Prioritization of Oro Kopi Gayo Company Performance Measurement Indicators Using the Extent Analysis Method on Fuzzy Analytical Hierarchy Process

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Abstract. This research aims to determine the prioritization of factors of green innovation in coffee company performance measurement indicators under uncertainty conditions. Using the extent analysis method on Fuzzy Analytical Hierarchy Process, this paper evaluates green technological innovation criteria, green managerial innovation, green process innovation, green product innovation, and green competitive advantage criteria as five main criteria for the performance of the Oro Kopi Gayo company, and considers 24 sub-criteria. In this case, a questionnaire prepared using a pairwise comparison model was used as a large sample to collect data from experts who work at the Oro Kopi Gayo company. As a result, the analysis identified green managerial innovation criteria as the most important criterion among the main criteria, and production location as the most preferred sub-criterion among these sub-criteria. The results of this research provide insight as they are based on data collected from experts in the coffee company sector, and offer opportunities for other sectors from the same perspective.

Keywords: Green innovation prioritization, fuzzy analytical hierarchical process, coffee company performance

INTRODUCTION

Indonesia has always been in the top three coffee producing countries in the world for around three decades. In the context of Aceh, coffee production continues to increase every year, in fact the increase reached 2.65% per year from 2017-2021. The value of coffee exports reached 1.19 billion USD [1]. Based on the BPS Plantation data, it is known that until February 2020, Indonesia's coffee exports were recorded at 55,989 tons, with an export value of USD 136.75 million. This proves that coffee is an export commodity that has the potential to be developed. The trend of increasing Aceh coffee production is truly extraordinary compared to other regions and nationally. Several coffee producing areas such as West Sumatra, Riau, South Sumatra and East Java experienced declines, some even reaching double digits. Central Aceh is one of the districts producing Arabica coffee which is used as an export commodity and is an agricultural production center that supports industrial development and economic growth [2]. The area of coffee plantations in Central Aceh has decreased, where in 2015 the area was 49,030 Ha to 48,701 Ha in 2016. This condition can also affect the availability of raw materials that farmers will supply to companies/industries. Coffee production will not run smoothly if there is no cooperative relationship between the industry and farmers who supply coffee beans. The supply chain is related to the flow and transformation of goods and services starting from the stage of providing raw materials until the final product arrives in the hands of consumers [3]. A factual problem that often occurs in the Gayo coffee agroindustry is the high risk to the quality of the coffee fruit produced by farmers, which is caused by non-uniform maturity levels [4]. According to [5], every company is a company that must be able to realize a raw material supply chain model in order to carry out a sustainable production distribution process.

The Oro Kopi Gayo Company is a coffee processing company originating from Central Aceh Regency. This company was founded by Mr. H. Rasyid in 2000, which operates in the coffee processing sector. This company sells Gayo coffee products in the form of unsorted green coffee. The coffee supply in this company comes directly from farmers in the assisted villages known as "Gayo Coffee Foreign Exchange Villages". This company sends its products to various regions in Indonesia and also exports them. Oro Kopi Gayo produces 320 burlap sacks of green coffee

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products to various regions in Indonesia and also exports them. Oro Kopi Gayo produces 320 burlap sacks of green coffee beans per export weighing 19,200 tonnes and sells them at a price of IDR 63,000/kg. The green beans produced at Oro Kopi Gayo are grade 1 Arabica green bean coffee which meets SNI No.01-0907-2008. Grade 1 coffee beans have the advantage of having a defect value of 0-11, having a water content of 12-13%, and if the coffee beans contain dirt in the form of twigs, milled stones and other foreign objects, the coffee beans will be damaged. can only reach a maximum of 0.5%. With advances in technology, this company purchased rosting machines, coffee bean roasters and other equipment to improve quality so that consumers become more loyal to the coffee brands they offer. The positive trend is the success of increasing sales of Gayo Arabica Coffee products at the Oro Kopi Gayo company because it is supported by complete facilities starting from warehousing, drying areas, rosting machines, certification, so that with these facilities consumers will have more trust and confidence in appropriate Gayo Arabica Coffee products. with the needs and desires of consumers, many products are produced with various types, qualities and shapes, all with the aim of attracting customer interest. In tight competition, the Oro Kopi Gayo company is always required to attract the hearts of consumers or people who come to buy so that it can increase the value of Gayo Arabica Coffee products in the eyes of consumers and people who come to buy. Therefore, it is important for the Oro Kopi Gayo company to answer these challenges with the right strategies and solutions [8].

Now, companies in all industries have to look over their shoulders for new challengers that are arriving with surprising speed from any corner of the globe and, increasingly, from the technology sector. New competitors are becoming more numerous, more formidable, and more global - and some destroy more value for incumbents than they create for themselves. Companies that adapt quickly to these new realities can capture enormous opportunities. Technology will spur new products and services. Startups will be able to tap global investors, suppliers, and customers with little up-front investment. But companies will face intense pressure to grow, innovate, and become more productive - not only to seize these opportunities but merely to survive [6]. According to [7], the critical success factors (CSFs) are inputs to project management practice that can lead directly or indirectly to project success. CSFs will become a gauge by which project managers can evaluate their companies. CSFs allowed the company to implement standard organizational management skills to improve the company and project performance.

The company should make ongoing changes to develop its effectiveness. The changes are intended to find or develop ways to utilize the existing resources and capabilities to enhance the ability to create values and improve long-lasting performance. The performance serves as an instrument to determine whether the company can sustain its life (going concern) and the basis for formulating the company's operational planning in the future as well as the information for shareholders, stakeholders, and customers, regarding the achievements and the success of the company [8]. An accurate assessment of companies in the industry may represent the position of various firms as they compete with each other, specifying benefits and drawbacks, prospects, and challenges for firms [9]. According to [10], firm assessment is an important industrial function. Investors are constantly searching for the right investment field for the benefit of further interest. As a result, they are constantly attempting to analyze and differentiate between successful and unsuccessful firms. Performance measurement is carried out to ensure the implementation of the planned performance as expected. To determine the level of quality of a performance, a standard must be set that refers to the company's goals. These standards will then be used as a benchmark in assessing the performance of individuals and groups to take corrective actions related to their performance [11]. Performance measurement systems should be designed according to various case-specific factors. A performance measurement system should be structured to drive day-to-day management. In addition, the performance measurement system should be based on a complex and formal audit and benchmarking process [12]. The term sustainability is described as the three dimensions of economic, environmental, and social in the triple bottom line or sustainability performance indicators [13]. The improvement of sustainability management and performance for a large company is an opportunity for a firm’s development and growth rather than a threat [14]. Therefore, the company should effectively utilize its resources and prioritize its performance factors.

Manufacturing is one of the most dynamic industries in the world with a broader scope, and it has attracted transformation practices into green innovation practices [15]. The organizations are under intense pressure to adopt green innovations in their supply chain [16]. Currently, uncertainty in the corporate environment is not only caused by local market variations but international market fluctuations also force companies to continue to be vigilant. Companies must survive in a dynamic environment and dynamism depends on uncertainty. To increase performance, companies operating in dynamic environments should move before their competitors develop more radical products, while companies operating in stable environments should focus more on incremental internally generated products [17]. According to [18], a proactive attitude and courage in making risky decisions are factors in the success and increase the company’s ability. Creative and innovative attitudes are needed in the business environment because the rapidly changing environmental conditions require companies to find innovative ways in business processes to generate profits. There are several studies that focus on company performance measurement, and according to [19] the traditional performance, measurement approaches commonly utilize financial measures only. [20] identify factors that contribute to professional satisfaction with the final aim of assessing the effects of job satisfaction on successful and competitive company work. [21] examined the impact of corporate social responsibility on company performance. The study recommended that for increased financial performance, UK firms after an industry examination should intensify more efforts in carrying out their corporate social responsibilities which can serve as a source of competitive advantage. [22] assess the importance of the financial and non-financial indicators by the opinions of the Latvian business persons and top-level officials of the Latvian companies. They found that the majority of the respondents find the financial indicators to be moderately important or very important, but the non-financial indicators are highly important. They concluded that the non-financial indicators are evaluated higher than the financial indicators, which confirms the necessity to use the non-financial indicators in the evaluation of the company's performance. [23] found that strategic management choices can significantly affect company performance. [24] stated that organizational innovation cannot be avoided to maintain organizational performance in an uncertain business environment, especially in dynamic industries. They found that organizational innovation plays a mediating role between environmental uncertainty and organizational performance. Therefore, manufacturing companies should use multiple differentiation strategies because they appear to have the greatest impact on performance [25].

Weighting and selection of criteria for the company performance assessment are onerous processes for managers since the process needs to be carefully undertaken to adequately assess sustainable company performance. A lot of multi-criteria aggregating methods have been developed, many of which require appropriate criteria and weights to evaluate sustainable company performance. MCDM is a technique utilized by researchers when making decisions involving the prioritization, ranking, or selection of preferences [26]. Diverse MCDM techniques have been created, encouraged, and provided in a variety of necessity-driven contexts [27]. [28] proposed an AHP-based integrated performance measurement scheme that can consolidate key performance indicators into an overall performance score based on the weighting of the performance indicators in humanitarian supply chains. [29] developed a performance measurement model combining AHP, TOPSIS and Grey Relational Analysis methods to use for public sector banks in India. [30] proposed a Multi-MOORA sorting-based measurement method for long-term corporate performance. [31] reported the emergence of new performance measures based on predictive and social analytics in the big data-driven supply chain to obtain robust performance measurement systems. AHP can be combined with fuzzy logic approaches to address ambiguity and provide a basis for an additional study that relies on the merits of fuzzy membership [32]. A fuzzy-AHP (F-AHP) maintains several of the benefits that traditional AHPs have, particularly the relative simplicity in which various quantitative and qualitative data parameters and combinations are managed. The fuzzy-based AHP approach is a more effective solution for solving problems related to multi-criteria decision making because of its strong ability to handle imprecise and uncertain data. Furthermore, it supports decision makers to assign linguistic variables in the form of numerical values to express their judgments and has the possibility to incorporate incomplete, unretrievable and non-quantifiable information into decision models in a fuzzy environment [33]. [34] presenting a new integrated approach based on the EFQM model using Fuzzy Logic, Analytical Hierarchy Process (AHP) technique, and Operations Research (OR) model to improve the organizations' excellence level by increasing the quality of business performance evaluation and determining of improvement projects with high priority. [35] focuses on the development of an effective performance evaluation framework based on a Balanced Scorecard (BSC) and Fuzzy Analytic Hierarchy Process (FAHP) to analyze the suitability of the organization's strategic decision of outsourcing in alignment with the organizational performance for the Indian coal mining organization. [36] identify the most critical performance indicators to measure the performance of construction companies in Iraq using Fuzzy-AHP technique. [37] identify and prioritize the knowledge management adoption in financial institutions using fuzzy AHP methods. The results indicate that human resources are the priority and organizational management, technological factors, and cultural factors are the next priority. [38] investigate and evaluate factors related to the knowledge management model at universities in Hanoi, Vietnam. Eight factors were synthesized with the fuzzy analytic hierarchy process (FAHP) to evaluate the priority order. [19] develops a multi-level hierarchical performance measurement model to measure a manufacturing firm's overall performance score by grading its success levels in critical operations and combining them. [39] applied performance measures for total productive maintenance (TPM) implementation level under a fuzzy environment. [40] proposed an interval-valued Pythagorean fuzzy WASPAS method to evaluate the performance of retail stores. Similarly, [41] presented a fuzzy approach based on the Mamdani fuzzy inference system for performance measurement of manufacturing systems. [42] used a Fuzzy AHP model that combines the strategic and operational attributes to determine an overall warehouse performance score. [43] proposed an intuitionistic fuzzy multi-criteria and multi-expert analytical hierarchy process (AHP) based performance management model. [44] developed a sustainability evaluation method for manufacturing small and medium-sized enterprises (SMEs) using an integrated fuzzy analytical hierarchal process (FAHP) and fuzzy inference system (FIS) approach. [45] proposes hybrid multi-criteria decision-making (MCDM) by combining FAHP and Fuzzy TOPSIS to analyze the effects of green innovation aspects on the sustainability performance of the manufacturing industry. They identify six green innovation aspects (criteria), twenty-four sub-aspects (sub-criteria), and three sustainability performance indicators (alternatives) for the manufacturing industry in China. The point is that the trend of using FAHP in published research continues in performance measurement, although its application in the case of company performance measurement in the coffee sector combining green innovation is still limited.

In our study, FAHP is designed for situations in which ideas, feelings, and emotions affecting the decision process can be quantified using a numerical scale. Next, we proposed the extent analysis method, which is the most commonly used method in the set of FAHP applications (e.g. [46], [47] & [48]). In this method, a fuzzy number is used to quantify the "extent". In the extent analysis of each object, a fuzzy synthetic degree value can be obtained based on the fuzzy values. The novelty of this research is threefold. First, this study captures attributes of green innovation that are rarely explored in the measurement of performance indicators specifically for coffee companies. Second, the development of a framework for measuring coffee company performance indicators which is characterized by quantitative and qualitative assessments of decision-makers. Third, the entire framework has been designed and measured using Microsoft Excel® 2010 platform which is a distinct feature of the proposed approach compared to other expensive software implementations. This paper is organized into four parts. Section 1 outlines the background to the need for company performance evaluation, provides an overview of the factors that influence company performance and its measurement system, and outlines the use of the Fuzzy Analytical Hierarchy Process (FAHP). Section 2 explains the research methodology which contains a step-by-step explanation of Chang's area analysis method in the Fuzzy Analytical Hierarchy Process (FAHP). Section 3 presents important results and a discussion regarding the performance criteria of the Oro Kopi Gayo company. And finally, Section 4, contains conclusions based on the findings of this research.

METHODOLOGY

Given the importance of the coffee industry in Takengon City, Aceh Province, decision-makers must give importance to ideas and policies that protect the environment. This research, therefore, aims to assess aspects of green innovation. Prioritization of factors of green innovation in Oro Kopi Gayo company performance measurement indicators in the present study is adopted from [45], which include green technological innovation, green managerial innovation, green process innovation, green product innovation, and green competitive advantage. In Table 1, these factors can be divided into five categories:

TABLE 1. Types of factors that influence company performance

Criteria	Sub-criteria	Source
Green Technological Innovation	Production location Market orientation Export destination	[45]
Green Managerial Innovation	Employee absence Training facilities for employees The ratio of operators to helpers on the factory floor The level of motivation of labor and management Appreciate creative suggestions Payment system	[19], [36], [45], [49]
Green Process Innovation	Working conditions of the unit Technological changes in the field Physical capital accumulation and (R&D) Corporate companies, management practices and work arrangements Resource allocation High level of non-first quality production Maintenance	[50]

Criteria	Sub-criteria	Source
Green Product Innovation	Quality of raw materials Frequent style changes Change from high volume to low volume orders Deviations from standard time in manufacturing Accessories	[45]
Green Competitive Advantage	Rejection rate Level of improvement (initial) Level of repair (final inspection)	[50]

Since the qualitative expert opinions on matters such as aspects of green innovation are still vague and ambiguous. To solve this issue, our research adopted the fuzzy set theory. It evaluates the probability of different weight values obtained by different decision makers using a pairwise comparison matrix, which includes the corresponding triangular fuzzy numbers. To collect research data, a questionnaire survey was conducted to determine the relative importance of each element in the hierarchy from the point of view of experts in the field. Here, the word 'expert' refers to people who have extensive experience in coffee companies. Each element in a level is compared in pairs with other elements at the same level, against the criterion elements at a higher level. The entire questionnaire is based and developed to determine the relative importance of the main criteria and to determine the relative importance of the sub-criterion measurements for each criterion, where there must be an assessment of pairwise comparisons $\left[\frac{n(n-1)}{2}\right]$ needed to develop a set of matrices. Experts were asked to make pairwise comparisons among criteria, decide which criterion was more important, and then assign levels of importance on a verbal scale; equally important, more important, much more important, very much more important, and absolutely more important in the form of linguistic variables. The experts' descriptive assessments in the form of linguistic variables then need to be transformed into a triangular fuzzy scale to construct a comparison matrix for each level with n criteria; $\tilde{A} = \left\{\tilde{a}_{ij}\right\}$ represents the relative importance of criteria i to j. In this research, it was completed to convert linguistic scales into fuzzy numbers by utilizing a triangular fuzzy conversion scale ranging from 1 to 7 with a scale solution approach $CITATION\ Saa16 \backslash l\ 1057$ [51], and is presented in Figure 1 and Table 2.

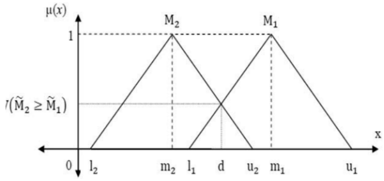

FIGURE 1. Linguistic scale of relative importance

TABLE 2. Linguistic scales and fuzzy scales according to their importance

Linguistic terms	Triangular fuzzy scale	Triangular fuzzy reciprocal scaling
Equally important	(1,1,1)	(1,1,1)
More important	(2/3, 1,3/2)	(2/3, 1,3/2)
Strongly more important	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
Very strongly more important	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)
Absolutely more important	(7/2, 4, 9/2)	(2/9, 1/4, 2/7

For example, if the decision maker states that criterion i is much more important compared to criterion j, then $\tilde{a}_{ij} =$ (3/2, 2, 5/2), if not $\tilde{a}_{ij} =$ (2/5, 1/2, 2/3); here, $\frac{n(n-1)}{2}$ pairwise comparison judgments require levels with n elements to build the comparison matrix; Comparison matrices need to be created for the main criteria and sub-criteria for each main criterion.

$$\tilde{A} = \begin{bmatrix} 1 & \tilde{a}_{12} & \cdots & \tilde{a}_{1n} \\ \tilde{a}_{21} & 1 & \cdots & \tilde{a}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{a}_{n1} & \tilde{a}_{n2} & \cdots & 1 \end{bmatrix} = \begin{bmatrix} 1 & \tilde{a}_{12} & \cdots & \tilde{a}_{1n} \\ \frac{1}{\tilde{a}_{12}} & 1 & \cdots & \tilde{a}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{1}{\tilde{a}_{1n}} & \frac{1}{\tilde{a}_{2n}} & \cdots & 1 \end{bmatrix}$$

After compiling a comparison matrix according to each expert's opinion, aggregation is required to represent one comparison matrix for each level and sub-level factor. For this reason, the conventional AHP concept can be used in the FAHP environment while AHP uses a geometric mean function that satisfies the Pareto principle and homogeneity conditions to combine group decisions. If a group of K decision makers makes pairwise comparisons regarding the importance of n criteria, then we obtain a set of K comparison matrices, $\tilde{A}_k = \{\tilde{a}_{ijk}\}$, where $\tilde{a}_{ijk} = (l_{ijk}, m_{ijk}, u_{ijk})$. Therefore, the triangular fuzzy numbers in the group comparison matrix can be obtained using the equation in [52].

The consistency of the evaluation needs to be analyzed to ensure whether the expert's decision is at a certain level of quality before further processing. [51] has proposed an index method to measure the level of consistency of sharp pairwise comparison matrices. So, the fuzzy comparison matrix needs to be converted into a crisp matrix to use any defuzzification method [52]. The defuzzification method has the ability to convert triangular fuzzy numbers into crisp numbers effectively. In this research, we use the defuzzification method proposed by [53] which uses the decision maker's level of confidence (α) regarding the criteria weights and risk tolerance (λ) of the decision maker to change the fuzzy comparison matrix into a crisp matrix. Here, the value of α may be between 0 and 1, and this will help avoid cumbersome and unreliable practices [54]. A larger α value means that the decision maker's judgment is more confident and closer to the most likely value, namely m, of the triangular fuzzy number (l, m, u). In practical applications, $\alpha = 1$; $\alpha = 0.5$, and $\alpha = 0$ indicate the decision maker's involvement as an optimistic, moderate, or pessimistic view, respectively [55]. Additionally, λ can be considered as the decision maker's level of optimism and its range is also between 0 and 1. The decision maker's attitude can be positive, moderate, or negative and hence will have higher, average, and smaller values for their fuzzy judgments. In practical applications, $\lambda = 1$, $\lambda = 0.5$, and $\lambda = 0$ are used to indicate optimistic, moderate, or pessimistic views, respectively [33].

RESULT

TABLE 4. Pairwise comparison matrix of fuzzy aggregates of main criteria

	Cr_1	**Cr_2**	**Cr_3**	**Cr_4**	**Cr_5**
Cr_1	**(1,1,1)**	(2/3,1,3/2)	(1,1,1)	(3/2,2,5/2)	(1,1,1)
Cr_2	(2/3,1,3/2)	**(1,1,1)**	(3/2,2,5/2)	(3/2,2,5/2)	(3/2,2,5/2)
Cr_3	(2/3,1,3/2)	(2/5,1/2,2/3)	**(1,1,1)**	(1,1,1)	(2/3,1,3/2))
Cr_4	(2/5,1/2,2/3)	(2/5,1/2,2/3)	(1,1,1)	**(1,1,1)**	(2/3,1,3/2)
Cr_5	(1,1,1)	(2/5,1/2,2/3)	(2/3,1,3/2)	(2/3,1,3/2)	**(1,1,1)**

TABLE 5. Fuzzy aggregate pairwise comparison matrix from sub-criteria of criteria 1

	Cr_{11}	**Cr_{12}**	**Cr_{13}**
Cr_{11}	**(1, 1, 1)**	(1, 1, 1)	(3/2, 2, 5/2)
Cr_{12}	(1, 1, 1)	**(1, 1, 1)**	(2/3, 1, 3/2)
Cr_{13}	(2/5, 1/2, 2/3)	(2/3, 1, 3/2)	**(1, 1, 1)**

TABLE 6. Fuzzy aggregate pairwise comparison matrix from sub-criteria of criteria 2

	Cr_{21}	**Cr_{22}**	**Cr_{23}**	**Cr_{24}**	**Cr_{25}**	**Cr_{26}**
Cr_{21}	**(1, 1, 1)**	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(1, 1, 1)
Cr_{22}	(2/3, 1, 3/2)	**(1, 1, 1)**	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)
Cr_{23}	(2/3, 1, 3/2)	(2/3, 1, 3/2)	**(1, 1, 1)**	(3/2, 2, 5/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)
Cr_{24}	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/5, 1/2, 2/3)	**(1, 1, 1)**	(2/5, 1/2, 2/3)	(1, 1, 1)
Cr_{25}	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(3/2, 2, 5/2)	**(1, 1, 1)**	(2/3, 1, 3/2)
Cr_{26}	(1, 1, 1)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(1, 1, 1)	(2/3, 1, 3/2)	**(1, 1, 1)**

TABLE 7. Fuzzy aggregate pairwise comparison matrix from sub-criteria of criteria 3

	Cr_{31}	**Cr_{32}**	**Cr_{33}**	**Cr_{34}**	**Cr_{35}**	**Cr_{36}**	**Cr_{37}**
Cr_{31}	**(1, 1, 1)**	(1, 1, 1)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)
Cr_{32}	(1, 1, 1)	**(1, 1, 1)**	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(1, 1, 1)

Pc_3	(2/3, 1, 3/2)	(2/3, 1, 3/2)	**(1, 1, 1)**	(3/2, 2, 5/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)
Pc_4	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/5, 1/2, 2/3)	**(1, 1, 1)**	(2/5, 1/2, 2/3)	(1, 1, 1)	(1, 1, 1)
Pc_5	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(3/2, 2, 5/2)	**(1, 1, 1)**	(2/3, 1, 3/2)	(2/3, 1, 3/2)
Pc_6	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	(1, 1, 1)	(2/3, 1, 3/2)	**(1, 1, 1)**	(2/3, 1, 3/2)
Pc_7	(2/3, 1, 3/2)	(1, 1, 1)	(2/3, 1, 3/2)	(1, 1, 1)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	**(1, 1, 1)**

TABLE 8. Fuzzy aggregate pairwise comparison matrix from sub-criteria of criteria 4

	Cr_{41}	**Cr_{42}**	**Cr_{43}**	**Cr_{44}**	**Cr_{45}**
Cr_{41}	**(1, 1, 1)**	(2/3, 1, 3/2)	(3/2, 2, 5/2)	(3/2, 2, 5/2)	(1, 1, 1)
Cr_{42}	(2/3, 1, 3/2)	**(1, 1, 1)**	(2/3, 1, 3/2)	(3/2, 2, 5/2)	(3/2, 2, 5/2)
Cr_{43}	(1, 1, 1)	(2/5, 1/2, 2/3)	**(1, 1, 1)**	(1, 1, 1)	(2/3, 1, 3/2)
Cr_{44}	(2/5, 1/2, 2/3)	(2/5, 1/2, 2/3)	(1, 1, 1)	**(1, 1, 1)**	(2/3, 1, 3/2)
Cr_{45}	(1, 1, 1)	(2/5, 1/2, 2/3)	(2/3, 1, 3/2)	(2/3, 1, 3/2)	**(1, 1, 1)**

TABLE 9. Fuzzy aggregate pairwise comparison matrix from sub-criteria of criteria 5

	Cr_{51}	**Cr_{52}**	**Cr_{53}**
Cr_{51}	**(1, 1, 1)**	(1, 1, 1)	(3/2, 2, 5/2)
Cr_{52}	(1, 1, 1)	**(1, 1, 1)**	(2/3, 1, 3/2)
Cr_{53}	(2/5, 1/2, 2/3)	(2/3, 1, 3/2)	**(1, 1, 1)**

Table 10. Fuzzy synthetic area values from the main criteria

Green Technological Innovation	(0.16, 0.22, 0.31)
Green Managerial Innovation	(0.19, 0.30, 0.45)
Green Process Innovation	(0.11, 0.17, 0.25)
Green Product Innovation	(0.105, 0.1481, 0.22)
Green Competitive Advantage	(0.113, 0.167, 0.25)

TABLE 11. Degree of possible fuzzy synthetic area values from the main criteria

minV (Green Technological Innovation)	0.63423
minV (Green Managerial Innovation)	1
minV (Green Process Innovation)	0.345936
minV (Green Product Innovation)	0.173669
minV (Green Competitive Advantage)	0.345936

The same steps are also taken to carry out evaluations and obtain weight values for sub-criteria. The final table 12 shows that green managerial innovation is the most important main criterion (0.4) in company performance, followed by green technological innovation criteria (0.254), green process innovation, green competitive advantage criteria (0.138), and green product innovation criteria (0.069). Following the same procedure, the sub-criteria can be compared with the corresponding main criteria, to find that the most favorable sub-criterion is production location (0.14).

TABLE 12. Weight of main criteria and sub-criteria

Main Criteria	**Weight**	**Sub-criteria**	**Weight Local**	**Weight Global**
Green Technological Innovation	0.254	Production location	0.548	0.14
		Market orientation	0.282	0.07
		Export destination	0.170	0.04
Green Managerial Innovation	0.4	Employee absence	0.164	0.066
		Training facilities for employees	0.166	0.067
		The ratio of operators to helpers on the factory floor	0.189	0.076
		The level of motivation of labor and management	0.130	0.052
		Appreciate creative suggestions	0.189	0.076

Main Criteria	Weight	Sub-criteria	Weight Local	Weight Global
		Payment system	0.162	0.065
Green Process Innovation	0.138	Working conditions of the unit	0.142	0.020
		Technological changes in the field	0.141	0.019
		Physical capital accumulation and (R&D)	0.160	0.022
		Corporate companies, management practices and work arrangements	0.115	0.016
		Resource allocation	0.160	0.022
		High level of non-first quality production	0.142	0.020
		Maintenance	0.139	0.019
Green Product Innovation	0.069	Quality of raw materials	0.267	0.018
		Frequent style changes	0.430	0.03
		Change from high volume to low volume orders	0.101	0.007
		Deviations from standard time in manufacturing	0.062	0.004
		Accessories	0.139	0.01
Green Competitive Advantage	0.138	Rejection rate	0.282	0.039
		Level of improvement (initial)	0.548	0.076
		Level of repair (final inspection)	0.170	0.023

CONCLUSION

Applying the extent analysis method on the fuzzy analytical hierarchy process to give weight to the criteria, this research concludes that currently, green managerial innovation criteria are the priority (the most important criteria) that influences the performance of the Oro Kopi Gayo company, followed by green technological innovation criteria in the second priority, green process innovation, and green competitive advantage criteria in the third priority, and the fourth priority is the green product innovation criteria. Meanwhile, production location is noted as a significant sub-criterion. With the lack of optimization of the criteria determining the company's success, it will be difficult for Oro Kopi Gayo to create a successful company. A more feasible action is to select more important factors as prioritized implementation items. The fuzzy-AHP technique provides a good solution to help decision-makers take the right actions. The results of this research can serve as a guide for coffee companies to plan strategy and innovation, helping them build a company performance evaluation system. In addition, coffee companies that serve customers can utilize the results of this research to understand customer needs and adapt to those needs. Therefore, from a company manager's perspective, this research's results provide insight to decision-makers in coffee companies and similar companies.

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