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AGROFORESTRY OF DRAGON FRUIT IN BUMI MULYO VILLAGE, EAST LAMPUNG REGENCY

Andhine Tri Prinanti[1], Indra Gumay Febryano[1,2,3]*, Hari Kaskoyo[1,2,3]

[1]Department of Forestry, Universitas Lampung
[2]Graduate Program in Forestry, Universitas Lampung
[3]Graduate Program in Environmental Science, Universitas Lampung

*Email: indra.gumay@fp.unila.ac.id

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ABSTRACT

The development of dragon fruit through agroforestry plays an important role because it increases land cover, suppresses pests and diseases, and reduces capital costs compared to monoculture systems. This study aims to analyze the dragon fruit agroforestry systems developed in Bumi Mulyo Village, Sekampung Udik District, East Lampung Regency. A qualitative approach using a case study method was employed in this research. Data were collected through in-depth interviews, field observations, and document analysis. The collected data were analyzed to identify plant species and planting patterns in dragon fruit agroforestry systems. The results showed that the agroforestry system consisted of dragon fruit (*Hylocereus polyrhizus*) as the main crop; kapok (*Ceiba pentandra*) as a living support and live fence tree; and other plant species, namely avocado (*Persea americana*), cocoa (*Theobroma cacao*), mamey sapote (*Pouteria sapota*), black sapote (*Diospyros nigra*), *durian* (*Durio zibethinus*), papaya (*Carica papaya*), banana (*Musa* spp.), *melinjo* (*Gnetum gnemon*), coconut (*Cocos nucifera*) and chilli (*Capsicum annuum)*. The kapok tree functions both as living support tree for dragon fruit and as live fence tree. Its leaves are also used by farmers as animal feed. The planting patterns applied by farmers include: (1) dragon fruit–kapok; (2) dragon fruit–kapok–avocado; and (3) dragon fruit–kapok–other plant species. These variations demonstrate farmers adaptation in optimizing growing space to maximize the economic and ecological functions of the agroforestry system. Farmers are encouraged to develop more complex agroforestry systems from simple ones in order to increase income and support soil and water conservation.

Keywords: *Agroforestry Classification*; *Ceiba pentandra; Live Fence Tree*; *Living Support Tree; Planting Pattern*

INTRODUCTION

Pressure on agricultural land in Indonesia is driving the adoption of more sustainable land use practices (Austin *et al*., 2019). Agricultural practices that do not take ecological sustainability into account contribute to a decline in soil fertility and environmental balance (Achmad *et al*., 2022). Agroforestry is a land-use approach that combines woody plants with agricultural crops or livestock on the same land (Nair, 1993). This approach increases land productivity while maintaining soil fertility (Octavia *et al*., 2023). Its implementation also supports biodiversity conservation in agricultural landscapes (Udawatta *et al*., 2019).

The implementation of agroforestry can increase soil organic matter content, retain moisture, and reduce the rate of erosion and nutrient loss (Zhu *et al*., 2020). This improvement in soil health has a direct impact on long-term agricultural productivity (Pakaya *et al*., 2025). Diversifying the types of crops grown on a single plot of land provides farmers with multiple sources of income while minimizing the risk of crop failure (Seghieri *et al*., 2021). The high potential for carbon sequestration makes this approach relevant to global climate change mitigation (Zomer *et al*., 2022). The integration of economic functions and environmental conservation makes agroforestry a strategic choice for sustainable agricultural development (Arshad *et al*., 2024).

Agroforestry systems are grouped into two main categories: simple agroforestry and complex agroforestry. Simple agroforestry consists of conventional combinations comprising a small number of components, representing what is now known as the classical agroforestry model. The application of this system is reflected in the presence of randu trees that have long been planted along the edges of rice fields in Central Java for hundreds of years. Complex agroforestry consists of systems comprising a large number of elements, including trees, shrubs, seasonal crops, and/or grasses (de Foresta *et al*., 2000). Based on planting patterns, there are four types of agroforestry planting patterns that are commonly used: tree along border, random mixture, alley cropping and alternate rows. The characteristics of agroforestry planting patterns depend heavily on the landowner, biophysical conditions, and the intended production goals, as a result, the patterns implemented may vary from one plot of land to another (Febryano *et al*., 2024).

Commercial-scale agroforestry prioritizes increasing the production of a single flagship commodity as the primary output within the implemented crop-tree combination system. Cocoa and coffee plantations integrated with shade trees are one example of this approach. Agriculture-based agroforestry has a higher degree of structure compared to forest-based agroforestry, as agricultural crops and livestock are prioritized as the main production focus within the system. Forestry elements serve as supporting components that enhance land productivity while ensuring the long-term sustainability of the system (Sardjono *et al*., 2003). The selection of plant species in agroforestry systems is based on various considerations, including income, continuity of production, ease of maintenance, and local cultural practices (Rajagukguk *et al*., 2018).

Selecting the right live fence tree in an agroforestry system can significantly increase farmers' income (Wanderi *et al*., 2019). Dragon fruit (Hylocereus polyrhizus) is known as a plant that is adaptable, easy to cultivate, and has high economic value for the community (Alfizar *et al*., 2025). This plant is rich in antioxidants, fiber, minerals, and vitamins, making it popular in both domestic and international markets (Alfizar *et al*., 2025). Farmers generally use permanent concrete posts as the main supports for their crops (Lion *et al*., 2023). However, the use of these concrete poles requires a relatively high capital investment (Alfizar *et al*., 2025). Therefore, the use of living support trees as an alternative is a more affordable solution because it reduces capital costs (Lion *et al*., 2023).

Experience with other climbing plants suggests otherwise. Vanilla (Vanilla planifolia), black pepper (Piper nigrum L.), and dragon fruit (Hylocereus undatus) have demonstrated that using trees as supports is not merely a technical solution, but rather a beneficial ecological strategy. In vanilla cultivation, living support trees serve a dual purpose: they support the vines and provide optimal shade, whether from native vegetation or from plants managed through periodic pruning (Martin *et al*., 2021). A similar approach is applied to pepper cultivation, where species such as dadap (Erythrina indica), gamal (Gliricidia sepium), jackfruit (Artocarpus heterophyllus) and coconut (Cocos nucifera) are selected as living support trees based on their growth rate, bark texture, and nitrogen-fixing ability (Kumar *et al*., 2021). Dragon fruit (Hylocereus undatus), which climbs on the horse-tail vine (Lannea coromandelica) as a living support, has been shown to provide mechanical support while also increasing micro-moisture levels around the plant (Alfizar *et al*., 2025). All three studies demonstrate that the integration of climbing plants into agroforestry systems produces ecological synergies that cannot be achieved in monoculture systems. A similar approach is also applied to dragon fruit cultivation; however, research on agroforestry in this context remains limited, particularly regarding plant species and planting patterns under local conditions. This study aims to analyze plant species and planting patterns in dragon fruit agroforestry.

METHOD

The study was conducted from March to May 2026 in Bumi Mulyo Village, Sekampung Udik Subdistrict, East Lampung Regency, Lampung Province, Indonesia. Key informants were selected purposively, namely nine farmers of dragon fruit agroforestry. The criteria were farmers who grow dragon fruit and have experience in managing both agroforestry systems and monocultures. A qualitative approach using the case study method was employed in this research. Data collection was conducted through in-depth interviews, participant observation, and document study. The collected data were analyzed to examine the types of plants and planting patterns in dragon fruit agroforestry.

RESULTS AND DISCUSSION

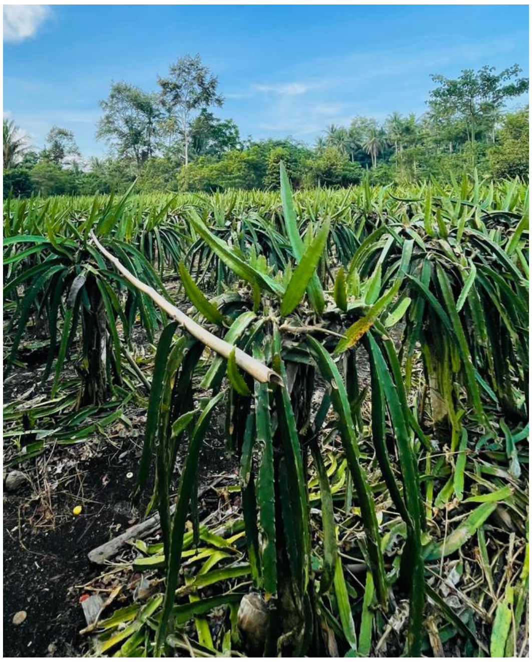
General Conditions at the Site

Bumi Mulyo Village is located in Sekampung Udik Subdistrict, East Lampung Regency. The village was formed as a result of the division of Mengandung Sari Village, which previously included the area of Hamlet IV. Bumi Mulyo Village was officially established on February 25, 2002, based on a decision by the local government. Geographically, Bumi Mulyo Village has fertile soil, which supports agriculture and plantation activities as the primary livelihoods of its residents. Administratively, Bumi Mulyo Village borders Marga Tiga to the north, Purwokertocono to the south, Banjar Agung and Toha to the east, and Mengandung Sari to the west. According to 2024 data from the Badan Pusat Statistik of East Lampung Regency, the population of Bumi Mulyo Village was recorded at 3,097 people. The primary occupations of the residents of Bumi Mulyo Village are farmers and farm laborers (Profile of Bumi Mulyo Village).

Farmers cultivate various agricultural and plantation crops, such as corn, coconuts, coffee, and cacao. Cacao was once one of the community’s mainstays crops, because it is relatively easy to grow and has high economic value. However, cocoa productivity has declined due to attacks by the cocoa pod borer, fruit rot fungus, and leaf pests, which have caused losses for farmers. The selling price of cocoa beans at the farm level has fallen, and the low quality of the harvest has a direct impact on farmers’ incomes (Mongabay Indonesia, 2018). As a result, farmers began switching to growing dragon fruit, which is considered to have greater economic value than cocoa.

The shift from growing cacao to dragon fruit began with a farmer who obtained dragon fruit seedlings from Java. Those seedlings were then planted and cultivated on land in Bumi Mulyo Village for the first time. This success caught the attention of other farmers in the village, who then gradually began switching to growing dragon fruit on their own land. Dragon fruit plants not only grow in the farmers’ fields but also fill their yards. Some farmers use artificial lighting to stimulate flowering in the plants. Bumi Mulyo Village was once promoted as a dragon fruit tourism village and a potential agrotourism destination through the Dragon Fruit Festival and a visit by the PAPHIRASI delegation. However, its development did not continue because tourist visits were not sustained (Graha Post, 2020).

Dragon fruit cultivation in Bumi Mulyo Village initially used concrete posts as trellises (Figure 1a). The concrete posts were made using wooden formwork with a cross-sectional dimension of 12 cm × 12 cm and a height of 170 cm. The concrete mixture consisted of cement, sand, and coral in a ratio of 1 : 2 : 1 (1 part cement, 2 parts sand, and 1 part coral). The poles were made by pouring the concrete mixture into the formwork until it reached about half the height of the formwork, after which triangular steel reinforcement was placed in the center of the formwork. After that, the remaining concrete mix is added until the formwork is filled, then the surface is compacted and leveled before the curing process. After the pouring process, the concrete is left to cure in the formwork for 24–48 hours. Next, the formwork is removed, and the concrete posts are allowed to cure further until they reach sufficient strength. The concrete posts are driven 20 cm deep into the ground. At the top of each post, a used tire and wire are attached to support the plants. Two dragon fruit vine cuttings are planted on either side of each concrete post. The vines are tied to the post so that they grow upward and can rest against the tire attached to the top of the post. The use of concrete posts involves a relatively high cost of approximately Rp70,000 per post.



a. Dragon fruit monoculture

b. Dragon fruit agroforestry

Figure 1. Dragon Fruit Agroforestry and Dragon Fruit Monoculture

Farmers have switched to using other living support trees that are more practical and cost-effective (Figure 1b). The support plant used is the kapok tree. Dragon fruit seedlings are planted after the kapok shoots show stable growth, generally 1–2 weeks after planting. Kapok seedlings come from stem cuttings 120–150 cm long taken from parent plants; farmers then plant them in holes measuring 30×30×30 cm (adjusted to the size of the kapok stem). The tips of the kapok shoots are covered with plastic to prevent them from rotting when exposed to rainwater. Two dragon fruit plants are planted next to each kapok tree, one on the right and one on the left side of the trunk base, with a planting spacing of 2,5×3 m. The vines are guided and loosely tied with raffia string so they climb upward along the support trunk. The kapok tree's shoots are pruned, leaving only two shoots on the right and left. The dragon fruit vines are guided to spread to the right and left of the support pole as they grow upward.

Plant Species and Planting Patterns

Eleven plant species were found on the dragon fruit agroforestry land in Bumi Mulyo Village (Table 1). The plant composition consists of dragon fruit as the main crop, kapok as living support and live fence tree, and other plant species.

Table 1. List of Plant Species in the Dragon Fruit Agroforestry System in Bumi Mulyo Village

No	Local Name	Scientific Name	Famili	Description
1	Dragon Fruit	*Hylocereus polyrhizus*	Cactaceae	Main crop
2	Kapok	*Ceiba pentandra*	Malvaceae	Living support
3	Avocado	*Persea americana*	Lauraceae	Other plant species
4	Cocoa	*Theobroma cacao*	Malvaceae	Other plant species
5	Mamey Sapote	*Pouteria sapota*	Sapotaceae	Other plant species
6	Black Sapote	*Diospyros nigra*	Ebenaceae	Other plant species
7	Durian	*Durio zibethinus*	Malvaceae	Other plant species
8	Papaya	*Carica papaya*	Caricaceae	Other plant species
9	Banana	*Musa spp.*	Musaceae	Other plant species

10	Coconut	*Cocos nucifera*	Arecaceae	Other plant species
11	Melinjo	*Gnetum gnemon*	Gnetaceae	Other plant species
12	Chilli	*Capsicum annuum*	Solanaceae	Other plant species

Source: Processed by Author, 2026

Dragon fruit is known as *pitahaya* or *pitaya* and is native to the Americas, with its original range extending from Florida to Brazil (Angkat *et al*., 2018). Morphologically, the stem is triangular, fleshy, green, and actively photosynthesizes because it contains chlorophyll, a unique adaptation of epiphytic cacti that do not rely on leaves (Shah *et al*., 2023). This variety contains beta-carotene as a natural antioxidant, as well as the pigments hylocerenin and isohylocerenin, which give the fruit flesh its red color, with a sugar content of approximately 16–18° Brix. From a health perspective, this fruit can lower cholesterol, stabilize blood sugar levels, and support bodily functions through its antioxidant content. The shape of this fruit varies from round to oval to oblong, with a distinctive scaly or fringed skin resembling a dragon's scales (Le Bellec *et al*., 2006). The fruit ranges in size from 7 to 30 cm and generally weighs between 120 and 800 grams (Balaji *et al*., 2025).

The marketing process for dragon fruit is straightforward. Farmers harvest the dragon fruit and bring their harvest home. Collectors pick up the dragon fruit directly from the farmers. Prices at the farm level range from Rp10,000 to Rp25,000 per kilogram, depending on market conditions and the harvest season. This system is convenient for farmers, as it does not require additional costs or labor for distribution to the market. However, this system places farmers in a weak bargaining position because collectors set the prices, so farmers' income depends on price fluctuations that are not always favorable.

Farmers choose kapok as a support plant for dragon fruit because it continues to grow and become stronger as the vine grows. As the number of dragon fruit stems increases, the kapok grows stronger as well, ensuring it remains capable of supporting the plant's weight. This system offers long-term benefits because kapok trees can be used for more than 20 years, whereas concrete posts last only about 5 years. From an economic perspective, the price of kapok cuttings is only about Rp5,000 per post, while concrete posts cost around Rp70,000 per post, resulting in a significant cost difference for farmers. The use of kapok also supports soil and water conservation by increasing land cover, reducing erosion, and improving groundwater infiltration. The benefits of kapok for farmers align with its characteristics (Table 2) as described by Heyne (1987).

Table 2. Characteristic of Kapok tree (Ceiba pentandra)

No	Aspect	Description
1	General Description	A high-value tree widely distributed in the tropical regions. In Java, it rarely exceeds 20 meters in height with a trunk diameter of about 50 cm, although related species such as Gossampinus heptaphylla can reach heights of 45 meters and a diameter of 4 meters.
2	Soil	Grows best in fertile, deep, and loose soil. Well-drained volcanic soil or porous alluvial deposits are considered the most suitable medium, while clay loam soil yields smaller harvests.
3	Climate	Requires a tropical climate with 1,500–3,000 mm of rainfall per year and a distinct dry season. The ideal altitude is below 1,000 masl (meters above sea level); excessive rainfall or overly humid air can cause the fruits to rot.

4	Propagation	Propagated through cuttings or seeds. Cuttings are often used as living fences because they root easily. If using seeds, seedlings are transplanted from the nursery to the field at 18–24 months of age, with an ideal planting spacing of 10 x 12 meters.
5	Processing	The fruits are harvested using long bamboo poles when they turn dull brown. Processing involves sun-drying the fruits until they split open, after which the fibers are separated from the seeds manually or by machine. The result is either clean fiber or fiber still mixed with seeds.
6	Economic Value	The fibers are used as filling for pillows and mattresses. The seeds are processed into soap oil or cooking oil. The seed cake (seed residue) is utilized as fertilizer or animal feed. Its lightweight wood is used for packing crates and matches. Other parts (roots, bark, leaves) are used medicinally to treat kidney stones, coughs, asthma, fever, and as a hair cleanse.

Source: Heyne (1987)

Kapok trees can serve as hedgerows and land boundaries. Within the framework of agroforestry, this practice falls under the category of boundary planting, offering dual benefits: physical protection of the land and the establishment of tenure rights without the need for permanent infrastructure (Nair *et al*., 2021). Kapok leaves are used as feed for goats, while goat manure is used as organic fertilizer for dragon fruit plants. Dragon fruit plants rely on kapok trees as structural supports for their growth. This approach reflects the concept of integrated crop-livestock systems (ICLS), integrated crop-livestock systems that have been proven to be more productive and more resilient to climate change than monoculture systems. (Sekaran *et al*., 2021). Cultivating kapok is relatively easy because the plant can be propagated through stem cuttings. Maintenance simply involves periodically pruning the branches to reduce shading on the dragon fruit plants.

Farmers grow avocados as a fruit crop to supplement their income alongside their main crops. The fruit is round to pear-shaped, weighing 200 grams to more than 1 kg, with greenish-yellow flesh that is soft and creamy in texture. It is rich in monounsaturated fats, vitamin E, potassium, and folate, which are good for heart health (Bhandari *et al*., 2025). Planting is carried out using grafted seedlings spaced 10x10 meters apart. Plant maintenance is carried out through fertilization, pruning, and spraying to support plant growth and productivity. Avocado trees begin bearing fruit at 5 years of age, with selling prices ranging from Rp10,000 to Rp35,000 per kilogram.

Cacao is planted along the edges of the field near the fence so as not to interfere with the main crops. Maintenance includes fertilizing, pruning, and spraying. The fruit is oval-shaped, 15–30 cm long and weighing 300–500 grams, and ranges in color from yellow to red when ripe. The dried beans contain fats, proteins, and antioxidant polyphenols that are beneficial to health (Blaser *et al*., 2018). Harvesting is done by picking the ripe fruit, then removing the beans and sun-drying them until they are dry. The price of dried cocoa beans ranges from Rp30,000 to Rp100,000 per kilogram, depending on the degree of dryness and the quality of the beans. The cocoa pod husks can be used as livestock feed or as raw material for organic fertilizer.

The mamey sapote fruit is round or elongated oval, with rough brown skin and sweet red-orange flesh that resembles a mixture of pumpkin and sweet potato. The meat is rich in beta-carotene, vitamin C, and dietary fiber, which are good for your health (Pino *et al*., 2012). This crop is grown only in a few spots among the main crops and is used for household consumption

The black sapote grows up to 25 meters tall with a dense canopy that shelters the plants beneath it. The fruit is round, green when young and turns black when ripe, with dark brown, soft, pudding-like flesh, earning it the nickname "chocolate pudding fruit". It contains vitamin C, vitamin A, potassium, and antioxidant phenolic compounds that hold potential as functional foods (Baskar *et al*., 2018). It is found only at a few spots among the main crops as a live fence tree.

Durian is known as the "King of Fruits" because of its very high value in both local and regional markets (Khaksar *et al*., 2024). The fruit is round to oval, with a hard, spiny skin and creamy yellow flesh with a strong aroma. The flesh contains carbohydrates, fats, protein, vitamins B and C, and the compound gamma-glutamylcysteine, which acts as an antioxidant (Khaksar *et al*., 2024). Durian trees are planted in limited numbers near the property fence, and the fruit is used for household consumption.

Papaya is known as a fast-growing intercrop, making it a strategic choice for generating income before the main crop begins to produce. The fruit is cylindrical to round, with orange to pink flesh that is soft and sweet. It contains vitamins A, B, C, E, and K, as well as various minerals essential for health (Salinas *et al*., 2023). The plants are spaced 10x10 meters apart, with a harvest period of 6–9 months after planting. The selling price ranges from Rp3,000 to Rp8,000 per kilogram, and the young leaves are also consumed as a vegetable by farmers.

Bananas grow quickly and produce suckers naturally at no additional cost, making them easy for farmers to maintain. The fruit is elongated and curved, with yellowish-white, soft, and sweet flesh. It contains carbohydrates, potassium, vitamin B6, vitamin C, and fiber, all of which are beneficial for digestive health (Ungbogu *et al*., 2023). They are planted along the edge of the field near the fence so as not to interfere with the main crops. The selling price ranges from Rp2,000 to Rp5,000 per bunch, and the fruit is also consumed directly by the farmers.

Melinjo has high economic value because all its parts can be used, from the young leaves and flowers as vegetables to the seeds, which are processed into emping (Alfatikha *et al*., 2020). This plant is grown near the boundary of the plot, and its leaves are commonly used as a vegetable for household consumption. The fruit is small, oval-shaped, green when young, then yellow, and red when ripe. Its seeds contain protein, fiber, B vitamins, calcium, phosphorus, as well as the antioxidants flavonoids and resveratrol (Alfatikha *et al*., 2020).

The coconut palm is a plant that has existed since the land was still dominated by cacao and has been preserved because it does not interfere with the main crop and can supplement farmers' income. Coconuts are round to oval, have a thick brown husk, and contain water and white flesh that can be processed into coconut milk, oil, and various other byproducts. Coconut flesh contains lauric acid, potassium, magnesium, and various vitamins that are beneficial to health (Huang *et al*., 2025). Coconuts can be sold as mature or young coconuts, with prices ranging from Rp2,500 to Rp3,300 per coconut.

Chilli is cultivated between rows of the main crop as an annual crop that provides additional income for farmers. Their relatively short harvest cycle enables chilli to generate economic value before the main crop reaches harvest time (Muflikh *et al*., 2021). Chilli have high economic value as they are a staple cooking ingredient with market demand that tends to remain stable throughout the year (Astutik *et al*., 2023). Farmers generally use their chilli harvest to meet household consumption needs, whilst any surplus can be sold or shared with relatives and neighbours.

Bayur trees grow naturally and have been present since the land was still a cocoa plantation. Today, bayur trees are generally found along the perimeter of the land. Although they have been cut down in the past, this species is still able to regenerate naturally, as evidenced by the emergence of new trees. Bayur wood is widely used by the local community as a building material because it possesses fairly good physical and mechanical properties, making it a high-value timber commodity (Lestari and Fahrussiam, 2024).

There are three planting patterns on dragon fruit agroforestry land in Bumi Mulyo Village (Figure 2). The planting patterns used by farmers are tree along border and random mixture.

a. Planting Pattern 1

b. Planting Pattern 2

c. Planting Pattern 3

Figure 3. Dragon fruit agroforestry planting patterns

Description :
a. Planting Pattern 1 :dragon fruit – kapok
b. Planting Pattern 2: dragon fruit – kapok – avocado
c. Planting Pattern 3: dragon fruit – kapok – other plat species

The agroforestry planting patterns on dragon fruit farms consist of three combinations classified under the dragon fruit agroforestry system. Dragon fruit serves as the main crop, the kapok tree acts as a living support tree and living fence, and other plant species serve as live fence tree (Figure 3). There are three planting patterns implemented, namely tree along border (Planting Pattern 1), systematic mixture (Planting Pattern 2), and random mixture (Planting Pattern 3). Tree along border is a systematic tree planting pattern distributed around the perimeter of the agroforestry area. Systematic mixture is a pattern of mixed planting in which agricultural crops, forestry trees, and live fence trees are arranged in alternating rows. Random mixture is a pattern of random planting in which agricultural crops and trees are planted irregularly on the same land (Mukti et al., 2024). The diversity of crop combinations in each cropping pattern reflects farmers' efforts to optimize land productivity while meeting their households' economic needs (Alfatikha et al., 2020).

Planting Pattern 1 combines dragon fruit as the main crop with kapok trees as both a trellis and a boundary fence for the plot. In this pattern, kapok trees are planted using the tree-along-border system, meaning they are systematically planted around the perimeter of the plot and scattered throughout the plot to support the rows of dragon fruit. Kapok trees are used as support structures because they are less expensive than concrete posts. Planting Pattern 2 employs the systematic mixture system, featuring two rows of dragon fruit vines climbing the kapok trees, interspersed with one row of avocado trees, and so on. This alternating pattern allows dragon fruit and avocado trees to grow side by side in an orderly manner, thereby optimizing the use of space and light on the plot (Nair et al., 2021). The inclusion of avocados in this cropping pattern enriches the diversity of crops produced, thereby increasing farmers' sources of income (Alfatikha et al., 2020).

The third planting pattern is the most diverse because it combines dragon fruit, kapok trees, and various fruit crops planted in a random mixture (random mixture). The fruit crops in this pattern include avocado, cacao, banana, papaya, melinjo, coconut, mamey sapote, chilli, and black sapote. This crop diversity reflects farmers' strategies to maximize land use while maintaining income stability throughout the year. This combination reduces the risk of crop failure, because when the yield of one crop declines, the other crops continue to provide income for farmers (Alfatikha et al., 2020).

CONCLUSION AND RECOMMENDATION

Dragon fruit agroforestry systems consist of various plant species, namely dragon fruit (*Hylocereus polyrhizus*) as the main crop; kapok (*Ceiba pentandra*) as living support and live fence tree; and other plant species, namely avocado (*Persea americana*), cocoa (*Theobroma cacao*), mamey sapote (*Pouteria sapota*), black sapote (*Diospyros nigra*), *durian* (*Durio zibethinus*), papaya (*Carica papaya*), banana (*Musa* spp.), *melinjo* (*Gnetum gnemon*), coconut (*Cocos nucifera*) and chilli (*Capsicum annuum)*. Kapok tree's function both as living support trees for dragon fruit and as living fence trees. Its leaves are also used by farmers as animal feed. The planting patterns applied by farmers include: (1) dragon fruit–kapok; (2) dragon fruit–kapok–avocado; and (3) dragon fruit–kapok–other plant species. This diversity reflects farmers' adaptations in optimizing growing space to maximize the economic and ecological functions of each crop type. Farmers are advised to increase crop diversity to enhance the productivity and sustainability of dragon fruit agroforestry.

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