

A STUDY ON FOOD SAFETY APPROACH METHOD DEVELOPMENT FOR MSC COC ONSITE AUDIT

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ABSTRACT. *The purpose of this study is to find how to apply food safety approach when the auditor conducts inspections on the site to meet the Marine Stewardship Council (MSC) and Chain of Custody (CoC) standards. MSC CoC Standard focuses on traceability of food products for MSC certification only. Actually, food safety issue is not mandatory although it is extremely important. So, the auditor would not require collective action about the food safety practices officially, even if they find serious problems on the site. Definitely, almost all consumers want to ensure that their food is safe and sustainable for them. For this reason, we suggest the approach method as a solution based on the priority of standard criteria in perspective of food safety. We expect this study will guide the MSC CoC auditors how to approach food safety when they are on the site.*

Keywords: Marine Stewardship Council, MSC, Chain of Custody, CoC, Food safety, Seafood standard, Criteria, Sustainable seafood, Eco-label

1. **Introduction.** Seafood has played an important role in humanity's protein and nutrient sources for a long time. According to statistics from the FAO, seafood consumption has reached 18.9 kg per capita and production has reached 158 million tones per year. In particular, the consumption is steadily increasing due to high income and wellness trend.

However, the increase of the consumption of fisheries causes indiscriminate killing over fishing and the development of fishing gear and fishing methods which lead to decrease of fishery resources and threaten the marine ecosystem [1]. Seafood industry and consumers recognized the need for sustainable fisheries because of the threat to short supply of seafood industry.

The MSC Eco-label was established in 1996 by the Unilever and WWF as a solution for sustainable fishery. After then, 17 similar programs were created [2]. Eco-label must be only attached to fish products that are captured through sustainable fisheries. This allows consumers to choose and purchase products that are ensured with sustainable fisheries and food supply [3].

Recently, consumers' preference to Eco-label products has increased [4]. This is not a trend only in developed countries. According to a consumer survey in 2012, Chinese consumers are willing to pay more, to the Eco-label seafood because they recognized importance of raw material information for sustainable future and social benefit [5]. The factors that influence consumers' purchase decisions are becoming increasingly complex such as sustainability, price and as well as food safety [6].

Seafood is particularly sensitive to food safety because it can be spoiled easily and is difficult to handle. Most food processing companies and retail companies guarantee food safety through GMP (Good manufacture practice), HACCP (Hazard analysis critical control point) and FSMS (Food safety management system). Consumers have high confidence in the certification mark of products that are certified to ensure food safety [7].

However, if a food safety incident occurs from a product that has Eco-label certification marks, it may lead to high distrust.

Finally, a certification mark does not only ensure sustainability but also the need for food safety. In this study, in order to ensure food safety on products harvested from sustainable fisheries, first, we will review the Eco-label standards and food safety standard. Next, we will suggest methods on how to access it.

This study will contribute to improving food safety practice in the seafood industry with MSC CoC certification through improving the audit practice and developing standard on the suggested food safety approach.

2. Literature Review. An ‘Eco Label’ is defined as a mark of approval or certification, usually a product label or scheme logo, which denotes that a product meets a specified standard [2]. Through the Eco-label on the products, consumers can assume those are considered environment-friendly and has sustainable capabilities. These affect the purchase decisions of consumers; therefore, the market size and distribution of sustainable products can be expanded. Through this, the Eco-label programs would be vitalized and there would be a conservation of the marine ecosystem, and finally, a virtuous circulation will be made.

There are 459 different Eco-labels that are used by 25 industries in 197 countries according to the world’s largest Eco-label registration site, the ‘Eco-label Index’ [8]. Especially, on the seafood Eco-label, MSC which was established by Unilever and WWF in 1996 is the most popular and the best model among 17 similar operated programs. The seafood from these programs are put into several stages of the distribution channel in international and domestic markets. In this process, products under the Eco-label program are required to have ensured traceability. Therefore, the CoC (Chain of Custody) certification has emerged to ensure that the supply chains distribute Eco-label products correctly [9].

CoC makes sure that the set of measures which is designed to guarantee that the product put on the market bearing the Eco-label logo is really a product coming from a certified fishery [10]. Through the CoC certification, the traceability can be ensured from all stages of production, processing, distribution, and sales which is managed strictly by something like Figure 1.

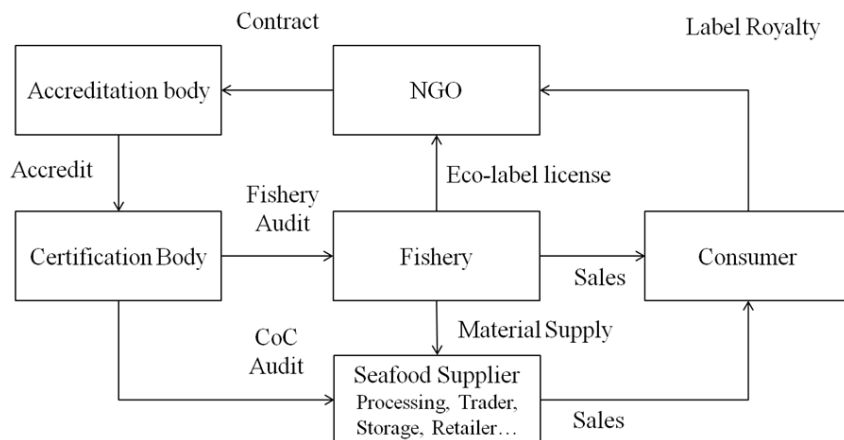


FIGURE 1. MSC chain of custody certification process

According to recent studies, product certifications which guarantee sustainability and food safety affect the consumers’ purchasing decisions. Continuously, in recent years consumer demand on environment friendly and food safety has been increased [5]. For that reason, the food safety approach through CoC has been required [11].

The guarantee on food safety basically includes the quality and hygiene. It has been managed by the food safety standard. These standards are all focused on the food safety

for the consumers. Particular, food companies adopt a management system according to the global food standards in order to improve food safety practice and risk reduction [12].

Globally, there is a similar structure and procedure followed by companies to ensure food safety. There are many FSMS standards companies used such as ISO 22000, BRC, IFS, FSSC 22000 for checking their HACCP, QM (Quality Management), and GMP [13]. In particular, GMP is a preceding and essential requirement in terms of facilities [14]. HACCP is a program that intensively manages the hygienic aspect [15]. HACCP provides a systematic way to identify, assess, and control a food production system where food borne hazards are most likely to happen.

Thus, the food industry makes an effort in order to ensure food safety and introduce standards, and it means that they will ensure food safety for consumers through a certification mark.

As mentioned above, Eco-label needs for more ensured products and a chain of custody, too [11]. However, in general, the Eco-label CoC standard mostly consists of traceability without food safety. For example, MSC CoC standard which obtained the best score from 'Assessment of On-Pack, Wild-capture seafood Sustainability Certification Programs and Seafood Eco-labels' by WWF had no criteria related to food safety [2]. However, as we mentioned earlier, consumers still want the ensured product of food safety, so we should find a way to guarantee the food safety.



FIGURE 2. Comparison of good practice and unsanitary processing

3. Methodology. We designed the four step research process for the study by AHP method. First, we analyze the CoC standard and requirement. Next, we make a hierarchy for the questionnaire survey. And we collect the data through conducting the questionnaire survey to the MSC CoC auditors all over the world. Finally, we analyze the result through AHP method and discuss with the engaged experts about the meanings.

3.1. Standard analysis. We analyzed the MSC CoC standard currently has the highest number of certifying companies and received a higher score from the Eco-label certification assessment [2]. MSC CoC consists of four principles, and each principle consists of the following sub-criteria. The principle and criteria are represented as the key words for hierarchy and surveys [16].

3.2. Criteria hierarchy. In the CoC standard, Pair-wise comparisons between each criterion is required for the priority of food safety approach. Thus it was constructed as a hierarchy in Figure 3. First, the pair-wise comparisons of 'Principle' is conducted on level 1. The next 'Criteria' depended on each 'Principle' is conducted on level 2.

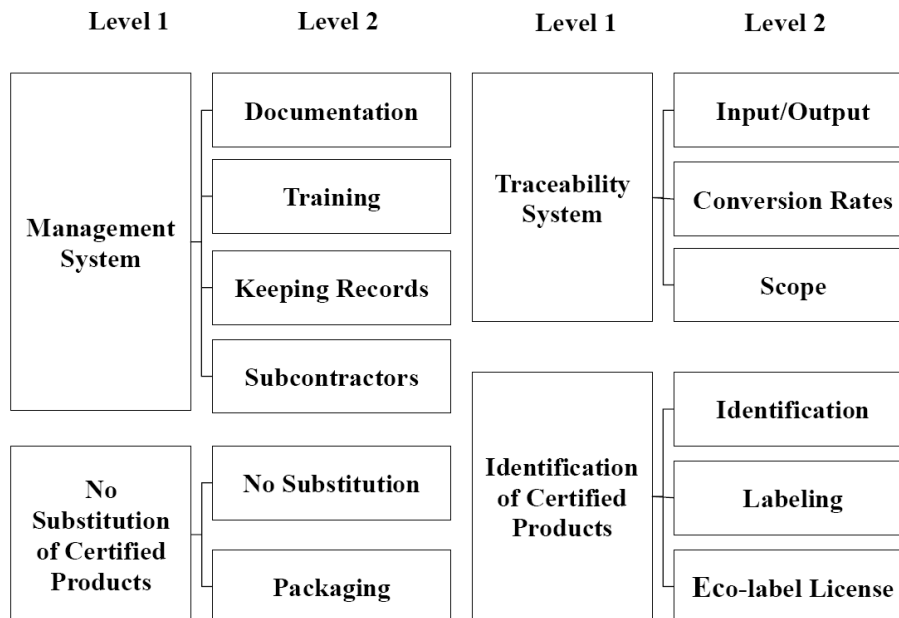


FIGURE 3. Hierarchy of MSC CoC standard's criteria

3.3. Questionnaire design and survey. The questionnaire was created based on the criteria hierarchy. The pairwise comparison needs the five-point ratio scale. The five-point ratio scale could stand for experts' opinions with preferences between options given as equally, moderately, strongly, very strongly, or extremely preferred which is recommended by Satty [17]. The question consists of pair-wise comparison between each 'Principles (Level 1)', and each 'Criteria (Level 2)'.

The questionnaires were distributed to MSC CoC auditors around the world who belong to the most commonly applied onsite audits in certification body from February 1st to March 25th 2015. We collected 23 answers among the distributed 80 questionnaires.

3.4. Consistency analysis. We verified the consistency of judgments across the Consistency Index (CI) through Formula (1)

$$CI = \frac{(\lambda_{\max} - n)}{(n - 1)} \quad (1)$$

where λ_{\max} is the Eigen value corresponding to the matrix of pair-wise comparisons and n is the number of elements being compared.

Saaty suggested 0.1 as acceptable maximum level of the decision maker's inconsistency [17].

In other words, under 0.1 score of the CI value is sufficiently accurate and there is no need for correction.

As a result of calculations by Microsoft excel 2007, the CI of pair-wise comparison to the Level 1 'Principles' was 0.031. And Level 2 'Management System' was 0.009, 'Traceability System' was 0.000, 'No Substitution of Certified Products' was 0.000, 'Identification of Certified Products' was 0.000.

3.5. Analyzing of result. Table 1 indicates that 'Management system' is the highest priority with 0.345 in the comparison between the principles. the second highest is 'Identification of satisfied products' with 0.266, the third is 'No substitution of certified products' with 0.207 and 'Traceability system' with 0.181 is the last. Ironically, 'Traceability system' is the most important part of the CoC auditing if it is not considered by food safety approach.

TABLE 1. The result of criteria priority in perspective of food safety

High Level	Weight	Priority	Low Level	Weight	Priority	Synthesizing	
						Weight	Priority
Management system	0.345	1	Documentation	0.309	1	0.106	1
			Training	0.241	3	0.083	3
			Keeping Records	0.28	2	0.097	2
			Subcontractors	0.17	4	0.058	6
Traceability system	0.181	4	Inputs/Outputs	0.331	2	0.045	11
			Conversion Rates	0.361	1	0.049	9
			Scope	0.307	3	0.042	12
No substitution of certified products	0.207	3	No substitution	0.479	2	0.05	8
			Packaging	0.521	1	0.054	7
Identification of satisfied products	0.266	2	Identification	0.407	1	0.081	4
			Labeling	0.364	2	0.073	5
			Eco-label License	0.228	3	0.046	10

The synthesizing result shows the comparison values between the criteria under the principles that were reflected in the principle comparison values.

‘Documentation’ obtained the highest priority with 0.106. The second is ‘Keeping Records’ with 0.097 with a slight difference. These criteria belong to the ‘Management system’ principle and seem to require a system approach. The third criterion is ‘Training’ with 0.083 belonging to the ‘Management system’ principle as well but the difference of value is bigger relatively. The following criterion that is ‘Identification’ with a slight difference is the only criterion out of ‘Management system’. This criterion is required for certified products to be identified in the whole process such as purchasing, storage, processing, packing, selling and delivery systems/processes.

The following criteria from ‘Labeling’ to ‘Scope’ which gained low values show being relatively non-critical in this perspective.

4. Discussion. As the above result, we could find the criteria belong to ‘Management system’ which has the highest priority to food safety approach on onsite auditing.

We discussed with the auditors and experts about the meaning of the result. Most of them agreed that food safety approach is very difficult to carry out when onsite CoC auditing because it needs enough time to spend for review all the management situation without specific requirements.

So, the approach to ‘Management system’ could be an appropriate method. For example, almost food processing companies have food safety system such as HACCP, FSMS which need documented procedures and record to meet certain requirements. The auditor is able to access this for review whether the company operates the system or not.

Some experts recommend visual inspection is a good alternative. Because according to the result ‘Identification’ principle is the second priority, the hygiene status and products handling practice are observed easily by onsite auditing. That kind of visual inspection is a very efficient approach because it does not need to spend time for food safety and adopted to complicated requirements. The auditors could conduct CoC auditing with food safety approach at the same time as well.

Through this discussion, we could understand the result and how to approach in the perspective of food safety.

In case of ‘Management system’, the auditor is able to approach food safety to the procedure or document recoding for the management system operating and the training program. If there is not any process and documented procedure in the company, it would have to regard as having potential risk to food safety of the product.

The ‘Identification’ principle needs to observe the whole process such as purchasing, storage, processing, packing, selling and delivery systems/processes [18]. So, the auditor could conduct visual inspection to hygiene practice in these stages at the same time.

Standard improvement would have to be treated very carefully because food safety is not a mandatory requirement for MSC standard. On the other hand, Audit approach is easier. The certification body is able to make an auditor procedure or checklist for this approach and MSC has only to describe this issue into the requirement in order to demand to certification body to refer to this.

So, we made a food safety approach after the discussion as seen in Table 2.

TABLE 2. Food safety approach in MSC standard and on-site audit

Principle	Criteria Improvement	Audit Approach
Management system	Keeping record for ensuring food safety system	System Approach (Only for ‘Observation’)
	Training about food safety for responsible person	Open Question (Only for ‘Observation’)
Identification	Ensuring that certified products are not contaminated	Visual Inspection (Only for ‘Observation’)

5. Conclusion. Through this study, we could suggest the approach based on the literature review and the questionnaire survey analysis using AHP.

Food safety is a very important issue these days because of the increase in food contamination as well as marine pollution. So two perspectives must be considered and those are traceability and hygiene management. However, it is impossible to conduct both of them on the CoC audit at the same time because hygiene management needs extensive system such as HACCP, FSMS, GMP.

So, we analyzed the criteria of the MSC CoC standard and what criteria should be the priority for food safety. This was done through the study of the AHP analysis in order to solve this problem.

According to the result, the ‘Management system’ principle has the highest priority to food safety approach. ‘Identification’ is next.

Through discussion with the auditors and experts, we could suggest two approaches in order to require collective action to non-conformity with food safety in certified seafood companies.

First, we suggest ‘System approach’. This approach is able to verify it in a short time. The review of food safety related certification, procedure, documents and records by auditor will see whether the certified company has the appropriate food safety system or not.

Second, the training for food safety is not mandatory in this standard but the auditor can attempt to lead the recognition about food safety in the process of ensuring CoC by open question.

Third, ‘Visual inspection’ is a very effective approach when making an onsite auditing for verification of the ‘Identification’ at all stages. In the process of the auditing, the auditor could immediately find contamination and hygiene practice at the same time.

This study has a limitation to use the previous vision standard because MSC standard is usually revised every three years. However, the criteria are not changed a lot compared to the previous. Also, there are still missing food safety related issues.

We hope this study would help MSC CoC auditors who consider food safety approach on the auditing and improve the standard requirement and criteria.

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