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The Impact of the Determination of the Mamminasata National Strategic Area on Rice Fields in Maros Regency

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ABSTRACT

The integration of the Mamminasata National Strategic Area (KSN) which includes Maros, Gowa, Takalar, and Makassar City has a significant impact on the existence of productive rice fields, especially in Maros Regency. This study aims to evaluate the impact of KSN determination on rice fields through a spatial policy analysis approach, farmers' perceptions, and spatial analysis of changes in rice field area during the period 2007–2024, using Boolean overlay methods, image interpretation, and structured interviews. The results showed that only 58.57% of rice fields were suitable between the spatial pattern of KSN and RTRW Maros, while the other 41.43% were in the non-aligned zone, at high risk of conversion of functions. Most farmers are over 50 years old and depend entirely on the agricultural sector for their livelihoods, with a low level of understanding of Protected Rice Fields (LSD) policies, particularly in areas with high conversion potential. However, the majority of farmers support the establishment of LSD in the hope of obtaining agricultural incentives. In the period 2007-2024, there was a decrease in the area of rice fields by 1,002 hectares, which was mainly caused by the expansion of built land in sub-districts that directly border Makassar City. These findings strengthen the hypothesis that the determination of the Mamminasata KSN accelerates the risk of conversion of rice fields in Maros through spatial insynchronization and weak implementation of land protection policies. Therefore, an integrated spatial policy and strong institutional support are needed to maintain the sustainability of rice fields and protect the welfare of farmers in the affected areas.

Keywords: agricultural land protection, land suitability analysis, national strategic area, Protected rice field (LSD), spatial policy integration

ABSTRAK

Integrasi Kawasan Strategis Nasional (KSN) Mamminasata yang mencakup Kabupaten Maros, Gowa, Takalar, dan Kota Makassar berdampak signifikan terhadap keberadaan lahan sawah produktif, khususnya di Kabupaten Maros. Penelitian ini bertujuan untuk mengevaluasi dampak penetapan KSN terhadap lahan sawah melalui pendekatan analisis kebijakan tata ruang, persepsi petani, dan analisis spasial perubahan luas lahan sawah selama periode 2007–2024, menggunakan metode Boolean overlay, interpretasi citra, dan wawancara terstruktur. Hasil menunjukkan bahwa hanya 58,57% lahan sawah yang sesuai antara pola ruang KSN dan RTRW Maros, sedangkan 41,43% lainnya berada pada zona tidak selaras, berisiko tinggi mengalami alih fungsi. Sebagian besar petani berusia di atas 50 tahun dan menggantungkan mata pencaharian sepenuhnya pada sektor pertanian, dengan tingkat pemahaman yang rendah terhadap kebijakan Lahan Sawah Dilindungi (LSD), khususnya di area dengan potensi konversi tinggi. Meski demikian, mayoritas petani mendukung penetapan LSD dengan harapan memperoleh insentif pertanian. Dalam kurun waktu 2007–2024, terjadi penurunan luas lahan sawah sebesar 1.002 hektar yang terutama disebabkan oleh ekspansi lahan terbangun di kecamatan yang berbatasan langsung dengan Kota Makassar. Temuan ini menguatkan hipotesis bahwa penetapan KSN Mamminasata mempercepat risiko alih fungsi lahan sawah di Maros melalui ketidaksinkronan spasial dan lemahnya implementasi kebijakan perlindungan lahan. Oleh karena itu, diperlukan kebijakan tata ruang yang terintegrasi dan dukungan kelembagaan yang kuat untuk menjaga keberlanjutan lahan sawah serta perlindungan kesejahteraan petani di wilayah terdampak.

Kata kunci: perlindungan lahan pertanian, analisis kesesuaian lahan, kawasan strategis nasional, lahan sawah dilindungi (LSD), integrasi kebijakan tata ruang

1. INTRODUCTION

Along with the increasing demand for land driven by population growth and development activities, the conversion of agricultural land particularly rice fields is accelerating. Meanwhile, land availability remains fixed (Yasa et al. (2023); Haldae et al. (2025); Brunetta et al. (2020). This situation poses serious implications for food security in many regions. In Indonesia, the conversion of agricultural land in nine main rice-producing provinces West Java, East Java, Bali, South Sulawesi, South Kalimantan, West Nusa Tenggara, Gorontalo, South Sumatra, and North Sumatra is estimated to reach 54,716 hectares per year based on high-resolution imagery analysis from 2000 to 2015 (Mulyani et al., 2016). Food security will be increasingly difficult to achieve if rice fields continue to be converted into non-agricultural land amid rapid population growth.

One area experiencing significant pressure on agricultural land is Maros Regency, which has been integrated into the Mamminasata National Strategic Area (KSN) through Presidential Regulation No. 55 of 2011. The Mamminasata KSN comprising Makassar, Maros, Sungguminasa, and Takalar is designated to serve three primary functions: as a center of economic growth and production processing, a hub for socio-cultural and defense development, and a service-oriented region (Yanuar et al., 2023). Ashari's (2015) found that between 2003 and 2011, built-up land in this area increased by 6,122 hectares, of which 1,909 hectares resulted from rice field conversion. The limited spatial capacity of Makassar City has triggered an uncontrolled population spillover into surrounding suburban areas such as Maros, Gowa, and Takalar, thereby increasing the threat to rice fields on the urban periphery especially in Maros Regency.

Although the integration of this area is intended to accelerate economic development with Mamminasata's economic growth averaging 7.88% from 2013 to 2017 (Dahliah & Fajriani, 2019) this progress has directly triggered the conversion of rice fields for infrastructure, housing, and industrial development (Suryawati & Efendi, 2013). Mujahid (2017) found that such land conversion has affected up to 77.7% of sub-districts in the metropolitan area, indicating a growing deficit in agricultural land. National Strategic Areas (KSN) are designated for prioritized spatial planning due to their critical influence on national sovereignty, security, economy, culture, and environmental sustainability (BKPRN, 2011). This prioritization often makes rice field conversion inevitable in the pursuit of economic acceleration.

Maros Regency plays a crucial role as a food production center in South Sulawesi, with rice production reaching 311,618 tons in 2022 and productivity ranging from 6.13 to 8.96 tons/ha (BPS, 2022). These productive rice fields are increasingly threatened by land-use change driven by strategic area designation (Pravitasari et al., 2019). Although Maros Regency has issued Regional Regulation No. 1 of 2020 on the Protection of Sustainable Food Agricultural Land (LP2B) to curb land conversion and maintain food supply (Iskandar et al., 2016), implementation remains hindered by incomplete spatial data and the absence of clearly defined LP2B zones in the regional spatial plan (RTRW). This situation risks disrupting local food balance, displacing farmers from their livelihoods, reducing agricultural income, and increasing food prices (Ansari et al., 2020; Munawir et al. 2023).

Unlike previous studies that tend to focus on a single aspect, this research uniquely combines spatial policy analysis with farmers' perceptions over a long temporal span from 2007 to 2024, offering a more comprehensive perspective on the dynamics of rice field conversion in the Mamminasata KSN. Therefore, this study aims to determine the impact of the Mamminasata KSN designation on rice fields in Maros Regency by evaluating spatial planning policies, analyzing farmers' perceptions regarding paddy field protection, and examining the dynamics of paddy field area changes in the region from 2007 to 2024.

2. METHODOLOGY

The research was conducted in the Maros Regency Area which is included in the Mamminasata National Strategic Area which includes 12 sub-districts including Maros Baru District, Turikale District, Marusu District, Mandai District, Moncongloe District, Bontoa District, Lau District, Tanralili District, Tompobulu District, Bantimurung District, Simbang District, and Cenrana District (Figure 1).

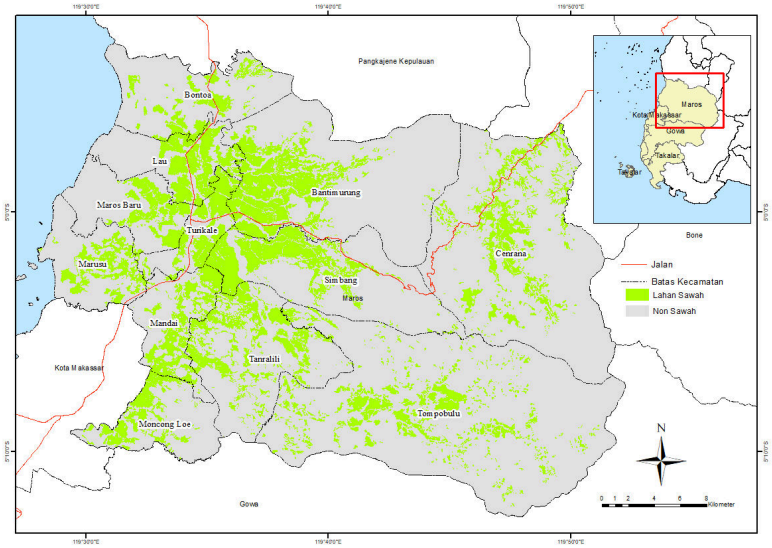

Figure 1. Map of the research location
Source: *Analysis results, 2025*

The data used in this study are secondary data and primary data. Secondary data includes spatial data on spatial patterns, including the direction of the spatial pattern plan of KSN Mamminasata based on Presidential Regulation No. 55 of 2011 and the Maros Regency RTRW based on Maros Regency Regional Regulation No. 7 of 2023 concerning the Maros Regency Regional Spatial Plan for 2023-2042. The rice field data used is Rice Field Raw Land data in accordance with the Decree of the Minister of ATR/BPN No. 446 of 2024. Primary data was obtained through interviews with respondents. The tools used are ArcMap spatial data processing applications, Microsoft Office and Microsoft Excel.

This study employed a mixed-methods approach combining spatial analysis, image interpretation, and qualitative surveys to evaluate the impact of the Mamminasata National Strategic Area (KSN) designation on rice fields in Maros Regency. To ensure the accuracy of the image interpretation, validation was conducted through a confusion matrix using stratified

random sampling and ground truth data collected via field verification in selected districts (Zhao et al., 2023).

2. Data Analysis Methods

2.1. Analysis of the Suitability of Rice Fields with Spatial Planning and Potential Conversion of Rice Fields

The research method was carried out by evaluating the alignment of spatial pattern direction with rice fields. The alignment of spatial patterns with rice fields was carried out by Boolean overlay spatial analysis. This technique combines different types of informative maps to achieve a specific goal (Rachmah et al., 2018). The overlay was carried out to evaluate the policies of the applicable spatial directions, in this case the spatial pattern direction of KSN Mamminasata and RTRW Maros Regency with rice fields sourced from the Rice Field Raw Land map. The mapping of the potential conversion of rice fields to built land is divided into three criteria, namely easy to convert, somewhat easily converted, and difficult to convert. The assessment of the criteria is based on the location of the rice fields from the distance of the road, the status of the area, and the location of the rice fields in the direction of the spatial pattern of the Maros Regency RTRW.

2.2. Farmers' Perception of Rice Field Protection

Primary data collection was carried out by interviews using questionnaires to capture farmers' perceptions of the protection of their rice fields in three potential conversion locations. Sample data collection was carried out by multistage sampling. Multistage sampling is a sampling technique that is carried out sequentially at two or more levels/hierarchy that can involve more than one method or a combined sampling method (Noerdin, 2016). This technique is suitable for very large and geographically dispersed populations. Multistage sampling is carried out in stages, with the initial stage of dividing the population based on strata/level, in this case divided into three criteria, namely easy to convert, somewhat easily converted, and difficult to convert. Furthermore, clustering/grouping is carried out by dividing according to the number of sub-districts included in the KSN Mamminasata area in Maros Regency, namely 12 sub-districts.

2.3. The Dynamics of Changing of Rice Fields Area

Identify changes in the area of rice fields with basic data sourced from Rice Fields in accordance with the Decree of the Minister of ATR/BPN No. 446 of 2024. Then visual interpretation was carried out using Landsat 7 imagery for 2007 and 2011 and using Landsat 8 OLI for 2015 and 2019 sourced from the US Geological Survey (USGS). From this analysis, an overlay was carried out between the maps of rice fields and non-rice fields in 2007 and 2024 to determine the trend of change. The visualization of rice fields in the Landsat imagery is shown depending on the planting phase. Considering that it is spread over a fairly large area, the appearance of rice fields has various planting phases. Rice plants through satellite image analysis are recognized by their growth phases, which consist of: water phase (tillage / inundation), vegetative phase, panicle/grain filling phase, harvest phase and bera phase (post-harvest). Thus, rice fields have an appearance that is always changing (Wahyunto et al., 2004). To make it easier to visually recognize rice fields, composite 654 was carried out to recognize

different appearances and assisted by visual information on Google Earth. Composite 654 allows the identification of rice fields based on different colors, such as blue (during tillage and planting), green (after planting), and red (during harvest or bera) (Koto et al., 2023). The interpretation of Landsat imagery is also directed to observe both dense and medium-sized settlements, industrial and office estates and other socio-economic infrastructure, which are characterized by the appearance of brighter or lighter colors, rough and regular textures, and square shapes, due to the high reflectivity of building materials such as concrete, tiles, and metal.

3. RESULT AND DISCUSSIONS

3.1. Suitability of Rice Fields with Spatial Planning & Potential Conversion of Rice Fields

In order to achieve the goal of KSN Mamminasata to become the center of growth in the Eastern Region of Indonesia and predicted to become an 'icon' of South Sulawesi, the central government stipulated Presidential Regulation No. 55 of 2011 concerning the Spatial Plan of the Urban Areas of Makassar, Maros, Sungguminasa, and Takalar. The KSN Mamminasata space pattern plan for the period 2011-2031 was determined during the period of 2011-2031. The spatial pattern plan of KSN Mamminasata for the period 2011-2031 in the Maros Regency area consists of the designation of protected functional areas (4 classes) and the designation of cultivation areas (5 classes). The protected functional area consists of Zone L1 which consists of protected forest areas and water catchment zones; Zone L2 consists of coastal boundaries and river boundaries; Zone L3 consists of nature reserves and national parks; and Zone L5 consists of abrasion-prone areas and spring borders. The designation of cultivation areas consists of Zone B1 which consists of high-density housing designation areas, city government designations, national and regional scale trade and services; Zone B2 consists of medium-density housing designation, regional-scale service trade designation; Zone B3 consists of low-density housing and trade and service areas; Zone B4 consists of low-density housing areas and wetland agriculture areas, dryland agriculture, plantations, fisheries, livestock, and agro-industry; Zone B6 functions for production forests The Mamminasata KSN Spatial Pattern Pattern Map in Maros Regency can be seen in Figure 2.

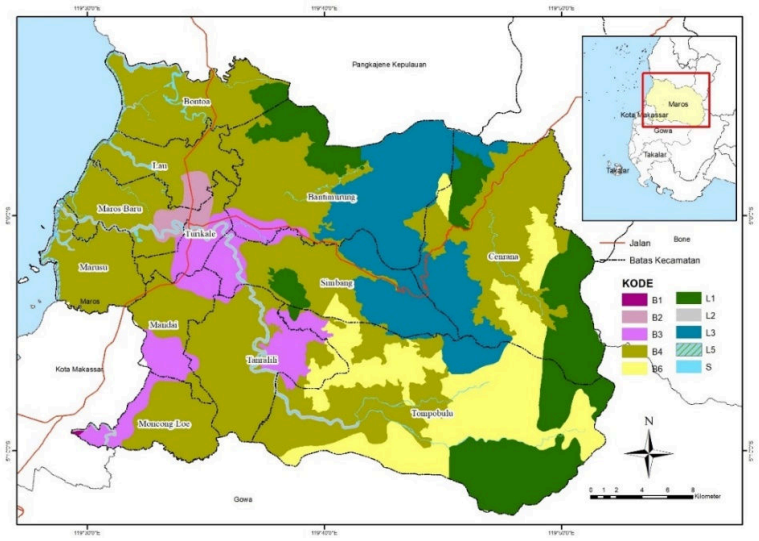

Figure 2. Map of the Spatial Pattern of KSN Mamminasata Maros Regency
Source: *South Sulawesi ATR/BPN Regional Office, 2025*

The National Strategic Area Spatial Plan (KSN) is a technical reference for the preparation and determination of regional spatial plans under it, namely provincial and regency/city areas. In addition, the KSN RTR is also a detailed plan of the National Regional Spatial Plan (RTRWN), which is also the basis for consideration in the space utilization control instrument. After the enactment of the Job Creation Law through Law No. 11 of 2021, RTR KSN became one of the bases for the issuance of Suitability of Space Utilization Activities (KKPR) with the principle of pairing and complementary. The tiered principle means that spatial planning is carried out in stages, where the spatial plan at a lower level must refer to and adjust to the spatial plan at a higher level. With the rule that the Regency/City Spatial Plan is guided by the Provincial Spatial Plan, and the Provincial Spatial Plan is guided by the National Regional Spatial Plan. Meanwhile, the complementary meaning is a regional spatial plan that fills in and complements the spatial plan of the level above it (Imamulhadi, 2021).

The alignment between the rice fields and the spatial pattern plan of KSN Mamminasata in the Maros Regency area is carried out through an overlay process between the map of the Raw Rice Fields in 2024 and the spatial pattern plan of the KSN Mamminasata in 2011-2031. The alignment of the KSN spatial pattern is carried out in Zone B4, namely as a wetland agricultural designation area. If the raw rice fields are located in the Zone B4 area, it is said to be aligned. On the other hand, if it is located outside Zone B4, it is included in the classification of non-alignment. Analysis of land alignment with spatial pattern plans was carried out to determine the level of suitability of land use with the spatial plan that has been set. This aims to ensure that the development and use of land runs in accordance with the vision and objectives that have been set in the spatial plan. By knowing the alignment of land with spatial patterns, the government can make more appropriate and sustainable decisions regarding land use, so that it will help in increasing the effectiveness of spatial planning and sustainable management of natural resources. The alignment map between the 2024 rice field raw land and the 2011-2031 KSN Mamminasata spatial pattern plan can be seen in Figure 3.

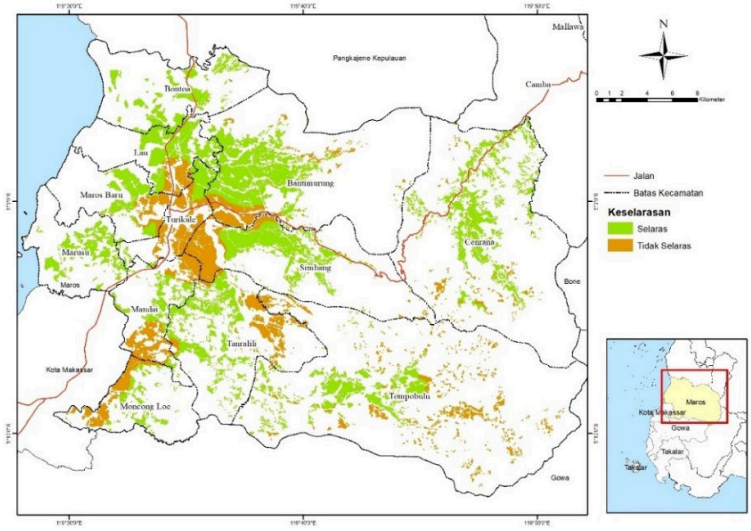

Figure 3. Map of Alignment between rice fields and rice fields in 2024 with the spatial pattern plan of KSN Mamminasata in 2011-2031
Source: *Analysis Results, 2025*

The results of the overlay of the use of paddy fields from the 2024 Raw Rice Land Map with the spatial pattern pattern map of KSN Mamminasata in the Maros Regency area show that the rice fields that have been aligned and are located in Zone B4 for wetland agricultural designation areas are 67.72% or an area of 14,691.04 Ha. Meanwhile, rice fields located outside Zone B4 or are not aligned by 32.28% or an area of 7,001.86 hectares. The distribution of rice fields located outside Zone B4 is found in Moncong Loe and Mandai Districts, both of which border Makassar City. In addition, rice fields that are not suitable are found in the urban area of Maros, including Turikale District, Lau District, Maros Baru District, and Simbang District. This will have the potential to change the use of rice fields to non-agricultural land by 32.28% of the rice fields in KSN Mamminasata in the Maros Regency area. Rice fields located outside the B4 Area allocation, are predominantly included in the B3 Zone directive for low-density housing and trade and services areas. Rice fields that are located in areas with higher land rent values such as settlements, the land will have a greater potential to change its function to non-rice fields or in accordance with its designation in the future. With the value of alignment with the direction of the spatial pattern of KSN Mamminasata of 67.72%, it is necessary to formulate a new policy on the existing spatial pattern plan, so that productive rice fields in KSN Mamminasata in the Maros Regency area need to be protected from land conversion. The table of the area of conformity of rice fields with the spatial pattern of KSN Mamminasata can be seen in Table 1.

Table 1. Conformity of rice fields area with the spatial pattern of KSN Mamminasata Maros Regency

Conformity		**Area (Ha)**	**%**
Suitable			
Zone	B4	14691,04	67,72
Not Suitable			
	B2	809,98	3,73
Zone	B3	4254,24	19,61
	B6	1017,03	4,69

Conformity		Area (Ha)	%
	L1	404,15	1,86
	L2	145,04	0,67
	L3	293,79	1,35
	L5	1,61	0,01
	S	76,03	0,35
Total		21692,89	100,00

Source: *Analysis Results, 2025*

An evaluation of the conformity of rice fields was also carried out on the Spatial Pattern plan in the Maros Regency Regional Spatial Plan for 2023-2041. The results of the overlay between the 2024 Rice Field Raw Land map and the Maros Regency spatial pattern map provide an overview of the suitable and not suitable of the existing rice fields compared to the spatial pattern direction which has a higher hierarchy, namely the spatial pattern direction of the KSN Mamminasata. The Regional Spatial Plan (RTRW) is a basic reference in the issuance of space utilization permits to ensure that space utilization activities are in accordance with the spatial plan that has been determined. The suitability map between the 2024 raw rice fields and the Maros Regency RTRW spatial pattern plan for 2023-2041 can be seen in Figure 4.

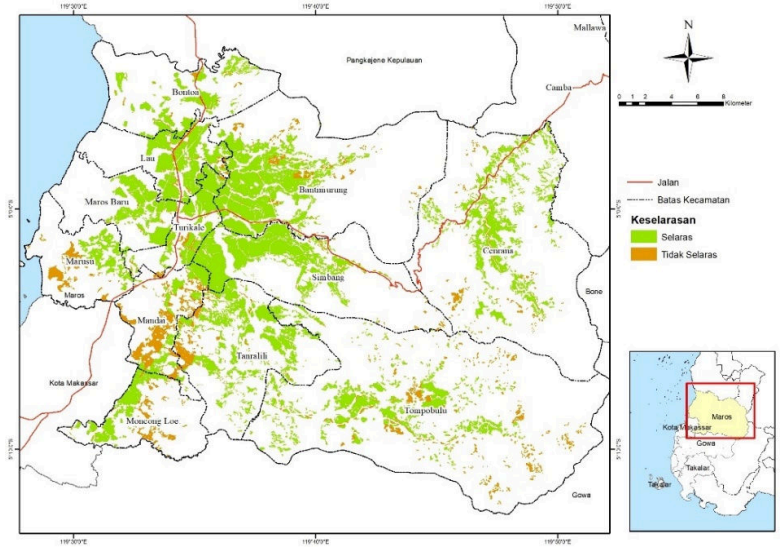

Figure 4. Suitability map between the raw rice fields in 2024 and the spatial pattern plan (RTRW) of Maros Regency
Source: *Analysis Results, 2025*

The results of the overlay between the use of rice fields from the 2024 Rice Field Land Map and the Maros Regency spatial pattern plan map for 2023-2041 show that rice fields that are aligned or included in the direction of the food agriculture spatial pattern in Maros Regency are 18,122.22 hectares or 83.54% of the total rice field area in the Mamminasata KSN area of Maros Regency. Meanwhile, rice fields that are not aligned or located outside the direction of food crops are 3,570.67 Ha or 16.46% of the total rice field area. This shows that most of the rice fields in KSN Mamminasata in the Maros Regency area have been accommodated in the 2023-2041 Maros Regency Regional Spatial Plan. Rice fields located outside the food crop area

by 16.46% have the potential to switch functions to non-rice fields. The conformity area of rice fields with the spatial pattern of the RTRW of Maros Regency can be seen in Table 2.

Table 2. Conformity of rice fields area with spatial patterns Maros Regency RTRW 2023-2041.

Conformity	Area (Ha)	%
Suitable	**18122,22**	**83,54**
Food Crop Area	18122,22	83,54
Not suitable	**3570,67**	**16,46**
Water bodies	1,75	0,01
Cultural Heritage Areas	4,89	0,02
Horticultural Area	20,80	0,10
Protected Forest Area	230,21	1,06
Permanent Production Forest Areas	323,70	1,49
Tourism Areas	13,18	0,06
Power Generation Area	0,43	0,00
Aquaculture Fisheries Area	28,72	0,13
Plantation Area	370,10	1,71
People's Plantation Areas	3,72	0,02
Local Protected Areas	308,20	1,42
Rural Settlement Areas	105,00	0,48
Urban Residential Areas	1221,98	5,63
Defense and Security Zone	25,27	0,12
Industrial Allocation Area	134,04	0,62
Rock Mining Allocation Area	24,96	0,12
Transportation Areas	515,38	2,38
National park	238,33	1,10
Total	**21692,89**	**100,00**

Source: Analysis Results, 2025

Rice fields located outside the food crop area have the potential to change land use to non-rice fields, especially in the direction of rural and urban residential space patterns, industrial designations, transportation areas, and power generation. This can be said to be a transition process, namely the use of existing land that is not in accordance with spatial patterns and has the potential to change according to the direction of spatial patterns (Sitorus et al., 2019).

To find out the conformity between the spatial pattern of the Maros Regency KSN Mamminasata and the spatial pattern plan of the Maros Regency RTRW for 2023-2041, an overlay was carried out between the alignment of rice fields in 2024 with the spatial pattern plan of Maros Regency in 2023-2041 and the alignment of Raw Rice Fields in 2024 with the spatial pattern plan of KSN Mamminasata in 2011-2031 to evaluate the hierarchy of spatial arrangement, from a higher level as a reference for the spatial pattern plan at the level lower. If the rice fields in the spatial pattern plan of KSN Maminasata and the spatial pattern plan of the RTRW of Maros Regency are compatible, then it can be said to be in conform. The map of the alignment between the alignment of raw rice fields in 2024 with the spatial pattern plan of Maros Regency in 2023-2041 and the alignment of raw rice fields in 2024 with the spatial pattern plan of KSN Mamminasata in 2011-2031 can be seen in Figure 5.

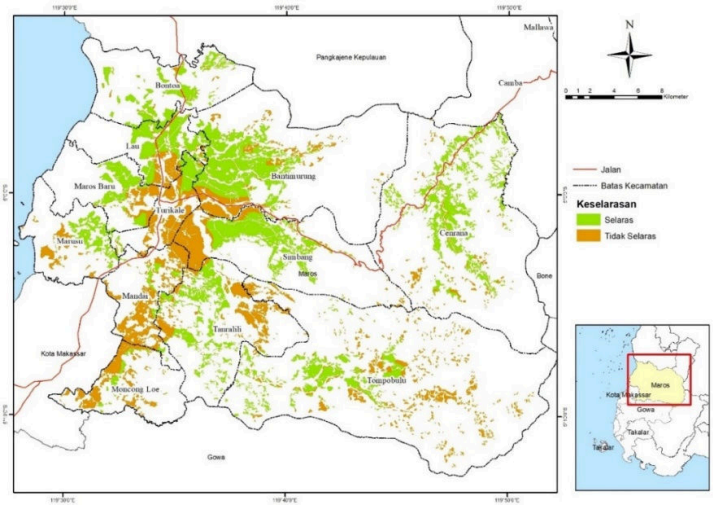

Figure 5. Suitability map of Rice Field in Spatial Patterns KSN Mamminasata and RTRW Maros Regency
Source: *Analysis Results, 2025*

From the results of the overlay between the two maps, it can be seen that the alignment of rice fields that are suitable with the spatial pattern plan of KSN maminasata and the spatial pattern plan of the Maros Regency RTRW is 12,706.44 Ha or 58.57%, while there is no alignment between the two spatial pattern directions of 8,986.45 Ha or 41.43%. This shows that the alignment of the spatial pattern plan has less than ideal proportions. The alignment between spatial plans aims to ensure that development plans, especially in KSN Mamminasata, do not conflict with development plans at the district level. Thus, it is necessary to evaluate or review the spatial pattern plan of KSN Mamminasata and RTRW Maros Regency so that it can be aligned with the development plan in the Regency area, considering that the Regency Spatial Plan must at least refer to the RTR KSN and the Provincial Spatial Plan. Although the Maros Regency RTRW Regional Regulation has been revised and issued in 2023, the Mamminasata KSN Spatial Plan, which has been in effect since 2011 until now, has not been revised or reviewed. If the latest regulation is issued regarding the revision of the spatial plan of KSN Mamminasata, it is necessary to readjust the RTRW of Maros Regency so that it can be in conform with the Spatial Plan of KSN Mamminasata.

The mapping of the potential for the conversion of rice fields aims to identify areas that have the potential to experience changes to paddy fields to non-paddy land, especially built land. The assessment of this conversion potential is carried out with variables such as distance from the road (national road, arterial road, collector road, local road), area status, and the location of the rice field in the direction of the Maros Regency RTRW spatial pattern. A map of the potential conversion of paddy fields can be seen in Figure 6.

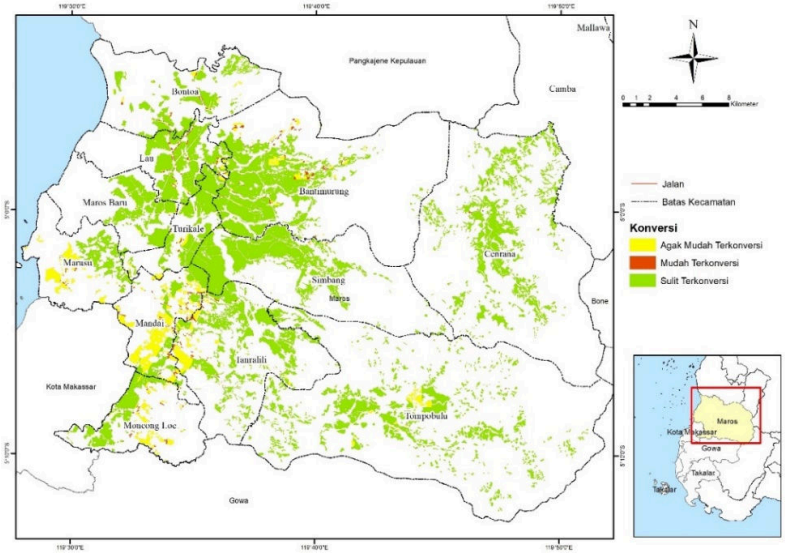

Figure 6. Map of the Potential Conversion of Rice Fields to Built Land
Source: *Analysis Results, 2025*

The results of the mapping of the potential conversion of rice fields to built land obtained the potential for rice fields that are difficult to convert are the most dominant with an area of 19,222.42 hectares or 88.54%. Rice fields with the category of difficult to convert are located in the pattern of Food Agriculture space in the Maros Regency RTRW. To change the use of rice fields at the location of the food crop space pattern, technical recommendations from the agriculture office and technical considerations from the land office are needed. If indicated in the location of the food crop space pattern, the application will be rejected. Rice fields with relatively easy conversion potential have an area of 2,120.4 hectares or 9.77%. Rice fields in this category are grouped in Mandai District, Marusu District, and Moncongloe District which border Makassar City. This rice field is located in the direction of spatial patterns outside food crops, such as in the designation of urban residential areas and in the transportation area/Sultan Hasanuddin international airport area. In addition, this rice field with a rather easily convertible category is located in a radius of more than 100 meters from the road, so additional access from the road is needed to reach the location of this rice field. For rice fields with the category of easy conversion to convert, the smallest area with an area of 368.44 Ha or 1.7%. The location of this category of rice fields is outside the direction of the food crop space pattern and is located at a distance of 100 meters from the road. This results in the easier conversion of the land into built land due to the ease of access from the road and resulting in an increase in the value of the land. *The* road buffer will affect the conversion rate of rice fields into built land. The farther away the rice fields are from the road, the transformation of rice fields into built land will decrease. The potential for changes in the use of rice fields to built land up to 50 meters from the road will increase (Monsaputra, 2023).

3.2. Farmers' Perception of Rice Field Protection

The establishment of KSN Mamminasata which has an impact on rice fields, can also affect livelihoods, especially farmers who depend on rice fields. To find out farmers' perceptions of the protection of their rice fields, interviews were conducted with farmers in three

classifications of potential conversion of rice fields into built land. Farmer samples were obtained based on the Cochran formula with a sample error rate of 10% and a confidence level of 90%, so from the results of the calculation of the Cochran formula, the required sample was obtained was 97 respondents. The determination of samples at the sub-district location was based on the consideration of the proportion of the area of classification of potential rice field conversion and Marusu, Mandai District, and Moncong Loe District were selected. The determination of the number of samples is based on the area of each potential conversion in the selected sub-district. The wider the conversion potential, the number of respondents will be the number of sample distribution. The proportion of area in each sub-district and the number of samples can be seen in Table 3.

Table 3. Distribution of Respondents in Selected Districts

District	Area (Ha)	Number of Samples
Mandai District		
Relatively Easy to Convert	754,13	17
Easy to Convert	68,58	2
Difficult to Convert	606,40	14
Marusu District		
Relatively Easy to Convert	331,85	12
Easy to Convert	20,94	1
Difficult to Convert	566,18	20
Moncongloe District		
Relatively Easy to Convert	228,98	7
Easy to Convert	33,54	2
Difficult to Convert	696,18	22
Total		**97**

Source: *Analysis Results, 2025*

The results of interviews with respondents related to the characteristics of farmers at the sampling location, from the status of land tenure there are two categories, namely owners and cultivators of land and land cultivators who are not land owners. Land that is cultivator owners dominates by 82% or 80 people while farmers who only cultivate land are 27 people or 28%. Farmers at the study site were dominated by the elderly with the age of 50 years and above at 56.7%, the age of 40-50 at 28%, the age of 30-40 at 13%, and the age of less than 30 years was only 2%. This shows that the interest of the younger generation in farming is still lacking, which is dominated by farmers aged 50 years or older. The length of farming of the farmers in the research site varied from less than 10 years to more than 40 years of farming. For farmers who have been farming for more than 40 years by 8%, 31-40 years of farming by 18%, farming time of 21-30 years by 29%, 10-20 years of farming dominate by 41% and those who have less than 10 years of farming by 2%. This shows that farmers have skills and abilities in cultivating rice fields as shown by the length of farming. As many as 35% of farmers or 34 people do not have any other job besides farming. Farmers who have other jobs besides farming include 11% self-employed, 11% pond farmers, 11% village officials, 8% as workers, 8% as traders, and 7% as farmers. Farmers who do not have other jobs other than farming will be threatened if their rice fields are functional. Of the farmers who have no work other than farming, as many as 15% are cultivators, who work only as farm laborers for land owners. This condition can threaten the

existence of cultivator farmers if the LSD policy is not implemented, so there is a need for policies so that farmers do not lose their main livelihood which only depends on rice fields. Farmers' perceptions related to the protection of paddy fields were studied through interviews on three criteria for the potential of paddy fields found in the sample location. The results of interviews related to farmers' perceptions of the protection of their rice fields are presented in Table 4.

Table 4. Recapitulation of farmers' perception of rice field protection

Farmers' Perceptions	Conversion Potential		
	Easy to convert	Relatively Easy to Convert	Difficult to Convert
Have received an explanation of the LSD/LP2B policy			
Ever	40%	64%	55%
Never	60%	36%	45%
Need protection for rice fields			
Yes	60%	89%	93%
Not	40%	11%	7%
Willing to be designated as an LSD area by the government			
Willing	60%	75%	86%
Unprepared	40%	25%	14%
Reasons to defend rice fields			
Primary source of income	100%	89%	88%
No other skills	0%	11%	8%
Passed on to the next generation	0%	7%	2%
Investment	0%	4%	4%
Facilitation from the government if willing to turn rice fields into LSD areas			
Providing capital loan facilities	0%	11%	19%
Fertilizer/seed subsidy	100%	85%	54%
Low taxes/tax breaks	33%	11%	23%
Agricultural Infrastructure Facilities	100%	74%	81%
Regular counseling by officers	33%	22%	17%
Compensation from the government if you have to convert rice fields for public interest/land acquisition			
Compensation (Land Compensation)	67%	44%	54%
A replacement farm is being sought	33%	52%	42%
Provision of training/skills of other professions other than farmers	0%	4%	4%

Source: *Analysis Results, 2025*

As a result of interviews with respondents related to policies and farmers' knowledge related to LSD policies, it is known that the level of understanding of farmers in general is not so high. On land that is easily convertible, 40% have received an explanation about the policy, while the remaining 60% have not. In land with the potential to be relatively easily converted, 64% have received an explanation of the policy, while 36% have never received one. For land that is difficult to convert, 55% of farmers have received an explanation about the policy, while 45% have never. This shows the possibility that there is still a lack of socialization regarding the LP2B policy by the Maros Regency government, even though a regional regulation regarding this LP2B policy has been issued.

The protection of rice fields in KSN Mamminasata Maros Regency is generally praised by farmer respondents. Around 93% of respondents on potentially difficult to convert land agreed with the protection of rice fields, in line with the approval of 89% of respondents on land that

is somewhat difficult to convert, and 60% on land that is easily converted. This shows that farmers understand the importance of maintaining the existence of rice fields for food security, in addition to being a source of livelihood.

The results of the study show that the majority of respondents are willing if their rice fields are designated as protected rice fields in KSN Mamminasata, Maros Regency. Respondents who are willing are as many as 60% on easily convertible land, 75% on relatively easily convertible land, and 86% on rice fields that are difficult to convert. There were 14% of respondents who were not willing to locate land that was difficult to convert, 25% on land that was relatively easy to convert, and 40% on land that was easy to convert. The reasons respondents who are not willing to have their rice fields designated as protected rice fields are that 58% want to sell their rice fields for other needs, 21% want to convert their land, and 11% do not have the capital to produce rice fields. If designated as LSD, existing rice fields should not be converted into land use and will be sanctioned if they violate the regulation. Most of the respondents who were willing to have their rice fields designated as LSD in KSN Mamminasata Maros Regency were motivated by the condition that rice fields are their main source of income. In easily convertible rice fields that are willing to convert their rice fields to LSD, all respondents (100%) make rice fields as the main source of income. Similar conditions occurred in land that was somewhat easily converted by 89% and in land that was difficult to convert by 88%.

Farmers who are willing if their rice fields are designated as Protected Rice Fields in Maros Regency want facilities/provision of assistance and incentives to maintain their rice fields to be sustainable. Of the total respondents who agreed that their rice fields should be designated as LSD, 79% of respondents expected modern agricultural facilities/equipment, 67% in the form of fertilizer and seed subsidies, 19% routine counseling by extension officers, and 19% to provide tax ease/relief, and 15% for easy access to capital loans. This is done so that the productivity of agricultural products increases more intensively which is routinely provided by the government.

Land designated in the LSD may switch functions if it meets the requirements for public interest, national strategic projects, and disaster or emergency events that cannot be used/functioned as rice fields. If the respondent's rice fields are included in the land that must be converted as a result of the policy, the majority (51%) expect to be compensated. However, there are also those who agree to find replacement land by 45%, and only 4% expect the provision of training/skills of other professions. Most of them stated that if they were given replacement land, the land that had been given by the government was feared to be less fertile and less productive for rice field farmland.

The interest of the next generation to farm continues the work of their parents as farmers at KSN Mamminasata Maros Regency shows fairly balanced results. As many as 56% of respondents stated that their sons/daughters were interested in farming, while as many as 44% of respondents were not interested in farming. This is enough to illustrate the age condition of farmers, the majority of whom are elderly. Many respondents stated that farming is a dirty and tiring job so that their sons/daughters are not interested in farming. There is hope from respondents that there is a need for educational scholarships for farmer children to improve

their competence and abilities in the field of agriculture, so that it can attract the younger generation to farm.

3.3. Dynamics of Change in Rice Field Area in KSN Mamminasata Maros Regency

The results of the mapping in the period from 2007 to 2024 show a decrease in rice fields from year to year, on the contrary, the use of built land has increased. Regional development and the growth of built land are one of the causes of the reduction in the area of agricultural land, especially rice fields in the KSN Mamminasata area, Maros Regency, presented in Figure 7.

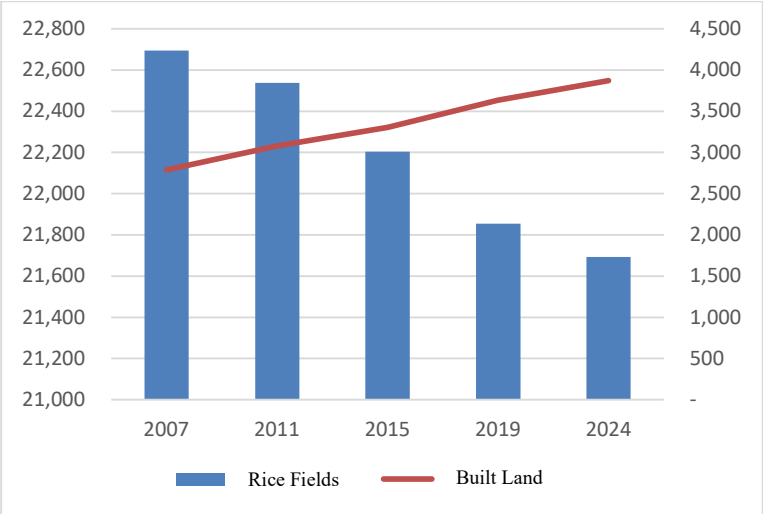

Figure 7. Graph of Trend Change in Rice Fields and Built Land

Along with the increasing population population, the development of built land will also increase. The increase in built-up land growth in KSN Mamminasata Maros Regency on the one hand is an indicator of regional development that will encourage economic growth. However, on the other hand, it will be a threat to the existence of rice fields which are productive lands. The existence of Makassar City as a core area that experiences limited space results in its suburban areas such as in Maros Regency will be affected by changes in land function to built land. Details of the change in the area of rice fields to built land in each sub-district can be seen in Table 5.

Table 5 Changing Area of Rice Fields to Built Land

No	District	Rice Field Area in 2007 (Ha)	Rice fields become built land (Ha)	%
1	Moncongloe	1152,43	193,71	19,33
2	Tompobulu	2871,16	0,62	0,06
3	Tanralili	2317,62	65,76	6,56
4	Mandai	1599,41	188,77	18,84
5	Simbang	2576,30	3,31	0,33
6	Marusu	1276,56	432,16	43,13
7	Turikale	1199,11	40,02	3,99
8	Maros Baru	1040,83	18,51	1,85
9	Cenrana	2482,32	0,89	0,07
10	Lau	1630,34	34,34	3,43

No	District	Rice Field Area in 2007 (Ha)	Rice fields become built land (Ha)	%
11	Bantimurung	3524,91	15,32	1,53
12	Bontoa	1023,81	9,38	0,94
Total		**22694,79**	**1001,89**	

Source: *Analysis Results, 2025*

From the detailed recapitulation of the area of change in rice field land use from 2007-2024, the total area of rice fields that have changed is 1,001.89 hectares. Districts that have significantly reduced the area of rice fields are found in Moncongloe District, Mandai District, and Marusu District. These three sub-districts are sub-districts that are directly adjacent to Makassar City so that the change in rice field land use is high. The change in rice fields is due to the increase in residential development due to the limited space in Makassar City so that the development of built land extends to the suburbs of Makassar City, especially in Maros Regency. The existence of the KSN Mamminasata policy in Maros Regency also triggers land use change such as national strategic projects, Makassar-Parepare railway construction projects, and land acquisition for public interests such as the development of industrial and warehousing estates as well as road construction. The expansion project of the Sultan Hasanuddin international airport in Mandai District and the construction of the Trans Mamminasata bypass road that crosses KSN Mamminasata in Maros Regency also resulted in a reduction in the area of rice fields.

The accessibility factor is one of the factors in the increasing development of built land. The close distance to Makassar City makes it easier for people who have activities in the city of Makassar. This is an attraction for people who want to live in suburban areas. The development of accessibility has caused urbanization so that it has an impact on land changes in the three sub-districts that are directly adjacent to Makassar City. The determination of an integrated warehouse and industrial area by the Maros Regency government located in Marusu District also resulted in a high change in the use of rice fields in the sub-district.

The establishment of KSN Mamminasata resulted in investors being interested in developing urban areas such as housing and commercial areas. This requires a lot of land to meet the direction of the spatial planning policy, so that land that has the initial function of agriculture is converted into residential, commercial, and other facilities, to support planned urban activities. The role of KSN Mamminasata as a center for growth and processing, industrial existence, and food production is inseparable from the need for land. The long-term impact of land conversion will result in a decrease in farmers' welfare, which can be identified from a decrease in the area of owned and cultivated land, a decrease in agricultural income, and an insignificant increase in non-agricultural income (Ruswandi et al., 2016) and the fading of the meaning of agricultural land so that it is difficult to realize farmer regeneration (Kusdiane et al., 2018). The map of changes in rice fields from 2007 to 2024 can be seen in Figure 8.

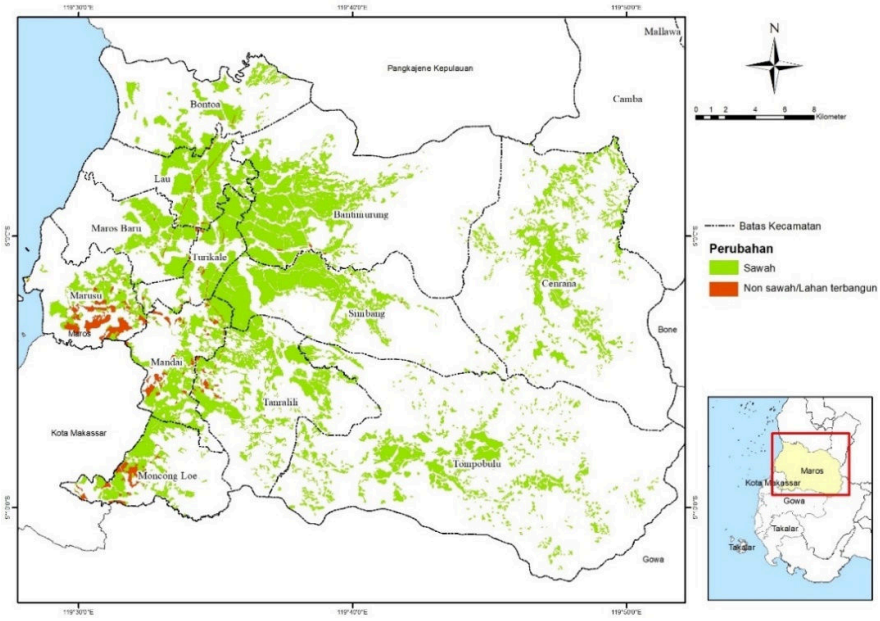

Figure 8. Map of Changes in Rice Fields in 2007-2024 KSN Mamminasata Maros Regency
Source: *Analysis Results, 2025*

3.4. Discussion

Although the introductory section did not explicitly formulate a research hypothesis, the core problem addressed in this study the potential threat of rice field conversion due to the designation of KSN Mamminasata has been quantitatively addressed through spatial overlay analysis. The findings indicate that 32.28% of rice fields in Maros Regency are not aligned with the spatial zoning designated for agricultural use in the KSN Mamminasata spatial plan, and 16.46% are also not aligned in the Maros RTRW 2023–2041. This suggests a significant risk of land-use change from agricultural to built-up land. Furthermore, the study identifies 11.47% of rice fields with moderate to high conversion potential based on accessibility and spatial allocation, confirming that the threat of conversion is both spatially embedded and development-driven. To strengthen the connection, the hypothesis could be explicitly stated in the introduction as: "The designation of KSN Mamminasata increases the risk of rice field conversion in Maros Regency, as indicated by spatial misalignment and farmer vulnerability." By doing so, the results presented here directly confirm that hypothesis through data triangulation involving spatial overlay, land change dynamics, and farmer perceptions.

Compared to previous research, this study makes a number of new contributions. In terms of time frame, the temporal scope of this study, which is from 2007 to 2024, provides a longer and more accurate overview of land change trends than previous studies such as Ashari (2015) which only covered the years 2003–2011. From the methodological aspect, the approach used is more integrative because it combines spatial policy evaluation, land conversion potential analysis, and farmer perceptions in a single study unit. This approach provides a more comprehensive understanding of the dynamics of changes in rice fields. In addition, another important finding is the low level of integration between the Maros RTRW and the spatial pattern of the Mamminasata KSN, where only 58.57% of the rice fields are suitable in the two

planning documents. This inequality shows the need for a thorough evaluation of the synchronization of spatial policies across levels. A summary of key comparisons is presented below:

Table 6. The Summaries of this research

Aspect	Previous Studies	This Study (Novelty)
Temporal Scope	≤ 10 years (e.g., 2003–2011)	17 years (2007–2024)
Scope of Analysis	Land-use change or farmer behavior	Multi-layer: spatial overlay + perception
Theory Application	General use of spatial policy	Explicit layering of RTRW-KSN hierarchy and LP2B policy limitations
Policy Harmonization	Rarely discussed	Emphasized through RTRW–KSN misalignment

To strengthen the interpretation of the findings, this discussion uses two theoretical approaches. First, the theory of rational behavior of land use (von Thünen) explains that land that is close to the city center or has high accessibility is more susceptible to conversion because the land rental value is higher. This is evident in the areas of Mandai, Marusu, and Moncongloe which are directly adjacent to Makassar City and close to the main road, so they are included in the category of easy to convert. Second, the policy implementation theories of Mazmanian and Sabatier emphasize the importance of clarity of objectives, consistency of implementation structures, and stakeholder involvement in the successful implementation of policies. The finding that 40-45% of farmers do not understand the LP2B policy shows the weak socialization of the policy at the grassroots level, even though formal regulations in the form of Regional Regulation No. 1 of 2020 have been issued. This indicates that the failure to protect rice fields lies not only in the substance of the rules, but also in the weak implementation in the field. Thus, the conversion of rice fields in the KSN Mamminasata area of Maros Regency is not only a spatial technical problem, but also reflects structural problems in spatial planning, policy implementation, and economic behavior of farmers in facing the pressure of changing land use.

5. CONCLUCION

This study began with the hypothesis that the designation of the Mamminasata National Strategic Area (KSN) increases the risk of rice field conversion in Maros Regency due to spatial misalignment and weak policy implementation. The findings of this study support that hypothesis.

First, spatial overlay analysis shows that only 58.57% of rice fields are aligned between the KSN Mamminasata spatial pattern and the 2023–2041 RTRW of Maros Regency, while the remaining 41.43% are not aligned. This low level of spatial alignment creates room for land conversion, as overlapping or inconsistent zoning in planning regulations allows rice fields to be designated for non-agricultural use. Therefore, urgent synchronization between the spatial plans of KSN and the RTRW is necessary to support the protection of existing rice fields.

Second, socio-demographic data from farmer interviews reveal that the majority of farmers are over 50 years old and rely solely on agriculture for their livelihoods. These farmers are highly vulnerable to the impacts of land conversion. Awareness of the Sustainable Food

Agricultural Land (LP2B) or Protected Rice Fields (LSD) policy remains low particularly in areas where conversion potential is high indicating inadequate government outreach and communication. Despite this, most farmers support the idea of protecting rice fields and are willing to have their land designated as LSD, provided that adequate support in the form of subsidies, agricultural infrastructure, and incentives is ensured. However, the declining interest of younger generations in farming further underscores the need for targeted programs to promote agricultural regeneration, such as agricultural education and youth empowerment initiatives.

Lastly, land cover analysis between 2007 and 2024 confirms a reduction in rice field area by 1,002 hectares, especially in sub-districts bordering Makassar City such as Mandai, Marusu, and Moncongloe. This trend is driven by rapid urban development, infrastructure expansion, and national strategic projects. The ongoing conversion of rice fields without strong protection mechanisms demonstrates the urgency to accelerate the designation of Protected Rice Fields (LSD), which is currently hampered by the lack of detailed spatial data in the existing LP2B regional regulation.

In conclusion, the results of this study affirm the initial hypothesis: the current spatial planning and policy conditions in Maros Regency under the influence of KSN Mamminasata pose a significant threat to rice field sustainability. Effective spatial integration and farmer-focused policy implementation are key to ensuring long-term food security and agricultural resilience in the region.

REFERENCES

Ansari, M. N., Bachri, S., & Lahae, K. (2020). Efektivitas terhadap pelaksanaan pengaturan lahan pertanian pangan berkelanjutan. Repertorium: Jurnal Ilmiah Hukum Kenotariatan, 9(2), 135–151.

Ashari, A. F. (2015). Analysis of land use change with the application of the clue-s model for spatial utilization directions in the Mamminasata national strategic area, South Sulawesi [Thesis]. Bogor Agricultural University.

BKPRN. (2011). Optimalisasi penyelenggaraan penataan ruang untuk percepatan dan perluasan pembangunan ekonomi yang berkelanjutan: Vol. . Buletin Tataruang (P 44).

Brunetta, G., & Caldarice, O. (2020). Spatial resilience in planning: meanings, challenges, and perspectives for urban transition. Sustainable cities and communities, 628-640.

Central Statistics Agency of South Sulawesi (Badan Pusat Statistik Sulawesi Selatan). (2022). Provinsi Sulawesi Selatan dalam angka 2022. BPS Sulawesi Selatan.

Dahliah, & Fajriani, D. (2019). Analisis disparitas pendapatan di kawasan Mamminasata. PARADOKS Jurnal Ilmu Ekonomi, 2(1), 241–251.

Haldar, S., Chatterjee, U., Bhattacharya, S., Paul, S., Bindajam, A. A., Mallick, J., & Abdo, H. G. (2024). Peri-urban dynamics: assessing expansion patterns and influencing factors. Ecological Processes, 13(1), 58.

Imamulhadi. (2021). Aspek hukum penataan ruang: Perkembangan,ruang lingkup, asas, dan norma (Legal aspect ofspatialplanning: Development, scope, principles, and norms). Bina Hukum Lingkungan, 6(1), 119–144.

Iskandar, I., Miftah, H., & Yusdiarti, A. (2016). Implementasi program perlindungan lahan pertanian pangan berkelanjutan (PLP2B) di kabupaten Garut Jawa Barat (kasus di Desa Jati kecamatan Tarogong Kaler kabupaten Garut). Jurnal Agribisains, 2(2).

Koto, A. G., Koto, H. A., & Dangkua, T. (2023). Spasial luas tanam padi sawah irigasi berdasarkan citra satelit optis (Spatial planting area of irrigated rice based on optical satellite imagery). Jurnal Teknologi Pertanian Gorontalo (JTPG), 8(2), 63–69. https://doi.org/10.30869/jtpg.v8i2.1268

Kusdiane, S. D., Soetarto, E., & Sunito, S. (2018). Alih fungsi lahan dan perubahan masyarakat di kecamatan cimanuk, kabupaten pandeglang (Land conversion and community change in Cimanuk district, Pandeglang district). Journal Of Agribusiness Management, 63, 246–251.

Monsaputra, M. (2023). Analisis perubahan penggunaan lahan pertanian menjadi perumahan di kota Padang Panjang (Analysis of changes in agricultural land use to housing in Padang Panjang city). Tunas Agraria, 6(1), 1–11. https://doi.org/10.31292/jta.v6i1.200

Mujahid, L. M. A. (2017). Pengaruh dinamika perkembangan kawasan perkotaan terhadap daya dukung lahan pertanian kawasan MAMMINASATA Provinsi Sulawesi Selatan [Thesis]. Institut Teknologi Bandung.

Mulyani, A., Kuntjoro, D., Nursyamsi, D., & Agus, F. (2016). Konversi lahan sawah Indonesia sebagai ancaman terhadap ketahanan pangan. Jurnal Tanah Dan Iklim, 40(2), 121–133.

Munawir, M., Abdullah, N., & Ashari, A. F. (2023). Arahan dan strategi perlindungan lahan sawah untuk mendukung ketahanan pangan di kabupaten Maros, Sulawesi Selatan (Direction and strategies for protection of rice fields to support food security in Maros regency, South Sulawesi). Jurnal Ecosolum, 12(2), 145–162. https://doi.org/10.20956/ecosolum.v12i2.29948

Noerdin, M. A. (2016). Pengaruh kepemimpinan kepala sekolah dan kinerja mengajar guru terhadap produktivitas sekolah pada sekolah dasar negeri di kabupaten Bandung Barat [Thesis]. Universitas Pendidikan Indonesia.

Pravitasari, A. E., Suhada, A., Mulya, S. P., Rustiadi, E., Murtadho, A., Wulandari, S., & Widodo, C. E. (2019). Land use/cover changes and spatial distribution pattern of rice field decreasing trend in Serang Regency, Banten Province. IOP Conference Series: Earth and Environmental Science, 399(1), 012033. https://doi.org/10.1088/1755-1315/399/1/012033

Ruswandi, A., Rustiadi, E., & Mudikdjo, K. (2016). Dampak konversi lahan pertanian terhadap kesejahteraan petani dan perkembangan wilayah: Studi kasus di daerah Bandung Utara (The impact of agricultural land conversion on farmers' welfare and regional development: a case study in the North Bandung impact area). Jurnal Agro Ekonomi, 25(2), 207. https://doi.org/10.21082/jae.v25n2.2007.207-219

Sitorus, S. R. P., Mustamei, E., & Mulya, S. P. (2019). Keselarasan penggunaan lahan dengan pola ruang dan arahan pengembangan ruang terbuka hijau di kabupaten Bengkulu Selatan: Conformity of land use with spatial pattern and direction of green open space development in South Bengkulu regency. Jurnal Ilmu Tanah Dan Lingkungan, 21(1), 21–29. https://doi.org/10.29244/jitl.21.1.21-29

Suryawati, & Efendi, R. (2013). Proyeksi daya dukung lahan sawah di kabupaten maros selama 20 tahun kedepan. Balai Penelitian Tanaman Serealia.

Wahyunto, Murdiyati, S. R., & Ritung, S. (2004). Aplikasi penginderaan validasinya penyebaran jauh untuk teknologi dan uji deteksi lahan sawah dan penggunaan lahan/penutup lahan (Remote deployment validation sensing application for technology and test of detection of rice fields and land use/land cover). Agricultural Informatics, 13, 745–769.

Yanuar, M. A., Dewi, R. S., Handayani, W., & Yuwanti, S. (2023). Perkembangan Metropolitan Mamminasata: Tinjauan kesenjangan aspek sosial-ekonomi dan tata kelola wilayah. Region : Jurnal Pembangunan Wilayah Dan Perencanaan Partisipatif, 18(1), 194. https://doi.org/10.20961/region.v18i1.60006

Yasa, I. W., Manggala, F. P., Kusuma, A. P. H., Setyawan, F., & Adiwibowo, Y (2023). Harmonization of Protected Agricultural Land (LSD) Policy as an Implementation of Protection for Regional Food Security. Research Studies, 3(12), 2365-2372.

Zhao, T., Zhang, X., Gao, Y., Mi, J., Liu, W., Wang, J., ... & Liu, L. (2023). Assessing the accuracy and consistency of six fine-resolution global land cover products using a novel stratified random sampling validation dataset. Remote sensing, 15(9), 2285.