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AGRIBUSINESS GOVERNANCE MODEL IN THE UPPER CITARIK SUB-WATERSHED: INSIGHTS FROM THE UPPER CITARUM WATERSHED, BANDUNG REGENCY

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Abstract: The goal of sustainable agriculture is to provide for present needs while protecting the environment for future generations. The Citarum River Basin's upstream section faces significant ecological issues due to farming activities that contribute to erosion and downstream flooding. Despite numerous policies and initiatives, sustainable ecosystem management remains a pressing concern. This study focuses on the upstream Citarik sub-watershed in Tanjung Wangi Village, Cicalengka District, which has a high erosion index (0.77). The research aims to characterise the upstream integrated Citarum watershed's agribusiness ecosystem management, assess the influence of empowerment on sustainable agribusiness governance, and develop a model for sustainable ecosystem management. A mixed-method approach was employed using a sample of 120 farmers, integrating quantitative analysis (structural equation modelling) with qualitative techniques like descriptive and system-thinking approaches. The findings indicate that specific agribusiness practices and limited resource access significantly contribute to erosion and environmental degradation, necessitating targeted interventions. The governance of sustainable ecosystems is significantly impacted by empowerment (73.1%). Proposals in this study offer policymakers a strategy to establish sustainable agribusiness in the upstream Citarum Watershed. Recommendations include encouraging agroforestry, replanting, farmer education, and reducing reliance on artificial fertilisers to enhance environmental protection.

Keywords: Sustainable agriculture, agribusiness governance, ecosystem management, empowerment by agribusiness, environmental conservation.

Introduction

Sustainable agribusiness governance in watershed regions is critical for balancing ecological health and economic demands, as it directly affects water resource management, food security, and local livelihoods (Kahirun *et al*., 2020). By promoting actions that preserve natural resources, particularly water and soil such governance contributes to mitigating global environmental concerns while maintaining resilient and sustainable local food systems (Panga *et al*., 2022). Sustainable development of rural and agricultural areas depends heavily on agribusiness management in watershed regions. As geographic areas that collect and manage water flow, watersheds are essential to the socioeconomic stability of local communities, as well as environmental sustainability (Rahayu *et al*., 2023). An excellent example of a watershed area where agricultural activities significantly affect water resources, land health, and residents' livelihoods is the Upper Citarik sub-watershed, located within the critical zone of the Upper Citarum Watershed (Andonie, 2014). An integrated approach to managing these landscapes is required due to the challenges posed by climate change, environmental deterioration, and the growing demand for agricultural products (Syafri *et al*., 2020). Agriculture is a key economic activity in West Java, supporting 48.68 million people, with food demand as a driving factor (Maskun *et al*., 2021). Agribusiness governance entails coordinating agricultural output with sustainable land and water management techniques, assuring that farming operations avoid exacerbating concerns such as soil erosion, water pollution, and deforestation. The environmental services provided by watersheds such as flood regulation, water purification, and biodiversity preservation, depend on maintaining this equilibrium (Nuraeni *et al*., 2018).

Social, economic, and ecological factors influence the agribusiness dynamics in the Upper Citarik sub-watershed. The region is known for its varied agricultural techniques, which range from commercial agribusiness to subsistence farming (Mardiharini *et al*., 2022). The primary source of the local agricultural economy is crops, including fruits, vegetables, and rice. However, various challenges hinder sustainable agricultural practices, including fragmented land, inadequate infrastructure, volatile market pricing, and limited access to cutting-edge agricultural technologies (Figure 1) (Kahirun *et al*., 2020).

Additionally, rapid urbanisation and population growth have intensified pressure on agricultural lands, leading to changes in land use that could be more sustainable and overuse of water resources (Wisnujati & Patiung, 2020). The adoption of modern agribusiness models has also introduced intensive farming practices that, while improving productivity, have detrimental effects on the environment, including biodiversity loss, degraded soil, and declining water quality (Wibowo *et al*., 2023). Given these complexities, an integrated governance model is necessary to manage the environmental concerns created by agricultural activities in watershed regions, while aligning the needs and objectives of multiple stakeholders (Nugraha *et al*., 2023).

An integrated governance model for the Upper Citarik sub-watershed must balance environmental health, community livelihoods, and agricultural productivity (Mardiharini *et al*., 2022). The principles of sustainability, equity, and resilience should all be included in the ideal agribusiness governance model to ensure that agricultural development does not lead to social injustice or environmental deterioration (Sjahza & Asmit, 2019). To ensure that governance policies represent local realities and requirements, an effective governance model must also be participatory, enabling the involvement of diverse stakeholders in decision-making processes (Panga *et al*., 2022). Local governments play a crucial role in executing regulations that promote sustainable agricultural practices, as they are best positioned to coordinate efforts between the national, regional, and local governance levels (Surya *et al*., 2021).

By encouraging innovation, expanding market accessibility, and strengthening local capacities, public-private partnerships and community-driven initiatives can significantly contribute to improve agribusiness systems' resilience (Afifah *et al*., 2021). By creating a complete governance framework incorporating ecological, economic, and social components, the Upper Citarik sub-watershed can serve as a model for sustainable agribusiness governance in other watershed regions of Indonesia and beyond. In the Upper Citarik sub-watershed, an integrated governance structure may promote sustainable agribusiness by balancing environmental protection, agricultural development, and community welfare.

Current agribusiness governance in watershed regions is often hindered by inadequate infrastructure, limited access to current agricultural technologies, and restrictive policy frameworks. These constraints impede effective resource management and sustainable practices, leaving local populations vulnerable to environmental deterioration and economic instability (Sumaryanto *et al*., 2022). Addressing these gaps is critical for creating a governance model that promotes resilience, maintains long-term production, and accommodates the environment's and local inhabitants' changing requirements.

This study contributes to existing research by proposing a sustainable governance model specifically tailored for agriculture in watershed areas, addressing the unique environmental and socioeconomic challenges of such region. The model's applicability extends beyond Indonesia, offering a framework that can be implemented in similar contexts worldwide. Ultimately, this study aims to promote sustainable agricultural practices, resource conservation, and community resilience on a global scale.

Figure 1 illustrates the chain of environmental issues in the Upper Citarum Watershed. Key risks such as deforestation and land degradation lead to severe consequences, including increased runoff, sedimentation, and flooding. These environmental changes result in public health concerns, economic losses, and negative ecological impacts, highlighting the interconnected nature of watershed degradation and its far-reaching socioeconomic effects.

Materials and Methods

Site Descriptions

Analysis Design and Research Location

This research was conducted in the Citarik sub-watershed area, Tanjungwangi Village, Cicalengka District, Bandung Regency, West Java Province. This village is located in the upstream areas of the Citarik River. The study was carried out from March 2019 to October 2019. The Citarum River region (WS) is administratively divided into nine regencies: West Bandung, Bandung, Subang, Purwakarta, and Karawang, with portions of it being in Sumedang, Cianjur, Beksi, and Indramayu. It also includes three cities: Kota Bandung, Bekasi City, and Cianjur City. The Citarum River region's geographic coordinates are 7°19'-6°24'South Latitude and 106°5 1'36"-107°51' East Longitude (Figure 2). A total of 15,300,758 people reside near the Citarum River region (BPS, 2009 data), with the population increasing annually, exacerbating environmental issues in the Citarum River. The Citarum River, the principal river of the region is the 269 km long. It originates from a spring in Mount Wayang (Bandung Regency) and flows through several regencies, including Cianjur, Purwakarta, Karawang/Bekasi, Bandung/West Bandung, and Muara Gembong, Java Sea (Figure 3).

Research Method

This study employs a descriptive-analytical approach, focusing on identifying solutions to real-world issues. Descriptive research aims to provide an organised, factual, and precise account of the characteristics, attributes, and relationships among the studied subjects.

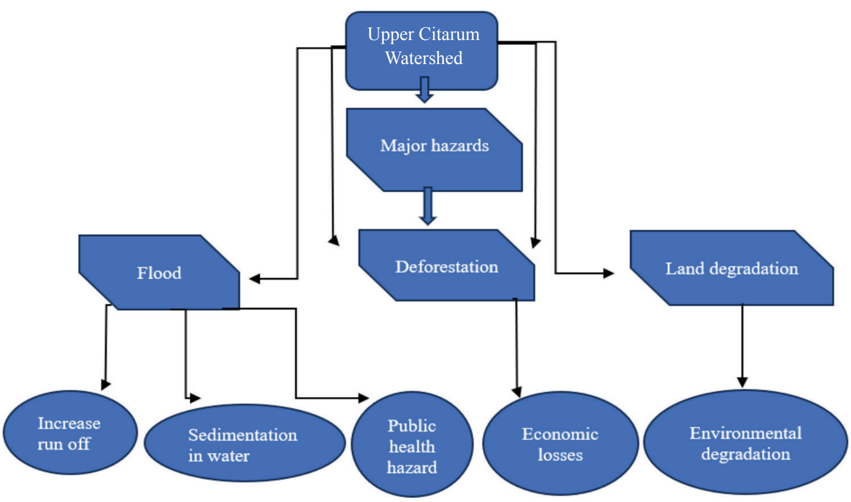


Figure 1: Flowchart illustrating watershed processes contributing to hazard formation

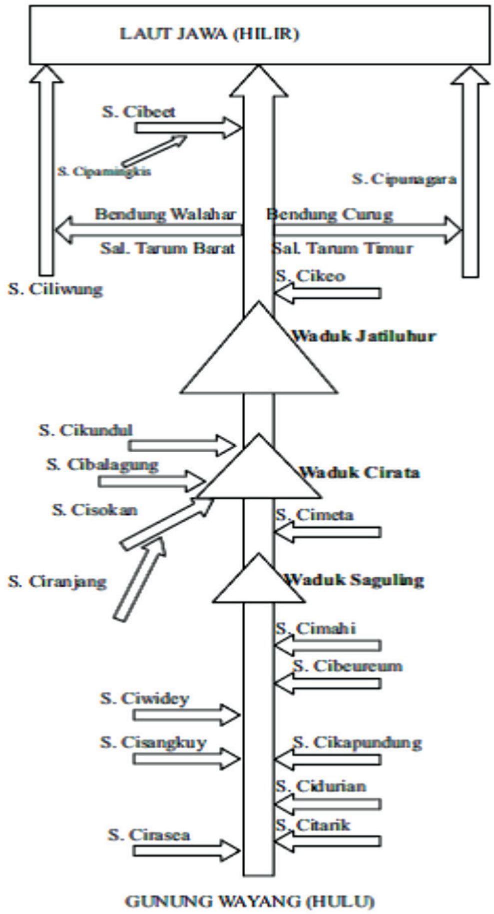


Figure 2: Site description of the Upper Citarum Watershed, Bandung Regency

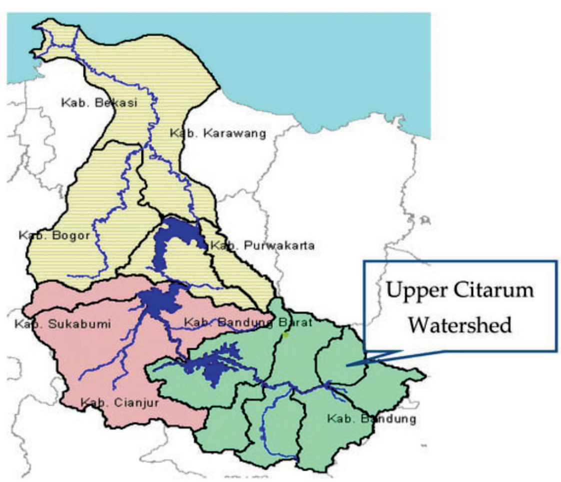


Figure 3: Determinants of the study area, representing important geographical and environmental characteristics of the Upper Citarum Watershed (Sumaryanto *et al*., 2022)

Data Collections

The study was conducted using questionnaires covering various aspects of the research area as shown in Table 1.

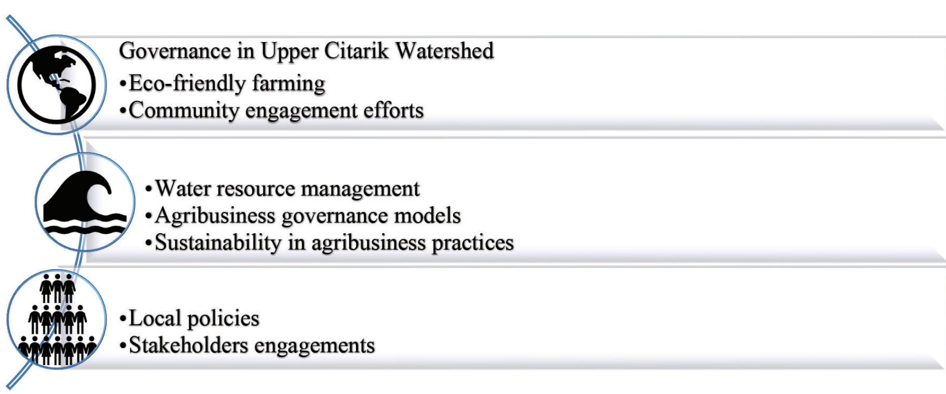
Table 1: Stakeholder survey instruments, governance indicators, and sustainability practices in agricultural systems

Survey Instruments		
Stakeholder Type	**Interviews Number**	**Data Collection Tool**
Farmers	50	Structured interviews
NGOs	5	Focus group discussion
Local government	10	Questionnaire
Governance Indicators		
Indicator	**Measurement Metric**	**Data Source**
Policy enforcement rate	Percentage of compliance	Local government
Agricultural productivity	Yield (kg/ha)	Farmers' reports
Stakeholder participation rate	Percentage of involvement	Survey data
Sustainability Index		
Practice	**Adoption Rate**	**Environmental Benefit**
Organic fertiliser usage	60	Improved soil health
Drip irrigation	40	Water conservation
Agroforestry	25	Biodiversity increase

Research Design

This study employs a mixed-method approach, combining qualitative and quantitative methodologies. The qualitative design analyses agribusiness ecosystem governance in the upstream Citarum Watershed, considering agroecosystem, sociosystem, policy, and empowerment aspects of watershed management. The qualitative aspect follows an explanatory method using in-depth interviews while the quantitative approach involves a survey method to assess the impact of empowerment on sustainable agribusiness ecosystem governance.

Study Framework



Data Analysis

Ecosystem Analysis in the Upper Citarum Watershed

The research examines the ecosystem components of water and land. These components include geographic location, air, rainfall, soil, water, plants, livestock, and microorganisms. Land and water are vital to human life and access to these resources was measured using the Integrated Rural Accessibility Planning (IRAP) method. Data were collected from field observations, followed by accessibility value calculations. The questionnaire responses were quantified based on predefined indicator values. The results were categorised into four priority groups, namely Group 1 (Good), Group 2 (Fair), Group 3 (Bad), and Group 4 (Very bad) as shown in Table 2.

The accessibility value was calculated as follows:

(a) Find the total number of times the indicator value (I) is multiplied by the indicator weight (B).

$$\sum(I_i xB) = (I_1 xB_1) + (I_2 xB_2) + ... + (I_i xB_i)$$

(b) Find the average value of the total result by multiplying the indicator value (I) by the indicator weight (B), divided by the number of indicators (i).

$$\text{Average } \sum(I_i xB_i) = \frac{\sum(I_i xB_i)}{i}$$

The research data were presented descriptively using tables and graphs of accessibility values for water sources and land. The results of the analysis are then interpreted to obtain conclusions that are relevant to the research objectives. The analysis of the data, including the presentation of the data was conducted using Origin software.

Results

Accessibility to land and water, the two primary ecosystem components are plotted against a corresponding response gradient ranging from approximately 40.5 to 42.8 (Figure 4a). Compared to accessibility to water, which displays a significantly lower response of around 40.5, accessibility to land exhibits a more significant reaction, with responses clustering around 42.8, suggesting a more favourable or better response. The increased land accessibility indicates ecosystem improvement or a more positive perception among respondents. Conversely, the decline in water accessibility suggests significant challenges in water resource management. This disparity implies that while land is accessible, water availability may be insufficient to meet demand, potentially restricting ecological or agricultural activity.

Table 2: Water access and household distribution indicators

No.	Indicator	Indicator Values			
		1	2	3	4
1	Number of households (%)	> 50	33-50	17-33	< 16
2	Water availability	Good all season	Good for one season	Bad for one season	Bad all season
3	Distance from water source (m)	< 250	250-500	500-1,000	> 1,000
4	Travel time (minute)	< 60	60-00	100-120	> 120

Indicator weights were determined by stakeholders (relevant institutions) in the research area, involving at least four people. Participants rated indicators using a five-point scale, from 5 (very important indicator), to 4 (important indicator), 3 (somewhat important indicator), 2 (not very important indicator), and 1 (not important indicator at all).

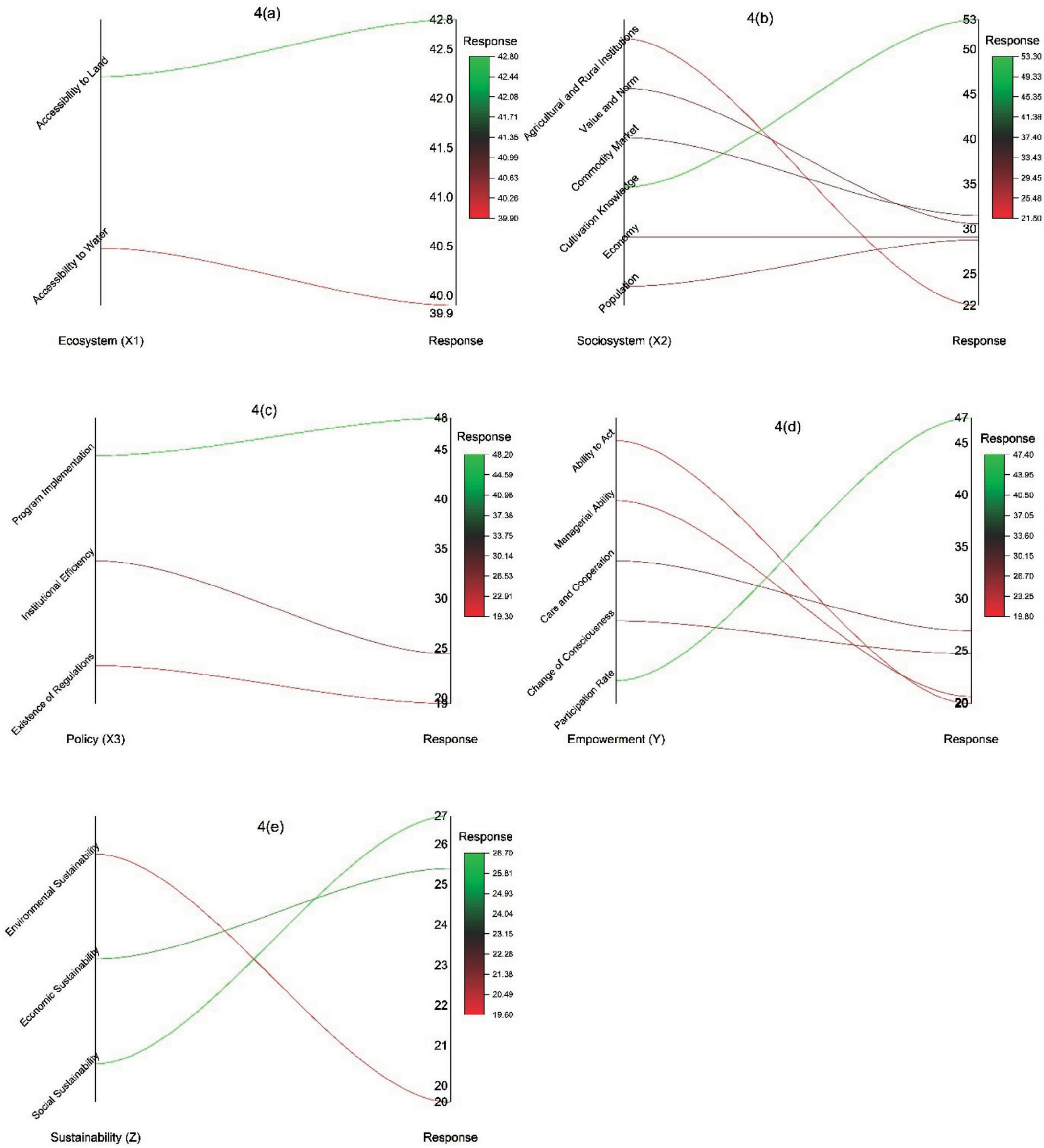


Figure 4: Multi-dimensional analysis of ecosystem (a), sociosystem (b), policy (c), empowerment (d), and sustainability factors (e): A comparative representation of responses across key indicators

The sociosystem, plotted against a response range of approximately 22 to 53, is divided into the following categories: Agricultural rural institutions, the value of the internships, company model, cultural networks/preferences, economy, and population (Figure 4b). The green trend at the top of the graph, peaking at 53, indicates that agricultural rural institutions received the most response. In contrast, variables like population, economy, and cultural networks/preferences have significantly lower responses, ranging from 22 to 30, as indicated by the red curve at the bottom.

These findings suggest that rural agricultural institutions are perceived as strong contributors to the sociosystem. However, economic conditions, cultural preferences, and population pressures are seen as major obstacles to broader social progress. The discrepancy between these variables implies that despite the presence of institutional frameworks, sociosystem improvement requires addressing underlying economic and cultural issues.

The policy dimension, evaluated based on programme implementation, institutional efficiency, and the existence of legislation is plotted against responses ranging from approximately 29 to 48 (Figure 4c). Programme implementation, represented by the green line, receives the highest response of approximately 48, indicating positive feedback. The existence of legislation, depicted by the red line, receives the lowest response at approximately 29 while institutional efficiency falls in the middle with a moderate response. These findings suggest that respondents view programme implementation favourably, indicating effective policy interventions. However, the low response regarding legislation suggests weaknesses in the legal framework that may compromise long-term policy sustainability and enforcement. While institutional efficiency is not the lowest-rated factor, improvements are needed, likely linked to deficiencies in legislative structures

The empowerment dimension, which includes factors such as ability to act, managerial ability, care and cooperation, change of consciousness, and participation rate is plotted against responses ranging from 20 to 47 (Figure 4d). The green line shows that the ability to act receives the highest response, peaking at 47. In contrast, as indicated by the red line, participation rate and change of consciousness are at the lower end of the response spectrum. A strong response for the ability to act suggests that participants feel empowered in their roles. However, the low response rates for change of consciousness and participation indicate challenges in raising awareness and fostering engagement. This suggests that while certain individuals or groups are empowered to act, there is insufficient collective awareness or widespread participation in addressing community or organisational challenges.

The sustainability dimension, divided into environmental, economic, and social categories is plotted against responses ranging from 19 to 27 (Figure 4e). The green line, representing the highest response at 27, corresponds to environmental sustainability. The red line, representing the lowest response at approximately 19, corresponds to social sustainability while economic sustainability falls in the mid-range. A high response for environmental sustainability suggests a positive perception of ecological sustainability efforts. However, the low response for social sustainability highlights issues related to equity, social cohesion, or other social factors. Although economic sustainability fares better than social sustainability, improvements are still needed, indicating that economic conditions may hinder broader sustainability efforts. Table 3 shows the Citarik sub-watershed's agribusiness ecosystem governance model.

Matrix Correlations and Principal Component

The relationships between the five variables Ecosystem (X1), Sociosystem (X2), Policy (X3), Empowerment (Y), and Sustainability (Z) are depicted in this graphic as a correlation matrix. The range of correlation coefficients is -1 to 1, with values near -1 denoting a robust negative link and values near 1 denoting a strong positive relationship. One key finding is the starkly negative correlation (coefficient of -0.96) between Sociosystem (X2) and Sustainability (Z), suggesting that gains in one usually lead to losses in the other. Empowerment (Y) has a modestly positive association (0.33) with Sustainability (Z), but Policy (X3) likewise exhibits a considerable negative connection (-0.71). The Sociosystem (X2) has a slight relationship with the Ecosystem (X1) and Empowerment (Y), but a moderate positive correlation (0.67) with Policy (X3). Except for a small negative connection with Empowerment (Y) at -0.24 and Sustainability (Z) at -0.28, the Ecosystem (X1) shows modest associations with all other factors. Conversely, Empowerment (Y) exhibits the poorest connections, exhibiting little to no link with Sociosystem (X2) or

Table 3: The Citarik sub-watershed's agribusiness ecosystem governance model: Variables, indicators, and attitude scales for evaluating sustainability and socioeconomic features

Concepts	Variables	Indicators	Parameters	Measuring Scale	Attitude Scale
Agribusiness ecosystem governance model in the Citarik sub-watershed of the Upper Citarum Watershed	Ecosystem characteristics	Access to water Access to land	1 = Very bad 2 = Bad 3 = Average 4 = Good	Ordinal	Like scale 2
	Sociosystem characteristics	Population Economy Cultivation knowledge/technology Commodity market Value and value Agricultural & rural institutions	1 = Strongly disagree 2 = Disagree 3 = Agree 4 = Strongly agree	Ordinal	Like scale 3
	Policy	Existence of regulations/legislation Institutional efficiency Program implementation	1 = Strongly disagree 2 = Disagree 3 = Agree 4 = Strongly agree	Ordinal	Like scale 2
	Empowerment	Participation Change of consciousness Cooperation and caring Managerial ability Ability to act	1 = Strongly disagree 2 = Disagree 3 = Agree 4 = Strongly agree	Ordinal	Like scale 3
	Sustainable agribusiness ecosystem governance	Social sustainability Economic sustainability Environmental sustainability	1 = Strongly disagree 2 = Disagree 3 = Agree 4 = Strongly agree	Ordinal	Like scale 2

Ecosystem (X1), and a modest negative correlation with Policy (X3) at -0.45. According to this matrix, some systems—like Sociosystem and Policy—have a strong relationship with sustainability while others like Ecosystem have a more autonomous impact. The solid inverse connections concerning Sustainability show potential systemic and policy sustainability trade-offs.

The correlations between variables Ecosystem (X1), Sociosystem (X2), Policy (X3), Empowerment (Y), and Sustainability (Z) are plotted onto two principal components, PC1 and PC2, which account for 55.94% and 20.90% of the variance, respectively, in the Principal Component Analysis (PCA) biplot (Figure 6). Sociosystem (X2) and Policy (X3) appear to be positively connected and contribute substantially to this significant component based on their clustering along PC1. Conversely, Ecosystem (X1) and Sociosystem (X2) are positioned in opposite directions from Empowerment (Y) and Sustainability (Z), suggesting negative relationships between them. The plot's proximity to each variable indicates how correlated they are; Empowerment and Sustainability are more closely aligned with PC2, indicating that they have a more significant impact on distinct dimensions than Policy and Ecosystem.

Figure 5 presents a correlation matrix for five variables: Ecosystem (X1), Socioeconomic (X2), Policy (X3), Empowerment (Y), and Sustainability (Z). Positive correlations are depicted in red and negative correlations in blue, with values closer to 1 or -1 suggesting more significant ties. Notably, Sociosystem (X2) shows a substantial negative correlation with Sustainability (Z) (-0.96), indicating an adverse link. Policy (X3) has a modest positive correlation with the Sociosystem (X2) of 0.67, suggesting a possible beneficial relationship between policy and social systems.

Discussion

Agricultural ecosystems face significant challenges in ensuring reliable access to water, particularly in areas with unpredictable rainfall patterns or inadequate infrastructure for water management (Binswanger-Mkhize & Savastano, 2017). Access to water is growing less reliable and may be a symptom of serious issues with water resource management in the face of rising demand, changing weather patterns, or deteriorating water infrastructure (Scoones & Scoones, 2010; Altieri & Toledo, 2011). A water shortage substantially affects agricultural output, resulting in lower crop yields, higher expenses, and increased vulnerability to climate change (Rockström *et al*., 2009; Koning & van Ittersum, 2009). These findings align with global trends, where pollution, over-extraction, and shifting weather patterns exacerbate water stress (United Nations, 2021).

The imbalance between the essential ecosystem components could impede agricultural expansion or intensification as land availability increases, but water scarcity

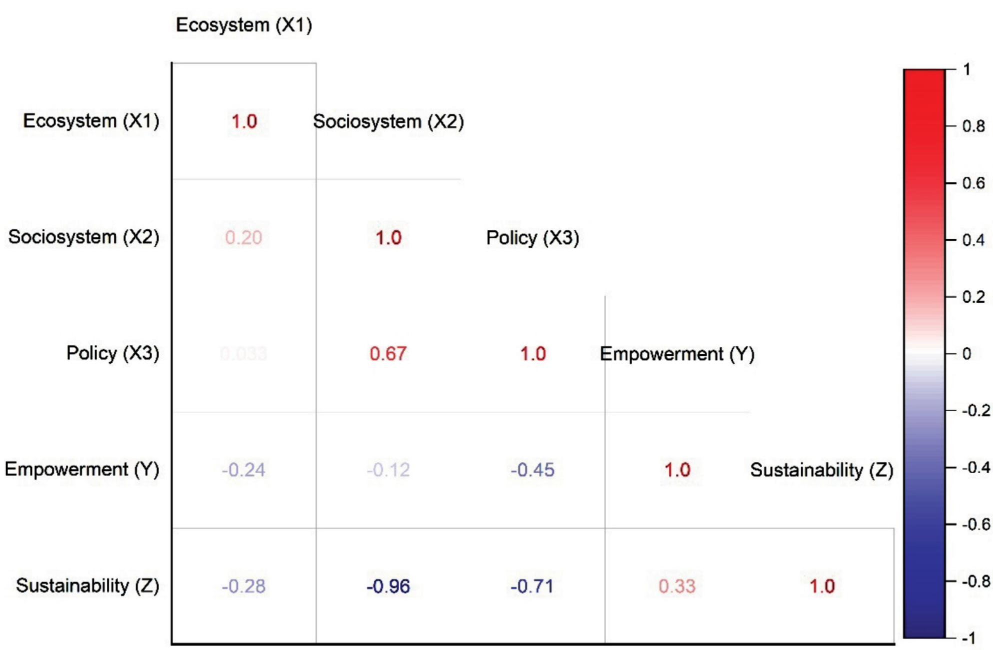


Figure 5: Correlations matrix among each aspect of the study observations

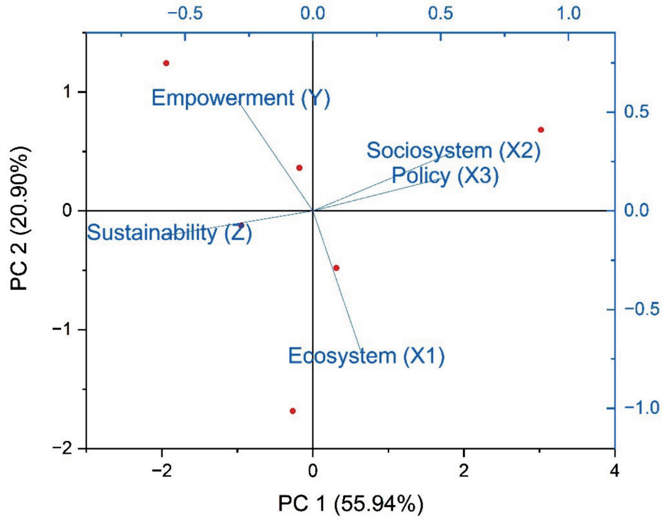


Figure 6: The biplot illustrates the correlations between the ecosystem, sociosystem, policy, empowerment, and sustainability using PCA

remains, ultimately endangering food security and rural livelihoods (Timmer, 2017). The discrepancy in accessibility between land and water emphasises the necessity of coordinated approaches to land and water management to guarantee sustainable farming practices (Falkenmark & Rockström, 2006; Pretty, 2011). Agricultural and rural institutions have indicated that they contribute favourably to rural development and agricultural output (Rahayu *et al*., 2023). Effective rural institutions can offer vital services, like input supply, market access, loans, and extension support for smallholder farmers and rural communities (Leha *et al*., 2018). Natural resource constraints brought on by population growth can result in resource conflicts and land degradation (Surya *et al*., 2021). Economic difficulties such as restricted access to loans and markets, can hinder farmers' capacity to invest in cutting-edge technologies or diversify their sources of revenue (Andonie, 2014; Nuraeni *et al*., 2018; Syafri *et al*., 2020). Adopting sustainable agricultural methods and promoting gender equality and social inclusion in rural regions may be hindered by cultural preferences and social conventions (Wibowo *et al*., 2023). Well-implemented programmes such as agricultural subsidies, rural development projects, or environmental conservation measures can provide tangible benefits to target communities (Djuwendah *et al*., 2018).

The effectiveness of policies designed to boost agricultural productivity, rural livelihoods, and ecosystem sustainability is frequently dependent on the successful execution of those programmes (Wisnujati & Patiung, 2020). Policies might not have the necessary enforcement tools to guarantee compliance or continuity without sufficient legal frameworks (Hansen *et al*., 2019; Kahirun *et al*., 2020). The ability to act reflects a degree of agency and autonomy in decision-making, indicating that respondents feel empowered in their specific positions or duties (Mardiharini *et al*., 2022). The low participation rate and change of consciousness reactions indicate a more significant problem with awareness and group action (Sjahza & Asmit, 2019; Sugihardjo *et al*., 2021). When individuals can take action, there may be a need to raise awareness of the importance of collective efforts in addressing systemic issues or to improve engagement in broader initiatives (Nastiti *et al*., 2015; Velten *et al*., 2015). This highlights the need for initiatives that not only build individual capacity but also foster community involvement in governance processes (Panga *et al*., 2022; Manurung *et al*., 2022). A high response rate for environmental sustainability suggests widespread support for environmental efforts (Sartika *et al*., 2023) such as climate adaptation plans, sustainable land use, or conservation (Reed *et al*., 2009). However, lower responses for social and economic sustainability point to major obstacles in achieving comprehensive sustainability (Astadi *et al*., 2022). Economic sustainability remains constrained by financial limitations and restricted market access (Velten *et al*., 2021). Meanwhile, the lowest response rate for social sustainability underscores critical issues related to inclusion, social cohesiveness, and equity (Kavvadia, 2022; Liu & Abu Hatab, 2023).

Conclusions

The Upper Citarik sub-watershed faces significant challenges in balancing agricultural expansion and environmental conservation due to water shortages and ecological deterioration. Disparities in land and water access hinder governance effectiveness, despite existing policies. Water scarcity, in particular, severely limits agricultural productivity and environmental sustainability. Empowerment accounts for 73.1% of governance, yet limited participation and collective action highlight the need for more coordinated and inclusive strategies. While agricultural organisations contribute to rural development, sustainability remains constrained by population growth, cultural norms, and economic pressures. This study advocates for sustainable agribusiness governance that integrates land and water management, promotes agroforestry, improves farmer education, and reduce reliance on chemical fertilisers to maintain long-term ecological balance. Strengthening legal enforcement is also essential to guarantee the continuation of sustainable practices. Environmental sustainability initiatives are highly regarded, but social and economic sustainability receive less emphasis, indicating that while ecological management has advanced, issues with equality and financial viability persist. Addressing these challenges requires a comprehensive strategy that promotes innovation fortifies rural institutions and raises stakeholder involvement in decision-making. By aligning environmental, economic, and social objectives, the proposed integrated governance model positions the Upper Citarik sub-watershed as a viable example of sustainable agribusiness governance for comparable areas. Policymakers and local governments should prioritise this framework to foster equitable development, increase resilience, and ensure that agricultural practices support regional livelihoods and more general sustainability objectives.

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Conflict of Interest Statement

The authors declare no conflict of interest.

References

Afifah, N. G., Sumadio, W., & Rustanto, A. (2021). Sustainable Livelihood Approach farming communities in Temoloyo River Basin, Kebumen Regency. *1st International Conference on Sustainable Agricultural Socio-Economics, Agribusiness, and Rural Development (ICSASARD 2021)*, *199*(Icsasard), 235-243. http://creativecommons. org/licenses/by-nc/4.0/

Altieri, M. A., & Toledo, V. M. (2011). The agroecological revolution in Latin America: Rescuing nature, ensuring food sovereignty and empowering peasants. *Journal of Peasant Studies*, *38*(3), 587-612. https://doi. org/10.1080/03066150.2011.582947

Andonie, M. (2014). *Soil and Water Conservation and Rural Livelihoods in the Upper Citarum Watershed in West Java, Indonesia.* http://www.cde.unibe.

ch/CDE/pdf/MSc_Miriam_Andonie ohne Selbständigkeitserklärung.pdf

Astadi, P., Kristina, S., Retno, S., Yahya, P., & Agni Alam, A. (2022). The long path to achieving green economy performance for micro small medium enterprises. *Journal of Innovation and Entrepreneurship*, *11*(1), 1-19. https://doi.org/10.1186/s13731-022-00209-4

Binswanger-Mkhize, H. P., & Savastano, S. (2017). Agricultural intensification: The status in six African countries. *Food Policy*, *67*, 26-40. https://doi.org/10.1016/j.foodpol.2016.09.021

Djuwendah, E., Priyatna, T., Kusno, K., Deliana, Y., & Wulandari, E. (2018). Building agribusiness model of LEISA to achieve sustainable agriculture in Surian Subdistrict of Sumedang Regency West Java Indonesia. *IOP Conference Series: Earth and Environmental Science*, *142*(1). https://doi.org/10.1088/1755-1315/142/1/012062

Falkenmark, M., & Rockström, J. (2006). The new blue and green water paradigm: Breaking new ground for water resources planning and management. *Journal of Water Resources Planning and Management*, *132*(3), 129-132. https://doi.org/10.1061/(asce)0733-9496(2006)132:3(129)

Hansen, B. B., Pedersen, Å. Ø., Peeters1, B., Moullec, M. Le, Albon, S. D., Herfindal, I., Sæther, B., Grøtan, V., & Aanes, R. (2019). *Global Change Biology - 2019 - Hansen - Spatial heterogeneity in climate change effects decouples the long-term dynamics of.pdf* (pp. 3656-3668).

Kahirun, Kilowasid, L. M. H., Sabaruddin, L., & Mukhtar. (2020). The sustainability status of Lahumoko Watershed Management, North Buton Regency, Southeast Sulawesi, Indonesia. *Journal of Environmental Science and Management*, *23*(2), 8-18. https://doi.org/10.47125/jesam/2020_2/02

Kavvadia, H. (2022). Green economy in the post-pandemic period: A framework for organizational stakeholder analysis. *Business and Economic Research*, *12*(1), 44. https://doi.org/10.5296/ber.v12i1.19450

Koning, N., & van Ittersum, M. K. (2009). Will the world have enough to eat? *Current Opinion in Environmental Sustainability*, *1*(1), 77-82. https://doi.org/10.1016/j.cosust.2009.07.005

Leha, E., Sutjahjo, S. H., Nurmalina, R., Anwar, S., & Kurniawan, R. (2018). Sustainability analysis of superior horticulture agribusiness development in East Sumba Regency, East Nusa Tenggara Province, Indonesia. *Journal of Resources Development and Management*, *49*(January), 56-67. www.iiste.org

Liu, Z., & Abu Hatab, A. (2023). Assessing stakeholder engagement in public spending, green finance and sustainable economic recovery in the highest emitting economies. *Economic Change and Restructuring*, *56*(5), 3015-3040. https://doi.org/10.1007/s10644-022-09414-3

Manurung, E. T., Maratno, S. F. E., Permatasari, P., Rahman, A. B., Qisthi, R., & Manurung, E. M. (2022). Do village allocation funds contribute towards alleviating hunger in the local community (SDG#2)? An insight from Indonesia. *Economies*, *10*(7). https://doi.org/10.3390/economies10070155

Mardiharini, M., Indrawanto, C., & Jamal, E. (2022). Strategy development of the Citarum watershed area through corporate coffee farmers in Bandung Regency, West Java. *IOP Conference Series: Earth and Environmental Science*, *1107*(1). https://doi.org/10.1088/1755-1315/1107/1/012096

Maskun, T., Masluh, M., Resmiawati, E. N., Tasdik, K., Muhafidin, D., Undang, G., & Putra, O. N. (2021). Geographic Information System (GIS): Potential mapping of agribusiness in the Southern part of West Java. *Journal of Physics: Conference Series*, *1869*(1). https://doi.org/10.1088/1742-6596/1869/1/012102

Nastiti, K. D., Kim, Y., Jung, K., & An, H. (2015). The application of the Rainfall-Runoff-Inundation (RRI) model for inundation case in upper Citarum Watershed, West Java-Indonesia. *Procedia Engineering*, *125*, 166-172. https://doi.org/10.1016/j.proeng.2015.11.024

Nugraha, S., Suryanto, Utomowati, R., & Saputra, A. E. (2023). The risk of landslides in the Jlantah upstream watershed in Karanganyar Regency in 2022. *IOP Conference Series: Earth and Environmental Science*, *1190*(1). https://doi.org/10.1088/1755-1315/1190/1/012040

Nuraeni, N., Rasyid, R., Boceng, A., Ilsan, M., & Amran, F. D. (2018). Model of community behavior in the management of the community forest in Bulukumba Regency, South Sulawesi, Indonesia. *Journal of Advanced Agricultural Technologies*, *5*(3), 232-235. https://doi.org/10.18178/joaat.5.3.232-235

Panga, L., Puguh, W., Dangi, E., & Hastian. (2022). The model of agrobusiness partnership of Trigona Honey Bee which was developed by the community around the forest area in Amonggedo District, Konawe Regency, Southeast Sulawesi Province-Indonesia. *Journal on Management and Education Human Development*, *2*(1), 91-99.

Pretty, J. (2011). Interdisciplinary progress in approaches to address social-ecological and ecocultural systems. *Environmental Conservation*, *38*(2), 127-139. https://doi.org/10.1017/S0376892910000937

Rahayu, E. S., Suryanto, Sudarwanto, A. S., & Sutrisno, J. (2023). Implementation of seasonal differences and sociodemographic factors on the achievement of agribusiness MSME output in the Bengawan Solo Wonogiri Watershed. *IOP Conference Series: Earth and Environmental Science*, *1153*(1). https://doi.org/10.1088/1755-1315/1153/1/012035

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C. H., & Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management*, *90*(5), 1933-1949. https://doi.org/10.1016/j.jenvman.2009.01.001

Rockström, J., Falkenmark, M., Karlberg, L., Hoff, H., Rost, S., & Gerten, D. (2009). Future water availability for global food production: The potential of green water for increasing resilience to global change. *Water Resources Research*, *45*(7), 1-16. https://doi.org/10.1029/2007WR006767

Sartika, R. C., Purwaningsih, Y., Gravitiani, E., & Nitiyasa, P. (2023). The role of stakeholders in achieving sustainable agriculture: A case study in Sragen Regency, Indonesia. *Nature Environment and Pollution Technology*, *22*(4), 2181-2188. https://doi.org/10.46488/NEPT.2023.v22i04.044

Scoones, I., & Scoones, I. (2010). Sustainability. *Development in Practice*, *17*(November 2012), 589-596.

Sjahza, A., & Asmit, B. (2019). Regional economic empowerment through oil palm economic institutional development. *Management of Environmental Quality: An International Journal*, *30*(6), 1256-1278. https://doi.org/10.1108/MEQ-02-2018-0036

Sugihardjo, Lestari, E., Setyowati, R., Widiyanto, & Rusdiyana, E. (2021). Factors that influence farmer adaptation to climate change (Case of dry land farmers in Cemoro Watershed in Central Java). *E3S Web of Conferences*, *232*. https://doi.org/10.1051/e3sconf/202123204006

Sumaryanto, Susilowati, S. H., Nurfatriani, F., Tarigan, H., Erwidodo, Sudaryanto, T., & Perkasa, H. W. (2022). Determinants of farmers' behavior towards land conservation practices in the Upper Citarum Watershed in West Java, Indonesia. *Land*, *11*(10), 1-21. https://doi.org/10.3390/land11101827

Surya, B., Saleh, H., Hamsina, H., Idris, M., & Ahmad, D. N. A. (2021). Rural agribusiness-based agropolitan area development and environmental management sustainability: Regional economic growth perspectives. *International Journal of Energy Economics and Policy*, *11*(1), 142-157. https://doi.org/10.32479/ijeep.10184

Syafri, S., Surya, B., Ridwan, R., Bahri, S., Rasyidi, E. S., & Sudarman, S. (2020). Water quality pollution control and watershed management based on community participation in Maros City, South Sulawesi, Indonesia. *Sustainability (Switzerland)*, *12*(24), 1-38. https://doi.org/10.3390/su122410260

Timmer, C. P. (2017). Food security, structural transformation, markets and government policy. *Asia and the Pacific Policy Studies*, *4*(1), 4-19. https://doi.org/10.1002/app5.161

Velten, S., Jager, N. W., & Newig, J. (2021). The success of collaboration for sustainable agriculture: A case study meta-analysis. *Environment, Development and Sustainability*, *23*(10), 14619-14641. https://doi.org/10.1007/s10668-021-01261-y

Velten, S., Leventon, J., Jager, N., & Newig, J. (2015). What is sustainable agriculture? A systematic review. *Sustainability (Switzerland)*, *7*(6), 7833-7865. https://doi.org/10.3390/su7067833

Wibowo, A., Suwarto, Lestari, E., & Rahayu. (2023). Adaptation to climate change through a social innovation approach in Keduang Watershed, Java, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1165*(1). https://doi.org/10.1088/1755-1315/1165/1/012033

Wisnujati, N., & Patiung, M. (2020). As the agriculture, forestry and fisheries sector still as a potential in the prosperity of Indonesian Society? *Agricultural Social Economic Journal*, *20*(4), 319-326. https://doi.org/10.21776/ub.agrise.2020.20.4.7