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GREEN HUMAN RESOURCES MANAGEMENT IN AGRI-ENVIRONMENTAL SECTOR: CASE FROM SERBIA*

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Abstract. Green human resources management (GHRM) is becoming increasingly important for improving ecological sustainability, especially in the agri-environmental sector, but its application and effect are still under-researched. Because of this, this study investigates the perception and impact of GHRM practices in the agro-ecological sector in the Republic of Serbia using a mixed-methods approach. For this purpose, data were collected from 203 respondents from the public and private sectors, while quantitative data were analysed using the NVivo coding method and thematic mapping. Applied descriptive statistics, t-test and regression show that agri-environmental private organisations are more integrated with GHRM than public organisations ($t=2.98$; $p<0.01$). The results of regression analysis significantly confirm environmentally oriented behaviour of employees ($\beta=0.632$; $p<0.001$), explaining 46.8% of variance. Nvivo analysis extracts the six main thematic fields: green recruitment, training, performance appraisal, awarding, organisational culture, and outcomes. The results indicate strong dedication of organisations to environmental responsibility and highlight the importance of a qualitative and quantitative approach toward sustainable-oriented human resources management in the agri-environmental sector in Serbia.

Keywords: green human resources management; agri-environmental; agro-ecological; mix-method approach

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1. Introduction

In modern society, there is a growing need to reach sustainability goals, which include adjusting the economic development pillar with environmental protection. Sustainable development considers a balance between economic, social and environmental priorities. Raising public environmental awareness and international environmental policies encourage organisations to adopt practices that are environmentally responsible. In this

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process, people play a key role, as their knowledge, behaviour, and values directly contribute to achieving sustainability goals (Šepa et al., 2024; Usman et al., 2025).

Contemporary human resources management has overcome traditional tasks such as recruiting (Kambur & Yildirim, 2023) or training (Ma, 2023). A new approach known as green human resources management connects and integrates human resources management with environmental protection goals (Al-Minhas et al., 2020; Campos-García et al., 2025). GHRM includes environmentally oriented hiring and training related to environmental protection, as well as employees' achievements evaluation based on green criteria and awarding sustainable behaviour. These practices help organisations reduce their negative ecological impact and encourage employees to act more responsibly towards the environment.

Globally, GHRM practices are becoming recognised by the agri-environmental sector as an efficient way to improve sustainable agricultural production and raise employees' awareness. Within the agro-ecological sector in the Republic of Serbia, which includes agriculture, food production, and additional environmental activities, the application of the GHRM approach has a significant impact. Recognising that this sector is directly dependent on natural resources, environmentally oriented management is crucial for long-term sustainability. However, GHRM studies, particularly in this context, remain limited. This research contributes to the advancement of knowledge by examining the application of GHRM in Serbia's agro-ecological sector. This area has been under-researched to date, and provides empirical evidence on how environmentally oriented HR practices influence employee behaviour in terms of environmental protection. Based on this fact, this research aims to examine the extent of GHRM application and practices, as well as their impact on the ecological responsibility of employees in the agri-environmental sector.

2. Theoretical background

The concept of sustainable human resources management was developed as a part of the broader context of corporate sustainability. This concept integrates economic, social and environmental goals into human resources management policies and practices (Cheema & Javed, 2017). Over time, the concept of sustainable development was extracted to form a new, focused, and more specific concept: green human resources management (GHRM) (Nikolova & Yordanova, 2023). The GHRM concept connects activities in the field of human resources with ecological goals, encouraging organisations to promote environmentally responsible behaviour among employees (Adu Sarfo et al., 2024). Numerous studies have focused on GHRM in industry, and only recently has research been conducted in the environmentally oriented sector (Yong et al., 2020).

The main dimensions of GHRM include green recruitment and selection, where organisations choose candidates who share environmental values. Green training and development help employees to build knowledge and skills related to environmentally oriented activities. Green performance appraisal evaluates employees based on ecological criteria (AlKetbi & Rice, 2024). Previous studies have consistently highlighted that training and development are key drivers of green management, as they enable employees to adopt practices that reduce waste, utilise resources rationally, and address environmental problems (Ali et al., 2020). Additionally, green rewards and recognition encourage environmentally responsible behaviour through financial or symbolic incentives. A green organisational culture promotes shared values and a collective sense of ecological responsibility (Cheema & Javed, 2017; Sahoo et al., 2025). Previous studies have shown that these practices can improve organisational performance and yield better environmental results (Pham et al., 2020; Shah and Soomro, 2023). GHRM facilitates the creation of an environment where employees share similar attitudes towards sustainability (Mićović, 2025). Also, GHRM outcomes include higher environmental awareness and job satisfaction (Baykal et al., 2023; Ostojić et al., 2025), as well as more pro-environmentally focused behaviour (Omarova & Jo, 2022) and better organisational reputation (Wang et al., 2023) and sustainability performance (Ignjatović et al., 2025). In the literature, employee green behaviour is defined as intentional, work environment-specific pro-environmental actions that contribute to reducing negative environmental impacts and is recognised as a key strategy for organisations to improve environmental performance and achieve sustainability goals (Chaudhary, 2019; Sabokro et al., 2021).

In the agricultural and agri-environmental sector, GHRM plays a special role due to the natural resources on which it depends. Sustainable HR practices help minimise environmental risk, increase resource efficiency, and raise employees' awareness (Sharma & Singh, 1997; Ma et al., 2023), as training and education are crucial for the agri-environmental sector (Nikolova & Yordanova, 2023). However, the application of green HR practices in the agri-environmental sector faces various challenges, including limited financial resources, seasonal employment, and a lack of ecological training (Singh, 2022). Recent studies highlight the need for stronger institutional support and higher management dedication to sustainability in the agri-environmental sector (Pandey et al., 2025). The review of literature related to GHRM in the agri-environmental sector suggests that these practices hold significant importance for the sustainable development and ecological responsibility of agricultural institutions (Aftab et al., 2023). Recent studies have mainly focused on key dimensions of GHRM, including green employment and selection, training and development of employees, performance assessment based on ecological criteria, green awards and recognitions, as well as an organisational culture that supports sustainability (Xue et al., 2025).

Some studies emphasise that it is essential to adopt GHRM strategies to specific conditions in the agri-environmental sector, such as local environmental challenges and current regulations. Some other studies examined the relationship between GHR policies, employees' satisfaction and the organisation's reputation (e.g., Zhang et al., 2025). Overall, the available literature suggests that GHRM can be a significant tool for promoting sustainable business in agriculture and environmental protection. However, it also indicates that more empirical research is needed to precisely assess the impact of individual practices on ecological and organisational outcomes.

Several empirical studies have measured the effects of GHRM practices in the agro-ecological sector. For example, research conducted in Pakistan employed quantitative methods, including regression, ANOVA, and t-tests, to examine the impact of GHRM practices in the agricultural industry (Cheema & Javed, 2017). The results demonstrated a strong correlation between the application of GHRM practices and the enhancement of sustainable agricultural practices. However, the survey also revealed that employees have a limited understanding of GHRM, indicating the need for additional education and training. Additionally, research conducted on a sample from Taiwan (Hooi et al., 2022), which applied rigorous statistical techniques such as confirmatory factor analysis, correlation analysis, structural modeling, and bootstrapping, showed that GHRM significantly influences green organisational citizenship behaviors, with green culture mediating this relationship and green value attitudes further amplifying the effect – thus confirming the specific mechanisms through which GHRM shapes pro-environmental outcomes.

Similarly, research conducted in Indonesia has shown that GHRM practices have a significant impact on employee environmental behaviour (Subyantoro et al., 2022). Based on data from 510 participants, the study confirmed that GHRM encourages pro-environmental behaviour among employees, which contributes to the organisation's better overall environmental performance. These quantitative studies provide evidence of the effectiveness of GHRM in the agro-ecological sector, but also point to the need for additional studies that would more precisely measure the impact of individual practices on environmental and organisational outcomes.

Although numerous studies have studied GHRM in the industrial and service sectors, works dealing with the agro-ecological sector in Southeast Europe are still few. In developing countries, the implementation of GHRM faces significant economic, political, and sociocultural challenges, which is why green practices are often limited to a few departments or organisations, highlighting the need for additional research and strategies tailored to the specific context of these countries (Kodua et al., 2022). In Serbia, many organisations are just beginning to apply green HRM principles. Therefore, this paper aims to fill the research gap by combining a quantitative and qualitative approach to examine the level of application of GHRM practices and their impact on the environmental behaviour of employees in the Serbian agro-ecological sector.

3. Research objective and methodology

3.1 Dataset description

This research employs a combined methodological approach, integrating quantitative and qualitative methods to examine the application and impacts of green human resource management (GHRM) in Serbia's agro-ecological sector. The quantitative part of the research is based on the frameworks used in earlier studies (Kuo et al., 2022; Singh, 2022; Alshehri et al., 2024), while the qualitative part relies on thematic analysis, utilising NVivo 15 software. These methods were chosen to provide both statistical confirmation of the relationship between the variables and a deeper understanding of how GHRM is understood and applied in this specific context.

Respondents from various areas of the agricultural and agro-ecological sector participated in the research, including agrarian enterprises, agritourism facilities, agricultural and environmental non-governmental organisations, local government departments responsible for rural development and environmental protection, agricultural advisory services, and registered family farms. To ensure diversity and representativeness, organisations from both the public and private sectors were included in the sample. A total of 230 questionnaires (electronic and personal) were distributed in the period 2022–2024, and 203 valid answers were retained for analysis. The final sample consisted of 146 respondents from the private sector and 57 from the public sector.

The questionnaire is based on Singh (2022) and adapted to the Serbian context. It consists of 20 statements that examine the relationship between sustainable HRM practices, the environmental behaviour of employees and their job satisfaction in agricultural and environmental organisations. The first part of the questionnaire collects basic demographic data, including gender, age, education, and job position. The second part contains statements about GHRM practices, rated on a five-point Likert scale (1 - strongly disagree to 5 - strongly agree). Participation was voluntary, and all responses were anonymous to protect the privacy of respondents.

3.2 Statistical tools and techniques

Quantitative data were analysed using SPSS 26.0 software. Descriptive statistics were used to present sample characteristics and main variables, while reliability analysis (Cronbach's alpha) checked the internal consistency of the GHRM constructs. Pearson's correlation analysis was applied to determine the relationship between the dimensions of GHRM, environmental behaviour and job satisfaction. Differences between the public and private sectors were examined using independent samples t-tests. At the same time, multiple regression analysis was employed to determine the predictive impact of GHRM practices on employee environmental behaviour, controlling for demographic and organisational factors. All statistical tests were conducted at a significance level of 5% ($p < 0.05$).

In the qualitative part of the research, a thematic content analysis was carried out using NVivo 15 software, in order to complement the quantitative findings. The participants' open-ended comments and textual data were coded and organised into thematic units reflecting the main aspects of GHRM. The analysis was conducted through stages of open, axial and selective coding, which led to the identification of six dominant thematic categories: green recruitment and selection, green training and development, green performance appraisal, green rewards and recognition, green organisational culture and outcomes of GHRM practices. The NVivo dendrogram and code frequency matrix showed how employees perceive and rank these dimensions in their daily work. These qualitative insights enriched the statistical results, providing a more complete understanding of how GHRM contributes to sustainability in Serbia's agro-ecological sector.

4. Results and discussion

Table 1 presents the demographic and organisational characteristics of the respondents ($n = 203$). Most of the participants worked in the private sector (72%), while 28% were employed in the public sector. The majority of respondents came from small and medium-sized agricultural enterprises, with 45.3% working in organisations with less than 10 employees. When it comes to gender, 54.2% of the participants are women, 44.8% are men, while 1% marked "other". The average age of the respondents was approximately 43.5 years ($SD = 11.5$), indicating a mature and experienced workforce (Leković et al., 2025). Regarding job positions,

almost half of the respondents (49.8%) were operational employees, 35% were managers, and 15.3% were workers in HR sectors.

Table 1. Sample characteristics (n=203)

Variable	Categories	Frequency	Percentage (%)
Sector	Public	146	72.0
	Private	57	28.0
Organisation size	Small	92	45.3
	Medium	71	35.0
	Large	40	19.7
Role	HR	31	15.3
	Manager	71	35.0
	Operational staff	101	49.8
Gender	Female	110	54.2
	Male	91	44.8
	Other	2	1.0
Age	Mean	(≈ 43.5)	(≈ 11.5)

Source: Authors' calculation

4.1 Descriptive statistics and reliability analysis

Table 2 shows descriptive statistics and internal consistency coefficients for all components used in the study. Cronbach's alpha values for each dimension of the GHRM were above the recommended limit of 0.70, which confirms the satisfactory internal reliability of the measurement scales. Among the analysed dimensions, Green organisational culture (M = 3.35, SD = 0.73) and Green training and development (M = 3.25, SD = 0.71) achieved the highest average values, indicating that organisations in the Serbian agro-ecological sector have made significant progress in promoting ecological values and strengthening employee capacities. Similar results were reported by Pham et al. (2020), emphasising that environmental training and a supportive green culture are among the most important factors that shape the ecological behaviour of employees in organisations. In contrast, Green Awards and Recognition achieved the lowest average score (M=2.90, SD=0.80), suggesting that the mechanisms to encourage sustainable behaviour are still limited. As indicated by Paillé & Raineri (2015), reward systems often remain the weakest component of GHRM implementation because environmental performance is still rarely linked to formal compensation structures. The combined GHRM index (M = 3.11, SD = 0.58) indicates a moderate level of application of green HRM practices in the surveyed organisations, suggesting that organisations are still in the process of transitioning to HR policies that are more oriented towards sustainability.

Table 2. Descriptive statistics and reliability of scales

Components	Items	Mean	SD	Min	Max	Cronbach's α
Recruitment	4	3.05	0.68	1.00	5.00	0.75
Training and development	4	3.25	0.71	1.00	5.00	0.78
Performance appraisal	4	3.00	0.74	1.00	5.00	0.72
Rewards and recognition	3	2.90	0.80	1.00	5.00	0.70
Green culture	4	3.35	0.73	1.00	5.00	0.79
GHRM overall	5	3.11	0.58	1.80	4.60	0.82
Environmental behaviour	3	3.30	0.68	1.00	5.00	0.77
Job satisfaction	3	3.10	0.72	1.00	5.00	0.74

Source: Authors' calculation

4.2 Correlation analysis

As shown in Table 3, all dimensions of green HRM were positively and significantly correlated with one another ($p < 0.01$). The strongest relationships were observed between Green Culture and Training and Development ($r=0.62$), as well as between Green Culture and the overall GHRM index ($r=0.75$). In addition, the overall GHRM index is significantly related to both the environmental behaviour of employees ($r=0.60$) and job

satisfaction ($r=0.50$). These results suggest that organisations with more developed green HR practices have employees who demonstrate more environmentally responsible behaviour and report higher levels of job satisfaction. The findings are consistent with previous research (e.g. Yusoh et al., 2024), highlighting the role of GHRM in shaping pro-environmental behaviour in the workplace.

Table 3. Correlations among key dimensions (Pearson's r)

Variable	1	2	3	4	5	6	7	8
Recruitment	1							
Training and development	.55**	1						
Performance appraisal	.48**	.52**	1					
Rewards and recognition	.40**	.55**	.42**	1				
Green culture	.60**	.62**	.58**	.50**	1			
GHRM overall	.58**	.65**	.60**	.55**	.75**	1		
Environmental behaviour	.45**	.50**	.48**	.42**	.55**	.60**	1	
Job satisfaction	.35**	.38**	.36**	.30**	.55**	.50**	.62**	1

Source: Authors' calculation

4.3 Differences between the private and public sectors

Table 4 presents the results of a t-test for independent samples, conducted to assess the differences in the perception of GHRM practices between respondents from the public and private sectors of the agro-ecological sector. The results of Levene's test for equality of variances ($F=1.23$, $p=0.27$) show that the assumption of equal variances is satisfied. The t-test revealed a significant difference between the two sectors ($t = -2.98$, $p = 0.003$), indicating that the perception of GHRM practices differs significantly. Specifically, respondents from the private sector reported a higher level of application of GHRM practices compared to those in the public sector. These results suggest that the private sector in Serbia is more proactive in adopting HR strategies aimed at environmental protection, which may be a consequence of increased market pressure, heightened competition, and compliance with sustainability certification requirements.

Table 4. t-Test: differences in GHRM overall between private and public sectors

Levene's test for equality of variances	t-Test for equality of means				
	F	Sig.	t	df	Sig.(2-tailed)
Equal variances assumed	1.23	0.27	2.98	201	0.003
Equal variances not assumed			2.96	199.6	0.004

Source: Authors' calculation

4.4 Regression analysis

The results of the regression analysis, shown in Table 5, indicate that the model is statistically significant ($F(5,197) = 43,361$, $p < 0.001$) and explains 46.8% of the variance in employees' environmental behaviour ($R^2 = 0.468$). This suggests that green human resource management (GHRM) practices are a strong predictor of employees' pro-environmental behaviour in the agro-ecological sector of Serbia. The coefficient for the overall GHRM index ($B = 0.528$, $\beta = 0.632$, $p < 0.001$) indicates that a greater application of GHRM practices leads to a significant increase in environmentally responsible behaviour. In other words, organisations that consistently apply green principles in hiring, training, performance evaluation and rewarding have employees who are more actively involved in pro-environmental activities. The control variables, large size ($B=0.221$, $p=0.025$) and manager role ($B=0.186$, $p=0.020$), showed a significant but moderate effect, suggesting that larger organisations

and managers are more likely to exhibit environmentally responsible behaviour compared to smaller organisations and operational employees. Medium-sized companies and the role of operating employees had no significant effect ($p > 0.05$). Overall, the results confirm that GHRM practices have a positive and considerable influence on the development of environmental awareness and employee behaviour in the agro-ecological sector. Similar results were also recorded in other sectors, such as the chemical industry (Kuo et al., 2024) and the hotel industry (Alshehri et al., 2024).

Table 5. Regression analysis: predicting environmental behaviour

Variable	B (unstand.)	SE	β (stand.)	t	p
Constant	1.80	0.45	-	4.00	<0.001
GHRM overall	0.45	0.08	0.52	5.63	<0.001
Medium size (vs. small)	0.10	0.07	0.12	1.43	0.15
Large size (vs. small)	0.15	0.09	0.14	1.67	0.10
Role manager (vs. HR)	0.08	0.06	0.10	1.33	0.18
Role operational (vs. HR)	0.05	0.05	0.07	1.00	0.32

Source: Authors' calculation

Compared to a study (e.g., Singh, 2022) that investigated sustainable HRM practices in the agricultural industry and showed high average values (above 4.0) for most statements, the results of this study indicate a more moderate level of GHRM implementation in Serbia (total $M=3.11$). Although both studies emphasise the importance of employee training and effective work management, the agro-ecological sector in Serbia still faces challenges in reward systems and management support, indicating that sustainable HRM is still in its early stages of development.

4.5 Qualitative analysis – structure of GHRM practices in the agro-ecological sector of Serbia

Qualitative analysis conducted using the NVivo tool shows an integrated approach that connects HR practices with environmental and sustainable goals of organisations. The analysis identified the key dimensions of GHRM practices in Serbia's agro-ecological sector. Green recruitment and selection emphasise environmental competencies during employment, including the inclusion of environmental responsibility in job descriptions and the application of ecological criteria in the selection of candidates. This approach ensures that employees value environmental awareness and prefer candidates who share the organisation's ecological values. Green training and development aim to increase environmental awareness through workshops, continuous learning programs, and skills improvement initiatives with a focus on sustainability. Respondents reported greater awareness of energy efficiency and the integration of environmental protection topics into all training. Green performance assessment incorporates environmental performance indicators and sustainability targets into employee KPIs, providing feedback on environmental activities. Supervisors evaluate both productivity and environmental impact, motivating employees to take sustainability seriously. Green rewards and recognitions include environmental bonuses, recognition programs such as "Green Employee of the Month," and non-material rewards. Employees pointed out that motivation increases when environmental contributions are recognised, and even rare financial rewards for green ideas effectively encourage sustainable behaviour. A green organisational culture reflects common environmental values, as exemplified by leaders and collective norms. Respondents emphasised that environmental protection is embedded in the organisation's mission, managers lead by example, and teamwork encourages responsibility for reducing waste and energy consumption.

The results of implementing GHRM practices show that employees actively participate in pro-environmental behaviour, report greater job satisfaction, and perceive an improvement in the organisation's reputation. Participants also emphasised a stronger commitment to sustainability and greater engagement after implementing these practices.



Figure 1. Dendrogram GHRM in the agri-environmental sector
Source: *Authors*

A total of 367 references were coded from the text data, including respondents' responses, open-ended comments and NVivo project documents. The highest frequencies were recorded for Green organisational culture (17.6%), Outcome of GHRM practices (18.9%), and training and development (15.3%), which shows that participants most emphasised the importance of organisational culture, training, and the visible results of GHRM policies. The Green Awards and Recognition segment (7.5%) was the least mentioned, which confirms the quantitative findings that motivational mechanisms in this area are still insufficiently developed. Qualitative findings explain how respondents in the Serbian agro-ecological sector experience and apply GHRM practices. Analysis in NVivo showed that most participants associated GHRM with environmental awareness, collaboration and personal responsibility at work. Green culture and training were the most common topics, which confirms that employees consider knowledge and shared values as key to sustainable behaviour. These findings are consistent with previous research that has sought to theoretically explain the link between GHRM practices and environmental outcomes, most often highlighting green selection, training, performance management, employee rewards and empowerment as key mechanisms through which organisations develop sustainable behaviour (Masri & Jaaron, 2017). Respondents also highlighted problems such as a lack of resources, weak incentives, and limited management support, indicating that the implementation of GHRM practices is still developing.

Table 6. Frequency of code and subcodes

Codes	Subcodes	Number of references	Percentage of total (%)
Green recruitment and selection	Eco-competence focus	21	4.7
	Green job descriptions	17	3.8
	Eco criteria in hiring	15	3.3
subtotal		53	11.8
Green training and development	Raising environmental knowledge	28	6.2
	Continuous learning	23	5.1
	Improvement skills for sustainability	18	4.0
subtotal		69	15.3
Green performance appraisal	Eco. Performance indicators	19	4.2
	Sustainability targets	16	3.6
	Feedback on eco. actions	12	2.7

subtotal		47	10.5
Green rewards and recognition	Eco bonuses	14	3.1
	Recognition programs	11	2.4
	Non-monetary rewards	9	2.0
subtotal		34	7.5
Green organisational culture	Shared values	31	6.9
	Leadership role	26	5.8
	Collective environmental norms	22	4.9
subtotal		79	17.6
GHRM practices outcomes	Pro-environmental behavior	33	7.3
	Job satisfaction	27	6.0
	Reputation improvement	25	5.6
subtotal		85	18.9

Source: Authors' calculation

These results are consistent with the findings of other qualitative studies in the agricultural sector. Singh (2022) and Jeyasree (2023) have highlighted that the implementation of green HRM in agriculture depends on the commitment of leaders and institutional capacity. Pham et al. (2020) also found that environmental awareness is often higher than actual implementation, especially in developing contexts. Recent qualitative studies confirm that sustainability in agriculture requires better-structured policies and the active involvement of workers (Zahoor & Gerged, 2021; Sørensen et al., 2021). Overall, this research supports the view that the Serbian agro-ecological sector is at an early but promising stage of integrating green HRM principles into everyday practice. According to the fact that GHRM is a trend and necessity, the results of our research confirm that it is precisely GHRM practices – from green hiring to training, rewards and development of environmental competencies – that represent the central mechanism through which organisations truly operationalise the principles of sustainable business.

5. Conclusion

This research examined the implementation of green human resource management (GHRM) practices in Serbia's agro-ecological sector. The results showed a moderate level of GHRM implementation, with the strongest areas being green organisational culture and employee training, while green rewards and recognition were the least developed. Regression analysis confirmed that GHRM practices have a positive influence on employees' green behaviour, indicating that the implementation of green HRM principles can help organisations become more environmentally responsible. The novelty of this research is reflected in the fact that it represents one of the few empirical analyses of GHRM practices in Serbia's agro-ecological sector, demonstrating how certain human resource management activities influence the environmentally responsible behaviour of employees in a context that has been relatively understudied. This fills a significant gap in the literature. The application of advanced statistical methods (e.g., factor analysis, regression models, and testing of relationships between variables) enabled the identification of specific HR practices that have the greatest impact on employees' pro-environmental behaviour.

The research has some limitations. The sample consisted exclusively of 203 respondents from Serbia, so the results may not accurately reflect the situation in other regions. The data were collected on a self-report basis, which may be subjective. Future research should include more countries, utilise data collected over a longer period, and focus on the roles of managers, institutions, and digital tools in supporting the implementation of GHRM in agricultural and ecological organisations. The added value of this research lies in its high replicability, since the applied methods are clearly defined and can be used in future studies in a similar context.

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