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Management of Kaleka (Traditional Gardens) in Dayak community in Kapuas, Central Kalimantan

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Abstract: ***This study aims at describing the management of Kaleka (traditional gardens) in Dayak community in Kapuas, Central Kalimantan. The study was conducted in Tumbang Danau Village and Dahian Tambuk Village in Gunung Mas District, Central Kalimantan. The results of this study confirm that Kaleka is a form of a traditional garden in Dayak community, arranged in a pattern of agroforestry. Kaleka was first created under the system of shifting cultivation, maintained continuously to take the advantage of the diversity of the trees that grow in the garden. Kaleka today is considered as a form of inherited custom from the predecessor generations of the community. The current community inherited Kaleka from their forebears do not have any desire to change the composition of the plants planted on the gardens and to divide Kaleka in small plots as individual property rights. Kaleka is retained as belonging to the family. Kaleka is considered very important in Dahian Tambuk Village and quite important in Tumbang Danau Village. In both places, people agree that conservation is very important for Kaleka. Kaleka can be maintained and managed by the family which owns the garden, but they less agree if Kaleka is managed by social or government agencies. In order to preserve Kaleka, the community refuses that Kaleka is converted into oil palm plantations, or inherited by the way of being distributed among the heirs. In general, Kaleka is still seen as economically beneficial to the owner of Kaleka itself. In addition to having economic value, Kaleka also possess ecological values valuable for the society.***

Keywords: agroforestry, sustainable agriculture, biodiversity, local wisdom.

1. Introduction

Agroforestry is one of the approaches to the management of agricultural lands which has become a tradition in the life of Indonesian. Agroforestry is a system that has been known and reported to provide many benefits to human life. Agroforestry is able to properly maintain biodiversity, and thus very strategic for environmental conservation. Agroforestry practices in certain communities are inseparable from the knowledge of those local communities in managing natural resources. The researchers found that local wisdom and participation in the cultivation of home gardens through the agroforestry system approach is a key to the conservation of biodiversity on the island of Borneo [1] [2].

There are some terminologies used for describing gardens and home gardens cultivated though community-based traditional agroforestry systems, includingthe words such as "*kebun*", "*kebon*", "*pekarangan rumah*", "*Talun Kebun*", "*Munan*", "*Sinpunkng*" "*Lembo*" and "*Kaleka*". Such systems have been developed by the Indonesian people for a long time and have become an integral part of the sustainable land management [3] [4] [5] [6]. Kaleka is a traditional garden for Dayak community in Central Kalimantan province. Kaleka is composed of a variety of species arranged in agroforestry systems with various plants aged tens and hundreds of years old; they are all well-maintained. As for many traditional communities in Indonesia, Kaleka has important social, cultural, and religious aspects preserved and respected by the local community of Dayak as an integral system of their life. This community-based conservation system is an example of the best systems in the local community's contribution for environmental conservation [7].

In the past few decades, the ever-increasing development needs new areas to be developed as industrial and residential areas as well as for intensive monoculture agricultural lands. Scholars observe that there have been changes and dynamics in the diversity and structure of the gardens and home gardens in West Java [4]. The economic aspect is one factor behind the change in the structure of the plants in home gardens. In Poncokusumo Village, population and economic growth has altogether changed the apple orchards into permanent buildings. The dynamics of the spread of apple orchards along the corridor of Poncokusumo Village is a reflection of the region's economic growth and the need for residential space [8]. Kaleka in Central Kalimantan is one type of traditional gardens having the potential to change. The existence Kaleka in some villages in Central Kalimantan is an interesting phenomenon in the middle of the issue of transformation of tropical forest and community gardens into monoculture areas of oil palm plantations.

Scholars find out that traditional orchards around the world make a positive contribution to solving global environmental problems. The gardens maintained by traditional communities are known to play a role in economic and community food resilience in villages. Agroforestry systems provide an economic commodity and food materials in a sustainable manner. In the ecological context, gardens and home gardens contribute to the absorption of CO^2 and store carbon as biomass. Thus, gardens and home gardens with trees aged tens and hundreds of years old are critical in the effort to control global warming. The gardens and home

gardens also provide an important contribution to the conservation of soil and water [9].

The conservation of Kaleka as a form of agroforestry practice done by Dayak community also plays a strategic role in solving global, national, and local problems. As far, Kaleka is still maintained on an ongoing basis by the community. The background for the successful management of Kaleka in a sustainable manner by Dayak community has not been widely studied as a key aspect for Kaleka management strategies and recommendations. This is particularly relevant with the increasing threats to tropical forests and biodiversity in the forests of Borneo or Kalimantan. This study basically aims at finding out the background and the motives behind Kaleka sustainable and successful management.

2. Methodology

2.1 Study Sites

This study was conducted in Dahian Tambuk Village and Tumbang Danau Village, Gunung Mas District, in Central Kalimantan Province (Fig.1). Gunung Mas District is located in the heart of Borneo Island, covering the area of 10,804 km^2. Administratively, Gunung Mas District is divided into 12 Sub-Districts, namely Manuhing, Manuhing Raya, Rungan, Rungan Hulu, Rungan Barat, Sepang, Mihing Raya, Kurun, Tewah, Kahayan Hulu Utara, Daman Batu, and Miri Manasa. Generally, Gunung Mas District has tropical and humid climate with the average temperature of 20 -23° C, and the maximum temperature can reach 36° C. Dahian Tambuk Village dan Tumbang Danau Village are both parts Mihing Raya Sub-District, in which it is easy to find Kaleka. These two villages are located at very strategic roads corridors connecting Palangkaraya City and Gunung Mas District, which are now developing rapidly. The majority of the villagers work as farmers and smallholder farmers. Some of the villagers work in plantation and service business.

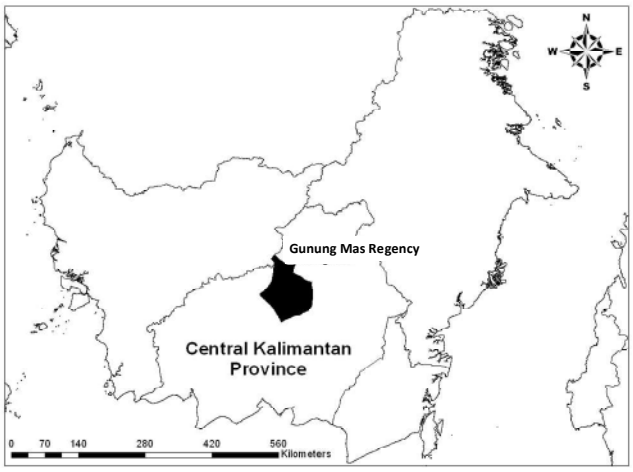

Figure 1: The location of Gunung Mas regency in Kalimantan Island (Adopted from Rahu et al., 2011)

2.2. Methods

A preliminary study was conducted prior the research to determine the profile of the community and ownership of Kaleka in Dahian Tambuk Village dan Tumbang Danau Village. From the results of this preliminary study, we determined the location of Kaleka and respondents to be included in the main study. The main data collection tool is questionnaire which contains a series of questions to determine the perception and management aspects of Kaleka among the community.

As many as 88 people lived around Dahian Tambuk Village dan Tumbang Danau Village were randomly selected as the respondents in this study; they were selected from all owners or family owners of Kaleka. To fill in the questionnaire, these respondents were helped by field research assistants whose guide the process of answering questionnaire items and ensuring that all questions were answered by the respondents. The questionnaire contained a set of questions to answer which were arranged using a Likert-scale system. Questionnaire filling was done in places that had been agreed by the respondents and the researchers, including, among other, homes, public places, and gardens. At each data collection activities involving the community as the respondents, the researchers started by introducing themselves and telling the intent and purpose of the research. The researchers were also doing introductions talks to establish good communication between the researchers and the respondents. To complete data related to Kaleka management, in-depth interviews were conducted.

The data obtained in the field was recorded in field notes and recorded using a tape recorder. Questionnaire filling and interview activities were done in less than one hour. After filling the questionnaire, the researchers checked the completeness the responses given by the respondents. All questions had to be answered for the ease of further analysis. The data obtained was tabulated and analyzed descriptively to explain the phenomena existing in the field.

3. Results and Discussions

3.1 Kaleka as a form of gardening heritage

Kaleka is a garden management system passed from one generation to the next in Dayak Kapuas community. According to the respondents, Kaleka was formerly made based on shifting cultivation which is then maintained within a period of decades to become such productive forest-based gardens. Kaleka is composed of a variety of species arranged in agroforestry systems with various plants aged tens and hundreds of years old, with a diversity of perennials, bushes, and shrubs that grow resemble tropical forests.

Kaleka is first made by opening the forest and bush clearance is done to provide arable land. The land opening could be done by a family. When the land is ready for planting, a diversity of staple crops along with annual crops are then planted. The main crops are grown primarily to meet the daily needs of the family owing Kaleka, while fruit trees and trees planted to be utilized in the future purposes. Crops are typically adaptive to dry land and are in forms of tubers. Crops are made to grow between the bigger trees. Thus, when the crops are unable to grow because of the influence of the tree canopies, the owner of Kaleka leaves the crops to die and gives the opportunity for a variety of perennial plants and fruits to grow. This pattern of shifting agriculture is common in traditional societies in Indonesia, Africa, South America, and other Asian regions. In Indonesia, the system is

still found in Sumatra, Sulawesi, Papua, and Kalimantan as traditional practices in cultivating the farmland [1] [10] [11].

In next steps of Kaleka succession, woody plants consisting of fruits and other commodity crops flourish and the land turns into such forest. In terms of vertical structure, the diversity of plants in Kaleka forms layers as seen in tropical forests. At the top layer are the higher plants forming a canopy. Under the canopy layer is a medium-sized plants. At the bottom layer herbs and shrubs are often found. The vegetation structure of old Kaleka is similar to a tropical forest. The fundamental difference is only in the social and economic value. Compared with tropical forests, Kaleka is different in terms that it is a place for commodities that can be sustained, utilized, and harvested from time to time. The same is also found in the gardens and home gardens systems with agroforestry-based management. In developing countries, economic interests and values are one of the many aspects to be taken into account when planting crops in home gardens [6].

Plants in Kaleka which have reached their climax are Durians (i.e.; *Durio zibethinus*, *Durio kutejensis*), Mangosteen *Garcinia mangostana*, Coconut *Cococ nucifera*, Rubber tree *Hevea brasiliensis*, and others. Previous surveys and reports noted that many woody plants have reached their maturity, plants such as Tamarind *Tamarindus indica* (plant diameter reaches 37-38 cm), *Durio zibethinus* (plant diameter reaches 31-38 cm), and *Peronema canescens* (plant diameter reaches 22 cm). Some of them was tall trees in Kaleka (Fig.2). Other woody plants are *Garcinia mangostana*, *Artocarpus heterophyllus*, *Heveabrasiliensis*, *Artocarpus champeden*, *Lansium domesticum*, *Dimocarpus longan*, and *Baccaurea motleyana*. Compared to some similar forms of gardens and home gardens in Java, Kaleka has more complexity and higher plant endemism [4] [6] [12]. Some of the plants in Kaleka are endemic to Borneo Island.

Figure 2: Old durian and numerous fruit trees grows in Kaleka

The ownership of Kaleka from one family to another rarely changes. Many family keep the Kaleka as permanent family gardens. This is the factor leading into the sustainable ecosystem of Kaleka from one generation to another without any changes in the structure of the existing vegetation. Recent generations of Kaleka maintain the types of vegetation that have been planted by their ancestors. It is a taboo for the local community to alter the composition of Kaleka vegetation in total. According to the local custom and belief, selling Kaleka to other is taboo and seen as humiliation and inability to maintain the dignity of the ancestors. Inside Kaleka, there often lies the tomb of the ancestors or the founders of Kaleka. A traditional ceremony is performed at certain times to commemorate and honor the ancestors who have opened up Kaleka. The Kaleka can be considered as sacred sites. There are many old Kaleka in Tahian Tambuk and Tumbang Danau which are considered important in Dayaks's spiritual value (Table 1). It is particularly important in many developing countries to maintain biodiversity [13].

Table 1: The establishment day of some Kaleka in Dahian Tambuk and Tumbang Danau

No	*Names of Kaleka*	*Location*	*Estimated first time opening as sifting agriculture lands*	*Age per 2013 (in year)*
1	Bereng Batu Landai	Dahian Tambuk	1812	201
2	Kasuhuri	Tumbang Danau	1862	151
3	Petak Rutus	Tumbang Danau	1860	153
4	Dahian Tambuk	Dahian Tambuk	1810	203
5	Tumbang Pundung	Dahian Tambuk	1956	57
6	Bukit Pukang	Dahian Tambuk	1898	115
7	Pukong Gohong	Dahian Tambuk	1910	103
8	Handuken	Dahian Tambuk	1930	83
9	Bukit Bajai	Dahian Tambuk	1925	88
10	Lutu Pulau	Tumbang Danau	1890	123

The analysis on the age of the ten Kaleka spreading in Tumbang Danau Village and Dahian Tambuk Village confirms that many Kaleka have an average age of 127.7 years (Table 1). The oldest Kaleka age is 201 years and has been passed down for3-4 generations, while the youngest Kalekais 57 years old. The existence of hundreds of years old of Kaleka provides for the conservation of large trees which are very strategic for biodiversity conservation and global carbon sequestration. The conservation of these old Kaleka is very crucial and can be an important aspects in nature conservation. Kaleka is one form of sustainable environmental management by Dayak Kapuas community. Culturally, the practices of traditional gardens management through Kaleka can said as an integral part of cultural landscapes in Central Kalimantan [14].

3.2 Local community perception to Kaleka

The existence and the future of Kaleka cannot be separated from the owners. With the increasing number of threats to forests and home gardens to be converted into oil palm plantations or other seed-based agricultural commodities, the perception of the public towards Kaleka becomes very important. The perception of Dayak community in Dahian Tambuk and Tumbang Danau toward Kaleka is presented in Table 2.

Table 2: Local community perception toward the ownership and management of Kaleka

No	*Questions*	*Likert scale*	
		Dahian Tambuk	*Tumbang Danau*
1	Kaleka is important in daily life	4.21	2.85
2	Kaleka should be conserved by community	4.89	4.27
3	Kaleka is managed under village regulation	1.69	2.04
4	Kaleka is managed by social organization	2.12	2.25
5	Kaleka officially was managed by district or provincial government	2.00	2.32
6	Kaleka is converted into oil palm plantation	1.35	1.97
7	Kaleka is divided to family members	2.20	2.31

From Table 2, it can be seen that Kaleka is considered very important in Dahian Tambuk Village and quite important in Tumbang Danau Village. Although there has been a slight difference in the ways the community perceives the important value of Kaleka, the respondents from these two villages agree that Kaleka in Central Kalimantan, especially in Dahian Tambuk dan Tumbang Danau, must be preserved. The reason behind the necessity for the preservation of Kaleka is to honor the ancestors who had been putting so much effort to open and maintain Kaleka for the sake of their descendants. This aspect becomes crucial key towards community participation in biodiversity management [15].

The respondents think that the conservation of Kaleka must be done by the owners or the descendants of Kaleka founders. The culture and tradition of harmonious society that is built on the spirit of "*rumah betang*" enables the harmony among family members to sustain the existence of Kaleka [16] [17]. Respondents in Dahian Tambuk and Danau Tumbang disagree that the management of Kaleka is handed over to the village government, social organizations and the provincial government. The local community feels that the management by the government or social organizationsis full with political interests that can threaten the existence of Kaleka itself. Kaleka is not an indigenous forest communally owned by the communities and governed by the country. Kaleka comes from a private initiative of a family as part of the effort to meet the daily needs of the current and future generations by planting variety of useful plants [7].

It is interesting that the respondents do not want change or Kaleka conversion into oil palm plantations. For the community, rubber is sufficient as a commodity. Changing the diversity of plants in Kaleka into oil palm is taboo because it means that they do not respect the ancestors who created Kaleka. In addition, in many Kaleka there are tombs of the ancestors of Dayak community. Oil palm plantations will displace these tombs, and the local community fear that they could no longer communicate with the ancestors through the sanctity of Kaleka. In many Kaleka, at a cetain time, a traditional ceremony named *Balian* is performed as to honor the ancestors. Taboo to do something is area with rich biodiversity lead to the protection of numerous living creatures in particular sites [13]. The local community disagrees with the option of dividing Kaleka into private properties (Table 2). In the ecological context, it can guarantee the integrity of the ecosystem because division into small parts does not happen to Kaleka. Habitat fragmentation and loss of habitat size is currently an important issue in an advanced conservation of tropical forest [18].

Kaleka from long time ago until now can survive possibly because several important factors and conditions, among others including (1) the simple lifestyle of the local people who seek to plant a variety of plants to meet their daily life, (2) the choices of the local people to plant crops following how the nature works, (3) the social aspect that is to divide the harvest to families and communities, and the absence of commercial aspects and profit, and (4) the diverse needs that can be met by utilizing the nature in such wise manners. The wisdom of the community is one of key for the recent existence of Kaleka. It is similar with the existence of many traditional land-uses management systems which are able to survive under recent rapid development [9] [11] [15].

For Dayak community in Dahian Tambuk and Danau Tumbang, Kaleka has important teconomic values because it can produce commodities for sale (Table 3). As a consequence of the economic potential of plant diversity in Kaleka, the economic revenue derived from Kaleka can be gained continuously. There are times during the year in which big economic value can be gained, such as during tapping rubber, durian harvest, or fruits harvest. Realizing that Kaleka is capable of producing economic values, then routine maintenance of Kaleka is performed by the owners of Kaleka. Maintenance is often associated with cleaning disturbing bushes, maintenance of roads to the gardens, monitoring the presence of nuisance animals, monitoring the seeds of new plants and possibly collapsed old plants, taking care of dead or damaged plants and other activities. There are no chemical fertilization applied, and soil fertility occurs naturally. Maintenance is mainly done to help increasing the productivity of the existing crops in Kaleka.

Interesting to note is that most respondents in Dahian Tambuk and Tumbang Danau are interested in trying new types of plants into their Kaleka. The local people are especially interested in the information obtained from the mass media such television or newspapers, and information from the local government. Fruit plants are plant species often mentioned as an interesting group of plants to be planted in Kaleka. Nevertheless, the nature of the introduction of new crops is limited and does not change the general composition of the existing plants in Kaleka.

Rubber is a kind of plantation crops growing in Kaleka. Rubber has long been grown in Kaleka together with durian, langsat, mangosteen, and other plants. Both in Dahian Tambuk and Tumbang Danau, rubber is regarded as an important crop.Until these days, the respondents considered that rubber plants in Kaleka in both villages are still productive and worthy to be maintained. Some Kaleka has attempted to regenerate the old rubber trees.

Table 3: The utilization of resources in Kaleka

No	*Questions*	*Dahian tambuk (%)*		*Tumbang Danau (%)*	
		Yes	No	Yes	No
1	Kaleka have economic value	90	10	85	15
2	To increase products, Kaleka is managed	90	10	87	13
3	Effort to introduce new crops	86	14	82	18
4	Rubber was important	88	12	80	20
5	Rubber productivity	High 91	Low 9	High 70	Low 30
6	Knowledge about medical plant inside Kaleka	87	13	82	18
7	Medical plants has potential economic value	91	9	89	11

3.3 Kaleka Contribution

From the statement of the respondents in this study, it is known that Kaleka has several important contributions to the life of the local community, among other is:

3.3.1 Maintain soil fertility

Kaleka system is believed to affect the fertility of the soil due to accumulation of soil organic matter. The amount of the accumulated litter and the richness of the soil organisms that degrade the litter is the key to soil fertility in Kaleka. According to the respondents, the indicatorsof soil fertility in Kaleka can be seen by the productivity of the abundant crops. According to the respondents, fertilization is not needed to be done in Kaleka. Kaleka will work alone to improve the quality of the land.

3.3.2 Increasing food diversification

Kaleka has a diversity of plants that can produce a variety of food to meet the needs of carbohydrate and protein. Learning from the past experience, cultivating only one kind of food is highly vulnerable to food availability. Kaleka contains high sources of carbohydrates from plant tubers. The fruits resulting from various trees in Kaleka are a good source of essential nutrients and vitamins to the community. In addition, it is identified that Kaleka has a variety of plants that can be used as vegetables. Diversity of food in traditional gardens has been reported by many researchers. This is a positive aspect of traditional farm management.

3.3.3 Providing sources of sustainable economy

In addition to food sources to meet the needs of the owners, Kaleka also provides economic resources that can be used continuously or sustainably. Fruit is a source of economic income that can be gained in a sustainable manner. Moreover, rubber is an important crop in Kaleka which is economically profitable. Other species that can be harvested is bamboo, rattan, and timber. The contribution of Kaleka resembles the benefits of the agroforestry systems that have been developed by other communities. Thus, Kaleka, together with other community-based agroforestry management models, can be driven synergistically into participatory conservation models made by local communities. In the global warming and rapid illegal logging in Kalimantan Island, Kaleka may be one solution and strategy for Kalimantan biodiversity conservation

3.2 Conclusions

Kaleka is a farm management system done by Dayak Kapuas community in Gunung Mas District whose existence is still preserved by the local communities. Many Kaleka are centuries old and have a diverse collection of plants that set up upper storey, middle storey, and lower storey layers. Many of the species in Kaleka are local and endemic species of Borneo Island. The diversity and complexity gives positive contribution to the conservation of biodiversity. Kaleka have a diversity of plants and ecosystems that benefit the daily life of the local community. The benefits from Kaleka causes people to preserve Kaleka passionately based on local community participation.

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