IDENTIFICATION OF CULTIVATION MANAGEMENT AND ABIOTIC COMPONENTS IN PEOPLE'S NUTMEG PLANTATIONS IN SOUTH ACEH REGENCY

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Abstract

Nutmeg is the leading commodity of South Aceh plantations. Cultivation management and environmental factors have an impact for optimal production. The aim of this research is to identify management and abiotic components in people's nutmeg plantations in South Aceh Regency. The methods used are interviews and direct observation on nutmeg plantation using purposive sampling to collect data of abiotic components. Location was recommended by Department Agriculture of Aceh Selaan Regency. The research parameters consist of management aspects of nutmeg cultivation and abiotic components. The results show that the average nutmeg land area is ≤1 ha, the planting pattern is agroforestry, and the planting distance is 5 x 5 m. The nutmeg seeds used are sourced from farmers' own propagation through generative propagation. On average, 50.66% of farmers do not fertilize, while the rest fertilize using NPK fertilizer (42.68%) in a spread at a dose of 1 kg/plant, and around 6% use organic fertilizer. The altitude ranges from 2.6-27.2 meters above sea level, the light intensity is 207.6-832.6 cd, the temperature is between 27.8oC-30.9 oC, and the humidity is 61-80%. The pH value is between 6.8-7, soil water content 21.78-65.52%, Nitrogent 0.10-0.43%, Phosfor 0.48-19.35, and Kalium 0.26-2.75%. In conclusion, the management of nutmeg cultivation in South Aceh Regency is still not optimal, such as planting distance, fertilization and seeding. Meanwhile, from the abiotic environmental aspect, such as light, soil pH and humidity are suitable for the growth of nutmeg. Agroforestry effects of water content and NPK elements in nutmeg plantations.

Keywords : ***Agroforestry, Light, Nutmeg, Water Content***

1. INTRODUCTION

Nutmeg (Myristica fragrans Houtt) is an ancient plant endemic to Indonesia originating from the Banda Islands, Maluku Province (Wakim et al., 2014). In Indonesia, nutmeg seeds and mace are used as spices, medicines, and nutmeg pulp can be processed into various foods such as sweets, pickles, dodol, jam and nutmeg syrup. Each part of nutmeg has active substances as antimicrobial, antibacterial, antioxidant, antifunctional and anti-inflammatory (Wijayanti et al., 2018). Apart from that, the nutmeg plant has high economic value and is a source of foreign exchange for non-oil and gas exports (Lawalata et al., 2017). Aceh Province is one of the nutmeg producing centers with an area of 24,897 Ha (Directorate General of Plantations, 2019). The main producer of nutmeg in Aceh Province is South Aceh Regency. Based on Indonesian Plantation Statistics data, the area of nutmeg land in South Aceh in 2018 was 16,941 ha spread over several sub-districts, with a production value of 5,251 tons and a productivity of 821 kg Ha-1. In general, the management of nutmeg plantation businesses by the people of South Aceh is still simple and follows conventional patterns. Nutmeg plants are grown on hillsides or mountains with limited application of agricultural inputs. The entire series of cultivation activities, starting from land processing, maintenance, controlling pests and plant diseases, to land management, is still minimally carried out by local farmers. The cultivation management system is very important to achieve optimal nutmeg productivity. Not yet implementing appropriate cultivation technology can make nutmeg plants vulnerable to environmental stress, both biotic and abiotic. Abiotic factors in the environment where nutmeg plants grow influence the quality of nutmeg plant growth, this is

caused by abiotic factors such as soil fertility, light intensity, temperature and humidity, which are certain indicators that can determine the metabolic and physiological processes of a plant species (Jayadi, 2015). According to the World Agroforestry Center (2015), environmental conditions that are very suitable for growing nutmeg are at an altitude of 0-700 meters above sea level, temperature 25-160C, relative humidity 60-800C, with neutral soil acidity. Apart from that, the intensity of sunlight also affects the quality of the nutmeg essential oil produced.Providing adequate sunlight, optimal distance between trees, adjacent plant types, and the number of plants in contact have a significant impact on the photosynthesis process, including the production of secondary metabolites. The factors received by each plant depend greatly on the position of the canopy within the strata. The success of an efficient photosynthesis process will result in a high level of plant productivity. The research results of Ariandi et al. (2018) shows that the best sunlight intensity for nutmeg plants is moderate sunlight intensity (25-75%) with an essential yield of 198.2 ml/kg, the best average distance between trees is 3.5 m with The essential oil yield was 196.6 ml/kg. Based on the description above, the availability of information related to cultivation management and abiotic factors in the environment where nutmeg grows is very necessary as an effort to maintain the sustainability and increase the productivity of nutmeg as a leading commodity in South Aceh Regency, therefore this research aims to identify cultivation management and abiotic components in nutmeg plantations. the people of South Aceh Regency.

2. IMPLEMENTATION METHOD

Place and time

This research was carried out in five sub-districts in South Aceh Regency, namely Labuhan Haji District, West Labuhan Haji District, and Meukek District, Sawang District, and Pasie Raja District (Figure 1.), from September 2023 to October 2023. Tools and materials used used are GPS, Lux Meter, pH meter, ring sample, oven and analytical scales.

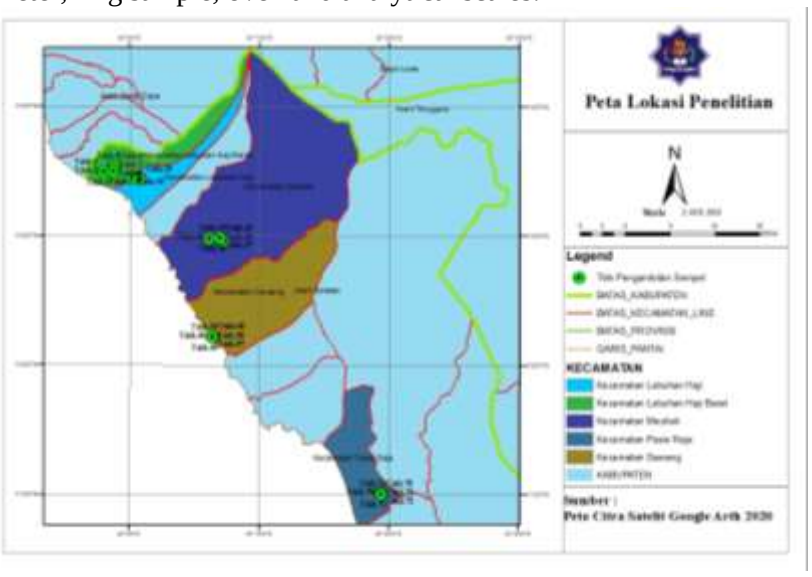

Figure 1. Map of sampling point locations

Method of collecting data

The research method used is the interview method and direct observation. For the interview method, respondent selection was carried out using a purposive sampling method where respondents were members of the nutmeg group based on recommendations from the South Aceh Agricultural Service. The criteria for respondents were based on the age of the nutmeg plant, land ownership status, and the area of land cultivated by farmers. Sampling for abiotic component data was also carried out using purposive sampling, namely location selection was based on the nutmeg

yield (TM) and was recommended by the South Aceh Agricultural Service. Three sampling locations were selected for each sub-district and each location was repeated 5 times.

Research Parameters

The research parameters consist of 1) management aspects of nutmeg cultivation (maintenance and post-harvest), and 20 abiotic components consisting of soil pH, air humidity, temperature, soil water content, light intensity and altitude.

3. RESULTS AND DISCUSSION

A. Nutmeg Cultivation Management

Land area

Based on the results of interviews with nutmeg farmers, information was obtained that the average area of nutmeg planting land managed by farmers was≤1 ha (66.66%), 2 ha (28%) and more than 3 ha (5.34%).Land area is an important production factor and if used optimally it can increase farming production which in itself will increase farming income. The land area owned by farmers is managed based on ability. The research results of Rako et al. (2023) stated that the greater the area of land used for nutmeg farming, the greater the number of trees owned so that it can increase the amount of production owned by farmers.

Planting Pattern

The planting pattern applied by nutmeg farmers in South Aceh is dominated by agroforestry planting patterns (90.66%) (Table 1), where farmers combine nutmeg plants with forest plants or other annual plants such as durian, jengkol, coffee, candlenuts, etc. . Agroforestry is a system of optimal and sustainable land use. This utilization is done by combining forestry plants and agricultural plants in the same land management unit by paying attention to the physical, social, economic and cultural environmental conditions of the communities that play a role in its management (Widayanti et al., 2020). The agroforestry pattern used by farmers is a suitable pattern for planting nutmeg because nutmeg plants require shade plants. Apart from that, agroforestry patterns can increase farmers' economic income (Anwar, 2012). Monoculture and polyculture planting patterns (mixed gardens or agroforestry) have advantages and disadvantages. According to Mahrizal (2013), the moculture pattern is more intensive in handling one commodity, so plant productivity is also higher compared to the polyculture planting pattern. However, the monoculture pattern is vulnerable to disease attacks, does not provide other additional results, and soil fertility tends to decline quickly. On the other hand, polyculture/agroforestry planting patterns provide opportunities for farmers to have diverse sources of income (Polakitan, 2004), farmers have the opportunity to become experts in handling various types of plants, the environment and biodiversity on plantation land is better maintained, and the production system is more sustainable.

Planting Distance

Table 1. Percentage of land area planted with nutmeg and planting patterns applied

	Labuhan Haji	West Labuhan Haji	Meukek	King's Patient	Sawang	Average
Nutmeg Planting Land Area						
≤1 ha	80%	66.7 %	73.3 %	53.3 %	60%	66.66
2 ha	20%	33.3 %	6.7 %	46.7 %	33.3 %	28
≥3 ha	-	-	20%	-	6.7 %	5.34
Planting pattern						
Monoculture	26.7 %	20%	-	-	-	9.34
Agroforestry	73.3 %	80%	100%	100%	100%	90.66
Planting Distance						
5 x 5 m	33.3 %	66.6 %	60%	40%	33.3 %	46.64

6 x 6 m	6.7 %	6.7 %	13.3 %	6.7 %	6.7 %	8.02
7 x 7 m	20%	-	13.3 %	-	13.3 %	9.32
8 x 8 m	20%	20%	6.7 %	20%	26.7 %	18.68
9 x 9 m	20%	6.7 %	6.7 %	33.3 %	20%	17.34

Judging from Table 1, jThe planting practices used by nutmeg farmers in South Aceh are still very diverse. On average as much46.64 %Nutmeg farmers use a planting distance of 5 x 5 m,weven though this planting distance does not follow the recommendations from the Ministry of Agriculture, namely 7 × 7 m or 8 × 8 m. The planting distances that farmers use are 5 × 5 m, 6 × 6 m, 7 × 7 m, 8 x 8, and 9 × 9 m (Table 1). This planting distance still really depends on the farmer's level of knowledge regarding how to cultivate nutmeg plants. Another thing that still needs attention is that even though some have been planted regularly, they have not yet filled the mature setting enough to get air and sunlight. Apart from that, mace flowers will come out from the ends of the twigs and branches so that during their growth efforts must be made so that the ends of the branches/twigs between one tree and another do not coincide with each other to receive sunlight (Wattimena, 2009, in Rehatta, 2016).

Seedlings

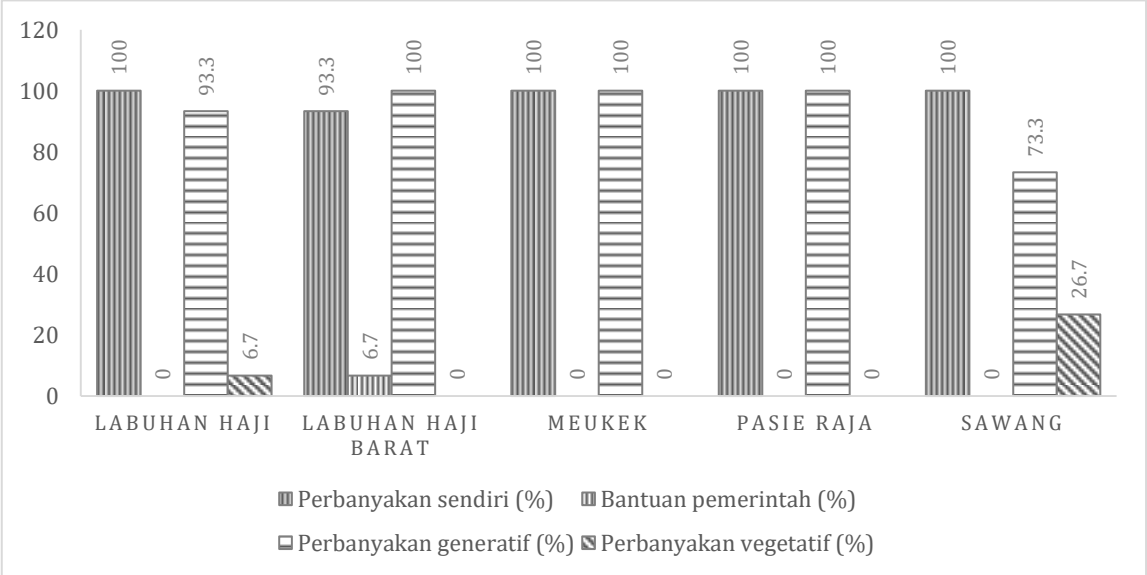

Figure 2.The nursery aspect includes the source of the seeds and the type of seeds used

Based on Figure 2, nutmeg seeds obtained from self-propagation were 100% in the four sub-districts except Labuhan Haji District at 93.3%, and seeds originating from government assistance were 6.7%. Meanwhile, for seed propagation, three sub-districts do it generatively, except Labuhan Haji Barat District 93.3% and Sawang District 73.3% which propagate seeds vegetatively (connection). This generative plant propagation is sometimes called the easiest propagation according to farmers. The use of seed sources originating from self-propagation is preferred by nutmeg farmers because the costs required to provide seeds are lower and the availability of generative propagation materials is also easy to obtain. Generally, the propagation of nutmeg plants is done using the generative method, using nutmeg seeds. Proper cultivation of nutmeg seeds is one of the keys to success in obtaining quality plant seeds. In generative propagation, the nutmeg seeds selected as seeds must meet physical, physiological and genetic quality requirements. Kartasapoetra (2003) in Patty et al. (2023), states that plants whose seeds are used as seeds must come from parent plants that are well maintained and have healthy growth, so that the fruit or seeds produced are of high quality. Apart from that, to obtain uniform seed growth,

the seeds need to be germinated first. Drazat (2007) states that nurseries for nutmeg plants are divided into 2, namely germination nurseries and maintenance nurseries. It was further explained that when nutmeg seeds are sown, the location must be protected from sunlight and wind, and must be watered frequently. The proper nutmeg seed seeding process produces quality nutmeg seeds.

Fertilization

Table 2. Fertilizing nutmeg plants in South Aceh Regency

	Labuhan Haji	West Labuhan Haji	Meukek	King's Patient	Sawang	Average
Number of fertilizer applications in a year						
Not fertilized	40%	60%	60%	40%	53.3 %	50.66
1 time	26.7 %	26.7 %	33.3 %	26.7 %	6.75	24.03
2 times	13.3 %	-	6.7 %	33.3 %	40%	18.66
≥ 3 times	20%	13.3 %	-	-	-	6.66
Type of fertilizer used						
Not fertilized	40%	60%	60%	40%	53.3 %	50.66
NPK	53.3 %	26.7 %	26.6 %	60%	46, 7 %	42.66
Compost / POC / Manure	6.7 %	13.3 %	13.4 %	-	-	6.68
How to apply fertilizer						
Without Fertilization	40%	60% %	60%	40%	53.3 %	50.66
Spread around	60%	40%	40%	53.3 %	20%	42.66
failed	-	-	-	6.7 %	26.7 %	6.68
Fertilizer Dosage						
Without fertilization	40%	60%	60%	40%	53.3 %	50.66
Don't use a dose	33.3 %	13.3 %	20%	-	-	13.32
½ kg/plant	26.7 %	-	20%	13.3 %	33.3 %	14.66
1 kg/plant	-	26.7 %	-	46.7 %	13.4 %	17.36
Use of organic fertilizer						
Without fertilization	40%	60%	60%	40%	53.3 %	50.66
Compost	13.3 %	13.3 %	6.7 %	13.3 %	13.3 %	11.98
Manure	-	13.3 %	6.7 %	13.3 %	-	6.66
Liquid organic fertilizer	6.7 %	-	6.6 %	-	-	2.66
Only inorganic fertilizer	20%	13.4 %	20%	33.4 %	33.4 %	24.04

In Table 2, around 50.66% of farmers do not fertilize, 24.03% of farmers fertilize at least once and the rest fertilize 2-3 times a year. Some of the reasons farmers do not fertilize are due to the increasing price of fertilizer and the implementation of agroforestry cultivation patterns so that the number of plants that must be fertilized also increases. According to Sutedjo (2002), fertilization is the provision or addition of materials/substances to plants or soil to provide sufficient food/nutrients in the soil which are not sufficient in it. In other words, fertilizer also determines the production results of the nutmeg plant. Because by providing good fertilizer to nutmeg plants, the nutrients needed by the plants will be sufficient. Improper fertilization can cause damage such as waste of fertilizer, not reaching the target so that it is inefficient in terms of levels and reduced quality (Katiandagho, 2019). The type of fertilizer used by nutmeg farmers in the five sub-districts is dominated by NPK compound fertilizer. The main nutrient elements that need to be added to plant fertilization include nitrogen, phosphorus, potassium and magnesium (Tarigan, 2018). The overall application method used is by spreading it around the plant with the fertilizer dose applied predominantly without dose, then 1/2kg and 1kg per plant. The level of effectiveness of nutrient absorption by plants depends on several factors, including the dose of fertilizer and the correct method of fertilizer application (Dhalimi, 2006).

Based on the research results, some farmers apply organic fertilizer such as compost, manure and liquid organic fertilizer. The use of organic fertilizers for farmers, both nutmeg farmers and other farmers, can minimize the purchase and use of inorganic/chemical fertilizers, can improve the physical, chemical and biological properties of soil on cultivated land (Salim, 2008). Organic fertilizer that can be applied besides compost and manure can be in the form of liquid organic fertilizer (POC). The use of POC has several advantages: it quickly absorbs into the soil and plants, is more practical to use, is safe to use and contains the nutrients that plants need (Afrillah et al., 2023).

B. Abiotic Factors

FactorAbiotic are external factors that influence plant growth and development. Abiotic environmental factors include light intensity, temperature, humidity, soil acidity, soil water content, and availability of nutrients in the soil.

Light intensity

Table 3. Data on altitude, light intensity, temperature and humidity on people's nutmeg plantations in five sub-districts in South Aceh Regency

Location	Height of Place (m above sea level)	Light Intensity (Cd)	Temperature (oC)	RH (%)
West Labuhan Haji District				
Kuta Trieng Village	6.6	788.2	30.2	62
Bate Meucanang Garden Village 1	8.4	207.6	28.7	72
Bate Meucanang Garden Village 2	15.8	497.7	29.4	68
Labuhan Haji District				
Manggis Harapan Kebun Village 1	3,2	708.1	29.5	61
Alue Pisang Village	11	680.2	29.5	65
Manggis Harapan Kebun Village 2	4	642.5	29.9	68
Meukek District				
Blang Kuala Kebun Village 1	12.8	619.8	29.4	72
Blang Kuala Kebun Village 2	2.8	628.5	29.8	76
Jamboe Papan Village	8.4	553.1	29.4	68
Sawang District				
Panton Village Garden Area 1	3.8	594.6	27.8	78
Panton Village Garden Area 2	9.6	550.3	27.9	77
Panton Village Garden Area 3	2.6	708.7	28	80
Pasie Raja District				
Lhoksalang Rayeuk Kebun Village 1	17	787.9	30.9	69
Lhoksalang Rayeuk Kebun Village 2	7.4	780.8	30.7	68
Lhoksalang Rayeuk Kebun Village 3	27.2	832.6	30.9	70

Sunlight is the main factor that influences plant growth and development through the process of photosynthesis. Apart from that, the intensity of sunlight also influences other weather factors such as temperature and humidity indirectly (Jayadi, 2015). Based on the measurement results in Table. 3, the daily light intensity at the research location ranges from 207.6 lux, the lowest in Bate Meucanang Kebun 1 Village in Labuhan Haji Barat District and the highest in Lhoksalang Rayeuk Kebun 3 Village in Pasie Raja District at 832.6 lux. This shows that

differences in light intensity in several research locations are influenced by cultivation patterns and shade plant vegetation in the agroforestry pattern implemented by nutmeg farmers. According to (Tuamely et al., 2023), sunlight plays an important role in plant physiological processes such as photosynthesis, respiration, growth and development, closing and opening of stomata, plant germination and green plant metabolism, so that sunlight determines the level of plant production. Green plants utilize sunlight through the process of photosynthesis. Lukitasari (2021) said that good lighting is important so that plant growth can increase and produce good fruit. Light regulation can be done by providing shade to protect plants from too much light or sunlight and heat, so that the light received by the nutmeg tree is good and can support its growth (Dhika, 2014).

Temperature

ResultsTemperature measurements obtained the highest average in Lhoksalang Rayeuk Village, namely 30.90C in Pasie Raja District and the lowest in Panton Luas Village, Sawang District, namely 27.80C (Table 3). The difference in temperature at the research location is influenced by the altitude of the research location. Referring to research by Goldsworthy & Fisher (1984) in Hafif et al. (2017) this temperature range is the standard temperature in tropical blood which is in the range of 250C to 300C. Based on land suitability criteria, the temperature range in several research locations shows that the land suitability class is very suitable (S1) where the best temperature for growth and production of nutmeg is around 25–300C (Djaenudin et al., 2011).

Humidity

Air humidity at the research location was found to range from 61% in Manggis Harapan village in Labuhan Haji District to 80% in Panton Luas Village, Sawang District (Table 3). The high percentage of daily humidity at the research location is because the canopies of the Bulian trees dominate quite tightly, so that the intensity of incoming sunlight is not too great. According to Rosman et al. (1989) in Suryadi (2017) humidity range of 60–80% is a very suitable land suitability criterion for nutmeg plants.

Table 4. Data on pH, soil water content and NPK elements in people's nutmeg plantations in sub-districts in South Aceh Regency

Location	pH	Soil Water Content (%)	N (%)	P (%)	K (%)
West Labuhan Haji District					
Kuta Trieng Village	6,8	42.98	0.24	3.30	0.39
Bate Meucanang Garden Village 1	7	45.16	0.24	0.60	0.36
Bate Meucanang Garden Village 2	7	42.7	0.10	1.65	0.38
Labuhan Haji District					
Manggis Harapan Kebun Village 1	7	34.32	0.13	0.95	0.50
Alue Pisang Village	7	57.3	0.19	18.8	0.71
Manggis Harapan Kebun Village 2	7	55.02	0.32	1.15	0.36
Meukek District					
Blang Kuala Kebun Village 1	7	33.56	0.17	4.70	0.40
Blang Kuala Kebun Village 2	7	38.12	0.43	14.0	2.75
Jamboe Papan Village	6,8	21.78	0.11	19.35	0.48
Sawang District					
Panton Village Garden Area 1	7	37.1	0.20	2.20	0.26
Panton Village Garden Area 2	7	43.94	0.23	2.35	0.40
Panton Village Garden Area 3	7	32.54	0.42	2.95	0.34
Pasie Raja District					
Lhoksalang Rayeuk Kebun Village 1	7	40.88	0.14	1.65	0.41
Lhoksalang Rayeuk Kebun Village 2	6,8	43.56	0.21	2.95	0.84

Location	pH	Soil Water Content (%)	N (%)	P (%)	K (%)
Lhoksalang Rayeuk Kebun Village 3	7	65.52	0.27	0.45	0.38

Based on Table 4, it is known that the highest pH is 7 in 12 locations, while the lowest pH is 6.8 in three locations. It is known that soil pH functions to determine the acid, wet and neutral levels of soil. The closer the soil pH is to neutral (Ph = 7), the more fertile the soil is and the easier it is for plants to absorb nutrients. According to Mudhar et al. (2018), soil pH for nutmeg plants ranges from 5.5 – 7.0. This means that nutmeg plants are suitable for growing in South Aceh Regency, including Labuhan Haji District, West Labuhan Haji District, Meukek District, Sawang District. According to Nazir et al. (2017); Novia and Fajriani, (2021), soil pH is a condition where there are bonds between elements or compounds in the soil, soil has several pH values consisting of acidic, neutral and alkaline. The neutral pH value is 7, in this situation many nutrients can dissolve in water so that they can affect the level of nutrient absorption by plants, whereas in acid soil (low pH <7), the soil is dominated by Al and Fe ions. In alkaline soil, the acidity value is >7 and the element P (phosphorus) will be mostly bound by Ca (calcium) and Mg (magnesium).

Soil Water Content

The highest soil water content was found in Lhoksalang Rayeuk Kebun 3 Village at 65.52% and the lowest was found in Jamboe Papan Village at 21.78% (Table 4). This shows that soil water content is related to temperature and humidity. The higher the temperature, the lower the soil water content and the lower the humidity, conversely, the lower the temperature, the higher the soil water content and the lower the humidity. The shade of trees in an agroforestry system for nutmeg plants affects soil water content which is also related to temperature and humidity. Apart from that, high solar radiation also affects soil water levels which influence the opening and closing of stomata on plants. According to Azmi (2019), the shade of shade tree vegetation will affect water content and soil temperature. The growth and development of a plant is greatly influenced by water content, because water content can affect soil humidity and temperature.

Soil N, P, K Content

Based on Table 4, it is known that the highest N content was found in Blang Kuala Kebun 2 Village at 0.43% and the lowest was found in Bate Meucanang Kebun 2 Village at 0.10%. The high N value is thought to be due to the agroforestry cultivation system and the large amount of litter produced and is also influenced by soil microbes in fixing nitrogen so that N becomes available. However, it is also important to know that N can decrease because many plants and soil microbes use it to carry out their life cycles, trees are cut down without reforestation, etc. According to Khalif et al. (2014), land with an agroforestry planting system has higher C-organic, total N and N content values compared to a monoculture system. The results of research by Yamani (2010) stated that in agrisilviculture areas the macro nutrient content of N and P in the soil under agroforestry plants and rambutan gardens was relatively high. Likewise with the availability of microbes and the ability of soil organic matter to fix nitrogen so that it can be available for main plants. Rahmah et al. (2014) stated that the loss of N from the soil was caused by use by plants or microorganisms. A decrease in the amount of carbon in the soil can be caused by harvesting wood/trees, burning plant remains, increased decomposition, less return of organic C, etc. Based on Table 4, it is known that the highest P content was found in Jamboe Papan Village at 19.35% and the lowest was found in Lhoksalang Rayeuk Kebun 3 Village at 0.45%. The high P content in Jamboe Papan Village is thought to be due to weathering of biomass by plants around the nutmeg plants and experiencing mineralization, and vice versa. The low P content in Lhoksalang Rayeuk Kebun 3 Village is thought to have experienced little weathering and little mineralization.

According to Handayanto et al. (2017), sources of available P nutrients can come from minerals containing P elements and organic materials through weathering of plant remains which

are one source of nutrients in the soil. The nutrient P will become available if it undergoes mineralization. High organic matter content and adequate mineralization speed will cause the release of sufficient P ions for plant growth.The highest K content was found in Blang Kuala Kebun 2 Village at 2.75% and the lowest was found in Panton Luas Kebun 1 Village at 0.26% (Table 4). It is suspected that the amount of the K nutrient is caused by the pH of the soil and parent material as well as during the photosynthesis process. According to Herawati (2015), the causes of high and low potassium in the soil are influenced by the parent material and also the soil pH. K ions are classified as easily mobile elements so they are easily lost from the soil through leaching, because K is not held firmly by the surface of soil colloids. The K property is easily lost from the soil causing low efficiency. Perkasa et al. (2017) stated that potassium is absorbed by plants in the form of K+ ions. One of the roles of K+ ions is to open and close the stomata. The accumulation of K+ ions around guard cells causes guard cell turgor to increase. As a result, the stomata open. When the stomata open, CO2 can enter. The entry of CO2 is needed as raw material for photosynthesis and the release of O2 as a result of photosynthesis.

4. CONCLUSION

The conclusions from this research include the following:

1. The average area is≤1 ha (66.66 % farmers), with pThe planting pattern applied is dominated by agroforestry planting patterns (90.66% of farmers), and the planting distance is 5 x 5 m (46.64 %farmer).
2. The nutmeg seeds used come from farmers' own propagation through generative propagation (from seeds)
3. Average50.66% of farmers do not fertilize, while the rest fertilize using NPK fertilizer (42.68%) in a spread at a dose of 1 kg/application, and around 6% use organic fertilizer.
4. The altitude ranges from 2.6-27.2 meters above sea level, the light intensity is 207.6-832.6 cd, the temperature is between 27.8oC-30.9 oC, and the humidity is 61-80%.
5. The pH value is between 6.8-7, soil water content ranges from 21.78-65.52%, N content ranges from 0.10-0.43%, P content ranges from 0.48-19.35, and K content ranges from 0.26-2.75%.

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