



Cultivation System and Marketing Chain of Nutmeg in East Seram District, Maluku Province, Indonesia

Esther Kembauw¹, Asri Subkhan Mahulette^{2*}, Rein Estefanus Senewe³, Anna Yuliana Wattimena⁴, Agustinus Kastanya⁵, Anton A. Lailossa⁶, Armin Ishak Wokanubun⁷, Rufaidah Samal⁸

¹ Agribusiness Study Program, Faculty of Agriculture, Pattimura University, Ambon, Indonesia

^{2,4} Agrotechnology Study Program, Faculty of Agriculture, Pattimura University, Ambon, Indonesia

³ Research Center for Holtikultura and Estate Crops, Research Organization for Agriculture and Food, National Research and Innovation Agency, , Indonesia

⁵ Postgraduate Forest Management Study Program, Pattimura University, Ambon, Indonesia

^{6,7,8} Regional Development Planning Agency (Bappeda) Maluku Province, Indonesia

¹ekembauw@yahoo.co.id, ²mahulette_07@yahoo.co.id, ³reinsenewe@pertanian.go.id, ⁴annawattimena@yahoo.com,

⁵aguskastanya@yahoo.com, ⁶anton_lailossa@yahoo.com, ⁷arwokanubun@yahoo.co.id, ⁸ufie.rufaidah@gmail.com



***Corresponding Author**
mahulette_07@yahoo.co.id

Article History:

Submitted: Jan 18, 2023

Accepted: Jan 25, 2023

Published: Jan 26, 2023

Keywords:

Village, nutmeg, marketing, spices, Maluku

Brilliance: Research of

Artificial Intelligence is licensed under a Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0).

ABSTRACT

Nutmeg is one of the leading plantation commodities in East Seram Regency, Maluku Province, Indonesia. The nutmeg cultivation system in East Seram Regency is still conventional with an inefficient marketing system. The research aims to obtain data and information on the cultivation system and marketing chain of nutmeg in East Seram District. The research was carried out during the nutmeg harvest season in 2021 using a survey method. The research was conducted in three sub-districts in East Seram District, namely Tutuk Tolu Sub-District (Danama Village), Kian Darat Sub-District (Kileser and Rumfakar Villages), and Bula Barat Sub-District (Dreamland Hills Village). The research was carried out through structured interviews with nutmeg farmers and collectors. Respondents of nutmeg farmers were selected by purposive sampling as many as 20 nutmeg farmers so that there were a total of 80 respondents. The results of the study were informed that the nutmeg cultivation system in East Seram Regency was still conventional, especially in Tutuk Tolu and Kian Darat Districts. Nutmeg farmers have a weak bargaining position in the marketing system because prices are fully determined by collectors.

INTRODUCTION

Indonesia is the world's largest producer of nutmeg, supplying around 66-77% of the world market (Hafif, 2021; Malda, Rusdi, & Sugianto, 2022). Based on data from the Directorate General of Plantation (2022), the total area of nutmeg in Indonesia in 2021 was recorded at 241,549 ha with a total production of 40 549 tons with an average production development from 2015 of 4.04%. The average development of nutmeg productivity is still relatively low at 0.96%. The destinations for Indonesian nutmeg exports are America, the Netherlands, Germany, India, China, Vietnam and Japan. Based on export data for 2021, the largest export value of nutmeg from Indonesia is to China (3 784.40 tons), followed by Vietnam (3 740.05 tons), India (2 257.46 tons), Netherlands (1 536.73 tons), America (1 198.89 tons), Germany (1 053.98 tonnes), and Japan (628.87 tonnes).

Most of the nutmeg plants in Indonesia are cultivated in the form of smallholder plantations (88.93%) (Ditjenbun, 2022). Based on data from the Directorate General of Plantation (2022), there are five centers of nutmeg plantations in Indonesia, namely Maluku, North Maluku, Aceh, North Sulawesi and West Papua. Maluku Province as one of the centers of nutmeg plantations in Indonesia has an area of 35 210 ha with nutmeg production reaching 5 310 tons or around 11 percent of Indonesia's total nutmeg production. Cultivation of nutmeg in Maluku is generally cultivated in an agroforestry model in the form of hamlets (Wattimena & Makaruku, 2022). Nutmeg in the hamlet system is generally cultivated together with other plantation commodities such as cloves and coconut and other fruit commodities (Hariyadi, Mahulette, Yahya, & Wachjar, 2019; Paley, Kembauw, & Tuhumury, 2021; Rehatta, Leatemala, & Laimeheriwa, 2021).

East Seram District is one of the centers of nutmeg plantations in Maluku. Based on BPS-Central Maluku data (2022), the total area of nutmeg plantations in East Seram District reaches 8 963 ha with a total production of 866 tonnes. Nutmeg cultivation in East Seram Regency is cultivated in the hamlet system with relatively low productivity of 0.09 tons/ha. The low productivity of nutmeg is generally caused by many factors, including the conventional cultivation system (Kembauw, Mahulette, Wattimena, & Senewe, 2021; Wattimena & Makaruku, 2022). The low knowledge of farmers in the nutmeg cultivation system is one of the reasons for the low productivity of nutmeg (Kembauw, Anindita, Mustadjab, & Muhaimin, 2015; Ridjayanti, Pattiasina, & Kembauw, 2020). In addition, the marketing chain which is not in favor of farmers and the presence of price fluctuations also affect the level of welfare of nutmeg farmers in East



Seram Regency (Kembauw et al., 2021).

Based on these problems, the research was carried out to obtain data and information on the cultivation system and marketing chain of nutmeg in East Seram District. These data and information are useful in the context of improving the cultivation system and marketing chain of nutmeg in East Seram Regency in the future.

METHOD

The study used survey methods and direct observation of the cultivation and marketing system of nutmeg in East Seram Regency, Maluku Province, Indonesia. The research was carried out during the 2021 nutmeg harvest season in three sub-districts in East Seram Regency, namely Tutuk Tolu Sub-district (Danama Village), Kian Darat District (Kileser and Rumfakar Villages), and Bula Barat District (Dreamland Hills Village). The selected location is part of a nutmeg producing center in East Seram Regency. The research was conducted through structured interviews with nutmeg farmers and buyers of nutmeg products at the village level. Respondents of nutmeg farmers were selected by purposive sampling, in which 20 nutmeg farmers were selected in each village so that there were a total of 80 respondents. Collectors of nutmeg at the village level were selected from each village to find out the purchase price and marketing chain of nutmeg at the research location.

The data collected is in the form of primary data and secondary data. Primary data collection was carried out through structured interviews (questionnaires) to nutmeg farmers and yield collectors at the village level. Secondary data obtained from written sources at relevant agencies and relevant literature. Primary data collected included: land characteristics (area and land ownership), cultivation systems (seed sources, cropping patterns, spacing, fertilization, and control of plant-disturbing organisms), post-harvest (harvest frequency, harvest time, harvesting method, drying in the sun), marketing (place and time of marketing, as well as marketing chain). Secondary data taken in the form of climate data, area and production of nutmeg. The research data were tabulated and then analyzed descriptively qualitatively.

RESULTS AND DISCUSSION

Conditions of Research Locations

The East Seram Regency is located between 129° 50' 00" - 131° 50' 00" East Longitude and 02° 50' 00" - 04° 50' 00" South Latitude. Geographically, the position of East Seram Regency has boundaries: North with the Seram Sea; South by the Banda Sea; West with Central Maluku Regency; East by Arafuru Sea. Based on its geographical location, East Seram Regency is located between the Seram Sea, Banda Sea, Central Maluku Regency and the Arafuru Sea. East Seram Regency is a maritime district, which consists of 15 Districts separated by 50 islands.

The climate in East Seram Regency is a tropical marine climate and a seasonal climate, because the location of the Seram area is surrounded by a wide sea. Therefore the climate in East Seram Regency is strongly influenced by the ocean and takes place simultaneously with the seasonal climate. According to a report from the Meteorology and Geophysics Agency for East Seram Regency, in 2018 East Seram Regency had an average annual temperature of around 29.04 °C, air humidity 87.75%, monthly rainfall 198.97 mm, average number of rainy days 14.75 days, irradiation sun 54.75% (Table 1).

Table 1
Climate by Month in East Seram District

Month	Average		Rainfall Amount (mm)	Number of rainy days (day)	Sun irradiation (%)
	Temperature (°C)	Humidity (%)			
January	29.3	87	75.0	12	45
February	29.3	85	123.6	15	59
March	29.3	86	200.8	12	66
April	29.2	89	311.6	19	55
May	29.8	94	185.3	12	50
June	28.1	92	265.0	19	39
July	28.1	91	219.0	20	48
August	28.1	89	91.4	12	57
September	28.2	91	181.6	16	49
October	29.7	84	319.9	12	71
November	29.7	83	107.9	10	58
December	29.7	82	306.5	18	60
Average	29.04	87.75	198.97	14.75	54.75

Source: Geophysics and Meteorology Agency, 2018

Based on the agro-climatic data, East Seram Regency is suitable for the development of nutmeg as one of the leading commodities. According to Priyanka et al. (2022), the development of the nutmeg commodity in an area is largely determined by several factors including the suitability of the agro-climate and the type of variety cultivated. Based on BPS-Central Maluku data (2022), nutmeg plants in Eastern Seram Regency are spread over 15 sub-districts



with a total area of 8,963 ha with a total production of 866 tonnes (Table 2). The total area and production of nutmeg plants at research sites in Tutuk Tolu District was recorded at 444 ha with a production of 30 tons, Kian Darat District 426 ha with a production of 41 tons, and Bula Barat District 510 ha with a production of 7 tons. Nutmeg is generally cultivated in the hamlet system with a mixed cropping pattern. These plants are cultivated in the community plantation system, where the management is still carried out conventionally. According to Wattimena and Makaruku (2022), conventional management of nutmeg in the hamlet system in Maluku is one of the causes of low crop productivity. Nutmeg plants in the smallholder plantation system in the study locations are on average cultivated by farming families who live in the plantation sector (Naisin & Fun, 2022; Sukarman, 2021; Waromi, 2021). Based on data from the East Seram Regency Agriculture Service, in 2018 the number of heads of nutmeg farming families in East Seram Regency was recorded at 6,717 farmers. The number of heads of families of nutmeg farmers at the study sites in Kian Darat subdistrict was recorded as 342 farmers, 278 farmers in Tutuk Tolu District, and 180 farmers in West Bula District (Table 3).

Tabel 2
Area and Production of Nutmeg Plants in East Seram District

No.	Sub District	Area Size (ha)	Production (ton)
1.	Pulau Gorom	1 275	294
2.	Wakate	796	128
3.	Teor	365	30
4.	Gorom Timur	473	60
5.	Pulau Panjang	6	0,47
6.	Seram Timur	485	40
7.	Tutuk Tolu	443	30
8.	Kilmury	1 064	47
9.	Lian Vitu	391	22
10.	Kian Darat	426	41
11.	Werinama	1 158	126
12.	Siwalalat	745	25
13.	Bula	313	6
14.	Bula Barat	510	7
15.	Teluk Waru	513	10
Total		8 963	866

Source: BPS Maluku, 2018

Tabel 3
Number of Nutmeg Commodity Farmers in East Seram District

No.	Sub District	Number of Farmers in Commodities Nutmeg (HH)
1.	Seram Timur	288
2.	Kian Darat	342
3.	Siritaun Wida Timur	289
4.	Werinama	784
5.	Bula	149
6.	Teluk Waru	100
7.	Pulau Gorom	1238
8.	Tutuk Tolu	278
9.	Wakate	710
10.	Kilmury	698
11.	Siwalawat	690
12.	Bula Barat	180
13.	Gorom Timur	728
14.	Pulau Panjang	50
15.	Teor	193
Total		6 717

Source : Department of Agriculture East Seram District, 2018

2. Land Characteristics

Geographical conditions and land use in East Seram Regency can provide an overview of the potential for the development of nutmeg commodities at the research location. According to Rehatta et al. (2021), geographical conditions and suitable land use will provide optimal nutmeg productivity. According to geographical conditions and

land use, the people in Danama Village, Tutuk Tolu District, Kileser Village, and Rumfakar Village, Kian Darat District, generally cultivate nutmeg in a smallholder plantation system with a mixed cropping pattern. The area of land owned varies between 1-2 ha and the land ownership is owned by the family. Nutmeg is cultivated by farmers in flat areas (<200 masl) with a canopy cover of up to 80%. Nutmeg plants are generally harvested three times a year, namely in March-April, July-August and November-December. The big harvest occurs in March-April. The cultivated land is generally in the form of mixed gardens with other vegetation as protective vegetation for nutmeg plants. Other vegetation found included: coconuts and walnuts (top strata), and cloves (middle strata).

Land use in the Tutuk Tolu sub-district and Kian Darat sub-district is different from that in Dreamland Hills Village, West Bula District. West Bula Subdistrict, which is adjacent to New Jakarta District, is a lowland area that has been developed by transmigration communities from Java Island, while the hilly and mountainous areas are cultivated with plantation crops, especially nutmeg. The nutmeg plantation area in the village of Dreamland Hills is on average at an elevation of 200 - 245 meters above sea level. The nutmeg plantation area is managed in a community plantation system with a number of plants ranging from 40,000 - 60,000 trees. The expansion of the nutmeg planting area in Dreamland Hills village is increasing every year, where up to 2021 there are recorded 273 farmers managing nutmeg plantations with an average plantation ownership of around 200 nutmeg trees per farmer.

3. Nutmeg Cultivation System

The community's nutmeg cultivation system in Danama Village, Tutuk Tolu District, Kileser Village, and Rumfakar Village, Kian Darat District, is generally simple and does not use optimal production facilities. The use of labor in the nutmeg farming system in the two sub-districts is still limited to labor from within the family. The use of production facilities (fertilizers, pesticides) was never used, the tools used were only hoes, machetes and crowbars. Garden sanitation has not been carried out properly and correctly, on average it is done 1 x 3 months, so there are still attacks by Plant Pest Organisms (OPT) such as stem borers, stem cankers, wet fruit rot, dry fruit rot and young fruit cracking. The use of spacing is also irregular and quite dense, which is about 5 m x 5 m. In the framework of rejuvenation, nutmeg plant nurseries have been carried out to replace plants that are old or that are attacked by pests and diseases. Farmers' knowledge regarding the ratio of male to female trees is also still very limited so that it becomes a problem in nutmeg cultivation in both sub-districts.

Based on survey results in two sub-districts in the East Seram Regency, namely in the Tutuk Tolu and Kian Darat sub-districts, it can be seen that nutmeg farmers in the two sub-districts have not yet applied optimal nutmeg cultivation technology. In addition, the types of nutmeg planted are also quite diverse. According to Wattimena and Makaruku (2022), the application of nutmeg cultivation that is not optimal will have an impact on the low productivity and income of farmers. Furthermore, according to Phitaloka (2022) and Malda et al. (2022), the selection of nutmeg plant varieties in a cultivation system also determines the level of crop productivity. Based on the results of the study, farmers in Kian Darat district generally cultivate Liat nutmeg more than Banda nutmeg (Andan) and Papuan nutmeg (Onin), whereas in Tutuk Tolo district, Banda nutmeg (Andan) and Papuan nutmeg (Onin) are more dominant. cultivated compared with nutmeg Clay.

The nutmeg cultivation system in Tutuk Tolu sub-district and Kian Darat sub-district is different from that developed in Dreamland Hills village, West Bula sub-district. Nutmeg cultivation system Nutmeg plants in the village of Dreamland Hills, West Bula sub-district have implemented a better cultivation system. On average, the nutmeg plants cultivated in Dreamland Hills Village, West Bula District, are new nutmeg plants with an average age of 5-10 years. The dominant variety of nutmeg cultivated is the Banda variety. Apart from the Banda variety of nutmeg, other varieties of nutmeg being cultivated are Liat nutmeg (Deletion of Release from the Ministry of Agriculture in progress) and Onin nutmeg.



Fig. 1 (a) Banda Nutmeg (*Myristica fragrans* HOUTT), (b) Papua Nutmeg (*Myristica argantea*) dan (c) Liat Nutmeg (*Myristica* sp)

The technological innovations of nutmeg cultivation implemented by 273 nutmeg farmers in the village of Dreamland Hills have been optimally applied which include the use of superior nutmeg seeds, regular spacing, use of organic fertilizers at planting time, and optimal harvest time, which is 9 months old. The type of shade tree planted is walnut which until now has started to produce. The technique of continuous propagation of nutmeg and grafting has also been applied to overcome the problem of the ratio of male to female nutmeg.



4. Harvest and Post Harvest

The superior products of nutmeg by farmers in the Tutuk Tolu and Kian Darat sub-districts are seeds and mace. Nutmeg is harvested in an average of less than 9 months, while the ideal harvest is 9 months when the fruit picked must appear cracked and the skin of the fruit is brown. The reason farmers do not harvest optimally is to avoid theft of nutmeg yields. The harvest time that is not optimal has an impact on the low quality of nutmeg yields. According to Jannah et al. (2022) and Mulyani et al. (2021), maturity of nutmeg is one of the determinants of the quality of nutmeg produced. Nutmeg in the study area was harvested by poking it with a hook. The fruit is collected under the tree and then split open to extract the seeds and mace. The flesh of the fruit is generally thrown away without being utilized to become processed nutmeg products. Harvested nutmeg seeds are generally dried in the sun for 5-7 days, while mace is dried in the sun for 2-3 days. Drying is carried out on a dirt floor with plastic mats and mats.

During the rainy season, the seeds are dried by smoking, which takes about 3 days, while mace is not smoked but only air dried. The dried seeds and mace are packed in plastic sacks to be sold to collectors at the village level. The average length of time for beans to be stored until they are sold to collectors is <3 months depending on family needs. Prior to selling, the seed shells are separated from the seeds and sorted before being sold to collectors at the village level.

5. Marketing of Nutmeg Crops

The survey of collecting traders was taken from collecting traders located in Danama village, Tutuk Tolu sub-district and Rumpfakar village, Kian Darat sub-district. A team survey was conducted to see the process of handling nutmeg and mace from farmers and their marketing chain. According to Jannah et al. (2022), good post-harvest handling will improve the quality of nutmeg. Furthermore, according to Sukarman (2021), the marketing chain will greatly determine the amount of income that nutmeg farmers receive. Based on the survey results, information was obtained those nutmeg farmers in Danama village, Tutuk Tolu sub-district and Kileser and Rumpfakar villages, Kian Darat sub-district, on average sold their harvest of nutmeg and mace seeds to collectors located in their respective villages. Seeds and mace are generally sold in dry form, but some farmers also sell them in raw form when they are finished harvesting.

Sales in raw form are mostly carried out by farmers due to urgent family needs. Collectors in the village buy nutmeg and mace seeds and then sell them to collectors who have larger warehouses in Kilga/Kilwouw village, Kian Darat district. The average collectors in the village and the collectors who own the big warehouse are villagers of Arab descent. Seeds and mace purchased from collectors in the village were then purchased by exporters of Chinese descent, namely Tong Yang, to be brought to Surabaya via Yos Sudarso sea port, Ambon.

Unlike the farmers in Tutuk Tolu sub-district and Kian Darat sub-district, nutmeg farmers in Dreamland Hills village, Bula sub-district, on average, do not sell their crops to collectors in the local village, but sell directly to collectors who own large warehouses in Kilga/Kilwouw villages, sub-districts Later Kian Darat was purchased by an exporter of Chinese descent, namely Tong Yang, to be brought to Surabaya

Purchase of dried nutmeg by collectors is generally in the form of dry beans which have been sorted based on quality class. Purchases are also made of dry nutmeg in its original form (mixture) or raw nutmeg. The purchase price of dried nutmeg seeds with the ABCD (super) quality class at the collector level in the village, namely: Banda nutmeg Rp. 40,000-45,000/kg, Papuan nutmeg IDR 35,000/kg, Clay nutmeg IDR. 35,000/kg. Meanwhile, the purchase price of wrinkled/rimple nutmeg and BWP is the same, where Banda nutmeg is Rp. 35,000/kg, Papuan nutmeg Rp. 25,000/kg, and clay nutmeg Rp. 25,000/kg. The purchase of dried nutmeg seeds by collectors in the village is also carried out for dry seeds which are still wrapped in the shell, where the price for dry nutmeg which is still wrapped in the shell is the same for all types of nutmeg, namely Rp. 30,000/kg. In addition to selling nutmeg, farmers also get a greater return on the sale of mace. The selling price of nutmeg (mace) at the level of village collectors at the survey locations was: Banda nutmeg Rp. 235,000/kg, Papuan nutmeg Rp. 220,000/kg, and clay nutmeg Rp. 220,000/kg.

Farmers' nutmeg seeds by collecting traders then go through an inspection and sorting process. Nutmeg seeds from farmers that are still not optimally dry are then dried again by collectors using the sun. The biggest obstacle experienced by nutmeg farmers in the survey locations was the absence of a seed dryer and mace, especially during the rainy season. This condition causes the seeds and mace that are sold to collectors during the rainy season to be of low quality which is indicated by the appearance of fungus. The assistance of seed dryers and mace was felt to be very much needed by the farmers at the survey locations to improve the quality of their crops. Apart from that, harvests that have not reached 9 months of age are also one of the causes of the low quality of the seeds and mace that farmers sell to collectors. The thing most felt by the nutmeg farmers in the study locations was that the price was fully determined by the collecting traders so that the nutmeg farmers had a weak bargaining position.

CONCLUSION

Nutmeg plants in East Seram Regency are generally cultivated in a smallholder plantation system with a mixed cropping pattern. The application of the average cultivation system is still conventional, especially in the Tutuk Tolu sub-district and Kian Darat sub-district. The types of nutmeg that are cultivated are various, such as Banda Nutmeg (*Myristica fragrans* Houtt), Papuan Nutmeg (*Myristica argantea*) and Clay Nutmeg (*Myristica* sp). In the marketing



system, nutmeg farmers have a weak bargaining position because prices are fully determined by collectors. On average, the farmers' nutmeg yields are sold to collectors at the village level, which are then purchased by local exporters and then sold to large exporters located in Surabaya.

ACKNOWLEDGMENT (optional)

Thanks are conveyed to the Regional Development Planning Agency (Bappeda) of Maluku Province for funding this research. Thanks also go to the Government of East Seram Regency for their support so that this research can be completed.

REFERENCES

- BPS. (2022). *Maluku Tengah Regency in Figures 2022*. (BPS-Statistics of Maluku Tengah Regency, Ed.). Maluku: BPS-Statistics of Maluku Tengah Regency.
- Ditjenbun. (2022). *Statistical of National Leading Estate Crops Commodity 2019-2021*. (D. Gartina & R. L. L. Sukriya, Eds.). Jakarta (ID): Secretariate of Directorate General of Estate Crops, Ministry of Agriculture.
- Hafif, B. (2021). The strategy to maintain Indonesia as a main nutmeg producer in the world. *The Strategy to Maintain Indonesia as a Main Nutmeg Producer in the World*, 40(1), 58–70. <https://doi.org/10.21082/jp3.v40n1.2021.p58-70>
- Hariyadi, Mahulette, A. S., Yahya, S., & Wachjar, A. (2019). Measuring the potential of biomass, carbon storage, and carbon sink of forest cloves. In *The 1st International Seminar on Natural Resources and Environmental Management (ISenREM 2019)* (pp. 1–9). Bogor: IOP Conf. Series: Earth and Environmental Science 399 (2019) 012063. <https://doi.org/10.1088/1755-1315/399/1/012063>
- Jannah, A., Anggarawati, S., Sunardi, S., & Turuy, I. (2022). Performance of nutmeg (*Myristica fragrans*) post harvest and marketing in East Halmahera Regency. *Advances in Biological Sciences Research*, 17, 74–78.
- Kembauw, E., Anindita, R., Mustadjab, M. M., & Muhaimin, A. W. (2015). Agricultural sector investment impact of economy Province Maluku. *Journal of Economics and Sustainable Development*, 6(6), 31–37.
- Kembauw, E., Mahulette, A. S., Wattimena, A. Y., & Senewe, E. (2021). Analisis Rantai Pasok Komoditas Cengkih Hutan di Maluku. *Journal of Agricultural Socio-Economics (JASE)*, 2(2), 68–74. <https://doi.org/10.33474/jase.v2i2.13083>
- Malda, S. A., Rusdi, M., & Sugianto, S. (2022). The distribution density of nutmeg plant using visual on screen classification. *Jurnal Ilmiah Mahasiswa Pertanian*, 7(3), 477–480.
- Mulyani, R., Atmajaya, D., & Umar, F. (2021). Klasifikasi kematangan buah pala menggunakan metode K Nearest Neighbor (k-NN) dengan memanfaatkan teknologi citra digital. *Buletin Sistem Informasi Dan Teknologi Islam*, 2(3), 140–146.
- Naisin, M. A., & Asyik, M. F. (2022). Strategi Pemberdayaan Petani Pala Dalam Meningkatkan Kualitas Tanaman Pala Oleh Dinas Perkebunan Di Kabupaten Fakfak. *Jurnal Terapan Pemerintahan Minangkabau*, 2(1), 73–91. <https://doi.org/10.33701/jtpm.v2i1.2439>
- Paley, W. B., Kembauw, E., & Tuhumury, M. T. F. (2021). Strategi pengembangan agroindustri kelapa ud wootay coconut di Kecamatan Teon Nila Serua Kabupaten Maluku Tengah. *AGRILAN: Jurnal Agribisnis Kepulauan Pendahuluan*, 9(1), 21–31.
- Phitaloka, A. (2022). Penerapan K-Means clustering pada efektifitas perkebunan tanaman pala. *Teknologipintar*, 2(6), 1–15.
- Priyanka, S. C., Miniraj, N., Lincydavis, P., & Vikram, H. C. (2022). Genotype-environment interactions in nutmeg (*Myristica fragrans* Houtt.). *Biological Forum – An International Journal*, 14(4), 394–403.
- Rehata, H., Leatemala, J. A., & Laimeheriwa, S. (2021). The impact of climate variables on nutmeg (*Myristica fragrans* HOUTT) production in Saparua Island. In *IOP Conf. Series: Earth and Environmental Science 797 (2021) 012025* (pp. 0–8). <https://doi.org/10.1088/1755-1315/797/1/012025>
- Ridjayanti, R., Pattiasina, M., & Kembauw, E. (2020). Analisis produksi dan pendapatan petani pala (*Myristica fragrans*) di negeri Hila, Kecamatan Leihitu, Kabupaten Maluku Tengah. *AGRILAN: Jurnal Agribisnis Kepulauan*, 8(3), 244–260.
- Sukarman, L. D. (2021). Australasian agribusiness perspectives. *Australasian Agribusiness Perspectives*, 24, 221–235.
- Waromi, J. (2021). Keberlanjutan Agroindustri Pala Fakfak : A Systematic Literature Review (SLR). *Median*, 13(1), 32–43.
- Wattimena, A. Y., & Makaruku, M. H. (2022). Characteristics cultivation of nutmeg (*Myristica fragran houtt*) dusing pattern in Leihitu and West Leihitu sub-District of Maluku Tengah district. *Agrinimal Jurnal Ilmu Ternak Dan Tanaman*, 10(164), 38–44. <https://doi.org/10.30598/ajitt.2022.10.1.38>