



Certifications as Catalysts for Enhancing Quality Management Maturity and Sustainability: Evidence from Fish Processing Enterprises in Indonesia

Heru Suseno¹, Suadi Suadi^{2*}, Jamhari Jamhari³, Rustadi Rustadi²

¹Faculty of Agriculture, University of Gadjah Mada, Jl. Flora Bulaksumur, Sleman, Yogyakarta 55281, Indonesia, ²Department of Fisheries, Faculty of Agriculture, University of Gadjah Mada, Jl. Flora Bulaksumur, Sleman, Yogyakarta 55281, Indonesia,

³Department of Agricultural Socio-economics, Faculty of Agriculture, University of Gadjah Mada, Jl. Flora Bulaksumur, Sleman, Yogyakarta 55281, Indonesia. *Email: suadi@ugm.ac.id

Received: 26 February 2025

Accepted: 28 June 2025

DOI: <https://doi.org/10.32479/irmm.19214>

ABSTRACT

The study aims to explore the correlation among certification, quality management maturity level (QMML), and Index of sustainability performance (ISP) of fish processing firms (FPFs). The QMMLs and the ISPs are compared among four different sizes of FPFs. Data were obtained from 102 certified FPFs in Indonesia. Descriptive statistical methods were used to examine the data to determine the QMML and the ISP and compare them across various firm sizes. The Spearman Rho test indicates a positive correlation between the certification, the QMML, and the ISP. The mean comparison using the Kruskal-Wallis test reveals no difference in the QMML and ISP of FPFs at a significant level of 5% among different-sized organizations. This finding challenges the notion that organizational management and human resource issues make micro and small enterprises (MSEs) fragile and not capable of competing with large-scale firms. MSEs have also been successful in raising the organizational quality management maturity since certification has pushed quality management implementation for enterprises of all sizes. Therefore, it expands understanding about the impact of certification on enhancing the micro-small business. The results can dispel doubts that MSEs cannot compete with large companies. This study can encourage MSEs to achieve sustainable performance.

Keywords: Fish Processing, Certification, Quality Management, Maturity Level, SME, Standard

JEL Classifications: M11, Q130, Q180, Q560

1. INTRODUCTION

Fish products play an important role for Indonesia, both as a source of healthy food and national income. According to data released by the Ministry of Marine and Fisheries, there are 63,364 fish processing firms (FPF) in Indonesia, of which 62,389 are micro and small enterprises (MSE), or 98.5% (KKP, 2019). SMEs contribute to sustainable development in terms of creating jobs, stimulating entrepreneurship, and encouraging innovation (Ozturk et al., 2024). To achieve sustained success, organizations are suggested to implement quality management (Anttila and Jussila, 2021; ISO,

2018). However, in implementing quality management, MSEs face several obstacles. Johnson and Schaltegger (2016) stated at least there are three obstacles, i.e. the first, internal limitations of MSEs include the absence of knowledge of sustainability matters, the lack of perceived benefits, the lack of knowledge and skill, and the lack of financial and human resources. The second reason deals with external issues, including inadequate incentives and external drive, the inappropriateness of management tools in MSE structures, and the complexity of international standards and instruments designed for locally especially MSEs. The third is the heterogeneity in the MSEs sector causes the management tool not to be widely

applied. The Indonesian MSEs have limited business networks, poor management skills, difficulty accessing market prospects, and inadequate organizational and human resources (KKUKM, 2022), technology and capital (KKP, 2020), inefficient production cost, and raw material (Iriyanti and Azis, 2012). MSEs often lack the required departments, functions, and skills, causing an impediment to some QM practices (Arab, 2020). Therefore larger companies have a higher level of maturity in quality management systems (Bravi and Murmura, 2021).

Food products, especially fish products are perishable (Samanta and Choudhary, 2019) and prone to decay or deterioration (Ahern et al., 2021). The fish products potentially are contaminated with hazardous materials that cause human health risks. The adoption of food safety standards is a way to eliminate the risk of food safety hazards (Teixeira and Sampaio, 2013). Therefore FPFs still have faced difficulties fulfilling processing feasibility standards (KKP, 2022b). The Ministry of Marine and Fisheries of Indonesia (KKP) reported the number of FPFs that already have accomplished the certificate of eligibility requirements of fish processors is 2.34% (KKP, 2022a).

The certification of fish products is not only able to confirm products safety but also enhance the performance of organizational (Liu et al., 2021). Scholars have observed the benefits of the certification. The certification affects operational, organizational, business, and innovation performances (Astrini, 2021), quality awareness, productivity, employee engagement, and market expansion (Cândido and Ferreira, 2023; Kakouris and Sfakianaki, 2018) so that certification could impact on effectiveness and efficiency of organization (Kakouris and Sfakianaki, 2018; Kotsanopoulos and Arvanitoyannis, 2017).

ISO 9004 is a standard of management system that guides achieving sustainable success. This standard can be used to assess organizational maturity levels (ISO, 2018). The capability of the organization to apply the quality management system can be determined as the level of quality management maturity (QMML). However, studies on the QMML of organizations and their performance have not been commonly conducted in the fish processing business, including in Indonesia. The main goal of this study is to explore the impact of certification of the fish processing industry in terms of firm sustainability performance, including social, environmental, and financial indicators. Considering this, we will answer the following questions:

- Are there relationships between certification, maturity of quality management, and sustainability performance?
- Are there differences in the maturity level of quality management among organizational sizes?
- Are there differences in sustainability performance among organizational sizes?

This study explores a deep understanding of the relationship between certification, the QMML, and the ISP. The study also compared the QMML and the ISP at different organizational sizes, i.e., micro, small, medium, and large firms. The relationship between certification, QMML, and ISP was identified to provide confidence in the significant role of certification in improving

performance. A better understanding of the QMML can be used as a model to evaluate and formulate an organization's strategic plan of FPFs in improving the performance continuously.

2. LITERATURE REVIEW

2.1. Standardization of Quality Management System

The definition of standards based on the International Organization for Standardization (ISO) is as follows:

"...document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context..." (ISO, 2004)

Standardization, which initially was a simple matter such as products, processes, systems and persons, has been pivotal in establishing complicated societal systems such as sharing economy, sustainable supply chains, smart cities, and circular economy (De Vries et al., 2018). Among the most popular and widely adopted standards by organizations are quality management system standards, for which ISO publishes ISO 9001, ISO 9004, ISO 14001, ISO 22000, and ISO 45000 (ISO, 2024). Some standards of food safety such as Hazard Analysis and Critical Control Point (HACCP), ISO 22000, and private standards are adopted to control pathogens in fish products along processes in the food chain of fish products, including infrastructure, staff, and equipment. Adopting standards for fish products is a method to overcome food safety risks. Food safety oversight of products, design, production, and quality control is intended to eliminate potential food hazards (Uçar et al., 2016). Some countries have adopted food safety management standards to regulate the food industry such as catering businesses in Hungary (Bánáti and Lakner, 2012), foods including fish products in the EU (Alasalvar et al., 2010), processing and trading of foods, and catering services in Vietnam (Nguyen, 2022), and food products in China (Liu et al., 2019; Zhang et al., 2015). In Indonesia, processors of canned tuna and sardine products must be certified based on product standards and food safety requirements (Suseno and Suadi, 2021).

Certification provides evidence that a product, system, or process has complied the requirements or standards (CAC, 2004). Certification is a power to drive improvement of food safety due to aware there is a lack of food risks awareness, the pursuit of short-term profit, and poor processing technology of foods (Guo et al., 2019). The certification is not only essential for enhancing the food safety assurance of fish products but also increasing the acceptance of products in the global market and boosting the industry's productivity and competitiveness. A study identified the main benefits of food safety management systems (FSMS) certification, namely (1) improving of food safety and providing of safer products, (2) minimizing of sickness and other risks occurring from food, and (3) improving of consumers' confidence (Paunescu et al., 2018). Also, Macheka et al. (2013) revealed that FSMS implementation improved employee expertise, company image, product sales, and market share, and expanded to new markets.

Adoption of standards encourages the organization to continually acknowledge challenges for effectiveness and efficiency in its external and internal conditions and changes in the requirements and expectations of its customers. Also, organizational learning and innovation encourage the quality management of organization improvement by strengthening the ability to manage to the situation to enable it to meet the business goals for sustained success (ISO, 2018).

2.2. Maturity Level of Quality Management

The maturity level is assessed, and the functioning of the organization's systems is comprehensively analyzed (Wolniak, 2019). The criteria for determining maturity levels are based on the international standard of ISO 9004:2018, Quality management - Quality of an organization - Guidance to achieve sustained success (ISO, 2018). The results of the maturity assessment can be used as an indicator of the effectiveness of standard implementation (Psomas and Kafetzopoulos, 2015), identification of opportunities for improvement (continual improvement) (Frankish et al., 2022; Sfreddo et al., 2021), measurement and control of quality management implementation (Crosby, 1979), self-assessment (ISO, 2018), and awarding appreciation (EFQM, 2021; Tan, 2002). The maturity assessment results indicate managerial effectiveness in achieving sustainable performance goals, i.e., economically, socially, and environmentally (Santos et al., 2022). Assessment of the maturity level of quality management based on ISO 9004 has been carried out by several scholars (Glogovac et al., 2022; Kafel and Sikora, 2014; Negron, 2020; Poltronieri et al., 2019; Santos et al., 2022; Xiaofen, 2013).

The studies on the maturity level have been carried out in various types of industries in several countries, including the food industry in Brazil (Santos et al., 2022), manufacturing and service industries in Serbia (Glogovac et al., 2022), and various industries in Portugal, Brazil, Peru and China (Fonseca, 2015; Negron, 2020; Poltronieri et al., 2019; Xiaofen, 2013).

2.3. Sustainable Performance

The standard guides how to process fish products following food safety practices and guides organizations that implement these standards to achieve sustainable success (ISO, 2018). Sustainable performance is defined as a business that can create benefits for all stakeholders while protecting the environment and improving the livelihoods of the people who interact with it. Sustainability performance refers to Elkington's theory, which includes three pillars (3P), namely people (social), planet (environment), and profit (financial) (Elkington, 1998). These three dimensions of sustainability are intertwined, and any change in one of them will have an impact on the other (Meza-Ruiz et al., 2017).

Social performance refers to corporate social responsibility, fairness, diversity, opportunity, health and safety, and other aspects that promote social well-being (Yu et al., 2020), employee satisfaction (Kafetzopoulos and Gotzamani, 2014; Mengistu and Panizzolo, 2023; Sadikoglu and Zehir, 2010), and satisfaction of customer and communities (Mengistu and Panizzolo, 2023). Arpanutud et al. (2009) examined the benefits of social legitimacy

and public perception of food safety. Companies that pay attention to social aspects are more acceptable to the community.

Environmental performance refers to the efficient and sustainable use of energy and natural resources and reducing negative externalities such as pollution caused by inefficient use of resources (Yu et al., 2020). In terms of environment and resource use, Agan et al. (2013) highlighted the efficiency of energy and raw material use, waste reduction and encouraging recycling processes, materials, leadership policies and employee responsibilities to the environment, and building an environmental management system. Mengistu and Panizzolo (2023) applied environmental indicators that include the use of raw materials, production processes, and energy.

The financial dimension refers to the company's sustainable financial performance, including profitability (Khalfallah et al., 2021; Mengistu and Panizzolo, 2023; Migdadi, 2022; Yu et al., 2020), sales growth and cash flow (Kafetzopoulos and Gotzamani, 2014), cost and competitiveness (Mengistu and Panizzolo, 2023), dan ROI (return on investment), ROA (return on assets), market, and the growth of the number of workers.

3. METHODOLOGIES

The survey was structured in four parts: (a) characteristics of the organization, (b) certification correlation, (c) maturity of the management system, and (d) sustainability performance. The model construct was addressed in two variables, i.e., quality management system elements and sustainability performance. There were six items for the quality management variable, which are adapted from the quality management elements of ISO 9004, i.e., (1). Identity of organization, (2). Leadership, (3). Process management, (4). Resource management, (5). Analysis and evaluation, and (6). Improvement, learning and innovation (ISO, 2018). There were three items of the sustainability performance variable, i.e., (1). Social performance, (2). Environmental performance, and (3) Financial performance, adopted from Elkington's Theory (Elkington, 1998). Each item consisted of 5-10 questions. Questionnaire responses used the Likert scale of 5 level, with a level of 1 being strongly disagree and a level of 5 being strongly agree.

The respondents were the owners, directors, or managers of FPFs in Indonesia. The FPFs were fish processing firms that obtained certificates from certification bodies accredited by the National Accreditation Body of Indonesia (KAN). The certification was based on the Indonesian National Standard (SNI), including HACCP, SNI ISO 9001, SNI ISO 22000, and SNI of fish products.

The data was collected through a structured survey using a questionnaire generated from Google™ Forms. The questionnaires were sent via e-mail and WhatsApp™ application. Reminders were also sent, urging respondents to participate in the survey. The survey was conducted between January and May of 2023. The total number of responses received was 111. There were 102 valid responses; the difference was due to some organizations not being certified, and there were double responses from respondents.

We classified the organization sizes based on the Government Regulation of Indonesia, Number 7, 2021 (PP 7/2021), i.e., micro, small, medium, and large (PP, 2021), as seen in Table 1.

The data was analyzed using the non-parametric test method, i.e., Spearman's rank correlation coefficient and the Kruskal-Wallis. The descriptive data was analyzed to graph the profile of respondents, i.e., organization size, employee number, and standards adopted. We used Spearman's rank correlation coefficient (Spearman's ρ) to measure the level of the relationship among certification, quality management maturity, and sustainability performance. Spearman's ρ was used to describe the significance of the relationship, strength, and direction of the relationship between variables. The coefficient varies between -1 (negative) and $+1$ (positive). In detail, we use the classification of Ali and Al-Hameed (2022) to describe the correlation coefficients as below (Table 2).

We used the Kruskal-Wallis test to compare quality management maturity levels (QMML) and sustainable performance (ISP) at different organizational sizes. The organizational size was classified based on assets value excluding land and building (Table 1). Table 3 shows the description of QMML adapted from Santos et al. (2022). The equation of quality management maturity level (QMML) is as follows:

$$QMML = \frac{1}{n} \sum_{i=1}^n x_i \quad (1)$$

Where: x_i = value of each quality management indicator, n = number of quality management indicators.

Table 1: Classification of organizational size based on PP 7/2021

Organization size	Description (based on assets value, excluding land and building in IDR*)
Micro-enterprise	<1 billion IDR
Small enterprise	1 billion - 5 billion IDR
Medium enterprise	5 billion - 10 billion IDR
Large enterprise	More than 10 billion IDR

* = in Indonesian Rupiah; 16,000 IDR equal 1 USD

Table 2: The classification of correlation coefficient

Description	Value of correlation coefficient
Completely positive correlation	+1.00
Strong positive association	0.70-0.99
Average positive correlation	0.50-0.69
Weak positive correlation	0.01-0.49
No relationship	0.00

Source: Ali and Al-Hameed (2022)

Table 3: The description of quality management maturity level

Quality management maturity level	Score range
Absence of maturity	0.0 <QMML ≤1.0
Introductory level	1.0 <QMML ≤2.0
Intermediate level	2.0 <QMML ≤3.5
Towards excellence	3.5 <QMML ≤4.5
Excellence	4.5 <QMML ≤5.0

Source: Adapted from Santos et al. (2022)

Table 4 shows the description of the index of sustainability performance (ISP) (Medel-González et al., 2013). The equation of ISP is as follows:

$$ISP = \frac{1}{n} \sum_{i=1}^n x_i \quad (2)$$

Where: x_i = value of each performance indicator, n = number of performance indicators.

4. RESULTS AND DISCUSSION

4.1. Profile of Respondents

We identified 130 fish processing firms (FPFs) that are SNI (national standard) certified. Of the identified FPFs, 102 FPFs, or 78%, had filled out valid questionnaire data. Table 5 describes the profile of the respondents. Women dominated the respondents of this study, which was 68.8%. Their education level mostly completed university, 83.3%. Most respondents were micro-enterprises, followed by large, small, and medium enterprises. The standards adopted were SNI of products, HACCP, ISO 9001, ISO 22000, and ISO 14001. Figure 1 compares sample size and

Table 4: The description of the index of sustainability performance

Index of sustainability performance (ISP)	Score range
Poor	0.00 ≤ISP 3.25
Deficient	3.25 ISP 3.75
Regular	3.75 ISP 4.25
Well	4.25 ISP 4.75
Very well	4.75 ISP 5.00

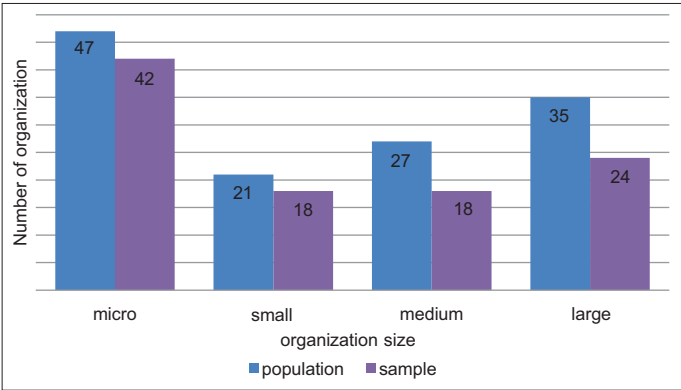
Source: Adapted from Medel-Gonzalez et al. (2013)

Table 5: The respondent profile of fish processing firms in this study

Characteristics	Description	Number of respondents (n)	Percentage
Gender	Female	62	60.8
	Male	40	39.2
Position	Manager	51	50.0
	Owner	43	42.2
	Director	8	7.8
Education level	Highschool and lower	17	16.7
	University	85	83.3
Firm size	Micro-enterprise	42	41.3
	Small enterprise	18	17.6
	Medium enterprise	18	17.6
	Large enterprise	24	23.5
Number of employees	1-10	37	36.3
	11-50	21	20.6
	51-250	19	18.6
	>250	25	24.5
Standards (each FPF may apply more than one standard)	HACCP	63	61.8
	SNI/ISO 9001	11	10.8
	SNI/ISO 14001	1	1.0
	SNI/ISO 22000	10	9.9
	SNI of products	83	81.4
	others	19	18.6

Source: Survey data

Figure 1: Comparison of sample size and population of fish processing firms based on organization size



population based on organization size, i.e., micro, small, medium, and large companies. The number of samples had been able to represent the FPF populations. The level of education is very essential to support good FPF management, considering the food safety risks of fishery products (Clayton et al., 2016). For this reason, FPF managers must have adequate education and skills in adopting food safety standards. Education is an essential factor in ensuring quality management (Shokri et al., 2016). Their education supports the company’s performance.

Interestingly, this data shows that the role of women entrepreneurship is very important in managing FPFs. Female respondents are more than male respondents. FPFs in Indonesia, especially MSEs, are businesses carried out by housewives to support family income, as one of their responsibilities in the family. It is also found in other developing countries such as Ghana (Asare et al., 2015).

4.2. Relationship among Certification, Quality Management Maturity Level, and Sustainability Performance

The Spearman Rho correlation coefficient (ρ) was used to measure the level of the relationship among certification, quality management variables, and sustainability performance. A statistical significance test at 0.01 level shows the correlation coefficient was positive and average association ($\rho = 0.559-0.689$), as presented in Table 6. There is a significant correlation between certification and other variables, respectively, as follows: Maturity of quality management ($\rho = 0.559^{**}$; average correlation) and Sustainability performance ($\rho = 0.689^{**}$, average correlation). The relationship between maturity of quality management and other variables, successively as follows: Certification ($\rho = 0.559^{**}$, average correlation) and sustainability performance ($\rho = 0.611^{**}$, average correlation). There are positive relationships among certification, quality management maturity, and sustainability performance.

Our finding is in line with findings of Sfreddo et al. (2018), Ullah et al. (2014), and Lakhali (2014). Sfreddo et al. (2018) revealed that the most of the studies found a positive relation between ISO 9001 adoption and organizational performance dimensions. Also the study of Ullah et al. (2014) in Latin American and Caribbean countries and Lakhali (2014) in Kenya showed that ISO

Table 6: Non-parametric test of correlation among quality management maturity level, operational performance, and sustainability performance

Variables	Spearman's rho (ρ)		
	Certification	Maturity of quality management	Sustainability performance
Certification			
Correlation coefficient	1.000	0.559**	0.689**
Sig. (2-tailed)	.	0.000	0.000
Maturity of quality management			
Correlation coefficient	0.559**	1.000	0.611**
Sig. (2-tailed)	0.000	.	0.000
Sustainability performance			
Correlation coefficient	0.689**	0.611**	1.000
Sig. (2-tailed)	0.000	0.000	.

** Correlation is significant at the 0.01 level (2-tailed)

certification is positively related to firm performance. Although, our study did not compare certified FPFs with non-certified ones, however, as investigated by Sfreddo et al. (2018) Ullah et al. (2014) and Lakhali (2014), we suspicious that there is a possibility that certification affects the performance of FPFs.

Certification implementation has a positive impact on the operational performance of organizations by improving operational efficiency, employee capacity, and resource utilization effectiveness (Antunes et al., 2018; Feng et al., 2007; Lakhali, 2014). Certified companies demonstrate better management practices and higher employee satisfaction, thus fostering a culture of continuous development. However, the impact of certification on financial success and market performance, particularly on sales growth and market share expansion, is still doubtful (Antunes et al., 2018; Antunes et al., 2020). However, certified companies enhance their reputation and credibility, which in turn can improve financial and commercial success. The effectiveness of implementing a quality management system largely depends on organizational commitment, strategic planning, and a culture of continuous improvement (Feng et al., 2007).

Certification is a tool for improving food safety, quality, and performance organization. Through certification, the organization is encouraged to improve its performance continuously. The organization periodically conducts evaluations based on internal and external input through audit findings and recommendations, complaints or attending to customer voices, and management reviews. Essential factors for improving quality management and performance are auditing key performance indicators (KPIs) and controlling improvement initiatives (Chiarini et al., 2020). The evaluation of key performance becomes a basis for innovation and continuous improvement. According to Tari et al. (2020), the implementation of management systems in certified organizations in daily practice has led to continuous improvement. Continuous improvement is an important factor that contributes to the sustainable success of an organization (ISO, 2018).

Table 7: The mean comparison test of quality management variables

Maturity/performance	Mean	Micro enterprise (n=42)	Small enterprise (n=18)	Medium enterprise (n=18)	Large enterprise (n=24)	Asymp. Sig *)
Quality management maturity level (QMML)						
Identity of organization	4.80	4.76	4.79	4.90	4.80	0.327
Leadership	4.71	4.71	4.63	4.82	4.68	0.408
Process management	4.74	4.69	4.64	4.91	4.77	0.222
Resource management	4.57	4.46	4.52	4.78	4.63	0.174
Analysis and evaluation	4.54	4.45	4.34	4.78	4.68	0.069
Improvement, learning and innovation	4.53	4.50	4.47	4.70	4.48	0.719
Overall	4.65 (excellent)					

*) Asymp. Sig; *Significant at 0.05, and **Significant at 0.01 levels

Table 8: The mean comparison test of sustainability performance variables

Maturity/performance	Mean	Micro enterprise (n=42)	Small enterprise (n=18)	Medium enterprise (n=18)	Large enterprise (n=24)	Asymp. Sig *)
Index of Sustainability Performance (ISP)						
Social performance	4.33	4.39	4.29	4.39	4.23	0.813
Environmental performance	4.29	4.34	4.30	4.29	4.21	0.911
Financial performance	4.35	4.48	4.28	4.41	4.15	0.589
Overall	4.33 (well)					

*) Asymp. Sig; *Significant at 0.05, and **Significant at 0.01 levels

4.3. The Quality Management Maturity Level and Sustainability Performance in Different Organizational Sizes

The maturity level of quality management and sustainability performance index of certified FPFs including micro-small organizations in different organizational sizes performed well (Table 7). The overall QMML shows an excellent level (QMML = 4.65). Based on the quality management elements, all QMML indicators also show excellent value, with a range of 4.53-4.80. This maturity level indicates that FPFs have implemented a system which meets the requirements of quality management, which provides confidence that continuous improvement is a key goal for the organization (Santos et al., 2022). Meanwhile, the overall performance of FPFs shows a good performance in sustainability performance (ISP = 4.33), with a range of 4.29-4.35. This ISP means the FPFs have reached a business sustainability performance based on the expectations defined with some opportunities for improvement (Medel-González et al., 2013).

The mean comparison test using the Kruskal-Wallis method is shown in Tables 7 and 8. The results show statistically no significant differences in all elements of the QMML in different sizes of organizations (Table 7). Likewise of all ISP indicators, there are no significant differences among different sizes of organizations (Table 8).

The result is in line with Arab's (2020) and Jalil's (2019) studies that there were no differences in the performance of the certified organizations due to different organizational sizes. This finding supports the notion that certification may yield consistent outcomes for organizations of all sizes. It is implying that the size of recognized entities may not have an impact on their performance (Al-Rawahi and Bashir, 2011). Therefore, rather than being influenced by the size of the firm or the industry, the decision to pursue certification should be motivated by its inherent advantages.

This finding also assuages worries about size-related constraints and demonstrates the universal utility of certification, which has significant practical consequences, particularly for organizations contemplating quality certification.

The certification has encouraged the implementation of quality management for both large companies and micro-small companies (Lepistö et al., 2022). These performances indicate that the certified micro and small FPFs have succeeded in improving their performances. Our result is contrary to Bravi and Murmura's (2021) study on ISO 9000-certified companies in Italy, which is the larger companies have a higher maturity level in quality management systems. It is interesting to study more deeply in different sectors in a variety of countries, both developing and developed countries. The certified FPFs can achieve excellent quality management maturity and obtain good sustainable performance. It therefore becomes relevant to the recommendations of Johnson and Schaltegger (2016) that the obstacles faced by MSEs can be overcome by implementing sustainability management tools.

5. CONCLUSION AND RECOMMENDATIONS

The analysis emphasizes the relationship between certification, QMML, and ISP of FPFs and whether there are differences in QMML and ISP on certified FPFs of different organizational sizes. The quality certification of fishery products shows a positive relationship and has an average correlation with QMML and ISP. The comparison of the QMML and ISP among micro-enterprises and larger businesses shows no significant difference. This indicates that all certified FPFs, including small ones, can achieve QMML and ISP at a good level. By certification, the small-sized certified FPFs could improve quality management practices for

better performance. Although micro-small businesses often face a lack of resources, the certification has provided an impetus for them to be able to compete with larger companies.

As a novelty, the study highlights that certification positively correlates with the performance factors of companies, not only large companies but also micro-small enterprises. The results of this study are expected to dispel doubts that micro-small companies are not able to compete with large companies through the application of standards and certifications.

In terms of implications, the study's findings can assist the Government in policy formulation and standard implementation to improve the competitiveness of MSEs. Also, certification can encourage MSEs to achieve continuous business improvement.

The limitation of this study is that it did not involve non-certified respondents, so it is recommended the future study investigate QMML and ISP in uncertified FPFs. Also, in addition, it is recommended that the study investigate the impact of the certification more broadly including different industry sectors and countries.

6. ACKNOWLEDGMENTS

Thanks to the Rector of Gadjah Mada University, who has funded the research through the UGM Final Project Recognition Program based on Letter Number 5075/UN1.P.II/Dit-Lit/PT.01.01/2023, May 12, 2023.

REFERENCES

- Agan, Y., Acar, M.F., Borodin, A. (2013), Drivers of environmental processes and their impact on performance: A study of Turkish SMEs. *Journal of Cleaner Production*, 51, 23-33.
- Ahern, M., Thilsted, S.H., Oenema, S. (2021), The Role of Aquatic Foods in Sustainable Healthy Diets UN Nutrition. UN Nutrition Discussion Paper, p3-37.
- Alasalvar, C., Shahidi, F., Miyashita, K., Wanasundara, U. (2010), In: Alasalvar, C., Shahidi, F., Miyashita, K., Wanasundara, U., editors. *Handbook of Seafood Quality, Safety and Health Applications*. United States: Wiley.
- Ali, K., Al-Hameed, A. (2022), Spearman's correlation coefficient in statistical analysis. *International Journal of Analysis and Applications*, 13, 2008-6822.
- Al-Rawahi, A.M.S., Bashir, H.A. (2011), On the implementation of ISO 9001:2000: A comparative investigation. *The TQM Journal*, 23(6), 673-687.
- Anttila, J., Jussila, K. (2021), ISO 9004 - A stimulating quality management standard for the creative leaders of contemporary sustainable organizations. *Production Engineering Archives*, 27(2), 148-155.
- Antunes, M.G., Mucharreira, P.R., Justino, M.R.T., Quirós, J.T. (2020), Total quality management and quality certification on services corporations. *International Journal for Quality Research*, 14(3), 847-864.
- Antunes, M.G., Quirós, J.T., Justino, M.R. (2018), Total quality management and quality certification: effects in organisational performance. *International Journal of Services and Operations Management*, 29(4), 439.
- Arab, S.D.B. (2020), Quality management practices in SMEs: The effects of contextual factors. *Quality Management Journal*, 27(4), 200-214.
- Arpanutud, P., Keeratipibul, S., Charoensupaya, A., Taylor, E. (2009), Factors influencing food safety management system adoption in Thai food-manufacturing firms: Model development and testing. *British Food Journal*, 111(4), 364-375.
- Asare, R., Akuffo-Bea, M., Quay, W., Atta-Antwi, K. (2015), Characteristics of micro, small and medium enterprises in Ghana: Gender and implications for economic growth. *African Journal of Science, Technology, Innovation and Development*, 7(1), 26-35.
- Astrini, N. (2021), ISO 9001 and performance: A method review. *Total Quality Management and Business Excellence*, 32(1-2), 5-32.
- Bánáti, D., Lakner, Z. (2012), Managerial attitudes, acceptance and efficiency of HACCP systems in Hungarian catering. *Food Control*, 25(2), 484-492.
- Bravi, L., Murmura, F. (2021), Evidences about ISO 9001:2015 and ISO 9004:2018 implementation in different-size organisations. *Total Quality Management and Business Excellence*, 2021, 1-21.
- CAC. (2004), Model Certificate for Fish and Fishery Products. WHO/FAO, Codex Alimentarius Commission CAC/GL 48-2004, p1-6. Available from: <https://www.fao.org/fao-who-codexalimentarius/codex-texts/guidelines/en>
- Cândido, C.J.F., Ferreira, L.M.F.R. (2023), ISO 9001 internal decertification motivations: Exploring barriers and benefits of certification as withdrawal antecedents. *Production Planning and Control*, 34(4), 330-344.
- Chiarini, A., Castellani, P., Rossato, C., Cobelli, N. (2020), Quality management internal auditing in small and medium-sized companies : an exploratory study on factors for significantly improving quality performance. *Total Quality Management*, 32, 1-21.
- Clayton, M., Smith, K., Rutkow, L., Neff, R. (2016), The role of food workers in food safety: A policy analysis of the U.S. 2011 Food Safety Modernization Act. *Journal of Agriculture, Food Systems, and Community Development*, 6(2), 55-72.
- Crosby, P.B. (1979), Quality Is Free If You Understand It. In: Winter Park Public Library History and Archive Collection. p. 4. Available from: <http://archive.wpp.org/wphistory/philipcrosby/qualityisfreeifyouunderstandit.pdf>
- De Vries, H., Jakobs, K., Egyedi, T., Eto, M., Fertig, S., Kanevskaya, O., Klintner, L., Koch, C., Mijatovic, I., Mirtsch, M., Morone, P., Orviska, M., Riillo, C., Scaramuzzino, G. (2018), Standardization: Towards an agenda for research. *International Journal of Standardization Research*, 16(1), 52-59.
- EFQM. (2021), The EFQM Model - Revised 2nd edition. European Foundation for Quality Management, p63. Available from: <https://efqm.org/news/818-the-efqm-model-brochure>
- Elkington, J. (1998), Accounting for the triple bottom line. *Measuring Business Excellence*, 2(3), 18-22.
- Feng, M., Terziovski, M., Samson, D. (2007), Relationship of ISO 9001:2000 quality system certification with operational and business performance. *Journal of Manufacturing Technology Management*, 19(1), 22-37.
- Fonseca, L.M.C. (2015), Relationship between ISO 9001 certification maturity and EFQM business excellence model results. *Quality Innovation Prosperity*, 19(1), 85-102.
- Frankish, E.J., Phan-Thien, K., Ross, T., Mcconchie, R., Luning, A., Bozkurt, H. (2022), Performance assessment of food safety management systems in Australian apple Packhouses in view of microbial control. *Food Control*, 133(PB), 108642.
- Glogovac, M., Ruso, J., Maricic, M. (2022), ISO 9004 maturity model for quality in industry 4.0. *Total Quality Management and Business Excellence*, 33(5-6), 529-547.
- Guo, Z., Bai, L., Gong, S. (2019), Government regulations and voluntary

- certifications in food safety in China: A review. *Trends in Food Science and Technology*, 90, 160-165.
- Irjayanti, M., Azis, A.M. (2012), Barrier factors and potential solutions for Indonesian SMEs. *Procedia Economics and Finance*, 4, 3-12.
- ISO. (2004), ISO/IEC Guide 2:2004 (en) Standardization and Related Activities - General Vocabulary. Switzerland: ISO, p. 60. Available from: <https://www.iso.org/obp/ui/#iso:std:iso-iec:guide:2:ed-8:v1:en>
- ISO. (2018), ISO 9004:2018 : Quality Management - Quality of an Organization - Guidance to Achieve Sustained Success. Switzerland: International Organization for Standardization. Available from: <https://www.iso.org/standard/70397.html>
- ISO. (2024), The ISO Survey of Management System Standard Certifications - 2021 - Explanatory Report. ISO Survey. Available from: <https://www.iso.org/the-iso-survey.html>
- Jalil, F. (2019), Effect of QMS on innovation and financial performance. *Pakistan Business Review*, 21(3), 595-611.
- Johnson, M.P., Schaltegger, S. (2016), Two decades of sustainability management tools for SMEs: How far have we come? *Journal of Small Business Management*, 54(2), 481-505.
- Kafel, P., Sikora, T. (2014), The level of management maturity in the Polish food sector and its relation to financial performance. *Total Quality Management and Business Excellence*, 25(5-6), 650-663.
- Kafetzopoulos, D.P., Gotzamani, K.D. (2014), Critical factors, food quality management and organizational performance. *Food Control*, 40(1), 1-11.
- Kakouris, A.P., Sfakianaki, E. (2018), Impacts of ISO 9000 on Greek SMEs business performance. *International Journal of Quality and Reliability Management*, 35(10), 2248-2271.
- Khalfallah, M., Ben Salem, A., Zorgati, H., Lakhal, L. (2021), Innovation mediating relationship between TQM and performance: Cases of industrial certified companies. *TQM Journal*, 14(3), 847-864.
- KKP. (2020a), The Performance Report of the Ministry of Marine and Fisheries 2020. In: Indonesia: Laporan Kinerja Kementerian Kelautan dan Perikanan 2020. Jakarta: KKP.
- KKP. (2020b), Competitiveness of Marine and Fisheries Products of Indonesia in Figure 2019. In: Indonesian: Penguatan Daya Saing Produk Kelautan dan Perikanan Indonesia Dalam Angka 2019. Direktorat Jenderal Penguatan Daya Saing Produk Kelautan dan Perikanan. Jakarta: Kementerian Kelautan dan Perikanan.
- KKP. (2022a), Marine and Fisheries in Figures 2022. Ministry of Marine and Fisheries. Vol. 1. Jakarta. Indonesia: Kementerian Kelautan dan Perikanan, p348.
- KKP. (2022b), Performance Report of General Director of Empowerment of Marine and Fisheries Products Competitiveness Year 2022 (in Indonesian). Jakarta: Kementerian Kelautan dan Perikanan. Available from: https://kkp.go.id/an-component/media/upload-gambar-pendukung/a_pds2/tahun_2023/akuntabilitas/lkj_ditjen_pdspkp_tw_iv_2022_rev.pdf
- KKUKM. (2022), The Performance Report of the Ministry of Cooperation and SME 2021. In: Indonesian: Laporan Kinerja Kementerian Koperasi dan UKM Tahun 2021. Jakarta: Kementerian Koperasi dan UKM Republik Indonesia. Available from: https://ppid.kemenkopukm.go.id/?page_id=6358
- Kotsanopoulos, K.V., Arvanitoyannis, I.S. (2017), The role of auditing, food safety, and food quality standards in the food industry: A review. *Comprehensive Reviews in Food Science and Food Safety*, 16(5), 760-775.
- Lakhal, L. (2014), The relationship between ISO 9000 certification, TQM practices, and organizational performance. *Quality Management Journal*, 21(3), 38-48.
- Lepistö, K., Saunila, M., Ukko, J. (2022), The impact of certification on the elements of TQM exploring the influence of company size and industry. *International Journal of Quality and Reliability Management*, 39(1), 30-52.
- Liu, F., Rhim, H., Park, K., Xu, J., Lo, C.K.Y. (2021), HACCP certification in food industry: Trade-offs in product safety and firm performance. *International Journal of Production Economics*, 231, 107838.
- Liu, Z., Mutukumira, A.N., Chen, H. (2019), Food safety governance in China: From supervision to coregulation. *Food Science and Nutrition*, 7(12), 4127-4139.
- Macheka, L., Angeline, F., Tambudzai, R., Mubaiwa, J., Kuziwa, L. (2013), Barriers, benefits and motivation factors for the implementation of food safety management system in the food sector in Harare Province, Zimbabwe. *Food Control*, 34(1), 126-131.
- Medel-González, F., García-Ávila, L., Acosta-Beltrán, A., Hernández, C. (2013), Measuring and evaluating business sustainability: Development and application of corporate index of sustainability performance. In: Erechchoukova, M.G., Khaite, P.A., Golinska, P., editors. *Sustainability Appraisal: Quantitative Methods and Mathematical Techniques for Environmental Performance Evaluation*. Berlin Heidelberg: Springer, p33-61.
- Mengistu, A.T., Panizzolo, R. (2023), Metrics for measuring industrial sustainability performance in small and medium-sized enterprises. *International Journal of Productivity and Performance Management*, 73(11), 46-68.
- Meza-Ruiz, I.D., Rocha-Lona, L., del Rocío Soto-Flores, M., Garza-Reyes, J.A., Kumar, V., Lopez-Torres, G.C. (2017), Measuring business sustainability maturity-levels and best practices. *Procedia Manufacturing*, 11, 751-759.
- Migdadi, M.M. (2022), Knowledge management processes, innovation capability and organizational performance. *International Journal of Productivity and Performance Management*, 71(1), 182-210.
- Negron, L.A. (2020), Relationship between quality management practices, performance and maturity quality management, a contingency approach. *Quality Management Journal*, 27(4), 215-228.
- Nguyen, B.A. (2022), The effects of laws and regulations on the implementation of food safety practices through supply chain integration and dynamic supply chain capabilities. *Uncertain Supply Chain Management*, 10(1), 137-154.
- Ozturk, I., Alqassimi, O., Ullah, S. (2024), Digitalization and SMEs development in the context of sustainable development: A China perspective. *Heliyon*, 10(6), e27936.
- Paunescu, C., Argatu, R., Lungu, M. (2018), Implementation of ISO 22000 in Romanian companies: Motivations, difficulties and key benefits. *Amfiteatru Economic*, 20(47), 30.
- Peraturan Pemerintah (PP). (2021), Government Regulation of Indonesia, Number 07 year 2021. In: Indonesian: Peraturan Pemerintah Republik Indonesia Nomor 07 Tahun 2021 tentang Kemudahan. Jakarta: Pelindungan, dan Pemberdayaan Koperasi dan Usaha Mikro, Kecil, dan Menengah, p1-121.
- Poltronieri, C.F., Ganga, G.M.D., Gerolamo, M.C. (2019), Maturity in management system integration and its relationship with sustainable performance. *Journal of Cleaner Production*, 207, 236-247.
- Psomas, E.L., Kafetzopoulos, D.P. (2015), HACCP effectiveness between ISO 22000 certified and non-certified dairy companies. *Food Control*, 53, 134-139.
- Sadikoglu, E., Zehir, C. (2010), Investigating the effects of innovation and employee performance on the relationship between total quality management practices and firm performance : An empirical study of Turkish firms. *International Journal of Production Economics*, 127(1), 13-26.
- Samanta, M., Choudhary, P. (2019), Safety of fish and seafood. In: *Food Safety and Human Health*. United States: Academic Press, p169-187.
- Santos, Á.R.S., Melo, R.M., Clemente, T.R.N., Santos, S. (2022), Integrated management system: methodology for maturity

- assessment in food industries. *Benchmarking*, 29(6), 1757-1780.
- Sfreddo, L.S., Vieira, G.B.B., Vidor, G., Santos, C.H.S. (2018), ISO 9001 based quality management systems and organisational performance: A systematic literature review. *Total Quality Management and Business Excellence*, 32(3), 389-409.
- Sfreddo, L.S., Vieira, G.B.B., Vidor, G., Santos, C.H.S. (2021), ISO 9001 based quality management systems and organisational performance: A systematic literature review. *Total Quality Management and Business Excellence*, 32(3-4), 389-409.
- Shokri, A., Waring, T.S., Nabhani, F. (2016), Investigating the readiness of people in manufacturing SMEs to embark on Lean Six Sigma projects: An empirical study in the German manufacturing sector. *International Journal of Operations and Production Management*, 36(8), 850-878.
- Suseno, H., Suadi. (2021), Review of standard regulations on the processing of fishery products in Indonesia. *IOP Conference Series: Earth and Environmental Science*, 919(1), 012007.
- Tan, K.C. (2002), A comparative study of 16 national quality awards. *TQM Magazine*, 14(3), 165-171.
- Tarí, J.J., Molina-Azorín, J.F., Pereira-Moliner, J., López-Gamero, M.D. (2020), Internalization of quality in public organizations. *Academia Revista Latinoamericana de Administración*, 33(3/4), 445-461.
- Teixeira, S., Sampaio, P. (2013), Food safety management system implementation and certification: survey results. *Total Quality Management and Business Excellence*, 24(3-4), 275-293.
- Uçar, A., Yilmaz, M.V., Çakiroglu, F.P. (2016), Food safety - problems and solutions. In: *Significance, Prevention and Control of Food Related Diseases*. London: InTech.
- Ullah, B., Wei, Z., Xie, F. (2014), ISO certification, financial constraints, and firm performance in Latin American and Caribbean countries. *Global Finance Journal*, 25(3), 203-228.
- Wolniak, R. (2019), The level of maturity of quality management systems in Poland-Results of empirical research. *Sustainability*, 11(15), 1-17.
- Xiaofen, T. (2013), Investigation on quality management maturity of Shanghai enterprises. *TQM Journal*, 25(4), 417-430.
- Yu, W., Chavez, R., Jacobs, M., Wong, C.Y. (2020), Innovativeness and lean practices for triple bottom line: Testing of fit-as-mediation versus fit-as-moderation models. *International Journal of Operations and Production Management*, 40(10), 1623-1647.
- Zhang, M., Qiao, H., Wang, X., Pu, M., Yu, Z., Zheng, F. (2015), The third-party regulation on food safety in China: A review. *Journal of Integrative Agriculture*, 14(11), 2176-2188.