

BENEFIT AND COST ANALYSIS OF ADOPTING INTERNATIONAL SUSTAINABLE FISHERIES CERTIFICATION IN THE DEVELOPING COUNTRY: EX-POST EVALUATION PERSPECTIVE

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ABSTRACT. *Sustainability of seafood has been very crucial in the globe recently. To solve this issue, related organizations, such as government, NGO, large companies, and supra-national organization, have been attempting to expand and maintain sustainability of fisheries. The Marine Stewardship Council (MSC) is the world's biggest and most representative sustainable fisheries organization. The MSC operates to fix the conservation of overfishing and seafood. MSC certified products cover around 10 percent of the world's complete manufacturing of wild seafood capture. The reason why the comparatively small coverage of certified MSC products is that developing countries are not sufficiently involved. Developing nations have doubts about this certification's benefits and costs. 30 companies have embraced this certification in the case of South Korea, which is a sample of this research. This research examines the benefits and costs of South Korea's adoption of global certification. Using the analytic hierarchy process (AHP), we conducted a benefit and cost (B/C) ratio analysis. The results show that these companies recognize benefit more than cost for the MSC certification in their business only distinction criteria. Traceability and management criteria are followed; however, B/C ratio is under 1. This study contributes in policy implications that what criteria are needed support including financial support, in developing countries.*

Keywords: Marine Stewardship Council (MSC), International certification, Analytic hierarchy process (AHP), B/C analysis, Ex-post evaluation, Developing countries

1. Introduction. Management for sustainability involves the setting of goals and regulations that enhance the sustainability of fishery. Compliance with such regulations by the fishing community is crucial, as it creates a level playing field [1]. 'Market discipline' develops when consumers exercise their right to reject fish caught by questionable fishing practices and/or origins [2-4]. In recent years, certification schemes have been developed as predominantly vibrant sources of setting the standards to govern the fisheries sector. These certification schemes are designated not only to make certified company to voluntarily comply with codes of conduct and self-regulatory modes of governance but also involve the formulation of prescriptive principles for certification, which need behavioural changes and independent verification of obedience [5]. There are more than 30 certifications for seafood products in the market; the Marine Stewardship Council (MSC) is a rapidly growing, and dominant certification [6].

Despite the good purpose and continuous activities of MSC, this certification represents still in the about 10% in the world [7]. Major reasons are that the adoption of certification is led by developed countries, and the spread to developing countries is slow. As the small-volume focused fishery business is carried out in the developing countries, they are under considerable pressure to obtain MSC certification.

It is necessary to pay attention to the South Korea, which is one of the most advanced nations among developing countries. According to [8], Korea's fishery is ranked 13th, and aquaculture is ranked 7th in the world. The number of fisheries industry workers also ranked fourth among the organization for economic co-operation and development (OECD) countries [9]. Korea's seafood consumption is expected to rise 10.1 percent in 2025 from the current level, with exports expected to minus 38.1 percent and imports expected to plus 14.2 percent [8].

In order to overcome limitations of previous studies, the aim of this study is ex-post evaluation of adopting the MSC certification considering both benefit and cost perspectives using analytic hierarchy process (AHP). In addition, firm-level study is conducted for understanding present condition based on Korean adopted companies. In order to analyze benefit and cost (B/C) ratio of adopting MSC certification, we proposed two levels of hierarchy. AHP survey is conducted in 30 Korean seafood distribution firms. Benefit and cost perspectives are evaluated separately. This paper is the pioneering research about B/C analysis for adopting international fisheries certification based on the developing country. Main results are very helpful understanding firm's internal benefit and cost. This study will provide valuable information on how to produce MSC certified fish products for not only market benefits but also for firms' internal cost and benefit. Additionally, the results will suggest information on the areas where prioritized policy support is required for adopting MSC certification to policy makers. This paper is organized into 4 sections. Section 2 provides needs and importance. Section 3 outlines the research design and main results. Lastly, Section 4 explains a summary, implications, and limitations of this study.

2. Needs and Importance. Certifications have been developed to be implemented so as to decrease ecological impacts and improve the resource conservation practices for production of produces to ultimately increase the sustainability of all products in the market [10]. Seafood certification has two main goals. The first one is to identify and register producers that meet defined ecological standards that allow traders and consumers to trust their products and the second main target is to improve sustainability and incentives environmental consideration of the production sector [11]. MSC certification uses science-based criteria to confirm that seafood products come from well-managed, sustainable fisheries. Together, MSC certified fisheries and those in full assessment represent more than 10% of the annual global harvest of wild-capture fisheries. The MSC Fisheries Standard comprises three key principles. The first is sustainable target fish stocks. Fishery should not lead to over-fishing or exhaustion of exploited populations, and for depleted populations, fishery must demonstrably lead to their recovery. Second is the ecological impact of fishing which should consider the recovery of structure, productivity, function and diversity of the ecosystem (including habitat and related dependent and ecologically associated flora and fauna) on which fishery depends. Third is effective management which should assure that fishery is operated under effective management system that abide with local, national and international laws and regulations with consideration of institutional and operational outlines that insist responsible and sustainable utilization resources [12].

Despite diversity of region, the clear global trend is the complicate and uncontrolled relations in world seafood trade among developed and developing countries [13]. Thus, promoting awareness of sustainable fishery in developing nations is a globally major issue, and this has led to concerns over the international certification [7]. Creating and maintaining market share is the main motivation to obtain MSC certification in developing nations. Benefits from certification can be different by social and commercial status in different places. However, it is very difficult to achieve in terms of developing countries' foundation. Fisheries from developing nations with small scale have many constraints in

knowledge, insufficient resources, and weak support from government to meet the international standard requirements [14,15]. It makes doubts about benefits from adopting certification compared with the costs [16]. The two issues are related with developing countries. Firstly, what are the key constraints to obtain MSC certification for these nations. Secondly, it is necessary to think about effective solutions for expanding MSC to developing nations [7]. This research tried to improve these two issues based on ex-post evaluation of Korean fishery distribution firms that were adopting MSC certification.

The AHP was introduced and developed by [17]. The method is a kind of complex to make decision with levels and links, and hierarchical structure [18]. It is one most preferable multiple level and criteria decision-making method [19]. This technique is suitable for applying qualitative parameters to change quantitative data. The results of AHP are presented in ratio priorities via paired comparisons [20]. Fisheries sector also has been using AHP, widely. Leung et al. [21] applied AHP method to understanding entry of longliners in Hawaii pelagic fishery. The main result was that restricted vessel size is the most important alternative to achieve sustaining a viable pelagic fishery. Soma [22] evaluated fisheries management factors in the shrimp fisheries in Trinidad and Tobago with comparative analysis in terms of stakeholders' type. This research's main goal was to sustain a shrimp fishery and management options. Another study focused on social objectives of fisheries management with managers' priorities [23]. The main goal was social outcomes considering industry, indigenous, and regional perspectives. According to literature review, most of fisheries studies with AHP are related with fisheries management without B/C analysis.

3. Main Results. The proposed AHP model consists of two levels of hierarchy. The first level is about key required criteria of MSC certification: distinction, traceability, and management system. The second level presents sub-attributes of each key required criterion on the first level. Figure 1 shows the B/C hierarchies of AHP. Notice that this study assumes the same structure between B/C perspectives.

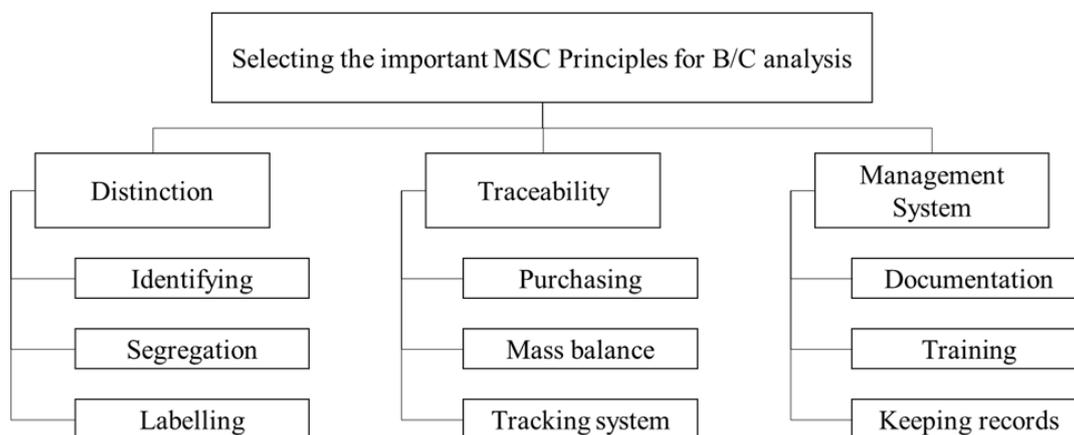


FIGURE 1. Hierarchy of MSC certification requirements for both benefit and cost perspectives

Table 1 is a summary of hierarchy. First, following previous studies, we used two independent surveys with benefit and cost perspectives using same hierarchy structure. This is to quantify the non-monetary and intangible factors in adopting MSC certification. The survey contents are based on below definition.

The total number of seafood distribution firms is about 100 in the South Korea. The survey collected AHP data, among which Korean 30 seafood distribution firms have MSC certification. The face-to-face survey was conducted from november 2016 to march 2017. After collecting survey, we checked the consistency ratio of the survey's results to ensure

TABLE 1. The definition of MSC certification requirements

Key required criteria	Sub-attributes	Description
Distinction	Identifying	Ensure that packing, brands and other resources as certified can solitary be used for certified products
	Segregation	Adequate systems or procedures in place to avoid mixing of certified and non-certified products
	Labelling	Promotion of produces as certified or using the ecolabel, symbol or other brand is based on a valid license agreement and guideline
Traceability	Purchasing	Ensure that all certified goods can only be acquired from certified dealers
	Mass balance	The demonstration system in place to prevent substitution or mixing of certified and non-certified seafood and conversion rates for certified products is precise and can be justified
	Tracking system	Allow tracking of certified products from point of sale back to a certified supplier and records that are sufficient to connect certified products at each step between purchase and sales
Management	Documentation	Documentation of policies and procedures to address all relevant requirements
	Training	Adequate training of responsible personnel to ensure conformity with the standard
	Keeping records	The relevant records for certified products and conformity kept for at least three years

its use in the AHP analysis ($CR \leq 0.1$). Finally, 15 persons in charge of sustainable or international certification related tasks respondents' contents were used for AHP analysis.

Figure 2 shows the process of B/C analysis using AHP in this research. First of all, the authors set up main goal of hierarchy. Second step is identifying key criteria, and sub-criteria. The third step makes hierarchy structure to conduct B/C analysis. The next step is receiving a review by MSC manager, and conducting pilot test with feedback. After checking consistency ratio, we collected the consistent respondent set.

Conducting the AHP analysis separately in terms of B/C perspectives is necessary to calculate the B/C ratio. In the benefit perspective, distinction is a relatively important criterion within the key required criteria. Traceability is the second priority, and the last is management. We can check in each key required criterion in the second hierarchy. Identifying, purchasing and documentation are the most important sub-attributes within each key requirement criterion. In the cost perspective, traceability has the highest ratio within the key requirement criteria. Among sub-attributes, the results are same as the benefit perspective. Based on the results of priority weight, we can calculate priorities among sub-attributes. We calculate each final score by multiplication of the significant weight of key requirement criteria by the precedence weight of each sub-attribute. Table 2 and Table 3 show the aggregated weight score of each sub-attribute and priority.

The B/C analysis is possible based on the results of priority weight between two perspectives. Every key requirement criterion and the priority weight of sub-attributes are used to evaluate the B/C ratio by dividing the benefit ratio by the cost ratio. According

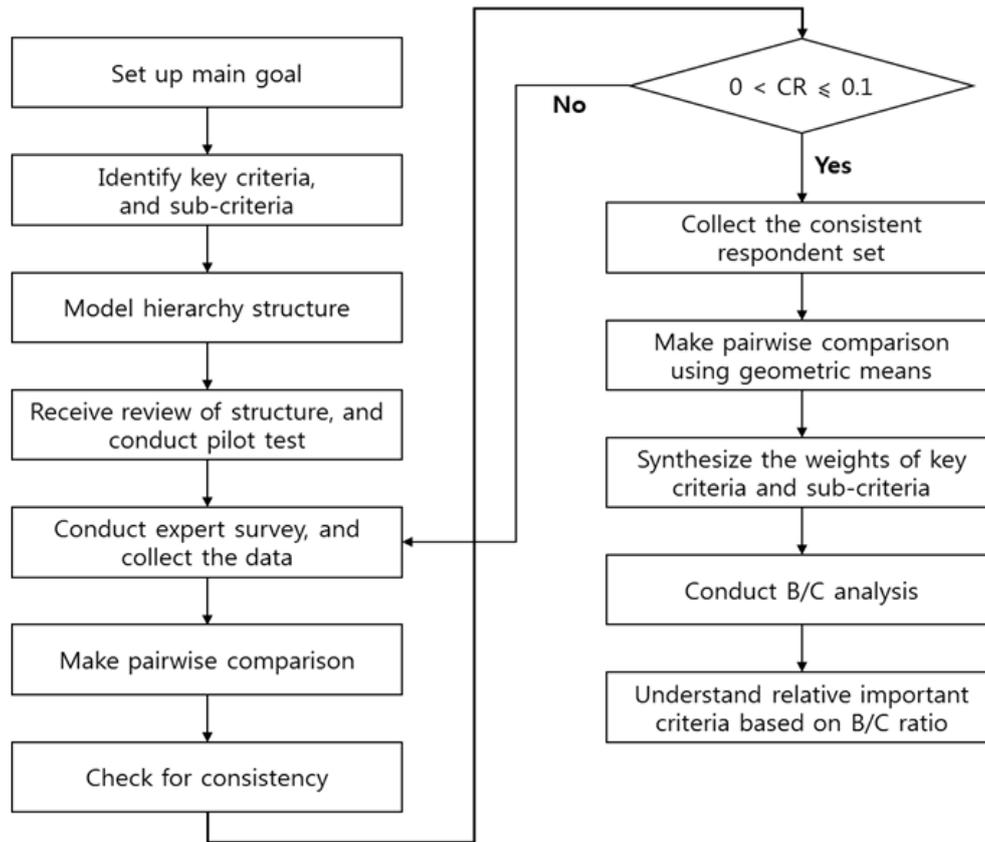


FIGURE 2. The procedure of AHP for B/C analysis

TABLE 2. Results of priority weight within each variable in the benefit perspective

Key requirement criteria	Priority weight (a)	Sub-attributes	Priority weight (b)	Final scores (a × b)	Rank
Distinction	0.461	Identifying	0.497	0.229	1
		Segregation	0.231	0.106	5
		Labelling	0.272	0.125	4
Traceability	0.364	Purchasing	0.470	0.171	2
		Mass balance	0.177	0.064	7
		Tracking system	0.352	0.128	3
Management	0.174	Documentation	0.411	0.072	6
		Training	0.297	0.052	8
		Keeping records	0.292	0.051	9

to B/C analysis results, distinction is the best suitable criteria. Furthermore, identifying has the highest ratio among sub-attributes. Segregation, labelling and purchasing have ratios above 1.000 indicating that the three sub-attributes have high priority of acquiring the MSC certification within related firms. If key requirement criteria, and sub-attributes' B/C ratio is above 1.000, these are good areas for firms to invest in for adopting MSC certification.

4. Conclusion. The aim of this paper is ex-post evaluation of benefit and cost of obtaining international sustainable fisheries certification in the developing country. In order to conduct this research, AHP method is used based on Korean seafood distribution firms that have been adopting MSC certification, recently. The results suggest that 'distinction'

TABLE 3. Results of priority weight within each variable in the cost perspective

Key requirement criteria	Priority weight (a)	Sub-attributes	Priority weight (b)	Final scores ($a \times b$)	Rank
Distinction	0.281	Identifying	0.453	0.127	4
		Segregation	0.235	0.066	9
		Labelling	0.312	0.088	8
Traceability	0.389	Purchasing	0.389	0.151	1
		Mass balance	0.251	0.098	5
		Tracking system	0.368	0.143	3
Management	0.329	Documentation	0.451	0.148	2
		Training	0.275	0.090	6
		Keeping records	0.273	0.090	7

TABLE 4. Results of B/C analysis

Key requirement criteria	B/C ratio	Sub-attributes	Final scores' B/C ratio	Rank
Distinction	1.641	Identifying	1.800	1
		Segregation	1.613	2
		Labelling	1.430	3
Traceability	0.936	Purchasing	1.131	4
		Mass balance	0.660	6
		Tracking system	0.895	5
Management	0.529	Documentation	0.482	9
		Training	0.571	7
		Keeping records	0.566	8

acquired the highest score. In addition, its sub-attributes, including identifying, segregation, and labelling have ratios above 1.000. The results distinguish between the areas where voluntary efforts by the company are possible and the areas where policy support should be supported. It means that the 'distinction' criteria can be prepared by firms' itself.

The MSC certification has characteristic of market-driven certification with eco-labelling. In other words, MSC's main benefit comes from the consumer. Developing nations' main purpose of adoption MSC certification is also to maintain or expand their market share [24]. The positive response of eco-labelling in market was revealed based on fast moving consumer goods (FMCG) that have more expensive price than traditional ones [25]. That is the main reason why B/C ratio of 'distinction' is the best. Traceability and management have different results compared with identification. These criteria can be explained developing nations' benefit doubtful area. These two criteria are system-related factors. Firms need to improve their internal capability for meeting MSC's international standards. This area may require long-term investment.

This research is a pioneering ex-post evaluation research of benefit cost analysis based on developing country's MSC certified firms using AHP. The main findings provide obvious benefit area, and relatively high cost area to obtain certification. The findings can suggest valuable information to developing nations' policy makers to allocate their resource for adequate supports. Previous studies explained that it is very hard to obtain MSC certification in developing nations, because of cost. Most of these researches are based on regional-level case study. This was a main limitation of previous researches. This paper has strongpoint at this point. We provide priorities, and B/C ratio based

on AHP with firm-level. Firm-level research is important in terms of the MSC certification that is a market-friendly certification. This research has three main limitations. Firstly, although it is necessary to treat the whole value chain of seafood in terms of MSC certification, this research conducts AHP analysis using only seafood distribution firms. In further study, comparative analysis among industries will be necessary. It can explain different characteristics based on industries to obtain international certification. Secondly, the number of survey sample is relatively small, and the hierarchy structure may look simple to understand actual benefit, and cost of obtaining MSC certification. Nevertheless, it is a partial achievement to conduct a face-to-face survey of the corporate representative who has recently adopted MSC after receiving review of hierarchy and pilot test. Lastly, this study is performed based on developing countries. Comparative research must be also conducted with developed countries. Future research should overcome these limitations by expanding sample firms within seafood value chain, and sample nations. It will provide more comprehensive and valuable implications.

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