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The Patterns of Agroforestry and Its Contribution to the Community Income

Emi Roslinda*, Fransiska Wiwi Prisila, Yeni Mariani

Faculty of Forestry, Universitas Tanjungpura, Pontianak, Indonesia
* Corresponding Author. E-mail address: eroslinda71@gmail.com

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ABSTRACT

Farmers choose an agroforestry pattern to fulfill various objectives, including obtaining their income. The diversity of fruit plants chosen by the Nanga Menterap village community as a component of the agroforestry system has the potential to contribute significantly as a source of community income. This research aimed to describe the agroforestry patterns and calculate the contribution of agroforestry patterns to the income of the people of Nanga Menterap Village, West Kalimantan Province, Indonesia. The research used a survey method by census. Data collection techniques included observation, questionnaires, and interviews with the Nanga Menterap Village community with agroforestry land. The agroforestry pattern in Nanga Menterap Village can be classified into two types: the agrisilvicultural and the agrosilvopastural. Farmers in Nanga Menterap Village apply a random mixture planting form in which crops and trees are planted irregularly. The agroforestry plants combined in the forestry component include durian (*Durio zibethinus*), aren (*Arenga pinnata*), tengkawang (*Shorea stenoptera*), mango (*Mangifera indica*), jackfruit (*Artocarpus heterophyllus*), and petai (*Parkia speciosa*). The agricultural component includes chili (*Capsicum annuum*), cocoa (*Theobroma cacao*), corn (*Zea mays*), coconut (*Cocos nucifera*), coffee (*Coffea robusta*), banana (*Musa* sp.), cassava (*Manihot esculenta*), long bean (*Vigna unguiculata*), ginger (*Zingiber officinale*), turmeric (*Curcuma longa* Linn. syn. *Curcuma domestica* Val.), eggplant (*Solanum melongena*), and tomatoes (*Solanum lycopersicum*), while the types of livestock such as pigs, domestic chickens, cows, and goats. The contribution of agroforestry to community income in Nanga Menterap Village is 82.74%. From these contributions, the agroforestry system is the right choice for the community and government to manage land. The governments should be able to facilitate and determine specific and targeted activity programs to improve the cultivation capabilities and welfare of farmers.

1. Introduction

Agroforestry is a land management system offered to overcome problems arising from land use change and food problems. Agroforestry generally includes mixed gardens, tree-lined fields, loading, fallow land (grub), yard gardens, and broader community plantation forests (Ardini et al. 2020). Agroforestry management is related to optimizing land use to meet the needs of farmers and in the context of preserving natural resources. Income is an economic indicator for agroforestry

farmers because the amount of income will determine the fulfillment of their needs. Income from agroforestry depends on several factors, including farming techniques, climatic conditions, land area and quality, working time, and product market prices (Naibaho et al. 2015). Agroforestry also has advantages, covering the soil surface as part of soil and water conservation (Hani and Geraldine 2018).

There are several advantages of agroforestry compared to other land use systems, including productivity, diversity, independence, and stability (Suryani and Dariah 2012). To determine the success of an agroforestry system, the patterns of selecting the composition of plant species and the management method are essential (Puspasari et al. 2017). Agroforestry patterns are supporting future forestry development (Novasari et al. 2023), best practices for sustainable management both from the perspective of the economy and the environment (Markum et al. 2021), increase in land productivity (Nandini et al. 2023), and sustain the livelihoods of the people (Sulistiyowati et al. 2023).

The agroforestry pattern is a type that has excellent prospects and is very promising for farmers to achieve their goals (Idris et al. 2019). Based on the structure or constituent components, agroforestry systems are divided into several types, namely agrisilvicultural, silvopastoral, agrosilvopastural, apicultural, aquaforestry, agroaquaforestry, and agroaquasilvicultural (Chundawat and Gautam 1993; Harun et al. 2022; King and Chandler 1978; Lal 1995; Siarudin et al. 2021; Stephen 1979). Meanwhile, the categorization of agroforestry patterns based on timing (temporal) is in the form of coincident, concomitant, overlapping, sequential (separate), and interpolated (Dembrow et al. 2015; Huxley 1999; Nair 1993; Rachman 2021). Vergara (1982) classified agroforestry cropping patterns into the following forms: trees along borders, alternate rows, alley cropping, blocking system, and random mixture.

Kogoya et al. (2018) found three forms of agroforestry planting, including border, random planting, and community forest forms, which were planted with regular spacing between coconut plants in Warembungan Village, Pineleng District, North Sulawesi Province. Agroforestry can be planted with various types of plants. Naibaho et al. (2015) reported that the products produced in Sosor Dolok Village show 13 types of fruit, three types of tubers, and two types of livestock. The agroforestry pattern in Sosor Dolok Village, Harian District, can be classified into agrisilvicultural and agrosilvopastural. In the Sesaot Forest of Lombok, Indonesia, the agroforestry patterns include candlenut dominant, mahagoni dominant, mixed agroforestry, and simple agroforestry (Markum et al. 2021). Meanwhile, Wulandari et al. (2014) found three agroforestry patterns practiced by most communities in their cultivated land in Wan Abdul Rahman Forest Park, Lampung. They said the patterns were coffee-cacao-wooden plants and fruits, rubber-coffee-wooden plants and fruit, and rubber-cacao-wooden plants and fruit. The reasons for farmers choosing crop types and cropping patterns are income (100%), productivity (88.89%), production speed (82.22%), and ease of harvesting (37.78%) (Novasari et al. 2023).

A farmer's income measures the income received from their farming business, which is the difference between income and production costs. Processing land with an agroforestry system will provide income for farmers. Research results show that agroforestry makes a significant contribution to farmers' income. Olivi et al. (2015) reported that 88.31% of people's income in Sukoharjo District, Lampung Province, comes from agroforestry. Zega et al. (2013) also reported that 63% of people's income in Sitaratoit and Lobulayan Village, South Tapanuli District, comes from land managed using the agroforestry system. However, agroforestry systems contribute less

than other incomes, showing that agroforestry systems contribute 26% to farmer household income (Hasannudin et al. 2022).

In Nanga Menterap Village, the community has implemented an agroforestry system where farmers manage their land by combining agricultural and forestry crops. The application of the agroforestry pattern system in Nanga Menterap Village was still traditional, emphasizing the use of fruit plants and determining the association between the planted plants. Plants planted by farmers have a random mixture pattern where crops and trees are not planted regularly. Choosing crop types and cropping patterns has a specific purpose. Previous studies have reported that the agroforestry systems can increase the community income. Therefore, it is essential to study the agroforestry patterns related to the farmer's income. This research aimed to describe the agroforestry patterns and calculate the contribution of agroforestry patterns to the income of the people of Nanga Menterap Village.

2. Materials and Methods

2.1. Location and Time

The research was conducted in Nanga Menterap Village (110.941016 E and 0.049637 S), Sekadau Hulu Sub-District, Sekadau Regency, West Kalimantan Province, Indonesia (**Fig. 1**). The location has a slope of 0%, and it is located at an altitude of 110 masl.

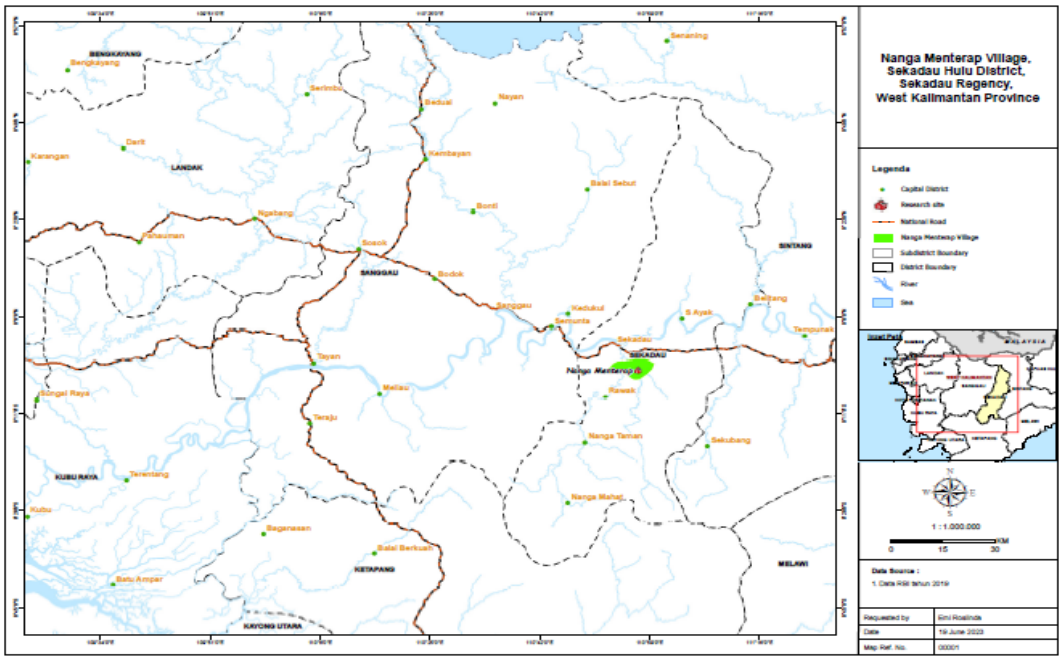

Fig. 1. Site location in Nanga Menterap Village, West Kalimantan Province.

2.2. Data Collection

Data collection was conducted from July to August 2022. The research used the census method on farmers who own agroforestry land. Sixty-two (62) farmer families who cultivated their land using an agroforestry system were chosen as respondents. A survey was carried out as the data collection method to obtain information directly in the field. Questionnaires are several written questions used to receive information from respondents. Interviews were conducted face-to-face with the people as research respondents.

The data collected in this study are primary data and secondary data. The primary data needed is in the form of the characteristics of the respondents (education, occupation, socio-economic), types and number of plants planted in agroforestry practices, and the cost components in agroforestry. Meanwhile, the secondary data collected was in the form of literature studies sourced from books, journals, and data from related agencies.

2.3. Data Analysis

The data were analyzed from interviews and field observations qualitatively and quantitatively. The data obtained was then carried out by analyzing the shape of the agroforestry land pattern, the types of plants and animals kept on agroforestry land, and the contribution of agroforestry to the income of the people in Nanga Menterap Village.

Agroforestry patterns were determined based on descriptive analysis through the categorization of the combination of crops and trees. Meanwhile, the values of agroforestry products for each type per year obtained by the community were measured using several equations.

a. The price of forest products is obtained using the market price approach. The price used was the selling price at the research location when the research was conducted in August 2022.
b. The mean value (income) of agroforestry products was calculated using Equation 1 (Nuryadi 2017).

$$x = xi + xii + \cdots + xn/n \quad (1)$$

where x is the mean of the number of agroforestry products, xi is the number of items taken by the respondent, and n is the number of agroforestry products.

c. The total harvest per unit of products per year was calculated using Equation 2 (Roslinda 2013).

$$TH = AH \times FH \times NH \quad (2)$$

where TH is the total harvest annually, AH is the average number of harvests, FH is harvest frequency, and NH is the number of harvests.

d. The economic value (income) of agroforestry products per type of item per year was calculated using Equation 3 (Roslinda 2013).

$$VH = TH \times P \quad (3)$$

where VH is the value of agroforestry products per type, TH is the total harvest (unit/year), and P is the price of agroforestry products.

e. The percentage of income can be calculated by dividing the income of each type of agroforestry by the income of all agroforestry products using Equation 4 (Nuryadi 2017).

$$\%EV = \frac{VEi}{\Sigma VE} \times 100\% \quad (4)$$

where $\%EV$ is the percentage of income, VEi is agroforestry income per product, and ΣVE is the total income of all agroforestry products.

f. The farmer's income is income from agroforestry plus income from non-agroforestry.
g. The level of contribution can be calculated by Equation 5 (Desmiwati et al. 2021; Hardiyanti et al. 2021).

$$Contribution\ (\%) = \frac{Income\ from\ Agroforestry}{Total\ income} \times 100\% \quad (5)$$

3. Results and Discussion

3.1. Respondent Identity

The characteristics of the respondents analyzed in this study were based on age, number of family members, education level, and area of land owned. The characteristics of respondents are presented in **Table 1**. Sixty-two respondents were interviewed using the census. The main occupation of the respondents was farmers. However, apart from their primary job as farmers, several farmers have side jobs such as traders, daily laborers, and private employees. The respondents are 23–79 years old. The most significant percentage of respondents age is in the age range between 39–54 years old (48.39%). The age of agroforestry farmers in Nanga Menterap Village is dominated by older farmers, with a few young farmers (≤ 25 years old), similar to several areas in Indonesia. In Talang Mulya village Bandar Lampung, Lampung, the agroforestry farmer's age ranges from 27–72 years old (Santoso et al. 2023). In Pondok Buluh village Simalungun District, North Sumatera, agroforestry activities are dominantly conducted by people aged 30–50 years old (Dewi et al. 2021). Align with this finding, the agroforestry farmers' age in Mount Merapi ranges from 28–40 years old (Rozaki et al. 2021). This condition needs attention because the young generation is less interested in being involved in farming activity.

Table 1. Characteristics of respondents of agroforestry farmers in Nanga Menterap Village

Characteristics	Category	Number	Percentage (%)
Age (years)	23–38	19	30.65
	39–54	30	48.39
	55–79	13	20.96
	Total	62	100.00
Family dependents (person)	1–2	9	14.52
	3–4	46	74.19
	5–6	7	11.29
	Total	62	100.00
Education	Elementary	41	66.13
	Intermediate	19	30.64
	Bachelor's degree	2	3.23
	Total	62	100.00
Land owned (ha)	0.5–2.5	17	27.42
	2.6–4.5	39	62.90
	4.5–6.5	6	9.68
	Total	62	100.00

The family's most significant dependents are 3–4 people (74.19%). In other areas like Talang Mulya Village Bandar Lampung, the member of the farmer family ranges from 1–6 people (Santoso et al. 2023). Likewise, Bucagu et al. (2013) also reported that the size of the family of agroforestry farmers in Kageyo, Rwanda, consists of 1–6 people. Family dependents strongly relate to family labor, income, and expenses (Jha et al. 2021; Pujiono et al. 2021). Respondents most completed elementary school (66.13%), which is a low formal education. This situation is similar to the findings of Dewi et al. (2021), where farmers in Pondok Buluh Village, North Sumatera, also have low education levels, mainly because they graduated from primary school to junior high school. The farmers in Talang Mulya Village, Bandar Lampung, have experienced 15 years of education level or finish their education until junior high school (Santoso et al. 2023).

This condition is also found in various regions (Kaba et al. 2020; Shennan-Farpón et al. 2022; Susanto et al. 2023). Each respondent has a different amount of agroforestry land, 0.5–6.5 ha, with different types of plants in each area. In New Juabeng Municipality, Ghana, Cocoa farmers have a 1–25 ha farm area (Kaba et al. 2020). Agroforestry farmers in Sao Paulo state South-West Brazil work in 6–29 ha of agricultural area (Shennan-Farpón et al. 2022), while in Pondok Buluh Village, Simalungun District, North Sumatera, the agricultural area owned by the farmer is less than 0.5 ha (Dewi et al. 2021).

3.2. Agroforestry Pattern

Respondents had various reasons for choosing plant species and cropping patterns. Saputra et al. (2021) stated that with an agroforestry/intercropping pattern, the community could utilize vacant (unproductive) land to plant other crops. Respondents choose plant varieties by considering the products with commercial value to fulfill their subsistence needs (Rajagukguk et al. 2018). From the result of this study, there were 18 plant types grown by the 62 respondents on their land. Based on spatial, respondents' agroforestry patterns are mixed random systems. The respondents managed the crops randomly without adjusting the spacing between plants. The number of plant types grown by the farmers of Nanga Menterap Village is slightly higher than those of the agroforestry farmers in Pondok Buluh Village, North Sumatera, which has 16 types. It is consistent with trees as timber-producing plants, multi-purpose and fruit-producing plants, crops plants, edible plants, and spices (Dewi et al. 2021)

Fig. 2 shows the appearance of the random mixture pattern in Nanga Menterap Village. Farmers choose the type of plant they cultivate not through careful planning but depending on the availability of seeds in their area. In mixed gardens, the spacing is generally irregular, the number of trees of each type varies, and variations in age are found within one species. Thus, there are variations in harvesting between each type of agroforestry product, which also causes variations in the timing of obtaining income from agroforestry products. Mixed garden cropping patterns provide varied income, namely routine, daily, weekly, monthly, seasonal, and yearly, so mixed planting provides sustainable results for farmers (Markum et al. 2021; Rahmani et al. 2021; Rossita et al. 2021; Zega et al. 2013).

Fig. 2. The several random mixture patterns of agroforestry in Nanga Menterap Village.

Based on components, the agroforestry pattern in Nanga Menterap Village can be classified into agrisilvicultural and agrosilvopastural. Agrisilvicultural is an agroforestry system that combines forestry components (woody plants) with agriculture components (non-woody plants). In comparison, the agrosilvopastural pattern in this village is forestry, agriculture, and livestock components. Some livestock components include cows, pigs, domestic chickens, and goats. The combination of the forestry component includes tengkawang (*Shorea stenoptera*), mango

(*Mangifera indica*), petai (*Parkia speciosa*), jackfruit (*Artocarpus heterophyllus)*, sugar palm (*Arenga pinnata*), and durian (*Durio zibethinus*). Moreover, the agriculture component includes chili (*Capsicum annum*), cocoa (*Theobroma cacao*), corn (*Zea mays*), coconut (*Cocos nucifera*), coffee (*Coffea arabica*), turmeric (*Curcuma* sp.), tomato (*Solanum lycopersicium*), eggplant (*Solanum melongena*), ginger (*Zingiber officinale*), long bean (*Vigna unguiculata* spp. sesquipedalis), banana (*Musa* sp.), and cassava (*Manihot esculenta*). Generally, the types of crops selected are the same in other locations, such as in Wanga Village East Motoling District South Minahasa Regency (Oping et al. 2023), in Batutegi Forest Management Unit Tanggamus Regency (Novasari et al. 2023), in Bontolerung Village Gowa District (Hasannudin et al. 2022), and Sungai Langka Village Gedong Tataan District Pesawaran Regency (Pasaribu et al. 2019). The community confirmed that the primary motivation for planting some tree species and crops on their land is to meet their livelihood needs and get economic benefits (Astuti et al. 2020; Hughes et al. 2020; Jaeck and Lifran 2014; Phondani et al. 2020; Rossita et al. 2021).

Fig. 3 shows the form of a random mixture where farmers in Nanga Menterap Village plant types of plants in empty agroforestry land without arranging the plants neatly. There are 18 plant types grown in farmer's agroforestry areas, including timber-producing plants like *S. stenoptera*. Fruit-producing plants like *M. indica*, *D. zibethinus, A. heterophyllus, and P. speciosa.* Sugar-producing plants such as *A. pinnata.* The farmers also grow some spices like turmeric (*Curcuma* sp.), ginger (*Z. officinale*), and chili (*C. annum*). The variation of plants grown is similar to those reported in (Dewi et al. 2021).

The livestock components used in this village are pigs, domestic chickens, cows, and goats. Some animals are kept in cages, and some are left alone around the farmers' fields. The agroforestry pattern that uses animals is called the agrosilvopastural pattern. Based on the results of interviews, the community raises these animals because the abundant source of feed that grows wild on agroforestry land can be used as fodder, so it only requires a little money to raise this livestock. In addition, livestock can also be sold to increase the farmer's income. In Simbi and Kageyo, Rwanda, farmers with > 2 cows can be categorized as wealthy farmers (Bucagu et al. 2013).

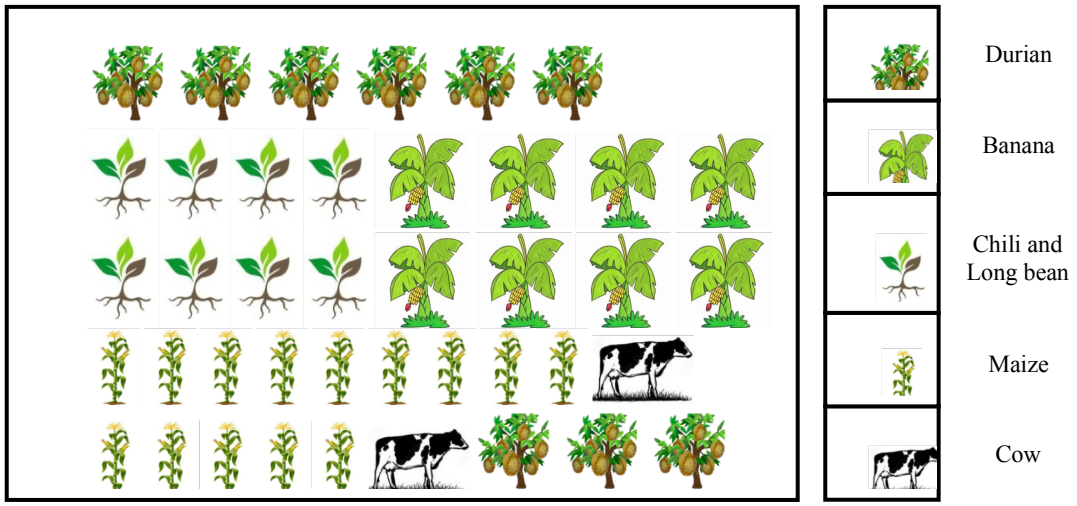

Fig. 3. A sketch of the random mixture pattern (agrosilvopastural).

In different locations, farmers in Nanga Menterap Village plant types of plants such as sugar palm, durian, banana, cocoa, and coffee and are surrounded by shrubs (**Fig. 4**). Farmers in Nanga Menterap Village did not apply agroforestry patterns when planting crops, such as the tree along

boarder, alternative row, alternative strips, or alley cropping patterns due to a lack of knowledge, and local farmers only planted plants in a random mixture form. This condition was similar to the agroforestry pattern used in Bakubulu Village, traditionally ensuring agroforestry management (Rahmani et al. 2021). Random mixture patterns were also applied by the agroforestry farmers in Mirring Village, Polewali Mandar, West Sulawesi (Idris et al. 2019). Farmers in Bangkalan District, Madura East Java, applied a silvopastoral system combined with a random mixture of teak as the monoculture plant (Putri et al. 2023).

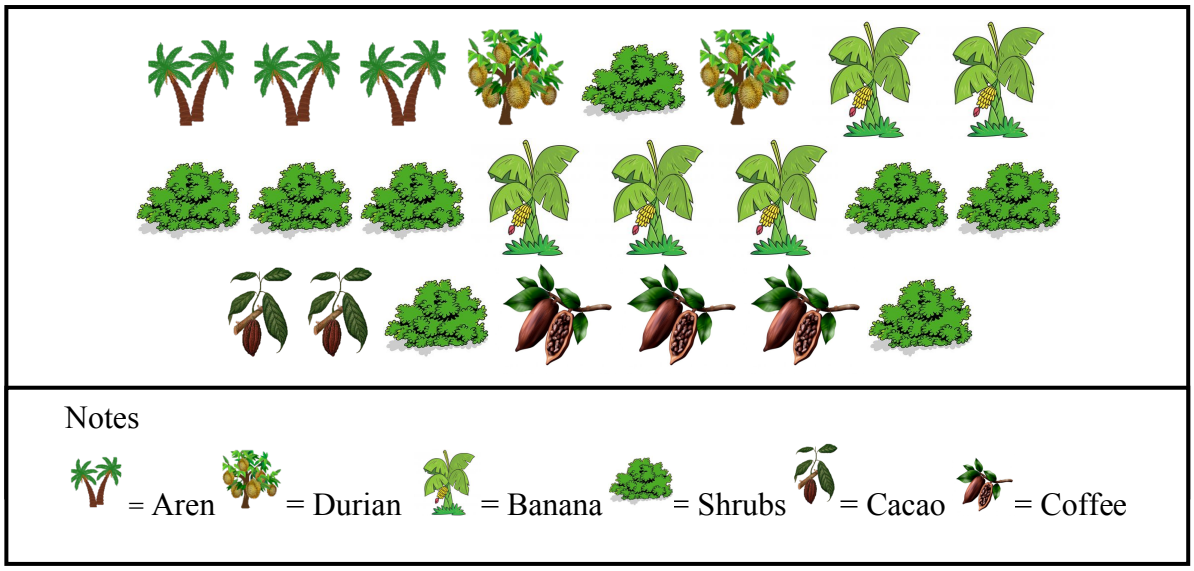

Fig. 4. The sketch of random mixture pattern (agrosilvopastural).

3.3. The Income from Agroforestry Products

The people in Nanga Menterap Village use agroforestry products to meet their daily household needs, and most of these products are sold to supplement household income. The agroforestry products are fruit, seed, rhizome, tubers, rhizome, sap water, pork, meat, and beef. A total of 22 agroforestry products are produced from community lands, mainly in the form of fruit. The selected forestry plants are also fruits. The concept of cultivating fruit plants in an agroforestry system is an option on community agricultural land, which aims to meet economic, social, ecological, and cultural needs (Ardini et al. 2020; Bucagu et al. 2013; Iiyama et al. 2018). The market for fruit products is relatively available and can be consumed directly. Therefore, this commodity has become the community's choice to plant on their land.

The most dominant crop grown and used by farmers is bananas, with 62 respondents with a percentage of 100%, where all respondents have banana plants on their agroforestry land. Bananas are usually for personal consumption or distributed to neighbors, but if they bear good fruit, they can be sold to the market for IDR 80,000/bunch. In addition to bananas, the most widely used plants are turmeric, and the third is durian and cassava. In contrast, the type of plant used the least by the community is coffee; only 4.8% of respondents plant this commodity on their land. This condition is rather different from other places, where many agroforestry lands are planted with the coffee commodity, as reported by Aminuddin et al. (2021) in Bolaromang Village, Buttono District, Gowa Regency, where coffee is one of the main trees grown in private forest in this village. Markum et al. (2021) explained that agroforestry farmers planted coffee in the Sesaot forest, Lombok, in a mixture pattern with other trees such as candlenuts, jackfruit, durian, and

avocado. Apart from being used directly, there are further processed agroforestry products in Nanga Menterap Village, including sap water into palm sugar and cassava into chips. This product is sold in the village. Palm sugar is one of the commercial products, usually sold for IDR 35,000–IDR 40,000/kg. Cassava plants can be processed as chips and are usually sold at IDR 2,000/pack.

Agroforestry products are the source of income for the people of Nanga Menterap Village. This condition supports the statement that agroforestry systems benefit local communities economically (Kamaluddin et al. 2020). **Table 2** shows that the amount of utilization of each type of agroforestry product is influenced by the number of items taken by each respondent and the harvest frequency. The income is derived from agroforestry product commodities. Related to the economic aspects, farmers would adopt a particular pattern if they would get economic benefits from these activities (Jaeck and Lifran 2014). The types of agroforestry plants that are widely used by the community are bananas (13.80%), followed by turmeric (8.68%), and durian and cassava (8.24%). Meanwhile, the agroforestry products that people use the least are cocoa (1.78%), mangoes and eggplants (1.56%), pork (1.56%), eggplant (1.34%), and coffee (0.67%). The agroforestry system is designed to produce agricultural products such as fruit, vegetables, and meat on one unit of land simultaneously so that farmers can carry out subsistence and meet economic needs (Jerneck and Olsson 2013).

Table 2. Calculation results of utilization of agroforestry products

No.	Agroforestry Products	Unit	Xi	N	FH	TH	%
1	*Durio zibethinus*	piece	73	37	1	2,701	8.24
2	*Arenga pinnata*	liter	5	28	360	50,400	6.23
3	*Shorea stenoptera*	kg	200	15	1	3,000	3.34
4	*Capsicum*	kg	3	32	2	192	7.12
5	*Theobroma cacao*	piece	10	8	2	160	1.78
6	*Zea mays*	kg	30	10	2	600	2.23
7	*Cocos nucifera*	piece	30	28	2	1,680	6.23
8	*Coffee*	kg	5	3	2	30	0.67
9	*Artocarpus heterophyllus*	piece	10	12	2	240	2.67
10	*Musa paradisiaca*	bunch	5	62	1	310	13.80
11	*Manihot esculenta*	kg	60	37	2	4,440	8.24
12	*Mangifera indica*	kg	50	7	2	700	1.56
13	*Vigna cylindrica*	kg	30	16	2	960	3.56
14	*Zingiber officinale*	kg	10	29	2	580	6.45
15	*Curcuma longa Linn*	kg	15	39	2	1,170	8.68
16	*Solanum melongena*	kg	5	6	2	60	1.34
17	*Parkia speciosa*	kg	10	5	1	50	1.11
18	*Solanum lycopersicium*	kg	8	11	2	176	2.50
19	Pork	kg	50	7	1	350	1.56
20	Chicken	kg	9	29	1	261	6.46
21	Beef	kg	350	13	1	4,550	2.89
22	Meat	kg	30	1	1	450	3.34
Total				449			100.00

Notes: Xi = number of harvest products, N = the number of respondents/products, FH = harvest frequency per year, TH = total harvest annually, and% = percentage of utilization products by respondent.

Table 3 shows the total amount of farmers' income from agroforestry land products. The smallest is coffee, IDR 450,000/year, with a percentage of 0.04%. Bananas, the most widely planted species, contributed IDR 24,800,000/year with a percentage of 2.34%. The biggest is a cow, IDR 546,000,000/year with a percentage of 51.59%, followed by palm sugar of IDR

252,000,000/year with 23.81%. Because only one person raises cows, the most commodity that contributes is palm sugar.

Table 3. Percentage of the economic value of agroforestry products

No.	Agroforestry component	Unit	TH	Price (IDR)	VEi (IDR/year)	%EV
1	*Durio zibethinus*	piece	2,701	8,000	21,608,000	2.04
2	*Arenga pinnata*	liter	50,400	5,000	252,000,000	23.81
3	*Shorea stenoptera*	kg	3,000	1,000	3,000,000	0.28
4	*Capsicum*	kg	192	35,000	6,720,000	0.63
5	*Theobroma cacao*	piece	160	3,000	480,000	0.05
6	*Zea mays*	kg	600	2,000	1,200,000	0.11
7	*Cocos nucifera*	piece	1,680	5,000	8,400,000	0.79
8	*Coffee*	kg	30	15,000	450,000	0.04
9	*Artocarpus heterophyllus*	piece	240	10,000	2,400,000	0.23
10	*Musa paradisiaca*	bunch	310	80,000	24,800,000	2.34
11	*Manihot esculenta*	kg	4,440	2,000	8,880,000	0.84
12	*Mangifera indica*	kg	700	20,000	14,000,000	1.32
13	*Vigna cylindrica*	kg	960	8,000	7,680,000	0.73
14	*Zingiber officinale*	kg	580	50,000	29,000,000	2.74
15	*Curcuma longa Linn*	kg	1,170	40,000	46,800,000	4.42
16	*Solanum melongena*	kg	60	10,000	600,000	0.06
17	*Parkia speciosa*	kg	50	35,000	1,750,000	0.17
18	*Solanum lycopersicium*	kg	176	20,000	3,520,000	0.33
19	Pig	kg	350	60,000	21,000,000	1.98
20	Chicken	kg	261	50,000	13,050,000	1.23
21	Cow	kg	4,550	120,000	546,000,000	51.59
22	Goat	kg	450	100,000	45,000,000	4.25
Total					1,058,338,000	100.00

Notes: TH = total harvest annually, VEi = agroforestry income per product, and %EV = the percentage of income.

3.4. Contribution to Respondent's Income

Most of Nanga Menterap's farmers' income comes from farming activities. Respondents in this study rely on their income from agroforestry products. Limited employment opportunities cause a very high dependence on land production. Diversifying income sources outside of the agroforestry sector was a good strategy for their incomes (Birthal et al. 2014; Zhao 2014), and enriching the types planted on farmers' land is a good strategy to develop in this situation. Apart from farming activities, some respondents also earn income from activities outside of farming. **Table 4** shows that the people in this village obtain other income besides agroforestry practices. Their source of income can come from farmers, traders, and laborers.

Table 4. Contribution of agroforestry products to community income

Source of income	Income (IDR/year)	Average household (IDR/year)	Contribution (%)
Agroforestry	1,058,338,000	17,069,697.74	82.74
Non-Agroforestry	220,800,000	3,561,000.29	17.26
Total	1,279,138,000	20,631,258.06	100.00

Table 4 shows that the net income from agroforestry practices is IDR 1,058,338,000/year, and income from non-agroforestry activities is IDR 220,800,000/year. In one year, the total

community income from agroforestry and non-agroforestry practices can reach IDR 1, 058,338,000. The results show that people's income from agroforestry products reaches IDR 1,279,138,000 or around 82.74%. Meanwhile, the community's income from non-agroforestry products is only IDR 220,800,000 or 17.26%. In contrast, Hasannudin et al. (2022) reported that the agroforestry system contributed 26% to farmer household income. However, other studies reported that the agroforestry system contributed 88.31% and 63% to farmer households (Olivi et al. 2015; Zega et al. 2013). This fact shows that society's dependence on agroforestry in this village is relatively high, which means agroforestry systems contribute to the socio-economic conditions of the community (Farooq et al. 2018). The high contribution of agroforestry products is due to people cultivating and utilizing their land by planting various types of plants. Land cultivation practices like this are knowledge passed down from generation to generation. The application of agroforestry can increase farmers' income if the farmers can maintain land productivity by selecting suitable plants, maintaining the plants, marketing products available, and having strong farmer institutions (Widiyanto and Hani 2021). When the farmer's income increases, the village's economy will improve, increasing development (Nurrochmat et al. 2023). Farmers in Nanga Menterap Village practiced traditional agroforestry, which should be improved to increase their contribution to the farmer household income. Not only farmer's knowledge of modern agroforestry practices is needed, but also agroforestry product processing could strengthen farmer income generation.

4. Conclusions

The agroforestry pattern in Nanga Menterap Village can be classified into two types of patterns, namely the agrisilvicultural and agrosilvopastural. Farmers only planted plants in a random mixture form, and the complex agroforestry cropping patterns they choose support their income. The types of agroforestry plants used in Nanga Menterap Village are in the forestry component, including durian, aren, jackfruit, mango, petai, and tengkawang. The agricultural component includes chili, chocolate, corn, coconut, coffee, banana, cassava, long bean, ginger, turmeric, eggplant, and tomatoes. The livestock types used by the Nanga Menterap Village community include pigs, domestic chickens, cows, and goats. The contribution of agroforestry to the income of the community in Nanga Menterap Village in the agroforestry component, the total income per year is IDR 2,062,800,000 with a contribution of 90.63%. In contrast, the total income from non-agroforestry per year is IDR 220,800,000, a contribution of 9.67%. Agroforestry systems can be developed intensively to improve the welfare of the community. Farmers can continue cultivating the crop species following their socially based and economic aspects. However, most farmers have been facing problems in their capacity to earn much productivity in their land. Therefore, more intensive agroforestry training is needed to increase farmer's capacity.

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