POLICY PAPER

77

Aquaculture Certification in India: Criteria and Implementation Plan

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI
December 2015

Aquaculture Certification in India: Criteria and Implementation Plan

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI

December 2015

CONVENER : Dr Iddya Karunasagar, Ex-Senior Fishery Industry Officer, FAO, Mangalore, Karnataka

EDITORS : Dr K.K. Vass, Dr V.K. Gupta

REVIEWERS : Dr Gopinath, Dr C.N. Ravishankar, Dr S.D. Tripathi and Dr K.K. Vijayan

CITATION : NAAS 2015. Aquaculture Certification in India: Criteria and Implementation Plan. Policy Paper No. 77, National Academy of Agricultural Sciences, New Delhi: 16 p.

Published by Mr H.C. Pathak, Executive Secretary on behalf of
NATIONAL ACADEMY OF AGRICULTURAL SCIENCES
NASC, Dev Prakash Shastry Marg, New Delhi - 110 012
Tel: (011) 25846051-52; Fax: (011) 25846054
Email: naas@vsnl.com; Web site: http://www.naasindia.org

Preface

The importance of aquaculture for meeting the global fish demand is widely recognized and according to FAO estimates, about half of global food fish production comes from aquaculture. India has been making rapid strides in both fresh water as well as brackish water aquaculture and is globally at second position in production after China. While India is becoming the major supplier of farmed shrimp to major global markets, we see that domestic market is also developing significantly. However, market requirements are also becoming more stringent. With the emergence of large supermarkets and retailers as major buyers of fish and fishery products, they are coming up with their own requirements, which are often referred to as non-regulatory requirements. They would like to demonstrate to their customers that the products they sell are safe, produced in a sustainable way and considering the environment and social factors. They demand certification of aquaculture by third parties and this has led to emergence of a number of private bodies that develop aquaculture standards, certification bodies. Proliferation of standard setting and certification bodies has led to problems for aquaculture producers, because they are only market driven. To address this issue, the Food and Agriculture Organisation of United Nations has come up with internationally accepted Aquaculture Certification Guidelines. National aquaculture certification schemes are expected to be harmonized with FAO Aquaculture Certification Guidelines.

In this context, the brainstorming session organized by National Academy of Agricultural Sciences with Dr. Iddya Karunasagar as the Convenor is very timely. Indian aquaculture scenario is very complex with diverse species and diverse environments involved. Developing a national certification scheme needs active participation by different institutions and this needs to be done in consultation with the stakeholders. I am happy to see that most of the potential institutions involved in aquaculture certification participated in brainstorming session. I very much appreciate participation from Bureau of Indian Standards, Quality Council of India, Marine Products Export Development Authority and Centers, Coastal Aquaculture Authority of India, Institutes of Indian Council of Agricultural Research, National Fisheries Development Board, Colleges of Fisheries and Private sector in this brainstorming session. I would like to thank the Convenor Dr. Iddya Karunasagar and Editors of NAAS per bringing this policy document.

S. Ayyappan
President

Aquaculture Certification in India: Criteria and Implementation Plan

1. INTRODUCTION

Fish is an important source of proteins, micronutrients, minerals and polyunsaturated omega-3 fatty acids required by the human population. Even fresh water carps that are widely consumed in Asia contain significant amounts of omega-3 fatty acids. Fish accounts for about 17% of animal protein supply to the global population and 6.5% of all protein (Thilsted *et al.*, 2014). Thus fish plays an important role in meeting the nutrition security of the global population. However, fish supply is not uniform across the globe. In industrialised countries, the per capita food fish supply is 27.4 Kg per year, while in low income food deficit countries (LIFDC), it is 10.9 Kg and in least developed countries it is 11.5 Kg (FAO, 2014).

According to the FAO State of the World Fisheries and Aquaculture (2014), the global fish production was 158.00 million tonnes in 2012, of which, 91.3 million tonnes came from capture and 66.6 million tonnes came from aquaculture. In addition to food fish, 23.8 million tonnes of aquatic algae were produced in 2012 and the value of aquaculture production in 2012 has been estimated to be 144.4 billion US$. World fish supply reached 19.2 Kg per capita in 2012. Farmed fish accounted for 42.2% of global fish production and if only food fish are considered, the contribution of aquaculture goes up to 49%. It is estimated that by 2030, the contribution of aquaculture to global fish supply will increase to 60% (World Bank, 2013).

As indicated in Fig 1, global fish production by capture has been stagnating for over last two decades and aquaculture has been contributing to increasing fish supply. The growth of aquaculture was at an annual rate of 9.5% during 1990-2000 and 6.2% during 2000-2012.

Asia accounts for over 88% of global aquaculture production (Table 1). The production in top 10 countries is indicated in Table 2. In terms of volume, finfish accounted for the major species cultured in most countries. In Asia, most of these are produced in freshwater. Significant portions of these fresh water farmed fish are consumed domestically in producing countries and these contribute to the nutritional security of the people in these countries. Norwegian aquaculture is dominated by salmon production in marine waters. Chile is another major aquaculture producer farming salmon and bivalve molluscs in marine waters, mainly for export. In Thailand, half

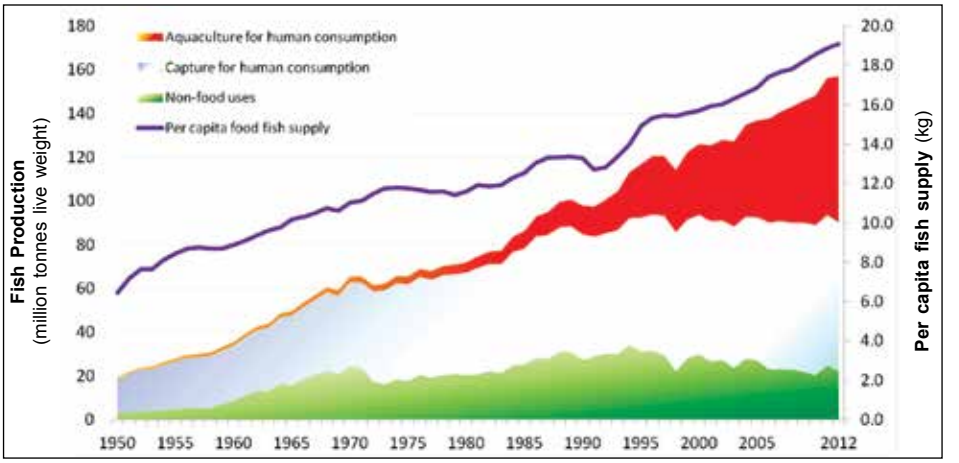

Fig. 1. Global fish production by capture, aquaculture and per capita fish supply (Source: FAO, 2014)

Table 1. Aquaculture production in different regions of the world (adapted from FAO, 2014)

Continent/Region	Aquaculture production			
	1990	2000	2010	2012
Africa				
Production (tonnes)	81,015	399,688	1,286,591	1,485,367
Percentage	0.62	1.23	2.18	2.23
North America				
Production (tonnes)	356,943	584,495	657,823	593,476
Percentage	2.73	1.8	1.11	0.89
Latin America				
Production (tonnes)	179,367	799,234	1,885,964	2,565,107
Percentage	1.37	2.47	3.19	3.85
Asia				
Production (tonnes)	10,801,537	28,420,611	52,436,025	58,895,736
Percentage	82.61	87.67	88.82	88.39
Oceania				
Production (tonnes)	42,005	121,482	185,617	184,191
Percentage	0.32	0.37	0.31	0.28
Europe				
Production (tonnes)	1,601,649	2,052,567	2,548,094	2,880,641
Percentage	12.25	6.33	4.32	4.32
World				
Production (tonnes)	13,074,679	32,417,781	59,037,416	66,633,253

Table 2. Aquaculture production of various aquatic species by top ten countries (adapted from FAO, 2014)

Country	Finfish (Inland)	Finfish (marine)	Crustaceans	Mollusc	Others	Total
China	23,341,134	1,028,399	3,592,588	12,343,169	803106	41,108,306
India	3,812,420	84,164	299,926	12,905	-	4,209,415
Vietnam	2,091,200	51,000	513,100	400,000	30,200	3,085,500
Indonesia	2,097,407	582,077	387,698	-	477	3,067,660
Bangladesh	1,525,672	63,220	137,174	-	-	1,726,066
Norway	85	1,319,033	-	2001	-	1,321,119
Thailand	380,986	19,994	623,660	205,192	4,045	1,233,877
Chile	59,527	758,587	-	253,307	-	1,071,421
Egypt	1,016,629	-	1109	-	-	1,017,738
Myanmar	822,589	1,868	58,981		1,731	885,169

of aquaculture production is accounted by crustaceans, intended mainly for export. Egypt has mostly inland aquaculture with a very tiny quantity of crustaceans produced. Even in Myanmar, inland aquaculture dominates in volume, but crustacean production is also significant.

At global level, two thirds (44.2 million tonnes) of the 66.6 million tonnes of farmed fish produced were finfish species grown inland (38.6 million tonnes) and in the sea (5.6 million tonnes). Though the latter accounted for only 12.6% of aquaculture production by volume, they constituted 26.9% (23.5 billion US$) by value due to high value species like salmon. Similarly, though crustaceans accounted for only 9.7% (6.4 million tonnes) by volume, they represented 22.4% (30.9 billion US$) by value.

2. DEVELOPMENTS IN AQUACULTURE PRODUCTION IN INDIA

Aquaculture production in India grew from 17,910 tonnes in 1950 to over 4 million tonnes in 2012 (Fig 2).

The commodities produced in India in 2012 are illustrated in Fig 3. Fresh water carps constituted a major portion of the production (83%) followed by other freshwater fish (7.26%), shrimp (6.28%), marine fish (2%), freshwater prawn (0.72%) and molluscs (0.3%).

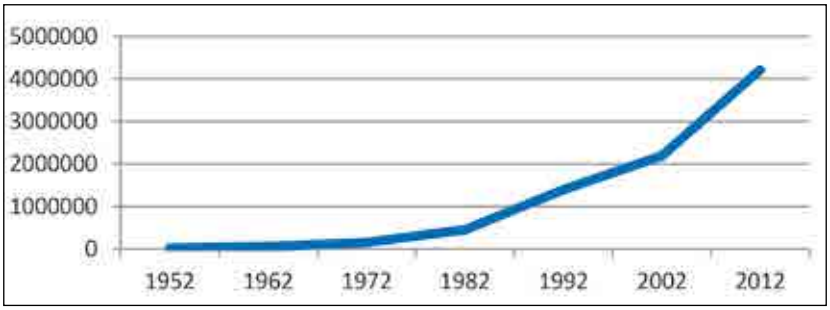

Fig. 2. Growth of aquaculture production in India during last sixty years (Source: FAO Statistical Service)

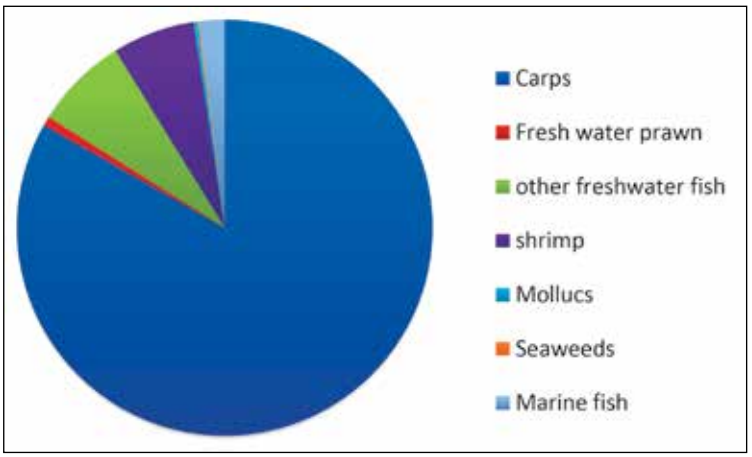

Fig. 3. Contribution of various species for aquaculture production in India (Source: FAO Statistical Service)

Shrimp aquaculture has been commercially important for India. The growth of shrimp aquaculture in India is illustrated in Fig 4.

Shrimp aquaculture in India was hit by white spot syndrome virus (WSSV) in the mid 90's and was showing a slow growth due to various disease problems. In 2009, India allowed import of Specific Pathogen Free (SPF) broodstock of Pacific white shrimp, *P. vannamei*. Since then, shrimp aquaculture has been showing steep growth (Fig 4). Presently, *P. vannamei* dominates shrimp production in India (Fig 5). Major vannamei producing states are Andhra Pradesh, Gujarat, Tamil Nadu and Odhisa. Production of black tiger shrimp is common in states like West Bengal and Odhisa, where extensive type of aquaculture is practiced.

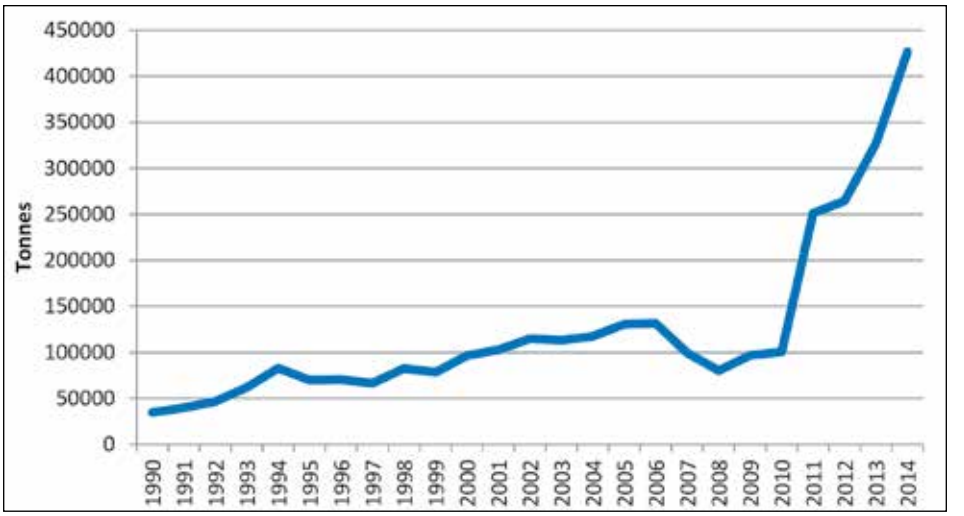

Fig. 4. Trends in shrimp aquaculture production in India
(Source: FAO statistical Service and MPEDA)

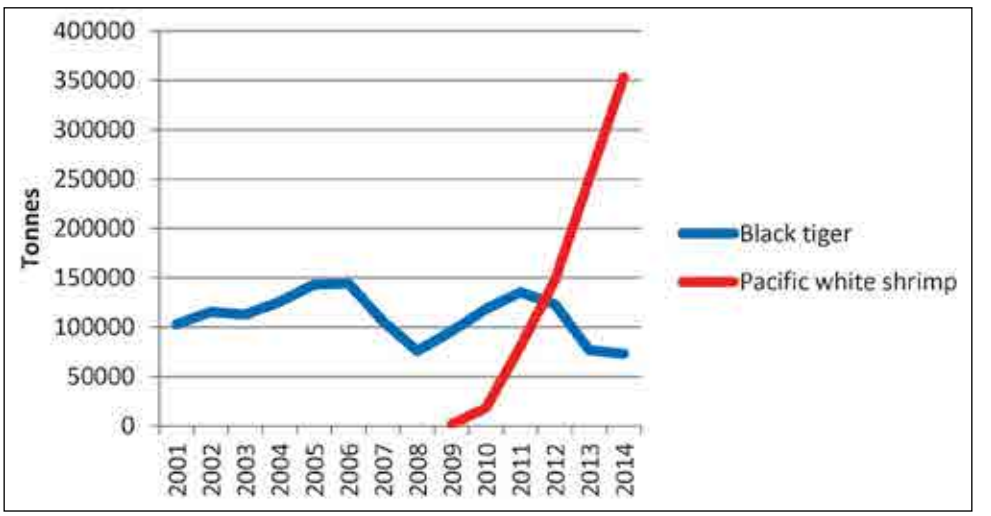

Fig. 5. Production trends in black tiger and Pacific white shrimp in India
(Source: data from MPEDA)

India has been lucky to escape outbreak of Acute Hepatopancreatic Necrosis Virus Disease (AHPND) that drastically reduced shrimp aquaculture production in Vietnam and Thailand. Due to this reason, India is emerging as the leading shrimp producing nation in South Asia.

3. INTERNATIONAL TRADE IN FISH AND FISHERY PRODUCTS AND CERTIFICATIONS AS MARKET ACCESS REQUIREMENTS

Fish is one of the most highly traded food commodities. According to FAO, global trade of fish and fishery products reached $136 billion in 2013. European Union is the single largest market with imports valued at $46 billion in 2012 representing 36% of world imports. United States and Japan are competing for the second place. In 2012, Japan was second with imports valued at $18 billion, but in 2013, this declined by about 15% to $15.3 billion, while US reached $19 billion in 2013, up 8% from 2012 figures (FAO, 2014). Thus, EU, US and Japan together account for about 70% of international fish imports and most fish exporting countries are trying to access these markets. Import requirements in these countries are very stringent in terms of quality, safety and fair trade practices.

The World Trade Organisation Sanitary and Phytosanitory (SPS) and Technical Barriers to Trade (TBT) agreements provide a framework for international trade including that of fish and fishery products. These are based on principles of (a) sovereignty, (b) harmonization, and (c) equivalence. According to these agreements, WTO member countries have the right to take measures to protect animal health and consumer health, but these measures should not be arbitrary, but should be based on a scientific risk assessment performed according to internationally accepted practices. The member countries are to harmonise their standards by those adopted by international organisations. For food safety, Codex Alimentarius Commission standards and for animal heath, OIE standards have been recognized in the SPS agreement. Member countries may follow different procedures to achieve the standards and consumer protection, but as long as the same goal is reached by different procedures, they are to be recognized as equivalent. Conformity assessment is a procedure used directly or indirectly to determine that relevant requirements in standards and technical regulations are met. These may include inspection, evaluation, verification, sampling, testing, and assurance of conformity (*e.g.* certification or declaration), registration, accreditation and approval or combination of these.

Issues related to food safety such as food hygiene, maximum permissible limits for contaminants, residues of veterinary drugs are generally part of national regulations. Examples include EU regulations and USFDA regulations. In India, the Food Safety and Standards Authority of India (FSSAI) is responsible for developing and implementing national food safety related standards. Food safety and quality requirements that are part of national regulations are generally referred to as “regulatory requirements”.

Different importing countries adopt different practices for authorizing imports. The major trading block, EU has the system of authorizing imports from countries that are

able to comply with EU regulatory requirements. The EU requires that the national regulatory requirements are harmonized and equivalent to EU requirements. They rely on national competent authorities (CA) to ensure that food business operators (FBO) including primary producers and all operators along the food chain operate following requirements such as good hygienic practice (GHP), good manufacturing practice (GMP) and in processing establishments, hazard analysis critical control point (HACCP) based food safety management. They want traceability to be implemented at all stages of food chain, so that, when any deficiencies are observed, the affected batch can be recalled/withdrawn from the market, the source of the problem and the stage in the food chain identified and appropriate corrective action can be taken. The EU Food and Veterinary Office (FVO) makes visit to the countries to verify whether the FBOs and CA are functioning as per the requirement. Once they are convinced, the country is included in the list of third counties authorized to export fish to EU along with the list of establishments and their activities (processing plants, aquaculture products or cold store) being displayed in their website (https://webgate.ec.europa.eu/sanco/traces/output/non_eu_listsPerActivity_en.htm#). US and Japan follow different procedure and it is the responsibility of the importing company to ensure that the operators in the producing country meet the USFDA/Japanese Ministry of Health requirements. India has been successful in accessing all these three major markets in addition to other regional markets. Indian seafood exports reached $5.5 billion in the year 2014-15 from a level of $2.9 billion in 2010-11. The importance of various export markets to India is illustrated in Fig 6. Notable is the emergence of US as the most important market (due to imports of *P. vannamei*) and the emergence of South East Asian markets that have overtaken even the EU.

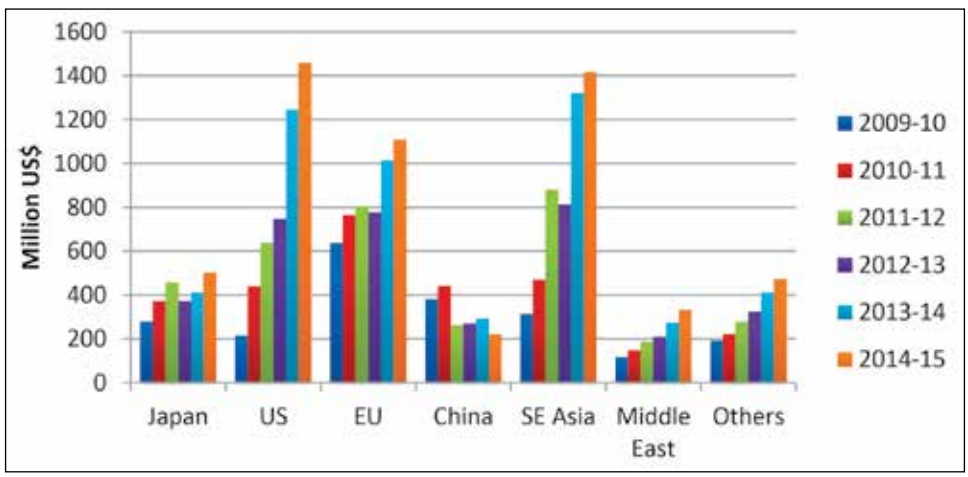

Fig. 6. Value of imports from major markets for last 6 years (based on data from MPEDA)

When the imported product arrives at a border post, they are subjected to inspection. Most often, these are document checks, but at random or when there is any suspicion of non-compliance, samples may be taken and tested. Detection of any non-compliance could lead to issue of rapid alerts (Rapid Alerts for Foods and Feeds, RAFF) in EU or import refusals in US or violations of food safety in Japan. A study of such alerts or import refusals could give an indication of the problems in operation of food chain. Table 3 shows main causes of alerts in EU market related to crustaceans. The annual number of alerts range from 53 in 2013 to 176 in 2009. The data indicates that high number of alerts before 2010 were mostly related to residues of veterinary drugs. This shows that aquaculture sector in producing countries need to implement good aquaculture practices to minimize disease problems and overcome the problem of use of antibiotics in aquaculture.

Table 3. Causes of rapid alerts associated with crustaceans imported by EU during the period 2004-2014 (based on data from EU RASFF portal)

Causes	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Microbiological	51	25	6	4	8	8	13	7	9	3	6
Chemicals and residues of vet drugs	103	128	122	108	111	145	43	40	31	24	57
Others	5	1	10	9	3	23	22	29	20	26	14
Total	159	156	139	121	122	176	78	76	60	53	77

Shrimp aquaculture in Asia has been facing serious disease problems. In the early 90's, WSSV caused a crash in shrimp production (mainly black tiger shrimp, Penaeus monodon) in many countries. Inability to overcome WSSV problem led to many countries importing Pacific white shrimp (P. vannamei), since Specific Pathogen Free (SPF) broodstock was available. But there were some indiscriminate import of non-SPF stock and this led to import of viruses like taura syndrome virus (TSV) and infectious myonecrosis virus (IMNV) to Asia, which again caused mass mortalities in P. vannamei. Further, under the false confidence that P. vannemie is disease resistant, the farmers neglected good aquaculture practices and went on with intensification of aquaculture. Poor culture practices led to outbreak of AHPND in China, Vietnam and Thailand causing shrimp production to be reduced to almost 50% in countries such as Vietnam and Thailand. These disease problems have led to unending problem of antibiotic residues in imported shrimp. High number of import alerts due to antibiotic residues led to bad publicity for cultured shrimp, which

was already suffering from negative media attention that picked upon few instances of mangrove destruction that happened during early years of shrimp aquaculture development in Asia. Environmental pressure groups were also contributing this type of negative publicity. Therefore, importers of shrimp and other aquaculture products have been under pressure to improve the image of aquaculture for their customers in developed markets. At the same time, capture fisheries has also come under criticism for over-exploitation and concerns about sustainability.

Another notable development in international markets is the growing importance of large retailers and supermarket chains in fish trade. In their effort to differentiate their products from that of competitors, they are coming up with strategies like selling only fish that has certain private certifications. Certifications for an environmental standard or ecolabel provide retailers and brand owners insurance against negative media coverage or boycotts from environmental groups. This will also help them tap into and meet consumer demand for ethical products. A number of private standard setting bodies have come up with their own certification standards and criteria. In the fisheries sector, private certifications first started with organisations like Marine Stewardship Council (MSC) certifying for sustainability of the fisheries and this has been promoted by policies of large retailers like Walmart. Reliance on third party certification for implementation of standards and for managing auditing of compliance minimises cost and responsibility to the retailers, while the certificates provide the “burden of proof” that meet the required standards. The certificates and labels help to reassure the consumers, respond to NGO pressures while shifting the costs involved in achieving these to the producers. This has led to a situation wherein there has been a proliferation of private standard setting organisations and organisations certifying compliance with private standards. Some examples of private aquaculture certifications include Aquaculture Stewardship Council (ASC), GlobalGAP, Best Aquaculture Practice (BAP) certification of Global Aquaculture Alliance (GAA). These private aquaculture certifications cover a range of issues like aquaculture practices, environmental aspects, food safety and aquaculture inputs like feed and chemicals.

Even fish processing establishments, that already implement the mandatory HACCP based quality and safety management programme, are obliged to get certified by private certifying bodies like the British Retail Consortium (BRC), International Featured Standards (IFS), Food Safety System Certification (FSSC) 22000, Safe Quality Food (SQF) Institute certification and others. A study conducted by FAO in Asia, Africa and Latin America showed that it is not uncommon to find one establishment having multiple certifications. Each of the certifications have their own requirements. Certifying agencies need to perform audits to verify compliance with the requirements. This would

involve cost to the establishments. There have been some attempts to harmonise the requirements. The Global Food Safety Initiative (GFSI) has representatives of a number of large retailers on their board and has been setup to deliver equivalence and convergence between the different food safety management systems. They benchmark the existing schemes and publish the list of recognized schemes. GFSI benchmarks food safety schemes for all sectors of food chain starting from primary production. Most of the private aquaculture certification schemes cover both food safety and sustainability aspects. Therefore, some aquaculture certification schemes like BAP and GlobalGAP have been benchmarked and recognized by GFSI.

Most aquaculture producers in developing countries are small producers operating farms of less than one or two hectares. Several studies have shown that such small farmers are unable to access international private certifications due to issues with infrastructure, cost and technical capability. Some countries in Asia have come up with their own national certification schemes. For example, Thailand came up with a Code of Conduct for Responsible Aquaculture Standard in 1997 and Good Aquaculture Practice Standard in 2000. In 2009, ThaiGAP for shrimp was developed based on FAO Technical Guidelines for aquaculture certification. In Vietnam, the national aquaculture certification scheme is called VietGAP and according to Vietnam Association of Seafood Exporters and Producers (VASEP) 30% of intensive and semi-intensive aquaculture systems will be certified by 2015 and 80% by 2020. In 2015, forty four farms have come under BAP certification of GAA and there are attempts to harmonise VietGAP with BAP certification and GlobalGAP certification.

India is yet to implement a national aquaculture certification scheme and it will be interesting to see the performance of countries like Thailand and Vietnam compared to India in complying with importer requirements. As shown in Table 4, there have been significant numbers of RASFF alerts in EU related to crustaceans from India. Most of these are related to residues of veterinary drugs. This contrasts with that in Thailand, which has been exporting more shrimp till 2013-14, when the shrimp culture industry was hit by AHPND. Vietnam, another important exporter of cultured

Table 4. Number of rapid alerts in EU market related to crustaceans exported from India, Thailand and Vietnam (based on data from EU RASFF portal)

Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Thailand	5	4	4	4	4	0	1	1	0	0	1
Vietnam	13	9	6	2	1	6	6	8	4	3	29
India	18	19	23	22	35	37	13	15	12	5	17

shrimp has been having less number of alerts except in 2014, when a spike is seen due to excessive use of antibiotics to combat the problem of AHPND.

Consistent problem with residues of veterinary drugs in India shows that the industry needs to improve aquaculture practices. India has experience of implementing small farmer cluster based "Better Management Practices" for shrimp aquaculture and reduce the impact of disease and simultaneously minimizing problems due to use of antibiotics (Umesh *et al.*, 2009).

4. FAO TECHNICAL GUIDELINES FOR AQUACULTURE CERTIFICATION

The emergence of private certification schemes has been impacting particularly small producers in developing countries. At international level, Codex Alimentarius Commission standards cover food safety, fair trade practices and OIE standards cover animal health. Though FAO Code of Conduct for Responsible Fisheries broadly covered sustainability, environmental and social issues, this did not contain guidance on certification. To fill up this gap, FAO (2009, 2011a, 2011b) developed guidelines for ecolabeling of fish from marine or inland capture and guidelines for aquaculture certification. The guidelines were developed following a series of expert consultations and a final technical consultation with member countries. The guidelines have been adopted by the FAO Committee of Fisheries (COFI).

The FAO Technical Guidelines for Aquaculture Certification recognizes that a credible certification scheme consists of:

- Standard setting processes required to develop and review certification standards
- Accreditation system needed to provide formal recognition to a qualified body to carry out certification
- Certification bodies required to verify compliance with certification standards

Standard setting encompasses the tasks of developing, monitoring, assessing, reviewing and revising standards. The standard setting body should be a legal entity and should have a Technical Committee of independent experts and a consultation forum with relevant stakeholder representatives, whose mandates are clearly established. The standard setting body should have sufficient resources to support standard setting function. The Standard setting body is responsible for ensuring appropriate communication and outreaching regarding the standard and standard setting, reviewing and validation process.

The certification standard should be based on international standards, guidelines and best scientific evidence available and also considering traditional knowledge.

The requirements for standard setting are transparency and participation by interested parties. It is to be ensured that there is no conflict of interest among the entities responsible for standard setting, accreditation and certification and ensure accountability for the entities. During the process, there should be identification and review of comparable systems, identification of research needs and knowledge gaps. The standard should include adequate procedures for maintaining chain of custody and traceability of certified aquaculture products and processes. The certification scheme should not discriminate any group of farmers practicing responsible aquaculture based on scale, intensity of production or technology. The scheme should promote cooperation between farmers and traders and should be cost effective to ensure inclusive participation of responsible farmers. Special considerations are to be provided to address the interests of resource-poor small scale farmers without compromising food safety.

FAO Technical guideline for aquaculture certification identifies minimum substantive criteria for certification under each of the following aspects: (a) animal health and welfare (b) food safety (c) environmental integrity and (d) socio-economic factors. The extent to which the standard addresses these issues depends on the objective of the scheme that should be clearly stated. Due consideration should be given for the ability to measure the performance of the aquaculture system, practices and ability to assess conformity with certification standards.

Before adopting, the standards should be notified and appropriate time given for the stakeholders to provide comments, identifying the focal point for standard related queries and comments. Proper records of standards and development activity should be maintained. Appropriate procedure should be put in place for validation to ensure that the standards (a) are effective in meeting certification goals, (b) are objective and auditable, (c) do not contain criteria or requirement that can become unnecessary barriers to trade or mislead aquaculture community, and (d) take into consideration practicality and cost of standard development and maintenance.

Accreditation provides assurance that certifying bodies are competent and perform conformity assessment according to aquaculture standard in relation to animal health and welfare, food safety, environmental integrity and socioeconomic aspects. Accreditation is an independent assessment of a certification body. The accreditation body should be a legal entity with adequate resources to perform their function. The requirements for an accreditation body include: non-discrimination, independence, impartiality and transparency, availability of human and financial resources, should have laid down procedures for demonstrating accountability and resolution of complaints.

Certification is a procedure by which a body or entity gives written assurance that the aquaculture operations are in conformity with relevant certification standards. Two types of assessments are to be made are to be made by an accredited certification body: (a) conformity assessment of aquaculture operation, (b) conformity assessment of chain of custody- whether adequate measures are in place to identify and differentiate products from a certified aquaculture operation along the supply chain (traceability). Consequently certification could be for aquaculture operation or for chain of custody or both. The certifying body should be legally and financially independent of the owner of certification scheme and should not have any conflict of interest. Access to the services of a certifying body should be non-discriminatory and open to all types of aquaculture operations.

5. RECOMMENDATIONS

The BSS discussed the aquaculture situation in India, international trade and the need for aquaculture certification. There was general agreement that the certification scheme should be developed using the FAO Technical Guidelines for Aquaculture Certification as the benchmark. Considering the wide diversity of type of farms and their target markets, it was considered useful to have two levels of certification. While food safety cannot be compromised and animal health is also important. The following are the major conclusions and action points:

1. The Food Safety and Standards Authority of India (FSSAI) develop mandatory product standards for fish and fishery products. There is a need for National Aquaculture Certification Standards for India.
2. National Good Aquaculture Practice (GAqP) certification will cover the process of production of fish/shrimp by Aquaculture. Different standards, for farms meeting the requirement and not meet the requirements.
3. National GAqP will be a voluntary standard. Initially, covering - fresh water aquaculture and brackish-water aquaculture.
4. National GAqP certification standard will be developed by Bureau of Indian Standards (BIS) involving all stakeholders including private sector and technical support from national institutes, universities, other academic institutions and line departments. BIS would come up with a draft standard for public comment as soon as possible.
5. Certification Scheme and other requirements for certification like accreditation will be developed by the Quality Council of India (QCI). The documents to be developed would include (a) Governing structure of the scheme, (b) Certification

process, (c) Requirements for Certification Bodies, and (d) Rules for ownership of certification mark. This work can start immediately after draft standard is available from BIS.

6. QCI and National Fisheries Development Board or Coastal Aquaculture Authority or MPEDA can jointly own the Certification scheme. The Scheme to be developed by QCI would be according to ISO17065. The certification could be valid for a period to be specified in the scheme (*e.g.* one year or two years).

7. The Certification Standard may be developed at two levels. Level 1 will be the basic scheme including criteria for food safety, animal health and welfare. Level 2 will be the complete scheme including Level 1 and in addition, environmental and socio-economic criteria.

8. Efforts need to be made to liaise with international benchmarking agencies such as Global Food Safety Initiative (GFSI) and Global Sustainable Seafood Initiative (GSSI) enabling smooth international market access.

9. Aquaculture farms intending to export products and interested in going for private certification schemes eg. Global GAP or ASC or BAP, QCI can help by developing national interpretation of these schemes in the Indian context.

10. To implement the certification schemes, there is need for capacity building. The Scheme owners may arrange capacity building and also carry out promotional activities.

11. All attempts need to be made to reduce the cost of certification. Group certification should be part of the scheme and this is in line with the FAO Technical Guidelines for Aquaculture Certification.

12. There would be number of constraints for implementation of certification schemes. Unless farms are registered, they cannot be certified. For shrimp farms, decentralize existing process of registration by empowering the Department of Fisheries for registration. Similar guidelines to be developed for freshwater aquaculture in accordance with national policies.

13. Use of unauthorized veterinary drugs in aquaculture is a serious issue, which is also affecting exports. There is a need for bringing sale and prescription of veterinary drugs for aquaculture under a national regulation.

14. Scientific data on pharmacokinetics of drugs for which Codex maximum residue limits (MRL) exist or for other drugs approved for use by national authorities is lacking for fish cultured in India. Such data would be essential for prescribing withdrawal times.

15. For certification, farms would need to use authorized inputs. There are number of inputs for which there are currently no standards or proper regulatory control. BIS should consider developing standards for these. The State Departments of Fisheries could develop guidelines for the use of aquaculture inputs.

16. The aquaculture farms drawing surface water passing through agriculture fields contaminated with agri-pesticides and chemicals will not meet certification requirements. Arsenic levels in farms using ground-water to be assessed. Fish safety needs to be assessed against all these contaminant.

REFERENCES

EU RASFF Portal. https://webgate.ec.europa.eu/rasff-window/portal/?event=SearchForm& cleanSearch=1.

FAO (2009). Guidelines for the ecolabeling of fish and fishery products from marine capture fisheries. http://www.fao.org/docrep/012/i1119t/i1119t.pdf.

FAO (2011a). Guidelines for the ecolabeling of fish and fishery products from inland capture fisheries. http://www.fao.org/docrep/014/ba0001t/ba0001t00.pdf.

FAO (2011b). Technical Guidelines for aquaculture certification. http://www.fao.org/3/a-i2296t.pdf.

FAO (2014). The State of World Fisheries and Aquaculture, FAO. http://www.fao.org/3/a-i3720e/index.html.

Thilsted, S.H., James, D., Toppe, J., Subasinghe, R. and Karunasagar, I. (2014). Maximising the contribution of fish to human nutrition. ICN2 Second International Conference on nutrition, FAO and WHO, http://www.fao.org/3/a-i3963e.pdf.

Umesh, N.R., Mohan, A.B.C., Ravibabu, G., Padiyar, P. A., Philip, M.J., Mohan, C.V. and Bhat, V. (2009). Shrimp farmers in India: Empowering small scale farmers through a cluster based approach. In: Success Stories in Asian Aquaculture. Ed. D'Silva, S.S., Davy, F.B. pp 41-66.

Vietnam Association of Seafood Exporters and Producers (VASEP). http://seafood.vasep.com.vn/ 702/onecontent/certifications.htm.

World Bank (2013). Fish to 2030 Prospects for Fisheries and Aquaculture. World Bank Report No. 83177-GLB. http://www.fao.org/docrep/019/i3640e/i3640e.pdf

List of Participants

1. Dr S. Ayyappan, President, NAAS and Secretary, DARE and DG, ICAR.
2. Dr R.B. Singh, Immediate Past President, NAAS.
3. Dr Iddya Karunasagar, Senior International Consultant, FAO.
4. Dr Alavandi, Central Institute of Brackishwater Aquaculture, Chennai.
5. Dr (Ms) Vani Bhambri Arora, National accreditation Board for Certification Bodies, Quality Council of India, Delhi.
6. Mr V. Balasubraminiam, General Secretary, Prawn farmers Federation of India, Pondicherry.
7. Dr V. Gopinath, Bureau of Indian Standards, Delhi.
8. Prof P. Hari Babu, College of Fisheries, Nellore, Andhra Pradesh.
9. Dr R. Jayakumar, Central Marine Fisheries Research Institute, Mandapam.
10. Dr S. Kandan, Deputy Director, MPEDA, Vijayawada.
11. Dr (Mrs) Indrani Karunasagar, NAAS Fellow, Mangalore.
12. Dr Madan Mohan, ADG (Marine Fisheries), ICAR, KAB-II, New Delhi
13. Dr Mohansundaram, Director Technical, Marine Products Export Development Authority of India, Kochi.
14. Mr Soumik Mondal, Manager (Certification), SGS, Kolkata.
15. Dr Madhumita Mukherjee, Executive Director, National Fisheries Development Board, Hyderabad.
16. Dr S.K. Otta, Central Institute of Brackishwater Aquaculture, Chennai.
17. Dr Bindu Pillai, Central Institute of Freshwater Aquaculture, Bhubaneswar.
18. Dr Pravatha Pradhan, National Bureau of Fish Genetic Resources, Lucknow.
19. Mr Rajkumar, CEO, National Center for Sustainable Aquaculture, Kakinada.
20. Dr Ravichandran, Member Secretary, Coastal Aquaculture Authority of India, Chennai.
21. Mr Prathapchandra Shetty, Executive Director, Emirates Star Fisheries, Dubai.
22. Dr S.D. Singh, ADG (Inland Fisheries), ICAR, KAB-II, New Delhi

Note: The designations and affiliations of the participants are as on the date of BSS.

NAAS Documents on Policy Issues

61. Mastitis Management in Dairy Animals - 2013
62. Biopesticides – Quality Assurance - 2013
63. Nanotechnology in Agriculture: Scope and Current Relevance - 2013
64. Improving Productivity of Rice Fallows - 2013
65. Climate Resilient Agriculture in India - 2013
66. Role of Millets in Nutritional Security of India - 2013
67. Urban and Peri-Urban Agriculture - 2013
68. Efficient Utilization of Phosphorus - 2014
69. Carbon Economy in Indian Agriculture - 2014
70. MOOC for Capacity Building in Indian Agriculture: Opportunities and Challenges - 2014
71. Role of Root Endophytes in Agricultural Productivity - 2014
72. Bioinformatics in Agriculture : Way Forward - 2014
73. Monitoring and Evaluation of Agricultural Research, Education and Extension for Development (AREE4D] - 2015
74. Biodrainage: An Eco-friendly Tool for Combating Waterlogging - 2015
75. Linking Farmers with Markets for Inclusive Growth in Indian Agriculture - 2015
76. Bio-fuels to Power Indian Agriculture - 2015

NAAS Documents on Policy Issues*

1. Agricultural Scientist's Perceptions on National Water Policy - 1995
2. Fertilizer Policy Issues (2000-2025) - 1997
3. Harnessing and Management of Water Resources for Enhancing Agricultural Production in the Eastern Region - 1998
4. Conservation, Management and use of Agro-biodiversity - 1998
5. Sustainable Agricultural Export - 1999
6. Reorienting Land Grant System of Agricultural Education in India - 1999
7. Diversification of Agriculture for Human Nutrition - 2001
8. Sustainable Fisheries and Aquaculture for Nutritional Security - 2001
9. Strategies for Agricultural Research in the North-East - 2001
10. Globalization of Agriculture: R & D in India - 2001
11. Empowerment of Women in Agriculture - 2001
12. Sanitary and Phytosanitary Agreement of the World Trade Organization Advantage India - 2001
13. Hi-Tech Horticulture in India - 2001
14. Conservation and Management of Genetic Resources of Livestock - 2001
15. Prioritization of Agricultural Research - 2001
16. Agriculture-Industry Interface: Value Added Farm Products - 2002
17. Scientists' Views on Good Governance of An Agricultural Research Organization - 2002
18. Agricultural Policy: Redesigning R & D to Achieve It's Objectives - 2002
19. Intellectual Property Rights in Agriculture - 2003
20. Dichotomy Between Grain Surplus and Widespread Endemic Hunger - 2003
21. Priorities of Research and Human Resource Development in Fisheries Biotechnology - 2003
22. Seaweed Cultivation and Utilization - 2003
23. Export Potential of Dairy Products - 2003
24. Biosafety of Transgenic Rice - 2003
25. Stakeholders' Perceptions On Employment Oriented Agricultural Education - 2004
26. Peri-Urban Vegetable Cultivation in the NCR Delhi - 2004
27. Disaster Management in Agriculture - 2004
28. Impact of Inter River Basin Linkages on Fisheries - 2004
29. Transgenic Crops and Biosafety Issues Related to Their Commercialization in India - 2004
30. Organic Farming: Approaches and Possibilities in the Context of Indian Agriculture - 2005
31. Redefining Agricultural Education and Extension System in Changed Scenario - 2005
32. Emerging Issues in Water Management The Question of Ownership - 2005
33. Policy Options for Efficient Nitrogen Use - 2005
34. Guidelines for Improving the Quality of Indian Journals & Professional Societies in Agriculture and Allied Sciences - 2006
35. Low and Declining Crop Response to Fertilizers - 2006
36. Belowground Biodiversity in Relation to Cropping Systems - 2006
37. Employment Opportunities in Farm and Non-Farm Sectors Through Technological Interventions with Emphasis on Primary Value Addition - 2006
38. WTO and Indian Agriculture: Implications for Policy and R&D - 2006
39. Innovations in Rural Institutions: Driver for Agricultural Prosperity - 2007
40. High Value Agriculture in India: Prospects and Policies - 2008
41. Sustainable Energy for Rural India - 2008
42. Crop Response and Nutrient Ratio - 2009
43. Antibiotics in Manure and Soil A Grave Threat to Human and Animal Health - 2010
44. Plant Quarantine including Internal Quarantine Strategies in View of Onslaught of Diseases and Insect Pests - 2010
45. Agrochemicals Management: Issues and Strategies - 2010
46. Veterinary Vaccines and Diagnostics - 2010
47. Protected Agriculture in North-West Himalayas - 2010
48. Exploring Untapped Potential of Acid Soils of India - 2010
49. Agricultural Waste Management - 2010
50. Drought Preparedness and Mitigation - 2011
51. Carrying Capacity of Indian Agriculture - 2011
52. Biosafety Assurance for GM food Crops in India - 2011
53. Ecolabelling and Certification in Capture Fisheries and Aquaculture - 2012
54. Integration of Millets in Fortified Foods - 2012
55. Fighting Child Malnutrition - 2012
56. Sustaining Agricultural Productivity through Integrated Soil Management - 2012
57. Value Added Fertilizers and Site Specific Nutrient Management (SSNM) - 2012
58. Management of Crop Residues in the Context of Conservation Agriculture - 2012
59. Livestock Infertility and its Management - 2013
60. Water Use Potential of Flood-affected and Drought-prone Areas of Eastern India - 2013

Continued on inside cover

***For details visit web site: http://www.naasindia.org**