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Sustainability of Jokowi and Prabowo's Food Estate Program

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Abstract

This study aims to identify key factors influencing the sustainability of the Food Estate program in Central Kalimantan, particularly in the Kapuas and Pulang Pisau districts. The Food Estate program was initiated to support national food security by enhancing food production on peatlands. However, its implementation faces various challenges, including difficult land conditions and the need for adequate infrastructure. This study employs the MICMAC method (Matrix of Crossed Impact Multiplications Applied to a Classification) to analyze the impact of strategic variables, such as government policy, infrastructure, institutional support, and local economy. The findings indicate that government policy and infrastructure support are dominant factors affecting the program's success, while variables like local economy and farmers' income heavily depend on these factors. Recommendations include the need for sustainable policy enhancement, development of supporting infrastructure, improved market access, and adaptive technology training for farmers. With optimal implementation, the Food Estate program is expected to not only enhance national food security but also foster economic growth and improve the welfare of local communities in Central Kalimantan.

Introduction

Indonesia faces a major challenge in ensuring long-term food security for its population. One of the main strategies implemented is the Food Estate program, which aims to develop large-scale agricultural areas to increase national food production. One of the main locations for food estate development is Central Kalimantan province, with a focus on Kapuas and Pulang Pisau districts. This area was chosen due to the availability of large areas of land, around 164,598 hectares in Pulang Pisau and 293,488 hectares in Kapuas, which have the potential to develop food commodities such as rice, corn and cassava (Ministry of Agriculture, 2020).

The Food Estate Program in Central Kalimantan is expected to make a significant contribution to Indonesia's food security, especially in supporting the grand vision of national food security and improving community nutrition through the provision of quality food. In addition, the program is also expected to reduce dependence on food imports and improve the welfare of local communities through job creation and regional economic improvement (Rob & Cattaneo, 2021; Sikandar et al., 2021; Woodhill et al., 2022).

However, the implementation of the Food Estate in Central Kalimantan faces various challenges. The land in the Kapuas and Pulang Pisau regions is mostly peat swamp, which requires special management techniques. Peatlands have different physical and chemical characteristics from mineral soils, such as low pH, high acidity and high organic matter content, which can inhibit plant growth if not managed appropriately (Astutik et al., 2019; Aminuloh et al., 2019; Kunarso et al., 2022; Paul et al., 2021). In this case, adequate agricultural technology,

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including the use of adaptive crop varieties and sustainable land management practices, is an important factor in the success of this program (Kolapo et al., 2022; Bayisa et al., 2025; Kremsa, 2021).

In addition to natural factors, the success of the Food Estate also relies heavily on infrastructure support and sustainable government policies. Infrastructure such as irrigation, roads and storage facilities need to be provided to ensure smooth production, distribution and storage of food products (Nayak & Bagchi, 2022; Nyawo, 2024). Data shows that inadequate infrastructure can lead to decreased production and difficulties in distributing agricultural products to the market, which impacts price stability and program sustainability (Sridhar et al., 2023; Mokgomo et al., 2022; Parmar & Murari, 2025). In this case, government support through clear policies, sufficient funding, and continuous supervision is needed so that the Food Estate program can run effectively and efficiently (Anwar, 2021; Tobing, 2024; Dugbartey, 2025; Girsang, 2021).

Several studies have shown that a structured approach to identifying factors affecting the sustainability of food estate programs can provide deep insights. The MICMAC (*Matrix of Crossed Impact Multiplications Applied to a Classification*) method, introduced by Duperrin and Godet, has been widely used in analyzing the interrelationships between variables in complex systems, such as food estates (Arantes & Ferreira, 2024). This method allows researchers to map the key factors that influence program sustainability, such as infrastructure support, agricultural technology, local community involvement and government policies (Arcade et al., 2011; Soesanto, 2021). In the context of food estates, these variables do not stand alone, but interact with each other and have a significant reciprocal influence on the overall success of the program (Sharma et al., 2011; Benjumea-Arias et al., 2016).

This study aims to explore the key factors that influence the sustainability of the Food Estate program in Central Kalimantan and how it can support Prabowo's vision of food security and nutritious eating initiatives. Using the MICMAC approach, this study identifies strategic variables that can support the sustainability of the Food Estate in Kapuas and Pulang Pisau. The results of this study are expected to provide strategic recommendations for the government and relevant stakeholders to improve the effectiveness and efficiency of the program, so that the Food Estate can contribute to providing quality and affordable food for the people of Indonesia.

Methods

Data analysis from the questionnaires was conducted using the MICMAC (Matrix of Crossed Impact Multiplications Applied to a Classification) method. This process begins by converting the weight of each variable into a Matrix of Direct Influence (MDI). The stages of MICMAC analysis, as outlined by Fauzi (2019), essentially involve two main phases. The first phase is understanding the scope of the problem and the system to be studied. The analysis flow using MICMAC can be seen in Figure 1. The next stage is analyzing the intensity of influence and dependence between variables. This is determined by the position of the variables on the quadrant map, as illustrated in Figure 2 (in the original document, this refers to the quadrant map image, but here we will refer to its visual representation). To enhance transparency and comprehensive understanding, the MICMAC analysis flow is expanded as follows:

Identification of Key Variables and Data Collection

Strategic variables relevant to the sustainability of the Food Estate program were identified based on literature studies, focus group discussions (FGDs) with experts and stakeholders, and direct observation. Data regarding the influence relationships between variables were collected through questionnaires distributed to stakeholders, including the agriculture department, the

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Regional People's Representative Council (DPRD), the rice industry, farmers, extension workers, and expert respondents. The assessment of these relationships used a scale of 0 to 3 (0 = no relationship, 1 = weak, 2 = moderate, 3 = strong) and P for potential influence, as illustrated by Godet (1994)

Formation of the Matrix of Direct Influence (MDI)

Quantitative data from the questionnaires were processed to form the Matrix of Direct Influence (MDI). This matrix presents how each variable directly influences other variables within the system. (See Table 2 for the general structure of the MDI and Figure 2 in the original document for the specific MDI of this research).

Analysis of Influence and Dependence (Quadrant Mapping)

Using MICMAC software, the MDI was analyzed to calculate the total influence (driving power) and total dependence (driving attraction) for each variable. The variables were then mapped into an influence-dependence diagram divided into four quadrants. This mapping visualizes the strategic position of each variable in the system. (See Figures 3 and 4 in the original document for a visual representation of the influence-dependence map and graph).

Interpretation of the Quadrant Map

Quadrant I (Determinant/Driving Variables): Variables in this quadrant have high influence but low dependence. This means that these variables significantly influence other variables in the system but are not greatly influenced by other variables. They are key drivers, and changes in these variables will have a significant impact on the overall system. In the context of this research, examples include Government Policy (GovPol), Institutions (Inst), and Infrastructure (Infr). Interventions focused on these variables are highly strategic.

Quadrant II (Key/Relay Variables): Variables here have high influence and high dependence. They are central, meaning they are influenced by driving variables and simultaneously influence other variables (especially result variables). These variables can be unstable because they are sensitive to changes in other variables. Examples include the Local Economy (Econ) and Farmer Income (Income).

Quadrant III (Result/Dependent Variables): Variables in this quadrant have low influence but high dependence. Their position is strongly influenced by variables in other quadrants, particularly determinant and key variables. They reflect the results or outputs of the system and can serve as indicators of program success. Examples include Agricultural Technology (AgTech), Farmer Training and Guidance (Train), and Product Prices (ProdPrice).

Quadrant IV (Autonomous/Independent Variables): Variables in this quadrant have low influence and low dependence. They are relatively isolated from the rest of the system and have little direct relationship with other variables. Nevertheless, they remain part of the system's context. Examples include Business Capital (Cap), Education Level (Educ), and others.

Analysis Method

Table 1. Tabulation of the Relationship Between Influence and Dependence

Dimension	Variables/Attributes	Short Labels
Amplifying Factor	Institution	X1 (Inst)
	Infrastructure	X2 (Infr)
	Local Economy	X3 (LocEcon)
	Government Policy	X4 (GovPol)
	Business Capital	X5 (BusCap)

ISSN 2721-0960 (Print), ISSN 2721-0847 (online)

	Agricultural Technology	X6 (AgriTech)
Human Resources	Level of **Education**	X7 (Edu)
	Farmer Experience	X8 (Exp)
	Farmer Training and Guidance	X9 (Train)
	Market **Access**	X10 (MktAcc)
Market	Product **Price**	X11 (ProdPrice)
	Distribution	X12 (Distrib)
	Product **Marketing**	X13 (Mktg)
	Land Quality	X14 (LandQty)
Environment	Water Availability	X15 (Water)
	Climate Condition	X16 (Climate)
	Waste Management	X17 (WasteMngt)
Economic Sustainability	Farmer Income	X18 (Income)
	Local Industry Development	X19 (LocIndDev)
	Financial Sustainability	X20 (FinSust)
Social Sustainability	Community Involvement	X21 (ComInvolv)
	Job Diversity	X22 (JobDiv)
	Access to Education	X23 (EduAccess)

Source: KemenristekdiktiBRIN (2019); b) data processed from FGD

The process of analyzing the data from filling out the questionnaire using MICMAC is by converting the weight of each variable into a matrix of direct influence (MDI) as presented in Table 2. According to Fauzi, (2019) the stages of MICMAC analysis are based on two main stages. The first stage is understanding the scope of the problem and the system to be studied. The flow of analysis using MICMAC can be seen in Figure 1. The next stage is to analyze the intensity of influence and dependence between variables determined by the location of variables on the quadrant map as shown in table 1.

Results and Discussion

Matrix of Direct Influence

Based on the results of questionnaire and FGD data processing, there are variables that have been determined and quantified the relationship between variables that have been built so that a direct influence matrix is obtained as shown in Table 1. Through the MICMAC application, Figure 2 in the form of Matrix of Data Influence (MDI) is transformed into a variable map, which reflects or illustrates the position of the influence-dependence chart into four sectors (quadrant) (Figure 3).

Based on the results of data processing from questionnaires and Focus Group Discussions (FGDs), key variables that influence the sustainability of the Food Estate program in Central Kalimantan have been identified and defined. Each of these variables was then qualified and quantified based on the intensity of its influence, allowing the relationships between variables to be analyzed more comprehensively. This process resulted in the Matrix of Direct Influence (MDI), which maps the direct relationships between the variables and helps identify which variables have a dominant role in the system.

Using the MICMAC method, the MDI results are visualized into an influence map (Matrix of Data Influence) that is easier to interpret. This map shows the intensity of influence and dependency between variables in the form of an influence-dependence chart. In this map, each variable is placed according to the level of influence it has on other variables (influence) and the level of dependence on other variables in the system.

ISSN 2721-0960 (Print), ISSN 2721-0847 (online)

	Var 1	Var 2	Var 3 . . .	Var n	Influence (Y-Axis)
Var 1	0	(V1,2)	(V1,3) . . .	(V1,n)	$\sum_{j=1}^{n}(Var_i, j)$
Var 2	(V2,1)	0			
Var 3	.				
.	.				.
.	.				
Var n	(Vn,1)			0	
Dependence (X-Axis)	$\sum_{i=1}^{n}(Var_i,1)$ ..			...	

Figure 2. Tabulation of the Relationship between Influence and Dependence

Figure 2 allows us to understand the dynamics of the relationships between variables within the context of the Food Estate program. By analyzing this table, we can identify: a) Key Variables: Variables with high "Influence" values are variables that have a significant impact on the system. Variables with high "Dependence" values are variables that are greatly influenced by other variables; b) Reciprocal Relationships: By comparing the values at (Vi, j) and (Vj, i), we can see whether the relationship between two variables is reciprocal (mutually influencing) or unidirectional (one variable influences the other more dominantly); c) System Structure: This table helps to map the structure of the Food Estate system, showing which variables are the main drivers and which variables are more of a result or consequence.

With this mapping, the influence-dependence chart facilitates the identification of strategic variables that need to be managed effectively to improve the success of the Food Estate program. For example, variables in the Determinant Variables quadrant need to be given priority in management, as they have a major influence on the overall system without being overly dependent on other variables. In contrast, variables in the Result Variables quadrant show the end result of the interaction of other variables and can be used as indicators of successful program implementation. Through this mapping, the government and stakeholders can better understand the complex dynamics between variables in the Food Estate program and design appropriate policy interventions based on the position of variables in the influence-dependency map.

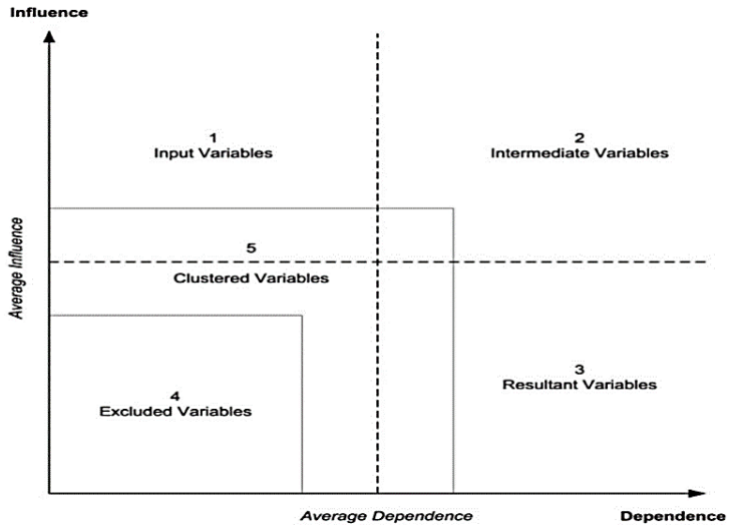

Figure 3. Illustration of MICMAC Analysis (Godet, 1994; Chatziioannou and Alvarez-Icaza, 2017)

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Based on the position of variables on this influence-dependence map, Figure 1 shows a division into several quadrants or groups of variables: a) Quadrant 1 (Input Variables/Driving Variables/Determinants): Located in the upper left, indicating variables with high influence but low dependence. These variables significantly affect the system but are not much influenced by other variables; b) Quadrant 2 (Intermediate Variables/Key Variables/Relay Variables): Located in the upper right, indicating variables with high influence and high dependence. These variables greatly influence the system and are also heavily influenced by other variables; they are unstable and act as important links in the system; c) Quadrant 3 (Resultant Variables/Outcome Variables/Dependent Variables): Located in the lower right, indicating variables with low influence but high dependence. These variables are the results or consequences of changes in other variables within the system; d) Quadrant 4 (Excluded Variables/Autonomous Variables/Independent Variables): Located in the lower left, indicating variables with low influence and low dependence. These variables are relatively isolated from the system; e) Area 5 (Clustered Variables/Central Variables): Positioned around the intersection of average influence and dependence, showing variables that have moderate levels of influence and dependence and are interlinked.

	1 : Inst	2 : Infr	3 : Econ	4 : GovPol	5 : Cap	6 : AgTech	7 : Educ	8 : Exp	9 : Train	10 : MktAcc	11 : ProdPrice	12 : Distrib	13 : Mktng	14 : LandQlty	15 : Water	16 : Climate	17 : WasteMngmt	18 : Income	19 : LocIndDev	20 : FinSus	21 : ComInv	22 : DivJobs	23 : PedAccess
1 : Inst	0	2	1	2	2	2	1	3	3	2	3	1	0	P	3	3	0	3	1	1	0	0	1
2 : Infr	2	0	2	3	2	1	0	P	3	1	3	2	0	P	2	3	1	3	1	1	1	0	0
3 : Econ	3	3	0	3	3	2	2	2	2	2	2	1	2	2	2	2	0	3	2	1	1	1	1
4 : GovPol	3	3	3	0	3	3	3	3	3	3	3	3	3	2	2	P	2	2	1	2	2	1	2
5 : Cap	1	3	3	2	0	3	1	P	1	2	1	2	3	P	2	0	1	P	P	P	P	P	P
6 : AgTech	1	2	P	1	P	0	0	1	2	1	P	P	2	0	0	0	0	0	0	p	0	0	0
7 : Educ	P	P	3	P	P	P	0	2	3	P	P	P	2	P	P	0	2	P	P	P	0	P	3
8 : Exp	0	1	3	0	1	2	P	0	2	0	1	0	0	2	2	0	1	3	0	0	0	0	0
9 : Train	0	0	3	1	1	2	0	3	0	0	1	0	0	1	1	0	1	3	1	0	P	P	0
10 : MktAcc	2	0	2	2	2	1	P	0	0	0	2	2	1	0	0	0	0	P	2	P	0	0	1
11 : ProdPrice	P	2	3	P	P	P	P	P	P	P	0	1	1	P	P	0	1	3	P	P	0	1	1
12 : Distrib	0	0	P	0	P	0	0	0	0	P	P	0	P	0	0	0	0	P	P	P	0	2	0
13 : Mktng	0	0	P	0	P	2	0	0	0	0	P	P	0	0	0	0	P	P	0	0	0	P	0
14 : LandQlty	0	0	P	P	0	0	0	P	P	0	P	0	0	0	P	0	0	P	0	0	0	0	0
15 : Water	0	0	P	P	0	0	0	0	0	0	P	0	0	P	0	0	0	P	0	0	0	0	0
16 : Climate	0	2	3	P	0	1	0	1	1	2	P	P	0	P	P	0	0	P	0	0	0	0	0
17 : WasteMngmt	2	1	1	1	0	3	0	0	1	0	1	0	0	3	3	0	0	P	0	0	1	0	0
18 : Income	P	P	P	P	P	P	2	1	0	1	3	0	0	2	2	0	0	0	3	3	3	3	3
19 : LocIndDev	0	0	3	P	P	P	P	0	0	0	0	1	1	0	0	0	2	1	0	0	1	0	0
20 : FinSus	0	0	1	0	1	0	0	0	P	0	0	0	0	0	0	0	0	1	0	0	0	2	0
21 : ComInv	0	1	1	1	0	2	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0
22 : DivJobs	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	0	1	0	0	2	0	0	3
23 : PedAccess	1	0	2	0	1	2	P	P	P	P	P	0	P	P	P	0	P	P	0	P	P	P	0

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Figure 4. Matrix of Direct Influence

Influences range from 0 to 3, with the possibility to identify potential influences:

0: No influence

1: Weak

2: Moderate influence

3: Strong influence

P: Potential influences

Figure 4 presents the Direct Influence Matrix (DIM), which is the foundation of the MICMAC analysis. This matrix visually shows how each variable (row) influences other variables (column) with scores ranging from 0 (no influence) to 3 (strong influence), and 'P' for potential

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influence. For example, if we look at the row for 'Government Policy' (GovPol) and the column for 'Infrastructure' (Infr), the indicated value (e.g., '3') shows that government policy has a strong influence on infrastructure development. A systematic reading of the matrix allows for an initial identification of which variables exert the most influence (high row totals) and which variables receive the most influence (high column totals)

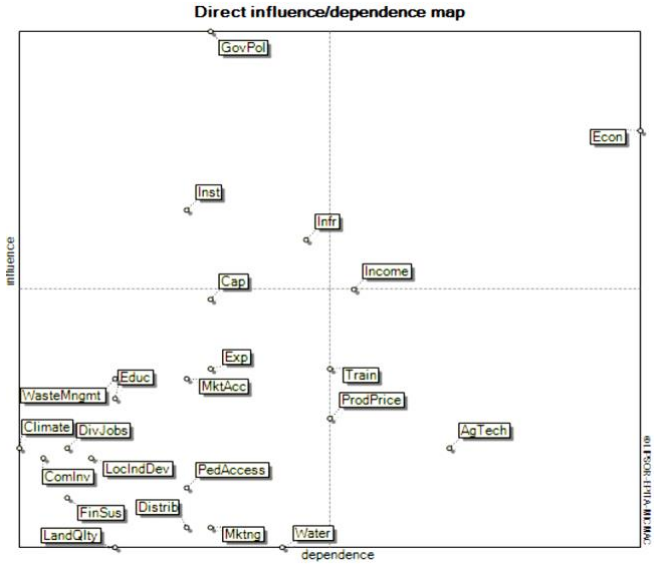

Figure 5. Position of a system variable in the direct influence-dependence map

Figure 5 is a visualization of the DIM into an influence-dependence map, which divides variables into four strategic quadrants. The vertical axis represents the level of influence (higher up means higher influence), and the horizontal axis represents the level of dependence (further to the right means higher dependence). The placement of each variable, such as 'Government Policy' (Kebj(GovPol)) in the determinant quadrant (high influence, low dependence), and 'Farmer Income' (Pdpt(Income)) in the key quadrant (high influence, high dependence), provides a quick visual guide to the strategic role of each variable in the Food Estate system. The dashed lines on the figure indicate the average influence and dependence, which aid in demarcating the quadrants

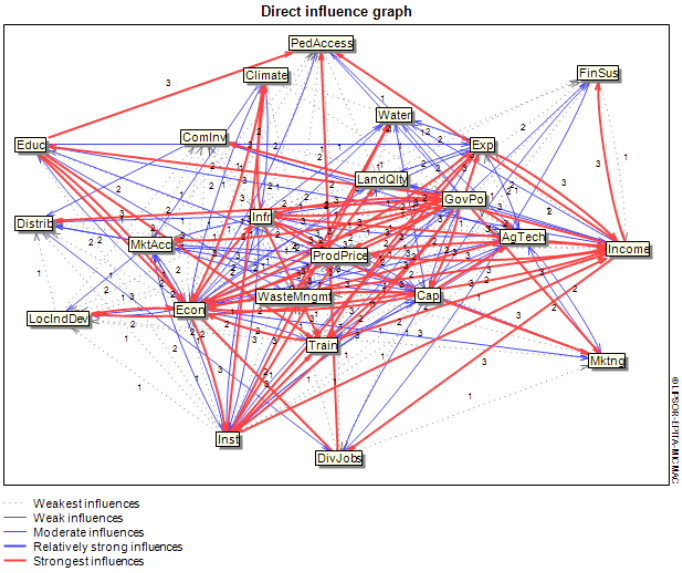

Figure 6. Graphic illustration of influence- dependence variables

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Figure 6 presents a more detailed graphic illustration of the interaction network among the 23 variables analyzed. The direction of the arrow from one variable to another indicates influence, while an arrow pointing to a variable indicates that the variable is influenced by or dependent on other variables. The thickness and color of the lines also indicate the strength of the relationship: green lines signify weak influences, blue for moderate influences, dark blue for relatively strong influences, and red for the strongest influences. For example, the many thick red lines emanating from variables like 'Government Policy,' 'Infrastructure,' and 'Institutions' confirm their dominant role in influencing many other variables in the system. Conversely, variables such as 'Farmer Income' and 'Local Economy,' which receive many thick arrows, indicate a high degree of dependence on other variables. This narrative helps the reader not only to see the static position of variables in the quadrants but also to understand the dynamic flow of influence within the entire system.

Based on the results of the MICMAC analysis, the variables in the first quadrant (determinant variables) are government policy (GovPol), institutions (Inst), and infrastructure (Infr). The characteristics of the first quadrant are variables that have a high level of influence and low dependence. Then variables with high influence with high dependency, but unstable relationships between variables in the second quadrant (key variables) are the local economy (Econ) and farmer income (In-come).

Furthermore, variables in quadrant three (result variables) are variables that have low influence and high dependence on agricultural technology (AgTech), farmer training guidance (Train), and product prices (ProdPrice). Quadrant four (Autonomous variables) are business capital variables (Cap), education level (Educ), farmer experience (Exp), market access (MktAcc), distribution (Distrib), marketing of production (Mktng), land quality (LandQlty), water availability (Water), climate conditions (Climate), waste management (WasteMngmt), local industry development (LocIndDev), financial sustainability (FinSus), community involvement (ComInv), job diversity (DivJobs), and access to education (PedAccess).

Variables in quadrant four have low influence and dependence. Based on this figure, the relationship expressed by the green line means Weak influences, the blue line means Moderate influences, the dark blue line means Relatively strong influences and the red line means Strongest influences. Illustration of the MICMAC graph of 23 variables marked by the direction of the arrow indicates the effect of dependence.

The direction of the arrow from a variable shows the influence of that variable on other variables. Conversely, an arrow to a variable indicates that the variable is influenced by (dependent on) other variables. The more arrows and thick red lines from a variable means that the variable has a large influence on many other variables. Likewise, more arrows and thick red lines to a variable means that the variable has a high level of dependency from many other variables.

Based on the figure, some variables such as government policies, infrastructure, institutions, business capital, and product prices have a strong influence on other variables, indicated by the thick red lines and arrows going outwards from these variables. In contrast, variables such as farmer income, local economy, and access to education are strongly influenced by other variables, indicated by the many arrows pointing towards them. This indicates a high degree of dependency of these variables on other variables.

Conclusion

The sustainability of the Food Estate program in Central Kalimantan hinges on the interplay of multiple factors, with government policy, infrastructure, and institutional support emerging as the dominant determinants (Quadrant I). These variables exert significant influence on the

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system but remain relatively independent of other factors. Meanwhile, local economy and farmer income (Quadrant II) are critical yet unstable "relay variables," as their success depends heavily on external factors like policy implementation and infrastructure development. Variables such as agricultural technology, farmer training, and product prices (Quadrant III) act as dependent outcomes, reflecting the program's downstream effectiveness. Autonomous variables like land quality, education level, and market access (Quadrant IV) have minimal systemic impact but require targeted support to avoid becoming bottlenecks. The study underscores the complexity of the Food Estate ecosystem, where peatland challenges, infrastructure gaps, and policy coherence directly affect productivity and community welfare. Without addressing these interconnected factors, the program risks inefficiency, despite its potential to bolster national food security and local economic growth.

Suggestion

For the sustainability of the Central Kalimantan Food Estate, a holistic strategic approach is necessary. The government needs to strengthen long-term policies that are adaptive to peatlands and climate change, accompanied by cross-sectoral coordination and regulations for sustainable peatland management. Prioritizing infrastructure development, such as irrigation, roads, and post-harvest storage, is crucial to support productivity and efficiency. Empowering farmers through adaptive technology training and access to capital, as well as developing agro-industries based on superior commodities with capital support and partnerships, will strengthen the local economy. Monitoring the peatland ecosystem, restoration efforts, and the utilization of environmentally friendly technologies are mandatory. Finally, multi-stakeholder collaboration and periodic evaluations based on sustainability indicators are key to the program's success.

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