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The Role of Planting Time Determination and Land Drainage Management on the Risk of Rice Crop Failure in Flood-Prone Areas in Indonesia

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ABSTRACT

Rice farming in flood-prone areas of Indonesia faces persistent risks of crop failure due to climate variability, particularly excessive rainfall and prolonged inundation. Effective adaptation strategies are therefore essential to sustain rice production and farmers' livelihoods. This study aims to analyze the role of planting time determination and land drainage management in reducing the risk of rice crop failure in flood-prone regions of Indonesia. A quantitative research approach was employed using survey data collected from 150 rice farmers. The data were obtained through a structured questionnaire measured on a five-point Likert scale and analyzed using SPSS version 25. Multiple linear regression analysis was applied to examine both partial and simultaneous effects of the independent variables on crop failure risk. The results indicate that planting time determination has a significant negative effect on the risk of rice crop failure ($\beta = -0.381$; $p < 0.05$), while land drainage management also shows a significant negative effect ($\beta = -0.296$; $p < 0.05$). Simultaneously, both variables explain 46.8% of the variation in crop failure risk. These findings highlight the importance of integrating adaptive planting decisions with effective drainage management to enhance the resilience of rice farming systems in flood-prone areas. The study provides empirical evidence to support policy interventions and agricultural extension programs aimed at improving climate-resilient rice production in Indonesia.

Keywords: *Planting Time Determination, Land Drainage Management, Rice Crop Failure, Flood-Prone Areas, Climate-Resilient Agriculture*

1. INTRODUCTION

Rice is a strategic agricultural commodity in Indonesia, serving as the primary staple food for the majority of the population and playing a crucial role in national food security, rural livelihoods, and economic stability [1], [2]. The sustainability of rice production is therefore a major policy priority. However, rice farming in many regions of Indonesia faces increasing challenges due to climate variability, particularly extreme rainfall and flooding. Flood-prone areas, such as lowland river basins, coastal plains, and swampy agricultural zones, are especially vulnerable to crop damage and yield losses. Recurrent flooding events not only disrupt the growth cycle of rice plants but also significantly increase the risk of crop failure, threatening farmers' income and regional food availability [3], [4].

In recent years, climate change has intensified rainfall patterns, leading to more frequent and severe flooding in several rice-producing regions of Indonesia. These conditions often result in prolonged waterlogging, submergence stress, delayed planting, and reduced plant survival rates. While rice is generally tolerant of water, excessive and uncontrolled flooding—particularly during sensitive growth stages—can severely affect germination, tillering, and grain formation [5], [6]. Consequently, crop failure in flood-prone areas is no longer an isolated phenomenon but a recurring structural problem that requires systematic management interventions.

One of the critical factors influencing rice crop success in flood-prone areas is the determination of appropriate planting time. Planting time determination refers to farmers' ability to align planting schedules with rainfall patterns, flood cycles, and seasonal climate forecasts. Inappropriate planting decisions—such as planting too early before floodwaters recede or too late during unstable weather conditions—can expose rice crops to prolonged submergence or drought stress [7], [8]. Despite the availability of climate information and planting calendars issued by government agencies, many farmers still rely on traditional practices or experiential judgment, which may not adequately account for increasingly unpredictable climate conditions.

In addition to planting time determination, land drainage management plays a crucial role in mitigating flood-related risks in rice cultivation, as effective drainage systems help regulate water levels, prevent prolonged inundation, and maintain soil aeration essential for root development; however, poorly maintained or inadequate drainage infrastructure—such as shallow channels, sedimentation blockages, and weak integration with irrigation networks—often exacerbates flood impacts in many flood-prone rural areas, causing rice fields to remain submerged for extended periods and increasing the likelihood of crop failure. Although both planting time determination and land drainage management are widely recognized as important technical aspects of rice farming, quantitative empirical studies that examine their combined effects on crop failure risk in flood-prone areas of Indonesia remain limited, as most existing research tends to focus on climatic factors or agronomic practices in isolation without integrating farmers' decision-making behavior and land management conditions into a single analytical framework. Therefore, this study aims to analyze the role of planting time determination and land drainage management in influencing the risk of rice crop failure in flood-prone areas of Indonesia using a quantitative approach by collecting data from rice farmers and applying statistical analysis using SPSS version 25, with the expectation that the findings will provide empirical insights to support the development of climate-resilient agriculture and offer practical implications for policymakers, extension services, and farmers in designing more adaptive and sustainable rice production strategies in flood-risk regions.

2. LITERATURE REVIEW

2.1 Rice Crop Failure in Flood-Prone Areas

Rice crop failure refers to a condition in which rice plants experience significant yield loss or total production failure due to biophysical, environmental, or management-related factors, and in flood-prone areas this failure is predominantly associated with excessive and prolonged inundation that exceeds the tolerance limits of rice plants; although rice is a semi-aquatic crop, uncontrolled flooding—particularly during early growth stages—can inhibit germination, reduce root oxygen availability, and ultimately cause plant mortality, with previous studies highlighting flood duration, water depth, and the timing of inundation as key determinants of rice survival and yield performance [9], [10]. Flood-related crop failure has become increasingly prevalent in developing countries with monsoon-based climates, including Indonesia, where climate variability and land-use changes have intensified flood risks, especially in low-lying agricultural zones, leading farmers to face higher production uncertainty, increased input costs, and unstable income streams, thereby underscoring the importance of understanding and implementing effective management strategies to reduce flood-induced crop failure in order to sustain rice productivity and improve farmer welfare [11], [12].

2.2 Planting Time Determination

Planting time determination is a critical agronomic decision that directly influences crop growth, productivity, and resilience to environmental stress, as it involves selecting an appropriate period for sowing or transplanting rice based on climatic conditions, rainfall patterns, soil moisture availability, and anticipated flood cycles, enabling rice plants to avoid exposure to extreme weather events during sensitive growth stages and thereby minimizing the risk of crop failure [13], [14]. Numerous studies have emphasized that misaligned planting schedules are a major contributor to yield loss in flood-prone environments, where early planting may expose seedlings to sudden flooding while delayed planting can shorten growing periods and increase exposure to late-season floods; research in Southeast Asia further shows that farmers who align planting decisions with seasonal climate forecasts and hydrological patterns tend to achieve higher yields and lower crop failure rates [14]. From a behavioral perspective, planting time determination is shaped by farmers' risk perceptions, experience, and access to extension services, and quantitative studies consistently demonstrate that informed and adaptive planting decisions significantly reduce production risk, positioning planting time determination as a key strategic adaptation mechanism in climate-sensitive agricultural systems.

2.3 *Land Drainage Management*

Land drainage management refers to the planning, construction, and maintenance of systems designed to regulate excess water in agricultural fields, and in rice farming effective drainage is essential to prevent prolonged waterlogging, maintain soil structure, and ensure adequate oxygen supply to plant roots; in flood-prone areas, these systems function as a critical buffer against excessive rainfall and river overflow by facilitating controlled water removal from fields [15], [16]. The literature consistently highlights that inadequate drainage infrastructure significantly exacerbates flood impacts on rice production, as poorly designed or neglected drainage channels can cause stagnant water, increased soil toxicity, and a higher incidence of plant diseases, while empirical studies show that farms with well-maintained drainage systems experience shorter inundation periods and lower crop failure risks [17], [18]. Despite its strategic importance, drainage management in many rural areas remains suboptimal due to limited investment, weak institutional arrangements, and insufficient technical guidance, leading land drainage management to be increasingly recognized as a key component of climate-resilient agriculture, particularly in regions that are highly vulnerable to flooding.

2.4 *Research Hypotheses*

The interaction between planting time determination and land drainage management plays a crucial role in shaping rice production outcomes in flood-prone areas, as appropriate planting schedules help crops avoid peak flood periods while effective drainage systems mitigate the severity of flooding when it occurs, making these two factors complementary in managing flood risk. Quantitative studies demonstrate that integrated management approaches combining adaptive planting schedules with improved water control significantly reduce production risks, with regression-based analyses consistently showing that both planting time determination and land drainage management have negative and significant effects on crop failure probability, either independently or jointly. Moreover, the simultaneous consideration of behavioral factors related to farmers' planting decisions and structural factors associated with drainage infrastructure provides a more comprehensive understanding of flood risk management in rice farming, forming a strong theoretical and empirical basis for the development of research hypotheses.

H1: Planting time determination has a significant negative effect on the risk of rice crop failure in flood-prone areas.

H2: Land drainage management has a significant negative effect on the risk of rice crop failure in flood-prone areas.

H3: Planting time determination and land drainage management simultaneously have a significant effect on the risk of rice crop failure in flood-prone areas.

3. METHODS

3.1 Research Design

This study employs a quantitative research design to examine the influence of planting time determination and land drainage management on the risk of rice crop failure in flood-prone areas of Indonesia. A quantitative approach is considered appropriate as it allows for objective measurement of relationships among variables and enables statistical testing of hypotheses. The study adopts a cross-sectional survey design, where data are collected from respondents at a single point in time to capture their perceptions, experiences, and management practices related to rice cultivation in flood-prone environments.

3.2 Population and Sample

The population of this study consists of rice farmers cultivating paddy fields in flood-prone areas of Indonesia, which are characterized by recurring seasonal flooding caused by high rainfall intensity, river overflow, or poor drainage conditions; given the wide geographical distribution of such areas, the study focuses on representative rice-farming communities that frequently experience flood-related production risks. A total of 150 rice farmers were selected as respondents, a sample size considered adequate for quantitative analysis, particularly multiple regression testing, using a purposive sampling technique based on specific criteria, namely that respondents are actively engaged in rice farming, have experienced flooding in their rice fields within the last three planting seasons, and are directly involved in decisions related to planting time and field water management, thereby ensuring the relevance and validity of the data collected in relation to the research objectives.

3.3 Research Variables and Operational Definitions

This study involves three main variables, namely planting time determination, land drainage management, and the risk of rice crop failure, where planting time determination (independent variable X_1) refers to farmers' ability and practices in selecting appropriate planting periods based on rainfall patterns, flood cycles, seasonal forecasts, and local environmental conditions to align planting schedules with hydrological and climatic conditions and minimize flood exposure; land drainage management (independent variable X_2) refers to the effectiveness of drainage systems and water control practices applied in rice fields, including the condition and maintenance of drainage channels, water flow regulation, and farmers' capacity to manage excess water during heavy rainfall or flooding; and the risk of rice crop failure (dependent variable Y) refers to the perceived likelihood and frequency of rice production losses due to flooding, such as partial or total crop damage, yield reduction, and plant mortality, with all variables measured using multiple indicators assessed through a structured questionnaire.

3.4 Data Collection Technique

Primary data were collected using a structured questionnaire distributed directly to rice farmers, which was developed based on relevant literature and adapted to local farming conditions, with all items measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree); the questionnaire comprised three sections corresponding to the research variables as well as an additional section capturing respondents' basic demographic and farming characteristics. Prior to data collection, the questionnaire was reviewed to ensure clarity and relevance, and the data were gathered through face-to-face interviews to enhance respondents' understanding of the questions and improve response accuracy, particularly in light of variations in farmers' educational backgrounds.

3.5 Validity and Reliability Testing

Before conducting hypothesis testing, the validity and reliability of the research instruments were examined, with validity testing carried out using item–total correlation analysis to ensure that each questionnaire item adequately measured the intended construct, where an item was considered valid if its correlation coefficient exceeded the minimum acceptable threshold. Reliability testing was then conducted using Cronbach's alpha coefficient to assess the internal consistency of the measurement items, with a Cronbach's alpha value greater than 0.70 indicating that the instrument was reliable and suitable for further analysis, and all validity and reliability tests were performed using SPSS version 25.

3.6 Data Analysis Method

The collected data were analyzed using SPSS version 25 through several stages, beginning with descriptive statistical analysis to summarize respondents' characteristics and provide an overview of each research variable, followed by classical assumption tests—including normality, multicollinearity, and heteroscedasticity tests—to ensure that the data met the requirements for regression analysis. Multiple linear regression analysis was then employed to examine the effect of planting time determination and land drainage management on the risk of rice crop failure using the regression model $Y=\beta 0+\beta 1X1+\beta 2X2+\varepsilon$, where Y represents the risk of rice crop failure, X1 represents planting time determination, X2 represents land drainage management, $\beta 0$ is the constant, $\beta 1$ and $\beta 2$ are regression coefficients, and ε is the error term; hypothesis testing was conducted using the t-test to assess the partial effects of each independent variable and the F-test to evaluate their simultaneous effect, with a significance level of 5 percent ($\alpha = 0.05$) applied in all statistical tests.

4. RESULTS AND DISCUSSION

4.1 Respondent Characteristics

A total of 150 rice farmers from flood-prone areas participated in this study.

Table 1. Respondent Characteristics (n = 150)

Characteristic	Category	Frequency	Percentage (%)
Age	≤35 years	38	25.3
	36–55 years	93	62.0
	>55 years	19	12.7
Farming Experience	≤5 years	27	18.0
	6–10 years	35	23.3
	>10 years	88	58.7
Land Area	≤1 ha	107	71.3
	>1 ha	43	28.7

Table 1 shows that the majority of respondents are within the productive age group of 36–55 years (62.0%), indicating that rice farming in flood-prone areas is largely managed by farmers who are physically active and possess substantial decision-making capacity in managing production risks. A relatively smaller proportion of farmers are aged ≤35 years (25.3%), while only 12.7% are above 55 years, suggesting limited involvement of elderly farmers in intensive rice cultivation. In terms of farming experience, most respondents have more than 10 years of experience (58.7%), reflecting strong familiarity with local environmental conditions and recurrent flooding patterns, which may influence adaptive practices such as planting time determination and drainage management. Meanwhile, 41.3% of farmers have 10 years or less experience, indicating the presence of relatively less-experienced farmers who may face higher vulnerability to flood-related risks. Regarding land ownership, the majority of respondents cultivate small landholdings of ≤1 hectare (71.3%), highlighting the dominance of smallholder rice farming systems in flood-prone areas, where limited land size may constrain farmers' capacity to absorb production losses and invest in improved drainage infrastructure, thereby increasing their exposure to crop failure risk.

4.2 Descriptive Statistics of Research Variables

Descriptive statistics were used to examine respondents' perceptions of planting time determination, land drainage management, and the risk of rice crop failure. All variables were measured using a five-point Likert scale.

Table 2. Descriptive Statistics of Variables

Variable	Min	Max	Mean	Std. Deviation
Planting Time Determination (X_1)	2.40	4.80	3.87	0.56
Land Drainage Management (X_2)	2.10	4.70	3.65	0.61
Risk of Rice Crop Failure (Y)	2.60	4.90	3.94	0.59

The mean score for planting time determination was 3.87, indicating that farmers generally perceived their planting time decisions as relatively good, although not optimal. Land drainage management had a mean score of 3.65, reflecting moderate drainage effectiveness, with several respondents reporting infrastructure limitations. The risk of rice crop failure had a relatively high mean score of 3.94, confirming that flooding remains a significant threat to rice production.

4.3 Validity and Reliability Test Results

Validity testing showed that all questionnaire items had corrected item–total correlation values ranging from 0.421 to 0.731, exceeding the minimum threshold of 0.30. Reliability testing using Cronbach's alpha yielded values above 0.70 for all variables, indicating strong internal consistency.

Table 3. Reliability Test Results

Variable	Number of Items	Cronbach's Alpha
Planting Time Determination (X_1)	6	0.812
Land Drainage Management (X_2)	6	0.785
Risk of Rice Crop Failure (Y)	6	0.834

Table 3 indicates that all research variables demonstrate good reliability, as reflected by Cronbach's alpha values exceeding the commonly accepted threshold of 0.70. The planting time determination variable (X_1) has a Cronbach's alpha value of 0.812, suggesting a high level of internal consistency among the six items used to measure farmers' practices and perceptions related to planting schedule decisions. Similarly, the land drainage management variable (X_2) shows a Cronbach's alpha value of 0.785, indicating that the measurement items consistently capture aspects of drainage condition, maintenance, and water control practices. The highest reliability is observed for the risk of rice crop failure variable (Y), with a Cronbach's alpha value of 0.834, reflecting strong consistency in respondents' perceptions of flood-related production losses.

4.4 Classical Assumption Test Results

The normality test using the Kolmogorov–Smirnov method produced a significance value of 0.200 (>0.05), indicating normally distributed data. Multicollinearity testing showed tolerance values of 0.612 and VIF values of 1.634 for both independent variables, confirming the absence of multicollinearity. The Glejser test for heteroscedasticity produced significance values above 0.05, indicating homoscedastic residuals.

Table 4. Multicollinearity Test Results

Variable	Tolerance	VIF
Planting Time Determination (X_1)	0.612	1.634
Land Drainage Management (X_2)	0.612	1.634

4.5 Multiple Regression Analysis Results

Multiple linear regression analysis was conducted to test the proposed hypotheses. The regression results indicate that both independent variables have a significant negative effect on the risk of rice crop failure.

Table 5. Multiple Regression Results

Variable	Unstandardized β	Std. Error	t-value	Sig.
Constant	5.214	0.432	12.076	0.000
Planting Time Determination (X_1)	−0.381	0.067	−5.692	0.000
Land Drainage Management (X_2)	−0.296	0.072	−4.113	0.001

Table 5 presents the results of the multiple regression analysis, showing that both planting time determination and land drainage management have statistically significant effects on the risk of rice crop failure in flood-prone areas. The constant value of 5.214 indicates the baseline level of crop failure risk when the independent variables are held constant, reflecting the inherent vulnerability of rice farming in flood-prone environments. Planting time determination (X_1) has a negative regression coefficient ($\beta = -0.381$) with a t-value of −5.692 and a significance level of 0.000, indicating a strong and highly significant negative effect on crop failure risk; this implies that better alignment of planting schedules with rainfall patterns and flood cycles substantially reduces the likelihood of rice crop failure. Land drainage management (X_2) also shows a negative and significant effect ($\beta = -0.296$; $t = -4.113$; $p = 0.001$), suggesting that improvements in drainage systems and water control practices contribute meaningfully to lowering flood-related production losses. Comparatively, the larger absolute coefficient and t-value of planting time determination indicate that this variable exerts a stronger influence on reducing crop failure risk than land drainage management, although both factors play complementary and essential roles in mitigating flood impacts on rice cultivation.

The model summary indicates a correlation coefficient (R) of 0.684, reflecting a strong relationship between planting time determination and land drainage management with the risk of rice crop failure, while the coefficient of determination (R^2) of 0.468 shows that 46.8% of the variation in crop failure risk can be explained by the two independent variables included in the model, with an adjusted R^2 value of 0.460 confirming the robustness of the model after accounting for sample size. The standard error of 0.433 suggests an acceptable level of estimation accuracy, and the F-test result, which yields an F-value of 64.71 with a significance level of 0.000, indicates that the regression model is statistically significant overall, demonstrating that planting time determination and land drainage management simultaneously have a significant effect on the risk of rice crop failure in flood-prone areas.

Discussion

The results clearly demonstrate that planting time determination plays a critical role in reducing the risk of rice crop failure in flood-prone areas. The negative and significant regression coefficient indicates that farmers who align planting schedules with rainfall patterns and flood cycles are better able to avoid submergence during vulnerable growth stages. This finding reinforces the importance of climate-informed decision-making and supports previous studies that identify planting time as a key adaptation strategy in flood-risk agriculture [1], [2].

Land drainage management was also found to significantly reduce crop failure risk. The results suggest that well-maintained drainage systems shorten flood duration and improve soil conditions, thereby enhancing rice plant survival. Although drainage management showed a slightly lower effect size compared to planting time determination, its contribution remains substantial, particularly in areas experiencing prolonged inundation [19], [20].

The relatively high R^2 value indicates that behavioral and infrastructural factors together explain nearly half of the crop failure risk in flood-prone rice farming. This highlights the importance of integrated management strategies that combine farmers' adaptive decision-making with investments in drainage infrastructure. In the context of increasing climate uncertainty, strengthening extension services, improving access to climate information, and upgrading drainage systems are essential steps toward enhancing rice production resilience in flood-prone areas of Indonesia.

CONCLUSION

This study demonstrates that planting time determination and land drainage management play significant roles in reducing the risk of rice crop failure in flood-prone areas of Indonesia. The findings show that farmers who are able to accurately align planting schedules with rainfall patterns and flood cycles experience lower levels of crop failure. Similarly, effective land drainage management contributes to reduced inundation duration and improved field conditions, thereby lowering production risk. The simultaneous influence of both variables indicates that behavioral adaptation through informed planting decisions and structural adaptation through improved drainage infrastructure are mutually reinforcing strategies. These results underscore the need for integrated agricultural management approaches that combine climate-informed decision-making, strengthened extension services, and investments in drainage infrastructure. Future policies and development programs should prioritize these aspects to enhance the sustainability and resilience of rice production systems in flood-prone regions of Indonesia.

REFERENCES

[1] X. Zheng, Y. Wang, Y. Zhang, T. Deng, and Y. Yang, "Impacts of COVID-19 Pandemic on Dietary Consumption among Chinese Residents: Evidence from Provincial-Level Panel Data," *Int. J. Environ. Res. Public Health*, vol. 19, no. 13, 2022, doi: 10.3390/ijerph19137612.

[2] P. Adeolu Adedibu and P. A. Adedibu, "Article title: Ecological problems of agriculture: impacts and sustainable solutions Ecological problems of agriculture: impacts and sustainable solutions," no. May, 2023, doi: 10.14293/PR2199.000145.v1.

[3] G. Zhao *et al.*, "Modelling enablers for building agri-food supply chain resilience: insights from a comparative analysis of Argentina and France," *Prod. Plan. Control*, vol. 35, no. 3, pp. 283–307, 2024, doi: 10.1080/09537287.2022.2078246.

[4] L. Fassam and S. Dani, "A conceptual understanding of criminality and integrity challenges in food supply chains," *Br. Food J.*, vol. 119, no. 1, pp. 67–83, 2017, doi: 10.1108/BFJ-07-2016-0314.

[5] E. Tielkes, *Food and nutrition security and its resilience to global crises. Book of abstracts*. Universidad Católica Boliviana" San Pablo". IUC VLIR-UOS., 2020.

[6] M. C.-P. Poo and Z. Yang, "Global food supply chain resilience assessment: A case in the United Kingdom," in *6th International Conference on Transportation Information and Safety: New Infrastructure Construction for Better Transportation, ICTIS 2021*, Offshore and MarineResearch Institute Liverpool John Moores University, Liverpool Logistics, Liverpool, United Kingdom: Institute of Electrical and Electronics Engineers Inc., 2021, pp. 5–9. doi: 10.1109/ICTIS54573.2021.9798501.

[7] P. S. Sutar, G. Kolte, S. Yamini, and K. Mathiyazhagan, "Food supply chain resilience in the digital era: a bibliometric analysis and development of conceptual framework," *J. Bus. Ind. Mark.*, 2024.

[8] D. M. Tendall *et al.*, "Food system resilience: Defining the concept," *Glob. Food Sec.*, vol. 6, pp. 17–23, 2015.

[9] I. Krisnawati, I. A. Ubaidi, H. Rais, and R. L. Batu, "Strategi Digital Marketing dalam Perdagangan Hasil Tani untuk Meningkatkan Pendapatan Kabupaten Karawang," *J. Ilm. Ekon. Glob. Masa Kini*, vol. 10, no. 2, p. 70, 2019, doi: 10.36982/jiegmk.v10i2.838.

[10] A. Mishra, P. Kumar, and J. W. Ketelaar, "Improving rice-based rainfed production systems in Southeast Asia for contributing towards food security and rural development through sustainable crop production intensification," *Food*,

vol. 1, pp. 102–123, 2016.

[11] H. Sajady, M. Dastgir, and ..., “Evaluation of the effectiveness of accounting information systems,” … *J. Inf.* …, 2008.

[12] M. S. Abas, “Factors influencing self-reliance in rice production, the case of small farmers in Bataan, Philippines,” *Int. J. Agric. Technol.*, vol. 12, no. 1, pp. 41–53, 2016.

[13] L. K. Sharma and S. K. Bali, “A review of methods to improve nitrogen use efficiency in agriculture,” *Sustain.*, vol. 10, no. 1, pp. 1–23, 2018, doi: 10.3390/su10010051.

[14] Z. Wang *et al.*, “Evaluation on real-time self-organization algorithm of forest cultivation, tea planting, and tea processing for sustainable ecosystem management of agricultural water resources,” *Water Supply*, vol. 23, no. 5, pp. 2197–2209, 2023.

[15] M. Z. Elamin *et al.*, “ANALISIS PENGELOLAAN SAMPAH PADA MASYARAKAT DESA DISANAH KECAMATAN SRESEH KABUPATEN SAMPANG,” *J. Kesehat. Lingkung.*, vol. 10, no. 4, p. 378, 2018, doi: 10.20473/jkl.v10i4.2018.368-375.

[16] E. V Sofiina and V. P. Dyachkov, “DIGITALIZATION: INTERCONNECTION WITH THE SCIENTIFIC AND RESEARCH SPHERE-ONE OF THE MAIN STRATEGIC DIRECTIONS OF QUALITY …,” *International Journal for Quality Research*. ijqr.net, 2022.

[17] A. García-Morán and J. S. Yates, “In between rights and power: Women’s land rights and the gendered politics of land ownership, use, and management in Mexican ejidos,” *World Dev.*, 2022.

[18] R. Thackway, S. Davey, J. Hoare, and I. D. Cresswell, “Strategies for an integrated approach to ecologically sustainable land management,” *Australas. J. Environ. Manag.*, vol. 12, no. 2, pp. 66–76, 2005.

[19] Z. Chen, E. Bulut, A. Trmčić, and R. Ivanek, “Rapid Review of Government Issued Documents Relevant to Mitigation of COVID-19 in the U.S. Food Manufacturing and Processing Industry,” *Food Prot. Trends*, vol. 42, no. 6, pp. 426–438, 2022, doi: 10.4315/FPT-22-006.

[20] I.-H. Su, L. Wu, and K. H. Tan, “The future of the food supply chain: A systematic literature review and research directions towards sustainability, resilience, and technology adoption,” *J. Digit. Econ.*, 2024.