

Typology of *Pekarangan* for food self-sufficiency in Papua, Indonesia: A review

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Abstract

Pekarangan management in Papua has a different characteristic where the land use of the *Pekarangan* for the family in Papua is strongly influenced by cultural characteristics and associated with natural resources. The Papuan people are geographically scattered in islands, the coastal of lowland to the hills area and the mountains. The aim of this study was to study the type and characteristics of the *pekarangan* in Papua in relation to culture-based socio-economic status in the ecological zone of Papua. *Pekarangan* area had potential in the supply of family food, reducing household expenditures and increasing the income of farm households. Utilization of *pekarangan* area in Papua was very rich and varied in type, function and usability in a very strong influencing cultural perspective. Management of *pekarangan* area for food self-sufficiency should be encouraged based on local knowledge of the local community to meet the family welfare.

Keywords: Food Self-Sufficiency; Typology of *pekarangan*

1. Introduction

Farm management in Papua is likely still to be substantive. High plant biodiversity in Papua and abundant in nature have not been managed and fully utilized. The use of beneficial plants in terms of food, horticulture, industrial medicine, arts and culture is still rarely planted and utilized in *Pekarangan* of Papuan people. *Pekarangan* here is not only open land around the house, but also lands managed by the community for generations passed down by lineage and recognized in tradition or in traditional institutions (Salosa, *et al.* 2014). Plant biodiversity and potential use by traditional communities with local knowledge are necessary to be studied more in depth in the useful studies for potential development in Papua (Pattiselano, *et al.* 2015).

"*Pekarangan's* Indonesia" term has been quite popular among the expert involved in the field of ecology and agriculture in some countries such as the Netherlands and Japan (Arifin. 1995). Studies of *Pekarangan* have been carried out and associated with eco-biological problems, production aspect, socio-economic aspects etc. In potential point of view, *Pekarangan* is a plot of land located around the house with the clear ownership status and boundaries. They are only a sign of the stakes or trees in the corner of the *Pekarangan* or with fencing. The land is usually planted with various species of seasonal and annual plants such as grasses, herbs, shrubs, vines and tall trees. *Pekarangan* is a complex ecosystem, because beside the plants in the *Pekarangan*, we also find the livestock, fish ponds, wildlife, other building structures including activity elements of the human itself (Arifin. 1995).

Agricultural patterns in *Pekarangan* area is generally a mixture (multi-commodity). Farmers cultivate various commodities of annual and seasonal crops. They also may be as food crops, horticulture, plantation and even for

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livestock and fish (Ashari. 2012). *Pekarangan* has a role in the social and economic life of farm households. According to Sajogyo (1994); (Ashari et al. 2012), *Pekarangan* is called living barn, living store or living dispensary. It is called alive barn because food needs such as rice, maize, tubers and other foods are available anytime on *Pekarangan*. The materials are stored alive in *Pekarangan*. It is also known as an alive store, because useful vegetable to meet family consumption are available in *Pekarangan*, where the most households must buy it with cash. It is referred to as a living dispensary because various beneficial herbs in curing diseases traditionally are planted in *Pekarangan*.

Utilization of *Pekarangan* varies from one region to another, depends on the levels of need, social, cultural, educational communities, physical factors and the local ecology (Ashari et al. 2012). According to Sayogyo (1994); Ashari (et al. 2012), functions of *Pekarangan* are to produce: (1). Foodstuffs as rice from paddy and dry-land field; (2) vegetables and fruits; (3) flavors, spices and perfumes; (4) craft materials; (5) firewood; (6) cash; and (7) the livestock and fish. Therefore, according to (Arifin et al.2012), production of *Pekarangan* contributes to the 137.8 kcal of energy (1.97%), 4.0 g of protein (2.0%), 158.0 IU (12.55%) and 40.2 mg of vitamin C (23.70%) per family. They also stated in their study that the contributions of nutrients from the *Pekarangan* on the recommended dietary allowance (RDA) are 1.89% of energy, 1.92% of protein, 12.39% of Vitamin A, and 23.63% of Vitamin C. In fact, the statistical analysis showed that there is no real difference between the narrow and intermediate *Pekarangan* in family consumption from *Pekarangan* to both total consumption and the RDA. However, in general, the contribution of *Pekarangan* is considerably meaningful to the donation of both vitamins A and C.

As an archipelago with diverse ethnic and culture, it necessarily have distinctive features and patterns as well as different forms of the *Pekarangan* one another, including in the Papua where the territory is geographically different. This geographical conditions form a community with different patterns and cultural diversity. About \pm 275 tribal cultures meet these areas so that affect the model of land use including different types of the *Pekarangan* (Kartikasari. et al. 2012).

Agricultural activities widely developed in Papua are still subsistent which means that people just cultivate and consume their agricultural products, and if any surplus, it will be sold to the market. Utilization of land for farming by ethnic and cultural groups in the Papua which are nomadic or move from one place to another, still occurs for some ethnic groups. Based on the description above, it can certainly be assured that the management of *Pekarangan* area for the community in Papua is largely determined by the characteristics of the area, the type and local culture. Started from it, then what becomes the problem points are as follows: How the typology of the *Pakarangan* in the Papua? How is geographical condition of the area and the type of geomorphology in relation to the socio-economic activity and its ecological relationship in nature of Papua? This literature study aimed to analyze the typology of *Pekarangan* in Papua towards food self-sufficiency.

2. Material and methods

Tracing the research results of the field of *pekarangan* that has been published both in the form, function and model of its utilization. The review of the research on the *pekarangan* will provide a complete picture of how communities manage based on their ecological and socio-cultural conditions.

Geographically Papua is divided into 4 regions: archipelagic areas, coastal areas, lowlands and mountain areas. In the context for the management of *pekarangan* is important for the community to be able to manage their yardlands independently.

The life of people in Papua is still nomadic (moving) in terms of farming. Opening new areas for sedentary farming activities is very rare. However, the study of the *pekarangan* is very important to be developed to provide a kind of alternative for them how has been thought of the development of the *pekarangan*.

The model of land ownership or area for farming activities is communal. This has an impact on land processing. People tend to manage together. However, it is certainly influenced by the geographical position of the ethnic group. The people living on the coast have different cultural wisdom from people in mountainous areas as well as for other geographical areas.

3. Results and discussion

Based on a literature review, the *Pekarangan* in Papua mapped based on regional geomorphology was divided into four characters: a) *Pekarangan* with the people living on the coast, b) *Pekarangan* with the people living in the islands, c) *Pekarangan* with people living on inland (the lowland to the hills) and d) *Pekarangan* with people living on mountainous

areas. Mountains clearly dominated the geography of Papua from the west and to the east of the central mountainous line of including the Jayawijaya and Trikora summit (Kartikasari *et al.* 2012). Communities developed agriculture by planting fruits and vegetables with a temperature below 18 °C. Their farm quite well developed in that region (Salosa *et al.* 2014).

Vegetables and tubers were cultivated in a steep slope with a very simple technique: making the shed first and then planted with certain vegetables, corn and tubers. Different conditions occurred in communities in coastal and small islands where their type of agricultural development in the *Pekarangan* was only developed by areca nut (*Areca catechu* L) and coconut (*Cocos nucifera* L) which were predominantly found. According to Simatupang & Suryana (1989); Ashari, *et al.* (2012), it is quite difficult to clearly and unambiguously define the *Pekarangan* where this difficulty arises because the effort in the *Pekarangan* is factually continuous and it is a part of the extension of agricultural land use. The *Pekarangan* does not only serve as a homestead (house and home garden) but as a place for gardening and other farming activities.

The Papuan people living in rural areas (lowland to highland) to those living in mountainous areas depend entirely on agriculture by farming. This condition was different from the people living in the coastal area (lakes, swamps and rivers) to the islands where their livelihood laid on their activities as fishermen. Therefore, their life highly depend on sea, rivers and lakes. Activity in *Pekarangan* done by them was not as intensive as inland and the mountains communities which were very intense in farming.

Papua Island is divided into seven indigenous territories as presented in cultures (Fig 4). Geographical conditions of the region were closely related with social and economic activity raised by the people of Papua in the agricultural sector. Coastal and small islands communities more prefer the fisheries as a permanent business unit performed by them. The agricultural activities carried out by them were only as a side job. For example when scarcity period (waves, wind) or specific rainy season caused them should be farming. Agricultural activity was only a side job and performed on a narrow land. Their main activity was as fishermen to catch fish and then the results were consumed and the leftovers were sold to the market.

It is quite different with inland and the mountains communities who fully depend on their livelihood on farming activities. Agricultural activities were usually carried out, in general, by the mix of the garden. Mix garden in here is where they cultivate fruits, vegetables and tubers together in one area of their farm (their *Pekarangan*). Agricultural activities were also substantive i.e. they cultivate for food and the rests are sold in the market. However, in their *Pekarangan*, livestock such as, in general, pig, chicken, cattle, usually can be developed. Pigs were very dominant for inland communities because there were strong social and cultural values in the context of a treasure that can show the existence or higher social status in the community if that people have a lot of livestock. Livestock management continues to receive guidance from relevant technical agencies in improving the quality of livestock in Papua. Most livestock was imported from outside or new species which had been developed through government programs. Pigs were used as a dowry payment for most people in the central mountains. Therefore, livestock management is economically profitable but socially has a high enough value to be reckoned within the community on particular ethnic groups in Papua for dowry payment procession.

Development of the agricultural sector in the mix of garden, home garden or the potential development of livestock and aquaculture had a great opportunity to be developed in the *Pekarangan*. On the other hand, the food needs of the community will continue to increase over time so there need to be better studies related to ecological zone considerations associated with extending the agricultural land settled in the fulfillment of community needs of food.

Southern Papua consists of many rivers and marshes while in the central mountainous region consists of hills and rugged mountains, while in the northern region consists of sandy beaches and rocky so that it can be ecologically considered for development in the agricultural program in accordance with the ecological conditions. Papua has a wet climate, which is not common in the context of Indonesia and globally. The vast mountain areas are too wet and cloudy so they do not support plant life. This moisture protects Papua from dryness and maintains heat balance. Mountain ranges formed during the Tertiary period determine parameters of climate where biota of Papua has been adapted to a broad range of heat but local diversity is low. Even the movement of ice which lowers the boundary line of snow does not significantly affect the surplus moisture in general except for the southern Papua. The impact of global warming may also be limited because the rainfall and variations will increase due to the influence of more frequent and severe El Nino and La Nina. Severe freezing of El Nino in the future will destroy important species that are sensitive to freezing at the top of the mountain forests and limit agricultural activities (Kartikasari *et al.* 2012).

3.1 Type and typical *Pekarangan* of Papua

Pekarangan has a role in the social and economic life of farmer households. According to Sajogyo (1994) in Ashari et al. (2012), *Pekarangan* is called as a living barn, living store or living dispensary. It is called as living barn because food needs such as rice, maize, tubers are available anytime in the *Pekarangan*. As the research conducted in Nigeria, most plants developed experienced cultivation by 60% over 15 years (Ogwu, et al. 2014). According to (Arifin.2013), *Pekarangan* from the ecological point of view is the integrated system of land and has a strong relationship between the human being as the owners or occupants with crops, fish, wildlife and livestock. In Papua, we can find vegetables, fruits, tubers, livestock in *Pekarangan* of the people of Papua with the different type and characteristics too.

Most farming techniques adopted by local farmers (the Papuan people) were still shifting cultivation. Shifting cultivation system was still applied in most areas of Papua. The main purpose of farming was especially to meet basic household needs (survival agriculture). Land clearing activities in Papua were built by two main properties; which was to meet the needs but also to expand the access to land ownership. Therefore, understanding the *Pekarangan* in Papua was greatly influenced by the strong culture and tradition of Papua. The people of Papua is still developing a farming system characterized by a subsistence characteristic that was still far from a market orientation in which the results of production that is not consumed is usually sold in very small quantities. A research conducted by Linger (2014) in Ethiopia found that the home garden with agroforestry techniques can significantly increase income compared with monoculture agriculture developed by the community. Farming techniques with agroforestry approach have been long done by the people in the archipelago, coastal lowland to mountainous areas of Papua but cannot be measured economically.

On the other hand, certain population groups in Papua used shifting cultivation by opening new land or cutting down forests designated as agricultural areas. In general, shifting cultivation will damage natural ecosystems and improve critical lands, erosion, flooding and landslides. This farming culture is very difficult to change due to nomadic lifestyle has a high level of mobility (moving from one place to another) so that the clearing process carried out by a particular ethnic group continues to occur. Generally, the cleared land was subsequently fenced to avoid and keep the plant was not harassed and damaged by wild pigs. As noted in the study by Arifin et al., (2008) the physical environment of contextual represents especially agro-climatic conditions and edaphic factors (source of parent material) has been known along the wet agro-climatic zones that have a more diverse species.

After clearing, cleaning and burning of branches and other crop residues were done. The land is then processed in the traditional way using a drill to make a hole in the ground for planting seeds. Maintenance of cultivated plants had not been almost done and the plants were allowed to grow sober. Farming system in this manner is still being conducted so that changing the culture of planting that has been long done by farmers Papua requires time, effort and long enough patience.

Labor used in farming activities were generally sourced from households. Labor from outside household was very hard to find. This related to the area of the land cultivated farm was not too vast and generally on a small scale to meet the needs of the household. In such circumstances, every farm households would use the manpower of the household optimally. The activity of Papuan women in the fields and gardens include cleanup activities of small trees and shrubs, land preparation, planting up to harvest time. Women dominated the farming activity compared to men. It occurred because, in the tradition of Papuan people, an adult female proposed generally received a higher value of dowry. Instead, women who had a family and as a wife were obliged to work and was responsible for the family domestic affairs. Such tradition greatly affected the productivity of agricultural labor. The effectiveness of women in farming activities was very low and not able to provide adequate farm output for the needs of their family. On the other hand, men generally spare their time to laze around or hunting (in the past) and this condition was very difficult to change.

The food needs of the farmers can be sourced from the food produced and sourced from outside the farming operation. Besides consuming tubers produced which is also a staple food, local farmers also consumed rice. The rice was not only obtained from the market, but also poor rice (beras raskin) provided by the government that was free of charge (aid) to each “kampung” office (the village in Papua term). Consumption of rice was not only when the money was available, but also the shape of the variety of food consumed.

In addition to crops, meat and fish consumption of freshwater were obtained from rivers and lakes for communities along the coast and in the area of swamps and rivers. Meat needs such as pork, beef and chicken were increasing from time to time. Livestock activities and freshwater fisheries can be conducted in a cage or left meadow grazing but also for the cultivation of freshwater fish in the lake for some people to make keramba and floating net keramba (KJA). According to Arifin et al (2008), chicken, goat, and sheep and cattle for meat and milk are most animals commonly kept

maintained in the home garden land by 38%, 23% and 7% and 19% and 6% of families, respectively. Furthermore, dimension to the designated number of fish, goats, cows and ducks are most pets commonly found in the tread.

3.2 Economic relations between social status and characteristics of *Pekarangan* land management

The plant species included tubers, vegetables, fruits, could generate money for local residents. They cultivated it especially in a place with such a small scale in the mountains of Bintang, Merauke and Kerom. However, in some places, Papuan people cultivate areca nut (*Areca cathecu* L) that were often consumed by people as bound by the local culture.

People income came from farming of tubers were not too high because these plants were cultivated to meet household food needs only. Tubers yield were sold in small quantities due to abundant production with the selling price of IDR 50.000, - per stack (Fifty thousand rupiah per stack), equivalent to 1.5-2 kg of weight which this price was the selling price in the city of Jayapura. This condition was sad because people more tend to buy rice at a price of IDR 8.000 per kg and it encouraged people to prefer rice instead of buying cassava or taro in the Market. But if we pair it with rice consumption at the national level, it is also still declining. According to Arifin (2013), rice consumption per capita in Indonesia, based on BPS 2012 is 113 kg per person per year, lower than the previous year, i.e. 139 kg (Arifin.2013).

Institutions that support a farm can not be separated from the farmers, extension, capital and marketing institutions. The existence of these institutions will encourage the attainment of the objectives of farming goes well. This is due to the role played by the four institutional aspects that will support each other. Institutional farmers had been formed well even in every district. There were also formal institutions regulated by the Department of agriculture and food crops in every district.

3.3 *Pekarangan* development focus associated with ecological zone in Papua

Papua is an extension of the Australian continental plates that form the surface water flow inhibitor in the western Pacific to the Indian Ocean. Therefore, the surface of the sea water is moved across the Pacific so that the hottest part of the planet is accumulated in western Pacific, in the north of Papua. Biodiversity condition in Papua is believed to be the result of various types of amazing environments, including the highest mountains in the Asia Pacific region and the only one that has tropical glaciers in Malesia (Whitmore.1975, Magen.1993, Kartikasari, et al. 2012).

Forest and land in Papua are still claimed by indigenous people although when they are juxtaposed with the National Law, all the land are controlled and managed by the state. Most people are still very dependent on forests and other natural resources to meet their needs. Land management system is more focused on the zoning system. Therefore, it is important to establish a new management system that allows low-impact activities and utilization of traditional communities. Linger (2014) says that a home garden (*Pekarangan*) with agroforestry models easily provides the needs of the community, and is economical, socio-culturally and ecologically able to contribute to farmers associated with climate change.

Therefore, the challenges in optimalization implementation of *Pekarangan* need to be regulated in considering not only the cultural aspects but also ecological aspects. Cultural and natural environmental conditions are highly related to high exposure, so as to manage natural resources to focus on home gardening activities should take into account the ecological aspect of any existing zones. These aspects would strongly be associated with damage or loss of biodiversity. Lots of plants in Papua have not been studied especially in their measurable benefits and eventually the plants are already extinct or dead. For example, red fruit (*Pandanus conodineus* L) which was forests plant, it is cultivated today in the *Pekarangan* of the community as a plant that has a high potential to be developed for health.

This ecological study aims to explore as many as possible plants in the forests of Papua that the benefits are not yet known to be raised and developed in their *Pekarangan* of the community. Efficacy and endemic plants can be studied and researched deeper so we will ultimately develop them in our *Pekarangan*. Some people with local knowledge know much about the benefits of forest plants that have not been scientifically proven. Furthermore, through ecological studies we are able to link the benefit values of the plants in aspects of indigenous culture and property values that can be obtained from these plants, can be further developed. Furthermore, according to Linger (2014), *Pekarangan* practice with agroforestry approach is able to provide the needs of the community from the social aspects of economic and ecological services for farmers and could be useful for micro climate regulation. Agroforestry approach we can practice in ecological zones in Papua highly varies ranging from coastal areas, islands to lowland and highland or mountain peak region. Other research also states that farm households in the coastal areas of Papua are highly dependent on agricultural products sold to the market (Antoh, et al., 2018).

According to Mohri et al. (2013) that *Pekarangan* is also traditionally able to maintain and protect ecosystems with high biodiversity, especially in the villages area, but not necessarily be able to change people participation from substantive agricultural activities towards commercial agriculture. This is in line with studies that have been conducted previously that generally the *pekarangan* of coastal villages in Papua have moderate biodiversity values (Antoh, et al., 2019). Coastal of *pekarangan* in Papua also differ from those in mountainous areas which are more dominated by cassava and sweet potato species (Antoh and Raunsay, 2019). It is also arising in the community of Papua who is still very comfortable to cultivate and eat their own, and then the rests can be sold on the market.

4. Conclusion

Our literature study conclude that the type and characteristics of the *Pekarangan* in Papua were greatly affected by geography and geomorphology of area that displayed the various type, shape, area and volume; Social and cultural conditions greatly affect the pattern and shape of the *Pekarangan* and economic activities of the *Pekarangan* included in one of the farming types of communities. Furthermore, ecological considerations become important in generating ideal forms and types *Pekarangan* related to the issue of biodiversity loss as a result of shifting cultivation. But it is also important means in the protection and preservation of the benefits value of the biodiversity potential in Papua.

Compliance with ethical standards

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