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ANALYSIS OF THE SUSTAINABILITY OF MAIN COMMODITIES OF NUTMEG IN SOUTH ACEH REGENCY (CASE STUDY OF SAMA DUA DISTRICT)

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Abstract

Nutmeg, which is native to Indonesia, is also a superior plantation crop in South Aceh District. As a superior crop that concerns the lives of many farmers, the sustainability of the nutmeg crop needs attention. Sustainability research conducted in Samadua District was conducted to determine the condition of the sustainability of nutmeg plants based on the economic, social, environmental and post-harvest cultivation dimensions. The results showed that in multi-dimensional, social, and environmental dimensions, the nutmeg plant was in a fairly sustainable condition. But the nutmeg crop is less sustainable in the economic dimension, post-harvest cultivation. Therefore, the development of nutmeg in South Aceh District, especially in Samadua District, needs to consider this condition of sustainability status.

Keywords**: *Sustainability, Nutmeg Plants, MDS Test***

1. INTRODUCTION

Islam teaches that every creature has received a guarantee of sustenance for his life (Abdullah bin Muhammad, 2005) in an amount that is not reduced or exceeded that which has been determined by Allah SWT (Hamim, 2003), and one source of abundant sustenance that has been prepared by Allah SWT is the agricultural sector (Magfhirah, 2015). Agriculture has provided food for 8 billion people in the world (Made for mids, 2022), with demand increasing 70% in 2009-2050 (Foley et al., 2011) and done by 874 million farmers in the world (FAO, 2021). The many human relationships with agriculture make agriculture interesting for discussion, including in scientific journals.

One of the agricultural sub-sectors that is also widely discussed is plantation which includes the commodity of nutmeg. Nutmeg (Myristica fragrans Houtt) is one of Indonesia's mainstay plantation commodities with a production of 43.97 thousand tonnes with an export volume of 20 thousand tonnes valued at US$111.68 million in 2018 (Hafif, 2021). While Aceh is one of the nutmeg centers with a production of 20.99% of the national production apart from Maluku, North Maluku, North Sulawesi and West Papua (Pusdatin 2020).

Aceh's nutmeg production reached 6,567 tons with a production center in South Aceh Regency with an area of 16,898 hectares, production of 5,317 tons or 80.97% of Aceh's production managed by 19,143 farmer families. This condition shows that nutmeg is a superior plantation commodity that supports the economy of the people of South Aceh Regency (Bappeda Aceh, 2018; Ulfah et al, 2020), so it needs to be managed in a sustainable manner, especially in Sama Dua District as one of the nutmeg production centers in South Aceh Regency with an area of 1,450 Ha, a production of 243 tons, and a productivity of 0.168 tons/ha below the productivity of South Aceh 0.315 tons/ha (BPS Aceh, 2022; BPS Aceh Selatan, 2022). Even though nutmeg is a superior commodity, this low productivity indicates something is wrong with the management of nutmeg in South Aceh District. One indicator of whether or not the management of agricultural commodities is the level of sustainability of these commodities (Nasution, et al, 2021).

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Sustainability is basically the concept of meeting human needs for the time being without compromising the needs of future generations (Dehen et al., 2013; Nasution et al., 2021). In addition Sustainability is also a normative idea about how the role of humans is in acting towards nature, being responsible for one another, and for future generations. (Baumgartner and Quass, 2010), and Sustainability in the agricultural sector is believed to be able to provide good and promising income for the wider community, especially for farmers (Karim et al., 2016). According to (Todaro, 2011) an area that wants to achieve sustainable development should start from the agricultural sector with superior commodities that have real growth, are environmentally sound, market-oriented, highly competitive, and integrated with other sectors. Nutmeg and its agribusiness derivatives are plantation commodities that have sustainable criteria, because apart from being a spice, confectionery and nutmeg essential oil, they have economic value that can improve the farmers' economy and regional development.

Knowing information on the sustainability status of nutmeg in South Aceh District, especially in Samadua District, is important, because this information becomes an existing standard for the condition of existing nutmeg, can become a basic reference for developing nutmeg, and minimizes failures and negative impacts of developing nutmeg. This is also related to South Aceh District, especially Samadua District as a center for nutmeg which involves the economy of farmers and the wider community.

2. RESEARCH METHOD

2.1 Time and Location

The research was carried out in August-December 2022 in Samadua District, South Aceh Regency. The choice of research location was based on the consideration that this area is a center for nutmeg production in South Aceh Regency.

2.2 Population and Sample

The population of this study were nutmeg plantation stakeholders consisting of farmers, village heads, entrepreneurs affiliated with nutmeg, totaling 28 people in 28 villages in Samadua District, South Aceh District. Sampling was carried out in clusters where 1 respondent for each village.

2.3 Data and Data Collection Techniques

The research was conducted descriptively using primary and secondary data. Primary data was obtained from respondents' answers to the issue of nutmeg sustainability in the economic, social, environmental, and cultivation and post-harvest dimensions through indicators that were measured with bad (score 1) to good (score 4) criteria following the RAPFISH concept and judgment knowledge from experts/ stakeholders. Primary data collection was carried out by observation, interviews and secondary data collection through literature and related agencies.

2.4 Research variable

The sustainability variables of nutmeg in this study are the economic, social, environmental, cultivation and post-harvest dimensions. Each dimension has attributes that refer to expert opinion as shown in Table 1.

Table 1 Research Dimensions and Attributes

Economic Dimension Attributes		Dimension AttributeSocial	
1	Income of nutmeg farmers	1	Farmers' compliance with local laws and customs
2	Price of nutmeg	2	Peasant social status
3	Market availability	3	Community social activities
4	The relationship between plantations and employment	4	Nutritional status of nutmeg farming families
5	Growth in other economic sectors due to the development of nutmeg plantations	5	Education of children of nutmeg farmers
6	Community motivation to plant nutmeg	6	Nutmeg farming organization
Dimension AttributeEnvironment		**Cultivation and Post-Harvest Dimensional Attributes**	
1	Conservation practice	1	Use of superior seeds
2	Maintain and protect rare animal species	2	Fertilization
3	Plant pest control practices	3	Plant care
4	Floods due to nutmeg plantations	4	Nutmeg Plant Conditions
5	Forest/land fires caused by nutmeg plantations	5	Post-harvest treatment
6	Critical land and environmental damage caused by nutmeg plantations	6	Garden weeding/cleaning
7	Encroachment on protected forest for nutmeg plantations	7	The government's concern for nutmeg farmers
8	Suitability of land used for nutmeg plantations		

2.5 Data Analysis Methods

Measuring and determining the status and sustainability index of the nutmeg plant was carried out by the Multi Dimensional Scaling (MDS) test using the Rap-Insus (Rapid Appraisal-Index Sustainability) technique modified from Rapfish (Pitcher and Preikshot, 2001; Kavanagh, 2007; Fauzi and Anna, 2005). The index scale and sustainability status are measured in the range of 0.00-25.00 bad (not sustainable); 25.01-50.00 less (less sustainable), 50.01-75.00 enough (quite sustainable) and 75.01-100.00 good (very sustainable) (Kavanagh and Pitcher, 2004), and each dimension of sustainability is visualized in the form of a kite diagram.

Furthermore, the evaluation of the effect of error on the process of estimating the ordinate value of the sustainability of the MDS analysis was carried out by means of a Monte Carlo analysis (Ramadan et al., 2015). The difference in index values between the results of the MDS and Monte Carlo analysis shows the level of confidence in the system being studied, the smaller the difference, the higher the level of trust or the smaller the error that occurs (Thamrin et al., 2007). The goodness of fit value indicated by S-stress and R^2 in the Monte Carlo analysis explains that the variables used represent the objects being compared, if the S-Stress value is <0.25 and R^2 is close to 1 or 100%, it indicates that the model being tested is good (Kavanagh and Pitcher, 2004).

3. RESULTS AND DISCUSSION

3.1 Description of Respondents

The respondents used in this study were nutmeg stakeholders in South Aceh District. Descriptionneeded to obtain information on the characteristics of the respondents as information on the conditions of the respondents. This information is needed to support research based on the

assumption that a person's actions in making decisions are strongly correlated with his personality traits, and underlies his behavior in various work situations, giving opinions and making decisions (Damihartini and Jahi, 2005). The description of the respondents in this study Table 2.

Table 2 Description of Research Respondents.

No	Age (Years)	Total (Org)	%	No	Education	Total (Org)	%
1	< 23	1	4	1	Under SLTP	3	11
2	24-30	7	25	2	high school	19	68
3	31-35	6	21	3	Diploma	4	14
4	36-40	5	18		S1	2	7
5	46-50	2	7		**Amount**	28	**100**
6	50-60	6	21	**No**	**Jobs other than Nutmeg Farmers**	**Total (Org)**	**%**
7	>60	1	4	1	Teacher	1	4
	Amount	**28**	**100**	2	Paramedic	7	25
No	**Gender**	**Number of People)**	**%**	3	civil servant	6	21
1	Man	18	64	4	Honorary Officer	5	18
2	Woman	10	36	5	Daily laborer	2	7
	Amount	**28**	**100**	6	Farmer	6	21
No	**Understand the Concept of Sustainability**	**Number of People)**	**%**	7	Seamstress	1	4
1	Yes, a little	18	64		**Amount**	28	**100**
2	Yes a lot	10	36	**No**	**Garden Area**	**Total (Org)**	**%**
	Amount	**28**	**100**	1	< 1 Ha	18	64
Source: Research Results (2022)				2	1 – 2 Ha	9	32
				3	>2 Ha	1	4
					Amount	28	**100**

Table 2 shows 71% of respondents aged 24-50 years, with an education level of 89% high school and above, 64% male, 79% of farmers have other professions, 36% understand the concept of sustainability well, and 96% have nutmeg plantations < 2 Ha. Respondents with a dominant age of 24-50 years are in the productive age range of 15-64 years. (Law No.13 of 2003), where a person's age is an indicator that can be used to measure productivity at work (Soekartawi, 2001), where increasing a person's age will reduce the physical and thinking abilities of humans (Isyanto, 2011). The level of education, which is generally high school and above, indicates that the respondent is competent in giving opinions on the questionnaires submitted, while a low level of education will make it difficult for someone to understand information and technological developments. (Damihartini and Jahi, 2005).

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Figure 1 Map of Location Points and Land Use Map of Samadua District, South Aceh District

3.2 Condition of Research Area

Samadua District, Aceh Selatan District is located on the southern side of the island of Sumatra and borders the Indonesian Ocean. (Fig. 1) Land use in this area is dominated by mixed gardens and secondary or logged-over dryland forests, and it is in these uses that nutmeg plantations are cultivated by farmers. As the southern coastal area of Sumatra Island, this area has rainfall of 1,500-2,000 mm/year, an altitude of 0-1,500 meters DPL, ultisol and inceptisol soil types, and slopes of 8-15%, 15-25%, and > 40%. (Bappeda Aceh, 2018). This type of land and climate is suitable for cultivating nutmeg.

3.3 Sustainability Index and Status

ordination technique The Rap-Insus using Multi Dimensional Scaling (MDS) assesses the index and sustainability status of the nutmeg crop. The results of the analysis of the index and status dimensions of the sustainability of nutmeg plants with the DMS test in Samadua District, South Aceh Regency, Table 3.

Table 3 Goodness of Fit Index Analysis and Sustainability Status of Nutmeg in Plants Samadua District, South Aceh Regency

Dimensions	Sustainability Index	Sustainability Status	Monte Carlo	Difference	S-Stress	R2
Multi Dimensional	51,013	Enough	50,073	0.940	0.232	0.962
Economy	45,873	Not enough	45,035	0.838	0.245	0.891
Social	54,330	Enough	53,419	0.911	0.235	0.981
Environment	58,238	Enough	57,307	0.931	0.202	0.912
Cultivation and post-harvest	44,973	Not enough	44,078	0.895	0.240	0.888

Source: Research Results (2022)

3.4 Multi-Dimensional Sustainability Status

In general, the multi-dimensional sustainability index and status values, the social and environmental dimensions show a fairly sustainable status. However, the economic dimension as

well as cultivation and post-harvest show less sustainable status. The difference between the MDS and Monte Carlo index values of all the dimensions tested is still low or <1, this indicates a high level of trust or small errors that occur from the system being tested (Ramadhan et al., 2015; Thamrin et al., 2007). In addition, the results of the S-Stress test are still below 0.25 and R^2 is close to 1 or 100%, these values indicate that the model being tested is good and the indicators used represent the nature of the object being compared (Kavanagh and Pitcher, 2004), is quite accurate and can be accounted for (Fauzi and Anna, 2005).

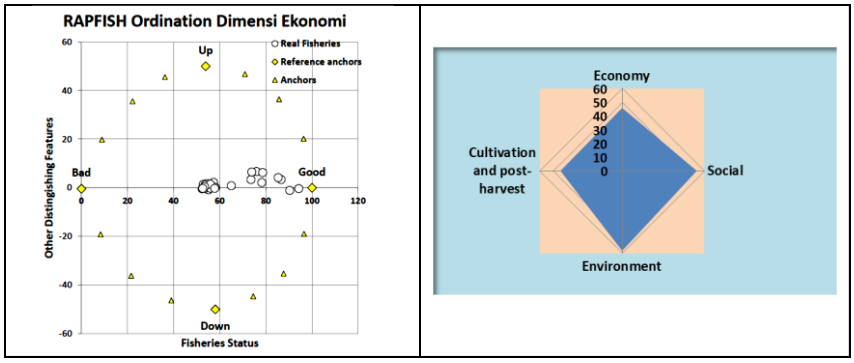

Figure 2 Status Index and Kite Diagrams Multi Dimensional Scaling Nutmeg Plant Sustainability in Samadua District, Regency South Aceh

Multi-dimensionally, the combination of economic, social, environmental and cultivation and post-harvest dimensions with 27 sustainability indicators shows an index value of 51.013 or quite sustainable status. This sustainability status is supported by the social dimension with an index of 54,330 and the environmental dimension with an index of 58,238, but the economic, cultivation and post-harvest indexes are less sustainable. This high sustainability status is visualized with the broader social and environmental index areas on the kite diagram (Fig. 1).

The status of sufficient sustainability of nutmeg plants in South Aceh Regency is in accordance with the factual conditions that occur that nutmeg is a superior plantation crop of South Aceh Regency (Zakiah et al., 2015; Bappeda Aceh, 2018). In addition, the South Aceh Regency government has made nutmeg a regional icon and will build a nutmeg tourist park (Dewi et al., 2022) which is a means of education for the community about nutmeg plants. In terms of land and climate, South Aceh District is dominated by ultisol soil types, altitude below 1,500 meters DPL, average temperature 27.2 0C, Oldeman climate types A, B, and C, A2, average rainfall 271, 99 mm/month and an average rainy day of 12 days/month (Bappeda Aceh, 2018), where the land and climate environment like this is desirable or suitable for nutmeg cultivation (Nasution and Handayani, 2019; Laimeheriwa et al., 2019). These favorable soil and climatic conditions make the environmental dimensions of nutmeg plantations in South Aceh District quite sustainable.

In terms of the social dimension, the nutmeg crop in South Aceh District has a fairly sustainable sustainability index, this is in accordance with the conditions of the nutmeg crop which are quite familiar among the people of South Aceh. Nutmeg, which is native to Indonesia, originates from the Banda and Maluku islands and entered South Aceh in 1870 via West Sumatra. The Aceh conflict that occurred resulted in farmers leaving their nutmeg plantations, and starting in 2005 after the peace conflict the farmers returned to take care of their nutmeg plants (Almunawir and Mursal (2019), but some of the plants have been damaged. The safety factor greatly influences the community in their activities and the government in carrying out development, while the unsafe

conditions that occur are a threat to the community in their activities and disrupt the course of development (Rani, 2012), including nutmeg cultivated by the community.

Research conducted Pranata and Agustiar (2022) which states that in South Aceh District nutmeg plants have good prospects for development, besides that the community has a good perception of nutmeg in terms of the level of public knowledge of the nutmeg plant, and nutmeg syrup, which is a nutmeg derivative product, provides economic added value to the nutmeg industry. Furthermore, in terms of agribusiness, nutmeg plantations in South Aceh Regency are able to provide an income of Rp. 36,163,000.-/Ha/year with an R/C Ratio of 2.87 (Bappeda Aceh, 2018), whereas Almunawir and Mursal (2019) noted that nutmeg farmers were able to earn Rp. 26-31 million/year. Where this value is still better than the income of nutmeg farmers in North Halmahera of Rp. 23,624,538, - with an R/C ratio of 1.8 (Hartati et al., 2020). Although based on the sustainability status of the economic dimension, the nutmeg crop in South Aceh District is in a less sustainable condition, as the cultivation and post-harvest conditions of the nutmeg crop are also unsustainable. Disruption of nutmeg cultivation and post-harvest in South Aceh District has occurred since the 1990s, when many nutmeg orchards were attacked by stem borer, stem powder, and fungus. (Almunawir and Mursal, 2019).

4. CONCLUSION

South Aceh Regency, especially Samadua District, is a center for the production of nutmeg plants, where nutmeg is a superior crop that revives the people's economy. The results of the Multi-Dimensional Scale (MDS) analysis carried out on nutmeg plants with economic, social, environmental, cultivation and post-harvest dimensions show that in multi-dimensional terms with 27 indicators the nutmeg plant is quite sustainable. From the social and environmental dimensions it is quite sustainable, but economically, cultivation and post-harvest are less sustainable. The condition of this dimension of sustainability is closely related to the nutmeg crop and the pattern of management carried out on the nutmeg crop such as favorable soil and climatic conditions, nutmeg that has been known by the community for a long time, and a trading system that affects farmers' income.

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