
- Atlantic Cod (*Gadus morhua*)
- Rainbow Trout (*Oncorhynchus mykiss*)



Krav

Sweden

KRAV is a membership-based Swedish incorporated association and the key player in the organic market in Sweden. KRAV develops organic standards, inspects compliance with these standards and promotes its KRAV label.

KRAV has developed joint standards for organic aquaculture of Salmonids, Perch and Cod, in cooperation with the Norwegian inspection body Debio. There is mutual recognition between KRAV and Debio for certified products. To date, there has been no certification for aquaculture products under the KRAV label.

Certified Species:

- None



Naturland

Germany

The Naturland-Association has grown to become one of the most important organisations in the field of organic agriculture in Germany. On the global scale, Naturland is one of the major certifying organisations for organic produce and it has been one of the pioneering standard organisations for organic aquaculture development.

Naturland developed the first species-specific standards in 1995, starting with carp, followed by salmonids, bivalve molluscs and shrimp. Naturland has been initiating various international projects for organic aquaculture, most of them related to standard development and piloting farms in Europe, Latin America and Asia. Today, Naturland certifies a wide range of different species. Naturland certified products are marketed internationally and are well accepted amongst market players. To date, there are more than 30 Naturland certified farms and aquaculture projects.

Certified Species:

- Atlantic Salmon (*Salmo salar*)
- Atlantic Cod (*Gadus morhua*)
- Arctic Charr (*Salvelinus alpinus*)
- Black Tiger Shrimp (*Penaeus monodon*)
- Carp (*Cyprinus carpio*)
- European Sea Bass (*Dicentrarchus labrax*)
- Gilthead Sea Bream (*Pagrus auratus*)
- Pangasius (*Pangasius hypophthalmus*)
- Pacific White Shrimp (*Penaeus vannamei*)
- Rainbow Trout (*Oncorhynchus mykiss*)
- Tilapia (*Oreochromis spp.*)



NASAA Certified Organic

Australia

The National Association for Sustainable Agriculture Australia (NASAA) is Australia's leading organic certifier. NASAA is a non-profit company limited by guarantee comprising an association of members and certified operators.

With operations both in Australia and Overseas, the company provides certification and inspection services. Through its role as a certifier, the NASAA develops and maintains organic standards and assists operators in gaining organic certification. Development of the NASAA's organic aquaculture standards started in 2000 and today NASAA standards encompass the farming of fish, crustaceans and bivalves. NASAA certified products are marketed domestically and internationally. In 2007, 5 aquaculture operations were certified by the NASAA.

Certified Species:

- Silver Perch (*Bidyanus bidyanus*)
- Rainbow Trout (*Oncorhynchus mykiss*)
- Freshwater Crayfish (*Cherax destructor*)
- Sydney Rock oyster (*Sacostrea glomerata*)
- Pacific oyster (*Crassostrea gigas*)
- Blue Mussels (*Genus mytilus*)



Soil Association

UK

The Soil Association is the UK's leading campaigning and certification organisation for organic food and farming. Specialist standard committees continually develop the Soil Association standards as the scope for organic certification expands. The Soil Association Standards are certified by Soil Association Certification Ltd, which is a wholly owned subsidiary of the Soil Association. The Soil Association's aim is to promote the highest level of organic integrity and its standards have become a benchmark for organic production globally.

Development of organic aquaculture standards first started in 1988 and certification began in 1999. Today, the Soil Association's standards encompass the farming of various finfish, shrimp and bivalves. Soil Association's certified products are marketed internationally and are well accepted amongst market players. Today, there are 45 Soil Association certified farms and aquaculture projects in the UK.

Certified Species:



- Atlantic Salmon (*Salmo salar*)
- Arctic Charr (*Salvelinus alpinus*)
- Black Tiger Shrimp (*Penaeus monodon*)
- Carp (*Cyprinus carpio*)
- Pacific White Shrimp (*Penaeus vannamei*)
- Rainbow Trout (*Oncorhynchus mykiss*)

4.3 Not selected Standards

Standards insufficiently encompassing and addressing environmental, social and animal welfare issues in order to permit the carrying out of the benchmarking analysis have not been selected for the benchmarking exercise (see section 4.1 in this Chapter).

Some standard issuing bodies decided not to share information with regards their standard's guidelines and certification system for carrying out this study or the information was simply not available for the public. Other standard issuing bodies decided not to participate in the study, or there was no response to requests for more in-depth information. Such standards have not been selected for benchmarking due to the lack of sufficient information available. There are also cases where standards and certification programmes have been developed and promoted but, to date, never have been launched on markets.

The following section mentions all standards that have been evaluated for the benchmarking study but were not selected due to one or several of the aforementioned reasons.

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|  <p>Irish Quality Salmon and Trout Ireland</p> | <p>The Irish Quality Salmon and Trout Schemes were the first EN 45011 accredited food quality scheme in Ireland. The Quality Scheme was formally launched in 2001 by the Irish Sea Fisheries Board.</p> <p>Participation in the Salmon and Trout Quality Assurance Scheme is voluntary and the Scheme currently has over 90% industry participation. Only companies that can meet the strict standards throughout the supply chain can use the coveted quality mark.</p> <p>The Irish Quality Salmon and Trout Schemes are designed to transparently demonstrate the integrity of product and processes used in the production and processing of Irish farmed fish by participating company members. The Irish Quality Salmon and Trout Schemes aim to deliver consistent Quality Irish Fish products to the marketplace and thereby enhance consumer confidence through traceability to best practice.</p> |
| <p>Certified Species:</p> | <ul style="list-style-type: none"> - Atlantic Salmon (<i>Salmo salar</i>) - Arctic Charr (<i>Salvelinus alpinus</i>) - Atlantic Cod (<i>Gadus morhua</i>) - Rainbow Trout (<i>Oncorhynchus mykiss</i>) |
| <p>Reason for not selecting</p> | <ul style="list-style-type: none"> - Standard criteria and specifics not open to public - Insufficient transparency |
|  <p>Label Rouge France</p> | <p>Label Rouge is a food quality label issued by the French Ministry of Agriculture and Fishing. It has been widely recognised as a benchmark label for premium quality of food – encompassing the primary production process as well as the manufacturing of the finished products. The requirements of Label Rouge certification were developed by food specialists to be later approved by the French National Commission for Labelling and Certification of Agricultural and Food Products. All conditions must be finally approved by the French Ministry of Agriculture and Fishing. Conditions for approval by Label Rouge primarily encompass food-quality criteria such as flavour, taste and texture as well as stringent requirements with regards food safety, hygiene and traceability. Label Rouge-certified products claim to be produced also in respect of the environment. Label Rouge currently certifies more than 8 products from aquaculture origin. All Label Rouge products are regularly inspected by independent inspection bodies which are officially accredited by COFRAC (Comité Français d'Accréditation).</p> |
| <p>Certified Species:</p> | <ul style="list-style-type: none"> - Atlantic Salmon (<i>Salmo salar</i>) Origin: Scotland - Smoked Salmon (<i>Salmo salar</i>) Origin: Norway, Ireland and Scotland - European Sea Bass (<i>Dicentrarchus labrax</i>) Origin: France - Turbot (<i>Psetta maxima</i>) Origin: France - Black Tiger Shrimp (<i>Penaeus monodon</i>) Origin: Madagascar |
| <p>Reason for not selecting</p> | <ul style="list-style-type: none"> - Food-quality focused label only - No information available on the standards with regards sustainability |



La Truite Charte Qualité

France

Certified Species:

Reason for not selecting

As the label "Qualité Aquaculture de France", La Truite Charte Qualité has been developed and is being issued by CIPA France (Comité Interprofessionnel des Produits de l'Aquaculture).

The standards criteria are mainly the same as for Qualité Aquaculture de France, guaranteeing the freshness and origin of the products, as well as the traceability.

- Rainbow Trout (*Oncorhynchus mykiss*)

- No coverage of environmental criteria



Norway Royal Salmon

Norway

Certified Species:

Reason for not selecting

Norway Royal Salmon AS - (NRS) was founded in 1992 and is today owned and controlled by a number of independent Norwegian fish farmers. NRS organises sales and marketing of salmon and trout products throughout the world based on farmed fish from NRS-members.

Norway Royal Salmon emphasises quality in production, product quality, chain traceability and food safety. The standard encompasses criteria with regards selection of salmon for breeding, fish feed, environmental and animal welfare and fish health.

For product quality, NRS refers to national Norwegian industry standards on quality grading and measurement of colour and fat. Norway Royal Salmon products are marketed worldwide.

- Atlantic Salmon (*Salmo salar*)
- Atlantic Cod (*Gadus morhua*)
- Arctic Charr (*Salvelinus alpinus*)
- Rainbow Trout (*Oncorhynchus mykiss*)

- Insufficient transparency
- No information available to the public
- No information available with regards the certification system
- Standard setting body chose not to participate in the study



Norge Seafood

Norway

Certified Species:

Reason for not selecting

The Norge Seafood programme is managed by the Norwegian Seafood Export Council (NSEC), a governmental organisation for the promotion and market development of Norwegian seafood at the national and international level. It addresses wild capture fisheries as well as aquaculture products.

The programme is operatively managed by the Norwegian seafood industry. The regulatory framework for the Norge Seafood programme is based on various national regulations and laws related to aquaculture activities, which have to be met by all producers taking part in the programme.

Norge Seafood can therefore be best described as a national, governmental owned seafood promotion programme, based on national legal regulations and enforcement by local authorities. Regulations with regards environmental, animal welfare and health issues are embedded in several national aquaculture acts and regulations.

- Atlantic Salmon (*Salmo salar*)
- Arctic Charr (*Salvelinus alpinus*)
- Atlantic Cod (*Gadus morhua*)
- Rainbow Trout (*Oncorhynchus mykiss*)

- Norge Seafood is not a product certification scheme, or a standard
- Regulatory basis is national Norwegian law, enforcement by authorities

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|  <p>Qualité Aquaculture de France</p> <p>France</p> <p>Certified Species:</p> <p>Reason for not selecting</p> | <p>“Qualité Aquaculture de France” is an aquaculture product-label developed and issued by CIPA (Comité Interprofessionnel des Produits de l'Aquaculture), a French industry association of aquaculture operators, feed manufacturers and fish processors.</p> <p>65% of the total French aquaculture production volume of Sea-Bream, Sea-Bass, Turbot, Meagre and Sturgeon are currently certified by CIPA. The standard is thus widely recognised by the French market.</p> <p>Qualité Aquaculture de France guarantees the true origin, strict measures of control and product quality, nature of the species and the date of harvesting by its label. Also, it states an environmental responsible production of all farm-raised fish.</p> <p>- Atlantic Salmon (<i>Salmo salar</i>) - European Sea Bass (<i>Dicentrarchus labrax</i>) - Gilthead Sea Bream (<i>Pagrus auratus</i>) - Meagre (<i>Argyrosomus regius</i>) - Sturgeon and Caviar (<i>Acipenser spp.</i>) - Turbot (<i>Psetta maxima</i>)</p> <p>- No coverage of environmental criteria</p> |
|  <p>Shrimp Seal of Quality (SSOQ)</p> <p>Bangladesh</p> <p>Certified Species:</p> <p>Reason for not selecting</p> | <p>The Bangladesh Shrimp Seal of Quality (SSOQ) was developed in 2001 within the framework of the Agro-based Industries and Technology Development Project (ATDP), an international assistance programme funded by the U.S. Agency for International Development (USAID).</p> <p>The programme's aim was to build-up local and international support from stakeholders for a quality certification programme while simultaneously establishing and implementing a domestic certification system for shrimp. The programme was designed to ensure high standards for Bangladeshi shrimp with regards food safety, environment and social issues.</p> <p>The SSOQ code of good practice was developed in close collaboration with the Aquaculture Certification Council (ACC). The SSOQ was implemented in field trials in 2003, but officially ended in 2005.</p> <p>- Black Tiger Shrimp (<i>Penaeus monodon</i>) - Pacific White Shrimp (<i>Penaeus vannamei</i>)</p> <p>- Unclear information on the actual status - No certified products, Programme ended in 2005, Future outlook unclear</p> |

5. Benchmarking Results

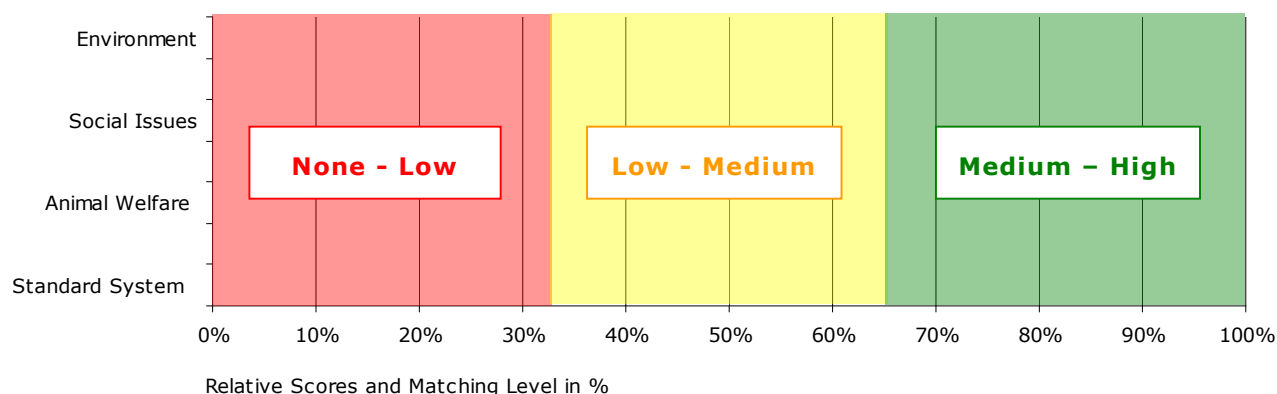
5.1 Presentation of Results

As mentioned in the methodology section (Chapter 3.2), the individual certification programmes' performance against the defined benchmarking criteria have been calculated and expressed by means of a relative score (RS). The following sections present the relative score for each standard by category and sub-category of the benchmarking criteria.

The relative scores have the following meaning as defined in section 3.2.2:

| Matching Level | Definitions | Relative Score |
|----------------|---|----------------|
| Full | <ul style="list-style-type: none">- Standard fully covers the defined criterion- The criterion is addressed in full compliance with the defined benchmark by the standard's regulatory framework | 100% |
| Medium | <ul style="list-style-type: none">- Standard does meet the defined criterion, but has some shortfalls- The criterion is addressed still sufficiently by the standard's regulatory framework | 67% |
| Low | <ul style="list-style-type: none">- Standard only basically meets the defined criterion and has serious shortfalls or lacks essential regulation- The criterion is addressed insufficiently by the standard's regulatory framework | 33% |
| None | <ul style="list-style-type: none">- Standard does not meet the defined criterion- The criterion is not subject to the standard's regulatory framework | 0% |

In the following overview of results, the relative benchmarking scores are presented for all sub-categories and main categories. For the four main categories the average score, calculated as described in section 3.2.3., is additionally presented as a graph.

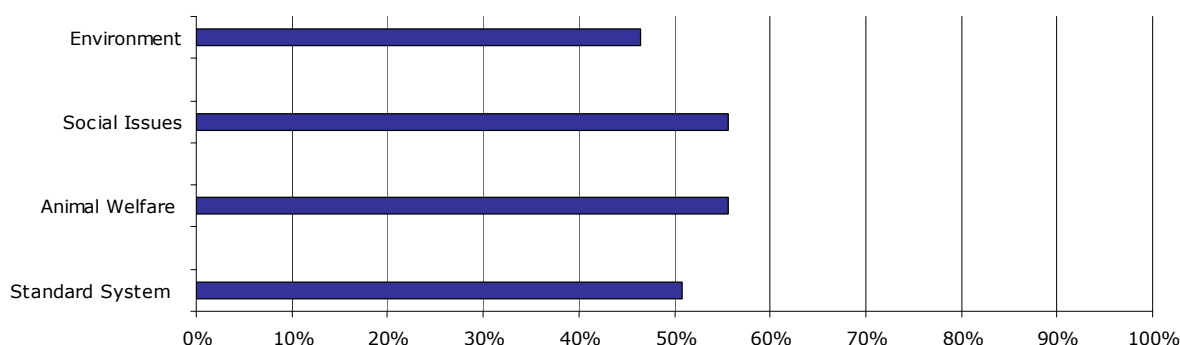


5.2 General Certification Programmes

5.2.1 Aquaculture Certification Council (ACC)



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 0 |
| | Feed | 22 |
| | Water | 78 |
| | Land and Soil | 83 |
| | Ecosystems and Biodiversity | 48 |
| Total | | 46 |
| Social Issues | Labour | 33 |
| | Community Impacts and Livelihoods | 78 |
| Total | | 56 |
| Animal Welfare and Health Issues | Animal Welfare | 44 |
| | Disease, Prevention and Medication | 67 |
| Total | | 56 |
| Standard Development and Verification Procedures | Standard Development and Governance | 46 |
| | Conformity Assessment and Verification | 40 |
| | Subject of Standard and Chain of Custody | 67 |
| Total | | 51 |



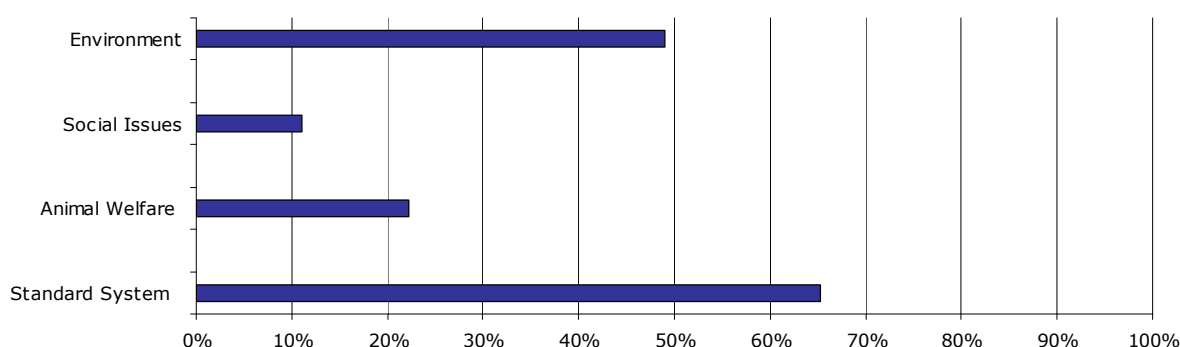
Identified Shortfalls

| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - No regulation and lack of performance metrics for energy efficiency of production - No regulation with regards energy sources and of air-freight of finished products - No regulation and performance metric for feeding efficiency (FCE or FCR) - No regulation for sustainable sources of fish-meal and fish-oil used in the feed - No regulation with regards detrimental sources of plant-based feedstuffs (e.g. soy) - GMO in feedstuffs and as cultivated species are not generally excluded - Insufficient regulation for safeguarding efficiency of water use - Insufficient regulation on prevention of escapes and transfer of diseases and parasites - New introduction of non-native species is allowed, risks are insufficiently addressed - Lack of regulation with regards sourcing brood stock in the wild - Insufficient regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Lack of labour standards according to ILO basic requirements or SA 8000 - Smallholder participation in the programme is not specifically encouraged by ACC |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - No regulations with regards animal welfare issues (husbandry systems and handling) - Insufficient regulation on species-specific and performance-based stocking densities - Lack of mandatory regulations with regards health management and medication |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - Limited openness of governance of standard creation and holding body (GAA & ACC) - Insufficient independency of standard creation (GAA) and standard holding body (ACC) - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of indicators and benchmark metrics for constant improvements - Insufficient independency of inspection bodies and certification body - Corrective measures and sanction procedures are not clearly defined - Inspections generally conducted on an announced basis - Certification may address only part of production (e.g. processing of shrimp) |

5.2.2 Friend of the Sea (FOS)



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 56 |
| | Feed | 78 |
| | Water | 22 |
| | Land and Soil | 17 |
| | Ecosystems and Biodiversity | 73 |
| | Total | 49 |
| Social Issues | Labour | 0 |
| | Community Impacts and Livelihoods | 22 |
| | Total | 11 |
| Animal Welfare and Health Issues | Animal Welfare | 0 |
| | Disease, Prevention and Medication | 44 |
| | Total | 22 |
| Standard Development and Verification Procedures | Standard Development and Governance | 63 |
| | Conformity Assessment and Verification | 67 |
| | Subject of Standard and Chain of Custody | 67 |
| | Total | 65 |



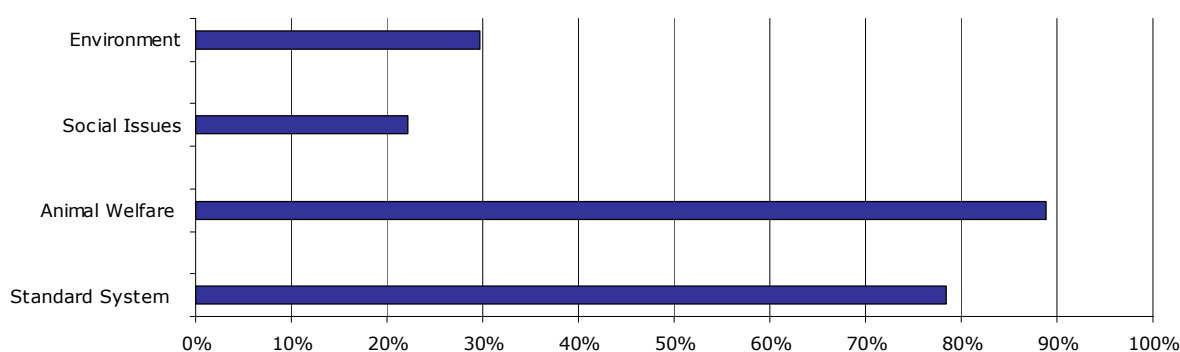
Identified Shortfalls

| | |
|---|---|
| Environmental Issues | <ul style="list-style-type: none"> - Lack of regulation and performance metrics for energy efficiency of production - Lack of regulation with regards type of energy sources - Lack of performance metric and species-specific regulation for feeding efficiency - No regulation on efficiency of water use and insufficient prevention against salinisation - No regulation with regards disturbance of hydrology and affected freshwater bodies - No regulation on efficient use of land and for the prevention of soil deterioration - Insufficient regulation on deforestation and restoration of mangroves - Insufficient regulation on effluent discharges, in compliance with national laws only - No indicators and performance metrics for limitation / reduction of effluent discharges - Insufficient regulation on proper procedures for safe handling of hazardous goods - No regulation on prevention of transfer of disease and parasites - No general exclusion of lethal measures for predator control (birds and mammals) |
| Social Issues | <ul style="list-style-type: none"> - No regulation on labour rights and no regulation on local land conflicts and land rights - No regulation on smallholder participation and economic benefits |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - No regulations with regards animal welfare issues (husbandry systems and handling) - No regulation on species-specific and performance-based stocking densities - No regulation on responsible killing procedures - Lack of mandatory regulations with regards disease prevention and bio-security - Lack of mandatory regulations for proper treatment and medication procedures |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - No documentation on standard development and review process - Limited process of stakeholder involvement in standard development and review - No openness of governance of standard creation and holding body - No complaint resolution process during standard development and review - No independency of standard creation and standard holding body - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of indicators and benchmark metrics for constant improvements - Corrective measures and sanction procedures are not defined - Inspections generally conducted on an announced basis, No full chain of custody |

5.3 Certification Programmes for Fish

5.3.1 GLOBALGAP Integrated Aquaculture Assurance (Salmonid-Module)

| | | Relative Scores (RS) in % | |
|---------------------|--|--|-----------|
| GLOBALG.A.P. | Environmental Issues | Energy | 22 |
| | | Feed | 0 |
| | | Water | 33 |
| | | Land and Soil | n.a. |
| | | Ecosystems and Biodiversity | 63 |
| | Total | | 30 |
| | Social Issues | Labour | 33 |
| | | Community Impacts and Livelihoods | 11 |
| | Total | | 22 |
| | Animal Welfare and Health Issues | Animal Welfare | 78 |
| | | Disease, Prevention and Medication | 100 |
| | Total | | 89 |
| | Standard Development and Verification Procedures | Standard Development and Governance | 42 |
| | | Conformity Assessment and Verification | 93 |
| | | Subject of Standard and Chain of Custody | 100 |
| | Total | | 78 |



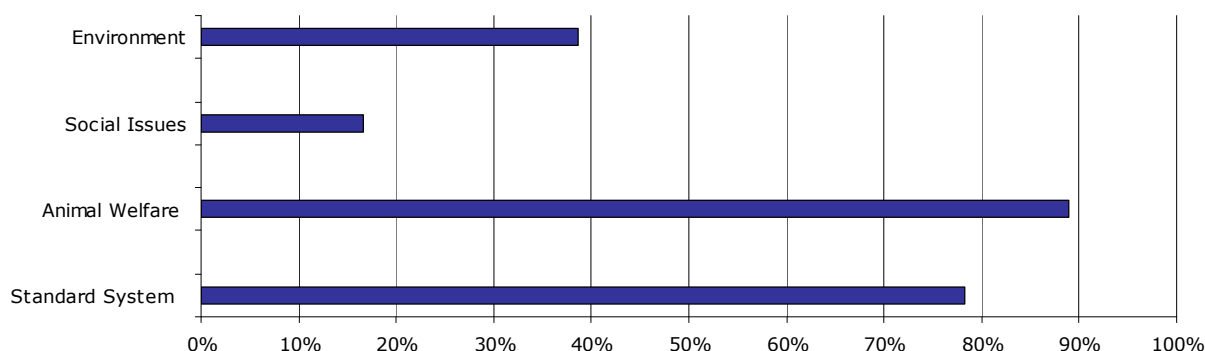
Identified Shortfalls

| | |
|---|---|
| Environmental Issues | <ul style="list-style-type: none"> - Lack of performance metrics for energy efficiency of production - Lack of regulation with regards energy sources and no regulation on air-freight - No regulation and performance metric for feeding efficiency (FCE or FCR) - No regulation for sustainable sources of fish-meal and fish-oil used in the feed - No regulation with regards detrimental sources of plant-based feedstuffs (e.g. soy) - GMO in feedstuffs are not generally excluded - No regulation on efficiency of water use (freshwater systems only) - Insufficient regulation on exclusion of farming operations from sensitive habitats - Insufficient regulation on effluent discharges, in compliance with national laws only - No indicators and performance metrics for limitation / reduction of effluent discharges - New introduction of non-native species is insufficiently addressed |
| Social Issues | <ul style="list-style-type: none"> - No regulation on labour rights according to ILO basic requirements or SA 8000 - No regulation on community impacts and resource rights - No coverage on smallholder participation and economic benefits |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Insufficient regulation on species-specific and performance-based stocking densities |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of external stakeholder involvement in standard development - Limited openness of governance (only open to retailer and supplier members) - Insufficient independency of standard creation and standard holding body - Limited options for issuing complaints during standard development process - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis |

5.3.2 Scottish Finfish Aquaculture Code of Good Practice (CoGP)



| | | Relative Scores (RS) in % |
|--|--|---------------------------|
| Environmental Issues | Energy | 22 |
| | Feed | 22 |
| | Water | 33 |
| | Land and Soil | n.a. |
| | Ecosystems and Biodiversity | 77 |
| Total | | 39 |
| Social Issues | Labour | 0 |
| | Community Impacts and Livelihoods | 33 |
| Total | | 17 |
| Animal Welfare and Health Issues | Animal Welfare | 78 |
| | Disease, Prevention and Medication | 100 |
| Total | | 89 |
| Standard Development and Verification Procedures | Standard Development and Governance | 42 |
| | Conformity Assessment and Verification | 93 |
| | Subject of Standard and Chain of Custody | 100 |
| Total | | 78 |



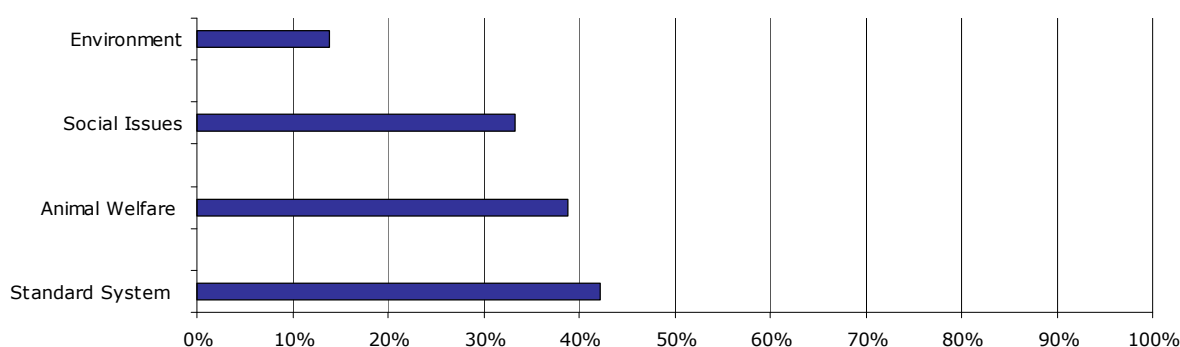
Identified Shortfalls

| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - No documentation on standard development and review process - Lack of performance metrics for energy efficiency of production - Lack of regulation with regards energy sources and no regulation on air-freight - No regulation and performance metric for feeding efficiency (FCE or FCR) - Lack of mandatory regulation for sustainable sources of fish-meal and fish-oil - No regulation with regards detrimental sources of plant-based feedstuffs (e.g. soy) - GMO in feedstuffs are not generally excluded - No regulation on efficiency of water use (freshwater systems only) - Insufficient regulation on effluent discharges, in compliance with national laws only - No indicators and performance metrics for limitation / reduction of effluent discharges - New introduction of non-native species is not generally excluded - No general exclusion of lethal measures for predator control (birds and mammals) |
| Social Issues | <ul style="list-style-type: none"> - No regulation on labour rights according to ILO basic requirements or SA 8000 - Insufficient regulation on community impacts and resource access rights - Insufficient coverage on smallholder participation and economic benefits |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Insufficient regulation on species-specific and performance-based stocking densities |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited external stakeholder involvement in standard development and review - Limited openness of governance of the standard holding body (industry-led) - Insufficient independency of standard creation and standard holding body - Limited options for issuing complaints during standard development process - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis |

5.3.3 SIGES Chilean Salmon



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 0 |
| | Feed | 0 |
| | Water | 22 |
| | Land and Soil | n.a. |
| | Ecosystems and Biodiversity | 33 |
| Total | | 14 |
| Social Issues | Labour | 33 |
| | Community Impacts and Livelihoods | 33 |
| Total | | 33 |
| Animal Welfare and Health Issues | Animal Welfare | 22 |
| | Disease, Prevention and Medication | 56 |
| Total | | 39 |
| Standard Development and Verification Procedures | Standard Development and Governance | 33 |
| | Conformity Assessment and Verification | 60 |
| | Subject of Standard and Chain of Custody | 33 |
| Total | | 42 |



Identified Shortfalls

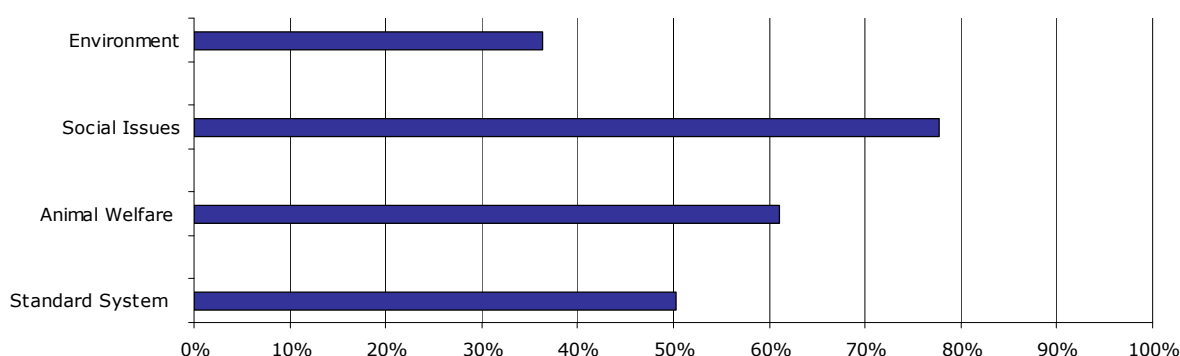
| | |
|---|---|
| Environmental Issues | <ul style="list-style-type: none"> - No performance metrics for energy efficiency of production - No regulation with regards energy sources and no regulation on air-freight - No regulation and performance metric for feeding efficiency (FCE or FCR) - No regulation for sustainable sources of fish-meal and fish-oil - No regulation with regards detrimental sources of plant-based feedstuffs (e.g. soy) - GMO in feedstuffs and as cultivated species are not generally excluded - No regulation on efficiency of water use (freshwater systems only) - Insufficient regulation on effluent discharges, in compliance with national laws only - No indicators and performance metrics for limitation / reduction of effluent discharges - Insufficient regulation on proper procedures for safe handling of hazardous goods - New introduction of non-native species is not generally excluded - Insufficient regulation on prevention of transfer of disease and parasites - Lack of regulation for the prevention of escapes - No general exclusion of lethal measures for predator control (birds and mammals) |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on labour rights according to ILO basic requirements or SA 8000 - Insufficient regulation on community impacts and resource access rights - Insufficient coverage on smallholder participation and economic benefits |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - No regulations with regards animal welfare issues (husbandry systems and handling) - No regulation on species-specific and performance-based stocking densities - Insufficient regulation on disease prevention, bio-security, treatment and medication |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited external stakeholder involvement in standard development and review - Industry-dominated and industry-led governance of the standard - No independency of standard creation and standard holding body - No options for issuing complaints during standard development process - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of indicators and benchmark metrics for constant improvements - Inspections and maintenance audits announced and not subject to all operations - Insufficient definition of corrective measures and sanction procedures - No chain of custody certification |

5.4 Certification Programmes for Shrimp

5.4.1 Shrimp Quality Guarantee ABCC (Brazil)



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 0 |
| | Feed | 0 |
| | Water | 67 |
| | Land and Soil | 67 |
| | Ecosystems and Biodiversity | 48 |
| Total | | 36 |
| Social Issues | Labour | 67 |
| | Community Impacts and Livelihoods | 89 |
| Total | | 78 |
| Animal Welfare and Health Issues | Animal Welfare | 56 |
| | Disease, Prevention and Medication | 67 |
| Total | | 61 |
| Standard Development and Verification Procedures | Standard Development and Governance | 38 |
| | Conformity Assessment and Verification | 80 |
| | Subject of Standard and Chain of Custody | 33 |
| Total | | 50 |



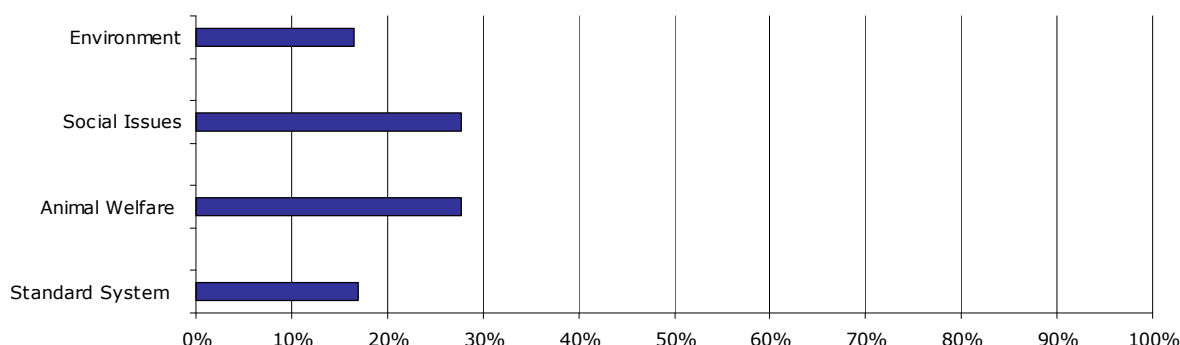
Identified Shortfalls

| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - No regulation and performance metrics for energy efficiency of production - No regulation with regards type of energy sources and air-freight of products - No regulation and performance metric for feeding efficiency (FCE or FCR) - No regulation for sustainable sources of fish-meal and fish-oil used in the diet - No regulation with regards detrimental sources of plant-based feedstuffs (e.g. soy) - GMO in feedstuffs and as cultivated species are not generally excluded - No regulation on efficiency of water use and prevention of salinisation of freshwater - Insufficient regulation on effluent discharges, in compliance with national laws only - No indicators and performance metrics for limitation / reduction of effluent discharges - Insufficient regulation on proper procedures for safe handling of hazardous goods - New introduction of non-native species is insufficiently addressed - Insufficient regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on labour rights, reference to national laws only |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Insufficient regulation on species-specific and performance-based stocking densities - Insufficient regulation of correct proceedings for treatment and medication |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - No documentation on standard development and review process - Limited process of stakeholder involvement in standard development and review - Limited openness of governance of standard creation and holding body - Insufficient independency of standard creation and standard holding body - No options for issuing complaints during standard development process - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of indicators and benchmark metrics for constant improvements - Insufficient definition of corrective measures and sanction procedures - Certification does not mandatorily encompass all production steps - No full chain of custody certification required along the product supply chain |

5.4.2 Thai Quality Shrimp



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 0 |
| | Feed | 0 |
| | Water | 22 |
| | Land and Soil | 33 |
| | Ecosystems and Biodiversity | 27 |
| Total | | 17 |
| Social Issues | Labour | 33 |
| | Community Impacts and Livelihoods | 22 |
| Total | | 28 |
| Animal Welfare and Health Issues | Animal Welfare | 22 |
| | Disease, Prevention and Medication | 33 |
| Total | | 28 |
| Standard Development and Verification Procedures | Standard Development and Governance | 21 |
| | Conformity Assessment and Verification | 13 |
| | Subject of Standard and Chain of Custody | 17 |
| Total | | 17 |



Identified Shortfalls

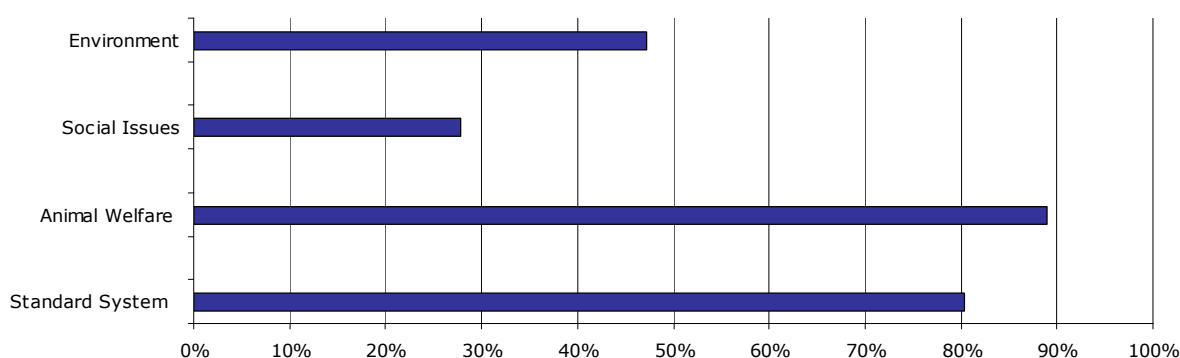
| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - No regulation and performance metrics for energy efficiency of production - No regulation with regards type of energy sources and air-freight of products - No regulation and performance metric for feeding efficiency (FCE or FCR) - No regulation for sustainable sources of fish-meal and fish-oil used in the diet - No regulation with regards detrimental sources of plant-based feedstuffs (e.g. soy) - GMO in feedstuffs and as cultivated species are not generally excluded - Insufficient regulation on efficiency of water use and prevention of salinisation - Insufficient regulation on effluent discharges, in compliance with national laws only - No indicators and performance metrics for limitation / reduction of effluent discharges - Insufficient regulation on mangrove protection and sensitive habitat conversion - Insufficient regulation on proper procedures for safe handling of hazardous goods - No regulation on new introduction of non-native species - No regulation with regards sourcing parental brood stock in the wild - No regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on labour rights, reference to national laws only - No regulation on natural resource access rights for local communities |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Insufficient regulation on species-specific and performance-based stocking densities - Insufficient regulation of correct proceedings for treatment and medication |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - No documentation on standard development and review process - Limited process of stakeholder involvement in standard development and review - Limited openness of governance of standard creation and holding body - Insufficient independency of standard creation and standard holding body - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of indicators and benchmark metrics for constant improvements - No independent third party inspections and certifications - Insufficient definition of corrective measures and sanction procedures - Certification does not mandatorily encompass all production steps - No full chain of custody certification required along the product supply chain |

5.5 Organic Certification Programmes

5.5.1 Agriculture Biologique AB Bio (France)



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 0 |
| | Feed | 56 |
| | Water | 44 |
| | Land and Soil | 67 |
| | Ecosystems and Biodiversity | 70 |
| | Total | 47 |
| Social Issues | Labour | 33 |
| | Community Impacts and Livelihoods | 22 |
| | Total | 28 |
| Animal Welfare and Health Issues | Animal Welfare | 89 |
| | Disease, Prevention and Medication | 89 |
| | Total | 89 |
| Standard Development and Verification Procedures | Standard Development and Governance | 54 |
| | Conformity Assessment and Verification | 87 |
| | Subject of Standard and Chain of Custody | 100 |
| | Total | 80 |



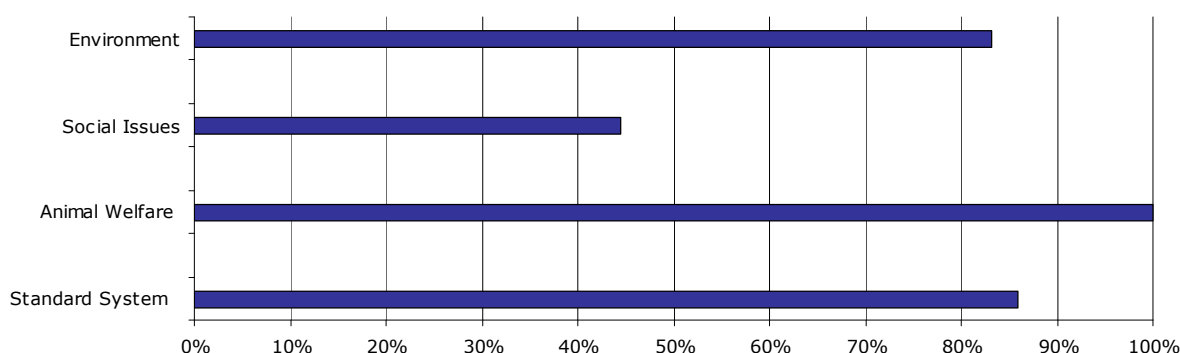
Identified Shortfalls

| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - No regulations and lack of performance metrics for energy efficiency for production - No regulation with regards energy sources - No regulation with regards air-freight of finished products - No regulation and performance metric for feeding efficiency - No indicator and lack of performance metric for efficiency of water use - Lack of regulation for protection of land and soil through proper practices - No regulation with regards habitat destruction (e.g. mangrove protection) - Lack of regulation and indicators for effluent discharges (performance metrics) - Insufficient regulation on prevention of escapes into the wild - Non-native, newly introduced species generally allowed (not excluded) - Insufficient regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on labour rights. Adherence to national legislation only - Insufficient regulation on community impacts and resource rights - No regulation on small holder participation |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Lack of clear regulations with regards animal husbandry systems - Lack of mandatory integrated health management plan |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - Limited openness of governance of standard creation and holding body - No firewall between standard creation and holding body (same legal entity) - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of indicators and benchmarks for constant improvement - Lack of verifiability and benchmark metrics for constant improvements |

5.5.2 Bio Austria (Austria)



| Relative Scores (RS) in % | | |
|--|--|------------|
| Environmental Issues | Energy | 50 |
| | Feed | 89 |
| | Water | 83 |
| | Land and Soil | 100 |
| | Ecosystems and Biodiversity | 94 |
| Total | | 83 |
| Social Issues | Labour | 33 |
| | Community Impacts and Livelihoods | 56 |
| Total | | 44 |
| Animal Welfare and Health Issues | Animal Welfare | 100 |
| | Disease, Prevention and Medication | 100 |
| Total | | 100 |
| Standard Development and Verification Procedures | Standard Development and Governance | 71 |
| | Conformity Assessment and Verification | 87 |
| | Subject of Standard and Chain of Custody | 100 |
| Total | | 86 |



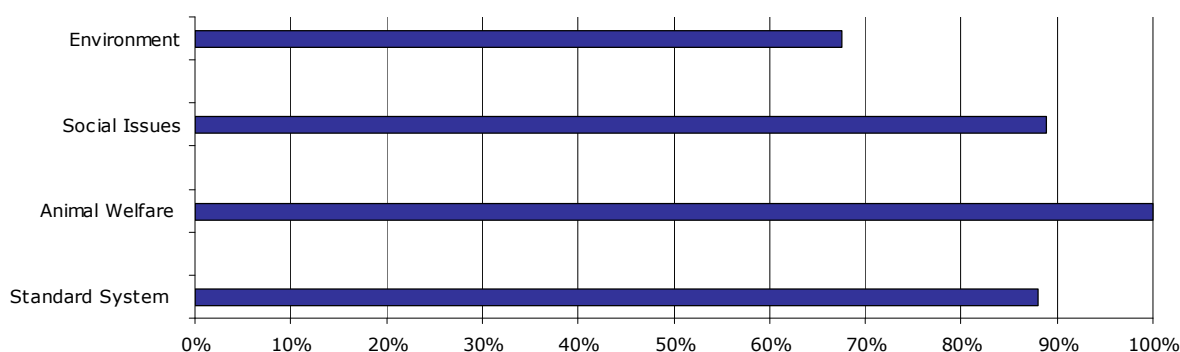
Identified Shortfalls

| | |
|---|---|
| Environmental Issues | <ul style="list-style-type: none"> - Lack of regulations and performance metrics for energy efficiency for production - No regulation with regards energy sources - No specific regulation for feed conversion ratio and efficiency for Salmonids - No indicator for measurable improvements of feeding efficiency (performance metrics) - Lack of mandatory regulation for effluent treatment and sedimentation (Salmonids) - No indicator and performance metric for efficiency of water use - Insufficient regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on labour rights. Adherence to national legislation only - Insufficient regulation on community impacts and resource rights |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - No shortfalls identified |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - No clear firewall between standard creation and holding body (same legal entity) - Certification not fully independent (conducted by internal Bio-Austria-Commission) - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of verifiability of criteria - Lack of benchmark metrics for constant improvements - Lack of indicators and benchmarks for constant improvement - Inspections generally conducted on an announced basis |

5.5.3 Bio Suisse (Switzerland)



| Relative Scores (RS) in % | | |
|--|--|------------|
| Environmental Issues | Energy | 56 |
| | Feed | 67 |
| | Water | 67 |
| | Land and Soil | 67 |
| | Ecosystems and Biodiversity | 82 |
| | Total | 67 |
| Social Issues | Labour | 100 |
| | Community Impacts and Livelihoods | 78 |
| | Total | 89 |
| Animal Welfare and Health Issues | Animal Welfare | 100 |
| | Disease, Prevention and Medication | 100 |
| | Total | 100 |
| Standard Development and Verification Procedures | Standard Development and Governance | 71 |
| | Conformity Assessment and Verification | 93 |
| | Subject of Standard and Chain of Custody | 100 |
| | Total | 88 |



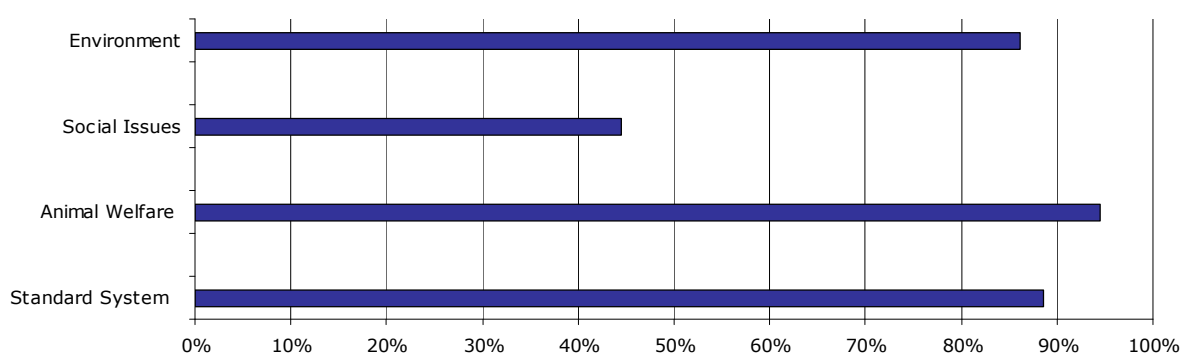
Identified Shortfalls

| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - Lack of regulations and performance metrics for energy efficiency in the production - No regulation with regards type of energy sources - No regulation for feed conversion ratio and efficiency - No indicator for measurable improvements of feeding efficiency (performance metrics) - Lack of mandatory regulation for effluent treatment and sedimentation - No measurable indicator for effluent discharge (performance metrics) - No indicator and performance metric for efficiency of water use - Lack of regulations with regards land, soil and local hydrology - Introduction of non-native species is not generally excluded - No regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on resource access rights for local communities - Insufficient regulation on land rights |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - No shortfalls identified |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - No clear firewall between standard creation and holding body (same legal entity) - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of verifiability of criteria - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis |

5.5.4 Bioland (Germany)



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 67 |
| | Feed | 100 |
| | Water | 83 |
| | Land and Soil | 83 |
| | Ecosystems and Biodiversity | 97 |
| | Total | 86 |
| Social Issues | Labour | 33 |
| | Community Impacts and Livelihoods | 56 |
| | Total | 44 |
| Animal Welfare and Health Issues | Animal Welfare | 100 |
| | Disease, Prevention and Medication | 89 |
| | Total | 94 |
| Standard Development and Verification Procedures | Standard Development and Governance | 79 |
| | Conformity Assessment and Verification | 87 |
| | Subject of Standard and Chain of Custody | 100 |
| | Total | 89 |



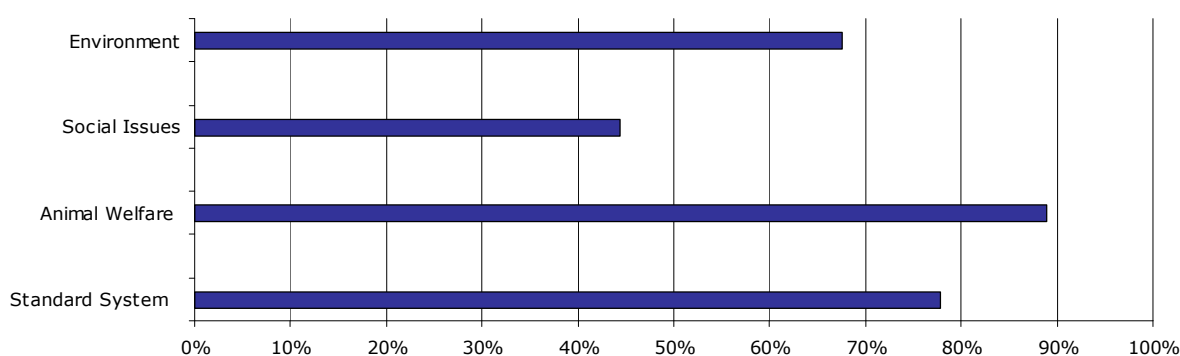
Identified Shortfalls

| | |
|---|---|
| Environmental Issues | <ul style="list-style-type: none"> - Insufficient regulation with regards type of energy used and renewable energies - Insufficient regulation on efficiency of freshwater use - Insufficient regulation on efficient use of land and carrying capacity - Insufficient regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on labour rights. Adherence to national legislation only - Insufficient regulation on community impacts and resource rights |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Lack of mandatory integrated health management plan |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - No clear firewall between standard creation and holding body (same legal entity) - Certification not fully independent (conducted by Bioland-Commission) - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of verifiability of criteria - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis |

5.5.5 Bio Gro (New Zealand)



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 11 |
| | Feed | 67 |
| | Water | 89 |
| | Land and Soil | 83 |
| | Ecosystems and Biodiversity | 88 |
| Total | | 68 |
| Social Issues | Labour | 33 |
| | Community Impacts and Livelihoods | 56 |
| Total | | 44 |
| Animal Welfare and Health Issues | Animal Welfare | 89 |
| | Disease, Prevention and Medication | 89 |
| Total | | 89 |
| Standard Development and Verification Procedures | Standard Development and Governance | 67 |
| | Conformity Assessment and Verification | 67 |
| | Subject of Standard and Chain of Custody | 100 |
| Total | | 78 |



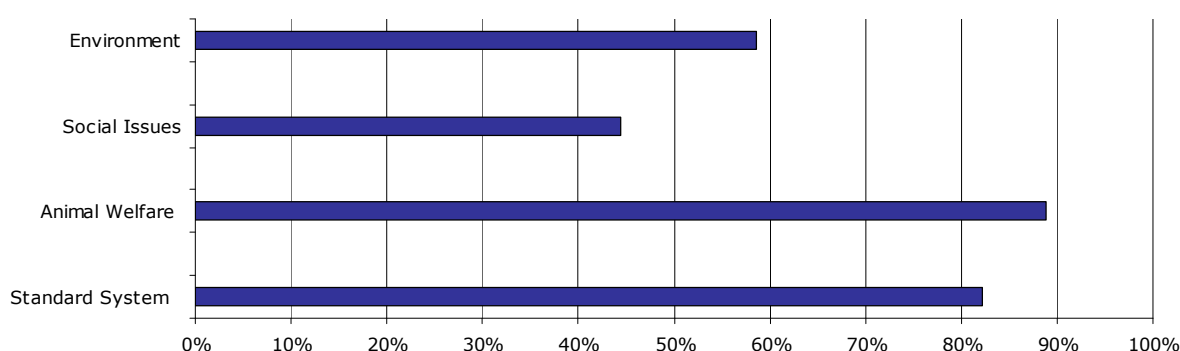
Identified Shortfalls

| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - No regulations and lack of performance metrics for energy efficiency for production - No regulation with regards energy sources - No regulation with regards air-freight of finished products - No regulation and performance metric for feeding efficiency - No indicator and lack of performance metric for efficiency of water use - Lack of regulation and indicators for effluent discharges (performance metrics) - Non-native, newly introduced species generally allowed (not excluded) - Insufficient regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on labour laws and labour issues - Insufficient regulation on local resource rights and resource access - Insufficient coverage on smallholder participation and economic benefits |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Insufficient regulation on species-specific and performance-based stocking densities - Lack of mandatory integrated health management plan |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - Limited openness of governance of standard creation and holding body - No firewall between standard creation and holding body (same legal entity) - Inspection not independent (conducted by standard holding body itself) - Certification not independent (conducted by standard holding body itself) - Lack of performance-based metrics and measurable criteria for negative key-impacts - Lack of verifiability of criteria - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis |

5.5.6 Debio (Norway)



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 11 |
| | Feed | 67 |
| | Water | 67 |
| | Land and Soil | 67 |
| | Ecosystems and Biodiversity | 82 |
| | Total | 59 |
| Social Issues | Labour | 33 |
| | Community Impacts and Livelihoods | 56 |
| | Total | 44 |
| Animal Welfare and Health Issues | Animal Welfare | 89 |
| | Disease, Prevention and Medication | 89 |
| | Total | 89 |
| Standard Development and Verification Procedures | Standard Development and Governance | 67 |
| | Conformity Assessment and Verification | 80 |
| | Subject of Standard and Chain of Custody | 100 |
| | Total | 82 |



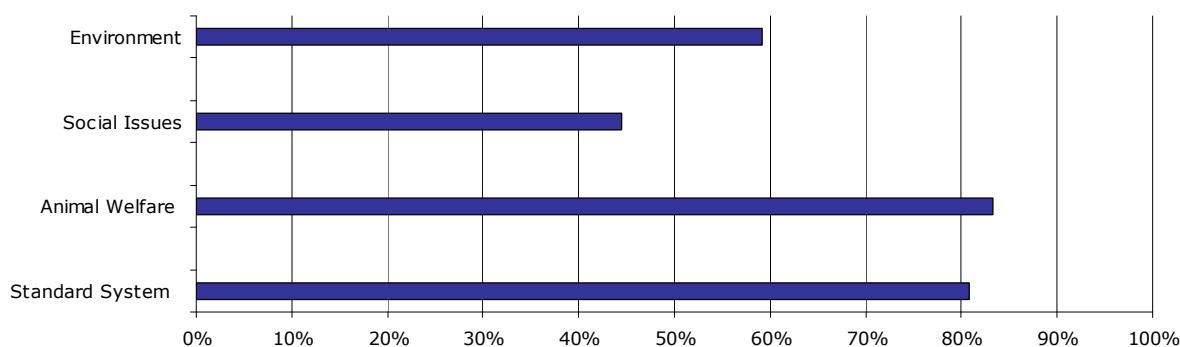
Identified Shortfalls

| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - No regulations and performance metrics for energy efficiency for production - No regulation with regards energy sources - No regulation with regards air-freight of finished products - No regulation and performance metric for feeding efficiency - No indicator and performance metric for efficiency of water use - Lack of regulation with regards disturbance of local hydrology - Lack of regulation for operations in sensitive habitats / habitat protection - Lack of regulation and indicators for effluent discharges (performance metrics) - Non-native, newly introduced species generally allowed (not excluded) - Insufficient regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on labour rights. Adherence to national legislation only - Insufficient regulation on community impacts and resource rights |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Insufficient regulation on species-specific and performance-based stocking densities - Lack of regulations with regards stringent bio-security measures - Lack of mandatory integrated health management plan |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - Limited openness of governance of standard creation and holding body - No firewall between standard creation and holding body (same legal entity) - Inspection not independent (conducted by standard holding body itself) - Certification not independent (conducted by standard holding body itself) - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of verifiability of criteria - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis |

5.5.7 Krav (Sweden)



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 11 |
| | Feed | 67 |
| | Water | 67 |
| | Land and Soil | 67 |
| | Ecosystems and Biodiversity | 85 |
| Total | | 59 |
| Social Issues | Labour | 33 |
| | Community Impacts and Livelihoods | 56 |
| Total | | 44 |
| Animal Welfare and Health Issues | Animal Welfare | 78 |
| | Disease, Prevention and Medication | 89 |
| Total | | 83 |
| Standard Development and Verification Procedures | Standard Development and Governance | 63 |
| | Conformity Assessment and Verification | 80 |
| | Subject of Standard and Chain of Custody | 100 |
| Total | | 81 |



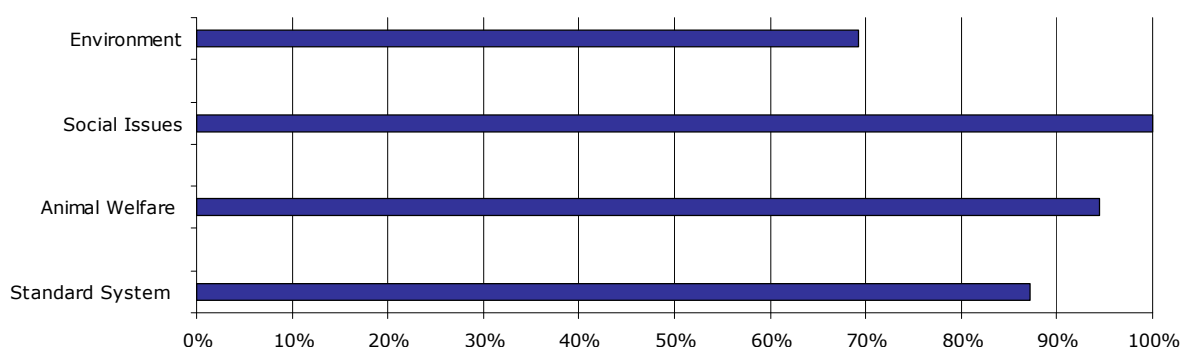
Identified Shortfalls

| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - No regulations and performance metrics for energy efficiency for production - No regulation with regards energy sources - No regulation with regards air-freight of finished products - No regulation and performance metric for feeding efficiency - No indicator and performance metric for efficiency of water use - Lack of regulation with regards disturbance of local hydrology - Lack of regulation for operations in sensitive habitats / habitat protection - Lack of regulation and indicators for effluent discharges (performance metrics) - Non-native, newly introduced species generally allowed (not excluded) - Insufficient regulation on the protection of local wildlife and predator deterrence |
| Social Issues | <ul style="list-style-type: none"> - Insufficient regulation on labour rights. Adherence to national legislation only - Insufficient regulation on community impacts and resource rights |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Insufficient regulation on species-specific and performance-based stocking densities - Lack of regulations with regards stringent bio-security measures - Lack of mandatory integrated health management plan |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - Limited openness of governance of standard creation and holding body - No firewall between standard creation and holding body (same legal entity) - Inspection and Certification are conducted by the same body (no separation) - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of verifiability of criteria - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis |

5.5.8 Naturland (Germany)



| Relative Scores (RS) in % | | |
|--|--|------------|
| Environmental Issues | Energy | 11 |
| | Feed | 89 |
| | Water | 89 |
| | Land and Soil | 67 |
| | Ecosystems and Biodiversity | 91 |
| | Total | 69 |
| Social Issues | Labour | 100 |
| | Community Impacts and Livelihoods | 100 |
| | Total | 100 |
| Animal Welfare and Health Issues | Animal Welfare | 100 |
| | Disease, Prevention and Medication | 89 |
| | Total | 94 |
| Standard Development and Verification Procedures | Standard Development and Governance | 75 |
| | Conformity Assessment and Verification | 87 |
| | Subject of Standard and Chain of Custody | 100 |
| | Total | 87 |



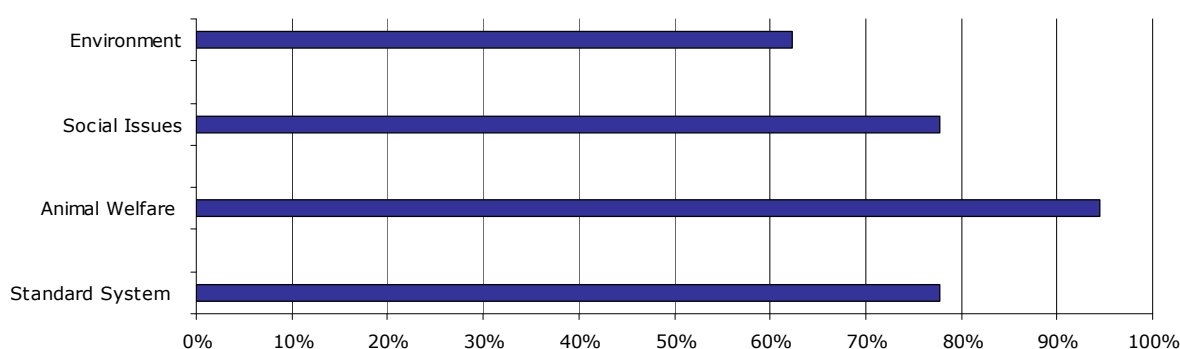
Identified Shortfalls

| | |
|---|---|
| Environmental Issues | <ul style="list-style-type: none"> - Lack of regulations and performance metrics for energy efficiency for production - No regulation with regards energy sources - No regulation with regards air-freight of finished products - No indicator for measurable improvements of feed efficiency (performance metrics) - No indicator and performance metric for efficiency of water use - No indicator for measurable improvements of effluent discharge (performance metrics) - Non-native, newly introduced species generally allowed (not excluded) |
| Social Issues | <ul style="list-style-type: none"> - No shortfalls identified |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Lack of regulations with regards bio-security measures - Lack of mandatory integrated health management plan |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - No clear firewall between standard creation and holding body (same legal entity) - Certification not fully independent (conducted by internal Naturland-Commission) - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of verifiability of criteria - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis |

5.5.9 NASAA (Australia)



| Relative Scores (RS) in % | | |
|--|--|-----------|
| Environmental Issues | Energy | 22 |
| | Feed | 56 |
| | Water | 78 |
| | Land and Soil | 83 |
| | Ecosystems and Biodiversity | 73 |
| Total | | 62 |
| Social Issues | Labour | 100 |
| | Community Impacts and Livelihoods | 56 |
| Total | | 78 |
| Animal Welfare and Health Issues | Animal Welfare | 100 |
| | Disease, Prevention and Medication | 89 |
| Total | | 94 |
| Standard Development and Verification Procedures | Standard Development and Governance | 67 |
| | Conformity Assessment and Verification | 67 |
| | Subject of Standard and Chain of Custody | 100 |
| Total | | 78 |



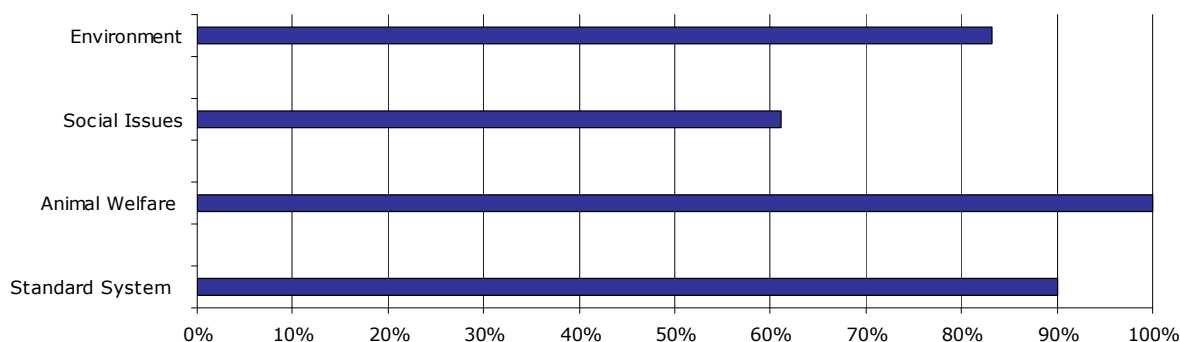
Identified Shortfalls

| | |
|---|---|
| Environmental Issues | <ul style="list-style-type: none"> - No regulations and lack of performance metrics for energy efficiency for production - No regulation with regards energy sources and with regards air-freight - No regulation and performance metric for feeding efficiency - No indicator and lack of performance metric for efficiency of water use - Lack of regulation for the prevention of freshwater salinisation and soil deterioration - Lack of regulation with regards deforesting activities - Lack of regulation with regards the spreading of parasites and disease - Lack of measurable indicators for effluent discharges (performance metrics) - No mandatory hazard-prevention measures for non-native, newly introduced species - Lack of prevention measures for escapes into the wild - No regulation for proper sourcing of brood stock in the wild - Lack of regulation for the prevention of impact on local wildlife |
| Social Issues | <ul style="list-style-type: none"> - Lack of clear regulation with regards community land and natural resource rights - Lack in addressing smallholder participation in developing countries |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - Lack of mandatory integrated health management plan |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - Limited process of stakeholder involvement in standard development and review - Limited openness of governance of standard creation and holding body - No firewall between standard creation and holding body (same legal entity) - Inspection not independent (conducted by standard holding body itself) - Certification not independent (conducted by standard holding body itself) - Lack of performance-based metrics and measurable criteria for key-impacts - Lack of verifiability of criteria - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis (routine inspection) |

5.5.10 Soil Association (UK)



| Relative Scores (RS) in % | | |
|--|--|------------|
| Environmental Issues | Energy | 44 |
| | Feed | 78 |
| | Water | 100 |
| | Land and Soil | 100 |
| | Ecosystems and Biodiversity | 94 |
| | Total | 83 |
| Social Issues | Labour | 67 |
| | Community Impacts and Livelihoods | 56 |
| | Total | 61 |
| Animal Welfare and Health Issues | Animal Welfare | 100 |
| | Disease, Prevention and Medication | 100 |
| | Total | 100 |
| Standard Development and Verification Procedures | Standard Development and Governance | 83 |
| | Conformity Assessment and Verification | 87 |
| | Subject of Standard and Chain of Custody | 100 |
| | Total | 90 |



Identified Shortfalls

| | |
|---|--|
| Environmental Issues | <ul style="list-style-type: none"> - Lack of performance metrics for energy efficiency for production - No regulation with regards air-freight of finished products - No indicator and regulation for feed efficiency (performance metrics) - Insufficient performance metric for efficiency of water use - No indicator for measurable improvements of effluent discharge (performance metrics) - Non-native, newly introduced species generally allowed (not excluded) |
| Social Issues | <ul style="list-style-type: none"> - Regulation on labour rights on recommendation basis only - Lack of regulation with regards communities' land rights - Lack of regulation of communities' rights for access to natural resources |
| Animal Welfare and Health Issues | <ul style="list-style-type: none"> - No shortfalls identified |
| Standards Development and Verification Procedures | <ul style="list-style-type: none"> - No established firewall between standard creation and holding body (same entity) - Certification not fully independent (SA Certification LTD. subsidiary of SA) - Lack of performance-based measurable metrics, emphasis on descriptive criteria - Lack of indicators and benchmark metrics for constant improvements - Inspections generally conducted on an announced basis |

5.6 Non-applicable Issues

As mentioned in the methodology part under section 3.2.3, all non-applicable issues have been clearly defined for each individual standard. Following table does list all standards with non-applicable issues.

| Standard | Non-applicable Criteria | | Justification |
|--------------------------------|-------------------------|---|---|
| Bio Austria | A.1.3. | Air Freight for Shipment of finished products | Bio Austria-certified products are marketed in Austria only. No air-freight of products within domestic trade channels and logistic routes. |
| | A.3.2. | Deterioration of Freshwater by Salinisation | Bio Austria addresses domestic aquaculture only. No seawater aquaculture systems practised or legally allowed. |
| Bioland | A.1.1. | Energy Efficiency | Bioland addresses only pond-based culture of carps with no feeding in extensive low / no input-systems. No process energy is used in the aquaculture process. |
| | A.1.3. | Air Freight for Shipment of finished products | Bioland-certified products are marketed in Germany only. No air-freight of products within domestic trade channels and logistic routes. |
| | A.2.1. | Efficiency of Feed Conversion | Bioland does not allow external feeding. No feed used. No fishmeal and fish-oil used. |
| | A.2.2. | Source of Fish-Meal and Fish-Oil | Bioland does not allow external feeding. No feed used. No fishmeal and fish-oil used. |
| | A.3.2. | Deterioration of Freshwater by Salinisation | Bioland addresses domestic inland aquaculture only. No seawater aquaculture systems practised. |
| Globalgap Salmon | A.4.1. | Land Use | Use of land and soil in salmon culture not of relevancy. |
| | A.4.2. | Soil Disturbance and Deterioration | Use of land and soil in salmon culture not of relevancy. |
| | A.5.2. | Deforestation | Use of land and soil in salmon culture not of relevancy. |
| Scottish Code of Good Practice | A.4.1. | Land Use | Use of land and soil in salmon culture not of relevancy. |
| | A.4.2. | Soil Disturbance and Deterioration | Use of land and soil in salmon culture not of relevancy. |
| | A.5.2. | Deforestation | Use of land and soil in salmon culture not of relevancy. |
| Siges Salmon Chile | A.4.1. | Land Use | Use of land and soil in salmon culture not of relevancy. |
| | A.4.2. | Soil Disturbance and Deterioration | Use of land and soil in salmon culture not of relevancy. |
| | A.5.2. | Deforestation | Use of land and soil in salmon culture not of relevancy. |

6. Conclusions and Recommendations

6.1 Prior Considerations

6.1.1 Expressiveness and Limitation of the Study

The benchmarking methodology developed and applied in this study allows a thorough comparison of aquaculture certification programmes with regards how well and to what extent they address the sustainability criteria defined by WWF in the standards' regulatory framework.

The study's benchmarking criteria reflect WWF's position with regards the effectiveness, efficiency and credibility by which a certification programme delivers its stated goals. The criteria are based on WWF's extensive experience in the realm of product certification programmes worldwide. Also, they have been defined in accordance with the internationally acknowledged consensus on the subject and objectives of aquaculture certification programmes.

Still, there are different views and opinions that have not been incorporated into this study and therefore the study's results and overall utility will vary depending on one's opinion on what has been included in the benchmarking methodology and perhaps, more importantly, on what has been left out. For example, if absolute performance was required or even if measurement against a global benchmark was required, none of the programmes benchmarked here would even score 50% on the environmental, social or animal welfare criteria. Thus, reasonable people are likely to disagree with different ratings.

This work is a desk-top study-based approach. It did not include any on-site evaluations or field studies. Also, the authors did not establish contact with producers and operators participating in the certification programmes or with relevant inspection and certification bodies (with the exception of standard-setting bodies that are also certification bodies).

Therefore, the study has limited value with regards practical and real benefits being delivered by a certification programme at the field level. However, by integrating appropriate and effective ways of incorporating key aspects of aquaculture into the study's benchmarking criteria (e.g. importance of meaningful indicators), the study results can be taken as an indicator for how well a certification programme can be implemented in the field and to what extent it could credibly make claims about the benefits it delivers.

Another aspect of the credibility and effectiveness of a standard has been addressed in the study by taking into account the standards' conformity assessment and verification procedures.

6.1.2 Subjectivity of Study

This study analyses and benchmarks existing certification programmes against criteria that WWF believes are important to achieve sustainability and credibility in the aquaculture sector.

As with many evaluations, the interpretation of the information available is subjective. The subjective nature of the evaluation process has been the main reason to develop the benchmarking tool that has been applied in this study. The tool provides the evaluating body with a detailed guiding framework that allows for a relatively objective and well balanced decision making and benchmarking process.

All standards have been analysed and benchmarked against the same criteria using the same matching level matrix. At the same time, the methodology behind the tool is transparent so that anyone can see whether or not they agree with its parameters.

As mentioned in section 3.3., the evaluation and analysis of the individual standards has been made on the basis of the best information available. Special attention has been paid

by the authors to ensure an open dialogue with the standard setting bodies in order to avoid misinterpretations during the benchmarking of an individual standard.

However, at the end of the day, standards should be held accountable for policies, governance structures and by-laws that are written rather than those that are communicated verbally. They also have to be held accountable for what they do not do as well as what they try to do.

All standard setting bodies have been able to actively contribute to the process of this benchmarking exercise.

6.1.3 Dynamic Development of the Aquaculture Sector

The aquaculture sector is the fastest growing food producing sector worldwide. In comparison to agriculture, aquaculture has been a relatively new concept for most producer countries with exception of those in Asia.




The sector is evolving quickly and very dynamically. Production technologies do change; they are constantly being adapted. Accordingly, some of the criteria defined as a benchmark in the realm of this study are subject to the same dynamic development processes.

Thus the study reflects the current status of both knowledge and experience with existing production technologies in aquaculture.

6.2 Appraisal of Aquaculture Standards by WWF

Based on this study's results and the overall experiences and lessons learned in the realm of certification programmes for consumer goods and food products, the following recommendations can be made to the industry, market players and consumers with regards credible aquaculture certification programmes. These recommendations are based on the methodology described in section 3.4.

The following colours are given to each category of recommendation in accordance with the specifically defined compliance level in the benchmarking exercise:

| Compliance Level | Definitions | Colour |
|------------------------------------|---|---|
| High Better Choice | Relative Score (RS) of a given category must reach at least 83% |  |
| Medium Needs Improvement | Relative Score (RS) of a given category must reach at least 50% |  |
| Low Serious Shortfalls | Relative Score (RS) of a given category is below 50% |  |

Recommendations are given separately for each category first; the last section summarises the performance for each standard in relation to all four categories.




All certification programmes in the following tables appear in order of their numerical scores and alphabetical order.

6.2.1 Environmental Issues



Better Choice






The following standards performed well against the benchmarking criteria; their relative total score for the category under consideration scored 83% or higher.


| Standard | | Relative Scores in % | | | | | |
|---|---------------------|----------------------|--------|------|-------|-------------|-----------|
| | | Total | Energy | Feed | Water | Land & Soil | Ecosystem |
|  | Bioland Germany | 86 | 67 | 100 | 83 | 83 | 97 |
|  | Bio Austria Austria | 83 | 50 | 89 | 83 | 100 | 94 |
|  | Soil Association UK | 83 | 44 | 78 | 100 | 100 | 94 |



Needs Improvement

The following standards do have some shortcomings and shortfalls but still address the key-issues under consideration. Their relative score for the category under consideration scored 50% or higher.









| Standard | | Relative Scores in % | | | | | |
|---|------------------------|----------------------|--------|------|-------|-------------|-----------|
| | | Total | Energy | Feed | Water | Land & Soil | Ecosystem |
|  | Naturland Germany | 69 | 11 | 89 | 89 | 67 | 91 |
|  | BioGro New Zealand | 68 | 11 | 67 | 89 | 83 | 88 |
|  | Bio Suisse Switzerland | 67 | 56 | 67 | 67 | 67 | 83 |
|  | NASAA Australia | 62 | 22 | 56 | 78 | 83 | 73 |
|  | Debio Norway | 59 | 11 | 67 | 67 | 67 | 82 |

| Standard | | Relative Scores in % | | | | | |
|---|-------------|----------------------|--------|------|-------|-------------|-----------|
| | | Total | Energy | Feed | Water | Land & Soil | Ecosystem |
|  | Krav Sweden | 59 | 11 | 67 | 67 | 67 | 85 |



Serious Shortfalls

The following standards have major shortfalls and shortcomings and do not or only basically address the key-issues of concern. Their relative total score for the category under consideration scored less than 50%.



| Standard | | Relative Scores in % | | | | | |
|---|----------------------------------|----------------------|--------|------|-------|-------------|-----------|
| | | Total | Energy | Feed | Water | Land & Soil | Ecosystem |
|  | Friend of the Sea (FOS) | 49 | 56 | 78 | 22 | 17 | 73 |
|  | AB Bio France | 47 | 0 | 56 | 44 | 67 | 70 |
|  | GAA / ACC International | 46 | 0 | 22 | 78 | 83 | 48 |
|  | Scottish CoGP Scotland | 39 | 22 | 22 | 33 | n.a. | 77 |
|  | ABCC Shrimp Brazil | 36 | 0 | 0 | 67 | 67 | 48 |
|  | GLOBALGAP Salmonid International | 30 | 22 | 0 | 33 | n.a. | 63 |
|  | Thai CoC Shrimp Thailand | 17 | 0 | 0 | 22 | 33 | 27 |
|  | SIGES Salmon Chile | 14 | 0 | 0 | 22 | n.a. | 33 |

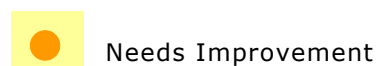
6.2.2 Social Issues



Better Choice





The following standards performed well against the benchmarking criteria, their relative total score for the category under consideration scored 83% or higher.

| Standard | | Relative Scores in % | | |
|---|------------------------|----------------------|--------|-------------------|
| | | Total | Labour | Community Impacts |
|  | Naturland Germany | 100 | 100 | 100 |
|  | Bio Suisse Switzerland | 89 | 100 | 78 |



Needs Improvement

The following standards do have some shortcomings and shortfalls but still address the key-issues under consideration. Their relative score for the category under consideration scored 50% or higher.

| Standard | | Relative Scores in % | | |
|---|---------------------|----------------------|--------|-------------------|
| | | Total | Labour | Community Impacts |
|  | ABCC Shrimp Brazil | 78 | 67 | 89 |
|  | NASAA Australia | 78 | 100 | 56 |
|  | Soil Association UK | 61 | 67 | 56 |
|  | GAA / ACC | 56 | 33 | 78 |



Serious Shortfalls

The following standards have major shortfalls and shortcomings and do not or only basically address the key-issues of concern. Their relative total score for the category under consideration scored less than 50%.

| Standard | | Relative Scores in % | | |
|---|---------------------------------------|----------------------|--------|-------------------|
| | | Total | Labour | Community Impacts |
|  | Bio Austria Austria | 44 | 33 | 56 |
|  | Bio Gro New Zealand | 44 | 33 | 56 |
|  | Bioland Germany | 44 | 33 | 56 |
|  | Debio Norway | 44 | 33 | 56 |
|  | Krav Sweden | 44 | 33 | 56 |
|  | SIGES Salmon Chile | 33 | 33 | 33 |
|  | AB Bio France | 28 | 33 | 22 |
|  | Thai CoC Shrimp Thailand | 28 | 33 | 22 |
|  | GLOBALGAP Salmonid International | 22 | 33 | 11 |
|  | Scottish CoGP Scotland | 17 | 0 | 33 |
|  | Friend of the Sea (FOS) International | 11 | 0 | 22 |


6.2.3 Animal Welfare and Health Issues



Better Choice

The following standards performed well against the benchmarking criteria, their relative total score for the category under consideration scored 83% or higher.



| Standard | | Relative Scores in % | | |
|---|----------------------------------|----------------------|----------------|----------------------------------|
| | | Total | Animal Welfare | Disease, Prevention & Medication |
|  | Bio Austria Austria | 100 | 100 | 100 |
|  | Bio Suisse Switzerland | 100 | 100 | 100 |
|  | Soil Association UK | 100 | 100 | 100 |
|  | Bioland Germany | 94 | 100 | 89 |
|  | NASAA Australia | 94 | 100 | 89 |
|  | Naturland Germany | 94 | 100 | 89 |
|  | AB Bio France | 89 | 89 | 89 |
|  | Bio Gro New Zealand | 89 | 89 | 89 |
|  | Debio Norway | 89 | 89 | 89 |
|  | GLOBALGAP Salmonid International | 89 | 89 | 89 |
|  | Scottish CoGP Scotland | 89 | 89 | 89 |

| Standard | | Relative Scores in % | | |
|---|-------------|----------------------|----------------|----------------------------------|
| | | Total | Animal Welfare | Disease, Prevention & Medication |
|  | Krav Sweden | 83 | 78 | 89 |



Needs Improvement




The following standards do have some shortcomings and shortfalls but still address the key-issues under consideration. Their relative score for the category under consideration scored 50% or higher.

| Standard | | Relative Scores in % | | |
|---|-------------------------|----------------------|----------------|----------------------------------|
| | | Total | Animal Welfare | Disease, Prevention & Medication |
|  | ABCC Shrimp Brazil | 61 | 56 | 67 |
|  | GAA / ACC International | 56 | 44 | 67 |



Serious Shortfalls

The following standards have major shortfalls and shortcomings and do not or only basically address the key-issues of concern. Their relative total score for the category under consideration scored less than 50%.






| Standard | | Relative Scores in % | | |
|---|---------------------------------------|----------------------|----------------|----------------------------------|
| | | Total | Animal Welfare | Disease, Prevention & Medication |
|  | SIGES Salmon Chile | 39 | 22 | 56 |
|  | Thai CoC Quality Shrimp Thailand | 28 | 22 | 33 |
|  | Friend of the Sea (FOS) International | 22 | 0 | 44 |

6.2.4 Standard Development and Verification Procedures



Better Choice

The following standards performed well against the benchmarking criteria, their relative total score for the category under consideration scored 83% or higher.

| Standard | | Relative Scores in % | | | |
|---|------------------------|----------------------|-----------------------------------|--------------------------------------|--|
| | | Total | Standard Development / Governance | Conformity Assessment / Verification | Subject of Standard / Chain of Custody |
|  | Soil Association UK | 90 | 83 | 87 | 100 |
|  | Bioland Germany | 89 | 79 | 87 | 100 |
|  | Bio Suisse Switzerland | 88 | 71 | 93 | 100 |
|  | Naturland Germany | 87 | 75 | 87 | 100 |
|  | Bio Austria Austria | 86 | 71 | 87 | 100 |



Needs Improvement



The following standards do have some shortcomings and shortfalls but still address the key-issues under consideration. Their relative score for the category under consideration scored 50% or higher.

| Standard | | Relative Scores in % | | | |
|---|---------------------------------------|----------------------|-----------------------------------|--------------------------------------|--|
| | | Total | Standard Development / Governance | Conformity Assessment / Verification | Subject of Standard / Chain of Custody |
|  | Debio Norway | 82 | 67 | 80 | 100 |
|  | Krav Sweden | 81 | 63 | 80 | 100 |
|  | AB Bio France | 80 | 54 | 87 | 100 |
|  | Bio Gro New Zealand | 78 | 67 | 67 | 100 |
| GLOBALG.A.P. | GLOBALGAP Salmonid International | 78 | 42 | 93 | 100 |
|  | NASAA Australia | 78 | 67 | 67 | 100 |
|  | Scottish CoGP Scotland | 78 | 42 | 93 | 100 |
|  | Friend of the Sea (FOS) International | 65 | 63 | 67 | 67 |
|  | GAA / ACC International | 51 | 46 | 40 | 67 |
|  | ABCC Quality Shrimp Brazil | 50 | 38 | 80 | 33 |



Serious Shortfalls

The following standards have major shortfalls and shortcomings and do not or only basically address the key-issues of concern. Their relative total score for the category under consideration scored less than 50%.

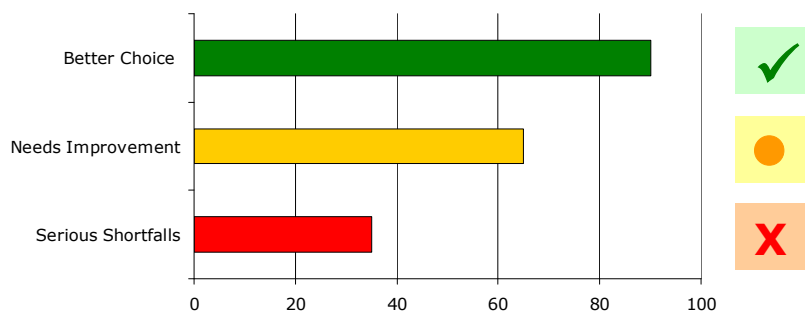
| Standard | | Relative Scores in % | | | |
|---|-------------------------|----------------------|-----------------------------------|--------------------------------------|--|
| | | Total | Standard Development / Governance | Conformity Assessment / Verification | Subject of Standard / Chain of Custody |
|  | SIGES Salmon Chile | 42 | 33 | 60 | 33 |
|  | Thai CoC Quality Shrimp | 17 | 21 | 13 | 17 |

6.2.5 Summary: Benchmarking Results for all Categories

A relative matching score encompassing all four main categories environmental issues, animal welfare, social issues and standard development and verification procedures has not been calculated.

Every single category shall stand for itself since the relative importance that might be attributed to the category may differ with the changing perception of the stakeholders involved. However, since sustainability is multi-dimensional and should not focus on one single criterion such as environmental issues only, the following section summarises all benchmarking results of the analysed standards and compares the results for all four main categories.

The bar graph colours correspond with the three defined levels of appraisal:



| Standard | Relative Scores of Main Categories in % | | | |
|------------------|---|---------------|---------------------------|---------------------------------------|
| | Environmental Issues | Social Issues | Animal Welfare and Health | Standard Development and Verification |
| AB Bio France | 50 | 25 | 80 | 75 |
| ABCC Brazil | 30 | 75 | 60 | 50 |
| Bio Austria | 60 | 40 | 80 | 80 |
| Bio Gro NZL | 45 | 40 | 80 | 75 |
| Bio Suisse | 45 | 80 | 80 | 80 |
| Bioland | 60 | 40 | 80 | 80 |
| Debio | 55 | 40 | 80 | 75 |
| GlobalGAP | 30 | 25 | 80 | 75 |
| Friend of Sea | 50 | 10 | 20 | 60 |
| GAA / ACC | 50 | 55 | 50 | 50 |
| Krav | 55 | 40 | 80 | 75 |
| NASAA | 60 | 75 | 80 | 75 |
| Naturland | 65 | 80 | 80 | 80 |
| Scottish GoGP | 40 | 15 | 80 | 75 |
| SIGES Chile | 10 | 35 | 40 | 40 |
| Soil Association | 80 | 60 | 80 | 80 |
| Thai CoC | 15 | 30 | 30 | 15 |
| Scores in % | 0 25 50 75 | 0 25 50 75 | 0 25 50 75 | 0 25 50 75 |

6.3 Not selected Standards

The following aquaculture certification programmes have not been selected for the benchmarking analysis due to the reasons stated below (see section 4.3). These programmes cannot be recommended by WWF and are therefore rated as encompassing serious shortfalls.



Serious Shortfalls

| Standard | Comments |
|---|--|
|  <p>Irish Quality Salmon and Trout Ireland</p> | No transparency with regards standard guidelines and requirements that must be followed by producers |
|  <p>Label Rouge France</p> | No transparency with regards standard guidelines and requirements that must be followed by producers. No coverage of environmental and social issues in the standards guidelines that exceed legislation requirements. |
|  <p>La Truite Charte Qualité France</p> | Insufficient transparency with regards standard guidelines and requirements that must be followed by producers. No coverage of environmental and social issues in the standards guidelines that exceed legislation requirements. |
|  <p>Norge Seafood Norway</p> | No coverage of environmental and social issues in the standards guidelines that exceed legislation requirements. |
|  <p>Norway Royal Salmon Norway</p> | No transparency with regards standard guidelines and requirements that must be followed by producers. No coverage of environmental and social issues in the standards guidelines that exceed legislation requirements. |
|  <p>Qualité Aquaculture de France France</p> | Insufficient transparency with regards standard guidelines and requirements that must be followed by producers. No coverage of environmental and social issues in the standards guidelines that exceed legislation requirements. |
|  <p>Shrimp Seal of Quality Bangladesh</p> | Certification programme for the Shrimp Seal of Quality Programme has been ceased. No products certified. |

6.4 Discussion of Benchmarking Results

6.4.1 General Observations

The benchmarking of the standards against the defined criteria revealed the following main observations and facts:

- None of the analysed standards meets the benchmarking criteria in full compliance in all four main categories.
- Most full compliance occurs in the category animal welfare and health, and all organic standards are in full compliance with the defined benchmarks.
- In the categories environment, social issues as well as with regards standard development and verification procedures, in full compliance with the defined benchmarking criteria have been identified very rarely (only 2-5 out of the total selected standards).
- Generally, organic aquaculture standards performed better in the benchmarking exercise than their conventional counterparts, indicating that today's organic aquaculture standards do address the defined criteria to a greater extent.
- The study revealed also significant shortcomings of organic standards, particularly with regards environmental and social issues.
- Only a few standards performed particularly low (benchmarking score for all four categories below 50%).

Summarised, it can be stated that, – according to the stringent benchmarking criteria defined by WWF –, most, if not all, of today's available aquaculture standards do have some shortfalls. The actual extent of the identified shortcomings differs a lot, not only between individual standards, but also within different categories of analysis of a selected same standard. The overall picture clearly shows that there is a lot of room and potential for improvement for almost all analysed aquaculture certification standards.

6.4.2 Major Shortcomings and Areas for Improvement

For each of the four main categories of criteria, the following major shortcomings have been identified. These shortfalls should be adequately addressed by any aquaculture certification scheme aiming to deliver real and effective benefits for the sustainability of future aquaculture development:

Environmental Issues:

- The *efficiency of energy use* and *use of renewable energy* in the production process is not adequately addressed by any of the analysed standard. Most standards do not address this issue at all. The same applies to the airfreight of finished products.
- Most standards lack measurable indicators for the *efficiency of feed conversion*.
- Most standards do not address the issue of the *type of sources of fishmeal and fish-oil* used in the diet. Only organic standards require fishmeal and –oil from sustainable fisheries or cut-offs and by-products from fish processing plants.
- Similarly to inputs of energy and feed, most standards have not incorporated meaningful and measurable indicators for *efficiency of water and land use*.
- Major shortcomings related to impacts on ecosystems and biodiversity have been identified within the issues of *protection of sensitive habitats*, regulations on *effluent discharges*, *introduction of non-native species*, *prevention of escapees*, *use of GMO-species* and *general impacts on local wildlife*.

Social Issues:

- Most standards with a low benchmarking score do not address basic labour rights in their regulatory framework at all.
- Similarly, issues such as land and natural resource exploration rights of local communities are rarely addressed by the standards.

- Other shortcomings have been identified in the field of smallholder participation in aquaculture certification programmes.

Animal Welfare and Health Issues

- Standards with a low benchmarking score do not or only insufficiently address the issue of *species-adapted husbandry systems* and *responsible methods for slaughtering*.
- Other shortcomings have been related to meaningful measures and regulation for the prevention of disease, meaningful and effective *bio-security measures*, *professional health management* as well as *correct and proper proceedings for treatment and medication*.

Standard Development and Verification Procedures

- Most and major shortcomings have been identified within the issue of standard development and governance: Lack of *stakeholder and public participation in the standard development process*, *limited openness of governance* and *no firewall between standard developing and standard holding body*.
- Another major lack concerning all analysed standards is related to the way standards criteria are defined and how they can be assessed: There are no *metric-based* and *performance-related indicators* for the key-environmental issues at stake. Standards tend to be rather descriptive in nature than performance- and process-oriented.
- There is a general lack of verifiable criteria that can be effectively assessed and enforced by a standards verification scheme.
- Other shortcomings are related to the organisational set-up of inspections and certification procedures: Some standards still have not established a complete independent verification and certification process, - a prerequisite for any kind of credible certification programme.
- Inspections are generally conducted on an announced basis - offering producers the opportunity to specifically prepare for inspection procedures.
- Clear and meaningful corrective measures and sanction procedures are not defined by all standards.
- Some standards do not cover the entire production process and there is also a lack of a full chain of custody certification requirement.

6.4.3 Effectiveness of Certification Programmes

The importance of effectiveness of certification programmes with regards delivered environmental and social benefits has been explained and outlined in section 1.6. in the introductory part of this study. Since it is clear that compliance with either process or product related standards does not automatically lead to reduced impacts, these must be measured directly.

Unfortunately, none of the certification programmes could be evaluated against performance results of reducing key impacts because, to date, certification programmes rarely, if ever, measure performance. Therefore, the study's results reveal that none of the programmes reviewed adequately introduce measurable performance-based indicators for any of the four major areas of assessment and categories of benchmarking criteria.

6.4.4 Scope of Certification Programmes

Whether a certification programme encompasses environmental, social and animal welfare issues still depends mainly on the focus, interests and background of the stakeholders of the certification scheme.

Yet, to be credible, it is increasingly expected that programmes should address all three issues, regardless of the limitations of the stakeholder group that created them. Also, the process of standard setting, governance and verification should meet internationally recognised principles. Again, just because one individual stakeholder group chooses not to address a specific topic does not mean that it is exempt from being evaluated against that topic if it is generally considered important.

6.5 Favourable Production Systems

All things being equal, aquaculture systems that are more closed have fewer negative impacts on the environment (e.g. domesticated lines rather than wild caught animals, dedicated ponds or raceways rather than open net pens, feed grown in the water column rather than as an input, less rather than more water exchange).

To date, there are no absolutely closed, commercially viable aquaculture systems. Closing production systems will be more difficult for some species than others, but the concept is important to be further developed and improved in the future.

The aquaculture industry is dynamic and there are numerous economic incentives to close the different production cycles. Although capital costs are high for completely closed commercial-scale production operations, increasingly self-contained parts of the system are becoming closed (e.g. hatcheries, freshwater smolt operations, recirculation systems, etc.) because they save money and reduce risk.

Ultimately, the physical isolation of production from the environment will be more economical and have a higher return on investment (e.g. less disease, higher survival, lower FCR, fewer chemicals and antibiotics, faster growth, etc.).

6.6 Favourable Species

Based on current knowledge of the impacts of aquaculture on the environment, it is evident that some cultured species have fewer negative impacts than others. Although it is finally on the individual consumer to decide which products to purchase and consume, in order to make informed choices, it is important to encourage and promote information about the impacts of producing different species that are on the markets in order to support those that can be produced more sustainably.

For example, the following species' groups have significantly fewer detrimental environmental impacts when raised in aquaculture:

- Aquatic plants (e.g. algae, seaweed, kelp)
- Filter-feeding organisms such as bivalves molluscs (e.g. clams, oysters, mussels, scallops)
- Herbivorous fish that require no fishmeal or oil in their diets (e.g. carps)
- Omnivorous fish that require low fishmeal and oil in their diets (e.g. catfish, pangasius and tilapia).

6.7 Final Conclusions and Outlook

To address the market demand for environmentally sound, resource-efficient, safe and healthy aquaculture globally, more sustainable aquaculture practices should be promoted and implemented. At a minimum, this should be done on a niche-production and market basis.

Doing so will require a paradigm shift. For years, sustainability and its practical implications have not been regarded by many aquaculture operators as a necessity. But, today, there is wide acknowledgement within the industry and the markets that sustainable practices will be the fundamental basis of any successful future business strategy and aquaculture operation.

However, one crucial question often remains: what is sustainability and how can it be implemented and achieved in the different aquaculture sectors? This issue is complex and demands a multi-stakeholder and consensus-building process to find a solution. Various initiatives, programmes and discussion forums are underway by WWF and others around the globe to address this question.

The results and findings of these dialogues and ongoing research in the field of sustainable aquaculture development have formed the basis for the definition of the benchmarking criteria within the framework of this comparative analysis of aquaculture certification programmes.

If aquaculture certification as a market-based tool to create incentives for adoption of more sustainable aquaculture practices is to be effective in delivering the desired results, it is critical that certification programmes (1) adequately reduce or minimise the key environmental and social impacts of aquaculture (2) introduce measurable performance-based metrics to demonstrate and monitor environmental improvement on the ground and (3) credibly identify sustainable products by a proper set-up of standards' governance and verification procedures.

It is WWF's mission to guide and advise the industry towards achieving sustainability. This benchmarking study's results shall provide one basis for the future development of reliable, credible and effective aquaculture certification programmes.

Annex

- A. Benchmarking Tool and Criteria
- B. References for Definition of Benchmarking Criteria
- C. Contact Data: Standard Organisations
- D. Contact Data: Institutions and Persons related to Study

Benchmarking Study on Aquaculture Standards

Master Version

| Benchmarking Criteria | | | Analysis of Standards | | | |
|--------------------------|--------------------------|---|--|--|-------|---|
| Issue | Relevancy | Indicator | Criteria | Matching Level | Score | |
| A. ENVIRONMENTAL ISSUES | | | Total Maximum Score: 66 | | | |
| | | | Applicable Score: 66 | | | |
| Use of Natural Resources | | | | | | |
| A.1. Energy | | | | | | |
| Total Maximum Score: 9 | | | | | | |
| A.1.1. | Energy Efficiency | Efficiency by which process energy (electricity, fuel, gas, heat) is converted into final production is a suitable and reliable indicator for sustainable use of energy. Energy efficiency is also relevant for climate protection. | Total Energy Use per Volume of production (e.g. kWh/tonne) | Standard establishes and includes measures, guidelines and benchmarks for energy efficiency by defining achievable, acceptable and measurable total energy use per volume of production taking into account all steps of production. | Full | 3 |
| | | | | Medium | | 2 |
| | | | | Low | | 1 |
| | | | | No | | 0 |
| A.1.2. | Source of Energy | Source and type of energy used in the process is of relevance in regard of overall ecological impact of an operation. Non-renewable energies shall be limited and if possible replaced by renewable energies. | Use of renewable energy and limitation for non-renewable energy sources. | Standard promotes the use of renewable energy and mandates a continuous reduction in all non-renewable energy use. | Full | 3 |
| | | | | Medium | | 2 |
| | | | | Low | | 1 |
| | | | | No | | 0 |
| A.1.3. | Air-Freight for Shipment | Air-Freight of final products significantly reduces overall energy-efficiency of production and leads to significant emissions of climate-relevant gases. | Use of non-aviation means of transportation and preference for highly efficient systems such as sea freight. | The standard excludes air freight for transportation of final products. | Full | 3 |
| | | | | Medium | | 2 |
| | | | | Low | | 1 |
| | | | | No | | 0 |

| A.2. Feed | | | | | | Total Maximum Score: 9 | |
|------------|----------------------------------|--|--|--|--------|------------------------|--|
| A.2.1. | Efficiency of Feed Conversion | Aquaculture of fish and crustaceans, specifically of carnivorous species, often result in a net-loss of aquatic animal protein. Reduction in fish meal use and high efficiency in feed use are important criteria for sustainable aquaculture. | Feed Conversion Efficiency (FCE) or Feed Conversion Ratio (FCR) | Standard defines species-specific FCE (carnivorous species) and constantly works towards measurable improvement of feed conversion efficiency. Alternatively, limitations of FCR (Feed Conversion Ratio) are defined for each species/cultivation system. | Full | 3 | |
| | | | FCE: ((FCR x % Fishmeal in feed)) + (FCR x % Fishoil in feed)) x CF | | Medium | 2 | |
| | | | CE: Fish-Meal: 4,5 CF: Fish-Oil: 12 | | Low | 1 | |
| | | | | | No | 0 | |
| | | | | | | | |
| A.2.2. | Source of Fish-Meal and Fish-Oil | The use of fishmeal / -oil in aquaculture as feed ingredients may directly lead to further depletion pressure on marine resources. Most of the fishmeal used in today's aquaculture originates from industrial fishmeal-fisheries or detrimental by-catch. | Ecological sound procurement source of Fish-Meal and Fish-Oil | Standard restricts fishmeal /-oil to by-products from fisheries for human consumption (cut-offs & trimmings) or to products from sustainable certified fisheries that are exploiting fish stocks not-suitable for human consumption (e.g. MSC-Certification). | Full | 3 | |
| | | | | | Medium | 2 | |
| | | | | | Low | 1 | |
| | | | | | No | 0 | |
| | | | | | | | |
| A.2.3. | Source of other Feed Ingredients | Other feed ingredients, specifically such intending to substitute fish-meal and -oil (e.g. Soy-Beans) may be produced by environmentally detrimental practices (e.g. large scale deforestation of rain forests). | No use of feed ingredients that are produced by environmentally detrimental practices. | Standard does encompass regulation on the source of feed ingredients and safeguards that no ingredients from environmentally detrimental production practices are used as feedstuffs. | Full | 3 | |
| | | | | | Medium | 2 | |
| | | | | | Low | 1 | |
| | | | | | No | 0 | |
| | | | | | | | |
| A.3. Water | | | | | | Total Maximum Score: 9 | |
| A.3.1. | Depletion of Freshwater | Freshwater is a key-resource in aquaculture and is worldwide considered to be one of the most essential natural resources. Aquaculture should not lead to long term depletion of local freshwater bodies nor be subject to local water use conflicts. | Efficiency of water use and type of freshwater sources | Efficiency measures for water use are encouraged (e.g. definition/reduction of water exchange rate), restriction for water use from non-renewable sources (fossil groundwater) or in case of limited availability of water. Adherence to national legislation. | Full | 3 | |
| | | | | | Medium | 2 | |
| | | | | | Low | 1 | |
| | | | | | No | 0 | |
| | | | | | | | |

| | | | | | |
|---|---|--|--|--------|---|
| A.3.2. Degradation of Freshwater by Salinization | The farming of marine species in terrestrial freshwater habitats may lead to serious degradation and salinization of freshwater bodies and soil by infiltration of saline water. | Prevention measures against salinization | Inland culture of marine species not allowed or clear regulations for inland farming of marine species are defined (e.g. implementation of BMP's to prevent salinization, verification that salinization does not occur). Adherence to national legislation. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |
| A.3.3. Disturbance of Hydrology | Improper design, construction and operation of land-based aquaculture sites may adversely affect local hydrology and lead to long term disturbance of natural water bodies (surface and groundwater). | Proper site selection, design, construction and operation of land-based aquaculture farms | Standard encompasses considerations and BMP's for proper site selection, planning, design, construction and operation of aquaculture farms that prevent disturbance of local hydrology (surface and groundwater bodies). Adherence to national legislation. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |
| A.4. Land and Soil | | | | | |
| Total Maximum Score: 6 | | | | | |
| A.4.1. Land use | Unplanned, inappropriate and illegal use of land for aquaculture operations may lead to degradation of land, land abandonment and multiple land use conflicts. | Legal, appropriate and efficient use of land taking into account the carrying capacity of a given area for aquaculture activities. | Standard addresses legal use of land, appropriate siting and design of farms / efficient use of land. New aquaculture development needs to address the carrying capacity of a specific area for aquaculture activities. Adherence to national legislation. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |
| A.4.2. Soil Disturbance and Degradation | Inappropriate farm design and planning, construction and operation may lead to serious soil disturbance and degradation (e.g. erosion, disturbance of soil integrity, salinization) | Proper site selection, design, engineering, construction and operation of land-based aquaculture farms | Standard encompasses regulatory measures to prevent soil degradation and erosion (e.g. no construction of farms on sandy soils, prevention of seepage and erosion, minimization of disturbance of acid-sulfat soils). Adherence to national legislation. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |

| Ecosystem Impacts and Biodiversity | | | | |
|--|---|--|--|---|
| A.5. Ecosystems and Biodiversity | | | | |
| Total Maximum Score: 33 | | | | |
| A.5.1. Habitat Sensitivity and Habitat Conversion | Potential negative impacts of aquaculture operations strongly depend on site-specific ecological sensitivity of habitats. Habitat damage shall be prevented in the realm of any aquaculture operation. | Exclusion and restrictions for aquaculture operations in highly sensitive habitats. Minimization of detrimental habitat conversion. | No new operations in highly sensitive habitats. Environmental Impact Assessment (EIA) must be conducted in planning phase of any new operation when sensitive areas may be affected. Habitat damage must be prevented. Adherence to national legislation. | |
| | High Sensitivity Coral reefs, coastal wetlands, intertidal zones, mangroves, sensitive freshwater bodies with no water exchange, pristine primary forests any kind of habitats containing endangered species. | Medium | | 2 |
| | Moderate Sensitivity Coastal & near shore waters, rocky intertidal or subtidal zones, lakes with little water exchange, Marine and freshwater shorelines (sea, rivers, streams, lakes), secondary forests. | Low | | 1 |
| | Low Sensitivity Open waters with high exchange rates (Lakes and Sea). Land less susceptible to degradation, already developed or used for agriculture. | No | | 0 |
| | | | | |
| A.5.2. Deforestation | Large scale deforestation of sensitive areas (e.g. Mangroves) for installation of aquaculture operations lead to significant disruption of the ecosystems function and local biodiversity loss. | No deforestation of sensitive habitats for aquaculture operations. | Highly sensitive habitats must not be deforested. Limited deforestation of other habitats must be assessed by EIA. Operations on previously cleared sensitive areas might not be accepted and/or are subject to reforestation plan (based on time limit for clear-cutting). Adherence to national legislation. | 3 |
| | | | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| | | | | |
| A.5.3. Discharge of Effluents | Discharge of farm effluents such as organic matter (solid and dissolved) and nutrients (N+P) cause ecological hazards such as eutrophication, anoxia, benthic habitat disruption and general decrease of water quality in the surrounding water bodies. | Measures to prevent and minimize discharge of organic matter and nutrients. Performance based metrics for acceptable discharge of effluents. | Regulatory measures/performance metrics for prevention/minimization of organic/nutrient effluents by proper operation/treatment/ recycling procedures (feeding, low-exchange systems, sedimentation, artificial wetlands). Adherence to national legislation. | 3 |
| | | | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| | | | | |

| | | | | | |
|--|---|---|--|--------|---|
| A.5.4. Use, Handling and Discharge of Chemicals and Hazardous Goods | Discharge and/or improper handling of hazardous goods (e.g. chemicals, fuels, lubricants, fertilizers) may lead to multiple detrimental effects through bioconcentration or accumulation affecting ecosystems, worker health and final product quality. | Restrictions for toxic and persistent chemicals and measures for proper handling, use and discharge of hazardous goods and chemicals. | Use of toxic / persistent chemicals prohibited (e.g. POP's, TBT, Malachite Green) Proper handling of all hazardous goods mandatory. Use of toxic compounds is limited/regulated and subject to inspections and enforcement. Adherence to national legislation. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |
| A.5.5. Introduction of New Species | The introduction of new, non native species is associated with multiple potential large scale risks for ecosystems. | Restrictions for (new) introduction of non-native species. Preferable use of indigenous species. | New introduction of non-native species not allowed. Products may be certifiable if non-native species are already present in the wild. Preference for indigenous species. Escapes must be prevented (A.5.7.). Adherence to national legislation. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |
| A.5.6. Spreading of Pathogens and Parasites into the Wild | Through intensive farming activities, pathogenic organisms and parasites can be spread out into the environment and harm wild populations of farmed species (e.g. Sea Lice, Viral Diseases). | Prevention measures and minimization of spreading of disease and parasites. | Prevention strategies for spreading of diseases / parasites (e.g. closed containment systems, proper site selection, limited stocking densities, physical barriers between culture system and surrounding environment). Adherence to national legislation. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |
| A.5.7. Escape of cultured Species into the Wild | Cultured species genetically differ from their wild relatives being present in the cultivating habitat. Escaped cultured species may genetically interfere with wild populations threatening long term survival and genetic diversity. | Prevention measures and minimization of escapes of cultured species into the wild. | The risk of escaped species for wild populations needs to be assessed prior to any operation. If a risk is present, escape prevention strategies need to be implemented to keep escapees on a minimum level. Adherence to national legislation. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |

| | | | | | |
|---|--|--|---|--------|---|
| A.5.8. GMO as cultivated Species | Genetically modified organisms (GMO) used in aquaculture as cultivating species can escape into the wild and may lead to serious multiple ecological hazards. | No GMO as culture species in aquaculture. | The standard excludes the introduction of any kind of genetically modified species for use in aquaculture. | Full | 3 |
| | | | | No | 0 |
| A.5.9. GMO in Feed from Agricultural Crops | Genetically modified organisms (GMO) used as agricultural crops may lead to serious multiple ecological hazards. | No GMO agricultural feed-stuffs for aquaculture feed. | The standard excludes plant-derived GMO-feedstuffs for use in aquaculture feed. Feed ingredients such as Enzymes and Vitamins produced by GM-Microorganisms in contained systems are excluded from this requirement. | Full | 3 |
| | | | | No | 0 |
| A.5.10. Brood stock and Seedlings | Sourcing of brood stock / juveniles in the wild can seriously harm the ecosystem if (a) species is over-fished / endangered or (b) harmful extraction method is used (e.g. destructive fishing gear) or (c) if extraction volumes exceeds carrying capacity. | Minimization of dependency on wild brood stocks. Use of domesticated brood stock. No harmful extraction methods. | Dependency on wild caught brood stock is to be minimized. Sourcing in the wild is only allowed if (a) species in not overfished / endangered, (b) no harmful extraction methods are used and (c) if there is no negative effect for wild populations. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| A.5.11. General Impacts on local Wildlife | Aquaculture might have negative impacts on wildlife such as reduction of foraging grounds, disruption of migratory routes and spawning areas, acoustic deterrents, entanglements in nets or cages, regular shooting of birds and/or mammals. | Prevention and minimization measures for negative impacts on local wildlife. | Aquaculture activity must be conducted in a way that preserves natural ecosystem functions. Negative impacts on local wildlife are to prevented and minimized. No lethal measures for predator control. Adherence to national legislation. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |

| B. SOCIAL ISSUES | | | | | Total Maximum Score: 12 | | |
|--|--|---|---|--|-------------------------|---|--|
| B.1. Labour | | | | | Total Maximum Score: 3 | | |
| B.1.1. | Labour Rights | Sustainable aquaculture must encompass social responsibility. International labour rights must be recognized (forced labour, child labour, worker safety & health, discrimination, discipline, working hours, freedom of association, wages). | Compliance with basic internationally acknowledged labour rights and standards. | The standard addresses labour rights on all steps of production incl. processing. Minimum workplace norms of the ILO (International Labour Organisation) are mandatory. Certification to SA8000 should be encouraged. Adherence to national legislation. | Full | 3 | |
| | | | | | Medium | 2 | |
| | | | | | Low | 1 | |
| | | | | | No | 0 | |
| B.2. Community Impacts and Livelihoods | | | | | Total Maximum Score: 9 | | |
| B.2.1. | Land Conflicts and Land Rights | Illegal / inappropriate land tenure for aquaculture operations may displace local communities that depend on land for cultivation of crops to sustain their livelihoods, often leading to social conflicts. | Existing community rights and land tenure must be recognized and respected. Conflicts shall be prevented and minimized by consultation and resolution procedures. | Standard recognizes role of community land rights. New operations should be planned involving existing communities, respecting tenures/rights. Operations should not encroach on land that is subject to customary use. Adherence to national legislation. | Full | 3 | |
| | | | | | Medium | 2 | |
| | | | | | Low | 1 | |
| | | | | | No | 0 | |
| B.2.2. | Access to natural Resources and Resource Rights | Local communities depending on subsistence activities may lose access to vital resources for their livelihoods (e.g. water bodies, wetlands, agricultural land or forests) through aquaculture facility and installations. | Access of communities to natural resources must not be prevented. Communities' resource rights must be recognized. | Aquaculture operations must not block or interfere local communities' access to traditional natural resources for subsistence activities. Existing community rights must be acknowledged and respected. Adherence to national legislation. | Full | 3 | |
| | | | | | Medium | 2 | |
| | | | | | Low | 1 | |
| | | | | | No | 0 | |
| B.2.3. | Economic Benefits of Smallholders and Access to Certification Programmes | In many areas aquaculture is a traditional activity involving many smallholders. Sustainability does encompass economic profitability and viability and therefore aquaculture certification must also allow smallholder participation & economic benefits | Smallholders' access to certification programmes must be allowed and improved. Economic benefits of aquaculture shall be mutually beneficial for all stake-holders and communities. | Standard addresses the issue of economic benefits of smallholders and communities in developing countries and allows/improves/facilitates access to certification programmes by training and capacity building. Group certification must be allowed. | Full | 3 | |
| | | | | | Medium | 2 | |
| | | | | | Low | 1 | |
| | | | | | No | 0 | |

| C. ANIMAL WELFARE & HEALTH ISSUES | | | Total Maximum Score: 18 | | |
|--|--|--|--|--------|---|
| C.1. Animal Welfare | | | Total Maximum Score: 9 | | |
| C.1.1. Husbandry System and Handling Procedures | Husbandry systems that do not allow natural expression of species behaviour may lead to higher stress, aggressive behaviour, susceptibility to diseases and mortalities. Excessive handling practices may also induce stress and lead to diseases. | Species specific and systems of adapted husbandry prevention and minimizing strategies in the production process. | Standard foresees husbandry systems allowing expression of natural behaviour and minimizing stress. Over-crowded / artificial non-species adapted conditions should be prevented. Physical disfigurement of cultured species shall not be allowed. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |
| C.1.2. Stocking Densities | Excessive, non-species and non-local environment adapted stocking densities may lead to increased stress levels and higher incidence of disease, threatening animal welfare and sustainability of aquaculture. | Stocking densities / performance metrics related to species-specific behaviour, stress-reduction, health and local environmental conditions. | Standard defines species-specific stocking densities and/or performance metrics related to natural behaviour, health and site specific environmental conditions. Stocking densities must not threaten species's health and eco-system integrity. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |
| C.1.3. Slaughtering | Improper killing methods increase stress of animals, reduce product quality and may result in decreasing consumer acceptance. | Proper methods and proceedings for killing. | Standard foresees upon harvesting appropriate and instant killing procedures resulting in no further harm and suffering of the animals, allowing maximum product quality and same time safeguarding ethical and animal welfare values. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| | | | | | |

| C.2. Disease, Prevention and Medication | | | Total Maximum Score: 9 | |
|---|---|--|---|---|
| C.2.1. Disease Prevention and Bio-Security | Disease outbreaks can be minimized by proper site selection, planning, installation and operation procedures and professional health management during operation. Bio-security measures should be installed for transportation (e.g. quarantine). | Proper disease prevention, bio-security measures and an integrated health management plan on all steps of production are essential elements. | Disease prevention and bio-security measures encompassing proper siting, design, construction and operation including transport of live animals. A health management plan should be mandatory, focusing on prevention rather than on treatment. | 3 |
| | | | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| | | | | |
| C.2.2. Treatment and Medication | Diseases need to be treated professionally without harming the cultured stock, endangering the surrounding ecosystems or threatening food-safety of the final product. | Proper, legal and professional treatment of diseases. | Diseases are handled by professionals or well instructed responsible persons. The standard regulates the use and withdrawal times of pharmaceuticals and defines personal responsibilities and documentation procedures. Adherence to national legislation. | 3 |
| | | | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| | | | | |
| C.2.3. Use of Antibiotics | Inappropriate use of antibiotics in aquaculture may lead to discharge into the environment, leading to build-up of microbial resistances. Antibiotics may be present in final products threatening consumer health / marketability. | Legal use of Antibiotics. No prophylactic use. For treatment of disease only. No use of Antibiotics as growth promoters in feed. | Antibiotics are allowed for treatment of disease only. No use for prophylactic measures / growth promotion. Use of antibiotics has to be prescribed by authorized professionals and strictly regulated and documented. Adherence to national legislation. | 3 |
| | | | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| | | | | |

| D. STANDARDS DEVELOPMENT AND VERIFICATION PROCEDURES | | | Total Maximum Score: 45 | |
|---|---|--|-------------------------|---|
| D.1. Standard Development, Governance and Criteria | | | Total Maximum Score: 24 | |
| D.1.1. Procedures for Standard Development and Review Process | Documented procedures for the process under which a standard is developed shall form the basis of all activities of a standard-setting organization. | Documentation of standard development procedures. Applies to regular standard's review process also. | Full | 3 |
| | | The standard-setting organization has a documentation / work-flow scheme of the process of standard development and regular review procedures being open to the public and transparent to all interested parties. | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| | | | | |
| D.1.2. Stakeholder Involvement, Consultation and Public Review Process | The development process of a standard's regulatory framework should be based on a meaningful multi-stakeholder and consultation process, also including a public review process allowing different interest groups to participate within the process. | Multi-stakeholder involvement and consultation process. Regular public review process. | Full | 3 |
| | | Standard development / review process has been/is subject to multi-stakeholder involvement/consultation/public review procedures. Standard strives for consensus among a balance of interested parties, no particular group shall dominate / be dominated. | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| | | | | |
| D.1.3. Openness of Governance | Governance of the standard setting body should be open and transparent in order to allow equal participation of various stakeholder and interest groups on the standards strategic and operational procedures. | Open governance board for various stakeholders and interest groups. Transparent to the public. | Full | 3 |
| | | Various stakeholder groups (e.g. industry, conservation institutions, research, market actors) can be part and equally contribute to a standard's governance process, which is being handled in a transparent manner. | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| | | | | |
| D.1.4. Complaint Resolution during Development and Reviews | The standards development procedures shall contain a complaint resolution mechanism for the impartial handling of any procedural complaints that may occur during process of new development of a standard or during regular review process. | Implementation of a complaint resolution mechanism into the standard's development and review procedures. | Full | 3 |
| | | The standard's development procedures do encompass a mechanism for complaint resolution which all interested parties have access to. Resolution mechanism shall apply both to new development of a standard as well as to regular review processes. | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| | | | | |

| | | | | | | |
|--|---|--|---|--------|---|--|
| D.1.5. Independence of Standard Creation Body and Standard holding Body | An entity that is operatively managing a certification programme should not be directly in charge of the creation and development process of the referring standard. | Firewall between standard creation body and standard holding body. | Standard creation body and standard holding body are not the same entity. | Full | 3 | |
| | | | | Medium | 2 | |
| | | | | Low | 1 | |
| | | | | No | 0 | |
| D.1.6. Definition and Formulation of Criteria and Performance Metrics | A standard shall be defined and expressed in terms of a combination of process-, management- and performance-criteria, rather than be mainly descriptive. Environmental key criteria must be metric-based and measurable. | Performance based metrics for key criteria, rather than descriptive and process oriented. | Key criteria in regard of environment are defined by performance-based metrics. Combination of process-, management- and performance-oriented criteria. | Full | 3 | |
| | | | | Medium | 2 | |
| | | | | Low | 1 | |
| | | | | No | 0 | |
| D.1.7. Effectiveness, Relevancy and Verifiability | Standard criteria shall effectively contribute to achievement of stated objectives. The criteria therefore should be of relevancy and a standard should provide indicators and benchmarks for constant improvement and effective verifiability. | Relevant and verifiable criteria complemented by objective indicators and benchmarks for improvements. | The standard does encompass most relevant criteria for all key-components under consideration for achievement of the stated objectives. Criteria are verifiable. Indicators and benchmarks are defined for constant improvement. | Full | 3 | |
| | | | | Medium | 2 | |
| | | | | Low | 1 | |
| | | | | No | 0 | |
| D.1.8. Accessibility and Applicability | Application to, and participation in a certification programme shall be broad and open to all potential applicants. Specific focus should be paid on enabling participation of small-scale producers in developing countries. | Open access to standard. Broad applicability of criteria. Suitability for small-scale producers in developing countries. Adaptability to various local conditions. | Standard criteria / participation in certification programme is open to all potential applicants. Participation of smallholders is specifically facilitated (e.g. training/capacity building/group certification). Standard can be adapted to local conditions. | Full | 3 | |
| | | | | Medium | 2 | |
| | | | | Low | 1 | |
| | | | | No | 0 | |

| D.2. Conformity Assessment and Verification | | | Total Maximum Score: 15 | |
|---|---|--|---|---|
| D.2.1. Inspection Bodies | Inspections shall be conducted by independent and officially accredited third party bodies. Inspection bodies directly linked / accredited by the standard holding body itself are not credible and may be biased. | Third party inspection body. Accreditation of Inspection Bodies (ISO/IEC 17020:1998) | Inspection of operations are conducted by officially accredited, independent 3rd party bodies according to ISO/IEC Norm 17020:1998. | 3 |
| | | | Full | |
| | | | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| D.2.2. Certification Bodies | Certification of products / operations should be conducted by independent third party and officially accredited certification bodies (CB). | Third party certification body. Accreditation of Bodies operating Certification Guide / EN 45011:1998. | Certification of products is conducted by independent and officially accredited third party bodies according to ISO Guide of Products (ISO Guide 65/EN 45011:1998) | 3 |
| | | | Full | |
| | | | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| D.2.3. Inspection Procedures | Inspections should be conducted on a regular basis and not be pre-arranged with the operators / operations subject to inspection. Effective and credible inspections check for compliance on randomly chosen time/date. | Regular inspection frequency (min. annually) on an unannounced basis. | All inspections are conducted regularly (minimum annually) on a random and unannounced basis. | 3 |
| | | | Full | |
| | | | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |
| D.2.4. Corrective Measures | Producers and farming operations deliberately not following the standards guidelines are threatening the standards credibility, public acceptance and quality / food-safety of the product. | Corrective measures and procedures. Complaint resolution process. | The standard defines a system of corrective measures in case of violation of guidelines. Corrective measures, sanctions and procedures are clearly defined and outlined. A mechanism for complaint resolution does exist. | 3 |
| | | | Full | |
| | | | Medium | 2 |
| | | | Low | 1 |
| | | | No | 0 |

| | | | | | |
|--|--|--|---|--------|---|
| D.2.5. Complaint Resolution during Assessment Process | Clients of a certification programme as well as different stakeholders directly affected by the operation under certification should have the opportunity for issuing complaints or offering formal certification process. | Opportunity for comments and complaints by different stakeholders directly affected by the operation. | The standard does provide the opportunity of offering comments and complaints in the realm of ongoing inspection and certification procedures. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| Total Maximum Score: 6 | | | | | |
| D.3. Subject of Standard and Chain of Custody | | | | | |
| D.3.1. Subject of Certification Programme | An environmental / social aquaculture certification programme shall cover all relevant steps of the production process where environmental and social impacts may occur. | All relevant steps of aquaculture production and processing are covered by the standard and subject to inspection and certification. | Certification programme covers all relevant steps of production where environmental and/or social impacts may occur. This includes broodstock sourcing, hatcheries, feed mills, procurement of feed ingredients, farms and processing facilities. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |
| D.3.2. Chain of Custody | A certification programme shall establish a system of guarantee to ensure that certified products will not be mixed with non-certified products or otherwise be manipulated along the supply chain to the final consumer. | Chain of Custody Certification (CoC) for all operators along the supply chain. | All operators along the supply chain must be assessed and CoC-certified for having implemented adequate tracking /handling system to ensure that certified products are not mixed with non-certified products. CoC is subject to annual audits. | Full | 3 |
| | | | | Medium | 2 |
| | | | | Low | 1 |
| | | | | No | 0 |

| Summary Benchmarking Analysis | | | |
|-------------------------------|-------|-----|----|
| | Score | MAS | RS |

| A. Environmental Issues | | | |
|-----------------------------|----|----|------|
| Energy | 9 | 9 | 100% |
| Feed | 9 | 9 | 100% |
| Water | 9 | 9 | 100% |
| Land and Soil | 6 | 6 | 100% |
| Ecosystems and Biodiversity | 33 | 33 | 100% |
| TOTAL | 66 | 66 | 100% |

| B. Social Issues | | | |
|-----------------------------------|----|----|------|
| Labour | 3 | 3 | 100% |
| Community Impacts and Livelihoods | 9 | 9 | 100% |
| TOTAL | 12 | 12 | 100% |

| C. Animal Welfare and Health Issues | | | |
|-------------------------------------|----|----|------|
| Animal Welfare | 9 | 9 | 100% |
| Disease, Prevention and Medication | 9 | 9 | 100% |
| TOTAL | 18 | 18 | 100% |

| D. Standards Development and Verification Procedures | | | |
|--|----|----|------|
| Standard Development, Governance and Criteria | 24 | 24 | 100% |
| Conformity Assessment and Verification | 15 | 15 | 100% |
| Subject of Standard and Chain of Custody | 6 | 6 | 100% |
| TOTAL | 45 | 45 | 100% |

MAS: Maximum Applicable Score
RS: Relative Score

ANNEX B

References for Definition of Benchmarking Criteria

The following references are given for persons and institutions that have either directly or indirectly contributed to the definition of the benchmarking criteria. References are given in alphabetical order and information is provided on the type of involvement, participation and role in the study's context.

Please also note that much of the background for the definition of the benchmarking criteria does stem from WWF US's work in the field of aquaculture certification issues, which is based on a prolonged and intensive multi-stakeholder dialogue with the aquaculture industry, conservation organisations, governmental bodies and research institutions during the past ten years. Contact persons within the organisation of WWF are listed in Annex D.

a.) External Consultation Process for Development of Benchmarking Criteria

| Institution | Person and Function | Role in Study's Context | Contact Details |
|--|---|---------------------------------------|---|
| Auburn University | Claude Boyd Professor for Limnology and Water Quality in Aquaculture | Participation in consultation process | Auburn University Department of Fisheries & Allied Aquacultures 203 Swingle Hall Auburn Alabama 36849 USA Tel. ++1 334 844 40 75 Email: boydce1@auburn.edu www.ag.auburn.edu |
| NACA Network of Aquaculture Centres in Asia-Pacific | Michael Philipps Environment Specialist | Participation in consultation process | NACA Suraswadi Building Department of Fisheries Kasetsart University Campus Ladyao, Jatujak Bangkok 10900 Thailand Tel. ++ 662 561 1728 Email: mjpaqua@yahoo.co.uk www.enaca.org |

b). Organisations that provided Basis for Benchmarking Criteria

| Institution | Role in Study's Context | Contact Details |
|--|--|---|
| ISEAL Alliance The International Social and Environmental Accreditation and Labelling Alliance | <p>ISEAL Alliance's <i>Code of Good Practice for Setting Social and Environmental Standards</i> has been taken as reference for definition of benchmarking criteria of standard development procedures, governance and verification procedures.</p> <p>ISEAL members represent standards and conformity assessment systems in sectors ranging from forestry and agriculture to fisheries, manufacturing and textiles. ISEAL members are committed to the highest standards for credibility in their work including the ISEAL Code of Good Practice for Setting Social and Environmental Standards and relevant ISO standards.</p> | ISEAL Alliance Unit 1 Huguenot Place 17a Heneage Street London E1 5LJ United Kingdom Tel: ++44 020 3246 0066 www.isealliance.org |
| ILO International Labour Organisation | <p>The ILO international labour standards have been used as a benchmark for the definition of the study's benchmarking criteria in regard of labour rights and related social issues.</p> <p>The International Labour Organization (ILO) is devoted to advancing opportunities for women and men to obtain decent and productive work in conditions of freedom, equity, security and human dignity. Its main aims are to promote rights at work, encourage decent employment opportunities, enhance social protection and strengthen dialogue in handling work-related issues.</p> | International Labour Organisation Office of the Director General Tel: ++41 22 799 60 26 Email: cabinet@ilo.org www.ilo.org |
| SAI Social Accountability International | <p>The SAI's SA8000 standard has been used as a benchmark in addition to ILO's basic labour standards for definition of benchmarking criteria in regard of social accountability and labour issues in aquaculture operations.</p> <p>Social Accountability International (SAI) was established and convened as an international multi-stakeholder advisory board to partner in developing standards and systems to address workers' rights. Representatives of trade unions, human rights organizations, academia, retailers, manufacturers, contractors, as well as consulting, accounting, and certification firms, by consensus, cooperated to develop the Social Accountability 8000 (SA8000) Standard.</p> <p>Published in late 1997 and revised in 2001, the SA8000 Standard and verification system is a credible, comprehensive and efficient tool for assuring humane workplaces.</p> | Social Accountability International (SAI) 220 East 23rd Street Suite 605 New York NY 10010 USA Tel: ++1 212 684 14 14 Email: info@sa-intl.org www.sa-intl.org |

ANNEX C

Contact Data Standard Organisations

a.) General Certification Schemes for Aquaculture

| Standard | Contact Person | Function | Contact Details |
|--|-----------------|------------------------------|--|
| ACC Aquaculture Certification Council USA | Jim Heerin | President ACC | Aquaculture Certification Council INC. 12815 72nd Avenue Northeast Kirkland, Washington 98034 USA Tel: ++1-425-825-7935 Mail: b.more@comcast.net www.aquaculturecertification.org |
| GAA Global Aquaculture Alliance USA | Dan Lee | GAA Standards Coordinator | Global Aquaculture Alliance 5661 Telegraph Road Suite 3A St. Louis Missouri 63129 USA Tel: ++1 314 29 35 500 Mail: Dangaelle@aol.com www.gaalliance.org |
| GLOBALGAP Integrated Aquaculture Assurance IAA Germany | Valeska Weymann | Technical Manager IAA | GLOBALGAP c/o FoodPLUS Spichernstr. 55 50672 Köln HRB 35211 Germany Tel. ++ 49 178 477 14 64 Mail: weymann@foodplus.org www.globalgap.org |
| Friend of the Sea Aquaculture Certification Scheme Italy | Paolo Bray | Director | Friend of the Sea Tel ++39 348 565 03 06 Mail: info@friendofthesea.org www.friendofthesea.org |

b.) Certification Schemes for Shrimp Aquaculture

| | | | |
|---|------------------|-----------------------|---|
| SSoQ Shrimp Seal of Quality Bangladesh Shrimp and Fish Foundation Bangladesh | Mahmudul Karim | Executive Director | Bangladesh Shrimp & Fish Foundation House 465 (First Floor), Road 8 (East), DOHS-Baridhara Dhaka 1206 Bangladesh Tel: ++ 880 2 988 77 31 Mail: karim@shrimpfoundation.org www.shrimpfoundation.org |
| Thai Quality Shrimp Thai Code of Conduct for Shrimp Farming Thailand | | | Thailand Department of Fisheries DOF Kaset Klang Chatuchak Bangkok 10900 Thailand Tel: ++ 66 2 579 79 39 Mail: fifad@fisheries.go.th www.thaiqualityshrimp.com |
| ABCC Quality Label of Brazilian Shrimp Farmers Association Brazil | Rodrigo Carvalho | Programme Officer | Association of Brazilian Shrimp Producers ABCC Av. Amintas Barros 4549 Nova Descoberta Natal-RN CEP 59075-250 Brasil Tel. ++ 55 84 3231 6291 Mail: rodrigo@abccam.com.br www.abccam.com.br |

c.) Specific Certification Schemes for Fish Aquaculture

| Standard | Contact Person | Function | Contact Details |
|--|--|---------------------------------|---|
| Irish Quality Fish Quality Salmon Scheme Quality Trout Scheme Ireland | Peter Marshall | Managing Director | IFQC Mail: petermarshall@ifqc.ie www.irishqualityfish.com |
| CoGP Scotland Code of Good Practice for Scottish Finfish Aquaculture Scotland | John Webster Scottish Salmon Producers' Organisation | Technical Director | Scottish Salmon Producers' Organisation Durn, Isla Road, Perth PH2 7HG Scotland Tel: ++ 44 1738 587 000 Mail: jwebster@scottishsalmon.co.uk www.scottishsalmon.co.uk |
| La Truite Charte Qualité France | | | Comité Interprofessionnel des Produits de l'Aquaculture (CIPA) www.lapisciculture.com |
| Qualité Aquaculture de France France | | | Comité Interprofessionnel des Produits de l'Aquaculture (CIPA) www.lapisciculture.com |
| SIGES / SQF Chilean Salmon Chile | Roberto Bravo | Quality Assurance Officer | Salmon Chile Félix de Amesti 124 pisos 6 y 7 Las Condes Santiago Chile Tel: ++ 56 65 256 666 Mail: rbravo@salmonchile.cl www.salmonchile.cl |

d.) Organic Aquaculture Standards

| Standard | Contact Person | Function | Contact Details |
|--|------------------------------------|---|--|
| AB Bio France Federation National de l'Agriculture Biologique France | Vincent Perrot | Délégué général | Fédération national d'agriculture biologique (FNAB) 40 rue de Malte 75011 Paris France Tel: ++33 1 43 38 69 Mail: vperrot@fnab.org www.fnab.org |
| Bio Austria Austria | Franz Scheriau Mark Mössmer | QA-Officer Aquaculture Expert | Bio Austria Theresianumgasse 11/1 1040 Wien Austria Tel + 43 732 654884 260 Mail: franz.scheriau@bio-austria.at Mail: office@biofisch.at www.bio-austria.at |
| Bio Gro New Zealand | | | Bio Gro New Zealand P O Box 9693 Marion Square Wellington New Zealand Tel. ++ 64 4 801 97 41 Mail: info@biogro.co.nz www.bio-gro.co.nz |
| Bioland Germany | Eckhard Reiners | Programme Officer | Bioland Bundesverband Kaiserstr. 18 55116 Mainz Germany Tel: ++ 49 821 346 801 38 Mail: landbau@bioland.de www.bioland.de |
| Bio Suisse Switzerland | Hans Ramseier | Programme Officer | Bio Suisse Margarethenstrasse 87 4053 Basel Switzerland Tel. ++ 41 61 385 96 17 Mail: hans.ramseier@bio-suisse.ch www.bio-suisse.ch |
| Debio Norway | Jan Widar Finden | Programme Officer | Debio N-1940 Bjørkelangen Norway Tel. ++ 47 63 85 88 41 Mail: jan-widar@debio.no www.debio.no |
| Krav Sweden | Johan Cejie | Standard Manager | KRAV Incorporated Association Box 1037 S-751 40 Uppsala Sweden Tel. ++ 46 18 15 89 00 Mail: johan.cejie@krav.se www.krav.se |

| Standard | Contact Person | Function | Contact Details |
|---|-------------------|-------------------|--|
| Naturland Germany | Stefan Bergleiter | Programme Officer | Naturland Verband für ökologischer Landbau Kleinhadener Weg 1 D- 82166 Gräfelfing Germany Tel. ++ 49 89 898 08 241 Mail: s.bergleiter@naturland.de www.naturland.de |
| NASAA Australia | Lyn Austin | Executive Officer | NASAA Limited Australia PO Box 768 Stirling SA 5152 Australia Tel: ++ 61 8 8370 8455 Mail: lyn.austin@nasaa.com.au www.nasaa.com.au |
| Soil Association United Kingdom | Peter Bridson | Programme Officer | Soil Association Tower Mains 18c Liberton Brae Edinburgh EH16 6AE Tel: ++ 44 131 666 12 05 Mail: PBridson@soilassociation.org www.soilassociation.org |

ANNEX D

Institutions and Persons related to the Study

a.) WWF Offices

| Institution | Name | Function | Contact Details |
|--------------------------------|-------------------|--|--|
| WWF Norway (Principle) | Maren Esmark | Marine Coordinator | WWF Norway P.O Box 6784 St Olavs plass 0130 Oslo Norway Tel. ++47 97 18 33 79 Mail: mesmark@wwf.no www.wwf.no |
| WWF Switzerland (Principle) | Mariann Breu | Programme Officer Environment and Consumer Affairs | WWF Switzerland Hohlstrasse 110 8004 Zürich Switzerland Tel. ++41 44 297 22 83 Mail: Mariann.Breu@wwf.ch www.wwf.ch |
| WWF US | Jason Clay | Vice President Markets | World Wildlife Fund 1250 24 th Street NW Washington DC 20037-1193 USA Tel. ++1 202 778 96 91 Mail: jason.clay@wwfus.org www.worldwildlife.org |
| | Katherine Bostick | Programme Manager Aquaculture | World Wildlife Fund 1250 24 th Street NW Washington DC 20037-1193 USA Tel. ++1 202 822 34 70 Mail: katherine.bostick@wwfus.org www.worldwildlife.org |

b.) Study Authors

| Institution | Name | Function | Contact Details |
|--|----------------|------------------|--|
| Blueyou AG Consultancy for sustainable Aquaculture and Fisheries | René Benguerel | Managing Partner | Blueyou LTD. René Benguerel Zentralstrasse 156 8003 Zürich Switzerland Tel. ++ 41 43 333 12 59 Mail: rene.benguerel@blueyou.com www.blueyou.com |