Check for updates

JFMSE, 37(6), pp. 1460~1469, 2025.
수산해양교육연구, 제37권 제6호, 통권138호, 2025.
www.ksfme.or.kr
https://doi.org/10.13000/JFMSE.2025.12.37.6.1460

An Analysis of Priorities on the Policy Direction of Korea Eco-Friendly Marine Product Certification Direct Payment System

Yunpil JUNG · Sang-Woo HAN† · Hyangmi YI* · Kijung SUNG**
Setsunan University(Ph.D program · **professor) · †Korea Fisheries Policy Institute(lead researcher) · Faculty of Agriculture(lead researcher) · *Setsunan University(Ph.D program)

한국 친환경 수산물 인증 직불제 정책 방향에 관한 우선순위 분석

정윤필 · 한상우† · 이향미* · 성기정**
세츠난대학교(박사후과정 · **교수) · †수산정책연구소(책임연구원) · *한국농어촌공사(책임연구원)

Abstract

This study employs the Analytic Hierarchy Process (AHP) to evaluate Korea's Eco-Friendly Marine Product Certification Direct Payment System, which supports fishers engaging in environmentally sustainable practices. Survey results show that implementation continuity is the highest priority, followed by social acceptance, efficiency, and business management, highlighting the relative importance of sustaining the program over other criteria. The findings emphasize the critical need for program sustainability, streamlined certification processes, targeted support for small-scale producers, and enhanced consumer awareness to foster social acceptance and market demand. Based on these results, concrete policy recommendations can be made to improve the effectiveness, equity, and long-term sustainability of fisheries governance in Korea.

Key words : Eco-friendly marine product certification direct payment system, Policy direction, AHP method

I. Introduction

In the Korean fisheries industry, there are endless questions about natural and artificial climate changes, changes in the fishery environment, illegal fishing, and indiscriminate overfishing. In addition, the fishing population has decreased by about 36.4% from 25.1 million in 2000 to 9.1 million as of December 1, 2022, and it is difficult to manage marine fishing grounds due to the aging population.

Accordingly, the Korean government is implementing various sustainable support and regulatory policies to enhance the competitiveness of the fisheries industry. In particular, the public-purpose direct payment system for fisheries for fisheries products has been in effect since March 1, 2021, to support fishermen who comply with certain obligations imposed to promote the public interest. The public interest direct payment system includes a total of six direct payment systems, such as the direct payment system for unqualified regions (2014), the payment system on transferred business (2021), the payment system to protect fishery resources (2021), the direct payment

† Corresponding author : 02－589-4612, readman80@korfish.or.kr

system to support product of eco-friendly fishery products (2021), the direct payment system for small-scale fishing (2023), and the direct payment system for fishing workers (2023).

Among the direct payment system to support product of eco-friendly fishery products, two main types exist: eco-friendly marine product certification direct payment system and the eco-friendly marine product assorted feed direct payment system. The direct payment system to support product of eco-friendly fishery products was introduced to promote marine ecosystem preservation and ensure food safety and well-being.

However, this system faces several challenges. First, the high certification cost often leads to higher consumer prices, limiting accessibility. Second, producers face a heavy burden due to additional costs and labor, making participation difficult for small-scale or economically vulnerable fishers. Third, strict regulations and certification standards require further effort and expense.

Despite an increase in the 2024 policy budget from KRW 27.9 billion in 2023 to KRW 34.5 billion, the effectiveness of the program remains unclear. A lack of systematic evaluation and low awareness among fishers hinder its proper implementation.

Korea has only recently introduced the public-purpose direct payment system for fisheries, and as a result, research on this topic remains limited. Previous studies related to fisheries certification and eco-friendly practices can be categorized into four main themes.

First, regarding the public interest and policy framework, Sim et al. (2020) defined the public interest function of fisheries and fishing villages and organized specific concepts of this function, providing a theoretical foundation for evaluating public-purpose interventions. Second, studies on certification systems and food safety have examined the role of eco-labels and HACCP certification. Seo et al. (2015) applied the Analytic Hierarchy Process (AHP) to identify key factors for ensuring food safety in the distribution of products harvested from eco-label certified fishing grounds. Similarly, Kim et al. (2020) investigated the importance and preference of HACCP certification in aquaculture farms through conjoint analysis and estimated potential market share impacts under a virtual simulation scenario. Third, research on marine life certification has focused on environmental implications. Tlusty (2011) used theoretical models to analyze the environmental effects of marine life certification and eco-labeling, and proposed various operational alternatives for the global seafood industry. Finally, studies on consumer behavior have highlighted the role of eco-friendly labeling in market acceptance. Hur et al. (2013) analyzed the consumption value structure of eco-friendly fishery products and examined how these values influence consumer satisfaction with certified products.

Among the six types of public-purpose direct payment systems for fisheries, this study focuses on the eco-friendly marine product certification direct payment system. There are several reasons for this focus. First, eco-friendly certified fishery products offer consumers a safe and trustworthy option—an increasingly important value in today's health-conscious society. Compared to other types of direct payment systems, this certification system plays a more direct role in enhancing consumer trust. Second, global demand for eco-friendly certified fishery products is steadily increasing. By supporting such certification, this system can strengthen the competitiveness of Korean seafood, both by expanding export opportunities and by

helping to establish premium pricing in the domestic market. Third, the certification system promotes sustainable fishing practices by encouraging eco-friendly production methods. This contributes to the preservation of marine ecosystems and the long-term viability of fisheries. Among the various direct payment systems, it stands out in terms of its positive impact on both the environment and consumers. Given these advantages, this study aims to analyze the eco-friendly marine product certification direct payment system using the AHP, with the goal of proposing future policy directions for its development and improvement.

Ⅱ. Research method

1. The Eco-Friendly Marine Product Assorted Feed Direct Payment System

The eco-friendly marine product refers to organic fishery products, non-antibiotic fishery products, and active treatment non-use marine products of active treatments obtained through environmentally

friendly fishing. Eco-friendly fisheries are industries that do not use chemical materials such as antibiotics and antibacterial agents to promote biodiversity, enhance biological circulation and activities in the ocean, and maintain a healthy fishing ecosystem(Sung, 2012). It is also an industry that produces seafood in a healthy environment by minimizing the use of antibiotics and antibacterial agents.

The eco-friendly marine product certification direct payment system provides financial support to fishers, corporations, and other eligible entities who have received certifications for organic or non-antibiotic marine products and are registered under Hazard Analysis and Critical Control Points (HACCP). The system aims to promote eco-friendly fishing practices and enhance public functions, such as marine environment preservation, by compensating

<Table 1> Payment Amount by Certification Type (Unit: 1,000KRW)

Certification	Seaweed	Dried Seaweed	Sea Tangle	Eel	Mussel	Pacific White Shrimp	Flatfish	Abalone
Organic Seafood	1,215	1,060	1,983	272,924	2,683	10,965	242,563	12,270
Non-Antibiotic	-	-	-	136,462	1,342	5,483	121,282	6,135
No active treatment used	607	530	991	-	-	-	-	-
No deadline	607	530	991	136,462	1,342	5,483	121,282	6,135
Certification	Seaweed Fulvescens	Ampullarius Insularus	Trout	Loach	Leather Carp	Catfish	Enteromorpha	Gray Mullet
Organic Seafood	1,191	48,359	66,594	22,636	18,173	22,336	604	145,088
Non-Antibiotic	595	24,179	33,297	11,318	9,087	11,168	-	72,544
No active treatment used	-	-	-	-	-	-	-	-
No deadline	595	24,179	33,297	11,318	9,087	11,168	302	72,544

for income reductions and additional production costs incurred during sustainable practices. Eligible recipients include fishers and corporations licensed for domestic fisheries, including inland and sea fisheries, who comply with eco-friendly certification requirements. Payment amounts are determined by both the type of certification and the scale of the farm, calculated as the certified area (ha) multiplied by the unit payment rate. Although the payment range is often

described as “from 530K to 2.73M KRW per certification,” actual amounts vary significantly depending on the specific product. For instance, as shown in <Table 1>, organic certification payments range from 1,215 thousand KRW for seaweed to 272,924 thousand KRW for eel, while non-antibiotic certification and no active treatment used certification also have distinct amounts. These differences reflect variations in production costs, policy priorities, and market characteristics.

Direct payments for organic fisheries products are provided for up to five years at 100% of the amount, and if maintained beyond the fifth year, a 50% payment is made from the sixth year onward without a time limit. Payments for non-use of antibiotics and active treatments are terminated after three years. The system imposes a maximum payment area of 60 ha per aquafarm, although adjustments can be made within the available budget. When a group of producers applies jointly, the sum of their areas is considered, but no individual member may exceed the 60 ha limit. If each member has an agreed operating area, payments cannot exceed that area. For example, if producers from corporations A (60 ha), B (70 ha), and C (50 ha) apply jointly, they will receive payments corresponding to 60 ha, 70 ha, and 50 ha, respectively. As of 2024, 334 companies in Korea have eco-friendly certification, with seaweed and kelp products comprising 55% and 19% of certified products, respectively, indicating a concentration in certain products. Not all certified companies benefit from direct payments, highlighting the need for accurate criteria and clear guidelines. <Table 1> summarizes the certified products and their corresponding payment amounts, showing that differentiation by product type is necessary to reflect both the production characteristics and policy objectives of the direct payment system.

2. The Model

Determining the priority for the eco-friendly marine product certification direct payment system is a factor that has an important influence on the efficient execution of policy funds and the success of the project. To this end, priorities are derived using AHP analysis techniques.

The AHP is a decision-making method developed by Saaty(1980) to analyze multiple attributes hierarchically, assess their importance, and select rational options. This analytic method is useful for supporting decision-making in various fields such as business decision-making, project prioritization, resource allocation, risk management, health management, and environmental management (Michele et al,2010). In this study, a pairwise comparison was conducted using the relative importance scale proposed by Saaty. The reason for this is to indicate in numbers how many times the attributes being compared are more important or more dominant than other attributes.

In the AHP, pairwise comparison matrices are used to represent the relative importance of various elements. In AHP, decision-makers directly compare

two elements to assess how much one is more important or dominant than the other. Such pairwise comparison matrices can be represented as shown in Eq. (1) (Chen, 2006).

$$A = \begin{bmatrix} \alpha_{11} & \alpha_{12} & \cdots & \alpha_{1n} \\ \alpha_{21} & \alpha_{22} & \cdots & \alpha_{2n} \\ \alpha_{31} & \alpha_{32} & \cdots & \alpha_{3n} \\ \vdots & \vdots & & \vdots \\ \alpha_{n1} & \alpha_{n2} & \cdots & \alpha_{nn} \end{bmatrix} \quad \cdots\cdots (1)$$

represents the relative importance between element and element . The main diagonal elements are always 1, because they are equal in comparison to the elements themselves. Since the comparison results are symmetric, the relative importance between elements can be established. The value indicates how much more important one element is compared to another. A value greater than 1 means the first element is more important than the second, while a value less than 1 means the second element is more important than the first.

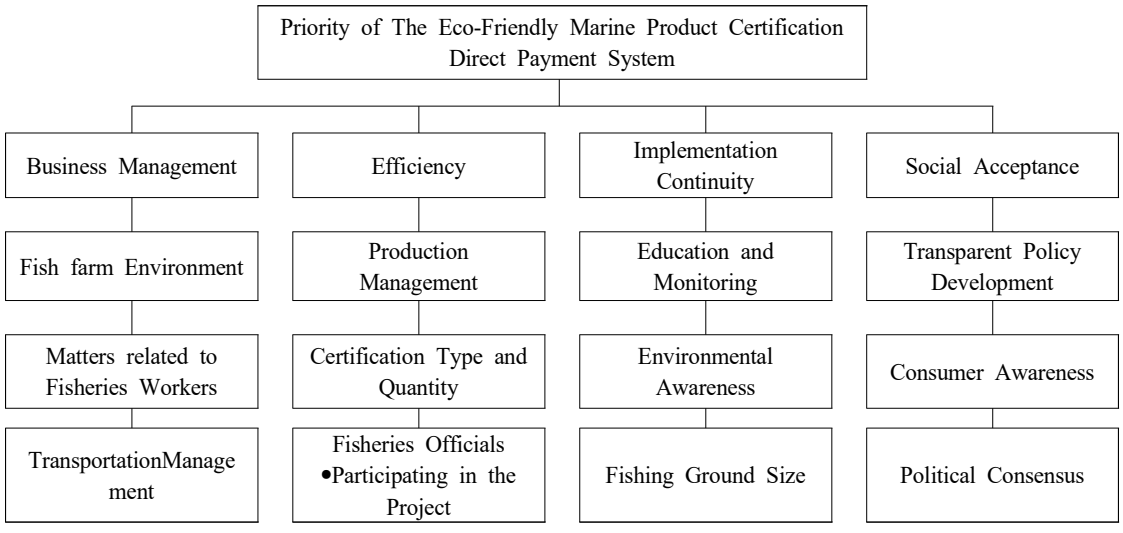
When calculating an average value of one of several factors, a simple arithmetic mean alone cannot draw a reasonable value, so the importance appropriate for each item is determined according to the weight and applied to obtain the average value. When the weights of the elements in the pairwise comparison matrix A are unknown, the matrix can be used to estimate these weights. The estimated weights are calculated using the transition matrix, as shown in Eq. (2) (Chen, 2006).

$$A \cdot \omega = \lambda_{\max} \cdot \omega \quad \cdots\cdots (2)$$

AHP is Consistency Index (CI) is used to evaluate the consistency of the pairwise comparison matrix. The equation for CI is shown in Eq. (3) (Chen, 2006).

$$CI = \frac{\lambda_{\max} - n}{n-1} \quad \cdots\cdots (3)$$

Consistency Ratio (CR) is based on CI, an indicator of consistency, and evaluates the actual consistency of the pairwise comparison matrix by comparing it with the expected value for the randomly



[Fig. 1] The AHP Hierarchy Structure.

generated comparison matrix. The closer the CR value is to 0, the more consistent it is, and if it is greater than 1, there is a high possibility of a contradiction. The equation for CI is shown in Eq. (4) (Chen, 2006; Saaty, 1982).

$$CR = \frac{CI}{RI} \quad \cdots\cdots (4)$$

3. Procedure and Data Collection of AHP

The hierarchical structure shown in Figure 1 forms the basis of this study. The evaluation criteria were derived with input from a group of experts, and their validity was supported by existing studies. Some subjectivity is inherent in AHP hierarchical design (Saaty et al., 2012), but we minimized this by incorporating input from fisheries researchers and stakeholders and consulting relevant literature. Previous studies also show that combining expert judgment with literature review is a widely accepted approach for deriving AHP hierarchical structures (Russo et al., 2015; Ishizaka et al., 2011).

To prioritize the eco-friendly marine product certification direct payment system, an AHP survey was conducted using a 9-point scale for pairwise comparisons, from December 2023 for approximately two months. The survey targeted 50 fisheries officials and experts, and the final analysis was conducted using valid responses from 20 participants whose CR values were allowed up to 0.2. Although the sample size was relatively small, previous studies have shown that AHP with a similar number of participants is appropriate for evaluating the relative importance of criteria (Saaty, 1980; Chen, 2006; Nguyen et al., 2022; Sahlin, 2024). Despite providing prior instructions on how to complete the questionnaire, a considerable number of responses were excluded due to high inconsistency ratios. To address these issues, future research will refine the survey design, simplify the hierarchical structure of the evaluation framework, and provide additional training on the AHP method.

Table 2 shows the demographic characteristics of the participants whose responses were used in the analysis.

<Table 2> Demographic Composition of the Survey Respondents

Category	Detail	Frequency (Number)	Percentage (%)
Gender	Male	17	85
	Female	3	15
Age Range	30s	1	5
	40s	6	30
	50s	9	45
	60 and over	4	20
Affiliation	Fisheries organizations and companies	11	55
	Korea National Federation of Fisheries Cooperatives	3	15
	Fishing Companies	5	25
	Fisheries Administrative Agencies	1	5
Professional Experience	5–9 years	1	5
	10–15 years	8	40
	16–20 years	1	5

Ⅲ. Results

<Table 3> shows the results of the first higher classification priority of the eco-friendly marine product certification direct payment system. In relation to the factors corresponding to the

upper-classification of the eco-friendly marine product certification direct payment system (4items), implementation continuity (0.633) was analyzed as the top priority factor. Implementation continuity (0.633) received a substantially higher weight than other factors, reflecting experts' view that program continuity and sustainability are the most critical for the eco-friendly marine product certification direct payment system. This priority likely stems from concerns over policy interruptions, regional disparities, and the long-term stability of program implementation.

The results of the sub-classification priority for business management showed that fish farm environment (0.500) was analyzed as the top priority factor. The matters related to fisheries workers (0.415) appeared as the second priority factor. With a weight difference of only about 0.085 between the first and second rankings, it can be understood that both items can be recognized as key tasks. On the other hand, transportation management (0.086) was analyzed to have a relatively low importance weight compared to other priorities. For efficiency, certification type and quantity (0.635) was the top priority, highlighting the importance of clear and appropriate certification

<Table 3> Analysis Results of Priority of the Eco-Friendly Marine Product Certification Direct Payment System (Upper-Classification)

Ranking	Weight	Priority of the eco-friendly marine product certification direct payment system
1	0.633	Implementation continuity
2	0.168	Social acceptance
3	0.158	Efficiency
4	0.041	Business management

<Table 4> Analysis Results of Priority of the Eco-Friendly Marine Product Certification Direct Payment System (Sub-Classification)

Ranking	Weight	Priority of the business management
1	0.500	Fish farm environment
2	0.415	Matters related to fisheries workers
3	0.086	Transportation management
Ranking	Weight	Priority of the efficiency
1	0.635	Certification type and quantity
2	0.287	Fisheries officials participating in the project
3	0.078	Production management
Ranking	Weight	Priority of the implementation continuity
1	0.649	Fishing ground size
2	0.279	Environmental awareness
3	0.072	Education and monitoring
Ranking	Weight	Priority of the social acceptance
1	0.769	Consumer awareness
2	0.125	Political consensus
3	0.079	Transparent policy development

standards. The involvement of fisheries officials (0.287) was the second priority, underscoring the need for effective administrative support. Production management (0.078) received a low weight, indicating it may be less influential in the overall efficiency of the program. Regarding implementation continuity, fishing ground size (0.649) emerged as the top factor, suggesting that program scalability and reach are critical. Environmental awareness (0.279) and education and monitoring (0.072) followed, indicating that while awareness and oversight are important, they are secondary to the overall program scope. For social acceptance, consumer awareness (0.769) was the top priority, emphasizing the crucial role of public perception in program success <Table 4>.

Ⅳ. Conclusion

In this study, an analysis was conducted on the policy priorities of the public-purpose direct payment system for fisheries, which aims to support fishermen who comply with certain obligations imposed for public interest promotion. Among these, the eco-friendly marine product certification direct payment system is gradually gaining importance. Previous studies have examined various aspects of fisheries certification and eco-friendly practices, including defining public interest functions in fisheries, evaluating food safety in certified fishing grounds using AHP, assessing the role of HACCP certification in consumer decisions, analyzing environmental impacts of marine life certification, and exploring consumer satisfaction with eco-friendly fishery products. Building on these studies, the present research differs in that it quantitatively evaluates the relative importance of the components of the eco-friendly marine product certification direct payment system using AHP, providing a structured prioritization of policy criteria. In light of these findings, the following suggestions are proposed to improve the system and enhance policy effectiveness.

First, the analysis of business management priorities revealed that the fish farm environment received the highest weight (0.500). A major issue is the inconsistency of environmental management standards across regions, which causes confusion among fishers. While eco-friendly farming requires clear guidelines, unclear or uneven standards can lead to poor compliance or financial strain. This challenge can be addressed through the public-purpose direct payment system. For example, payments could support ecosystem restoration around aquaculture farms and promote training in energy-efficient, sustainable practices. Although the current system is largely production-focused, expanding it to cover environmental improvements would encourage sustainable operations and increase fishers' income. Supporting environmentally friendly aquaculture facilities thus contributes to both environmental protection and economic stability.

Second, as a result of the analysis of the efficiency, the certification type and quantity (0.635) showed the highest weight. Currently, Korea has five types of eco-friendly certification labels, such as "organic aquatic products" and "organic processed foods," each with explanatory text. This complexity can be confusing especially for older fishers and some certifications require significant time and cost. When multiple certifications are needed, the burden increases further. To resolve these issues, certification standards should be integrated and simplified, direct payment benefits fairly distributed, and a clear link established

between certification and payment eligibility. These measures would support more efficient and sustainable operations for fishers.

Third, in the analysis of implementation continuity, fishing ground size showed the highest weight (0.649). Larger fishing grounds tend to benefit more from the current direct payment system, while smaller ones may face disadvantages due to less favorable criteria and increased economic burden. To address this, small fishing grounds can adopt several strategies: participating in ecosystem conservation projects, forming cooperatives to apply jointly, and engaging in regional resource management plans. These approaches can help small operators access more support and maximize the benefits of the direct payment system.

Finally, the social acceptance was analyzed with the highest weight of consumer awareness (0.769). Consumer awareness is essential for promoting sustainable seafood production and consumption. To enhance awareness, the government can run campaigns highlighting the value of certification and the benefits of direct payment systems. In addition, consumer education programs can help build trust in the production process and encourage the purchase of safe, high-quality certified products. In this way, the system can support informed consumer choices and increase demand for eco-friendly seafood.

Above all, this study aimed to propose future developmental directions for the current system by determining the priority of the eco-friendly marine product certification direct payment system through AHP analysis among the public-purpose direct payment systems for fisheries. Currently, there is still a significant lack of data regarding eco-friendly certification in Korea. Additionally, future studies are expected to yield more valuable research results if these areas are supplemented and diverse opinions are collected, considering that some data have not been utilized due to inconsistencies in the survey results. Based on these results, this study is expected to serve as important foundational data for future fisheries policy decision-making.

References

Bernasconi M, Choirat C and Seri R(2010). The Analytic Hierarchy Process and the Theory of Measurement, Management Science, 56(4): 699~711. https://doi.org/10.1287/mnsc.1090.1123

Chen CF(2006). Applying the Analytical Hierarchy Process (AHP) Approach to Convention Site Selection, Journal of Travel Research, 45(2): 167174. https://doi.org/10.1177/004728750629159

Hur WM, Kang SH and Park KD(2013). The Antecedents of Satisfaction of Eco-friendly Seafood: The Moderating Effect of Gender, The Journal of Fisheries Business Administration, 44(2): 51~68. https://doi.org/10.12939/FBA.2013.44.2.051

Ishizaka A and Labib A(2011). Review of the main developments in the analytic hierarchy process. Expert Systems with Applications, 38(11): 14336~14345.

Kim JU and Park JH(2020). Consumer's Preferences for Fish Farm HACCP Certification: An Application of Conjoint Analysis, The Journal of Fisheries Business Administration, 51(2): 001~013. https://doi.org/10.12939/FBA.2020.51.2.001

Nguyen HN, Lasa G, Iriarte I, Atxa A, Unamuno G and Galfarsoro G(2022). Datasets of skills-rating questionnaires for advanced decision-making, (1): 123.

Sahlin S(2024). Utilizing AHP and conjoint analysis in educational research, (2): 345~367.

Russo RFSM and Camanho R(2015). Criteria in AHP: A systematic review of literature. Procedia Computer Science, 55: 1123~1132.

Korea Ministry of Oceans and Fisheries(2024) Fisheries Education Portal, https://www.susanedu.kr/guide/evrfrndMprc.do (accessed on April 20, 2024).

Saaty TL(1980). The Analytical Hierarchy Process: Planning, Priority Setting, Resource Allocation,

New York: McGraw-Hill.

Saaty TL(1982). Decision Making for Leaders, New York: Lifetime Learning.

Saaty TL and Vargas LG(2012) Models, Methods, Concepts& Applications of the Analytic Hierarchy Process, Springer Press. 6.

Seo JS, Seo YH, Yoon DH, Seo WC and Ock YS(2015). A Study on Food Fafety Approach for Seafood Eco-label Chain of Custody: Focused on Requirement Analysis by AHP Method, The Journal of Fisheries Business Administration, 46(3): 051~061. https://doi.org/10.12939/FBA.2015.46.3.051

Sim SH, Oh SY and Ryu JG(2020). A Study on Setting Public Interest Functions of Fisheries and Fishing Villages in Korea, The Journal of Fisheries Business Administration, 51(2): 89~105. https://doi.org/10.12939/FBA.2020.51.2.089

Sung KJ(2012). A Study on Efficient Management and Economic Evaluation Technique in Biodiversity of Agriculture, Forestry and Fishery Field, Regional Comprehensive Research, 13(1): 47~72.

Tlusty MF(2011). Environmental Improvement of Seafood through Certification and Eco-labelling: Theory and Analysis, Fish and Fisheries, 13(1): 1~13. https://doi.org/10.1111/j.1467-2979.2011.00404.x

• Received : 20 October, 2025
• Revised : 19 November, 2025
• Accepted : 01 December, 2025