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Regular Research Article

Homegarden Ethnobotany of Two Saibatin Villages in Lampung, Indonesia: Species Diversity, Uses, and Values

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Abstract: Since homegardens reflect a culture of a particular ethnic group, the study in homegardens provide unique insights into ethnobotany. The Saibatin sub-tribe in Lampung has extensive uses for plants, but an ethnobotanical study of their homegardens are still lacking. This study aimed to describe the structure and composition of the Saibatin community homegarden and to explain the diversity of plants and the usage patterns through an ethnobotany perspective. The study also aimed to elaborate species with social-economic and ecological functions and to describe the overall functions of homegardens. Ethnobotanical data were collected using participant observation methods, which were complemented by questionnaires. We determined the key respondents and common respondents using the purposive sampling and snowball sampling method, while homegarden plant species diversity was identified using vegetation analysis methods. The results showed that 3 size categories of homegardens are present in this area, including narrow, medium, and broad. The homegarden structure consisted of hadap/tangebah (front yard), gelekhan (side yard), and kudan (backyard). Six types of habitus composed the homegarden structure, namely herbaceous, epiphytes, shrubs, trees, succulents, and vines. The homegarden species richness index (DMg) in Way Jambu Village (WJA) (17.34) was higher than Labuhan Mandi Village (LMA) (16.87). Even so, the homegarden plant diversity (H') and evenness (J) in LMA was higher than WJA. There were 16 plant usage categories used by the Saibatin community (WJA 15; LMA14). Foodstuffs were the usage category of homegardens with the highest number of species in both villages. The species ICS value ranges between the two villages were relatively similar. The highest ICS species in WJA was *Cocos nucifera* while in LMA was *Cymbopogon citratus*. By studying ethnobotany of Saibatin sub-tribe homegarden we conclude that the three main roles of the homegardens are to provide social-economic impacts, ecological services, and representing the cultural value of Saibatin community identity.

Keywords: ethnobotany; homegarden; lampung, west pesisir; Saibatin community

1. Introduction

A homegarden is defined as ready-to-use traditional land located around residential areas that are planted with a number of plant species and maintained by family members and the crop production is intended for household consumption (Sherstha et al., 2001). One of the many factors that influence the diversity of homegarden plants is the culture of an ethnic group (Wiersum, 2006; Galhena et al., 2013). The homegarden is closely related to the life of the owner (Galluzzi et al., 2010). Homegardens function as an important food source that supplies tubers, fruits, and vegetables for households (Galhena et al., 2013) and indicates the social status and economic level of a family (Coomes & Ban, 2004). Moreover, homegardens with high plant diversity act as *in situ* conservation sites especially for local species (Sherstha et al., 2001). In the tropics, homegardens have high plant diversity but the threats to the preservation of plant diversity are quite alarming such as the need for land expansion due to population growth and transformation of plant composition due to changes in owner lifestyle (Wiersum, 2006).

Lampung is a province in Sumatra in which the communities are composed by various ethnic groups. This matter causes ethnobotanical research of Lampung homegardens in particular ethnic

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becoming fascinating. Unfortunately, the studies of Lampung homegardens that have been conducted were still limited to the homegarden landscape components, while the structure and plant composition is not well studied (Pratiwi & Gunawan, 2017). In addition, there is a community in Lampung called the Saibatin sub-tribe who still closely adhere to traditional cultural customs passed down through many generations. The Saibatin community live in areas reaching from coastal areas to the hills and mountains which are follow along the coast of Lampung (Friscilia, 2015) overlapping with West Pesisir Regency. The culture of plant usage by this community is extensive evident from the use of patterns and shapes of certain plant in cultural artifacts, such as the design of the Lampung traditional cloth called tapis (Budiman, 2013), flower shaped decoration on women's crowns (Hidayat et al., 2017), and various household and garden tools originating from plants. The Saibatin community also uses a variety of plant species to complement the implementation of various traditional rituals (Habsary, 2017).

Based on these overall backgrounds, we have sought to conduct an ethnobotanical study of the Saibatin sub-tribe homegarden. The study aimed to: (1) describe the structure and vegetation composition of the Saibatin community's homegardens in West Pesisir Regency, Lampung; (2) assess the diversity of plants of Saibatin homegardens and how the community uses those plants; (3) explain homegarden plant species that have social, cultural, economic and ecological functions; and (4) describe homegarden main functions for the Saibatin community.

2. Materials and Methods

2.1 Study Area

This research was conducted at two villages (*pekon*) in West Pesisir Regency, Lampung, Way Jambu Village (WJA) and Labuhan Mandi Village (LMA) (Figure 1). WJA Village is located on the coast of the Indian Ocean to the westand the total area of WJA is ± 799 Ha. It lies at an altitude of 0-200 meters above sea level. The range daily temperature is about 26ºC—35ºC and rainfall ranges between 1,500 to 2,000 mm per year.The topography of this village consists mainly of coastal and low-lying areas. There are also swampy and high-altitude areas also found in a small portion of this region. Meanwhile, LMA Village is located in the highlands, in Way Krui Subdistrict, West Pesisir Regency. This village is directly adjacent to Bukit Barisan Selatan National Park (TNBBS) in the north. The total area of the LMA village is about ± 1,000 ha. It ranges from an altitude of 200-400 meters above sea level. The range daily temperature is 22ºC - 32ºC and rainfall ranges between 3,000 to 3,500 mm per year. The topography of LMA consists of highlands intersected regularly by ravines. The village area is occupied by *repong damar* agroforestry that cover around 89% (± 894 Ha) of the total village area. The two villages were chosen because of the difference of their geographical conditions, which allows for comparative analysis of home gardens in lowland and highland areas.

2.2 Ethnobotanical data collection

Data were collected from October until December 2018, and then data processing and analysis was carried out from June to September 2019. We determined the key respondents and common respondents using the purposive sampling method. Key respondents were local experts who have more knowledge than other respondents, selected based on information from village chiefs, traditional elders, farmers, traders, medicine shamans, and traditional birth attendants (Vogl et al., 2004). Other respondents included residents who own homegardens, determined by purposive sampling method and continued by a snowball method of sampling at least 35 people aged 20 to 70 years in each village (Hoffman & Gallaher, 2007). Afterwards, ethnobotanical data were collected using participant observation interviews and questionnaires (Gómez-Beloz, 2002; Vogl et al., 2004). The use of these two methods aimed to understand ethnobotanical knowledge of the Saibatin

community. The ethnobotanical data collected consisted of plant usage categories, the importance level of plant species utilization, and the main role of the homegarden for Saibatin community.

2.3 Data collection of plant diversity

Data of homegarden plants were collected together with respondents by visiting the respondents' homegardens. We recorded the local names of each plant and then later searched the scientific name. If there were unknown species of plants, the plants were collected and made into herbarium and were identified in the Laboratory of Plant Resources and Ecology, Department of Biology, Faculty of Mathematics and Natural Science, IPB University. The voucher specimens were stored at the herbarium of this laboratory. The scientific names were verified by referring to http://www.plantsoftheworldonline.org/. The structure and composition of homegardens were assessed by observing the division of homegarden space, homegarden area, number of species per homegarden, and type of plant habitus. The homegarden plant species diversity was identified using vegetation analysis methods (Soerianegara & Indrawan, 1998).

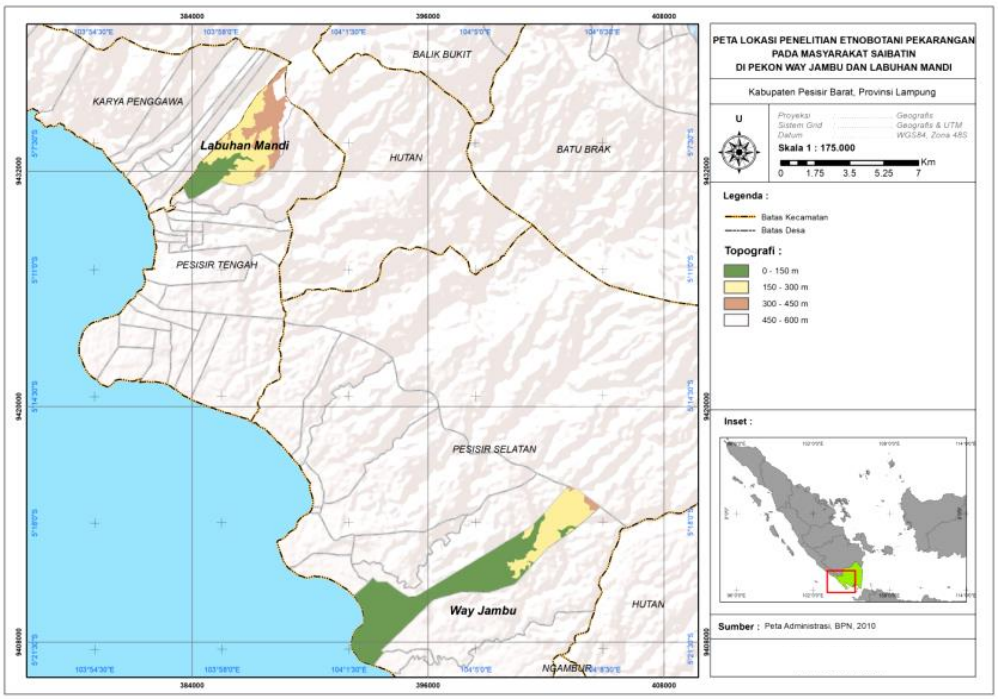

Figure 1. Research location of Saibatin community homegarden in Way Jambu and Labuhan Mandi Village, coloured areas are the research site, which located on West Pesisir Regency in Lampung Province, Indonesia

Vegetation analysis was carried out by measuring the total area of the selected homegarden firstly, then determined the number of the quadrant sample. Vegetation samples were taken at least 3 plots for homegarden in size <800 m^2. A size plot of 20x20 m was made for trees, 10x10 m for stakes, 5x5 m for poles, and 2x2 m was made for the ground vegetation. Every habitus found was counted and recorded in the field book; the height was also measured used hagameter. In order to obtain the vertical structure profile of the LMA and WJA village's homegarden, an analysis of height and number of individuals per species was carried out. The result of the analysis was presented in the table to facilitate the drawing process. To draw the overview schematic of homegarden's vertical structure in both villages, we selected the dominantly encountered plant species at the site. In addition, the physiognomy of the dominant species was also observed one by one.

2.4 Data Analysis

Data of the homegarden structure, plant usage categories, and homegarden role were analyzed using a qualitative approach and presented in the form of sketches, tables, or diagrams. Composition of the homegarden plant diversity was analyzed qualitatively and presented in diagrams and quantitatively analyzed by using the following analysis,

The homegarden species richness was calculated using Margalef Index (DMg),

$D_{Mg}=\frac{(S-1)}{ln(n)}$

where *S* is the number of taxon and *n* is total of all taxon(Magurran, 1988).

The homegarden plant diversity was analyzed using the Shannon-Wiener Index (H') (Magurran, 1988),

$H = \sum \frac{n_i}{n} ln\ (\frac{n_i}{n})$

where *ni* is the number of taxon *i*, and *n* is the total number of taxon *I*.

The level of evenness of species in both villages was calculated using the Pielou Index (J) (Magurran, 1988),

$J = {}^{H}/_{lnS}$

where *H* is the result of the Shannon-Wiener index and *S* is the sum of all taxon.

The level of importance homegarden plant species was analyzed quantitatively by calculated Index Cultural Significance (ICS) each species (Turner 1998 in Hoffman &Gallaher, 2007). The calculation of the index value is as following,

ICS = $\sum_{i=1}^{n}(qxixe)$

where n is the use value of a species; q is the value of the quality of the use of a species; i is the value of the intensity of use of a species; and e is the value of the exclusivity of using a species. Hereafter the various species whose high ICS value would be presented using table to show that those plants play an important role at both villages.

3. Results and Discussions

3.1 Homegarden structure and composition

As many as 40 homegardens in the WJA Village and 30 homegardens in LMA Village were successfully surveyed. The total numbers of respondents were 55 people in WJA and 38 people in LMA. The size of homegardens in WJA ranged between 141m^2—5,794 m^2 while homegardens in LMA had a narrower size range, which were 62.5m^2–3,940m^2. The homegarden size were much smaller than the others homegardens found in tropic region, such as in VacaBraca, Brazil with size range of 320 m^2–15,982 m^2 (Carvalho et al., 2013) and homegardens in Barak Valley, India with size of 200 m^2–12,000 m^2 (Das & Das 2005). Based on the 2013 Tax Return Letter of Land and Building [SPPT-PBB] in Indonesian Law No. 12 of 1994, the homegarden sizes were divided into 3 categories, namely, narrow (≤500m^2), moderate (501-1,500m^2), and broad (≥1,500m^2). Based on that categorization, narrow homegardens were the most common homegarden size in both villages, i.e. 65% in WJA and 76% in LMA (Table 1). The same homegarden categorization was also found on a study of homegarden around the Napu Valley, Central Sulawesi. Homegarden in that area were categorized by size, age, and species composition (Kehlenbeck & Maass, 2004).

Table 1. Homegarden size categorization in Way Jambu (WJA) and Labuhan Mandi (LMA) Village, West Pesisir Regency, Lampung along with range of species number founded

Categories	Small		Medium		Large	
	WJA	**LMA**	**WJA**	**LMA**	**WJA**	**LMA**
Number of homegarden	65%	76.6%	17.5%	13.3%	17.5%	10%
Number of species (sp.)	2—36	3—60	15—55	26—36	15—40	30—49

The number of species found in the narrow homegardens in WJA was fewer than in the medium and broad categories. In contrast, the number of species found in the narrow category homegardens in LMA was far more in number than the medium and broad categories (Table 1). This result showed that the area size factor did not affect the richness number of plant species in the homegardens (Coomes & Ban, 2004; Carvalho et al., 2013). This is contrary to the results of the homegarden study in other tropic regions which stated that more variations in species composition were encountered with increasing homegarden size (Das & Das, 2005; Larios et al., 2013). The findings revealed that homegardens with larger sizes probably used to grow certain species of plants in large quantities that are used to increase income by the owner. Therefore, its plant diversity was not as high as narrow yards in those villages. It becomes clear with the explanation revealed by Albuquerque et al. (2005) that homegarden size tends to increase the number of individual plant species but not on the diversity of species. Thus, factors that affect the number of homegarden plant species can vary, such as the owner's personal preference, knowledge, and requirement to have a great influence ton umber of homegarden plant species (Coomes & Ban, 2004; Kehlenbeck & Maass, 2004; Huai & Hamilton, 2009).

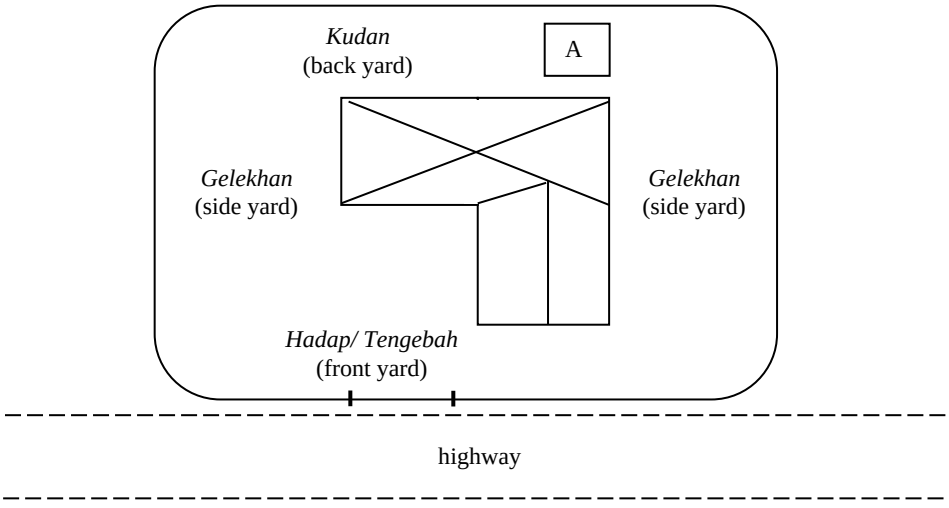

Figure 2. The formation of space structure of Saibatin community homegarden at Way Jambu and Labuhan Mandi Village, in West Pesisir Regency, Lampung; *sakhang kayu* – firewood hut (A)

Gelekhan/ *gekhil*or the side yard is generally planted with ornamental plants, spices, and medicinal plants. As for the narrow homegardens, side yard was left empty and used as a connecting way between the front yard and back yard. Next, the back yard (*kudan*) was used for storing firewood (Figure 2). This part was usually planted with fruit, vegetable, spices, and medicinal plants. Backyard at WJA was relatively broad because many homegardens in this region was connected with plantations without any border. This type of plantation is similar to Low Vaca Brava, Brazil which plantations are included in the homegardens' area (Carvalho et al., 2013). As many as 17.5% of the

WJA homegardens (≤5,794 m^2 in size) had plantations in the backyard. Meanwhile, the backyard area of the LMA homegardens tended to be narrower (≤3,940m^2 in size) with a percentage of about 10% of the homegarden joined with the plantation. In the backyard of some of the households at both villages, we also found livestock stables. The species of livestock included goats, chickens, and cows.

At least 6 types of habitus composed the homegarden structure in WJA and LMA Villages; herbaceous, epiphytes, shrubs, trees, succulents, and vines. Herbaceous or herbs are not both flowering and sterile shoots present, plant dying after flowering; also this habitus type are not woody, often green, rather juicy, and soft. Epiphytes are herbaceous or woody plants growing on the boles or branches of others, not parasitic on the host plants, but on a fungus. Shrubs are woody plants of sizeable height which donot have main stems but have several similar sized ones, originating from the ground level (Vogel, 1987). Trees are perennial woody plants with secondary thickening, with a clear main trunk. The distinction between tree and shrub is fluid, but generally accepted to be dependent on the single trunk, and on height, a tree being at least 2-3 m tall. Succulents are plant with thick, fleshy and swollen stems and or leaves, adapted to dry environments (Beentje, 2016). Meanwhile, vines are usually woody plant climbers with specialized climbing organs (Vogel, 1987). Based on our research, the herbaceous type were the most frequent habitus encountered in homegardens in both villages (WJA 87 species; 75 species LMA). This was followed in number by trees (WJA 69 species; LMA 65 species), shrubs (WJA 48 species; LMA 50 species), and vines (WJA 16 species; LMA 11 species). Another habitus were found only less than 10 plant species (Figure 3).

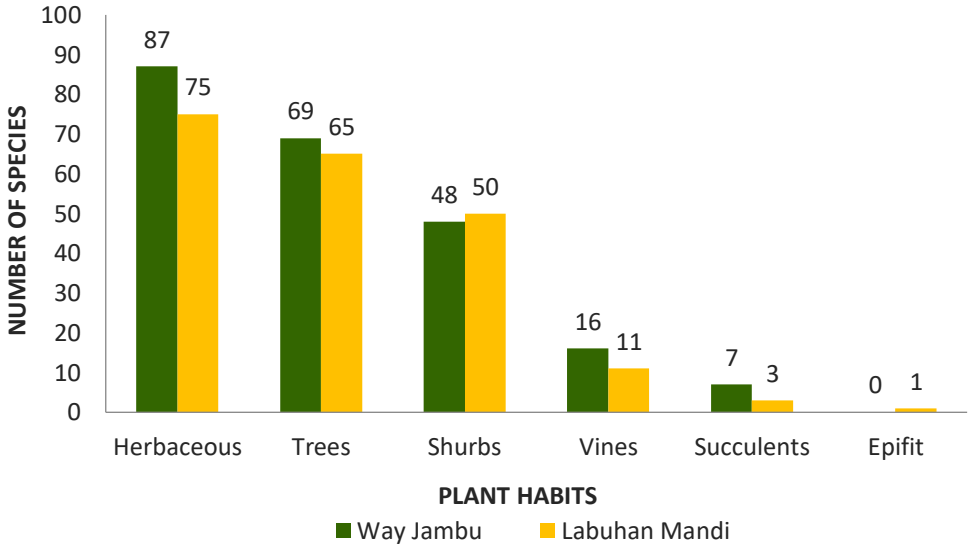

Figure 3. A Comparison of habitus composition in Way Jambu and Labuhan Mandi, West Pesisir Regency, Lampung

The combination of plant habitus formed a configuration structure of multilayer canopy in homegardens (Kabir & Webb, 2008; Pamungkas et al., 2013). Herbs, succulents, and shrubs composed the ground stratum (0—2 m) such as *Zingiber montanum, Capsicum frutescens, Kalanchoe pinnata, Mirabilis jalapa, Kaempferia galanga*, and *Cymbopogon citratus*. Shrubs and climbing plants were in the understory stratum (>2—5 m) such as *Durata erecta, Jatropha curcas, Bougainvillea cultivars, Sechium edule*, *Citrus* x *lemon*, *Musa acuminata,* and *Cucumis sativus*. The middle canopy stratum (>5—15 m) consisted largely of woody plants and perennial fruit plants. The distinct species composition between WJA and LMA were recorded in this stratum. The middle canopy stratum in LMA homegardens dominated by perennial fruit plants, such as example *Durio*

zibethinus, Lansium domesticum var. *Duku*, *Artocarpus heterophyllus*, *Garcinia xanthochymus,* and *Garcinia mangostana*. Meanwhile in WJA homegardens, mostly encountered species were *Cocos nucifera, Gnetum gnemon,* and *Manilkara zapota*. The fruits species in LMA homegarden more diverse than WJA homegarden, as a result the middle stratum in LMA homegarden was thicker than WJA (Figure 4). While most of the encountered species in the overstory stratum (>15—25 m) in both villages were similar to species in the middle story stratum.

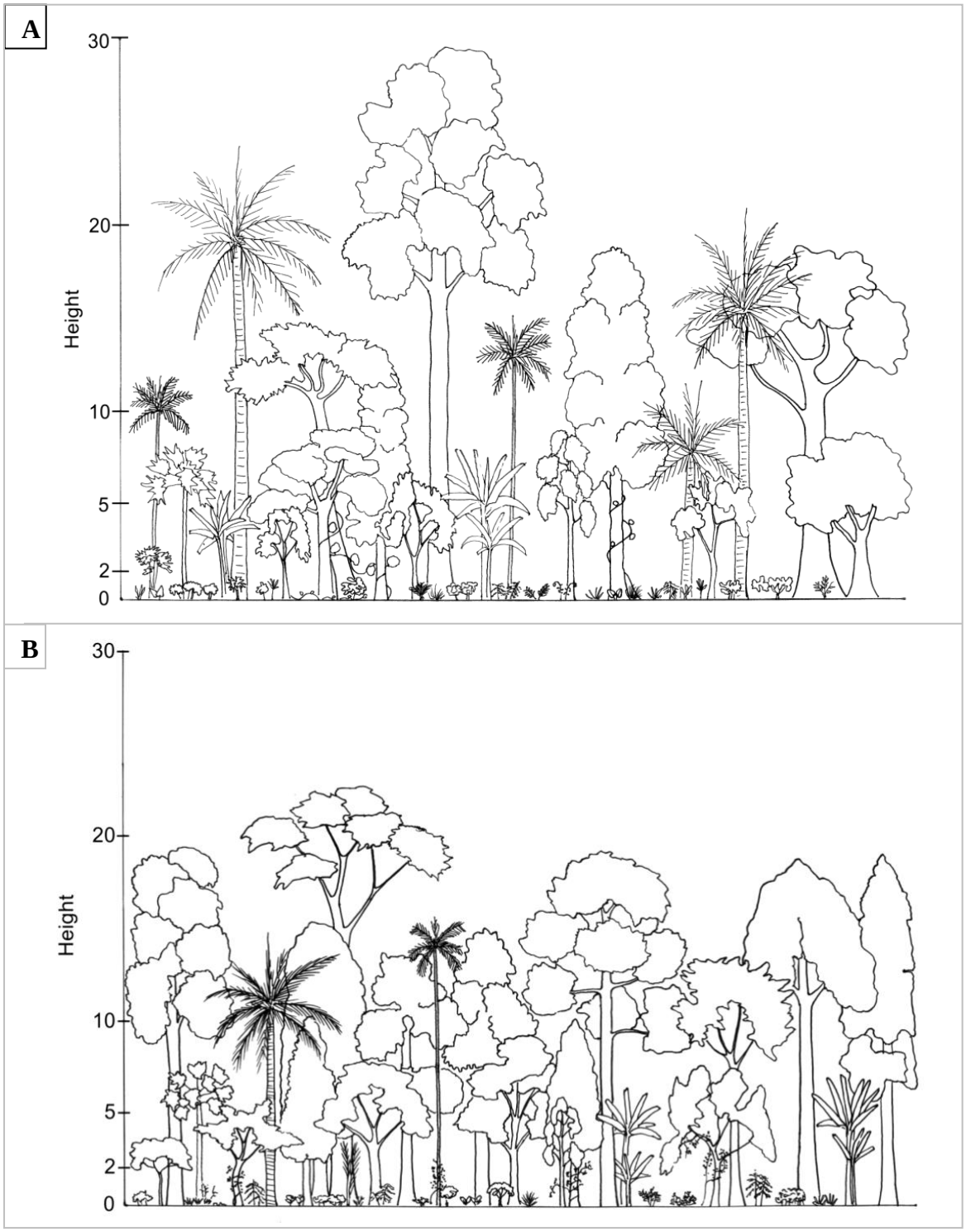

Figure 4. The schematic of vertical structure of homegarden at Way Jambu Village (A) and Labuhan Mandi Village (B), the distinct of configuration structure of multilayer canopy between both villages showed clearly, where fruit trees are more abundant at LMA compare to WJA homegarden (Drawn by: W.A. Mustaqim 2020)

3.2 Homegarden plant diversity

Based on our study results, as many as 73 plant families were compiled among the diversity of homegarden plants in WJA and LMA Villages. More specifically, the homegarden plant diversity in WJA Village consisted of 192 species, 30 cultivars, and 8 variants distributed across 62 families. Meanwhile, the homegarden plants in LMA Village were composed of 177 species, 33 cultivars, and 5 variants classified into 63 families. The number of overlapping species found at the two villages was 131 species. Furthermore, compared to other study sites in tropical regions, these results were more abundant than the number of species in South Wakorumba homegardens in Southeast Sulawesi, which recorded 44 species belonging to 25 families (Feriatinet al., 2017); but less than the results of homegarden research in Southwestern Bangladesh, which were recorded 419 species belonging to 109 families (Kabir & Webb, 2008).

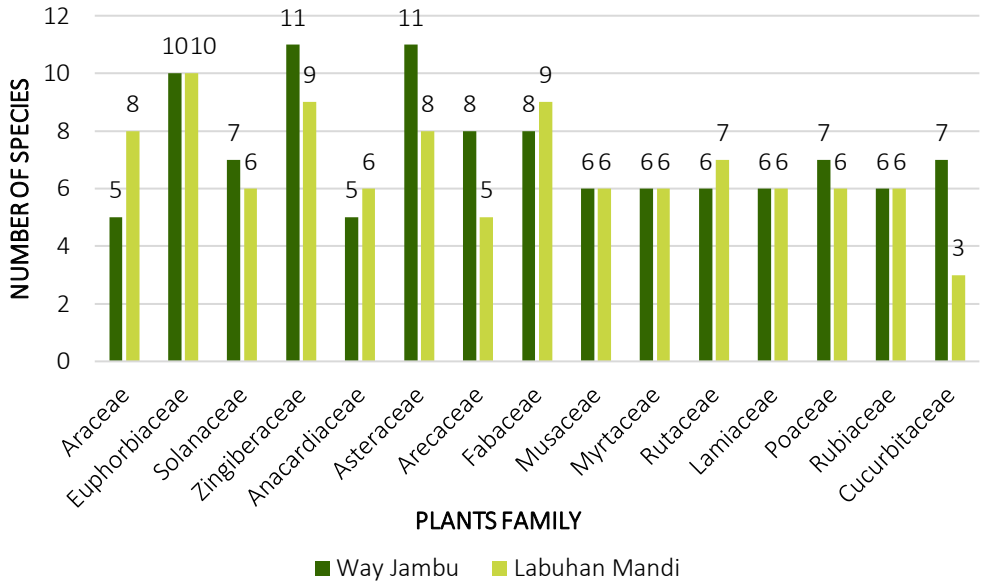

Figure 5. Comparison of 15 plant families (number of species ≥3) compile homegardens plant diversity of Saibatin indigenous community in Way Jambu and Labuhan Mandi Village, Pesisir Barat Regency, Lampung

As many as 15 plant families had a high number of species (≥3 species) in both villages (Figure 5). Zingiberaceae and Asteraceae had the highest number of species in WJA villages whereas family with the highest species number in LMA villages was Euphorbiaceae (10 species). The other family with a relatively high number of species was Fabaceae (Figure 5). This composition of homegarden plant diversity was quite different compared to the composition of homegardens in other tropical regions, such as in the southwestern region of Bangladesh and Vaca Brava region, Brazil, which found that the Fabaceae family had the highest number of species (Kabir & Webb, 2008; Carvalho et al., 2013). Meanwhile, Cactaceae has the highest number of species in homegardens in San Rafael, Mexico (Blanckaert et al., 2004). Thus, geographical and socio-cultural differences are important factors that influence the composition of homegarden plant diversity (Wiersum, 2006; Huai & Hamilton, 2009).

Both in WJA and LMA, Zingiberaceae was commonly found in the side yard and backyard, and usually used as spices and medicinal ingredients, for example the genera *Curcuma, Zingiber*, and *Kaempferia*. Species from Asteraceae were often found in the front yard used as ornamental plants such as *Sphagneticola trilobata* and *Cosmos sulphureus*, as well as a side yard as the source of daily

foods such as *Cosmos caudatus*. The Euphorbiaceae was found at the front yard cultivated as hedges and fodder, for example the genera *Jatropha, Manihot*, and *Codiaeum*. The Fabaceae species were often found in the backyard as shades and fodder, for example *Gliricidia sepium* and in the side yard as food or hedges, such as *Pisum sativum*. The use of *Gliricidia sepium* as fodder was also found on Rajegwesi community, Banyuwangi because of its leaves having high nutrition which is good for livestock (Pamungkas et al., 2013).

The species richness index in WJA homegardens (DMg = 17.34) was more abundant than the LMA (DMg = 16.87). But, the distribution of species in the LMA (J=0.84) was more evenly than in the WJA (J=0.79). The distribution of species (J) indicates that the community has equitable species distribution since the evenness index values close to "1", whereas if the values are close to "0" then the distribution of communities is uneven (Magurran, 1988). The even distribution of species indicates that the number of species in a habitat is stable so that the resilience tends to be high (Zulkaidhah et al., 2018). This result influenced the plant species diversity in LMA (H'= 4.08) that was higher than in WJA (H'= 3.91). However, the diversity index between the 2 villages showed a slight difference of only 0.17 in dissimilarity. The value of the species diversity index (H') can range from 0 to 7, when the value is >3 then the diversity of an area is high (Barbour et al., 1987). Thus, the result of index diversity at the two villages is classified as high compared with research on plant diversity of homegardens in other tropical regions (Albuquerque et al,. 2005; Das & Das, 2005; Kabir & Webb, 2008; Kumar 2011; Carvalho et al., 2013).

3.3 Homegarden plant usage

There were 16 categories of plant usage in the homegardens by Saibatin community at both villages, 15 categories in WJA and 14 categories in LMA. The categories were greater than those found on the Rajegwesi community, Banyuwangi Regency (10 use categories) (Pamungkas *et al.* 2013), or on the Sunda community, Cianjur Regency (7 use categories) (Silalahi, 2019), even in the Malay community, Jambi (5 use categories) (Hidayat et al., 2014). However, the results were less than the categories of homegarden plant usage in the central Kerala region, India,which had as many as 20 categories (Kumar, 2011). Foodstuff was the use category with the highest number of species (WJA 54 species; LMA 68 species), followed by medicine (WJA 51 species; LMA 56 species), ornamental plants (WJA 41 species; LMA 32 species), spices (WJA 21 species; LMA 23 species), and sources of income (21 species WJA; 22 species LMA). The major usage of homegarden plants as foodstuff is also found in some other tropical communities (Albuquerque et al., 2005; Kabir & Webb, 2008; Carvalho et al., 2013; Pamungkas et al., 2013; Hidayat et al., 2014; Feriatin et al., 2017). The numbers of plants in other use categories were only found ≤15 species, namely hedgerows, ritual plants, cosmetic, fodder, buildings, wrappers, green manure, dyes, adhesives, household appliances, and children's toys (Table 2).

Due to the higher species of fruit and vegetable cultivated or protected in LMA homegarden compared to WJA, the number of plants for foodstuff at LMA homegardens (68 species) was higher than WJA (54 species). The larger number of plant species at LMA is most likely influenced by a variety of plants that grow in *repong*, the local polyculture gardens, and moreover, the location of *repong*are adjacent to settlements (Widianto et al., 2003). This condition allows seed distribution to reach out from the homegardens because of the movement of humans or wild animals living in the area. The difference in diversity of crops is also thought to be affected by the variations in local knowledge between the two communities (Das & Das, 2005; Akerreta et al., 2007). There was plant species that are not used as foodstuff at WJA but are used in LMA such as tenggawi (*Schismatoglottis calyptrata*). The plant's leaves and stems are mixed with coconut milk and various spices, and then cooked until done. The dish is served with rice as daily food for local people. In addition, the difference in crop species composition and diversity between both villages may strongly be affected by the difference in environmental factors.

Food crops from the homegardens of the two villages were grouped into 3 categories, namely fruits such as *Durio zibethinus, Persea americana, Passiflora edulis*; vegetables and fresh vegetables for example, *Allium schoenoprasum, Sauropus androgynus, Cnidoscolus aconitifolius*; and staple food substitutes such as *Colocasia esculeta, Canna indica, Manihot utilissima*. Similar categories of crops are found in several Indonesia regions, for instance, Dayak Kerabat tribe at TapangPerodah Village, West Kalimantan and indigenous people of Rongkong at Rinding Village, South Sulawesi (Wartika et al., 2013; Kuni et al., 2015). The traditional market in those regions is only 1 time per week. That factor influenced the Saibatin indigenous community to cultivate various species of crops at homegardens. A similar case also occurred in a community around the Napu Valley, at Rompo Village, Central Sulawesi. Their homegardens had high crop diversity in order to fulfill their daily need because of poor market access (Kehlenbeck & Maass, 2004). By cultivating various species of food crops in the homegardens, the daily food needs of local peoples can be easily met (Galhena et al., 2013).

Table 2. Comparison of the number of homegarden plant species distributed to 16 categories of utilization by the Saibatin indigenous community in Way Jambu and Labuhan Mandi Village, Pesisir Barat Regency, Lampung

No	Plant Utilization Categories	Number of Species	
		Way Jambu Village	Labuhan Mandi Village
1	Foodstuff		
	a) Fruits	26	31
	b) Vegetables	25	34
	c) Staple food Subsituttes	3	4
2	Spices	21	23
3	Medicine	51	56
4	Side Income	21	22
5	Ornamental	41	32
6	Hedgerows	11	15
7	Rituals	16	15
8	Cosmetic	3	5
9	Fodder	9	4
10	Buildings	11	8
11	Wrappers	11	9
12	Green Manure	1	0
13	Dyes	1	2
14	Adhesives	1	0
15	Household appliances	0	2
16	Children's toy	1	1

Health facilities that are not easily found in WJA and LMA villages impacted the local community in finding medicine when emergency conditions. Therefore, besides their local culture, the local community also utilized medicinal plants in homegarden to fulfill their medicine needs. A generous portion of the homegarden plants have some medicinal value and they can be used to treat a variety of common health problems (Galhenaet al., 2013). Some ailments addressed by herbal remedies include fever, back pain, coughing, colds, colic, diarrhea, mouth sores, headaches, high blood pressure, and wounds. Homegarden plants are also used for treating pregnant women, essential

during childbirth, and support infant health problem. There was also a concoction of herbs which are usually used by farmers for body warmth (*betimun*) after returning from the farm. Based on the number of medicinal species (Figure 4), 22 of the same species were found in both villages (Table 3). Four species that werefrequently encountered atthe 15 homegardens at both villagesinclude*Perseaamericana*, *Cucurma longa*, *Cymbopogon citratus*, and *Jatropha curcas*.

Table 3 shows a comparison of the number of medicinal properties of homegarden plants between the two villages. A total of 16 species were equally used in both villages and have different amounts of efficacy, for example *Persea americana* at WJA address a single ailment while at LMA helps to remedy 3 different types of ailments. This fact shows that although the two communities belong to one Lampung Saibatin customary region, the geographical differences and origin of local knowledge influence community ethnobotanical knowledge in different ways (Akerreta et al., 2007). Besides, the Saibatin indigenous community elders at the two villages are different.The WJA elders came from the Pugung region of Tanumbang tribe who first founded the WJA Village, while the origin of the elders of LMA came from Mount Kemala of the Ulu Krui tribe.

Table 3. Homegarden plant species used as medicinal ingredients found in Way Jambu and Labuhan Mandi villages, West Pesisir Regency, Lampung following the number of ailments that they address

Local Name	Scientific Name	Family	Medical Value	
			WJA	LMA
Bakhelai	*Zingiber montanum*	Zingiberaceae	2	2
Cambay	*Piper betle*	Piperaceae	1	2
Gedang	*Carica papaya*	Caricaceae	1	1
Hameloh	*Chinchona calisaya*	Rubiaceae	3	2
Jahe	*Zingiber officinale*	Zingiberaceae	3	2
Jambu landa	*Psidium guajava*	Myrtaceae	2	4
Jambu pokat	*Persea americana*	Lauraceae	1	3
Jarak betadine	*Jatropha multifida*	Euphorbiaceae	2	1
Sesuka	*Jatropha curcas*	Euphorbiaceae	4	5
Jukuk Ancing	*Ageratum conyzoides*	Asteraceae	2	1
Jukuk Ketumpang	*Peperomi apellucida*	Piperaceae	1	2
Kelapa hijau	*Cocos nucifera*	Arecaceae	3	1
Cekur	*Kaempferia galanga*	Zingiberaceae	3	1
Kumbang tetokh	*Kalanchoe pinnata*	Crassulaceae	1	1
Kumis kucing	*Orthosiphon aristatus*	Lamiaceae	2	1
Kunyikh	*Curcuma longa*	Zingiberaceae	5	3
Mahkota dewa	*Phaleria macrocarpa*	Thymelaeaceae	1	1
Miansam	*Mikania micrantha*	Asteraceae	3	4
Pegaga	*Centella asiatica*	Apiaceae	1	3
Sawo	*Manilkara zapota*	Sapotaceae	1	1
Serai	*Cymbopogon citratus*	Poaceae	2	2
Sirsak	*Annona muricata*	Annonaceae	2	5

The homegardens in both villages also functioned as a family recreation area. Local people planted various species of ornamental plants in the homegardens to create beauty in their homes (Pamungkas et al., 2013). Ornamental plant species in WJA homegarden (41 species) were more

than in LMA (32 species). This is purportedly due to the size comparison of the WJA homegardens in the front yard was much wider than the LMA (5 in WJA >< 1 in LMA). Meanwhile, ornamental plants were generally cultivated in the front yard in order to add aesthetic value to the beauty of the house (Blanckaert et al. 2004). Because of the limited homegarden space, the amount of plant species diversity is also limited in the LMA (Das & Das, 2005; Feriatin et al., 2017). Ornamental plant species in both villages were mostly classified into Araceae, Asparagaceae, and Euphorbiaceae.

3.4 Homegarden plant cultural significance

How important the homegarden plant species for social, cultural, and economic can be determined by calculating the value of cultural importance (ICS) of that species. The result of ICS calculation of homegardens at WJA and LMA showed an almost similar value range of (1—52 in WJA; 1—65 in LMA). At WJA homegardens, several species had the lowest ICS value, for example, *Sansevieria trifasciata* (ICS= 1) was used only as an ornamental plant. The highest ICS value was obtained by *Cocos nucifera* (ICS= 64) that has 4 categories of utilization, namely food ingredients, seasonings, medicines, and sources of income. The lowest ICS value at LMA is *Bougainvillea cultivars* (ICS= 1) that has only a category of utilization as an ornamental plant whereas the highest one is *Cymbopogon citratus* (ICS= 65) which had 3 categories of utilization namely herbs, medicines, and sources of income. The more use categories of plant, the higher the cultural importance of the plant (Da Silva et al., 2006).

Table 4. Homegarden plant species that are widely used by Saibatin indigenous people in Way Jambu and Labuhan Mandi Village, West Pesisir Regency, Lampung along with ICS values ≥33 and conservation status

Local Name	Scientific Name	Family	Used Category		ICS Value		IUCN red list category
			WJA	LMA	WJA	LMA	
Bakhelai	*Zingiber montanum*	Zingiberaceae	2	2	44	40	DD
Cabe rebon	*Capsicum frutescens*	Solanaceae	1	2	44,5	49	LC
Cekur	*Kaempferia galanga*	Zingiberaceae	2	2	33	54	NE
Damar	*Shorea javanica*	Dipterocarpaceae		2		36	EN
Daun Suji	*Dracaena angustifolia*	Asparagaceae	5		41		NE
Duku	*Lansium domesticum*	Meliaceae		3		41	NE
Jakhi	*Zingiber officinale*	Zingiberaceae	2	3	39	54	NE
Jakulkisam	*Allium schoenoprasum*	Amaryllidaceae	3		42		LC
Jambe	*Areca catechu*	Arecaceae	2		36		NE
Jambu landa	*Psidium guajava*	Myrtaceae	3		42		NE
Jekhangau	*Acorus calamus*	Acoraceae	2		40		LC
Kelapa	*Cocos nucifera*	Arecaceae	4	4	64	46	NE
Kunyikh	*Curcuma longa*	Zingiberaceae	2	3	39	60	DD
Mendighra	*Solanum lycopersicum*	Solanaceae		2		40	NE
Daun Mint	*Mentha spicata*	Lamiaceae	1		40		LC
Pelisa	*Psophocarpus tetragonolobus*	Fabaceae		3		37	NE
Putti nipah	*Musa acuminata x balbisiana*	Musaceae		3		37	NE
Salam	*Syzygium polyanthum*	Myrtaceae	2	3	35	47	NE
Sekhai	*Cymbopogon citratus*	Poaceae	2	3	36	65	NE

Based on the results of the ICS calculation there were 19 plants species that had ICS values ≥33. Those species were considered the most important and most favoured by the WJA and LMA

communities (Table 4). As many as 8 species were found in the two villages with a relatively high frequency of discovery and frequently encountered in each plot, namely, *Zingiber montanum, Capsicum frutescens, Kaempferia galanga, Zingiber officinale, Cocos nucifera, Cucurma longa, Syzygium polyanthum, Cymbopogon citrates*. These species were frequently used as spices and medicines which are used almost every day and difficult to find alternative species with the same contents. The same plant species usagewas also found in the Malay community, in Durian Sebatang Village, West Kalimantan (Wulandara et al., 2018).

Judging from the acquisition of high ICS values and categories of usage, those eight plant species have economic potential to be developed into ready products which can be applied as additional incomeforthe local community, such as instant spices and beauty care products (Ahmad *et al.* 2006). The information collected from the local community is alsoan important resource for the exploration of many bioactive contents of plants that have the potential for advance studies as a medicine (Adhikari et al., 2018), i.e.herb simplicia and standardized herbal medicines (OHT). In addition, species with high ICS values help to conserve useful local plant species also have a conservation status as endangered (EN), such as damar (*Shorea javanica*). Thus, the homegardens play an important role in conserving the source of genetic diversity of local plant species and protecting species that are not widely planted in various places as well (Sherstha et al., 2001; Das & Das, 2005).

3.5 The role of homegardens for the Saibatin community

Based on our study of the usage category of the homegarden plants by the Saibatin community, there were at least three important roles of the homegardens in terms of social-economic, ecological, and cultural value. Regarding the socio-economic roles of homegardens, it provides the fulfillment of daily food and medicine, and thus contributes to maintaining the nutrition and health needs of the owners. The Saibatin community planted various species of food and medicinal plants species in their homegardens for daily consumption and for unexpected medicinal needs (Figure 6A). This function is similar to that observed in several homegarden studies in tropical regions (Lamont et al., 1999; Albuquerque et al., 2005; Kabir & Webb, 2010), where the highest number of encountered species is used as foodstuff or medicinal purposes. In addition, homegardens were also used as a place for recreation and social interaction among the Saibaitin communities. The front yard was relatively wide and the presence of ornamental plants could create a comfortable place for interaction between household members and the community. The example interactions that occur were chatting in the late afternoon after returning from the garden or in the rice field that allows for at the same time accompanying children to play inthe yard. Interaction in and around the homegarden will increase a sense of belonging among community members (Galhena et al. 2013).

Furthermore, homegardens have a role as an additional source of household income. Homegarden plant species used as income sources in the two villages tend to differ as well as the number of species (21 species in WJA and 22 species in LMA). In WJA Village, most Saibatin community sold crops such *Capsicum frutescens*, *Solanum lycopersicum*, *Solanum melongena*, *Cucumis sativus*, and *Sauropus androgynus* (Figure 6D). Meanwhile, in the LMA Village mostly sold species of fruit plants,such as *Durio zibethinus*, *Garcinia mangostana*, *Mangifera indica, Lansium domesticum* var. *Duku* and *Musa acuminata*. In general, the homegarden yields will be sold if the amount is excessive. The yields at both villages were usually bought by middlemen; some residents sold them directly at the market. But sometimes fruit crop yields were bought with prices determined directly per tree. The amount of additional household income from the yield of homegardens ranged from Rp 968,500 to Rp 2,499,000 per year in WJA, while in the LMA it was between Rp 1,940,000 to Rp 3,500,000 per year. At both villages, the average basic income of the head household whose profession as farmers is ± Rp 1,700,000 per month (Director-General of Village Development 2017). Therefore, additional income from homegarden yield sales per month

was 4.7% -- 12.3% in WJA village and 9.5% - 17.2% in LMA village, of the average basic income. The amount of income is influenced by the homegarden size, the number of individuals planted, pest attacks, and fluctuations in market commodity prices (Mulyanto, 2011).

Figure 6. The main role of homegarden for Saibatin indigenous community at West Pesisir Regency, Lampung; as a supplying daily foodstuff and medicinal plants needs (A & C); the source of ritual plant fulfillment (B): a supplementary source of household income (D) (Personal Documentation, 2018)

Table 5. The distribution of number of homegarden plant species based on conservation status categorizationin Way Jambu and Labuhan Mandi Village, West Pesisir Regency, Lampung

IUCN red list category	Number of Species	
	WJA	LMA
NE	142	138
DD	12	7
LC	33	31
NT	2	0
VU	1	0
EN	2	1

The ecological value of the Saibatin community homegarden was categorized into two roles, as an *in situ* and *ex situ* conservation site and also an environmental service provider. Homegardens in both villages turned out to be habitats for endangered species based on IUCN conservation category which are categorized into several conservation statuses (Table 5). Those species were cultivated for various purposes such as food, medicine, ornamental plants, and sources of additional income (Figure 6C). Two species were near threatened (NT) in WJA Village, *Dypsis lutescens* and *Dimocarpus longan. Dypsis lutescens* was cultivated as ornamental plants and *Dimocarpus longan* used as

foodstuff (fruit) and shade plant. *Santalum album* conservation status is a vulnerable species (VU) and was also encountered at WJA Village's homegarden. Its leaves were utilized as medicine and its stem is used for ritual purposes, for example *ngumbai laut*, a traditional ritual that aimed to maintain the welfare and safety of fisherman while at sea.

Shorea javanica, known as damar by the local community, is listed as an endangered species (EN) and was found in both villages. *Shorea javanica* is an endemic species of Sumatra which its distribution is limited to the Bukit Barisan Selatan National Park region. The plant is also cultivated on traditional *plantations* belonging to local communities (*repong*). This population of *Shorea javanica* is declining due to habitat loss and forest fragmentation (Barstow, 2018). The Saibatincommunityin LMA village sold its resin for livelihood income. The resinisused as raw materials for the manufacture of paints, dyes, and glass. It can be harvested every 30 days to obtain the best quality. The role of the homegarden for *Shorea javanica* conservation was as a nursery, which is place to grow damar seeds to the seedling stage before planting in the *repong*. Some larger homegardens were used by local people to maintain damar trees and also to harvest its resins. For that reasons, homegarden not only function as foodstuff and medicines sources but also serves as *in situ* conservation sites that provides genetic reserves for near threatened, vulnerable, or endangered local species (Shresthaet al., 2001; Das & Das, 2005; Galhena et al., 2013). Furthermore, since the homegardens also save genetic reserves, introduced plants such as *Dypsis lutescens,* which is native to Madagaskar and *Dimocarpus longan,* which is a native species ranging from South-Central China to the Malaya Peninsula. Thus the homegardens serve as *in situ* and also *ex-situ* conservation sites.

As an ecosystem service provider, homegardens at West Pesisir regency served to reduce soil erosion, supply organic fertilizer, and contribute to energy cycling. The structure of homegarden vegetation reduced erosion in sloping lands in LMA village (Figure 7A) and sandy areas in WJA Village (Figure 7B). Since the settlements are located at different altitudes in LMA village, the presence of tree roots in the yard *would* keep the soil structure stronger and helps reduce the risk of landslides (Erfandi 2013). In WJA village where the soil structure is composed of sandier soils, the plants roots help reduce soil erosion from rainwater currents. The usage of *Gliricidia sepium* leaves and twigs as fodder and compost material in WJA village helps the energy cycle between plants and livestock in the yard. The livestock gets nutritious food from the homegarden plants, then is digested and the final result is fertilizer that returns to the soil (Figure 7C). The cattle dung for example, is mixed with *Gliricidia sepium* leaves for fermentation and then made into compost (organic fertilizer) (Figure 7D). The fertilizer was used to increase plant fertility in the yard or in the plantation. This cycle continues as long as there are no disturbances. As a result, the homegarden can provide sustainable environmental services for the owners and the overall ecosystem as well.

As for the culture ethnical value, the homegardens represent the cultural identity of a particular ethnic community and the fulfillment source of the ritual plant needs. Owner preferences, culture, and knowledge greatly influence diversity of homegarden plants, and consequently provide a unique cultural identity,and the particular ethnic community appears to also reflect the structure and composition of homegarden plants (Das & Das, 2005; Galluzzi et al., 2010). As observed, the structure of the Saibatin indigenous community homegardens consisted of 3 parts, *tengebah* (front yard), *gelekhan* (side yard), and *kudan* (back yard) (Figure 2). Ornamental plants are generally planted in the front yard area, while vegetable and spices are planted in the side or backyard. The arrangement of every part of the front, side, and back may differ in each community, for instance homegarden structure in Vietnam has a large area of the front yard. Instead of ornamental plants, vegetables and spices are planted in the front yard; fish pondsare also well-organized in front of the house in the Vietnam homegarden system (Mohri et al., 2011). Furthermore, as a source of ritual plant fulfillment, the Saibatin community in both villages cultivated various species that were often needed in daily rituals, such as *Acorus calamus*, *Ipomoea quamoclit*, and *Proiphys amboinensis*. An example of the use of *Proiphys amboinensis* is as a species that must be provided during the

implementation of the *ngangison* ritual. A traditional customary ritual of the Saibatin community is in the form of greetings and blessings for the daughter-in-law or son-in-law before entering the house of the mother-in-law for the first time when beginning to live together (Figure 6B).

Figure 7. The role of homegarden as ecosystem service provider at LMA and WJA Village; the structure of homegarden vegetation helps reduce erosion on sloping lands in LMA village (A); on sandy land in WJA Village (B); Livestock gets nutritious food from the homegarden plants (C); The cattle dirt is mixed with *Gliricidia sepium* leaves for green manure (compost) (D) (Personal Documentation 2018)

4. Conclusions

The spatial structures and division of homegardens in WJA and LMA Villages consisted of *hadap*/*tangebah* (front yard), *gelekhan*/*gekhil* (side yard), and *kudan* (backyard) and were divided into 3 size categories narrow, moderate, and broad. As many as 6 habitus types that were compiled from the homegarden structures in both villages included herbaceous, epiphytes, shrubs, trees, succulents, and vines. According to the species richness index, the number of homegarden plant species in WJA was higher than LMA. However, the results of the diversity index (H') and evenness index (J) at LMA were higher.

The homegarden of Saibatin community greatly contributes to meeting the food needs of the local community. This is indicated by the number of plant species found, which were mostly for foodstuffs. This result is unsurprising and similar to the ethnobotanical research of homegardens in other regions. Meanwhile, the high ICS plant species have economic potential to increase household income, play an ecological role in helping conserve local species, i.e. *Cocos nucifera* and *Cymbopogon citrates*, and could be important resources for the next research. Each region

possibility has a difference of the highest ICS plant species. It depends on the community's habit and cultural use of plants. The roles of the homegarden of Saibatin community are common findings that are also reported in many regions. In general, the homegardens provide social-economic impact for the owners, contribute to the ecological role, and represent the cultural identity of an ethnic group.

Ethics approval and consent to participate: Permission obtained from the local government and local elders before collecting data at the research site. Besides, each respondent was informed about the purpose of the interview firstly.

Consent for publication: This paper contains photos of the respondents' homegarden and customary activity. The data has consented by respondents to published.

Availability of data and materials: Data are available from the authors upon required.

Competing interests: The authors declare that they have no competing of interests.

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