

Fostering Sustainable Agricultural Performance: The Mediating Role of Green Innovation in the Relationship between Green HRM Practices and Sustainability under the Pentahelix Model

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Abstract. This study investigates the impact of green human resource management (HRM) practices on sustainable performance in the agriculture sector of Jember Regency, Indonesia, and explores the mediating role of green innovation. The research is based on the pentahelix model, which brings together stakeholders from government, academia, business entities, society, and media to foster innovation in knowledge and sustainable agricultural products or services. A quantitative approach using Partial Least Squares Path Modeling (SEM-PLS) was employed, with data collected from 125 farmers through quota sampling method. The findings reveal that green HRM practices, including green training and development, green rewards and compensation, and green knowledge sharing, have a significant positive effect on sustainable performance among farmers. Additionally, green innovation was found to mediate the relationship between green HRM practices and sustainable performance. The study contributes to the understanding of how green HRM practices and green innovation can enhance sustainable performance in the agriculture sector, while highlighting the importance of the pentahelix model in facilitating multi-stakeholder collaboration and innovation.

Keywords: Green HRM Practices, Green Innovation, Pentahelix, Sustainable Performance

1. Introduction

Agriculture is one of Indonesia's potential that can be maximized (Ratna et al., 2020). Around 30 percent of Indonesia's land area is used for agriculture (Hastings, 2018). Since the agriculture industry heavily utilizes natural resources and contributes significantly to both the global economy especially GDP and the standard of living of people, it is clear that discussions about sustainability and the need for innovation are necessary in this field (Pacheco Dias & Souza Braga, 2022). Since environmental issues are now a major concern for the entire world (Amrial et al., 2017), particular attention must be paid to them. Indonesia is the sixth-highest emitter of greenhouse gases due to a variety of factors, including poorly managed agriculture that does not promote a sustainable environment (Hastings, 2018). Various problems are faced, such as land degradation, agricultural processing that does not grow significantly and especially the quality of the environment (Setiartiti, 2021) including also felt in agriculture in the Jember region. The difficulty lies in how to sustain agricultural expansion necessary to meet basic requirements and protect the environment. These problems have an impact on the growth of the economy (Soewarno et al., 2019). Therefore, a model is needed to support sustainable agriculture.

The various challenges faced require a model to encourage sustainability and innovation in the agricultural sector, where researchers use the pentahelix model. The pentahelix concept is common in public policy (Munir, 2022). Through this model, can make Indonesia's industrial sector can be strengthened and developed sustainably (Amrial et al., 2017). The Penta-Helix paradigm, which views scientific advancement and environmental development as crucial components of any project, can be applied in the agriculture sector to boost sustainable competitiveness. The Penta-Helix Model necessitates an inventive management approach that enables us to define with respect to natural resources because it is made up of numerous elements with unique and dynamic properties (Cabrera-Flores et al., 2020). Environmental development in the agricultural sector requires the participation of all stakeholders. The government, organizations or communities, academic institutions, the business world and the media must work together to develop a region. The collaboration between these five parties is expected to produce policies that are supported by various resources working together with each other (Hatmaja et al., 2024). If this is put into practice it can encourage sustainability and innovation in the agricultural sector.

In the globalized world, where there are abundant growth opportunities, green human resource management (HRM) is crucial for enterprises to gain a competitive edge. This is especially true for emerging economies (Al-Abbadi & Abu Rumman, 2023). Ensuring environmental preservation is a primary priority for enterprises in the current competitive market, as they strive to develop responsibly and gain a competitive advantage (Ha & Nguyen, 2022). Companies have coordinated their aims and techniques to reflect the increased importance they currently place on environmental and green management. A more contemporary, capacity-based economic structure has replaced the conventional one in the economy as a consequence of corporate globalization's realities. Stated differently, it considers environmental management as well as environmental economics (Aggarwal et al., 2023). Performance is the term used to describe the metrics or standards used to assess the effectiveness of exchange rates, production methods, and final goods. Job performance is defined as behavior (i.e., formal positions) linked to particular goals that are anticipated to meet organizational goals. It is one of the most significant outputs of an organization (Yener et al., 2021). Decision-makers can utilize these indicators to see how the network's structure, chain management, and business procedures have advanced farmers' businesses beyond their initial goals (Adetoyinbo & Mithöfer, 2023).

Several variables that play a role in sustainable performance, one of which is Green HRM Practices. Developing a workforce that understands, embraces, and applies green concepts while maintaining the organization's green HRM practices is the main objective. The preservation of intellectual property and environmentally responsible HR procedures are two essential components of green HR (Aggarwal et al., 2023; Li et al., 2023). Businesses are facing pressure from many groups to implement this practice due to the favorable societal impacts it will have. Consequently, several companies have started looking

for more ways to solve environmental management issues. Environmental harm has led to the development of GHRM as one remedy (Hadi et al., 2023). The strategic tension between long-term growth and environmental concerns is being addressed at several levels. Environmental restoration has grown in importance for a long time (Fang et al., 2022). The HR section of any association is in charge of describing the strategies meant to produce the planned representatives that are ecologically friendly. Green HRM presents a number of difficulties for the HR department. The association's successful Green HRM practices and values encounter several obstacles. Each employee behaves in accordance with their own distinct sense of judgment, acceptance, and mannerisms (Alnaqbi et al., 2024).

Another variable to reach sustainable performance is green innovation. Green innovation, measures how well a company does in creating improved environmental through efficient and successful management techniques (Yuniarti et al., 2022). Green innovation pertains to the intentional endeavors aimed at mitigating or minimizing the unfavorable ecological consequences linked to the manufacturing or administration of commodities, ultimately enhancing the efficacy of environmental governance (Taleb & Pheniqi, 2023; Xu & Liu, 2023). An innovation concept that produces new products, processes or technologies that are environmentally friendly, efficient in using resources and reduce negative impacts on the environment. In order to achieve high-class expansion during the crucial period, agriculture plays a crucial role in fostering green technological progress as players in market development (Wibowo et al., 2024; Yang et al., 2024). Owners now understand that green innovation may provide them a competitive edge and is crucial to sustainable development (Song & Yu, 2018) including agriculture sector.

Political and scholarly interest in environmental issues is growing as a result of each nation's policies pertaining to these issues (Yuniarti et al., 2022). Similarly, internal resource and competence limitations can make it difficult to consider more green innovation. (Mellett et al., 2018). In this era of acceleration, the use of digital technology is essential for achieving ambitious and long-term objectives. an intelligent, low-carbon, green urban growth paradigm. Furthermore, new prospects have been brought about by digitalization, technology manufacturing methods for green innovation enterprises (Yang et al., 2024). Product and process innovation tasks must be prioritized in order to meet the environmental innovation target (Song & Yu, 2018). Additionally, the business environment in which farmers interact and operate is imperfect can reduce competitive performance (Adetoyinbo & Mithöfer, 2023). Agriculture becomes a system that is able to struggle and strengthen his position. For farmer-entrepreneurs, get involved in network gives them the opportunity to predict market trends, and at the same time suppliers or buyers, farmers can anticipate future market demand (Udimal et al., 2021).

Effective GHRM practices encourage ecological resource utilization with a focus on environmental sustainability and improve HRM by raising knowledge of the value of environmental protection (Hadi et al., 2023). Previous research refers to research conducted by (Altassan, 2024; Fang et al., 2022; Mensah et al., 2023) where green HRM has a positive effect to green innovation. After organizational commitment to environmentally friendly behavior is implemented in human resource management practices, it is hoped there will be changes in individual employee behavior to behave environmentally friendly in the work environment. Previous research refers to research conducted by (Al-Abbadi & Abu Rumman, 2023; Almemari et al., 2021; Bahmani et al., 2023; Hadi et al., 2023) where green HRM has a positive impact on sustainable performance. Environmental innovation nowadays aims to lessen the effect that processes and products have on the environment (Yuniarti et al., 2022). Previous research refers to study by (Bahmani et al., 2023; Cen, 2023; Xue et al., 2019; Yuniarti et al., 2022) where green innovation has a positive effect on performance. By adopting a green mindset and utilizing green communication channels, employees' green behavior and awareness are increased through the use of GHRM development. Prior research is defined as studies carried out by (Akhtar et al., 2023; Fang et al., 2022; Zhao & Huang, 2022).

Agriculture was chosen because in Indonesia agriculture is one of the sectors that produces the

largest level of economic activity and contributes to GDP (Pacheco Dias & Souza Braga, 2022). Farmers are regarded as early adopters and innovators. This method may provide fresh perspectives on how the pentahelix model is applied in agriculture. There are still discrepancies in the findings that the researchers have discovered, which makes this research crucial. The pentahelix model will later describe the role of each stakeholder, such as the government as a regulator, farming communities as economic actors, investors as fund contributors, business actors as product buyers and the media as stakeholders in publications. Where every stakeholder will play a role green HRM practices to sustainable performance through green innovation. As a result, the study presented in this paper enables the development of a Penta-Helix Model-based framework that promotes greater project efficiency for natural resource management. So this research concentrates on determining the influence of green HRM Practices to farmer performance through green innovation using the pentahelix model in agricultural sector.

2. Literature Review

2.1. Pentahelix Model

The risk of continuing to engage in activities necessitates the concerted efforts of an Innovation Penta Helix Strategy, which consists of risk capital, industry, academia, government, and entrepreneurs united share a common vision to establish an ecosystem for innovation that can capitalize on the benefits of the new technological wave (Capetillo et al., 2021; Wicaksono et al., 2023). Adaptation of the development of the pentahelix image as follows:

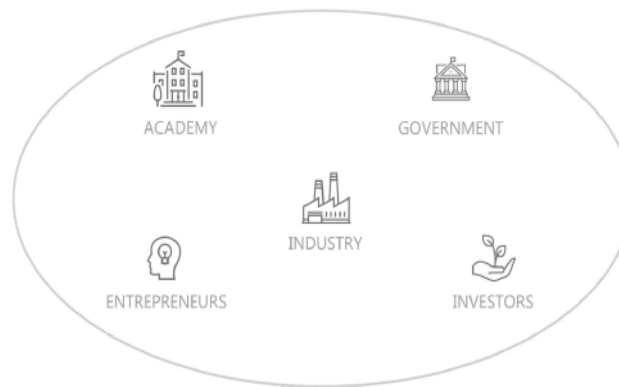


Fig 1. Development of Pentahelix Model

Source: (Capetillo et al., 2021)

Stakeholder analysis plays a crucial role in both public and private organizations (Kismartini et al., 2023). Furthermore, every component of the Penta-Helix Model needs to function in multiple ways, bringing concepts and best practices to particular natural resources (Cabrera-Flores et al., 2020).

2.2. Green HRM Practices

Green HRM is the application regulations to promote environmental causes and the wise use of resources within companies, boost morale and employee satisfaction (Aggarwal et al., 2023). Organizations have a big part to play in addressing environmental management issues because they contribute significantly to environmental degradation (Hadi et al., 2023). Service-based firms should put more of an emphasis on employee behavior and the service-based component in order to achieve their objectives and succeed in competitive markets (Hu et al., 2023). In the contemporary context, green Green HRM is defined as concentrating on environmental issues inside work activity in a holistic manner that includes waste management, development areas, and member green behavior (Bahmani et al., 2023). Green performance practice using established green standards to evaluate employees' work to offer incentives based on the achievement of the organization's green goals (Aboramadan, 2022). It

have been outlined in a recent study on GHRM practices to clarify the function of GHRM in HRM: employees' environmental awareness and their pursuit of chances that are environmentally beneficial (Altassan, 2024).

2.3. Green Innovation

Green innovation capabilities are taken even further develop the dynamic capabilities of owners and micro companies, although networks might ease access to more resources, they can also give facilities, space, and chances for resource sharing (Mellett et al., 2018). An innovation concept that produces new products, processes or technologies that are environmentally friendly, efficient in using resources and reduce negative impacts on the environment (Muafi, 2024). In order to achieve high-class expansion during the crucial period, agriculture plays a crucial role in fostering green technological progress as players in market development (Yang et al., 2024; Zhang, 2023). The creation of environmentally friendly products lowers a company's overall environmental impact and enhances its financial and social performance by reducing expenses and encouraging the production of sustainable goods, which also saves time and money. This is referred to as improved environmental performance (Ngo & Ngo, 2023). Owners now understand that green innovation may provide them a competitive edge and is crucial to sustainable development (Song & Yu, 2018) including agriculture sector.

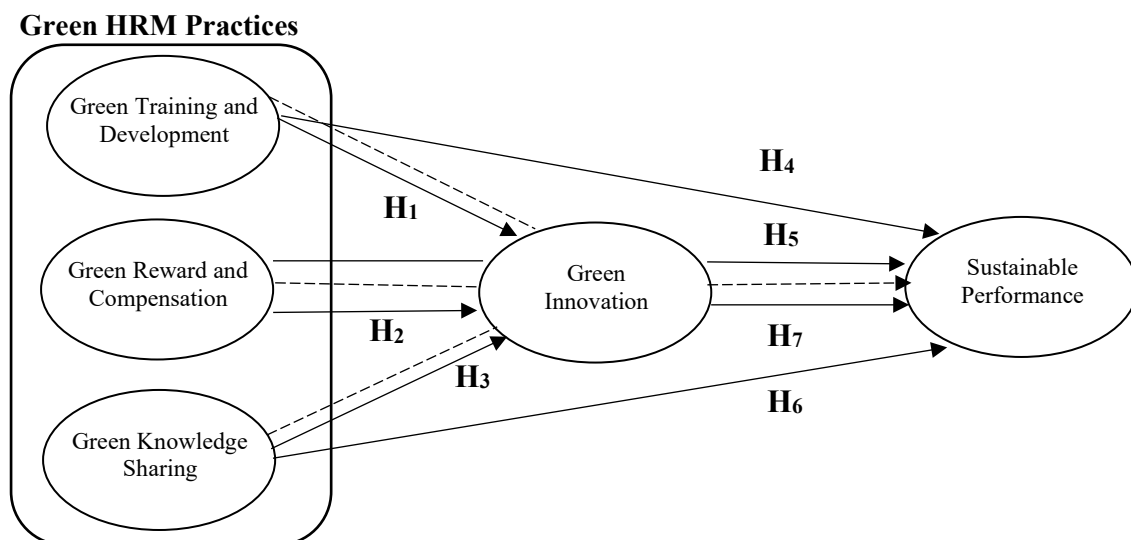
2.4. Sustainable Performance

Sustainable performance is connection that exists economic, social, and environmental performance its business (Alraja et al., 2022). It is the ability of the company to achieve its goals in long-term social, environmental, and economic obligations in mind (Al-Abbadi & Abu Rumman, 2023). According to the Organization for Economic Cooperation and Development (OECD) Sustainable performance is:

Sustainable performance: Given that it speaks to people's mindsets and ways of thinking, it is among the most significant components of sustainability. Together with goals, equitable living conditions, social discourse, responsibility delegation, and cultural and heritage preservation.

Sustainable performance refers to the metrics or standards used to assess the effectiveness of exchanges, manufacturing methods, and goods. Job performance is defined as behavior (i.e., formal positions) linked to particular goals that are anticipated to meet organizational goals. It is one of the most significant outputs of an organization (Sari et al., 2024; Yener et al., 2021). Decision-makers can utilize these indicators to see how the network's structure, chain management, and business procedures have advanced farmers' businesses beyond their initial goals (Adetoyinbo & Mithöfer, 2023).

2.5. Conceptual Model and Hypothesis Development



Information: —→ **Direct Effects**
 --→ Indirect Effects

Fig 2. Conceptual Model Research
 Source: Developed by Researchers (2024)

Green HRM Practice to Green Innovation

Definition and conceptualization of GHRM practices include the following: Green performance reviews using established green standards to evaluate employees' work; green hiring and recruiting of staff members who have knowledgeable about environmental issues; green training to enhance and green rewards to organization's green goals (Aboramadan, 2022). Globally, green development has given rise to the concept of Green HRM, which promotes sustainability. Businesses can benefit from green HRM by raising client knows of their brand by putting appropriate procedures in place (Almemari et al., 2021). Previous research refers to research conducted by (Altassan, 2024; Fang et al., 2022; Jinliang et al., 2023; Joseph, 2023; Mensah et al., 2023) where green HRM has a positive effect to green innovation. So, based on previous research, a hypothesis can be drawn, namely:

H₁: Green Training and Development has positive impact to Green Innovation

H₂: Green Reward and Compensation has positive impact to Green Innovation

H₃: Green Knowledge Sharing has positive impact to Green Innovation

Green HRM Practice to Sustainable Performance

Service-based firms should put more of an emphasis on employee behavior and the service-based component in order to achieve their objectives and succeed in competitive markets (Hu et al., 2023). Human resource managers frequently actively promote their company's environmental credentials to draw in job seekers who are searching for companies that align with their values (Fang et al., 2022). Previous research refers to research conducted by (Al-Abbadi & Abu Rumman, 2023; Almemari et al., 2021; Bahmani et al., 2023; Hadi et al., 2023; Shahzad et al., 2024). where green HRM has a positive impact on to performance. So, based on previous research, a hypothesis can be drawn, namely:

H₄: Green Training and Development has positive impact to Sustainable Performance

H₅: Green Reward and Compensation has positive impact to Sustainable Performance

H₆: Green Knowledge Sharing has positive impact t to Sustainable Performance

Green Innovation to Sustainable Performance

According to (Jirakraisiri et al., 2021) Green innovation is a collection of tools for enhance a company's environmental management procedure. Examples of these tools include innovations pertaining to energy conservation, pollution avoidance, trash recycling, and toxin elimination. Environmental innovation nowadays aims to lessen the effect that processes and products have on the environment (Yuniarti et al., 2022). Previous research refers to research conducted by (Bahmani et al., 2023; Cen, 2023; Xue et al., 2019; Yuniarti et al., 2022) where green innovation has a positive effect on to performance. So, based on previous research, a hypothesis can be drawn, namely:

H₇: Green Innovation has positive impact to Sustainable Performance

Green Innovation as Mediation in Green HRM Practice to Sustainable Performance

The group of HRM practices known as GHRM assists companies in making more sustainable use of their resources and protecting the environment from harm brought about by their operations. By adopting a green mindset and utilizing green communication channels, employees' green behavior and awareness are increased through the use of GHRM development. Prior research is defined as studies carried out by (Akhtar et al., 2023; Fang et al., 2022; Zhao & Huang, 2022; Shahzad et al., 2024). So, based on previous research, a hypothesis can be drawn, namely:

H₈: Green Training and Development has positive impact to Sustainable Performance Through Green Innovation

H₉: Green Reward and Compensation has positive impact to Sustainable Performance Through Green Innovation

H₁₀: Green Knowledge Sharing has positive impact to Sustainable Performance Through Green Innovation

The results of previous research studies written by researchers, give rise to inconsistencies and gaps in each research, so this research is important to carry out in order to add strength to the research results.

3. Research Methodology

3.1. Analysis Method

This study design employs a quantitative methodology with SmartPLS 3.0 software with Partial Least Squares Path Modeling (SEM-PLS) method to analyze the hypothesis and ascertain the impact of green HRM on sustainable performance through green innovation with the research object, namely farmers in Jember Regency. Analytical tools used in the study This is Smart-PLS. Purpose of use Smart-PLS can predict connections between constructs, confirm theories, and can also be used. To explain, there is a connection or not between variables (Hair, 2017).

3.2. Population and Sample

Population is defined as all objects/people to be studied. All of the participants in this study are farmers in Jember Regency. The sample is defined as part of the population whose determination is adjusted to the needs of the researcher (Sugiyono, 2018). The demographics of this research consist of farmers in Jember Regency. The size of the population in this study is not known with certainty, so the sampling method used is non-probability sampling, especially quota sampling. Quota sampling is a technique for determining a sample from a population that has certain characteristics up to the desired number (quota) (Sugiyono, 2018). This research using cross-sectional studies allows researchers to look at multiple characteristics at once. Because research data is collected all at once, multiple variables can be assessed simultaneously.

The minimum number of respondents required is 85 respondents, the maximum is 170 respondents. Researchers took a sample size between the minimum and maximum limits of respondents required to fill out the questionnaire, namely 125 farmers. Jember has agricultural areas spread across 31 sub-districts and requires 4 farmers in each sub-district to fill out the questionnaire so that each region has the same quota to be used as research samples.

3.3. Variable Measurement

According to (Hair, 2017) While the structural model outlines the in the variables, the measurement model explains how each construct is measured. All variables were measured using previously established and utilized tools to enable comparison of this study with earlier research. before to distribution. The questionnaire item scale: greatly agree (1), strongly disagree (5). The results are presented in table 1:

Table 1. Variable Measurement

Variable		Reference	Questionnaire Statement	Code
Green HRM Practice (Independent Variable)	Green Training and Development	(Almemari et al., 2021)	I benefited from environmental sustainability-based training	GTD1
			I have a vision for the future and am always active in efforts to improve the quality of life	GTD2
			I have the courage to make breakthroughs to protect the environment	GTD3
	Green Reward and Compensation	(Almemari et al., 2021)	I get rewards according to innovative environmental performance	GRC1
			I received an award for environmental performance	GRC2

			I get monetary rewards based on environmental performance	GRC3
			I received a reward for initiating a green environment	GRC4
			I feel that environmental performance is recognized publicly	GRC5
Green Knowledge Sharing	(Ngo & Ngo, 2023)		I have a good ability to follow changes that occur	GKS1
			I always try to share knowledge, experience, ideas with employees regularly at my place of business	GKS2
			I have the ability to develop new knowledge to improve the quality of the products I produce	GKS3
Green Innovation (Mediation Variable)	(Yuniarti et al., 2022)		I always try to improve the quality of the new products I produce	GI1
			I always take the initiative in developing new ways in the production process	GI2
			I am able to implement ideas for new, more effective and efficient resource allocation	GI3
Sustainable Performance (Dependent Variable)	(Almemari et al., 2021)		Sales volume (sales growth)	SP1
			Company assets (assets growth)	SP2
			Operational profits (profit growth)	SP3

Source: Primary data processed by researchers (2024)

3.4. Data Collection Tecnique

In February 2024, farmers were requested to complete standardized questionnaires, and enumerators were trained to gather this information through direct questionnaire completion. This study used a variety of data gathering techniques, including questionnaires, which are lists of questions that are printed or printed out and handed to respondents to complete. Interview: this is a direct-ask approach of gathering data from farmers. observation, specifically the methodical or sequential recording of the variables under study (Sugiyono, 2018).

4. Research Results

4.1. Respondent Characteristics

Characteristics of respondents is part of the use of primary data, namely questionnaires answered by respondents. Based on primary data from questionnaires to farmers in Jember Regency, an overview of gender, age, business experience, level of education and annual sales in table 2:

Table 2. Responden Characteristics

Respondent Characteristics	Item	Frequency (Person)	Percentage (%)
Gender	a. Man	86	68,8
	b. Woman	39	31,2
	Amount	125	100
Age	a. 22-29 years	4	3,2
	b. 30-37 years	42	33,6
	c. 38-45 years	48	38,4
	d. ≥ 50 years	31	24,8
	Amount	125	100
Business Experience	a. < 5 years	3	2,40
	b. 5-10 years	27	21,6
	c. 11-15 years	41	32,8

	d. 16-20 years	43	34,4
	e. > 20 years	11	8,8
	Amount	125	100
Level Of Education	a. Senior High School	73	58,4
	b. SD/SMP	12	9,6
	c. S1	40	32
	Amount	125	100
Sales Results Per Year (Rp.000)	a. < 75.000	36	28,8
	b. 75.000-149.000	42	33,6
	c. 150.000-224.000	24	19,2
	d. 225.000-300.000	23	18,4
	Amount	125	100

Source: Primary data processed by researchers (2024)

The attributes of the respondents are grouped according to gender, age, business experience, education, and yearly sales in table 2 above. Men made up the majority, with 86 individuals, or 68.8%, and women, with 39 individuals, or 31.2%. Then, the majority of people (48 out of 48, or 38.4%) are 38–45 years old, and the majority of people (43 out of 34.4%) have 16–20 years of company experience. Based on the latest education, the majority are senior high school with 73 people or 58.4% and finally the highest annual sales are in the range of Rp. 75,000,000-Rp. 149,000 with a total of 73 people or 58.4%.

4.2. Data Analysis Result

4.2.1. Instrument Test

a. Validity Test

When conducting research, it is important to know whether or not the frequency distribution of the data provided by respondents when filling out the questionnaire is valid or not as a means of measuring the accuracy of the indicator values for the variables, so a validity test is carried out. Convergent and discriminant validity are used to assess the collected data. According to (Duryadi, 2021) For an indication to be deemed legitimate, the correlation value needs more than 0,6. The results in table 3 below:

Table 3. Convergent Validity Test

Variable	Item	Loading Factor		Ket.
		Score	Rule of Thumb	
Green Training and Development (X ₁)	X _{1.1}	0,854	0,600	Valid
	X _{1.2}	0,779	0,600	Valid
	X _{1.3}	0,625	0,600	Valid
Green Reward and Compensation (X ₂)	X _{2.1}	0,881	0,600	Valid
	X _{2.2}	0,849	0,600	Valid
	X _{2.3}	0,759	0,600	Valid
	X _{2.4}	0,826	0,600	Valid
	X _{2.5}	0,796	0,600	Valid
Green Knowledge Sharing (X ₃)	X _{3.1}	0,800	0,600	Valid
	X _{3.2}	0,833	0,600	Valid
	X _{3.3}	0,879	0,600	Valid
Green Innovation (Z)	Z _{1.1}	0,804	0,600	Valid
	Z _{1.2}	0,885	0,600	Valid
	Z _{1.3}	0,734	0,600	Valid
Sustainable Performance (Y)	Y _{1.1}	0,724	0,600	Valid
	Y _{1.2}	0,732	0,600	Valid

Y _{1,3}	0,780	0,600	Valid
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Source: Primary data processed by researchers (2024)

The goal of convergent validity is to assess an indicator's suitability as a measuring variable based on how each variable indicator loads externally. If each indicator's outer loading value matches a preset number, the indicator is considered to have strong reliability. Table 3 shows that all indicators for each variable show a loading factor value above 0.6 so indicators can be declared valid. Next, the AVE value is examined to conduct testing. A research model is considered good if the AVE value is greater than 0.5 (Duryadi, 2021). To ascertain if the requirements discriminant validity, AVE is utilized. The results in table 4 below:

Table 4. Average Variance Extracted (AVE) Test

Variable	Loading Factor		Ket.
	Score	Rule of Thumb	
Green Training and Development (X ₁)	0,575	0,500	Valid
Green Reward and Compensation (X ₂)	0,678	0,500	Valid
Green Knowledge Sharing (X ₃)	0,702	0,500	Valid
Green Innovation (Z)	0,556	0,500	Valid
Sustainable Performance (Y)	0,656	0,500	Valid

Source: Primary data processed by researchers (2024)

Table 4 shows that the AVE value is higher than 0.5 so that all variables used in this research are said to be valid.

b. Reliability Test

Dependability tests are performed to ascertain the dependability of a research variable. In this study, the reliability tests are conducted using the Cronbach alpha and composite reliability methods. According to (Duryadi, 2021) A variable's composite reliability and Cronbach alpha values need to be more than 0.6 in order for it to be considered reliable. The results are presented of table 5 below:

Table 5. Reliability Test

Variable	Cronbach Alpha		Composite Reliability		Ket.
	Score	Rule of Thumb	Score	Rule of Thumb	
Green Training and Development (X ₁)	0,634	0,600	0,800	0,600	Reliable
Green Reward and Compensation (X ₂)	0,880	0,600	0,913	0,600	Reliable
Green Knowledge Sharing (X ₃)	0,787	0,600	0,876	0,600	Reliable
Green Innovation (Z)	0,735	0,600	0,851	0,600	Reliable
Sustainable Performance (Y)	0,603	0,600	0,790	0,600	Reliable

Source: Primary data processed by researchers (2024)

Table 5 demonstrates every research variable has a composite reliability value and Cronbach alpha is greater than 0.6, indicating variables are deemed trustworthy and suitable for use as a hypothesis test, indicator of respondent consistency in answering a variable correctly or consistently.

4.2.2. Partial Least Square Analysis

Partial Least Square (PLS) analysis which seeks to identify how variables relate to one another as well as variables and their indicators and create a model as a predictor.

a. Structural Model

This research uses variable X (exogenous) which consists of Green Training and Development (X₁), Green Reward and Compensation (X₂), and Green Knowledge Sharing (X₃). Meanwhile, variable Z (endogenous 1) is Green Innovation and variable Y (endogenous 2) is Sustainable Performance.

b. Path Diagram Construction

According to (Duryadi, 2021), For explanatory research, the loading factor value needs to be more than 0.6 in order to be considered a construct indicator that satisfies the criteria.

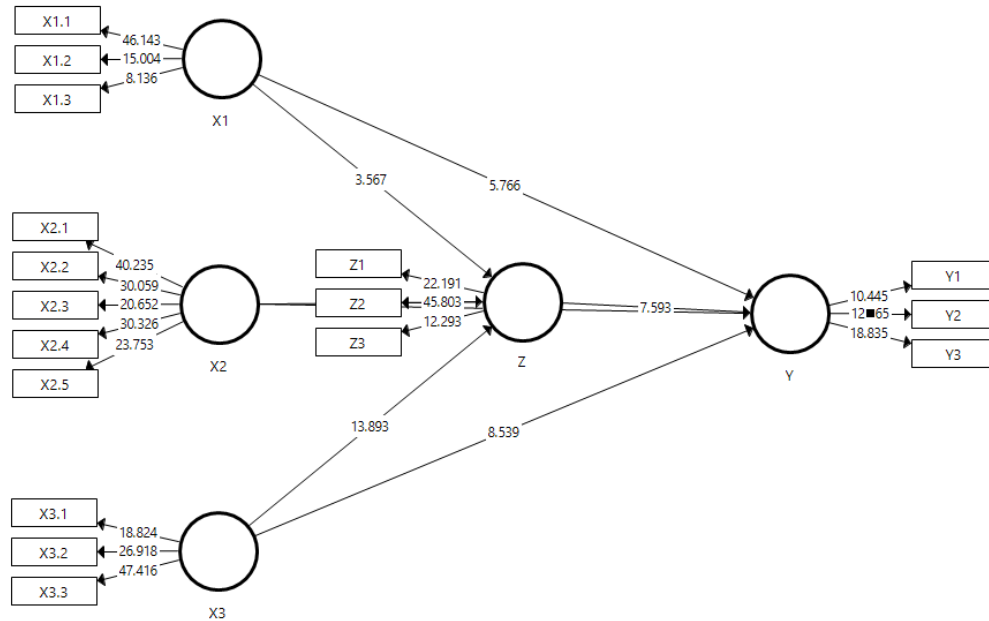


Fig. 3 Line Construction Diagram

Source: Primary data processed by researchers (2024)

Path Diagram Construction merges the inner and outer models using the SmartPLS 4.0 application. In Figure 3 describe, this study employed a reflecting model (arrow pointing from construct to indicator) because the construct is reflected or embodied in the indicator. Indicators in variable green human resource practices, for instance, where these three indicators constitute the X1 variable or construct, are used in this context and same for other variables in this research.

c. Evaluation Goodness of Fit

There are two testing phases involved in evaluating goodness of fit: testing the outer model and testing the inner model. Outer model testing is a test that is useful for determining the level of validity and reliability of an indicator. Validity testing uses convergent validity and discriminant validity methods, while reliability testing is based on composite reliability and Cronbach alpha methods. These four tests have been carried out in the instrument test, so that the outer model testing is considered to have been carried out and continues to the next stage, namely inner model testing. When doing inner model testing, f-square (f^2) and Q-square (Q^2) are used to determine impact size and predictive relevance, respectively. The R-Square (R^2) value, known as the determinant coefficient is used. According to (Duryadi, 2021) The A score of 0.67 indicates a significant exogenous effect on the endogenous, a value of 0.33 indicates a moderate exogenous influence, and a value of 0.19 indicates a tendency for the exogenous influence on the endogenous to be mild. The results are in table 6 below:

Table 6. R-Square Test

Variable	R-Square	Ket
Green Innovation (Z)	0,880	Strong
Sustainable Performance (Y)	0,861	Strong

Source: Primary data processed by researchers (2024)

Table 6 shows that the value achieved in variable sustainable performance (Y) is 0.861 or 86.1% (strong), whereas value variable green innovation (Z) is 0.880 or 88% (strong). So the ability of the green training and development (X_1), green reward and consumption (X_2), green knowledge sharing (X_3) variables to influence the green innovation variable (Z) is 88.0%, while influencing the sustainable performance variable (Y) is 86.1%. Thus, other factors not employed in the research describe fewer than 15% of the remaining variables related to green innovation and sustainable performance.

The F-Square (F^2) technique is the next test. In addition to determining whether a significant association exists between variables, so have to determine the extent of the impact between variables

using the effect size, or F-Square. For this test, if 0.02 for a little influence, 0.15 for a medium influence, and 0.35 for a high influence. The results are presented in table 7 below:

Table 7. F-Square Test

Variabel	F-Square	
	Green Innovation (Z)	Sustainable Performance (Y)
Green Training and Development (X ₁)	0,083	0,448
Green Reward and Compensation (X ₂)	0,057	0,244
Green Knowledge Sharing (X ₃)	0.390	0,822
Green Innovation (Z)		0,766

Source: Primary data processed by researchers (2024)

Table 7 explains that based on the value obtained, namely 0.083, which means that the Green Training and Development (X₁) variable and the value of 0.057 for the Green Reward and Compensation (X₂) variable means it has a small influence on the Green Innovation (Z) variable. However, the knowledge sharing variable (X₃) has a value of 0.390 which has a moderate effect on Green Innovation (Z). Then the Green Training and Development (X₁) variable has a value of 0.448, the Green Reward and Compensation (X₂) variable is 0.244, and Green Knowledge Sharing (X₃) is 0.822, meaning it has a moderately large influence on the Sustainable Performance (Y) variable. The Green Innovation variable on sustainable performance also has a large influence, namely 0.766.

Next, the Q-Square (Q²) test was carried out. In the q-square test, there is a rating range, namely $0 < Q^2 < 1$. This means that if the Q² value is closer to one, then the model is said to be getting better. The Q-Square calculation is as follows:

Table. 8 Q Square Test

Variable	Q Test
Green Innovation (Z)	0,556
Sustainable Performance (Y)	0,449

Source: Primary data processed by researchers (2024)

The Q-Square calculation this research were 0.556 or 55.6% for the green innovation variable and the sustainable performance value was 0.449, which was 44.9%. So that the model in this research has relevant predictive value, where the model used can explain the information contained in the relatively large research data.

The final test on the inner model is the goodness of fit value. The calculation is carried out using the following formula:

$$\text{GoF} = \sqrt{\text{AVEX } R^2}$$

$$\text{GoF} = \sqrt{0,633} \times 0,870$$

$$\text{GoF} = 0.742$$

Based on the calculation above, the GoF obtained is 0.742, which means the GoF value is 74.2%. The final value of GoF supports the results of the R² calculation analysis, so it can be concluded that the model is said to be good or has good predictive value for conditions in the field so that it can be used to carry out hypothesis testing.

d. Hypothesis Testing

Using the bootstrap resampling method, hypothesis testing employs to assess the relevance of the influence of exogenous variables on endogenous variables. The p-value used in this study is less than 5%, or 0.05.

a) Direct Effects

Without the use of additional endogenous variables as a mediator, the direct effect test demonstrates

the direct impact of exogenous variables on endogenous variables. Table 9 below presents the findings from the hypothesis testing for direct influence:

Table 9. Path Coefficient Results and Hypothesis Testing

Variable	Path Coefficient	t-statistic	p-value	Ket
$X_1 \rightarrow Z$	0,047	3,677	0,000	Significant
$X_2 \rightarrow Z$	0,056	2,634	0,008	Significant
$X_3 \rightarrow Z$	0,065	13,931	0,000	Significant
$X_1 \rightarrow Y$	0,080	5,629	0,000	Significant
$X_2 \rightarrow Y$	0,069	11,029	0,000	Significant
$X_3 \rightarrow Y$	0,137	8,485	0,000	Significant
$Z \rightarrow Y$	0,125	7,494	0,000	Significant

Source: Primary data processed by researchers (2024)

Based on table 9 above which describes the direct influence, it was found that each p-value showed <0.05 , so that green HRM practices have an effect on green innovation, and also have an effect on sustainable performance. Then green innovation has a significant positive impact on sustainable performance. This shows that H_1 to H_7 are accepted and H_0 is rejected.

b) Indirect Effects

Indirect influence testing shows the indirect influence of exogenous variables on endogenous variables through other endogenous variables. The results in table 10 below:

Table 10. Indirect Effect Calculation Results

Variable	Path Coefficient	t-statistic	p-value	Ket
$X_1 \rightarrow Z \rightarrow Y$	0,049	3,333	0,001	Signifikan
$X_2 \rightarrow Z \rightarrow Y$	0,061	2,258	0,024	Signifikan
$X_3 \rightarrow Z \rightarrow Y$	0,140	6,086	0,000	Signifikan

Source: Primary data processed by researchers (2024)

Table 10 above which describes the direct influence, it was found that each p-value showed a result of <0.05 so that green HRM practices had an impact on green innovation and also had an impact on sustainable performance through green innovation so that H_8 to H_{10} were accepted and H_0 was rejected.

4.3. Discussion of Research Results

4.3.1. Direct Effect of Research

According to Table 9 shows that the Green Training and Development, Green Reward and Compensation, and Green Knowledge sharing have significant affect on Green Innovation variable obtained a p-value. So H_1 , H_2 , and H_3 is accepted and H_0 is rejected. Strategic planning must include green HRM, and both senior management and staff must be committed to it. Strategic planning with HRM's assistance is necessary for manufacturing firms to make the most of their current resource base. The worker is the focal point of eco-friendly tactics (Almemari et al., 2021). Environmental deterioration is currently a concern for all businesses globally, particularly small and medium-sized enterprises. It is anticipated that environmental cooperation and green innovation would be the main drivers of environmental preservation and business performance (Achmad et al., 2023). Green innovation is the own novel procedures and services with a favorable environmental impact. Previous study refers to research conducted by (Altassan, 2024) where green HRM has a positive effect to green innovation in SME Saudi Arabia, same result with (Fang et al., 2022) conducted manufacturing in Malaysia and also result of (Mensah et al., 2023) at different country in Ghana with the same result.

According to Table 9 shows that the Green Training and Development, Green Reward and

Compensation, and Green Knowledge sharing have significant affect on Sustainable Performance variable obtained a p-value. So that H_4 , H_5 , and H_6 is accepted and H_0 is rejected. This must also be applied to agriculture in Jember Regency. The process of implementing environmentally friendly behavior relating to environmentally friendly behavior in HRM is implemented in the employee training activities, in the compensation system for employees, and in knowledge sharing agricultural sector. After organizational commitment to environmentally friendly behavior is implemented, it is hoped that there will be changes in individual employee behavior to behave environmentally friendly in the work environment. Previous research refers to research conducted by (Al-Abbadi & Abu Rumman, 2023; Almemari et al., 2021) carried out in the firms sector. Another researchers (Bahmani et al., 2023; Hadi et al., 2023) have the same result where green HRM has an effect on sustainable performance.

Table 9 explain Green Innovation variable has a significant influence on the sustainable performance among farmers in the agricultural sector of Jember. So that H_7 is accepted and H_0 is rejected. Environmental innovation nowadays aims to lessen the effect that processes and products have on the environment (Yuniarti et al., 2022). Previous study refers to research conducted by (Bahmani et al., 2023; Cen, 2023; Xue et al., 2019; Yuniarti et al., 2022) in different object, (Bahmani et al., 2023) conducted in university, (Cen, 2023) conducted in organization, (Xue et al., 2019; Yuniarti et al., 2022) conducted in firm, where green innovation has an impact on to sustainable performance.

4.3.2. Indirect Effect of Research

Table 10 shows that Green Training and Development, Green Reward and Compensation, and Green Knowledge sharing variable on Sustainable Performance Through the Green Innovation variable among farmers in the agricultural sector of Jember Thus it can be said that H_8 , H_9 , and H_{10} is accepted and H_0 is rejected. When GHRM principles are applied in a company, the organization experiences a number of benefits. In their research, academics have employed various GHRM techniques (Mohammad et al., 2021). This study only looks at green HR practices that assist employers in hiring workers who have experience with the environment and who can help staff members develop their skills (through training and development), take environmental initiatives (through reward and compensation), and share knowledge.

The group of HRM practices known as GHRM assists companies in making more sustainable use of their resources and protecting the environment from harm brought about by their operations. By adopting a green mindset and utilizing green communication channels, employees' green behavior and awareness are increased through the use of GHRM as a scale for development. Prior research is defined as studies carried out by (Akhtar et al., 2023; Fang et al., 2022; Zhao & Huang, 2022).

4.4. Implementation of Green HRM Practice, Green Innovation on Sustainable Performance Based on Pentahelix Model

This study answers the main challenges in green innovation from the individual level, namely farmers in the agricultural sector with the Pentahelix approach, which concentrate to environment damage that have been problems in the development world in Indonesia. The application of Pentahelix in the agricultural sector has contributed to creating a sustainable performance agricultural sector in terms of environmental, social, and economic aspects (Setianingsih et al., 2022). The Pentahelix which consists of government, academia, government, entrepreneurs and media united share a common vision to establish an ecosystem for innovation that can capitalize on the benefits of the new technological wave (Capetillo et al., 2021; Wicaksono et al., 2023). The Penta helix approach enables energy and stakeholder cooperation to achieve common goals in agribusiness development.

Applications that can be carried out based on the pentahelix model in agriculture sectors are: starting from the government, especially regional governments, making regulations that can make it easier for farmers, starting from regulations related to fertilizer, buying and selling systems and prices. The farming community can support farmer performance by participating in training programs that support

farmer performance, so that farmers can continue to innovate in a way that supports the environment. Academics can increase literature or research related to green HRM, such as creating a kind of environmentally based HRM flow. Inventors can further maximize funding that can support farmers' results, thereby supporting sustainable farmer performance. Business institutions, namely by purchasing various farmers' products in Jember so as to maximize regional results. Lastly, the media can publish in various media to explore various agricultural potentials that support the environment. If everything is done correctly, it will create green HRM practices for performance by maximizing innovation and achieving a sustainable environment.

This study also explains impact of green innovation as a mediation on the association with environmentally green HRM practices and environmental sustainability. Eco-friendly agriculture, an emerging global challenge, has driven the agricultural sector to continuously develop its sustainability capacity and adopt green innovation practices to protect the environment and improve business outcomes (Cabrera-Flores et al., 2020). The variables of green HRM practices collectively provide a comprehensive recognition of how green HRM practices and environmental impacts are interrelated (Shahzad et al., 2024). The findings reveal that there is a strong and positive influence of green HRM practices on sustainable performance and the mediating effect of green innovation (Altassan, 2024; Jinliang et al., 2023).

There are several theoretical contributions as a result of this research. First, this study strengthen the perspective on the relationship in green HRM practices and pentahelix practices (Cabrera-Flores et al., 2020; Setianingsih et al., 2022). Therefore, due to the growing environmental awareness between agriculture farmers, the findings of this research explore the need for critical competencies of organizations, namely green HRM practices and their implementation (i.e., green training and development, green rewards and compensation, green knowledge sharing) enhancing green innovation (Jinliang et al., 2023; Shahzad et al., 2024). This research expands the framework concept and suggests that the agriculture sector can improve its sustainability performance by adopting green HRM practices. Previous research confirms the findings of this research as implementation of a framework is necessary to form associations across organizations by enforcing the ability of all farmers to be involved in seizing opportunities to improve sustainability performance (Al-Abbadi & Abu Rumman, 2023; Almemari et al., 2021; Bahmani et al., 2023; Hadi et al., 2023). Thus, these findings confirm that green HRM practices promote sustainable performance through green innovation (Akhtar et al., 2023; Fang et al., 2022; Shahzad et al., 2024; Zhao & Huang, 2022). The limitation of the alternative carried out by researchers is that the research is only limited to the Jember area so that in the future it can be explored in various other areas to test further research.

5. Conclusions and Implications

5.1. Conclusions

The findings of the research indicate that Green HRM significantly improves Sustainable Performance in Jember Regency Agriculture. Green innovation is then possible to mediate the effect of green HRM Practice on sustainable performance, based on comparable data processing outcomes. Good GHRM practices encourage ecological resource utilization with a focus on environmental sustainability and improve HRM by raising knowledge of the value of environmental protection (Hadi et al., 2023). Previous research refers to research conducted by (Altassan, 2024; Fang et al., 2022; Mensah et al., 2023) where green HRM has an effect to green innovation. Previous research refers to research conducted by (Bahmani et al., 2023; Cen, 2023; Xue et al., 2019; Yuniarti et al., 2022). By adopting a green mindset and utilizing green communication channels, employees' green behavior and awareness are increased through the use of GHRM as a scale for credibility and development. Prior research is defined as studies carried out by (Akhtar et al., 2023; Fang et al., 2022; Zhao & Huang, 2022).

This research provides empirical evidence on the positive impact of green HRM practices on

sustainable performance in the agriculture sector of Jember Regency, Indonesia. The findings demonstrate that green training and development, green rewards and compensation, and green knowledge sharing significantly influence sustainable performance, both directly and indirectly through the mediating role of green innovation. The study underscores the importance of adopting green HRM practices and fostering green innovation to achieve sustainable performance in the agriculture sector.

The integration of the pentahelix model highlights the crucial role of multi-stakeholder collaboration, involving government, academia, business entities, society, and media, in driving innovation and sustainable development in the agriculture sector. By leveraging the collective knowledge and resources of these stakeholders, farmers can better implement green practices, adopt innovative solutions, and enhance their sustainable performance.

While this research provides valuable insights, future studies could explore additional factors influencing sustainable performance, such as technology adoption, supply chain management, or policy interventions. Additionally, replicating the study in different agricultural contexts or regions would further validate the findings and enhance their generalizability.

5.2. Implications

Following are some recommendations that have been made in light of the findings of the research and the discussions that have taken place:

a. For Farmers in Jember Regency Agriculture

Farmers are expected to be able to apply Green HRM Practices to their environment. The process of implementing environmentally friendly behavior relating to environmentally friendly behavior in Green HRM is implemented in the employee training agenda, in the compensation system for employees, and in knowledge sharing agricultural sector. Green innovation capabilities are taken to even further develop the dynamic capabilities of owners and micro companies, Although networks can ease access to more resources and give spaces and facilities and opportunities to share this resource so that sustainable performance in the agricultural sector can be achieved.

b. For Researcher

To increase the number of variables, indicators, and comprehensive references to back up theoretical and empirical research investigations, it is hoped that this study can serve as a reference for future researchers interested in conducting research on the same topic and on green HR practices towards sustainable performance with green innovation as a mediating variable. This way, research findings can improve existing research. Subsequent researchers may utilize the findings as a point of reference.

5.3. Limitations and Recommendation

This study has several limitations in carrying out research. First, researchers only used a few variables, namely green HRM practices, green innovation and sustainable performance. Second, study is limited to the agricultural sector only so it does not describe research results in other sectors. Third, the researcher used only one analysis method and was limited to 125 samples so it did not provide a generalized picture of the population in the study.

So for further research, it is recommended to: 1) Add other variables that could influence sustainable performance such as use of technology, ability to work, cooperation or other variables; 2) Using other sectors as research objects, to be able to describe research results on different objects or replicate research with different sectors such as manufacturing, industry, economics and others; 3) Using collaborative data analysis methods and increasing the number of samples so that it can describe the generalization of the population as a whole.

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