

A Review on *Dusun* as an Indigenous Agroforestry System Practiced in Small Islands

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Abstract

Since the ancient time, farmers in Maluku have practiced *dusun* as an agroforestry system to develop spices crops in some parts of the Maluku, such as Banda, Ternate, Saparua, and Seram islands. *Dusun* is an indigenous agroforestry model of the Maluku farmers, where perennial, annual, and forest crops are grown together. In *dusun*, the perennial crops are considered as main crops, while annual and forest crops are considered as secondary crops. The most important perennial crops of *dusun* in Maluku are cloves, nutmegs, sago, coconuts, cacao, and edible fruit trees. The dominated annual crops are cassava, sweet potato, cocoyam, yam, maize, beans, and vegetables, while forest crops in general are shading trees and timber species. *Dusun* has been known for a long time as a source of local security foods, because it support meeting daily needs of farmers, generate cash money, increase household income, and conserve the ecosystem. Therefore, *dusun* may be considered as a farmers' bank in some isolated islands.

Keywords: agroforestry, annual crops, conservation, *dusun*, forest, perennial crops

Introduction

Maluku Province consists of approximately 659 small islands and the total population is about 1.8 million people. The majority people are farmers (80%), governmental servants (15%), and others (5%). In general, the communities live in the coastal areas of each island. THE REGIONAL MALUKU PLANNING AND DEVELOPMENT BOARD (2005) reported that about 20% of small islands in Maluku Province are occupied by the communities, and the other islands are not inhabited. Most of the empty islands are atolls or coral islands and their size is smaller than 2 km². Therefore, the majority of the communities occupy only some islands, such as Seram, Buru, Jambena, Wetar, Kei, Ambon, and Lease islands.

The capital city of Maluku Province is Ambon, and it is located in Ambon Island. Ambon Town is the center places of offices, business, education, and culture. There are also some other small towns, such as Masohi, Piru, Bula, Tual, Saumlaki, and Dobo in different islands.

Maluku Province has about 5 million ha of forests, but the rate of deforestation is

predicted about 1.2% per year. The dominant factors of this problem are shifting cultivation, forest logging, and some other activities to change forest land to other uses, such as palm oil plantations, transmigration programs, and mining activities. To overcome these problems, the Forestry Department of Indonesia has introduced some national programs, such as Community Forest, 'Gerhan', One Man One Tree' and 'One Million Trees Planting'. However, these programs are not yet successful because of their incompatibility to local customs of farmers in Maluku Province. Therefore, *dusun* as an indigenous agroforestry system in Maluku, where forest trees are combined with the annual and perennial crops, must be in priority to consider as one of the national program for Maluku farmers.

Dusun in Maluku is almost similar to a multiple cropping system in Java and Malaysia, *taungya* system in Myanmar, or agroforestry systems in the other parts of the world. The difference is only in the priority crops species and management system. Spices, food, and fruit trees are the priority crops of *dusun* in Maluku; meanwhile in the other parts of Indonesia annual crops dominate in the system. In Java or other parts of Indonesia, the multiple cropping system or agroforestry system is more intensively managed than *dusun* in Maluku.

The main activity to do and develop by the indigenous farmers in Maluku is *dusun*. Some ethnic groups or family groups consider *dusun* as a livelihood, and therefore special rituals related to *dusun* have been developed by some ethnic groups, such as Wemale or Alone ethnics in Seram Island. These rituals are conducted by the head of the ethnic group (*kepala adat*) in the location where a *dusun* will be opened and developed, to ask the deity for permission, protection, successful activities, and the highest productivity of *dusun*.

Short History of *Dusun*

Dusun is an indigenous agroforestry system of farmers in Maluku, and in this system farmers grow a combination of annual, perennial, and forest crops. This model has been long time practiced by the Maluku peoples since the eighth century for planting spices. In the thirteenth century, Maluku was famous as a source of spices, and therefore it attracted the Asian and European traders. Today *dusun* systems are practiced by almost 50% of the small island farmers, while about 40% practice shifting cultivation, and about 10% practice permanent agriculture. *Dusun* systems are applied almost in all regions of Maluku; however, the majority are found in the districts of Central Maluku, Western Seram, and Eastern Seram.

Types and Characteristics of *Dusun*

Many types of *dusun* can be found in Maluku. There is a classification of *dusuns* based

on land owners, such as *dusun milik* (owned *dusun*, developed by a farmer in a land area of himself), *dusun dati* (communal or clan *dusun*, in a land of family groups), and *dusun negeri* (village own *dusun*, in a land owned by a village, managed for the needs of the village). Based on the performing process of *dusun*, a natural and an artificial *dusun* can be found. The natural *dusun* is established through the natural process without significant human intervention. For instance, *dusun sago* (sago palm forest), *dusun damar* (agathis forest), *dusun kayu putih* (*Melaleuca* spp forest), and *dusun mayang* (sugar palm forest). Human interventions in natural *dusun* are mainly focused on product extraction and processing. Meanwhile, the artificial *dusun* is established by in intervention of farmers who grow a certain combination of annual, perennial, and forest crops, with their activities from land preparation to harvesting. The examples include *dusun cengkih* (dominated by cloves trees), *dusun pala* (dominated by nutmeg trees), *dusun kelapa* (dominated by coconut trees), and *dusun coklat* (dominated by cacao plants). *Dusun* has been practiced for a long time by farmers in Maluku as an exertion land, which can support meeting the farmers' needs, because *dusun* has many different plants (MATINAHORU 2011).

The important characteristics of *dusun* are; (1) easy accessibility because *dusun* is located close to the residential area or village, (2) high species diversity, (3) consist of multiple combination of crops, including annual, perennial, and forest crops, (4) several harvest times of crop products, (5) semi-intensive management system, (6) with low economic values of the forest crops (MATINAHORU 2007).

The advantages of the *dusun* practices are; (1) reduction of the erosion and sedimentation during rainy season, (2) stabilization of microclimate and soil water system, (3) creation of laminar canopy structure, (4) increase of species diversity, (5) domination by species with high economic value, (6) increase of activities of wild animals, especially birds and microorganisms, (7) increase of quality of land and ecosystem, (8) making available security foods, (9) increase of household income, and (10) sustainance of local community customs. The main disadvantages of *dusun* are: (1) strong change of microclimate and animal habitats in the initial stage of land preparation, (2) low productivity of some crops because of high competition in growth space, radiation, nutrients, and water (MATINAHORU 2007).

Crop Species of *Dusun*

The important species of perennial crops are clove (*Eugenia aromatica*), nutmeg (*Myristica fragrans*), cacao (*Theobroma cacao*), sago palm (*Metroxylon sago*), and some edible fruits, such as durian (*Durio zibethinus*), Canarium nut (*Canarium commune*), kemiri (*Aleurites moluccana*), gandaria (*Bouea macrophylla*), langsung (*Langsium domesticum*), jackfruit (*Artocarpus heterophyllus*), mangosteen (*Garcinia mangostana*), avocado (*Persea*

americana), mango (*Mangifera indica*), and jambu (*Syzygium* spp.).

The main annual crops are cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*), ubimerah (*Dioscorea* spp.), taro (*Colocasia esculenta*), cocoyam (*Xanthosoma sagittifolium*), banana (*Musa* spp.), maize (*Zea mays*), peanut (*Arachis hypogaea*), and some vegetables, such as melinjo or genemo (*Gnetum gnemon*), bayam (*Amaranthus* spp.), long bean (*Vigna unguiculata*), sawi (*Brassica* spp.), cucumber (*Cucumis sativus*) and tomato (*Lycopersicon esculentum*).

The important forest crops are salawaku (*Paraserianthes falcataria*), lenggua (*Pterocarpus indicus*), gofasa (*Vitex gofusus*), pulaka (*Octomeles sumatrana*), teak (*Tectona grandis*), mahogany (*Swietenia macrophylla*), samama (*Anthocephalus macrophylla*), makila (*Litsea* spp.), and merbau (*Intsia bijuga*).

Usefulness of *Dusun*

Dusun contributes to meet daily needs of farmers. In a food security aspect, *dusun* can supply food, medicines, and cash money. LOUHANAPESSY (2010) reported that in Seram Island *dusun* contributed to each households a cash of about a million rupiah (USD 90) per month. While in Ambon Island each of farmer household earned about USD 210 per month (MATINAHORU 2011). In contrary, the farmers of Allang Village earned only about USD 70 per month (LOPUMETEN 2011), which means that farmers there obtained very small income from *dusun*. However, based on the analysis, it was shown that farmers income from *dusun* are inconstant because crop production depends more on the season, climate, and soil factors. Some perennial crops have a certain habit in their productivity if there is no intensive management. For instance, clove trees may give a high fruit yield only once in 5 years. However, if there is an intensive control of nutrients, pest, and disease, continuous production in every year can be reached (MATINAHORU 2011).

The importance of *dusun* in the conservation aspect are; (1) species diversity increases because many species are introduced into *dusun*, compared to monoculture agriculture, (2) erosion and sediments are limited by a root system, a canopy structure, and tree density of crops, (3) a water system and microclimate are more stable because of canopy and root density of crops.

Construction Process of *Dusun*

Based on the land conditions, two types of *dusun* have been identified. The first type is the development of *dusun* by opening “forest lands”. The activity stages of this type are; (1)

determination *of* forest land, (2) clearance of forest covers, (3) selection of important trees, (4) cutting of unimportant trees, (5) clearance of the land, (6) preparation of seeds or seedlings, (7) planting seeds or seedlings of annual and perennial crops, (8) construction of fences, and (9) protection and maintenance of the crops. The second type is to develop *dusun* by using “marginal lands”. Its activity stages are; (1) determination of a marginal land, (2) clearance of bushes or under-brushes, (3) clearance of the land, (4) preparation of seeds or seedlings of annual and perennial crops, (5) planting seeds or seedlings of annual and perennial crops, (6) introduction of forest crops, (7) construction of fences, and (8) protection and maintenance of the crops.

The principle difference between both types is the status of land conditions and the supplying process of forest crops. Trees selection and cutting are applied in the first type of *dusun* when the forest land started to open. Normally, the tree selection is a priority to keep the shading trees or timber species. This type is practiced by farmers with large forest land areas, such as farmers in Seram, Buru, and Jamdena islands. While in the second type, the supplying process of forest crops is done after the stage of planting annual and perennial crops. This model is applied in many parts of small islands, such as Saparua, Haruku, Ambon, and Kei islands.

Productivity of *Dusun*

The main problem of *dusun* is the low productivity of the crops; and the reasons are poor growth space, nutrients, and genotypes of the crops. Many *dusuns* are established without considering the space of growth, and therefore the crops there will be difficult to develop optimally and produce flowers and fruits (MATINAHORU 2011).

Many species of plants are grown in shaded areas because of canopies of the dominant and taller species. The next data are collected from farmers at Hative Besar Village in Ambon Island, where most farmers never consider supply of nutrients and growth space of the crops (SAHULATA 2008). Many crops do not reach the optimal production (Table 1, Table 2). For instance, one durian tree in the age of about 50 years can only reach about 30% production capacity from its total fruit productivity at the heavy harvest season (MATINAHORU 2011). If farmers can apply additional nutrients and control plant parasites, each crop can increase its productivity every year. The other reason of low productivity is the spacing among crops. In general, farmers believe that increasing the number of crops per area can directly increase total productivity, which is not necessarily true. The same problem of low productivity also occurs for the annual crops, as indicated in Table 3 (HATULESILA 2008).

SAHULATA (2008) reported *dusun* potentials of farmers at Hative Besar Village as shown in Table 4. Durian, *gandaria*, and mangosteen are grown by farmers in high density. In an

hectare of land for all levels of tree growth (seedlings, saplings, poles, and trees), they are the dominant species. The main reason is that they are famous fruits for local markets. Some of these fruits are specifically consumed or processed, such as durian fruits for fresh food, meanwhile, *gandaria* and mangosteen are for making juice.

Table 1. Productivity of perennial crops in *dusun* at Hative Besar Village.

No.	Tree species	Productivity (kg/tree/year)
1	Durian (<i>Durio zibethinus</i>)	50 – 70
2	Jackfruit (<i>Artocarpus heterophyllus</i>)	20 – 50
3	<i>Kedondong</i> (<i>Spondias pinnata</i>)	10 – 30
4	Canarium nut (<i>Canarium commune</i>)	10 – 20
5	Rambutan (<i>Naphelium lapaceum</i>)	5 – 20
6	Langsat (<i>Langsium domesticum</i>)	5 – 12
7	<i>Gandaria</i> (<i>Bouea macrophylla</i>)	5 – 10
8	<i>Jambu</i> (<i>Syzygium</i> spp.)	5 – 12
9	Mangosteen (<i>Garcinia mangostana</i>)	5 – 8
10	Nutmeg (<i>Myristica fragrans</i>)	3 – 6

Table 2. Productivity of forest crops in *dusun* at Hative Besar Village.

No.	Trees species	Productivity (m ³ /hectare)
1	<i>Lenggua</i> (<i>Pterocarpus indicus</i>)	1
2	<i>Pule</i> (<i>Alstonia scholaris</i>)	3
3	<i>Salawaku</i> (<i>Paraserianthes falcataria</i>)	2
4	<i>Samama</i> (<i>Anthocephalus macrophylla</i>)	3
5	<i>Titi</i> (<i>Gmelina moluccana</i>)	2

Table 3. Productivity of annual crops in *dusun* at Hative Besar Village.

No.	Crops species	Productivity (kg/species/year)
1	Cassava (<i>Manihot esculenta</i>)	50 – 70
2	Banana (<i>Musa</i> spp.)	50 - 100
3	Taro (<i>Colocasia esculenta</i>)	30 - 50
4	Peanut (<i>Arachis hypogaea</i>)	25 - 50
5	Maize (<i>Zea mays</i>)	50 – 80
6	Water morning glory (<i>Ipomoea aquatica</i>)	50 – 70
7	<i>Bayam</i> (<i>Amaranthus</i> sp.)	40 – 50
8	<i>Sawi</i> (<i>Brassica</i> spp.)	40 – 60
9	Cowpea (<i>Vigna unguiculata</i>)	50 – 70
10	Egg plant (<i>Solanum</i> spp.)	50 - 75

Table 4. Potential of edible fruit trees at Hative Besar Village.

No.	Crops species	Potential (individual/hectare)			
		Seedlings	Saplings	Poles	Trees
1	Durian (<i>Durio zibethinus</i>)	19	32	25	42
2	Jackfruit (<i>Artocarpus heterophyllus</i>)	2	1	3	4
3	Kedondong (<i>Spondias pinnata</i>)	-	-	2	3
4	Canarium nut (<i>Canarium commune</i>)	-	1	3	11
5	Rambutan (<i>Naphelium lappaceum</i>)	1	6	10	2
6	Langsat (<i>Langsium domesticum</i>)	8	24	33	22
7	Gandaria (<i>Bouea macrophylla</i>)	61	18	15	34
8	Jambu (<i>Syzygium</i> sp.)	8	3	2	6
9	Mangosteen (<i>Garcinia mangostana</i>)	13	26	12	16
10	Nutmeg (<i>Myristica fragrans</i>)	7	20	12	20

Conclusions

Conclusions from this study are:

1. *Dusun* is the local custom of Maluku farmers, and therefore it must be sustained as an important culture for new generation in Maluku Province. It has been practiced since the ancient time, and it is still continued by new generation in Maluku.
2. *Dusun* has many important roles to support daily needs of farmers and also to protect and conserve the ecosystem.
3. Productivity of *dusun* should be increased by supports of the regional government, especially in the aspects of management system, farmers' capacity, and the marketing system of *dusun* products.

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