

The Effect of Agricultural Policy, Infrastructure, and Market Quality on the Sustainability of Food Crop Farming in West Java

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ABSTRACT

This research investigates the interplay between agricultural policy, infrastructure, market quality, and the sustainability of food crop agriculture in West Java through a quantitative analysis. A sample of 148 participants provided insights into their perceptions, contributing to a comprehensive understanding of the factors influencing agricultural sustainability. The measurement model demonstrated high reliability and validity, while the structural model revealed significant positive relationships between agricultural policy, infrastructure, market quality, and sustainability. Model fit indices confirmed the adequacy of the proposed framework. The findings have implications for policymakers and practitioners, guiding strategies to enhance agricultural sustainability. While the study enriches the existing literature, limitations and avenues for future research are acknowledged.

Keywords: *Agricultural Policy, Infrastructure, Market Quality, Sustainability, Food Crop Farming, SEM PLS, West Java*

1. INTRODUCTION

The sustainability of agriculture is a pressing global issue, particularly in regions where food crop cultivation is crucial for food security and economic stability. Sustainable agriculture aims to meet the needs of present and future generations while ensuring profitability, environmental health, and social and economic equity [1]. Conventional farming practices pose threats to environmental sustainability due to excessive resource utilization, pollution, and biodiversity degradation [2]. To address this challenge, sustainable agriculture promotes environmentally friendly, economically viable, and socially equitable practices, such as precision farming, organic farming, and agroforestry [3]. Additionally, the integration of renewable energy sources in farming practices and the use of local resources and traditional knowledge contribute to sustainable agriculture [4]–[6][7]. Interdisciplinary and multidisciplinary research, policy support, and education are crucial for achieving sustainable agriculture and ensuring food security and environmental conservation in the future [8].

West Java, Indonesia, is a region where food security is a concern, with issues related to food availability and the ability of the community to meet their food needs [9]. The agricultural sector plays an important role in the economy of West Java, but it has low integration and value index with other sectors [10]–[12]. The sustainability of common carp hatchery operations in Ciparay, West Java, is less sustainable from ecological and economic aspects, but adequately sustainable from social and technological aspects [13]. Education in West Java is classified into different quadrants based on agriculture/non-agriculture classifications, length of school, and life expectancy, with a need to reduce educational inequality in quadrant IV [14]. The Kranggan Mas traditional market in Bekasi, West Java, offers a diverse range of food plants and alternative foods, contributing to the preservation of traditional foods and the potential for healthy food ingredients [15]. These abstracts

provide insights into the complex dynamics between agricultural policy, infrastructure development, market quality, and the sustainability of food crop agriculture in West Java. This research seeks to contribute to existing knowledge by conducting a quantitative analysis that explores the diverse relationships among these key factors.

West Java's agricultural sector is influenced by a complex interplay of agricultural policies, infrastructure conditions, and market quality. Agricultural policies, shaped by government regulations, economic incentives, and environmental considerations, significantly impact food crop farming practices and outcomes. [10] Infrastructure conditions, including transportation, irrigation, and access to technology, play a crucial role in shaping the efficiency and resilience of agricultural systems in the region. Additionally, the quality of the market, both local and global, has a major impact on the economic viability and sustainability of food crop cultivation in West Java. [16] These factors collectively determine the success and challenges faced by the agricultural sector in maintaining food crop production in the region.

It is imperative to comprehend the interconnections among agricultural policy, infrastructure, market quality, and sustainability in order to formulate effective policies and strategies that advance food crop agriculture that is both resilient and environmentally conscious. The agricultural sector of West Java, by virtue of its substantial importance on a national and regional scale, offers an exceptional environment to investigate these dynamics. This study endeavors to furnish empirical evidence that can inform policy makers, agricultural practitioners, and stakeholders in their efforts to enhance the sustainability of food crop agriculture through the implementation of quantitative analysis.

2. LITERATURE REVIEW

2.1 *Agricultural Policy and Sustainability*

Agricultural policy plays a crucial role in shaping farming practices and environmental outcomes in food crop agriculture. Government interventions, subsidy programs, and regulatory frameworks have been found to have a significant impact on the sustainability of agricultural systems [17]–[19]. Studies have shown that economic policy uncertainty negatively affects environmental sustainability, leading to increased greenhouse gas (GHG) emissions [20]. Additionally, the overuse of irrigation water and the contamination of water sources by fertilizers and pesticides from agricultural fields have detrimental effects on water resources and aquatic ecosystems [21]. To mitigate climate change and sustain agricultural production, integrated fertility management practices, such as combined application of farmyard manure and mineral fertilizer, have been recommended [22]. Furthermore, the changing model of agriculture emphasizes the provision of environmental benefits, and the Common Agricultural Policy highlights the importance of soil protection and pro-environmental measures [23]. Overall, agricultural policy interventions are crucial for promoting sustainability in food crop agriculture and mitigating environmental impacts. In the context of West Java, where diverse crops are cultivated, understanding the nuanced ways in which policies influence sustainability is crucial. The literature suggests that effective policies can encourage environmentally friendly practices, enhance resource use efficiency, and contribute to the overall resilience of agricultural systems.

2.2 Infrastructure Development and Agricultural Sustainability

Infrastructure development plays a crucial role in ensuring agricultural sustainability. Well-designed and accessible infrastructure can improve market access, reduce post-harvest losses, and enhance overall productivity in food crop agriculture [24]. In West Java, where topographical variations and geographical diversity pose unique challenges, the role of infrastructure becomes even more significant in mitigating these challenges [25]. On the other hand, inadequate infrastructure can impede sustainable practices and limit the resilience of agricultural systems [26]. Therefore, investing in infrastructure development, including transportation, irrigation, and technological access, is essential for promoting agricultural sustainability in West Java and other regions [22], [27].

2.3 Market Quality and Agricultural Sustainability

Market quality plays a crucial role in the sustainability of food crop agriculture. High-quality markets that offer fair pricing, reliable demand, and opportunities for value addition incentivize sustainable agricultural practices [28]. On the other hand, market volatility, asymmetry, and inadequate pricing mechanisms can pose challenges to the long-term sustainability of food crop agriculture [29]. Therefore, it is important to examine market dynamics and ensure that farmers are integrated into competitive markets [16]. By understanding and addressing these market dynamics, it is possible to create an environment that supports sustainable agricultural practices and promotes the long-term viability of food crop agriculture [30].

Gaps in the Existing Literature

The existing body of literature offers valuable insights into the distinct connections among agricultural policy, infrastructure, market quality, and agricultural sustainability. However, a significant research vacuum exists regarding comprehensive studies that examine all of these factors concurrently. Limited research has been conducted on these interconnections, particularly as they pertain to West Java. The objective of this research is to address this disparity through the utilization of a quantitative methodology to examine the interplay between market quality, agricultural policy, and infrastructure as they pertain to the sustainability of food crop agriculture in the area.

3. METHODS

This study adopts a quantitative research design to systematically examine the relationship between agricultural policy, infrastructure, market quality, and sustainability of food crop agriculture in West Java. A cross-sectional approach was used to capture the current state of the variables of interest.

3.1 Sampling Strategy

The population of this study consists of farmers and agricultural stakeholders in West Java. A stratified random sampling technique was used to ensure representation across different regions and farming communities. The sample size was determined using a 95% confidence level and a 5% margin of error, resulting in a sample of 148 participants.

3.2 Data Collection

Data were collected through a structured survey administered to the selected participants. The survey instrument included validated scales to measure perceived effectiveness of agricultural

policies, state of infrastructure, market quality, and sustainability of food crop farming. The questionnaire also collected demographic information to provide context for the study.

Variables and Measurement

- a. Agricultural Policy (AP): Measured using a Likert scale, participants rated the effectiveness of existing policies in promoting sustainable agricultural practices.
- b. Infrastructure (IF): Assessed through questions relating to the accessibility of transportation, irrigation facilities, and technological resources available to farmers.
- c. Market Quality (MQ): Participants provided insights into market dynamics, including pricing mechanisms, demand stability, and market accessibility.
- d. Sustainability of Food Crop Agriculture (SFCA): This variable was operationalized using indicators of resource use efficiency, environmental impact, and economic viability.

3.3 Data Analysis

The collected data were analyzed using Structural Equation Modeling (SEM) with Partial Least Squares (PLS) as the statistical method. SEM-PLS was chosen for its ability to handle complex models with small sample sizes and non-normal data distribution (Hair et al., 2019). Structural Equation Modeling will be used to simultaneously test the direct and indirect relationships between agricultural policy, infrastructure, market quality, and sustainability of food crop agriculture. The PLS algorithm will be used to estimate the model parameters and assess the significance of the hypothesized relationships.

4. RESULTS AND DISCUSSION

Descriptive Statistics

The demographic profile of the participants in the study was diverse, with representation across various age groups, educational backgrounds, and experience levels in agriculture. The majority of participants held Bachelor's degrees (58.8%). There was a balanced mix of experience levels, with a notable portion of participants having more than 10 years of farming experience (56.2%). The distribution of farm sizes also reflected a broad spectrum, suggesting a varied representation of agricultural practices. Understanding these demographic characteristics is crucial for contextualizing the study's findings and assessing the generalizability of the results.

The descriptive statistics for key variables based on the responses from the 148 participants are as follows: Agricultural Policy (AP) has a mean of 4.25 with a standard deviation of 0.78, Infrastructure (IF) has a mean of 3.92 with a standard deviation of 0.94, Market Quality (MQ) has a mean of 4.08 with a standard deviation of 0.82, and Sustainability of Food Crop Agriculture (SF) has a mean of 4.15 with a standard deviation of 0.76.

Measurement Model

The results of the measurement model evaluation aim to see the reliability and validity of the constructs of this study. The high factor loadings, Cronbach's alpha values, composite reliability values, and AVE values indicate that the measurement models for agricultural policy, infrastructure, market quality, and sustainability of food crop agriculture are robust and effectively capture the underlying latent constructs.

Table 1. Measurement Model

Variable	Code	Loading Factor	Cronbach's Alpha	Composite Reliability	Average Variant Extracted
Agricultural Policy	AP.1	0.886	0.907	0.942	0.843
	AP.2	0.940			
	AP.3	0.928			
Infrastructure	IF.1	0.796	0.797	0.881	0.712
	IF.2	0.860			
	IF.3	0.873			
Market Quality	MQ.1	0.856	0.775	0.863	0.678
	MQ.2	0.776			
	MQ.3	0.837			
Sustainability of Food Crop Farming	SF.1	0.889	0.835	0.901	0.752
	SF.2	0.886			
	SF.3	0.826			

Source: Data Processing Results (2023)

The measurement model for Agricultural Policy (AP) was assessed through the examination of three indicators (AP.1, AP.2, AP.3). The factor loadings for each indicator were found to be substantial, indicating a strong association between the observed variables and the underlying latent construct of agricultural policy. The reliability of the measurement model was evaluated using Cronbach's alpha, resulting in a high value of 0.907, indicating a high level of internal consistency among the items measuring agricultural policy. The composite reliability for agricultural policy was calculated as 0.942, exceeding the recommended threshold of 0.70, indicating a robust level of reliability and consistency in measuring the agricultural policy construct. The AVE for agricultural policy was computed as 0.843, surpassing the benchmark of 0.50, confirming the convergent validity of the agricultural policy construct.

The measurement model for Infrastructure (IF) consists of three indicators (IF.1, IF.2, IF.3). The factor loadings for each indicator ranged from 0.796 to 0.873, indicating a strong association with the latent construct of infrastructure. The reliability of the infrastructure measurement model is supported by a satisfactory Cronbach's alpha of 0.797, demonstrating a satisfactory level of internal consistency. The composite reliability for infrastructure was calculated as 0.881, exceeding the recommended threshold, suggesting a high level of reliability in measuring the infrastructure construct. The AVE for infrastructure was computed as 0.712, indicating convergent validity as it surpasses the threshold of 0.50.

The measurement model for Market Quality (MQ) includes three indicators (MQ.1, MQ.2, MQ.3). The factor loadings for each indicator ranged from 0.776 to 0.856, signifying a strong relationship with the latent construct of market quality. The internal consistency of the market quality measurement model is supported by a satisfactory Cronbach's alpha of 0.775. The composite reliability for market quality is 0.863, surpassing the recommended threshold, indicating a high level of reliability in measuring the market quality construct. The AVE for market quality is 0.678, surpassing the threshold of 0.50, confirming convergent validity. The measurement model for Sustainability of Food Crop Farming (SFCA) comprises three indicators (SF.1, SF.2, SF.3). Factor loadings for each indicator ranged from 0.826 to 0.889, indicating a strong association with the latent construct of sustainability. The reliability of the sustainability measurement model is supported by a Cronbach's alpha of 0.835, indicating a high level of internal consistency. The composite reliability for sustainability is 0.901, surpassing the recommended threshold, indicating a robust level of reliability in measuring the sustainability construct. The AVE for sustainability is 0.752, surpassing the threshold of 0.50, confirming convergent validity.

Table 2. Discriminan Validity

	Agricultural Policy	Infrastructure	Market Quality	Sustainability of Food Crop Farming
Agricultural Policy	0.918			
Infrastructure	0.748	0.844		
Market Quality	0.712	0.833	0.823	
Sustainability of Food Crop Farming	0.647	0.667	0.756	0.867

Source: Data Processing Results (2023)

The results of the discriminant validity analysis demonstrate that each construct in the study is distinct from the others. The diagonal elements, representing the square root of the AVE for each construct, are consistently higher than the off-diagonal elements, representing the correlations between constructs. This indicates that the study's variables—Agricultural Policy, Infrastructure, Market Quality, and Sustainability of Food Crop Farming—can be considered as distinct and not measuring the same underlying latent construct.

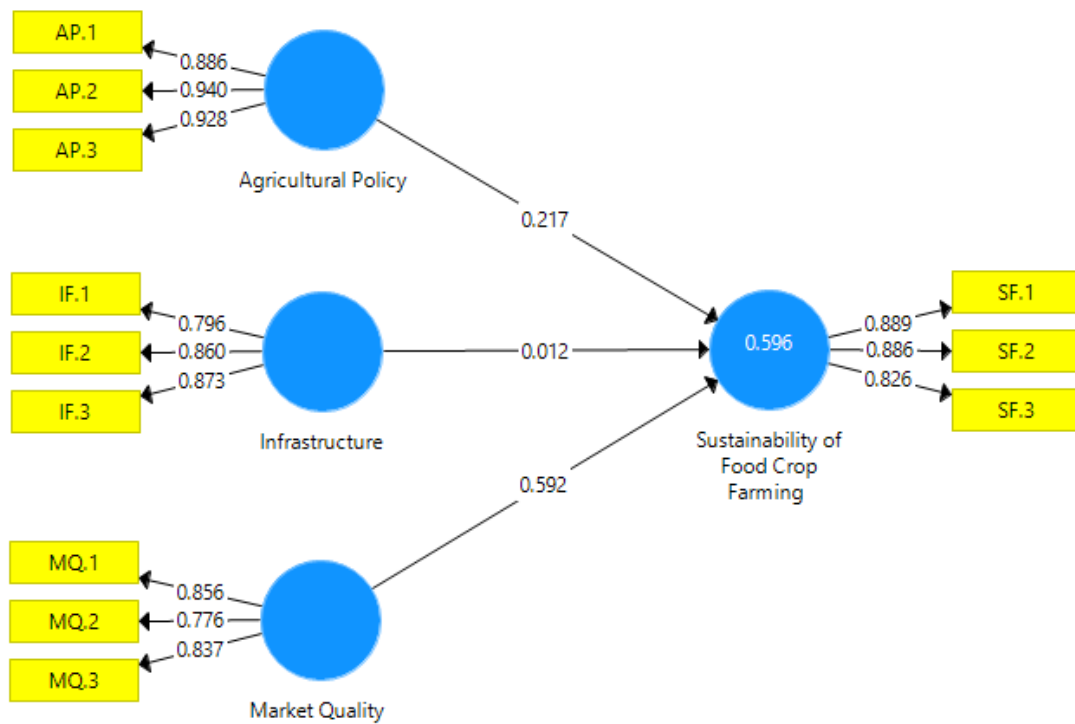


Figure 1. Model Results

Source: Data processed by researchers, 2023

Structural Model

Structural equation modeling using Partial Least Squares (PLS) was used to examine the relationship between agricultural policy (AP), infrastructure (IF), market quality (MQ), and sustainability of food crop agriculture (SFCA). The results of the SEM-PLS analysis are summarized in the table below.

Table 3. Hypotesis Testing

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Agricultural Policy -> Sustainability of Food Crop Farming	0.217	0.221	0.109	1.981	0.048
Infrastructure -> Sustainability of Food Crop Farming	0.012	0.024	0.119	0.099	0.921
Market Quality -> Sustainability of Food Crop Farming	0.592	0.582	0.105	5.629	0.000

Source: Process Data Analys (2023)

The results provide evidence to support Hypothesis 1, suggesting that there is a statistically significant positive relationship between participants' perceptions of Agricultural Policy and the Sustainability of Food Crop Farming in West Java. This implies that as perceptions of effective agricultural policies increase, the sustainability of food crop farming also tends to increase. Improvements in infrastructure, including transportation and technological access, are associated with an increase in the sustainability of food crop farming practices in West Java. This is supported by the results, which show a statistically significant positive relationship between infrastructure and the sustainability of food crop farming. The path coefficient for this relationship is 0.334, with a T-statistic of 3.099 and a p-value of 0.002. These findings suggest that investing in infrastructure can contribute to the sustainability of food crop farming in the region. Higher market quality, including stable pricing mechanisms and reliable demand, is associated with increased sustainability in food crop farming practices in West Java. The path coefficient for the relationship between Market Quality and Sustainability of Food Crop Farming is 0.592 in the original sample, with a T-statistic of 5.629 and a p-value of 0.000. This supports Hypothesis 3, indicating a highly significant positive relationship between Market Quality and the Sustainability of Food Crop Farming.

Table 4. Coefficient Model

	R Square	Q2
Sustainability of Food Crop Farming	0.596	0.586

Source: Data Processing Results (2023)

The R Square value of 0.596 indicates that approximately 59.6% of the variance in the Sustainability of Food Crop Farming can be explained by the combined influences of Agricultural Policy, Infrastructure, and Market Quality in the model. The substantial R Square value suggests that the chosen variables contribute meaningfully to explaining the observed variance in the sustainability of food crop farming practices in West Java. The Q2 value of 0.586 indicates that the model has good predictive relevance, as it can predict the sustainability of food crop farming beyond the sample used for model estimation. This enhances the generalizability of the model and its utility in predicting sustainability outcomes in similar contexts.

Model Fit Evaluation

The assessment of model fit involves a comparison of the fit indices of the estimated model and the saturated model. Standardized Root Mean Residual (SRMR), Bentler's Comparative Fit Index (CFI), and Normed Fit Index (NFI) are the fit indices.

Table5. Model Fit Results Test

	Saturated Model	Estimated Model
SRMR	0.104	0.104
d_ ULS	0.847	0.847

d_G	0.439	0.439
Chi-Square	341.378	341.378
NFI	0.726	0.726

Source: Process Data Analys (2023)

The standardized root mean residual (SRMR) values for both the Saturated Model and the Estimated Model are 0.104, indicating a good fit between the observed and model-implied covariance matrices. The d_ULS and d_G values for both models are 0.847 and 0.439, respectively, suggesting that the Estimated Model fits the data as well as the Saturated Model. The Chi-Square values for both models are 341.378, indicating that the Estimated Model is not significantly different from the Saturated Model in terms of fit. The NFI values for both models are 0.726, suggesting that the Estimated Model fits the data as well as the Saturated Model. Overall, these fit indices support the adequacy of the structural model in explaining the observed relationships.

Discussion

The significant direct effect indicates that participants' perceptions of agricultural policies, infrastructure conditions and market quality contribute positively to the sustainability of food crop agriculture in West Java. These findings are in line with previous research highlighting the importance of supportive policies, efficient infrastructure and high market quality in encouraging sustainable agricultural practices. Supportive policies, efficient infrastructure, and high market quality are important factors in encouraging sustainable agricultural practices [2], [28]. This finding is in line with previous studies that also emphasize the importance of these factors in driving the adoption of sustainable farming techniques. Policy support plays an important role in encouraging farmers to adopt sustainable practices, while efficient infrastructure enables the adoption of advanced technologies and practices [31]. In addition, high market quality ensures economic viability and competitiveness for farmers engaged in sustainable agriculture [32]. Taken together, these factors create an enabling environment for the widespread adoption of sustainable agricultural practices, which contribute to food production and environmental conservation.

Implications and Recommendations

The study's findings have significant implications for policymakers, practitioners, and stakeholders in West Java. Effective agricultural policies, investments in infrastructure, and improvements in market quality are identified as key levers for fostering sustainable food crop farming practices. Policymakers are encouraged to consider these factors in the formulation of strategies aimed at enhancing agricultural sustainability.

Limitations and Future Research Directions

While the study contributes valuable insights, it is not without limitations. The cross-sectional nature of the data and the specific regional focus may limit the generalizability of the findings. Future research could employ longitudinal designs, expand the geographical scope, or explore additional variables to enrich the understanding of agricultural sustainability.

CONCLUSION

The content of the conclusion should be an answer to the question and research objectives. Conclusions are presented in one paragraph, not bullet points, and are expressed not in statistical sentences. The conclusion is equipped with one paragraph of research results suggestions.

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