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## Analysis of Site Selection Criteria for Design of Paddy Research Facilities in Nganjuk Regency

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### ABSTRACT

Nganjuk Regency in East Java is one of the contributors to rice production in Indonesia, where agricultural land areas are more dominant than non-agricultural land areas. However, this sector faces major challenges including declining production due to internal and external factors such as climate change, limited infrastructure, and less than optimal use of modern agricultural technology. This study aims to analyze the criteria for selecting a location for designing a paddy research facility in Nganjuk Regency to support sustainable production increases. The methodology used includes analysis of regional potential based on statistical data on agricultural production, agro-climatic conditions, and topography. The survey results show that although rice production in this area reached 418.10 tons in 2023 and became one of the contributors to the rice harvest in East Java Province, intensive research and infrastructure development have not been carried out. The main criteria for selecting a location include proximity to water resources and ease of land access, suitability with regional spatial planning, and potential with other agricultural research centers. The design of this facility aims to be an integrated solution not only to increase the production and quality of high-quality seed varieties, but also to support scientific research and cutting-edge technology in the agricultural sector. By integrating technology-based approaches and local potential, this facility can become a model for sustainable agricultural development in Nganjuk Regency.

**Keywords:** *Nganjuk Regency, Rice Production, Paddy Research Facility, Site Analysis*

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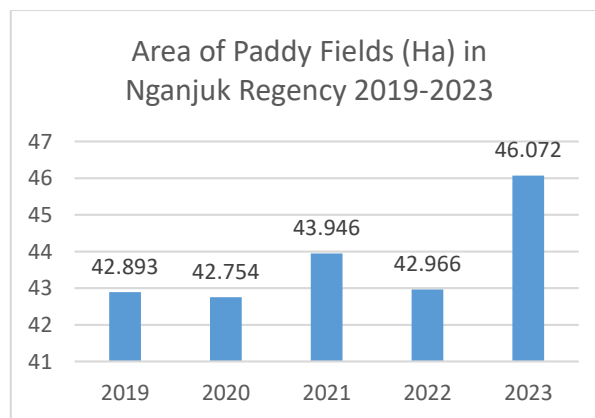
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### INTRODUCTION

Nganjuk Regency is located in East Java Province, Indonesia. It covers a total area of 1,224.33 km<sup>2</sup> and has a population of approximately 1.145 million people. The regency is administratively divided into 20 sub-districts. Geographically, Nganjuk is situated in a lowland area flanked by two mountain ranges, with agriculture serving as the leading sector contributing to regional income. The southern part of Nganjuk Regency features mountainous terrain and is known for producing plantation and horticultural commodities, while the central and northern regions, which are predominantly lowlands, serve as major centers for agricultural production (*Dinas Pertanian dan Ketahanan Pangan Provinsi Jawa Timur, 2023*).

In the Gross Regional Domestic Product (GRDP) sector, the year-on-year economic growth rate of Nganjuk Regency in 2023 reached 5.4 percent, representing an increase of 0.56 percentage points from 2022. This figure exceeds the economic growth rates of both East Java Province (4.90 percent) and the national level (5.04 percent) in the same year. The economic structure of Nganjuk Regency is primarily dominated by the Agriculture, Forestry, and Fisheries sector (27.31 percent), followed by Wholesale and Retail Trade (20.33 percent), and the Manufacturing Industry (15.96 percent) (*Badan Pusat Statistik Kabupaten Nganjuk*).

Based on data from the *Badan Pusat Statistik (BPS)* of Nganjuk Regency (2023), agricultural land in Nganjuk Regency remains dominant compared to non-agricultural land, comprising 46.072 hectares of rice fields and 46.004 hectares of non-rice agricultural fields. In contrast, non-agricultural land covers 30.357 hectares. Over the past five years (2019–2023), the total area of agricultural land in Nganjuk Regency has shown a significant upward trend, with an increase of 3.106 hectares in 2023 compared to 2022. However, fluctuations in agricultural land area occurred during the 2019–2022 period, primarily due to land conversion for industrial development. This shift aligns with the implementation of Regional Regulation (*Peraturan Daerah*) of Nganjuk Regency No. 6 of 2022, concerning the Nganjuk Regency Industrial Development Plan 2020–2040, under the Nganjuk Industrial Area Program (*Pemerintah Kabupaten Nganjuk, 2022*).

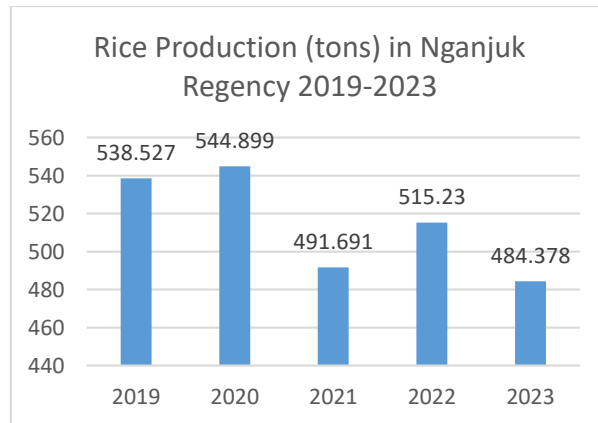


**Figure 1. Area of Paddy Fields (Ha) in Nganjuk Regency 2019-2023**

The Agriculture Service of Nganjuk Regency classifies food crops in the region to include rice, corn, soybeans, cassava, sweet potatoes, peanuts, and mung beans. In 2023, the highest production was achieved by rice, with a total of 484.378 tons, followed by corn at 199.812 tons. Meanwhile, other crops such as soybeans, cassava, sweet potatoes, peanuts, and mung beans produced less than 50 tons, due to their uneven distribution compared to rice and corn.

In the rice crop sub-sector, production has fluctuated from year to year, particularly over the past three years (2021–2023). An interview with the Head of the Production and Business Licensing Division of the Agriculture Service of Nganjuk Regency revealed that rice production trends in recent years have been influenced by both internal

and external factors. These include limited water supply due to dry seasons, fertilizer usage, pest infestations, and agroclimatic conditions. In 2021, rice production declined in the post-COVID-19 pandemic period due to a rat infestation that persisted until the end of 2022. In 2023, production declined again, this time due to the El Niño climate phenomenon, which caused a significant reduction in water supply.



**Figure 2. Rice Production (tons) in Nganjuk Regency 2019-2023**

In the Strategic Plan (*Renstra*) of the Agriculture and Food Security Service of East Java Province for the years 2025–2026, point 4.1 on the objectives and targets outlines a goal to increase the production of priority food and horticultural crops (*Dinas Pertanian dan Ketahanan Pangan Provinsi Jawa Timur, 2024*).

This objective aligns with Regional Regulation (*Peraturan Daerah*) of Nganjuk Regency No. 4 of 2022 concerning the Regional Medium-Term Development Plan (*Rencana Pembangunan Jangka Menengah Daerah*) of Nganjuk Regency for 2018–2023, specifically Mission 4, which aims to strengthen government commitment to developing a people-centered economy based on agriculture, local potential, and other productive sectors supported by appropriate technology. Strategy point 3 of the mission outlines the development of food crops, horticulture, plantations, and fisheries through the Nganjuk Farming Development Center (*Pemerintah Kabupaten Nganjuk, 2022*).

Identification of the problems found are: 1.) There is no centralized infrastructure to handle the problem of declining rice production in Nganjuk Regency. 2.) The decline in rice production caused by several factors, including the lack of availability of agricultural facilities that support increased production, the unavailability of superior variety seeds according to needs, farmer human resources that have not fully implemented modern agricultural technology, scientific studies and studies on the problem of declining rice production in Nganjuk Regency.

With the identification of the problems found, it is necessary to resolve architectural ideas, there are: 1.) Centralized infrastructure planning is needed that can meet the needs in the field of agricultural studies with a focus on increasing rice food crop production in Nganjuk Regency 2.) Improvements are needed by implementing modern

agricultural technology in agricultural infrastructure facilities aimed at supporting increased rice production, improving the quality of superior varieties, and conducting scientific studies and studies on the agricultural sector in Nganjuk Regency.

## **METHOD**

The design methodology employed is based on literature research and field research. Both methods are used to obtain preliminary and advanced data as part of a qualitative research approach. Additional activities include documenting project-related events that support the design of the paddy research facility by taking photographs, recording information, and compiling documentation of all activities conducted both in literature and in the field. The collected data serves as the foundation for the design process of the architectural object.

## **FINDING AND DISCUSSION**

### **RESEARCH RESULT**

#### **General Overview**

Site planning can be defined as a process involving the analysis and design of physical space to meet the functional and aesthetic needs of an area. According to De Chiara et al. (1989), site planning is an effort to create the design of a specific functional area through the analysis of both physical and non-physical characteristics of a city. This process includes several stages, ranging from goal formulation to detailed planning. A site has several key aspects, which are explained as follows:

- a. Physical aspects include land, water, light, air, minerals, animals, buildings, and infrastructure.
- b. Non-physical aspects refer to intangible elements, such as the behavior of users. Intangible components in this context relate to socio-cultural aspects consisting of human activities and place-rooted values, such as environmental regulations (Silva et al., 2022).

The site is a key element that determines the success of a design. Therefore, site selection is a crucial aspect. The following are criteria for selecting a site:

- a. Located in an area that supports paddy crop production activities.
- b. Sufficiently large to accommodate the needs of paddy production.
- c. Accessible to the administrative center.

**Table 1. Site Selection Criteria and Scoring Framework**

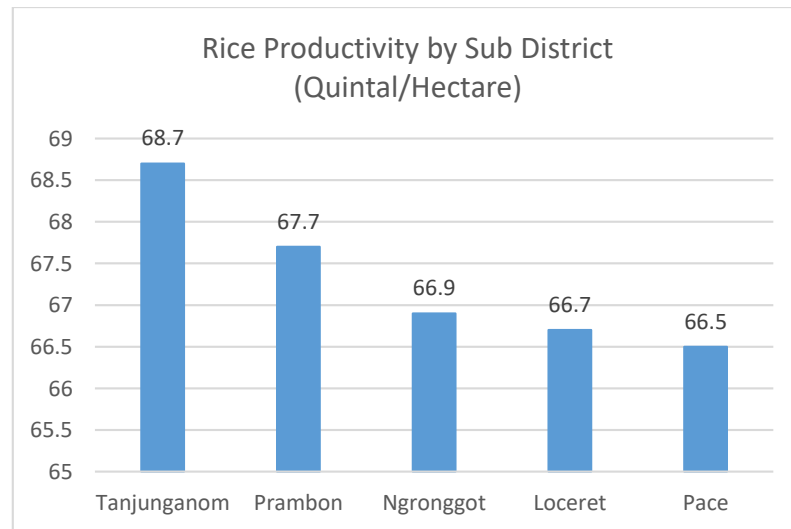
| No. | Criteria                 | Value Limit  |          |            |
|-----|--------------------------|--------------|----------|------------|
|     |                          | Score 1      | Score 2  | Score 3    |
| 1   | Land Suitability         | Inadequate   | Fair     | Adequate   |
| 2   | Accessibility            | Poor         | Fair     | Good       |
| 3   | Land Area                | Small        | Moderate | Large      |
| 4   | Surrounding Environment  | Unsupportive | Fair     | Supportive |
| 5   | Reach to Regional Center | Far          | Moderate | Near       |

Source : Personal Data

### Site Selection Analysis

When placing a building or group of buildings in a specific location, it is essential to analyze the current conditions of that location—identifying its strengths and weaknesses. Upon completion of this analysis, the designer can determine the necessary steps for proper building placement. In selecting site alternatives, planners must also adhere to applicable regulations to avoid conflicts with stakeholders (Rukayah, 2020).

According to rice productivity data by sub-district in Nganjuk Regency published by the *Badan Pusat Statistik (BPS)* of Nganjuk Regency, five sub-districts recorded productivity levels exceeding 65 quintals per hectare. Following an analysis based on the established site selection criteria—specifically, accessibility to the administrative center and alignment with the *Rencana Pembangunan Jangka Menengah Daerah (RPJMD)* and the *Rencana Detail Tata Ruang (RDTR)* of Nganjuk Regency as stipulated in the Regional Regulation (*Peraturan Daerah*) of Nganjuk Regency; Loceret Subdistrict was identified as the most suitable location (*Badan Pusat Statistik Kabupaten Nganjuk, 2023*).



**Figure 3. Rice Productivity by Sub District in Nganjuk Regency 2023**

### Site Alternative 1



Location : Jalan Raya Kediri-Nganjuk, Loceret, Nganjuk, East Java  
 Area : 2.8 hectares (28.000 m<sup>2</sup>)  
 Zone : Agriculture (P)  
 Sub Zone : Food Crops (P-1)  
 Boundaries : North; Residential Area, South; Village Road, East; Jalan Raya Kediri-Nganjuk, West; Candirejo Village Field

### Site Alternative 2



Location : Jalan Semeru, Loceret, Nganjuk, East Java  
 Area : 4.67 hectares (46.700 m<sup>2</sup>)  
 Zone : Agriculture (P)  
 Sub Zone : Food Crops (P-1)  
 Boundaries : North; Paddy Fields, South; Semeru Street, East; Merapi Street, West; Residential Area

**Table 2. Site Selection Analysis**

| No. | Criteria                 | Value Limit              |                         | Weight |
|-----|--------------------------|--------------------------|-------------------------|--------|
|     |                          | Alternative 1            | Alternative 2           |        |
| 1   | Land Suitability         | Within agriculture zone  | Within agriculture zone | 30%    |
| 2   | Accessibility            | Located on district road | Located on village road | 20%    |
| 3   | Land Area                | < 2.5 Ha                 | > 2.5 Ha                | 15%    |
| 4   | Surrounding Environment  | Agricultural zone        | Agricultural zone       | 20%    |
| 5   | Reach to Regional Center | < 5 km                   | < 5 km                  | 15%    |

Source : Personal Data

**Table 3. Site Scoring Result**

| No.                | Criteria                 | Value Limit   |               | Weight      |
|--------------------|--------------------------|---------------|---------------|-------------|
|                    |                          | Alternative 1 | Alternative 2 |             |
| 1                  | Land Suitability         | 3             | 3             | 30%         |
| 2                  | Accessibility            | 3             | 1             | 20%         |
| 3                  | Land Area                | 2             | 3             | 15%         |
| 4                  | Surrounding Environment  | 3             | 3             | 20%         |
| 5                  | Reach to Regional Center | 2             | 2             | 15%         |
| <b>Total Score</b> |                          | <b>13</b>     | <b>12</b>     | <b>100%</b> |
| <b>Sub Total</b>   |                          | <b>2.6</b>    | <b>2.4</b>    |             |

Source : Personal Data

Based on the evaluation, **Site Alternative 1** on **Jalan Raya Kediri–Nganjuk** is determined to be the most suitable site for the design of the paddy research facility.

## DISCUSSION

The selection of a site that aligns with the design and supports its intended function requires a comprehensive analysis of existing conditions to ensure outcomes that conform to established principles of site analysis (De Chiara, Panero, & Zelnik, 1989). The site selected for the planning of the Paddy Research Facility in Loceret Sub-district, Nganjuk Regency, satisfies the key criteria deemed beneficial to the project. Among these, the environmental context is the most critical, as it must support the functional needs of the facility. The chosen site demonstrates sufficient accessibility, alignment with local spatial planning (RPJMD and RDTR), and physical feasibility to support rice research and production activities.

This finding supports the idea that successful site selection in agricultural research facilities is strongly influenced by proximity to production areas and infrastructure support (Silva et al., 2022). It confirms the notion that integration between physical and non-physical aspects of a site enhances the effectiveness of agricultural development planning. However, the study is limited by the scope of data collection, which focuses only on spatial and environmental factors without in-depth analysis of socio-economic or legal constraints that may affect long-term project sustainability.

The implication of this study is the necessity of a multi-criteria site selection approach for future agricultural facilities, incorporating interdisciplinary methods including GIS analysis, stakeholder consultation, and climate adaptation frameworks. Future research may explore these aspects in more detail to develop a more holistic site assessment model for rural agricultural development projects.

## CONCLUSION

The selection of a site that aligns with the design and supports its intended function requires an analysis of existing conditions to ensure results that are consistent with site analysis theory. The chosen location for the planning of the Paddy Research Facility in

Loceret Subdistrict, Nganjuk Regency, meets the criteria that provide benefits to the project. The most crucial criterion is the surrounding environment, which must support the needs of the facility. The selected environment for this design must be capable of supporting all activities related to rice production processes, while also considering accessibility to the site and the physical feasibility of the environment.

## REFERENCES

- Rukayah, S. (2020). Analisis pemilihan tapak berdasarkan potensi kawasan dan peraturan tata ruang. *Jurnal Ilmiah Arsitektur dan Lingkungan Binaan*, 4(2), 121–130.
- Wahyuni, S. (2021). Penerapan teknologi pertanian modern dalam peningkatan produksi padi. *Jurnal Teknologi Pertanian*, 15(1), 12–21.
- Yusuf, A., & Handoko, M. (2023). Evaluasi perencanaan ruang wilayah pertanian berbasis potensi lokal. *Jurnal Tata Ruang Wilayah*, 6(3), 101–110.
- Rahayu, T. D., & Sutrisno, H. (2022). Strategi pemilihan tapak untuk fasilitas riset pertanian berbasis spasial. *Jurnal Arsitektur Nusantara*, 9(1), 33–44.
- Sumarno, D. (2020). Kajian agroklimat dan dampaknya terhadap produktivitas padi di Jawa Timur. *Agromet Indonesia*, 4(2), 65–73.
- Silva, R. A., de Oliveira, R. L., & Neto, R. D. (2022). Site analysis in urban planning: physical and socio-cultural dimensions. *Urban Planning Review*, 10(3), 45–58.
- De Chiara, J., Panero, J., & Zelnik, M. (1989). *Time-saver standards for housing and residential development* (2nd ed.). New York: McGraw-Hill.
- Andarwati, R. A., Roolisasi, A., & Murti, F. (2024). Kriteria Pemilihan Tapak Pada Perancangan Rumah Susun Sederhana Milik Di Medokan Ayu Surabaya. *Jurnal Arsitektur DASENG*, 13(3), 34–45.
- Badan Pusat Statistik Kabupaten Nganjuk. (2023). *Nganjuk dalam angka 2023*. Nganjuk: BPS Kabupaten Nganjuk.
- Dinas Pertanian dan Ketahanan Pangan Provinsi Jawa Timur. (2023). *Statistik pertanian Provinsi Jawa Timur tahun 2023*. Surabaya: DPKP Jatim.
- Dinas Pertanian dan Ketahanan Pangan Provinsi Jawa Timur. (2024). *Rencana strategis Dinas Pertanian dan Ketahanan Pangan Provinsi Jawa Timur 2025–2026*. Surabaya: DPKP Jatim.
- Pemerintah Kabupaten Nganjuk. (2022). *Peraturan Daerah Kabupaten Nganjuk Nomor 6 Tahun 2022 tentang Rencana Pengembangan Industri Kabupaten Nganjuk Tahun 2020–2040*. Nganjuk: Pemkab Nganjuk.
- Pemerintah Kabupaten Nganjuk. (2022). *Peraturan Daerah Kabupaten Nganjuk Nomor 4 Tahun 2022 tentang Rencana Pembangunan Jangka Menengah Daerah (RPJMD) Tahun 2018–2023*. Nganjuk: Pemkab Nganjuk.