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## Research Article

### Evaluation of Land Suitability for Clove (*Eugenia Aromantica L*) and Nutmeg (*Myristica Fragrans Houtt*) in Nusalaut Island Central Maluku Regency

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#### ABSTRACT

This research aimed to obtain land characters and qualities data and to determine land suitability for clove and nutmeg and their spatial distribution in Nusalaut Island, Central Maluku Regency. The results showed that the land suitability for clove are marginally suitable class (S3) with the coverage area is 1452.38 ha or 66.51%, and the limiting factors are water availability and nutrient retention (wa, nr) limiting factors and unsuitable class (N) of 731.52 ha or 33.50 %. While the land suitability for nutmeg are moderate suitable (S2) with root media and nutrient retention (rc, nr) limiting factors and the coverage area is 123.75 ha or 5.66%, S2nr of 409.93 ha or 18.77%, slope (S2eh) limiting factor with the coverage area is 918.7 ha or 42.1% and the unsuitable class (N) with the area of 731.52 ha or 33.50 %. The land suitability of the clove and nutmeg is located in the Other Used-Areas (APL) with the area of 2183.63 ha, while total land units in the study area is 2697 ha.

**Keywords:** Cloves, Land Evaluation, Land Suitability, Nutmeg, Nusalaut Island

#### Introduction

The increasing need for land and the scarcity of fertile and potential agricultural land, as well as competition for land use between agricultural and non-agricultural sectors, requires appropriate technology in an effort to optimize land use in a sustainable manner. In order to be able to optimally utilize land resources in appropriate and efficient manner, data and information regarding soil, climate and other physical characteristics of the environment, as well

as requirements for plant growth are needed (Ahmed et al., 2022).

Aspects of land that always have a direct influence on an agricultural development are very closely related, with external and internal conditions (Zeng et al., 2022). These conditions include topography, elevation, slope, drainage, water and soil characteristics (Hariyadi et al., 2019). These factors are the main basis for assessing land suitability whether it is suitable or not suitable for a land use plan (Syeda et al., 2022).

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The increase in population and ongoing development activities have resulted in a reduction in the area of productive agricultural land due to land conversion for various needs (Deribe, 2021). Efforts to increase agricultural production in an area require the integration of all productive factors such as natural resources in the form of land, water and climate (Mariuzza et al., 2022; Shekari et al., 2019).

Observing the survival of the farmers in Central Maluku Regency, especially the customary lands located on the Lease Islands, (Saparua, Haruku and Nusalaut), Seram and Ambon who control a plot of farming land for generations with the title *dusung*, a form of land use agroforestry (Addharu et al., 2022). The application of agroforestry plant composition aims to maintain the ecological function of forests and increase farmers' income (Haque et al., 2021). Agroforestry has ecological functions such as providing water sources, preventing erosion and landslides from trees on managed land (Ghodszad et al., 2022). However, with a management system that is still traditional without the adoption of modern agricultural technology, hamlet land has not been able to provide adequate economic support for the lives of farming families. Particularly on Nusalaut Island, the agroforestry plants that are commonly planted are cloves and nutmeg (Pickova et al., 2020).

Nusalaut Island has the form of a flat area with a smaller area compared to the shape of a hill area which has a larger area (Nendissa et al., 2021). The most dominant potential agricultural conditions are clove and nutmeg commodities, so these conditions need to be maintained to provide benefits and welfare for the community (Erasito et al., 2022).

Clove and nutmeg plants are specific to the people of Maluku and have been known since the colonial era, both the Portuguese, the British and the Dutch (Liu et al., 2022). It even became a struggle at that time to be sold overseas. Therefore, with the current government regulations to promote clove and nutmeg commodities again, these commodities need to be developed and the most important thing is to re-evaluate land aspects, especially land suitability (Le Moullac et al., 2018).

Nusalaut Island is part of the Lease Islands apart from Saparua and Haruku Islands which are one of the small islands in Maluku Province, Central Maluku Regency, where until now information regarding data on land aspects and other land resources is still very limited. As is the case with other small islands in Maluku Province, in order to provide data related to information on land resources, it is necessary to carry out a research activity (Zachariah & Leela, 2018).

This study aims to: (1). Obtain data and information about the characteristics and quality of land on Nusalaut Island. (2). Establish land suitability classes and their distribution in Nusalaut Island for the development of agricultural commodities, especially clove and nutmeg commodities. (3). Producing land suitability class maps for clove and nutmeg commodities (Wen et al., 2022).

## Methods

The tools and materials used in this research were Topographic Maps, Geological Maps, Administrative Maps, compasses, abney levels/clinometers, altimeters, soil drills, description cards of soil properties in the field, soil pH, GPS, digital cameras, meters, field knife, stationery and laptop with ArcGIS program (Basir et al., 2018). The research method used was a survey method with an analytical approach and the observation distance used was a free survey with a boring type of observation and a complete profile (Ji et al., 2020).

The research procedure was carried out in three stages, namely: the preparation stage, the field work stage, and the report preparation stage (Rahmi et al., 2021a).

In the preparatory phase, information gathering activities related to research activities are carried out, such as searching for maps, analyzing topographic maps, geological maps and land cover maps to obtain land unit maps that are used as field work maps, preparing field survey equipment in the form of tools and materials. surveys and administrative data for the smooth running of field survey activities, in the form of cover letters and others according to research needs. The Land Use Map was obtained based on the analysis of

Google Earth satellite imagery which was then digitized using ArcGIS 10.8 software.

Preparation of Land Unit Maps (PSL) through the process of superimposing thematic maps resulting from the analysis of geological maps, slope class maps, land cover and land use maps (LASAIBA, 2023).

The field work was carried out through detailed observation based on land units map 1:50,000 scale, and field observation and data collecting was conducted by using free survey observation distances (free survey) in all sample areas with boring and profiles observations.

### Result and Discussion

Nusalaut Island is located between 3° 42' 5.36" - 3° 39' 16.07" South Latitude and 128° 45' 10.17" - 128° 48' 22.5" East Longitude. Geographically, the North of Nusalaut Island is bordered by Saparua Island, the South is bordered by the Banda Sea, the East is by the Seram Sea and the West is bordered by Molana Island. Administratively, the Nusalaut Island region is one of 5 (five) sub-districts within the Central Maluku Regency, Maluku Province which has 7 (seven) countries with a total land area of 32.50 km<sup>2</sup> (Khikmah & Gamaliel, 2018)

The results of Arcgis measurements of Nusalaut Island have a total area of 2697 ha consisting of 2183.63 ha of other use areas (APL) and 513.38 ha of protected forest (HL).

The research area has a rainfall of 3,336 mm/year with an average air temperature of 26.60C, has a climate type A (Q= 10.04%), which is a very wet area with tropical rain forest vegetation (Laimeheriwa, S. 2015). climate is one of the determining factors for achieving optimal plant growth/production (Bhunia et al., 2023).

The topographic condition of Nusalaut Island has a complex regional shape and consists of several regional form units. With geological formations of uplifted coral reefs and tuff brickey lava with soil types found according to the national soil classification and equivalent are Regosol (Psamments), Gleisol (Aquepts), Litosol (Orthents), Cambisol (Udepts), and Latosol (Udepts) (Wang et al., 2019).

Based on the results of field observations and chemical data on soil fertility status obtained from laboratory analysis, then compared to land characteristics and plant growth requirements, the land suitability class for clove and nutmeg commodities were obtained (Rahmi et al., 2021b). as presented in Table 1 below:

Table 1. Results of land suitability assessment for clove and nutmeg commodities

No	Land Unit	Nutmeg			Clove		
		Class	Sub Class	Limiting Factor	Class	Sub Class	Limiting Factor
1	L011	N	-	-	N	-	-
2	L012	S2	S2rc, nr	Rooting media, Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
3	L013	S2	S2rc, nr	Rooting media, Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
4	L014	S2	S2rc, nr	Rooting media, Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
5	L021	N	-	-	N	-	-
6	L022	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
7	L023	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
8	L024	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
9	L025	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
10	L111	N	-	-	N	-	-
11	L113	S2	rc, nr	Rooting media, Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
12	L114	S2	rc, nr	Rooting media, Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
13	L121	N	-	-	N	-	-
14	L122	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
15	L123	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
16	L124	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
17	L125	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
18	L212	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
19	L213	S2	S2nr	Nutrient retention	S3	S3wa, nr	Water availability, nutrient retention
20	L214	S2	S2eh	Erosion hazard	S3	S3wa, nr	Water availability, nutrient retention
21	L222	S2	S2eh	Erosion hazard	S3	S3wa, nr	Water availability, nutrient retention
22	L223	S2	S2eh	Erosion hazard	S3	S3wa, nr	Water availability, nutrient retention
23	L224	S2	S2eh	Erosion hazard	S3	S3wa, nr	Water availability, nutrient retention
24	L225	S2	S2eh	Erosion hazard	S3	S3wa, nr	Water availability, nutrient retention
25	L323	N	-	-	N	-	-
26	L324	N	-	-	N	-	-
27	L325	N	-	-	N	-	-
28	L423	N	-	-	N	-	-
29	L424	N	-	-	N	-	-
30	L425	N	-	-	N	-	-

Based on the data in Table 1 above, the results of the assessment of land suitability class

for clove and nutmeg commodities are as follows: Assessment into class and sub-class of

clove plant land suitability is according to marginal (S3) area, 1452.38 ha or 66.51%, with a factor limiting water availability and nutrient

retention (wa, nr) and for class not suitable (N) an area of 731.52 ha or 33.50% (Jia et al., 2019).

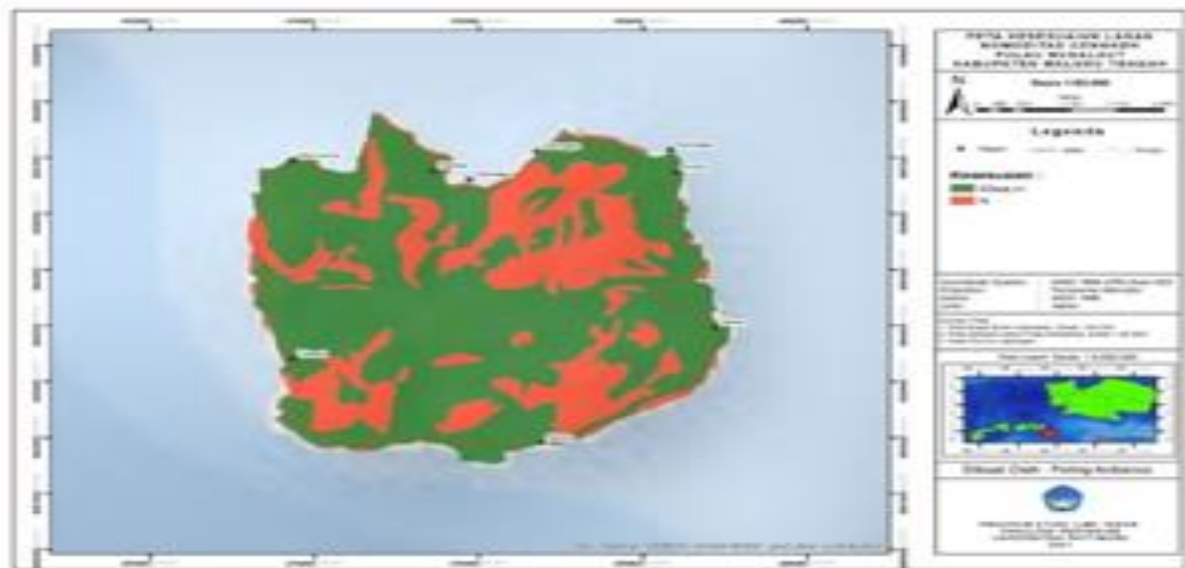


Figure 1. Clove Commodity Land Suitability Map

As for the land suitability class for nutmeg plants, it is quite suitable (S2) covering an area of 123.75 ha or 5.66% with limiting factors for root media and nutrient retention (rc, nr), S2nr covering an area of 409.93 ha or 18.77%, S2eh limiting factor for slopes covering an area of

918.7 ha or 42.1% and for class not appropriate (N). area of 731.52 ha or 33.50% (Gayathri et al., 2021).

The distribution can be seen on the map below:

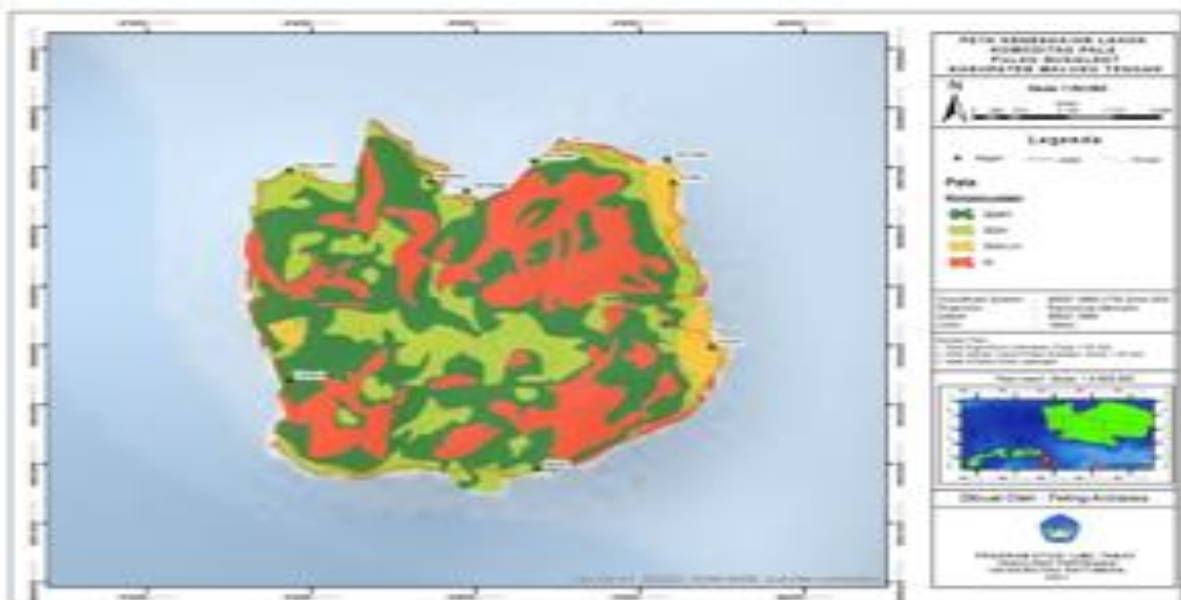


Figure 2. Land suitability map for the nutmeg commodity

The results of the assessment obtained are based on a comparison of the characteristics of

the land at the research location with the criteria for land use requirements used (Gruda, 2022).

## Conclusion

Based on the results of the research that has been described, the following conclusions can be drawn:

- 1) the characteristics of the land found are: good and rather poor drainage, texture consisting of coarse, medium to slightly fine, with very shallow to deep effective depths, slopes including flat to steep, erosion conditions occur as a result of human influence. Meanwhile, land quality The results found were: Soil reaction (pH) 5.9 – 7.5 slightly acidic to neutral, very low to moderate CEC (2.3 me/100g – 24.4 me/100g), very low to very high KB (22.6% - 100%), material content Organic ranges from very low to high (0.6% - 4.9%).
- 2) Based on the results of the land suitability class and sub-class assessment for clove commodities, the suitability class S3 and N was obtained with the suitability sub-class S3wa, nr with the limiting factors of water availability ( wa) and nutrient retention (nr). As for the nutmeg commodity, land suitability class values S2 and N were obtained with suitability sub-classes S2rc, nr, S2nr, and S2eh with the limiting factors found being rooting media (rc), nutrient retention (nr) and erosion hazard (eh).
- 3) The land suitability map for clove commodities according to the marginal (S3) area is 1452.38 ha or 66.51%, and for the unsuitable class (N) it is 731.52 ha or 33.50%. While the nutmeg commodity is quite suitable (S2) covering an area of 1,452.38 ha or 66.51%, and for the unsuitable class (N) covering an area of 731.52 ha or 33.50%..

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