



Land Conversion's Impact on Food Security in Sindangsari, Karawang, Indonesia

Henny Widyastuti^{1*}, Deffi Ayu Puspito Sari²

¹Disaster Management, Indonesia Defense University, Sentul, Indonesia

²Environmental Engineering, Universitas Bakrie, Jakarta, Indonesia

*Correspondence E-mail: henny.widyastuti@idu.ac.id, henny1401@yahoo.com * dan
deffi.sari@bakrie.ac.id, deffiayu@gmail.com

Article History: Received: August 26, 2024; Accepted: September 18, 2024

ABSTRACT

According to the Food Security and Vulnerability Atlas (FSVA) standard, of the 309 villages in Karawang, 63 are classified as food insecure. This study aims to determine the land conversion factors that affect food security in Karawang and to identify the factors influencing food access at the farm level. Using quantitative methods, including multiple linear regression analysis and logistic regression, the results show that the variable "number of industries" has a significant impact on food security, while income per month and farming experience significantly affect food access at the farm level. Additionally, food security (represented by the percentage of the poor) and regional security (represented by the crime rate) demonstrate a linear correlation.

Keywords: Land Conversion, Food Security, Food Insecurity, FSVA, Disaster Management

1. INTRODUCTION

The demand for food continues to rise along with population growth. However, meeting all food demands remains challenging due to food production and distribution capacity limitations. This imbalance can lead to food instability between demand and supply on a national scale.

Karawang Regency is one of the areas in West Java known for its fertile land, making it largely dedicated to agriculture. The total land area in Karawang Regency is 175,327 hectares, with 98,164 hectares of paddy fields and 77,163 hectares of dry land (Badan Pusat Statistik Kabupaten Karawang, 2015a). As a primary rice producer in West Java, Karawang Regency contributes significantly to the national rice demand, which averages 865,000 tons per year (Pemerintah Daerah Kabupaten Karawang, 2014). Figure 1 shows paddy production in Karawang Regency.



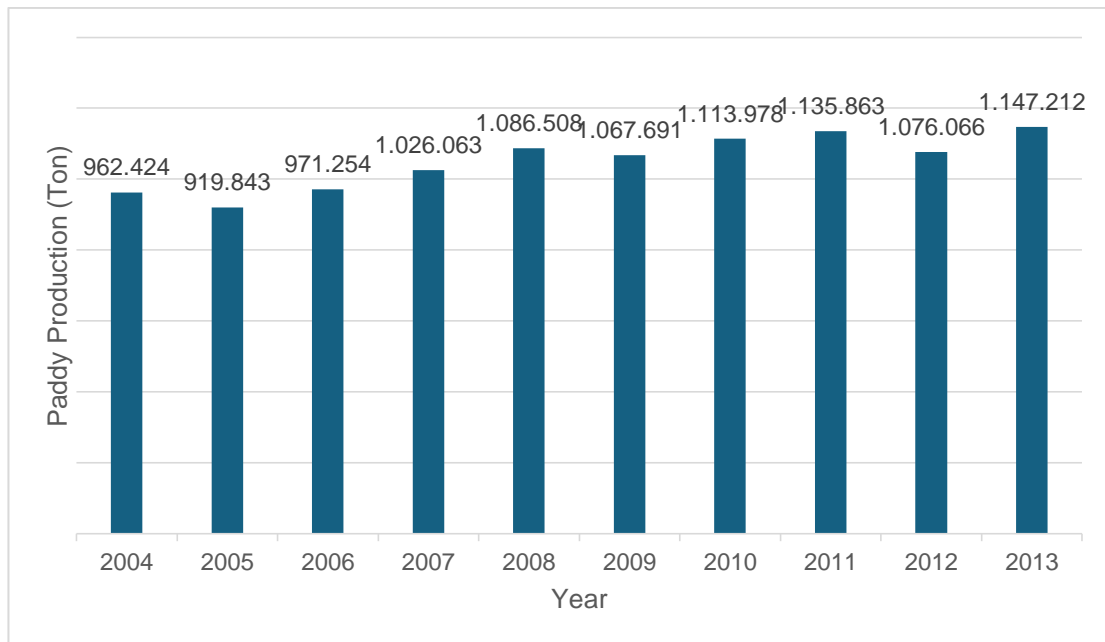


Figure 1. Paddy Production in Karawang Regency

Source: Adapted from (Badan Pusat Statistik Kabupaten Karawang, 2010, 2011, 2012, 2013, 2014, 2015b, 2015a)

Figure 1 shows that paddy production from 2011 to 2012 experienced the highest decline in the last decade at 5.26%, though it rose again by 6.61% in 2013, in line with the increase in harvested area (Badan Pusat Statistik Kabupaten Karawang, 2015a). Due to the uneven distribution of food, varying levels of food access, agricultural disruptions from natural disasters and pest infestations, and the ongoing threat of agricultural land conversion, not all areas in Karawang Regency have food security.

Food security refers to a condition, where people have physical and economic access to sufficient, safe, and nutritious food (Rajindra et al., 2021). In Indonesia, food security is closely associated with meeting the demand for rice as the staple food (Carvalho, 2006). Achieving national food security relies heavily on the availability of locally grown food, contributing to regional food security (Martanto, 2021). According to the 2012 Food Insecurity Atlas (FIA), Karawang District is identified as food insecure (Tambunan, 2010). Karawang Regency comprises 309 villages, of which 63 (20.38%) are classified as food insecure, based on the Food Security and Vulnerability Atlas of Indonesia (FSVA).

Effective disaster management is essential, as natural disasters can result in property loss, infrastructure damage, and a negative impact on food security in affected areas (Sari et al., 2018). In disaster management, Article 53 of Law Number 24 of 2007 mandates that food is one of the

basic needs the government must provide (*Undang-Undang Nomor 24 Tahun 2007 Tentang Penanganan Bencana*, n.d.). Indonesia, being highly prone to various types of disasters—such as natural disasters, transportation risks, and famine—faces ongoing food security challenges (Departemen Pertahanan Republik Indonesia, 2008). Food-insecure communities are those with insufficient access to adequate food for a healthy and active life, including the poor, disaster-affected populations, and those living in geographically isolated areas (*Undang-Undang Nomor 18 Tahun 2012 Tentang Pangan*, n.d.)

Land use change poses a tangible threat to food security efforts. Food needs cannot be viewed solely as a commodity due to their political implications, highlighting the crucial role of government intervention in ensuring year-round rice availability, equitable distribution, and stable pricing (Firdaus et al., 2008). Disruptions in food distribution may lead to scarcity and price increases, reducing access to food, particularly for the economically disadvantaged. Limited food access among low-income populations stems from poverty, lack of stable employment, low and variable income, and limited purchasing power (Dewan Ketahanan Pangan, 2013).

Land availability is essential to support agricultural growth in Karawang District. However, industrial, residential, and commercial needs often cause land use changes. According to data from the Karawang Regency Agriculture Office, rice field areas shrank by an average of 190.4 hectares annually between 1996 and 2006, primarily in Karawang Kota District, both west and east. This land conversion, closely linked with industrial and residential expansion, leads to a permanent reduction in food production, a problem with lasting consequences even if no further land conversion occurs (Pambudi, 2021).

The continued rate of agricultural land conversion can reduce food production, particularly rice. While land productivity can be increased, the area of agricultural land in each region continues to shrink. This reduction raises food security concerns as rice availability decreases. Despite West Java's Rice Barn and Karawang Regency contributing 865,000 tonnes to the national market, there are still 63 food-insecure villages in Karawang District (Pemerintah Daerah Kabupaten Karawang, 2014; Pusat Data dan Analisis Pembangunan Jawa Barat, 2013). Inefficient food distribution and limited food access contribute to food insecurity. Ideally, with increased productivity, effective food distribution, and access, food security could be achieved even in shrinking agricultural areas.

Research conducted at the farmer level focuses on a case study in Kutawaluya District, Karawang Regency. The site was selected based on Karawang Regency Regional Regulation Number 2 of 2013 concerning Spatial Planning for 2011-2030. Although the Kutawaluya District

is a designated area where agricultural land conversion is prohibited, it includes seven villages identified as food insecure, with a food insecurity ratio ranging from 18.17% to 38.49%.

This study aims to analyze the impact of agricultural land conversion on food security levels in Karawang Regency, focusing on Sindangsari Village.

2. RESEARCH METHOD

The research employed both quantitative and descriptive methods. The quantitative method was used to analyze the effect of land conversion factors on food security in Karawang District and to identify factors influencing food access for farmers in food-insecure areas. The descriptive method was applied to explain the impact of land conversion factors on food security and the relationship between food security and regional security in Karawang Regency.

The study population consisted of residents in Sindangsari Village, Kutawaluya District, Karawang Regency, classified as food-insecure households, totaling 1,390 people (Badan Pusat Statistik Kabupaten Karawang, 2015b). The sampling technique used was proportionate stratified random sampling, focusing on heads of families classified as food-secure or insecure households. The sample size was determined using the Isaac and Michael formula, resulting in a sample of 65 individuals.

Quantitative analysis in this study involved variables such as population, land area, number of industries, and the Gross Regional Domestic Product (GRDP) chain index, analyzed through multiple linear regression and logistic regression. Statistical analysis was conducted using SPSS Statistics 17.0 software. This study also included relational or associational explanatory research to evaluate variable relationships (Nugroho, 2013).

The research was conducted using a survey method, including visits to agencies and organizations related to agricultural land and food security in Karawang District. Secondary data collection involved literature reviews and surveys of agencies such as The Regional Development Planning Agency, BPS-Statistics Indonesia, the Department of Food Security, the City Planning Office, the National Land Agency, and the Regional Library of Karawang Regency. Primary data was gathered through interviews and questionnaires. Interviews were conducted with the Village Head and staff from the Sindangsari Village Office. Meanwhile, questionnaires were distributed to farmers in the sample group, including landowners, non-landowners, and those who had or had not converted their land related to food access.

The primary research instrument was a questionnaire designed for respondents. Each indicator variable was measured using an interval measurement scale and a rating scale model.



3. RESULTS AND DISCUSSION

GRDP Chain Index

Based on the GRDP data for the Karawang Regency population from the BPS-Statistics Indonesia of West Java Province, we calculate the GRDP growth rate using the chain index formula. The results are presented in Table 1 for the data from 2004 to 2013 and in Table 2 for the data from 2014 to 2023:

Table 1. GRDP Chain Index of Karawang Regency Population 2004-2013

Year	GRDP (Million Rupiah)	Chain Index (%)
2004	19,816,749.00	1.19
2005	25,653,850.00	1.29
2006	31,348,367.00	1.22
2007	36,131,054.03	1.15
2008	42,445,653.25	1.17
2009	48,283,355.85	1.14
2010	57,046,690.09	1.18
2011	67,159,367.60	1.18
2012	71,321,444.49	1.06
2013	81,682,675.41	1.15
Total	480,880,203.73	11.73
Average	48,088,920.37	1.17

Source: Adapted from (Badan Pusat Statistik Provinsi Jawa Barat, 2008, 2009, 2010, 2011, 2012, 2013, 2014)

Table 2. GRDP Chain Index of Karawang Regency Population 2014-2023

Year	GRDP (Million Rupiah)	Chain Index (%)
2014	156,318,620.93	1.91
2015	167,116,457.80	1.07
2016	182,503,201.67	1.09
2017	197,057,313.40	1.08
2018	217,404,171.00	1.10
2019	230,201,341.00	1.06
2020	223,422,079.00	0.97
2021	243,713,323.00	1.09



Year	GRDP (Million Rupiah)	Chain Index (%)
2022	268,228,786.00	1.10
2023	290,916,318.00	1.08
Total	2,176,881,611.80	11.56
Average	217,688,161.18	1.16

Source: Adapted from (Badan Pusat Statistik Kabupaten Karawang, 2019, 2024)

Over ten years (2014–2023), Karawang's GRDP has consistently increased each year, with a total chain index reaching 11.56%. The increase in the number of industries (especially medium and large industries) has generally led to a rise in the Gross Regional Domestic Product (GRDP) of Karawang Regency's population. However, when examining income sources by type of employment, this GRDP growth has not extended to the agricultural sector, even though Karawang Regency is recognized as a key food-producing area (one of West Java's main rice granaries, alongside Indramayu and Subang). Consequently, the GRDP increase is not felt by farmers, especially those who earn their livelihood solely as farm laborers or small-scale farmers.

India and South Africa indicate that similar dynamics occur when systemic barriers, such as poor market access and limited farm size, prevent agricultural workers from participating in economic growth (Ndlovu, 2021). To address structural issues, providing better access to irrigation and market logistics is essential to integrate small-scale farmers into broader economic gains (Dhilon, 2023; Ndlovu, 2021)

Population Growth Rate

The population growth rate of Karawang Regency over the past 10 years can be seen in Table 3 for 2004 to 2013 and Table 4 for 2014 to 2023:

Table 3. Population Growth Rate of Karawang Regency 2004-2013

Year	Total Population	Population Growth Rate
2004	1,902,537	1.01
2005	1,929,208	1.01
2006	1,958,381	1.02
2007	2,073,356	1.06
2008	2,112,433	1.88
2009	2,134,389	1.04
2010	2,144,126	0.46
2011	2,165,996	1.02



Year	Total Population	Population Growth Rate
2012	2,198,978	1.52
2013	2,225,383	1.20
Total	20,844,787	11.22
Average	2,084,478.70	1.12

Source: Adapted from (Badan Pusat Statistik Kabupaten Karawang, 2010, 2011, 2012, 2013, 2014, 2015b, 2015a).

Table 4. Population Growth Rate of Karawang Regency 2014-2023

Year	Total Population	Population Growth Rate
2014	2,250,120	1.11
2015	2,273,579	1.04
2016	2,295,778	0.98
2017	2,316,489	0.9
2018	2,336,017	0.84
2019	2,334,084	-0.082
2020	2,431,847	4.188
2021	2,465,574	1.387
2022	2,496,191	1.241
2023	2,526,002	1.194
Total	68,917,681	12.80
Average	6,891,768.10	1.28

Source: Adapted from (Badan Pusat Statistik Kabupaten Karawang, 2019, 2024)

The population of Karawang Regency steadily increased over the 10 years from 2014 to 2023. This growing population will inevitably lead to a rise in food consumption. Studies show that countries with projected decreases in population growth tend to experience higher levels of food security. In contrast, those with rapidly growing populations often face greater challenges to food security (Molotoks et al., 2021). Additionally, previous studies highlight that rural and urban population growth positively influences malnutrition reduction in upper-middle-income countries (Miladinov, 2023). These findings underscore the complex interplay between demographic trends, urbanization, and food security outcomes.

Industrial Growth Rate

The increase in the number of industrial business units in Karawang Regency for ten years can be seen in Table 5.



Table 5. The Industrial Growth Rate for Small, Medium, and Large Industries in Karawang District
2008-2017

Year	Number of Industrial Business Units	Industrial Growth Rate
2008	9,264	0.60
2009	9,314	0.50
2010	9,518	2.04
2011	9,764	2.46
2012	9,920	1.56
2013	9,963	0.43
2014	10,009	0.46
2015	10,104	0.95
2016	10,332	2.28
2017	10,515	1.83
Total	98,703	13.11
Average	9,870.30	1.31

Source: Adapted from (Badan Pusat Statistik Provinsi Jawa Barat, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016)

The Karawang Regency Government has stipulated through Karawang Regency Regional Regulation Number 2 of 2013, regarding the 2011-2031 Karawang Regency Spatial Planning, that only designated areas may be used for industrial and residential purposes. Karawang Regency hosts several large-scale industries, both nationally and internationally recognized. For example, it is home to the world's largest transportation equipment factories, including Yamaha and Toyota.

In addition, there are internationally significant electronics factories in the area, along with hundreds of national-scale factories. Several expansive luxury cemeteries, such as San Diego Hills, Al Azhar Memorial Park, and Lestari Memorial Park, also occupy considerable land in Karawang Regency. The planned construction of an international port in Cilamaya District raises concerns about the potential increase in agricultural land conversion. Such development could drive a need not only for expanded industrial areas but also for additional residential zones, as new industrial units would create job opportunities, drawing workers who would require housing.

The urban-industrial growth reduces the agricultural growth rate by decreasing the availability of land for farming and increasing competition for water and labor resources. In



countries like China and India, rapid industrialization has been linked to declining agricultural yields and employment (Wang, 2023)

The Depreciation Rate of Agricultural Land Area

The annual depreciation rate of the agricultural land area can be seen in Table 6.

Table 6. The Depreciation Rate of Agricultural Land Area in Karawang Regency in 2007-2016

Year	Land Area (Ha)	New Land Printing (Ha)	Converted Land Area (Ha)	Land Area Depreciation Rate
2007	94,379	-	-6	-
2008	94,311	-	-68	-0.07
2009	97,529	3,218	-	3.41
2010	97,529	-	-	0
2011	98,346	817	-	0.84
2012	98,079	-	-267	-0.27
2013	98,164	85	-	0.09
2014	97,203		-961	-0.98
2015	96,482		-721	-0.74
2016	95,906		-576	-0.60
Total	967,928	4,120	-2,599	1.68
Average	96,792.80	1,373.33	-433.17	0.19

Source: Adapted from (Badan Pusat Statistik Kabupaten Karawang, 2010, 2011, 2012, 2013, 2014, 2015b, 2015a)

The area of agricultural land in Karawang Regency fluctuated from year to year during the 2007-2016 period. This fluctuation has impacted both the harvested area and rice production. In 2009, the government of Karawang Regency opened 3,218 hectares of new agricultural land to increase the harvested area and rice output, as the region's status as a rice granary in West Java began to be questioned. This new agricultural land was developed from uncultivated land (vacant state-owned land) and community forests.

However, in 2012, there was a surprising reduction of 267 hectares due to the increasing conversion of agricultural land to non-agricultural uses, specifically for industrial and residential development, resulting in a 5.26% decrease in production. According to the Agriculture Office of Karawang Regency, changes in rice production rates are influenced not only by fluctuations in land area but also by the occurrence of natural disasters and the limited ability of farmers to enhance land productivity. It also happened in Karanganyar Regency, Indonesia, the conversion of





agricultural land to non-agricultural purposes, including residential and industrial development, has led to declining food security. Agricultural land loss due to high land values and the shift to non-agricultural uses disrupts local food production and security, particularly in high-conversion areas near urban centers (Martanto, 2021)

Based on the 2013 Food Security and Vulnerability Atlas (FSVA) of West Java, food security consists of three pillars and nine indicators. This research examines food security through access to food and livelihoods, focusing solely on the indicators related to the population living below the poverty line.

The percentage of poor people continued to decrease from 2007 to 2013, reaching 10.69% by the end of 2013, which translates to approximately 237,893 individuals in Karawang Regency still classified as poor. The poverty line was set at 335,273 IDR per capita per month (Badan Pusat Statistik Kabupaten Karawang, 2014).

Multiple Linear Regression Analysis

The estimated impact of macro factors on changes in land use and food security is presented in Table 7.

Table 7. Estimation Results of Macro Factors of Land Use Change Allegedly Affecting Food Security in Karawang Regency

Variable	Coefficient (R)	t-count	Probability (P.)	Tolerance	VIF
(Constant)	11.707	7.094	0.000		
Log Total Industry (X3)	-2.667	-6.421	0.000	1.000	1.000
Log GRDP (X1)	0.634	1.524	0.171	0.101	9.922
Log Total Population (X2)	0.544	1.853	0.106	0.181	5.528
Log Agricultural Land Area (X4)	0.065	0.193	0.852	0.203	4.934
R	0,915		Prob F-statistic		41.233
R-squared	0.838		Std.Error. of Estimate (SEE)		0.0214409
Adj-R-squared	0.817		Durbin Watson		0.976
Asymp.Sig. (2-tailed) Kolmogorov-Smirnov Z		0.986			

Source: Author Secondary Data



Based on the table above, all macro factors related to land conversion significantly influence food security. The probability values for the GRDP variable (0.171), population variable (0.106), and agricultural land area (0.852) are greater than α (0.05), indicating these variables do not have a statistically significant impact at the 5% level. However, the industry variable has a probability value smaller than α ($0.000 < 0.05$), indicating a significant effect.

The coefficient of determination (Adjusted R-squared) is 0.817, showing that 81.7% of the variation in the dependent variable is explained by the independent variables, with the remaining 18.3% influenced by factors outside the model. The correlation coefficient (R) of 0.915 indicates a strong positive linear relationship, suggesting that the number of industries and food security (as represented by the percentage of poor individuals) are positively correlated.

The R^2 value of 0.838 implies that approximately 83.8% of the (log) output variation is explained by the (log) number of industries, indicating a high level of model fit with the data. The Standard Error of the Estimate (SEE) is 0.0214409, indicating a smaller SEE value makes this regression model more precise in predicting the dependent variable. The F-test probability value (Prob F-statistic) is 41.233, which is greater than the F-table value of 5.32, confirming that variable X3 has a significant effect on variable Y in the regression model. Centered VIF values range from 0 to 1.000, with a tolerance of 1.000 (greater than 0.10), indicating no multicollinearity issues.

The Kolmogorov-Smirnov test for normality yielded an Asymptotic significance (2-tailed) value of 0.986, confirming that residuals are normally distributed with no normality issues. Autocorrelation was assessed using the Durbin-Watson statistic, yielding a DW value of 0.976.

Based on Table 7, the multiple linear regression equation for land conversion factors affecting food security is as follows:

$$\text{LogY} = 11,707 - 2,667.\text{LogX}_3$$

In general, the increase in land conversion factors has a significant impact on food security in almost all regions, including the Karawang Regency. Research indicates that the number of industries has a substantial effect on food security; furthermore, a decrease in the number of industries can lead to a decline in food security levels. Industrial expansion is frequently linked to reduced agricultural productivity in regions where urban and industrial development takes priority over agricultural land conservation. For instance, in northern Laos, industrial and infrastructure projects have intensified land use conflicts, adversely affecting rural livelihoods and food security (Hirsch, 2021). Not to mention a reduction in the number of industries increases the percentage of poor people, resulting in more individuals living below the poverty line. Consequently, it becomes



increasingly difficult for this segment of the population to obtain adequate food, both in terms of quality and quantity.

Logistic Regression Analysis

To identify the factors influencing farmers' ease of access to food, logistic regression analysis was used by including the independent variables as predictors for the dependent variable. The data processing results are presented in Table 8 below.

Table 8. Estimation Results of Micro Factors Allegedly Influencing Food Access at the Farmer Level

Variable	Coefficient (R)	Wald	Probability (Sig.)	Exp. (β)
(Constant)	-52.882	4.112	0.043	0.000
Monthly Income (logX1)	12.877	3.989	0.046	391,135.138
Farming Experience (logX2)	8.862	2.910	0.088	7056.819
Distance from Farmland to the House (logX3)	-1.746	0.883	0.347	0.174
R	13.924		Cox & Snell R Square	0.510
-2 Log likelihood	29.232		Nagelkerke R Square	0.783
Chi-square Model	0.914		Overall Percentage	90.2
Chi-square Hosmer & Lemeshow Test				

Source: Author Primary Data

Based on the output in Table 8, the variable 'distance from farmland to the house' (X3) has a significance value greater than α ($0.347 > 0.10$), so this variable is excluded from the model. The -2-log likelihood value is 13.924, which is smaller than the χ^2 table value, indicating that the inclusion of two independent variables makes the model fit the data well. Similarly, the Chi-square Model value of 29.232, which is greater than the χ^2 table value, further supports the model fit. The Nagelkerke R-square value (0.783) is greater than the Cox & Snell R-square value (0.510), showing that the two independent variables explain 78.3% of the variance in food access.

The model equation derived from the logistic regression results in Table 8 is as follows:

$$L = (-52,882) + 12,877.\log X1 + 8,862.\log X2$$

The monthly income variable has a significance value (Sig.) of 0.046, which is less than $\alpha = 10\%$, indicating that monthly income significantly affects food access at the farm level. The coefficient value (β) of 12.877 suggests a positive correlation between monthly income and food

access. If a farmer's monthly income increases by 1 rupiah, the likelihood of easier food access increases by 12.877 times. The Odds Ratio (Exp.(β)) is very high (391,135.138), indicating that a 1% increase in monthly income raises the likelihood of easier food access by 391,135 times.

The farming experience variable has a Sig. value of 0.088, showing a significant effect on the likelihood of easier food access at the farmer level. The coefficient (β) of 8.862 means that if a farmer's experience increases by one year, the likelihood of easier access to food increases approximately 8.862 times. The Odds Ratio (Exp.(β)) value of 7,056.819 suggests that each additional 1% in farming experience increases the likelihood of easier food access by 7,057 times.

Based on the research, it is evident that monthly income significantly affects access to food at the farmer level. The higher a farmer's monthly income, the greater the opportunity for them to access food. Conversely, a lower monthly income corresponds to a decreased ability for farmers to obtain adequate food. Thus, it can be concluded that a higher level of a farmer's monthly income reduces the difficulty in obtaining sufficient food, both in quantity and quality. Various studies indicate that economic growth and per capita income can enhance people's capacity to access food (Gandhi & Zhou, 2014; Liu et al., 2015; Putra et al., 2020; Regmi & Dyck, 2001).

In addition, farming experience significantly influences the ease of obtaining access to food at the farmer level. Farmers with more extensive farming experience tend to possess greater expertise in the agricultural sector, while their expertise outside agriculture is often minimal. The longer the experience, the better-equipped farmers are to tackle issues related to agriculture. For example, experienced farmers are more adept at managing problems such as pests, rodents, climate change, irrigation challenges, and natural disasters like floods and droughts. Adequate experience enables farmers to identify suitable seeds, fertilizers, and pesticides, as well as to perform cost calculations that enhance their farming practices. This experience encourages them to maximize their land use to increase rice production, thereby improving their access to food for themselves and their families. Furthermore, advancements in farmers' production capabilities tend to reduce poverty levels, positively impacting access to food (Sari, 2018).

Farmers with sufficiently large landholdings often retain a portion of their crops for personal consumption, which lowers the likelihood of difficulties in accessing food. However, in Sindangsari Village, a significant amount of agricultural land is owned by residents from outside the village, with approximately 40% of landowners coming from outside Karawang Regency. The restriction of agricultural land ownership to a maximum of 5 hectares per person does not necessarily ensure food security in agricultural areas. This is because landowners often sell their agricultural products outside the region at higher prices, yielding greater profits than if they sold

their products locally or shared them with sharecroppers. Currently, the Karawang Regency Government has not imposed any restrictions on the domicile status of agricultural landowners. If this trend continues, there is a concern that agricultural land in Karawang Regency may become predominantly controlled by non-residents.

Analysis of the Influence of Food Security in the Context of Regional Resilience in Karawang Regency

Food security is a crucial fundamental element in regional resilience. As a key component of human security, food security is vital for maintaining regional stability. In Karawang Regency, the percentage of poor people remains high, although it has decreased each year. The presence of individuals living below the poverty line contributes to the food insecurity situation in Karawang Regency.

Moreover, the availability of food in both quantity and quality is insufficient, placing residents in a state of food insecurity. The food produced in Sindangsari Village, particularly rice, is inadequate to meet the needs of its population, as most of the crops are sold outside the village. This condition of food insecurity can adversely affect the existing human resources. For instance, rice, which should be consumed three times a day, may only be eaten once. The low state of human resources resulting from food scarcity can hinder the development of Sindangsari Village in all aspects, including regional resilience.

Unmet food needs leading to food insecurity can also trigger social problems. Social issues stemming from food insecurity are rooted in the conditions of those living below the poverty line in Karawang Regency, including abandoned children, malnourished children under five, the homeless, beggars, and sex workers. Health and socioeconomic challenges can lead to broader societal issues, including increased healthcare costs, higher crime rates, and reduced workforce productivity (Wang, 2023). The COVID-19 pandemic significantly increased food insecurity, highlighting the social strain caused by inadequate food access. Households facing food insecurity often encounter a cycle of dependency on emergency food resources and healthcare systems, further deepening social disparities (Wang, 2023).

To establish robust regional resilience, four aspects must be fulfilled, one of which is defense and security, encompassing human security (*Human Development Report*, 1994). Human security includes economic, health, food, environmental, individual, community, and political security, emphasizing that citizens must be free from poverty and fear, enabling them to become quality, dignified individuals (*Human Development Report*, 1994). In Karawang Regency, the percentage of poor people decreased between 2015 and 2016, which coincided with a decline in

crime rates (BPS 2023; Pradana, 2016). The poor population decreased by 45%, from 235,000 people in 2015 to 230,600 in 2016 (BPS, 2023). Similarly, the crime rate dropped by 2%, from 795 cases in 2015 to 435 cases in 2016 (Pradana, 2016).

Compliance with the law can foster a sense of security within the community, thereby reducing fear. Decreasing fear can enhance individuals' sense of security and safety in the area, positively impacting economic security. This allows residents to work without the worry of crime, enabling them to earn sufficient income to prevent themselves and their families from falling into poverty.

4. CONCLUSIONS

Based on the estimation results from the regression model, it is evident that the number of industries has a significant effect on food security. Food security is represented by access to food, as indicated by the percentage of poor people. The analysis reveals that the percentage of poor people is negatively correlated with the land conversion factor (measured by the number of industries). This means that the elasticity indicates that if the number of industries increases by 1%, the average estimated percentage of poor people will decrease by approximately 2.667%. Thus, it can be concluded that the number of poor people in Karawang Regency is elastic to the number of industries.

According to the logistic regression test, two independent variables significantly affect access to food at the farmer level: monthly income and farming experience. Monthly income demonstrates a direct relationship, indicating that as the monthly income decreases, the ease of obtaining proper food also diminishes. Meanwhile, farming experience shows that the opportunity for ease of access to food improves because farmers with longer experience tend to have greater expertise in the agricultural sector. This expertise drives them to maximize rice production, thereby facilitating access to food.

Social problems stemming from food insecurity are rooted in the conditions of those living below the poverty line in Karawang Regency, including neglected children, malnourished toddlers, the homeless, beggars, sex workers, and others. When analyzing the relationship between food security and regional security in Karawang Regency, it is evident that the crime rate exhibits a linear correlation with the percentage of poor people in the area.

**REFERENCES**

- Badan Ketahanan Pangan Kemetrrian Pertanian (2019). *Food Security and Vulnerability Atlas*. [online] Available at: [https://badanpangan.go.id/storage/app/media/Pusat%20Ketersediaan/FSVA%202019%20FIN AL.pdf](https://badanpangan.go.id/storage/app/media/Pusat%20Ketersediaan/FSVA%202019%20FINAL.pdf) [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Kabupaten Karawang (2009). *Kabupaten Karawang Dalam Angka Tahun 2009*. [online] Bps.go.id. Available at: <https://karawangkab.bps.go.id/id/publication/2010/11/22/e1d8bdc145a911ed39069bab/kabupaten-karawang-dalam-angka-tahun-2009.html> [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Kabupaten Karawang (2010). *Kabupaten Karawang Dalam Angka Tahun 2010*. [online] Bps.go.id. Available at: <https://karawangkab.bps.go.id/id/publication/2010/11/22/4796c18b460eb774f6f677d8/kabupaten-karawang-dalam-angka-tahun-2010.html> [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Kabupaten Karawang (2011). *Kabupaten Karawang Dalam Angka 2011*. [online] Bps.go.id. Available at: <https://karawangkab.bps.go.id/id/publication/2011/12/22/05f1a90ae2187ec6d1c441bd/kabupaten-karawang-dalam-angka-2011.html> [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Kabupaten Karawang (2012). *Kabupaten Karawang Dalam Angka 2012*. [online] Bps.go.id. Available at: <https://karawangkab.bps.go.id/id/publication/2013/10/25/0f25f5fff4803649fe8781c8/kabupaten-karawang-dalam-angka-2012.html> [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Kabupaten Karawang (2013). *Statistik Daerah Kabupaten Karawang 2013*. [online] Bps.go.id. Available at: <https://karawangkab.bps.go.id/id/publication/2014/02/20/7f5535ceaae79a391d9b55ad/statistik-daerah-kabupaten-karawang-2013.html> [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Kabupaten Karawang (2014a). *Karawang Dalam Angka 2014*. [online] Bps.go.id. Available at: <https://karawangkab.bps.go.id/id/publication/2015/07/02/dce2a2c18ecbfaf4b1ee5e3c/karawang-dalam-angka-2014.html> [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Kabupaten Karawang (2014b). *Kecamatan Kutawaluya Dalam Angka Tahun 2014*. [online] Bps.go.id. Available at: <https://karawangkab.bps.go.id/id/publication/2015/05/06/21312468549fcd84f0725285/kecamatan-kutawaluya-dalam-angka-tahun-2014.html> [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Kabupaten Karawang (2022). *Jumlah Penduduk Miskin Tahun 2002-2022 - Tabel Statistik*. [online] Bps.go.id. Available at: <https://karawangkab.bps.go.id/id/statistics-table/1/Mjg5IzE=/jumlah-penduduk-miskin-tahun-2002-2022.html> [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Provinsi Jawa Barat (2007). *Jawa Barat Dalam Angka 2007*. [online] Bps.go.id. Available at: <https://jabar.bps.go.id/id/publication/2009/01/01/d0629ae10172177a9d4b997d/jawa-barat-dalam-angka-2007.html> [Accessed 20 Nov. 2024].
- Badan Pusat Statistik Provinsi Jawa Barat (2008). *Jawa Barat Dalam Angka 2008*. [online] Bps.go.id. Available at:





<https://jabar.bps.go.id/id/publication/2008/11/03/a9db04209f2c1f8162411f35/jawa-barat-dalam-angka-2008.html> [Accessed 20 Nov. 2024].

Badan Pusat Statistik Provinsi Jawa Barat (2009). *Provinsi Jawa Barat Dalam Angka 2009*. [online] Bps.go.id. Available at: <https://jabar.bps.go.id/id/publication/2009/12/10/b3d478b42d1fb56dedbd2f0e/provinsi-jawa-barat-dalam-angka-2009.html> [Accessed 20 Nov. 2024].

Badan Pusat Statistik Provinsi Jawa Barat (2010). *Jawa Barat Dalam Angka 2010*. [online] Bps.go.id. Available at: <https://jabar.bps.go.id/id/publication/2010/10/20/899987542a34f935ad1e46bb/jawa-barat-dalam-angka-2010.html> [Accessed 20 Nov. 2024].

Badan Pusat Statistik Provinsi Jawa Barat (2011). *Jawa Barat Dalam Angka 2011*. [online] Bps.go.id. Available at: <https://jabar.bps.go.id/id/publication/2011/10/28/7f6d4a0bd9372ae644bc6e22/jawa-barat-dalam-angka-2011.html> [Accessed 20 Nov. 2024].

Badan Pusat Statistik Provinsi Jawa Barat (2012). *Jawa Barat Dalam Angka 2012*. [online] Bps.go.id. Available at: <https://jabar.bps.go.id/id/publication/2013/01/17/74f344151b23aba1402a159f/jawa-barat-dalam-angka-2012.html> [Accessed 20 Nov. 2024].

Badan Pusat Statistik Provinsi Jawa Barat (2013). *Jawa Barat Dalam Angka 2013*. [online] Bps.go.id. Available at: <https://jabar.bps.go.id/id/publication/2013/11/08/608dc2f5d0680ca167c6e30a/jawa-barat-dalam-angka-2013.html> [Accessed 20 Nov. 2024].

Carvalho, F.P. (2006). Agriculture, pesticides, Food Security and Food Safety. *Environmental Science & Policy*, [online] 9(7-8), pp.685–692. doi:<https://doi.org/10.1016/j.envsci.2006.08.002>.

Departemen Pertahanan Indonesia (2008). *Defence White Paper Indonesia, 2008*. Jakarta, Indonesia: Dept. of Defence of the Republic of Indonesia.

Dhillon, R. and Moncur, Q. (2023). Small-Scale Farming: A Review of Challenges and Potential Opportunities Offered by Technological Advancements. *Sustainability*, [online] 15(21), p.15478. doi:<https://doi.org/10.3390/su152115478>.

Firdaus, M., Baga, L.M. and Pratiwi, P. (2008). *Swasembada Beras Dari Masa Ke Masa*. IPB Press.

Gandhi, V.P. and Zhou, Z. (2014). Food Demand and the Food Security Challenge with Rapid Economic Growth in the emerging economies of India and China. *Food Research International*, 63, pp.108–124. doi:<https://doi.org/10.1016/j.foodres.2014.03.015>.

Hirsch, P. (2021). *Land zoning, planning, conversion and food security Extended synopsis*. [online] Available at: <http://www.mekonglandforum.org/sites/default/files/Extended%20Synopsis%2005%20Land>





%20zoning%2C%20planning%2C%20conversion%20and%20food%20security.pdf
[Accessed 20 Nov. 2024].

- Jiao, L. (2024). Social Determinants of Health, Diet, and Health Outcome. *Nutrients*, [online] 16(21), p.3642. doi:<https://doi.org/10.3390/nu16213642>.
- Liu, H., Wahl, T.I., Seale, J.L. and Bai, J. (2015). Household composition, income, and food-away-from-home Expenditure in Urban China. *Food Policy*, 51, pp.97–103. doi:<https://doi.org/10.1016/j.foodpol.2014.12.011>.
- Martanto, R. (2021). Land Use Conversion Pattern and Food Security for Sustainable Food Land Direction in Karanganyar Regency, Indonesia. *AgBioForum*, 23(2), pp.143–152.
- Miladinov, G. (2023). Impacts of population growth and economic development on food security in low-income and middle-income countries. *Frontiers in human dynamics*, 5. doi:<https://doi.org/10.3389/fhumd.2023.1121662>.
- Molotoks, A., Smith, P. and Dawson, T.P. (2020). Impacts of Land use, population, and Climate Change on Global Food Security. *Food and Energy Security*, [online] 10(1). doi:<https://doi.org/10.1002/fes3.261>.
- Ndlovu, C. and Masuku, M. (2021). Small-scale Farming and Access to Market: Challenges and Opportunities in South Africa. *Journal La Sociale*, 2(5), pp.50–63. doi:<https://doi.org/10.37899/journal-la-sociale.v2i5.491>.
- Nugroho, R. (2013). *Metode Penelitian Kebijakan*. [online] Yogyakarta: Pustaka Belajar. Available at: http://perpustakaan.pascasarjana.unismabekasi.ac.id/katalog-buku/index.php?p=show_detail&id=2652.
- Pambudi, A.S. (2021). Overview and evaluation of the Indonesia's water resources management policies for food security. *Indonesian Journal of Applied Environmental Studies*, 2(2), pp.84–93. doi:<https://doi.org/10.33751/injast.v2i2.3586>.
- Pemerintah Daerah Kabupaten Karawang (2020). *Situs Resmi - Pemerintah Daerah Kabupaten Karawang*. [online] Situs Resmi - Pemerintah Daerah Kabupaten Karawang. Available at: <https://www.karawangkab.go.id> [Accessed 20 Nov. 2024].
- Pradhana, H. (2016). *Sepanjang Tahun 2016, Angka Kriminalitas di Karawang Menurun* - *Kontenindonesia.com*. [online] *Kontenindonesia.com*. Available at: <https://www.kontenindonesia.com/society/tni-polri/sepanjang-tahun-2016-angka-kriminalitas-di-karawang-menurun.html> [Accessed 20 Nov. 2024].
- Putra, A.S., Tong, G. and Pribadi, D.O. (2020). Food Security Challenges in Rapidly Urbanizing Developing Countries: Insight from Indonesia. *Sustainability*, 12(22), p.9550. doi:<https://doi.org/10.3390/su12229550>.
- Rajindra, Jumiyati, S. and Irmawati (2021). Increasing Production and Income of Rice Farming: Keywords of Food Security and Poverty Alleviation. *IOP Conference Series: Earth and Environmental Science*, 870(1), p.012021. doi:<https://doi.org/10.1088/1755-1315/870/1/012021>.





- Regmi, A. and Dyck, J. (2001). Effects of Urbanization on Global Food Demand. *Changing Structure of Global Food Consumption and Trade*, [online] pp.23–30. Available at: https://www.ers.usda.gov/webdocs/outlooks/40303/14974_wrs011e_1_.pdf?v=529#:~:text=Urbanization%20can%20lead%20to%20structural,maintain%20a%20given%20body%20weight.
- Sari, D.A.P. (2018). *Food Production, Poverty Indices and Capability Related Variables (Case of Central Java and Yogyakarta Provinces)*. [online] ADRI. Available at: https://repository.bakrie.ac.id/2001/1/B20_Deffi_Food%20Production%2C.pdf [Accessed 20 Nov. 2024].
- Sari, D.A.P., Listiyowati, I., Nefianto, T. and Lasmono (2018). The Discrepancy between the Programs and Disaster Management Policy in Klapanunggal District, Bogor, West Java. *IOP Conference Series: Earth and Environmental Science*, 135, p.012011. doi:<https://doi.org/10.1088/1755-1315/135/1/012011>.
- Tambunan, T. (2010). *Pembangunan Pertanian Dan Ketahanan Pangan*. UI Press. UI Press.
- UNDP (1994). *Human Development Report 1994*. [online] hdr.undp.org. Available at: <https://hdr.undp.org/content/human-development-report-1994>.
- UU Nomor 18 Tahun 2012.Database Peraturan | JDIH BPK. [online] Available at: <https://peraturan.bpk.go.id/Details/39100>.
- UU Nomor 24 Tahun 2007. Available at: <https://bnpb.go.id/storage/app/media/uploads/migration/pubs/1.pdf>.
- Wang, Z., Zhang, X., Lu, H., Kang, X. and Liu, B. (2023). The Effect of Industrial Agglomeration on Agricultural Green Production Efficiency: Evidence from China. *Sustainability*, 15(16), pp.12215–12215. doi:<https://doi.org/10.3390/su151612215>.