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The Threat of Agricultural Land Conversion to Food Security and Self-Sufficiency in Karawang Regency, Indonesia

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ABSTRACT

This study examines the threats posed by agricultural land conversion and analyzes the strategic role of intelligence agencies in mitigating these risks. Employing a qualitative case study approach in Karawang Regency, the research demonstrates that uncontrolled land conversion directly leads to diminished harvest areas, declining rice production, severe soil degradation, and heightened socio-economic pressures on rural communities. Furthermore, weak inter-agency coordination, ineffective law enforcement, and a lack of real-time spatial data accelerate productive land loss. This institutional gap triggers widespread farmer migration, food price inflation, social inequality, and land-access conflicts. To address these vulnerabilities, intelligence institutions play a pivotal role by implementing systematic field data collection, trend analysis, and early warning systems. These measures intercept illicit conversions and support targeted mitigation policies, including farmer capacity building, intervention mapping, and cross-sector collaboration. Ultimately, strategic intelligence serves as a critical instrument for projecting food availability, monitoring supply stability, and structuring crisis mitigation to secure sustainable food self-sufficiency in Indonesia.

A. Introduction

The world currently faces complex food security challenges. The Food and Agriculture Organization (FAO) reported that between 282 and 400 million people would experience acute hunger by 2023, particularly across Africa, Asia, and Latin America (Ouko & Odiwuor, 2023). Data compiled by the Central Statistics Agency (2025) indicates that Indonesia—an agrarian nation with approximately 36 million hectares of agricultural land—remains heavily dependent on commodity imports. In 2023, Indonesian rice imports reached a five-year high of 3.06 million tons, while corn and soybean imports continued to rise to 1.35 million tons and stabilized above 2.2 million tons, respectively. Despite the government's implementation of strategic initiatives such as UPSUS PANJALE, Food Estate, and LP2B (Inopianti et al., 2021), alongside claims of achieving rice self-sufficiency by the end of 2025 under President Prabowo, agricultural land conversion remains a critical threat. With an annual conversion rate of approximately 96,000 to 102,000 hectares, this phenomenon has led to severe declines in rice production across major agricultural hubs, including West, Central, and East Java (Sutrisno, 2022).

This land conversion phenomenon is a crucial problem because it erodes the national food production base. Each hectare of rice fields lost has the potential to reduce rice output by up to 5 tons

per year, weakening the food self-sufficiency program, a pillar of the current administration's Asta Cita (Asta Cita- the national strategic development program of the current administration) program.

Factors driving land conversion in Karawang include the higher economic value of land for industry and housing (Achsanuddin et al., 2023), which encourages farmers to sell their rice fields for short-term profits (Hasibuan et al., 2018). Furthermore, the younger generation's disinterest in agriculture exacerbates the situation, as much land is abandoned due to a lack of successors to the farming profession (Shafaruddin, 2020). These two factors will lead to a decline in harvested areas in central provinces like West Java by 2023, despite national production increasing by 2025 thanks to intensification in other regions. Consequently, dependence on rice imports continues, triggering the risk of food price inflation, a projected deficit of millions of tons, and posing a national security threat, as stipulated in Law No. 17/2011 concerning state intelligence. Intelligence plays a crucial role in maintaining national security through early detection and warnings of threats such as agricultural land conversion. Geospatial Intelligence (GEOINT) analysis, based on satellite imagery and GIS, can detect these conversion patterns and identify land use changes spatially (Sumarjiyo, 2018). Land conversion risks are identified through threat assessments to detect potential threats and risk assessments to evaluate their impact on food security. Intelligence provides recommendations for mitigation policies, such as synergizing with regulatory authorities to prevent land conversion (Iqbal & Sumaryanto, 2025). Agricultural land management requires cross-sector collaboration, including intelligence, spatial planning, and agriculture, to support food self-sufficiency (Pamekas et al., 2023).

This research aligns with previous studies on agricultural land conversion and its impact on food security and farmer welfare, such as those by Pratomo & Wijayanti (2023) and Sudarma et al. (2024). Both studies highlight the driving factors of land conversion, such as economic pressures, weak land protection policies, and limited water resources, and the resulting shrinking of productive land that threatens national food security. These studies used qualitative approaches or spatial analysis, focusing on aggregate conversion patterns and macroeconomic impacts without integrating national intelligence perspectives. Key limitations include the lack of GEOINT analysis for early detection, which is difficult to detect using Landsat, and the limited evaluation of threat risk assessments for national security due to rice field conversion in central industrial areas like Karawang. Furthermore, mitigation recommendations tend to be normative without a collaborative approach across institutions such as the State Intelligence Agency (BIN) and the Directorate of Land Protection. This research addresses this gap by integrating geospatial intelligence (GEOINT) analysis with threat and risk assessments, using satellite imagery data to detect conversion patterns.

The objective of this research is to analyze the threat of agricultural land conversion to Indonesia's overall food self-sufficiency and food security. Furthermore, the research explores the role of intelligence through early detection via GEOINT for spatial monitoring, threat assessment, and risk assessment for risk mitigation. This approach offers novelty by integrating an intelligence perspective into agricultural policy, going beyond conventional agrarian studies to provide strategic recommendations to stakeholders.

B. Method

The research method used is qualitative with a case study approach. John W. Creswell defines qualitative research as an investigative process to understand social or human problems holistically

through verbal descriptions, detailed reports of informants' perspectives, and presentation within a scientific context (Creswell, 2019). In this research, a case study approach was applied to examine the phenomenon of rice field conversion in Karawang Regency in depth, related to the threats posed by agricultural land conversion and the role of intelligence in mitigating these threats. The scope of this research was limited to a five-year period (2020-2024) to analyze land conversion patterns. The primary data collection process was conducted through interviews with three groups of informants: stakeholders, academics, and practitioners.

This research involved fifteen informants, grouped into three informant categories to obtain comprehensive data. The Stakeholder Group acted as primary informants, comprising representatives from various strategic agencies: the Directorate of Agricultural Land Mapping and Irrigation, the Directorate General of Agricultural Land and Irrigation (Land Conversion Section), the Directorate of Land Protection and Optimization, the Head of the Agricultural Land Resource Instrument Standards Testing Center, the Deputy VI for Economic Intelligence at the State Intelligence Agency (BIN), and the Directorate of Food Crops, Horticulture, and Plantation Statistics. Furthermore, the academic group served as key informants, including three professors from Bogor Agricultural University (IPB) and a lecturer from the State Intelligence College (STIN). To supplement the data, the Practitioner Group, represented by five farmer groups from various regions, was involved as supporting informants: the Jaya Makmur Farmers Group (Palembang), the Tambak Rejo Farmers Group (Semarang), the Sri Jembar Farmers Group (Karawang), the Sendang Biru Group (Surabaya), and the Mamampang Farmers Group (Makassar).

Subsequently, observations were conducted in Karawang Regency, West Java, an area with a significant rate of agricultural land conversion due to the rapid development of the industrial, housing, and infrastructure sectors. The collected data and information were then analyzed through intelligence analysis to generate judgments, forecasts, and early warnings regarding the phenomenon of agricultural land conversion. Meanwhile, to determine the level of threat posed by agricultural land conversion, data from interviews and observations were processed using the following risk assessment formula.

R = T x V x C

Description:

R : Risk

T : Threat

V : Vulnerability

C : Consequence

C. Results and Discussion

Karawang Regency has a strong socio-economic structure, marked by a Gross Regional Domestic Product (GRDP) at Constant Prices (ADHK) reaching IDR 268 trillion in 2022 and a GRDP per capita of IDR 121.3 million in 2024. This is primarily driven by the manufacturing sector, although agriculture remains a vital pillar, as shown in the following graph.

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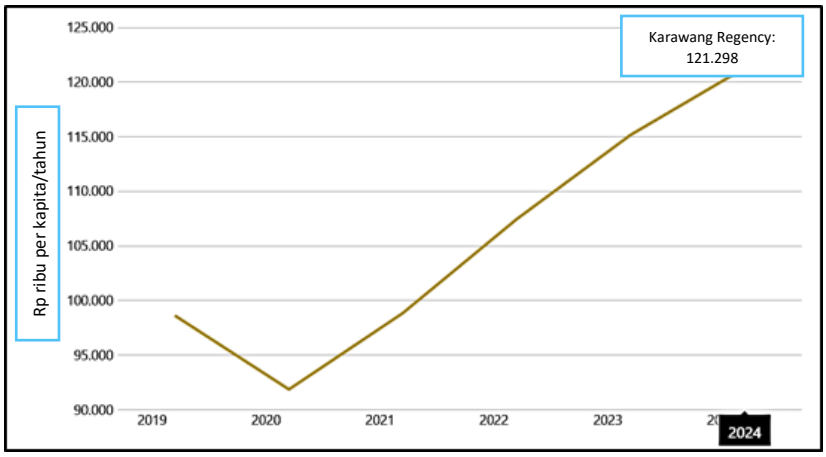

Figure 1. Graph of ADHB GDP per capita in Karawang Regency
Source: Databoks, 2025

As the third largest rice producer in West Java, Karawang manages 87,000 hectares of protected rice fields with the support of technical irrigation and highly productive andosol soils, which account for 12–15% of the province's rice production. This potential strengthens national food self-sufficiency efforts through high planting indexes and pumping programs, although it continues to be pressured by the rate of land conversion. Leading commodities in the region include rice, horticulture, and freshwater fish from the Jatiluhur Reservoir, which collectively support regional food security amid industrial economic dynamics.

Table 1. Rice Field Area of Karawang Regency

No	Year	Rice Field Area (Ha)
1	2020	97.000
2	2021	97.000
3	2022	97.000
4	2023	97.000
5	2024	101.143

Source: BPS Karawang Regency, 2024

Table 1 shows that the area of rice fields in Karawang Regency is relatively stable at around 97,000 hectares during the 2020–2023 period, with a peak of 101,143 hectares of Rice Field Land (LBS) in 2024, which reflects the success of Regional Regulation (Perda) No. 1/2018 in securing Sustainable Food Agricultural Land (LP2B) covering an area of 85,339 hectares plus reserves of 1,914 hectares to prevent conversion. Although there was a decrease of 31 hectares in Kotabaru District in 2022, it was successfully overcome through *multi-cropping practices*, where the cumulative harvest area reached 137,965 hectares in 2023 thanks to the planting index 2-3 times per year. This strategy maintains national productivity despite the pressure from industrial expansion.

1. Agricultural Land Conversion Patterns

Land cover maps generated through remote sensing and Geographic Information Systems (GIS) allow for accurate identification of critical locations of land conversion, thus facilitating more targeted

monitoring, as reflected in the data on rice field area per sub-district in Karawang Regency for the 2020-2024 period.

Table 2. Comparison of Rice Field Land Cover (Ha) 2020 to 2024

No	Districts	2020 (Ha)	2021 (Ha)	2022 (Ha)	2023 (Ha)	2024 (Ha)	%
1	Purwasari	12.500	12.450	12.400	12.380	12.350	1.20
2	Klari	15.200	15.150	15.100	15.050	15.000	1.32
3	Majalaya	8.800	1.750	8.700	8.650	8.600	2.27
4	Cilamaya Wetan	18.300	18.250	18.200	18.150	18.100	1.09
5	Ciampel	22.100	22.000	21.950	21.900	21.850	1.13

Source: BPS Karawang Regency & IPB, 2025

The decrease in the area of rice fields by 1,000 hectares, or 1.23%, in the 2020–2024 period in the five main sub-districts of Karawang Regency reflects the pressure of controlled conversions from productive land to settlements, industrial estates, and dryland agriculture. The highest conversion rate occurred in Majalaya District, which was 2.27%, followed by Klari, while Purwasari and Cilamaya Wetan were relatively stable. This pattern indicates the vulnerability of northern areas near industrial corridors to land conversion, which has the potential to reduce rice production per year. Although it is a small percentage, the impact is significant on local food security because Karawang accounts for 12-15% of West Java's rice production (Muzqufa et al., 2025).

This condition highlights the challenges of spatial management that require strengthening LP2B regulations in accordance with Regional Regulation No. 1/2018, especially in high-risk zones. The rate of decline is lower than the 2000–2010 period, which was around 19,000 hectares, showing the effectiveness of the conservation policy of protected rice fields, supported by collaboration between institutions and land insurance. The integration of remote sensing with GIS enables precision detection of critical zones for targeted intervention. Strengthening technology-based supervision, farmer socialization, and PBB-P2 fiscal incentives are important to maintain the function of LP2B to support national food self-sufficiency in 2025, as well as maintain a balance between industrial economic growth and Karawang's food security.

Land mapping identifies the main physical threats in the form of conversion of productive agricultural land to non-agriculture, which reduces food production capacity and increases regional and national food security risks. Lack of coordination between agencies and weak law enforcement exacerbate this vulnerability, as illegal conversion often escapes strict sanctions, as revealed by the Directorate of Land Protection and Optimization regarding overlapping roles and data that is not *real-time*. Many government agencies, both at the central and regional levels, have overlapping or less synchronous roles in supervising land conversion (IPB, 2025).

The Directorate of Land Mapping and Agricultural Irrigation emphasized that modern geographic information system technology, digital sensors, and irrigation are adequate for accurate monitoring, although it requires improved competence. Farmers and agricultural extension workers need to be equipped with basic GIS skills to verify field data from remote sensing, while irrigation technicians need IoT sensor certification to monitor *real-time* water distribution. Digital monitoring tools such as soil moisture sensors and land monitoring drones provide more detailed and fast data on the physical

condition of the land and water needs so that irrigation management can be optimized to be efficient and equitable (Saban & Na'atonis, 2020).

The Agricultural Land Resources Instrument Standard Testing Center detects soil degradation such as erosion and biotic attacks through physico-chemical parameters, which predict that land is at high risk of conversion due to loss of fertility and water retention, potentially reducing rice yields by up to 30%. Damage to agricultural land due to the threat of conversion causes a significant decrease in crop production capacity, due to the loss of the fertile *top soil* due to erosion, thereby reducing the availability of nutrients and organic matter essential for plant growth (Asetyasih et al., 2019). Deputy VI for Economic Affairs of BIN integrated the intelligence perspective with the findings, highlighting that the economic value of industrial land drives conversion as well as the existence of inconsistencies in spatial regulations and licensing corruption that trigger farmer poverty and local food inflation. The Directorate of Food Crop Statistics of BPS complemented the spatial data with a survey of harvest area, although *underestimation* in remote areas affected the projected production of 34.77 million tons of rice in 2025.

2. Impact on Food Production

Karawang Regency experienced a decline due to the conversion of rice fields of around 1,000 hectares or 1.23% during 2020-2024 in five main sub-districts. Each hectare of rice fields lost has the potential to reduce *the output of* 5 tons of rice per year from the average productivity of 6 tons/ha of GKG, causing a loss of rice production potential and Karawang's contribution to West Java's rice production in 2025. Majalaya and Ciampel sub-districts recorded the highest conversion of paddy fields, which shows strong pressure from the expansion of industrial estates in the northern region of Karawang. This decrease in land area significantly weakens the foundation of sustainable food agriculture (LP2B), although intensification with a planting index of 2–3 times per year and pumping programs have managed to maintain overall productivity levels.

3. Implications for Food Security

Food self-sufficiency is the ability of the state to meet all its food needs independently from domestic production without significant import dependence, including aspects of quantity, quality, diversity, and accessibility of nutritious food for all people in both normal and crisis conditions (Virgiani et al., 2023). In Karawang Regency as the major rice-producing region in West Java, the Directorate of Land Mapping and Agricultural Irrigation emphasizes the role of mapping protected rice fields and the Jatiluhur Reservoir irrigation network in maintaining local food availability through the optimization of planned water distribution. Land monitoring drone technology, soil moisture sensors, and data-driven irrigation management applications improve water efficiency. The Directorate of Land Protection and Optimization strengthens this strategy through the determination of Sustainable Food Agricultural Land (LP2B) and Protected Rice Fields (LSD) in accordance with Regional Regulation No. 1/2018, which suppresses land conversion in critical zones. Economic barriers such as high land prices due to urbanization are overcome with PBB-P2 incentives and irrigation assistance, while the OPLAH Program increases the planting index from 1 to 2-3 times per year through superior varieties and water-efficient irrigation. The Agricultural Land Resources Instrument Standard Testing Center ensures that Karawang's soil quality remains optimal through standardized fertility parameter testing,

with advanced soil sensor innovations and low-cost monitoring software that is easily accessible to farmers. This technology detects early degradation due to erosion, maintaining the stability of rice production in the midst of industrial conversion (Aji et al., 1999). The Directorate of Food Crop Statistics BPS Karawang complemented the data on harvest areas in 2023 and local rice price trends to measure food affordability, using *mobile* applications and survey drones to overcome *underestimation* in peripheral areas. The Deputy VI for Economic Affairs of BIN monitors the risk of converting agricultural land to industrial use, which could negatively impact the agricultural sector's contribution to GDP. He suggests improved licensing oversight and collaboration between agencies to ensure local food self-sufficiency. This integrated approach makes Karawang a supporter of national self-sufficiency, balancing the industrial growth of GDP with sustainable food security.

4. Factors Driving Land Conversion

The qualitative analysis of this study identified the driving factors for the conversion of paddy fields in Karawang Regency through in-depth interviews with farmers of the Sri Jembar Farmers Group (Klari) and officials of the Directorate of Land Protection, who revealed that the main pressure comes from the economic value of industrial land, which is much higher than agriculture. The farmers stated that the offer of the selling price of the land reached Rp 500 million to 1 billion per hectare from the developer, far exceeding the income of the rice farming business of Rp 150-200 million per year, thus triggering a voluntary decision to sell the land. Field observations indicate that the main external drivers are the strategic location near the Jakarta-Cikampek Toll Road and industrial areas. Investors are pressuring Klari to convert, disrupting irrigation due to development. Internal driving factors include an aging farming demographic—with an average age of 55 years—compounded by a lack of generational successors, low formal education levels, and the peer-effect of neighboring farmers selling their land, which creates a domino effect within rural communities. Triangulation of interview data with the document of Regional Regulation No. 1/2018 reveals the weak implementation of PLP2B regulations in peripheral zones such as Ciampel and Majalaya, where ease of licensing and local corruption accelerate the transfer of functions despite the existence of protected zoning of around 87,000 hectares. Farmers complain of sporadic early warning and ineffective village responses, while the main hope is placed on UN-P2 incentives and consistent legal protection. The spatial patterns of GIS observations support this finding, with the conversion concentrated in the volcanic fluvial plains near transport access, confirming the farmer's narrative of "*land is good for sale because it is close to the factory.*"

5. Risk Assessment of Rice Field Land Conversion in Karawang Regency

The risk assessment of agricultural land conversion uses three main dimensions, namely threat, *vulnerability,* and *consequence*. Allen & Derr (2015) classify the assessment of threats to food security as part of the hazard category evaluation. Hazards include natural disaster hazards or man-made hazards. The scale of the assessment of the likelihood of a land conversion threat in the next 12 months uses a clear range of numerical values to facilitate risk interpretation. A value of 10 indicates "Likely to Happen" with high certainty; 7-9 is categorized as "Likely to Happen" for medium-high probability, while 4-6 means "Likely to Happen" with moderate odds. Ranges 1-3 reflect "Unlikely to Happen" (low risk), and negative or zero values indicate "Not Likely to Happen" (no threat) as follows.

Table 3. Assessment of the Threat of Rice Field Land Conversion in Karawang Regency

Main reported	Scenario Description	Types of Hazards		Value	Remarks
		Man-made	Natural Disasters		
1	Conversion of irrigated rice fields in Purwasari District into a textile factory with illegal licensing	√	X	6	Could happen
2	Conversion of productive rice fields in Klari District into suburban cluster housing	√	X	5	Could happen
3	Conversion of productive rice fields in Majalaya District into logistics warehouses	√	X	5	Could happen
4	Rice fields in Cilamaya Wetan District are transformed into chemical industrial areas	√	X	6	Could happen
5	Expansion of automotive factory in Ciampel District converts cultivated land	√	X	5	Could happen
6	Total conversion of 300 hectares/year to industry, threatening rice production	√	X	7	High probability

Source: Researcher data processing, 2025

The vulnerability assessment phase determines the susceptibility level of agricultural land to conversion based on specific environmental, institutional, and socio-economic parameters. To maintain objectivity, each parameter is quantified using a standardized numeric scale from 0 to 5. The comprehensive scoring rubric and its corresponding vulnerability point conversions are structured in Table 4.

Table 4. Vulnerability Scoring Rubric and Point Conversion System

Assessment Parameter	Score 0	Score 1	Score 2	Score 3	Score 4	Score 5
Exposure/Visibility Level	Invisible	Very Low	Low	Moderate	High	Very High
Jurisdictional Criticality	No Benefit	Low Benefit	Moderate Benefit	High Benefit	Very Useful	Critical
Impact Beyond Jurisdiction	None	Very Low	Low	Medium	High	Very High
Threat Access to Targets	Restricted	Controlled	Limited	Medium	Open	Unlimited
Potential Harm to Assets	None	Minimum	Low	Medium	High	Very High
Location Population Capacity	0	1 – 250	251 – 5,000	5,001 – 15,000	15,001 – 50,000	> 50,001
Potential Affected Population	0 – 100	101 – 250	251 – 5,000	5,001 – 15,000	15,001 – 50,000	> 50,001

Total Cumulative Score	Converted Point	Total Cumulative Score	Converted Point
0 – 2 points	1	18 – 20 points	7
3 – 5 points	2	21 – 23 points	8
6 – 8 points	3	24 – 26 points	9
9 – 11 points	4	27 – 29 points	10

12 – 14 points	5	30 – 32 points	11
15 – 17 points	6	33 – 35 points	12

Table 5. Vulnerability Assessment of Rice Field Land Conversion in Karawang Regency

No	Vulnerability aspects							∑	Points
	Levels of Vulnerabi-lity	Location criticality to jurisdiction	Impact beyond jurisdiction	Threat access to targets (assets)	Potential threat of harm to the target (asset)	Potential population capacity of the location	Potential victims		
1	4	3	2	4	4	5	4	26	9
2	4	4	2	3	4	5	4	26	9
3	4	3	2	4	4	5	4	26	9
4	4	3	3	3	4	5	4	26	9
5	4	3	2	3	4	4	4	24	9
6	4	3	2	3	3	5	4	24	9

Source: Researcher data processing, 2025

Consequence scores are limited to a scale of 1 as the minimum level and 10 as the maximum level. Consequence assessment uses the following metrics: C (consequence), HI (human impact), and EI (economic impact).

Table 6. Assessment of the Consequences of Rice Field Conversion in Karawang Regency

No	Impact		C	Category
	HI	EI		
1	3	4	7	High
2	3	4	7	High
3	3	4	7	High
4	3	4	7	High
5	4	4	8	High
6	3	4	7	High

Source: Researcher data processing, 2025

Next is risk analysis based on the results of hazard analysis (threat) using the following risk level assessment.

Table 7. Risk Assessment of Rice Field Land Conversion in Karawang Regency

No	Scenario Description	Risk Aspects			Value R	Risk Level
		Threats (T)	Vulnerability (V)	Consequences (C)		
1	Conversion of irrigated rice fields in Purwasari District into a textile factory with illegal licensing	6	9	7	378	Medium Risk
2	Conversion of productive rice fields in Klari District into suburban cluster housing	5	9	7	315	Medium Risk
3	Conversion of productive rice fields in Majalaya District into logistics warehouses	5	9	7	315	Medium Risk

No	Scenario Description	Risk Aspects			Value R	Risk Level
		Threats (T)	Vulnerability (V)	Consequences (C)		
4	Rice fields in Cilamaya Wetan District are transformed into chemical industrial areas	6	9	7	378	Medium Risk
5	Expansion of automotive factory in Ciampel District converts cultivated land	5	9	8	360	Medium Risk
6	Total conversion of ±300 Ha/year to industry, threatening rice production	7	9	7	441	Medium Risk

Source: Researcher data processing, 2025

Based on the calculation of the risk of rice field conversion in Karawang Regency, the risk value (R = T × V × C) is in the range of 101-600, including the medium category. The highest risk of 441 occurred in the conversion scenario in five vulnerable sub-districts in Karawang Regency, threatening rice production. Data on the risk assessment of rice field conversion in Karawang Regency shows that all conversion scenarios in five sub-districts of Purwasari, Klari, Majalaya, Cilamaya Wetan, and Ciampel as well as the aggregate conversion scenario of ±300 ha/year are in the category of medium risk level, with an R value ranging from 315 to 441. A threat value (T) in the range of 5-7 and a high vulnerability (V) value of 9 illustrate that the conversion pressure is rooted in the economic attractiveness of industrial land, housing, and logistics warehouses, while the consequence (C) of 7-8 indicates a real impact on rice production and national and local food security. Thus, intelligence analysis can assess that the northern zone of Karawang near industrial corridors and toll roads is a priority zone for LP2B/LSD protection, as the repeated conversion pattern in the same place indicates that this risk is systemic, not incidental.

In the context of *early warning*, this risk table is the basis for early detection because it identifies the specific sub-districts and types of conversion that are most at risk, such as irrigation fields that are turned into textile factories, logistics warehouses, chemical industries, cluster housing, and automotive factory expansion. The relatively high T and C values in the scenario of converting irrigated rice fields to industry show that this change in function has more serious implications than conversion to other sectors, so it can be a warning signal to tighten licensing supervision around industrial estates and transportation corridors. If the "conversion of ±300 hectares/year" scenario continues, *early warning* can trigger cross-agency intervention by BPN, the Agriculture Office, Bappeda, and the police to verify permits, block land grabbing, and crack down on illegal licensing before permanent damage to food production occurs. Based on these risk profiles, intelligence analysis can formulate alternative *problem-solving* that is different but complementary. In the realm of *forecasting*, the conversion scenario is the basis for medium-long-term projections of Karawang's contribution to West Java and national rice production. If the average productivity of 5-6 tons/ha of GKG is maintained, the loss of 300 Ha/year means a potential decline of around 1,500-1,800 tons of rice per year, which cumulatively can reduce Karawang's production surplus as the main buffer for national rice. With spatial models of land-use change, such as CLUE-S, this conversion scenario can be projected up to 2030-2033, allowing governments to simulate several policy alternatives.

6. The Threat of Land Conversion to Food Security

Agricultural land conversion is known as "land conversion," which is a partial or complete change in land use functions from the original function to another different function (Fauziah et al., 2018). The conversion of agricultural land, particularly productive rice fields, into functional fields reduces the available area for food production. This decline has a direct impact on national food production capacity, especially major commodities such as rice, thus threatening food availability and supply stability. The Directorate General for Economic and Fiscal Strategy (2024) explained that land conversion directly reduces the amount of land in the agricultural sector that can be planted with various agricultural commodities, especially rice. If this trend continues to be left untreated, the impact will threaten national food security, which is very dangerous. The conversion of agricultural land is a phenomenon that typically arises from the pressure to meet growing economic demands. In general, the growth in population causes the need for space for housing, industry, and infrastructure to become more urgent. This trend causes the price of non-agricultural land to be much higher than that of agricultural land, thus triggering the transfer of land functions as a form of investment or land use that is considered more economically profitable (Ilhami et al., 2024). This shift in function is not only caused by market factors but also by government policies that encourage economic and infrastructure development in certain regions, which change the priority of land use from the agricultural sector to the non-agricultural sector (Corolina et al., 2024).

The main weakness in the current agricultural land protection mechanism lies in the lack of effective coordination between relevant agencies so that supervision and policy enforcement are often fragmented and not integrated (Nasir, 2024). This situation leads to weak law enforcement against cases of illegal land conversion that take place, where perpetrators can take advantage of regulatory loopholes or limited supervision. In addition, the availability of data that is not updated in *real-time* is one of the main causes of difficulties in detecting and handling land use changes quickly, opening up opportunities for certain parties to exploit agricultural land without official permits (Nurhidayah et al., 2025). In addition, the most frequently detected physical threats include soil quality degradation, especially erosion and decreased soil fertility obtained from land monitoring instruments. This condition has a direct impact on agricultural land productivity because eroded soil and nutrient deficiencies are less supportive of plant growth (Salote et al., 2022). In addition, biotic threats such as pest attacks and plant diseases are also critical factors that accelerate land destruction and reduce crop yields. This combination of physical and biotic threats requires intensive monitoring and integrated mitigation measures to maintain the sustainability of agricultural land, especially in the face of land conversion pressures and climate change.

If this threat is not managed properly, the economic and social impacts that arise can be very severe; food productivity will decrease, thus disrupting the availability and stability of the food supply. Farmers as the main actors in the agricultural sector will lose their livelihoods, which has the potential to trigger migration and increased unemployment in rural areas. In addition, the increase in food prices will burden people, especially low-income groups, exacerbating social inequality (Yulian et al., 2019). Socio-economic pressure for farmers and rural communities who depend on agriculture arises because agriculture is the main source of income and the support of social life. When agricultural land is reduced due to conversion, farmers' incomes decrease, disrupting the sustainability of farmers' livelihoods, leading to poverty and social instability (Adriani et al., 2022). In addition, the reduction in

agricultural activities has an impact on reduced employment in related sectors, such as agricultural processing and local trade, which also worsens the economic conditions of rural communities.

From a social perspective, agriculture is closely tied to local traditions and culture; therefore, pressure on this sector can erode social order and community identity, leading to conflicts over land and resource access, as well as increasing injustice due to the displacement of residents from productive land and residential areas caused by the expansion of non-agricultural land (Hasibuan, 2023). Therefore, effective threat management is essential to maintain economic stability, farmers' welfare, and social harmony in society. The decrease in harvest area has a direct impact on the national food production capacity because the harvest area is one of the key factors that greatly affect the total rice production. The larger the rice harvest area, the more rice production in the central area will also increase significantly, and vice versa: if the harvest area decreases, rice production will also decrease (Nur et al., 2024). Because rice is the main food commodity in Indonesia, the decline in rice production due to reduced harvest area will reduce the availability of rice in the market, thus threatening food self-sufficiency (Rahim et al., 2024).

7. The Role of Intelligence in Land Conversion Mitigation

Intelligence plays a strategic role in food security through its investigation, security, and fundraising functions, with a focus on monitoring agricultural land conversion as a major threat to national self-sufficiency. The investigation function involves systematic data collection via HUMINT (farmer/village interviews), IMINT (heavy equipment satellite imagery), and OSINT for conversion trend patterns such as changes in ownership in Karawang. The analysis of the trend of developer activity is validated as an *early warning* to anticipate a crisis before illegal conversion reduces the harvest area of thousands of hectares due to urbanization (Sarastika & Anggrasari, 2024). The Security Function monitors the stability of the national food supply through production, distribution, rice price fluctuations, and post-conversion land degradation (Iqbal & Sumaryanto, 2025). The intelligence analyzed food affordability and import risks and recommended strengthening LP2B and controlling KKPR licensing in *West Java* hotspots (Wardani et al., 2014). In times of crisis, advice includes food aid and market controls to prevent *irreversible threats*. The fundraising function maps the technology needs of farmers in vulnerable areas such as Karawang for intensification interventions (Mulyani et al., 2020). The main recommendations include stakeholder collaboration, fostering suboptimal land productivity, and supervising conversion permits to maintain rice fields. From an economic perspective, intelligence monitors price/distribution fluctuations to prevent spikes that harm people, monitors national supplies, and makes recommendations for crisis mitigation, such as food aid and market control for national stability.

Risk assessment data on the conversion of rice fields in Karawang Regency shows that the conversion of rice fields into industrial estates, housing, and logistics facilities is not a sporadic occurrence but a systemic pattern in a number of sub-districts that has serious implications for food production. From an intelligence perspective, areas near industrial corridors and main transportation access are the most vulnerable zones, so prioritizing their protection is essential for LP2B and LSD. This risk can be used as an early *warning* basis to detect early patterns of land use change, especially the type of conversion of irrigated rice fields into industries or logistics warehouses that have the most potential to disrupt production, so that the government can tighten licensing supervision, review

permits, and improve coordination between agencies before land destruction becomes permanent. Based on these risk characteristics, several alternative solutions can be formulated, such as strengthening law enforcement against LP2B/LSD, refusing to transfer functions in protected zones, providing strict sanctions for illegal licensing, and adjusting spatial planning and providing economic incentives for farmers so that they are not encouraged to sell productive land, so as to create a cross-sector strategy that integrates spatial planning policies, land protection, and economic development. In addition, this risk data is the basis for long-term forecasting of Karawang's contribution to national rice production, where the government can project the impact of the decline in rice field area on rice production capacity and utilize spatial models to simulate various policy scenarios to strengthen regulations, increase intensification, and provide land protection incentives to maintain a balance between industrial economic growth and food security. sustainable.

D. Conclusion

The conversion of agricultural land, especially productive rice fields, poses a serious threat to the achievement of food self-sufficiency and food security in Indonesia. The loss of sustainable rice fields reduces the national rice production capacity, increases dependence on reserve stocks or even imports, and suppresses the surplus that has been produced by barn areas such as Karawang. This impact not only reduces food availability but also puts pressure on rice prices and accessibility for the poor, thus undermining the country's ability to meet its food needs independently and sustainably.\

The role of intelligence in this context is crucial as a link between spatial, socio-economic, and regulatory data and policies oriented toward risk mitigation. By leveraging remote sensing, geographic information systems, and intelligence analysis, intelligence agencies can detect critical conversion zones early, project long-term impacts on food production, and identify patterns of land conversion related to urbanization, industry, and illegal licensing. This information can then be used as a basis for more precise policymaking, such as tightening licensing, strengthening LP2B/LSD regulations, providing incentives for farmers, and improving cross-agency coordination, so that intelligence plays a frontline role in maintaining a balance between economic growth and national food security.

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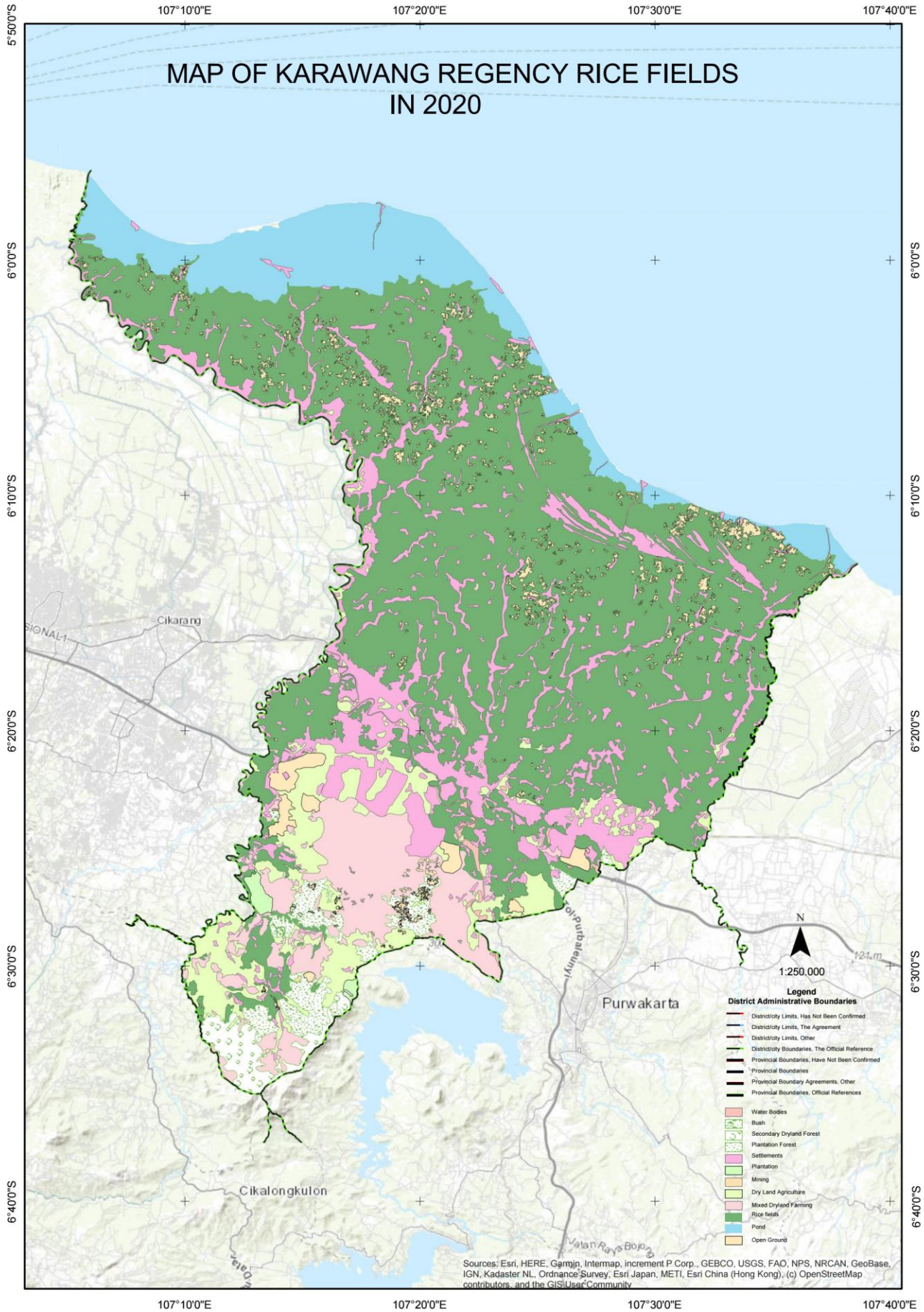
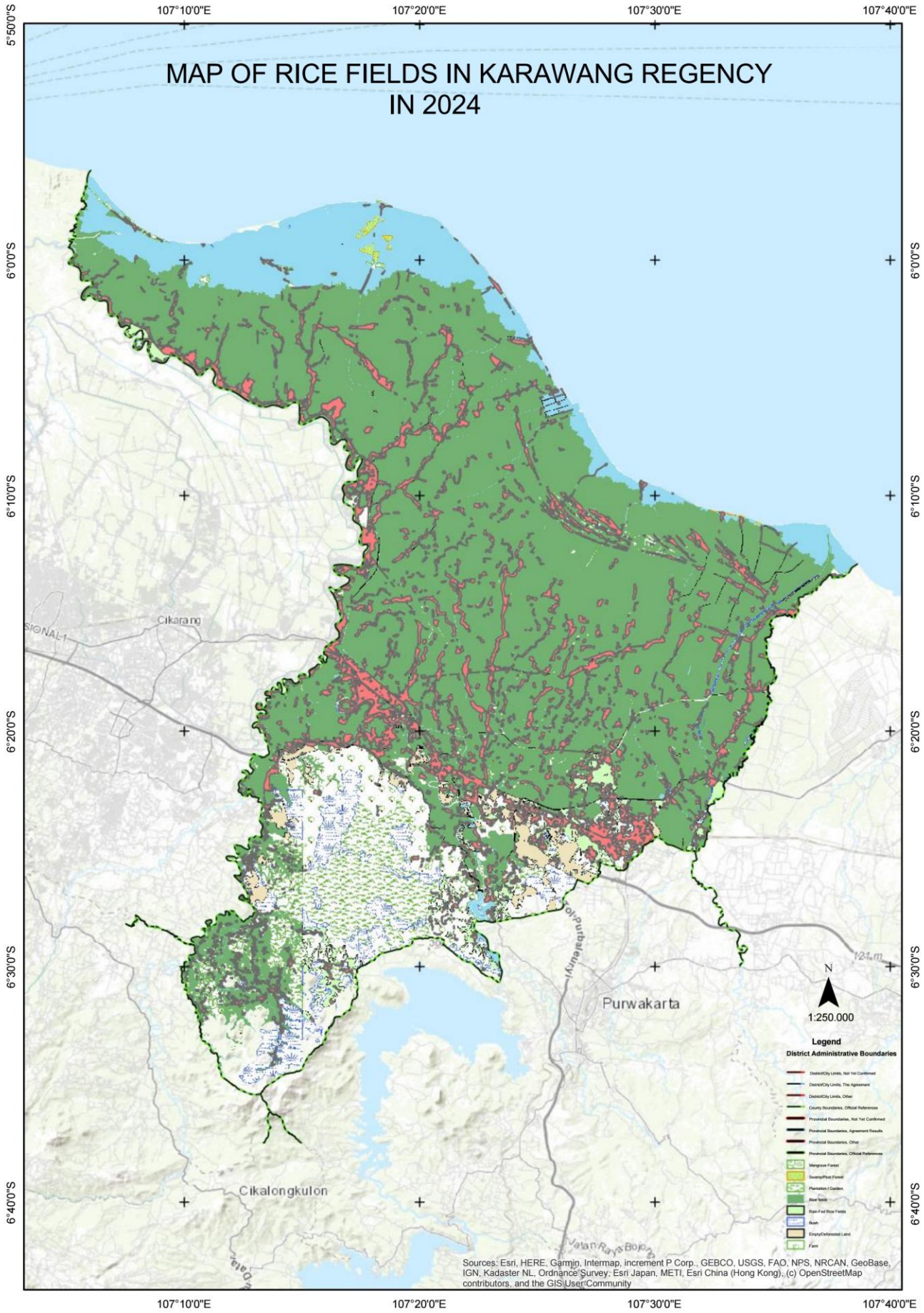
APPENDIX:


MAP OF KARAWANG REGENCY RICE FIELDS
IN 2020
107°10'0"E
107°20'0"E
107°30'0"E
107°40'0"E
5°50'0"S
6°0'0"S
6°10'0"S
6°20'0"S
6°30'0"S
6°40'0"S
Cikarang
Purwakarta
Cikalongkulon
N
1:250,000
Legend
District Administrative Boundaries
District/city Limits, Has Not Been Confirmed
District/city Limits, The Agreement
District/city Limits, Other
District/city Boundaries, The Official Reference
Provincial Boundaries, Have Not Been Confirmed
Provincial Boundaries
Provincial Boundary Agreements, Other
Provincial Boundaries, Official References
Water Bodies
Bush
Secondary Dryland Forest
Plantation Forest
Settlements
Plantation
Mining
Dry Land Agriculture
Mixed Dryland Farming
Rice fields
Pond
Open Ground
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community


MAP OF RICE FIELDS IN KARAWANG REGENCY
IN 2024
107°10'0"E
107°20'0"E
107°30'0"E
107°40'0"E
5°50'0"S
6°0'0"S
6°10'0"S
6°20'0"S
6°30'0"S
6°40'0"S
Cikarang
Purwakarta
Cikalongkulon
1:250.000
Legend
District Administrative Boundaries
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community