

# Local knowledge of the Baduy Community of South Banten (Indonesia) on the traditional landscapes

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**Abstract.** Iskandar J, Iskandar BS. 2017. Local knowledge of the Baduy Community of South Banten (Indonesia) on the traditional landscapes. *Biodiversitas* 18: 928-938. The Baduy people are a distinctive group of 11,620 people representing 3,395 households who live in an area of 5.136,58 hectares in the mountainous region of South Banten, Java. Traditional Baduy land cultivated by Baduy alone is described as tanah Baduy (Baduy land). This paper discusses the local knowledge of the Baduy community on the traditional landscapes. A qualitative method was used in this study. The result of the study shows that based on the Baduy categories, the Baduy landscape can be divided into four types, mainly forest, swiddens, gardens, and settlements. These landscape types have been traditionally managed based on the Traditional Ecological Knowledge (TEK) and beliefs. As a result, the Baduy people have continuously been able to practice traditional swidden cultivation, despite population growth and the depletion of the forest around them.

**Keywords:** Baduy community, local knowledge, traditional landscapes, swidden cultivation

## INTRODUCTION

Agricultural land use in West Java and Banten can be grouped into two major systems, i.e., wetland for growing rice (*sawah*) and dry land agriculture. Rice fields (*sawah*) can also be divided into irrigated and non-irrigated systems based on soil conditions and water content. Dry land agriculture can be divided into various types, including swidden farming (*huma* or *ladang* in Indonesia or *milpa* in Latin America), mixed-garden (*kebon campuran* or *talun*), and home garden (*pekarangan*) (Iskandar and Abdoellah 1988; Iskandar and Iskandar 2011). Unlike the rice field, today the swidden farming has rarely practiced by Sundanese farmers in West Java and Banten. Because based on ecological history, the swidden farming-as one of the original Sundanese agriculture-have formally been prohibited by the government since early twenty . Swidden cultivation had been officially banned in decree no.4046/36 on 30 July 1896 by the Resident of Banten (see Kools 1935; Iskandar 1998). In addition, the swidden farming has decreased over time in Java due to demographic pressure and forest decrease. Although the swidden farming has rarely practiced in Java, this original Sundanese agroecosystem type has still intensively practiced by the traditional people of Baduy community, who reside in village of Kanekes, district of Lebak, South Banten. Unlike the ordinary Sundanese, the Baduy have rejected the cultivation of wet rice field (*sawah*). Baduy people have maintained a traditional form of swidden cultivation alone. It is strongly prohibited (*tabu* or *buyut*) for Baduy to cultivate *sawah*, and their way of life is bound by social obligations and restrictions enforced by informal leaders

(*puun*). For instance, Baduy are not allowed to dig soil; plant clove, plant rubber, and teak; raise buffalo, cattle, sheep, and goat; apply synthetic chemical pesticides and chemical fertilizers; poison wildlife and fish; and go to school. The Baduy children have traditionally involved in various works of swidden farming activities instead of attending formal school.

Like Sundanese people in the past, the Baduy people have traditionally managed the swidden system (*sistem*) that is strongly based on traditional ecological knowledge (TEK) and embedded by belief (cf. Wessing 1978; Mustapa 1996; Toledo 1992; Berkes 2008; Iskandar 1998, 2012a; Iskandar and Iskandar 2011). The term of traditional ecological knowledge has interchangeably used with various terms, including local knowledge, indigenous technical knowledge, and folk knowledge (Ellen and Harris 2000). It can be defined as 'a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of a living being (including humans) with one another and with their environment' (Berkes 2008). Many authors, such as Berkes (2008) mentions that four analyses of the traditional knowledge and management systems are considered at four interrelated levels. *The first level*, there is local and empirical knowledge of plants, animals, soils, and landscape. *The second level*, there is management system. The third level, social institutions, sets of rules-in-use, norms and codes of social relationships. *The fourth level*, the analysis is concerned on worldview, which shapes environmental perception and gives meaning to observations of the environment. Therefore, to study the

local knowledge of Baduy on the landscape, can only be properly understood in relation to a *knowledge-practice-belief complex* and involving for four level analyses (cf. Berkes 2008).

On the basis of some studies of ethnobiology, it has grown recognition that one emergent property of ecosystems having experienced significant human presence use over time is that they are a biocultural—system that has jointly shaped by biological and cultural dynamics. For example, various biodiversities found in place including in habitats commonly thought of as pristine, such as tropical rain forest is actually anthropogenic (Posey 1999; Carlson and Maffi 2004). While the behavior of individual community in management and use of resource use, it has been determined by the perception of this individual on the environment. For example, Baduy is regulated by many prohibitions locally called *buyut* or *teu wasa* which are related to the perception their land is considered as a sacred place. Consequently, traditional management and resource use of traditional Baduy community based on local knowledge, beliefs, and practice have much to contribute to the conservation of biodiversity and environment (cf. Carlson and Maffi 2004; Berkes 2008). There is also now growing recognition of the contribution of ethnobiology and traditional ecological knowledge to support environment conservation and sustainable use of resources. Moreover, various kinds of traditional ecological knowledge have come to be accepted and used by scientific experts in a number of areas. For example, the results of study on various TEKs, have been practically used for supporting the sustainable development in various aspects, including food and agriculture, human health and livestock health, biodiversity prospecting, forest and agroforestry, conservation of biodiversity, global warming, and natural and ecological disasters (Schultes 1989; Groenfelt 1991; Johannes 1993; Warren et al. 1995; Anderson 2005; Ellen 2007; Berkes 2008; UNEP 2008). In terms of the belief system of the traditional communities, it can be seen a shared pattern of beliefs can often provide a strong sense of group solidarity to manage and conserve biodiversity and ecosystem (cf. Lovelace 1984). In other words, religious beliefs, traditional beliefs, cultural mores and practices play a crucial role in the successful conservation and specific organism especially in developing countries (cf. Berkes et al. 2000; Lingard et al. 2003; Sasaki et al. 2000; Lingard et al. 2003; Iskandar 2012b; Ngara and Mangizvo 2013). Nowadays, however, various traditional ecological knowledge (TEK) and ecological view in many developing countries, including Indonesia have eroded due to replace by the domination of Western scientific knowledge and anthropogenic view, and intensive penetration of market economy (cf. Marten 2001; Keraf 2002; Iskandar 2012b). Consequently, although some wild animals and forest areas of Nature Reserves, Wild Reserves, National Parks, Biosphere Reserves, and Hunting parks of Indonesia had been formally protected based on 'Biodiversity and Ecosystem conservation No. 5 1990, various biodiversities and ecosystems in many places in Indonesia have been intensively exploited and became seriously damaged (cf. Groombridge 1992; Iskandar 2010; Iskandar 2014).

Therefore, the traditional ecological knowledge composing local knowledge of plants, fauna, and landscapes; traditional resource management system, traditional institution, and belief system or world view rather than ignoring or attempting to replace, it may be more useful to be studied and its positive aspects can be integrated into Western scientific knowledge and can be used to support sustainable development program in Indonesia (cf. Lovelace 1984; Hunn 1993; Berkes 2008; Iskandar 2012b). For example, Baduy area which is considered as sacred place by Baduy people, under the traditional *adat* land is regarded as *hak ulayat* of Baduy community based decree of Regent of Lebak District No. 550/Kep.223/Huk/2002 has been an informant role for conservation actively practiced by the local people of Baduy community (Iskandar 2009).

This paper discusses the local knowledge of the Baduy community on the traditional landscapes. Four main aspects are discussed in this paper namely Baduy perception on their environment and landscapes; categories of landscapes and development of landscapes; vegetation of each landscape, and the traditional Baduy conservation.

## MATERIALS AND METHODS

### Study sites

The study was undertaken in the village (*desa*) of Kanekes, sub-district (*kecamatan*) of Leuwidamar, district (*kabupaten*) of Lebak, province (*provinsi*) of Banten, Indonesia (Figure 1). Geographically, the village of Kanekes is located at approximately latitude  $6^{\circ} 27' 27''$ - $6^{\circ} 30'$  North and longitude  $106^{\circ} 3' 9''$ - $106^{\circ} 4' 5''$  East. The main river flowing through the area is the Ciujung. The upstream is located in the forest area of Gunung Kendeng, south Cikeusik hamlet in Inner Baduy, where sacred placed called *Arca Domas* is found. Culturally, Baduy social organization is closely related to their self-conception as *mandala* community (an ascetic group) within the wider holistic area. Based on the Baduy tradition, the Baduy area can be divided into two main groups, the Inner Baduy (*Baduy Dalam*, *Baduy Jero*) and Outer Baduy (*Baduy Luar* or *Panamping*). In addition, it has special area belonged to Baduy that is located in the neighboring Muslim area, as enclave areas called *dangka area*. The Inner Baduy consists of 3 hamlets, Cibeo, Cikertawarna and Cikeusik, while the Outer Baduy is composing more than 50 hamlets, such as Cisaban, Kadukohak, Batara, Gajeboh, and Kaduketug. Those living in Inner Baduy or *Tangtu* area are considered most sacred, while Outer Baduy or *Panamping* people are less so. Also, adherence to a traditional identity is stronger in Inner Baduy than in Outer Baduy. Moreover, the Inner Baduy area is considered *tanah larangan* (prohibited land) or *tanah suci* (sacred land), where only people who strongly adhere to ancestral traditions, *urang tangtu* (*Tangtu* people) are permitted to live. Anyone who violates taboos or customary law is banished to *Dangka* (exterior area).

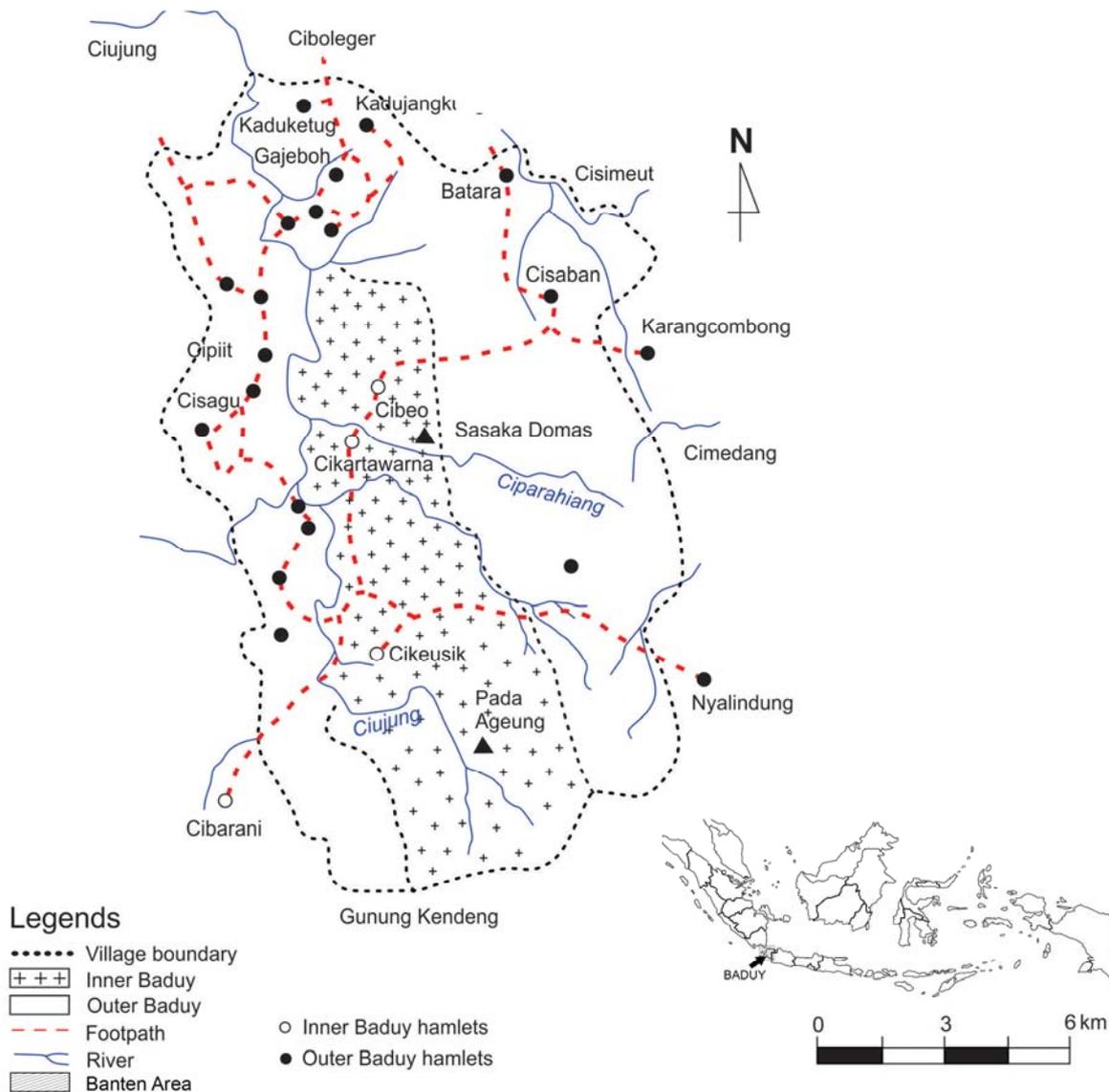
Based on the village statistical data (1980-2015), the total population of Baduy was revealed increasing over

time. For example, in 1980 total population of Baduy was recorded 4,057 and 25 years later, in 2015 it was recorded 11,620 people (Table 1). The population was dominated by Outer Baduy people approximately 90 percent of the total population of Baduy.

The religion of the Baduy community is called *Sunda Wiwitan* (original Sunda) or *Agama Baduy* (Baduy religion). Based on the Baduy religion, the swidden cultivation is considered as their obligation. Conversely, the *sawah* cultivation is prohibited. In addition, various modern external inputs, such as modern rice varieties, chemical fertilizer, and chemical pesticides have been prohibited from applying in the swidden farming.

**Table 1.** Population of Baduy in 1980 to 2015 (Iskandar 1991, 1998, 2012, Statistical Data of Kanekes Village 2015)

| Year (year) | Time (year) | Population (people) | Change of number (people) |
|-------------|-------------|---------------------|---------------------------|
| 1980-1983   | 3           | 4057-4574           | 517                       |
| 1983-1984   | 1           | 4574-4586           | 13                        |
| 1984-1986   | 2           | 4587-4850           | 263                       |
| 1986-1994   | 8           | 4850-6440           | 1590                      |
| 1994-2010   | 16          | 4850-11172          | 6322                      |
| 2010-2015   | 5           | 11172-11620         | 448                       |



**Figure 1.** Study site Baduy area of Kanekes Village, Leuwidamar Sub-district, Lebak District, Banten Province, Indonesia (adapted from Iskandar and Ellen 2000)

## Procedure

This study was applied the qualitative and used of ethnoecology and ethnobiology approaches (Martin 1995; Cotton 1996; Iskandar 2012b; Albuquerque et al. 2014). To collect primary data, the observation, participant observation, and in-depth interviews were conducted both in Inner and Outer Baduy. The observation was undertaken to observe various Baduy landscapes, including mature forest, the swidden field, the fallowing the swidden field of secondary forest, and settlement and hamlet forest. The participant observation we have been living in some informant houses of Inner and Outer Baduy and sharing with informants many aspects of their life, from subsistence activities, such as swidden farming, to ritual occasions such as planting and harvesting rice, and perception of forest and rice (cf. Martin 1995). In-depth interviews were held with key informants or local experts, including religion or informal leaders, the formal village leader and his staff, hamlet leaders, and old male and old female swidden farmers who are purposively selected and using the ethnoecological and ethnobiological approach. While, the collecting data of various plants in each landscape types, was undertaken by sampling plots. The inventory of plants of the plot of 20 m x 20 m that is considered as minimal area (Muller-Dombois and Ellenberg 1974) with 30 plot numbers of each landscape type, namely the forest hamlets (*dukuh lembur*), swidden fields (*huma*), secondary forest (*reuma*), and mature forest (*leuweung kolot*) was applied.

## Data analysis

Analysis of data involved cross-checking, summarising and synthesizing from different sources, including observation, participant observation, semi-structure or deep interview, and secondary data, and built up a narrative accounts as a descriptive analysis which is focused on the annual Baduy swidden system management which is based on the traditional calendar (*pranta mangsa* or *panggalan*) (cf. Iskandar 2012b; Newing et al. 2011). While various species of plants that are recorded in each plot of the hamlet forest (*dukuh lembur*), swidden field (*huma*), secondary forest (*reuma*) and mature forest (*leuweung kolot*) were identified in the Herbarium Bogoriense, Indonesian Institute of Sciences (LIPI), Cibinong, Bogor, West Java, Indonesia.

## RESULT AND DISCUSSION

### Baduy perception on their environment and landscapes

Baduy people have traditionally managed their forest for swidden farming based on the traditional ecological knowledge (TEK) and belief or cosmos (cf. Iskandar 1998; Barks 2008; Pretty et al. 2009; Toledo 2002). In other words, the Baduy has utilized and managed various resources in their ecosystem based on their perception and the world view of their environment (Iskandar 1998; Toledo 2002; Carlson and Maffi 2004; Ellen 2006). In Baduy cosmology, the earth was initially created that called

them *Sasaka Pusaka Buana*, *Arca Domas*, or *Pada Ageung*, located in the forest place near the present day Cikeusik hamlet, Inner Baduy. *Sasaka buana* is derived from *sasaka* and *buana*, meaning 'pole, foundation or basis' and 'place or earth, respectively, indicating this place as the center of the earth where all life began. Two of the seven bataras (*batara tujuh*) descended from *Batara Tunggal* in this place, and these area considered to be the ancestor of present-day Baduy religion leader (*puun*). While the *batara tujuh* were sent to the earth in the forest of upstream Ciparahiang, Cibeo, Inner Baduy, that is called *Sasaka Domas*. As a result, the *Sasaka Pusaka Buana* in the forest of Cikeusik that is believed to the centre of the earth (*pancer dunia*), and *Sasaka Domas* of Cibeo that is believed as the place where the *Batara Tujuh* were sent to the earth is considered by Baduy as very sacred (Iskandar 1998, 2009). These two sacred areas have been known as *kabuyutan* area. Today, the *Sasaka Pusaka Buana*, *Pada Ageung* or *Arca Domas* is usually visited annually by *Puun* Cikeusik and a small number of people who conduct ascetic rituals (*ziarah*) over three days, on 16, 17, and 18 of the month *Kalima* (*bulan kalima* in the Baduy calendar (May-June). While the *Sasaka Domas* is the responsibility of *Puun* Cibeo and is visited annually by its *puun* and other some other people during *Kalima*, to conduct ascetic rituals (*ziarah*).

On the basis of the Baduy cosmology, therefore, the Baduy area can be divided into three zones that are similar to that of the biosphere reserve of UNESCO or the National Park concept based on the Western scientific knowledge (cf. Soedjito 2004). *The first zone*, the *kabuyutan* area of *Sasaka Pusaka Buana* or *Arca Domas* and *Sasaka Domas* analog with a core area that is strict protection areas where is no disturbance by the Baduy. This is traditionally used to conduct ascetic rituals. *The second zone*, it is analog to the buffer zone based on the biosphere concept, located in outer of *kabuyutan* area, as recognized as the Inner Baduy area. This area is considered less sacred compared to the *kabuyutan* area. *The third zonation*, it is analog with transition are of the biosphere reserve, is considered less sacred compared to the Inner Baduy area, as recognized as the Outer Baduy area (Figure 2).

In addition, in each mountain of both Inner Baduy and Outer Baduy, can be divided into three zones. The first zone is a flat area in located in the valley, near river or water resources, mainly used for settlement. It is surrounded by anthropogenic hamlet forest (*dukuh lembur*). In the settlement area, the traditional houses (*imah*) are found, while in the hamlet forest, the rice barn (*leuit*). The second zonation is located in the upper of the settlement area on hillsides. These have as the main purpose of intensive the swidden cultivation (*huma*). In the second zone, overlapping with *huma*, the *reuma* that is fallowed land abandoned after harvesting rice and converted to a succession of secondary forest is found. Therefore, in the second zonation is composed by overlapping mosaic of swidden field (*huma*) and secondary forest (*reuma*) of a different age of fallow time. The third zonation is located on top the hills that are grown by mature forest, called

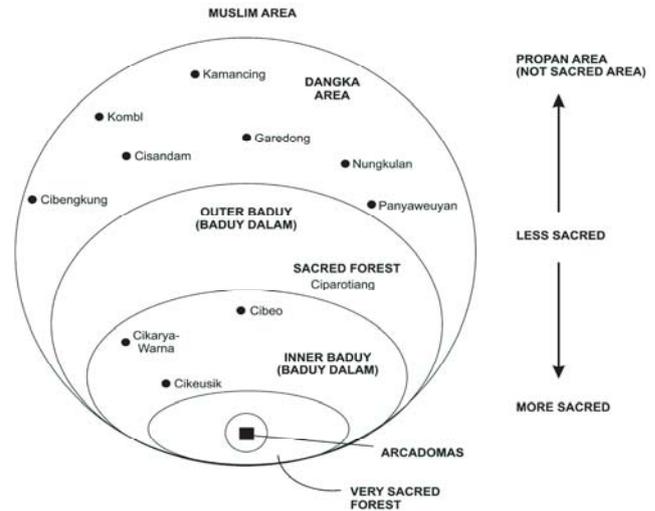
*leuweung kolot* or *leuweung titipan*. Based on the Baduy tradition, the hamlet forest (*dukuh lembur*), riverbank forest, and the mature forest of the hill is traditionally protected that is prohibited from cultivating for swidden cultivation. It is shown that traditional ecological knowledge has been a significant role in the conservation of flora and fauna species and various landscapes of the Baduy ecosystem (cf. Barkes 2008).

**The categories of landscapes**

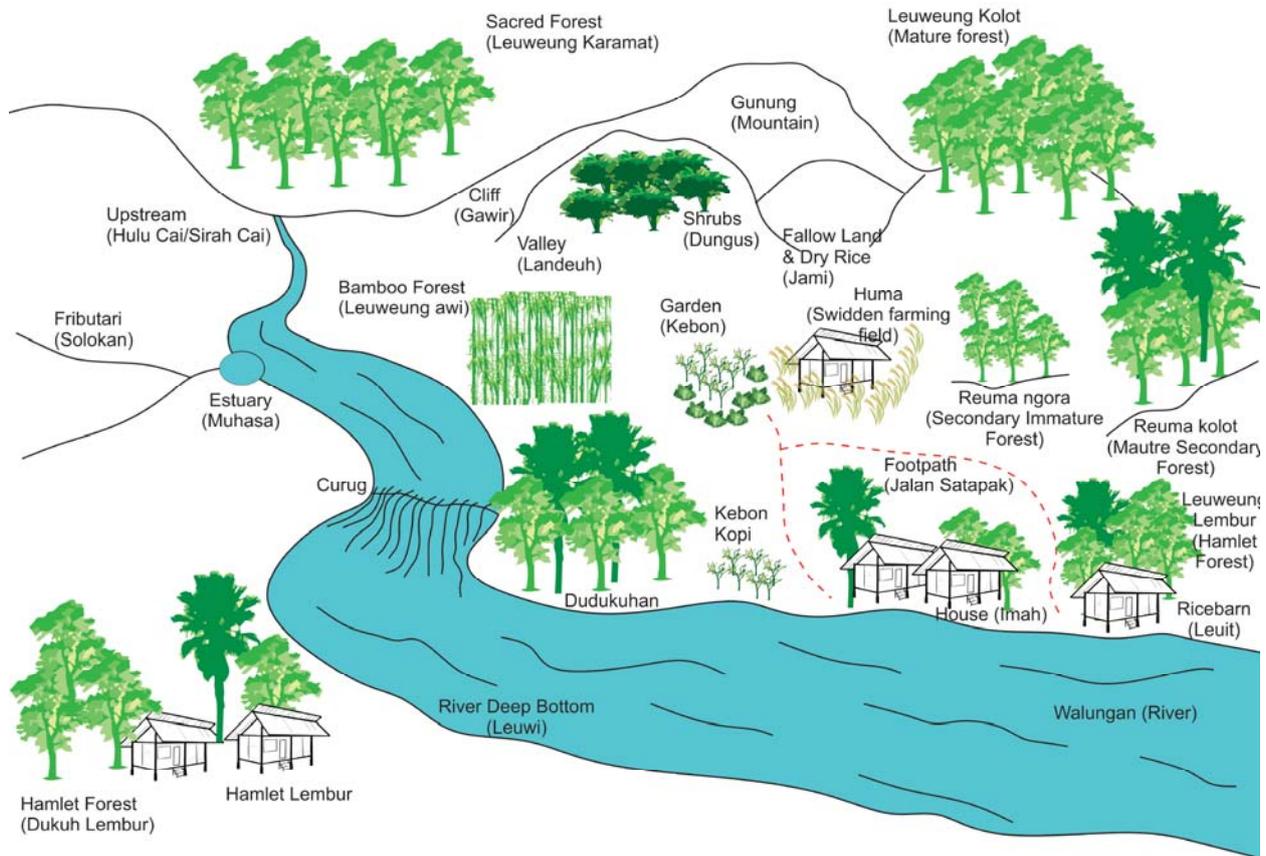
The Baduy areas are arranged of mixed natural and man-made landscapes as depicted in Figure 3. These are composed various landscapes, namely hamlets (*lembur* or *kampung*), swidden field (*huma*), garden (*kebun*) and mixed garden (*dukuh*), secondary forest (*reuma*), mature forest (*leuweung kolot*), and river (*wahangan*)(Figure 3) and Table (2).

The first, the hamlet is traditionally named as *kampung* or *lembur*. Based on the Baduy *lembur* can be categorized into two groups: *babakan* or *lembur anyar* (new hamlet) and *lembur kolot* (old hamlet) or *lembur gede* (big hamlet). Hamlet names are usually based on rivers, plants, and general landscape feature. Hamlet named after rivers usually have *ci* (*ci* = water) as prefix, as *Cikeusik*, *Ciparahiang*, *Cisadane*, and *Cihulu*. Hamlet names based on plant name or landscape features, include *Kadujangkung*

(*kadu* = durian, *jangkung* = tall), *nangka bengkung* (*nangka* = jack fruit, *bengkung* = bent), *Cicakal muhara* (*muhara* = estuary) and *Cicakal girang* (*girang* = river upstream).



**Figure 2.** Baduy area showing Inner Baduy, Outer Baduy, and the Dangka area in relation to the distance from sacred places (Iskandar 2009).



**Figure 3.** Various traditional Baduy landscapes (field note, 2004)

**Table 2.** Various traditional landscapes of Baduy (field notes, 2004)

| Baduy terms  | Indonesian terms   | Glossaries  |
|--|--|---|
| <i>Lembur</i> or <i>kampung</i><br>- <i>Babakan</i><br>- <i>Kampung</i> or <i>Kampung gede</i>   | Kampung<br>- Kampung baru<br>- Kampung lama  | Hamlet<br>- New settlement<br>- Old settlement  |
| <i>Huma</i><br>- <i>Huma panamping</i><br>- <i>Huma Baduy jero</i>   | Ladang<br>- Ladang Baduy Luar<br>- Ladang Baduy Dalam  | Swidden field<br>- Swidden field of Inner Baduy<br>- Swidden field of Outer Baduy   |
| <i>Leuweung</i><br>- <i>Leuweung titipan</i><br>- <i>Leweung pihumaeun</i><br>- <i>Leuweung ngora, reuma ngora</i><br>- <i>Reuma kolot</i> | Hutan<br>- Hutan konservasi<br>- Hutan untuk ladang<br>- Hutan sekunder muda<br>- Hutan sekunder tua | Forest<br>- Protected forest<br>- Non-protected forest for swiddening<br>- Immature secondary forest<br>- Mature secondary forest |
| <i>Kebon</i><br>- <i>Kebon kopi</i><br>- <i>Kebon cengkeh</i><br>- <i>Dukuh</i>  | Kebun<br>- Kebun kopi<br>- Kebun cengkih<br>- Kebun campuran   | Garden<br>- Coffee garden<br>- Clove garden<br>- Mixed- garden  |
| <i>Wahangan</i><br>- <i>Wahangan</i><br>- <i>Solokan</i><br>- <i>Hulu cai, girang</i><br>- <i>Muhara</i><br>- <i>Leuwi</i>                 | Sungai<br>- Sungai besar<br>- Sungai kecil<br>- Mata air, Hulu sungai<br>- Hilir Sungai<br>- Lubuk   | River<br>- Big river<br>- Small river<br>- Upstream<br>- Down stream<br>- River deep bottom                                       |

The second, swidden field that is named *huma* can be categorized by Baduy based on ownership and location. For example, based on the location it is popularly recognized as *huma urang Panamping* (swidden field belongs to each family Panamping people or Outer Baduy People) and *huma urang Girang* (swidden field is belong each family of the *Girang* people = upstream people or Inner Baduy people), or *huma urang Baduy Jero* (swidden field belongs to Baduy Jero or Inner Baduy). In addition, based on ownership, the *huma* can be categorized into four types, *huma puun* (belonged to *Puun*), *huma serang* (belonged to entire community), *huma girang seurat* (belonged to family of *Girang Seurat/Puun* staff), *huma jaro dangka* (belonged to family of *Jaro Dangka*/informal leader staff)

The third, forest or *leuweung* based on structure vegetation can be divided into two categories; *reuma* (immature forest) and *leuweung kolot* (mature forest). In addition, the forest based on the traditional management can be divided into three groups, *leuweung titipan* (protected mature forest), *leuweung pihumaeun* (non-protected forest for swidden farming) and secondary forest of fallowing swidden farming (*reuma*) composing of immature secondary forest (*reuma ngora*) and mature secondary forest (*reuma kolot*).

The fourth, the gardens (*kebon*) can be categorized into several types that is based on occurring dominant species, such as *kebon kopi* (dominated by *kopi*/coffee crop and *kebon cengkeh* (dominated by *cengkeh*/clove crops), and mixed-garden planted mixed annual and perennial crops is called *dukuh* (talun-mixed perennial crops or *kebon kai-*

woody garden, and *kebon tatangkalan*-tree garden, in other Sundanese areas of non-Baduy) (see Iskandar et al. 2016).

The fifth, the river or *wahangan* based on size can be divided into two categories, namely small river (*solokan*) and big river (*walungan*). In addition, the big river can be divided into two categories, namely upstream that is name *hulu cai* or *girang* (upstream) and *hilir* or *muhara* (downstream) (Figure 3).

### The development of landscapes

As mention earlier, there are four traditional landscapes in the Baduy area: forest (*leuweung*), swiddens (*huma*), garden (*kebon*) and Hamlet (*lembur* or *kampung*) and forest hamlet (*dukuh lembur*). According to Baduy people, the forest can be divided into main categories: protected and non-protected. Protected forest constitutes those areas which *leuweung kolot* (mature forest not known to have been previously farmed), big or large forest (*leuweung gede*) or entrusted forest (*leuweung titipan*). In addition, there is some small plot of protected forest located on hills (*dungus*). In generally protected forest (*leuweung kolot* or *leuweung gede*) is found in Inner Baduy. Two of the most important protected forest area *Arca Domas* and *Sasaka Domas*, located in Cikeusik and Cibeo, respectively. These places can be visited only once a year by traditional leaders (*puun*), who are accompanied by a few people from both Inner Baduy and Outer Baduy who undertake ascetic rituals (*ziarah*). This happens during the month of *Kalima* (*bulan Kalima*/May-June) in the Baduy calendar.

Another forest type, non-protected forest, that can be opened for swiddening. If the protected forest has been

opened for swiddening, the term *leuweung* is usually no longer used and is replaced by *reuma* (secondary forest). Moreover, if *reuma* is opened to established a settlement, the anthropogenic forest surrounding the hamlet is called *lindung lembur* (hamlet shelter forest) or *dukuh lembur* (hamlet forest).

Generally speaking, most land use types derive from the non-protected mature forest (Figure 4). To practice swidden cultivation (*ngahuma*), a piece of land is cleared completely of vegetation. However, woody plants and those of economic value, such as fruit, are only pruned. Branches and stems are collected for fuel. The remaining biomass is burned to supplement soil nutrients. The piece of land is then prepared for planting rice and other annual crops. A piece of land is usually only cultivated for one or two years for swiddening (*huma*) before being fallowed. The length of time depends on soil fertility. After harvesting rice and other annual crops, the land is fallowed and transformed into the immature secondary forest (*reuma ngora*) and mature secondary forest (*reuma kolot*) through natural succession. A swidden in fallow for less than one year, and which still has lots of dried rice stalks, is called *jami*. From this land, annual crops such as taro (*taleus* = *Collocalia esculenta* L), African tuber (*kumili* = *Plectranthus rotundifolius* (Poir) Spreng), and pigeon pea (*hiris* = *Cajanus cajan* (L) Millsp) continue to be harvested. In addition, if the Albizzia trees (*Paraserianthes falcataria* (L) Nielsen) have been grown during swiddening, these are also allowed to grow together with natural vegetation (see Iskandar and Ellen 2000). Therefore, although rice has been harvested, the land is regularly visited by the owner to check fallowed land (*nempo jami*).

The secondary forest can be opened for rice planting again in the following year or fallowed for more than three years. The people will shift to another place of mature secondary forest (*reuma kolot*) for rice planting and fallow the same procedure: cutting and pruning, burning, weeding, harvesting and fallowing. In Outer Baduy, due to high population density and lack of *reuma kolot*, farmers temporarily rent non Baduy land and sharing crop, while waiting for their own land to fallow. They usually return to cultivate their own land after about three years swiddening in the non Baduy area.

In some cases, the development of the landscape system is from swidden fields (*huma*) into annual monoculture garden (*kebon*) and mixed-perennial crop garden (*kebon campuran* or *dukuh*), triggered when other annuals or perennials are cultivated after the rice harvest. In the 1980s, mixed-perennial crop garden has become the norm in Outer Baduy due to introduction cash crops such as clove (*cengkeh* = *Syzygium aromaticum* Merr & L.M Ferry), coffee (*kopi* = *Coffea arabica* L) and Albizia (*albasiah* = *Paraserianthes falcataria* (L) Nielsen). By the 1990s, however, clove had been abandoned because of the very low market price and is culturally prohibited cultivate in Baduy area.

Eventually new land develops into another landscape type, a new settlement or new hamlet (*babakan*) and big or old hamlet (*lembur* or *kampung*) with anthropogenic forest surrounding the hamlet (*dukuh lembur* or *lindung lembur*).

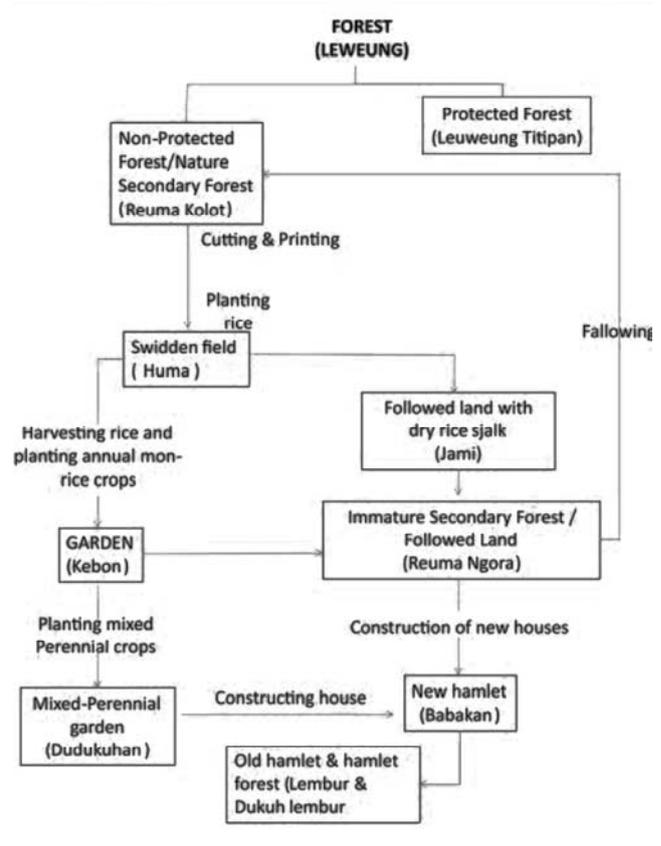


Figure 4. Development of landscapes in Baduy, Banten (Iskandar 1998)

#### Pattern of settlement

Each Baduy settlement has a clear symbolic orientation, based on a main directional axis leading to a sacred place: *Arca Domas*, *Sasaka Pusaka Buana* or *Pada Ageung* and *Sasaka Domas* or *Mandala Parahiangan*, all located in Inner Baduy, near Cikeusik and Cibeo, respectively. According to Baduy cosmology, *Arca Domas* and *Sasaka Buana* are believed to be the center of the earth (*pancer dunia*), the first place created by God, and the place where 'Seven Batara' (*Batara Tujuh*, the oldest of which, *Batara Cikal*, is considered the ancestor of the Baduy traditional leader) were sent to the earth (Danasasmita and Djatisunda 1986). Within this symbolic framework, therefore, settlement to the south, in the core area, containing the three Inner Baduy hamlets of the Cikeusik, Cikartawarna, and Cibeo, are considered as most pure; while those to the north, north and north-west, where Outer Baduy hamlet are located, are considered less pure (Figure 2). Based on Baduy perceptions, the oldest hamlets (*lembur* or *kampung*) is Cikeusik, located close to the sacred place of *Arca Domas*.

Internally, each hamlet is also ordered according to cosmological coordinates. The settlement of Inner Baduy is usually composed of houses (*imah*), rice barns (*leuit*), public rice pounding places (*lisung lembur* or *lisung kampung*), and a meeting house or *bale kapuunanan*. Houses are set very close together, along the main axis which is usually north-south. The house of traditional leader (*imah puun*) is located to the extreme south. This consistent the belief that the spirit (*sanghyang*) or soul of

their ancestor (*wongatua*), who is considered to live in the sacred place to the south, should have easy access to the hamlets. In contrast, the meeting house and public rice pounding area are located in the northernmost area. Between the *imah puun* and the meeting house ordinary dwelling are located, each surrounded by rice barns. In the center, there is an open square about 4 meters wide. The river is located outside the housing complex and is commonly used for bathing, washing, and fishing.

The outer Baduy settlement, particularly in big or old hamlets, such as Kaduketug, are much like those of Inner Baduy composed of houses, rice barn, and public rice pounding areas. The public rice pounding area is located to the north or northwest, with wooden mortar (*lisung*) towards the east. The house of the traditional leader (*imah kolot lembur*) and the *jaro dangka* are found only in older hamlets, such as Kaduketug. The house is usually located in the southmost area.

### Vegetation of each landscape

#### Vegetation of forest

Mature forest (*leuweung kolot*) contains a high diversity of plants. On the basis of plant survey in the 30 sample plots of the mature forest of Cibeo, Inner Baduy, at least 165 plant species. Various wild and semi-wild species including **maja** (*Aegle marmelos* (L) Corr), **tondeh** (*Aleurites triloba* Forst), **pensar** (*Artocarpus rigida* Bl), **eucit** (*Baccaurea javanica* M.A), **pelah** (*Daeronarops ruber* Renw ex Mart Bl), **durian** (*Durio zibethinus* Murr), **tapos** (*Elatiospermum tapos* Bl), **ki sampang** (*Evodia* sp), **beunying** (*Ficus brevicuspis* Miq), **kimancirang** (*Ficus pumila* L), **bisoro** (*Ficus virens* W.Ait), **kiteja** (*Cinnamomum* sp), **ki sapi** (*Gardenia exelsa* (Bl) Bl), **putat** (*Planchonia valida* (Bl) Bl), **bubuay** (*Plectocomia elongata* Mart ex Bl), **ki leho** (*Saurauria bracteosa* DC), **jirak** (*Symplocos fasciculata*) and **kopo** (*Syzygium malaccense* (L) Merr & Ferry) are predominantly recorded (Figure 5). Although by definition it has never been opened for cultivating rice, mature forest performs many useful functions. For instance, maintains the hydrological Ciujung river, provides animal habitats, plant genetic resources, protect the soil and maintains the microclimate. It provides a variety of non-timber forest products, such as fruits, medicinal plants, ritual plants, handicraft materials, fungi, honey bees, bamboo shoots, and other vegetables. Based on direct observations and interview with informants, it has been recorded some protected animals in the mature forest area, including the Java leaf monkey (**surili** = *Presbytis aygula*), the silvered leaf monkey (**lutung** = *Trachypithecus cristatus*), the Java gibbon (**oa/kueung** = *Hylobates moloch*), the scaly anteater (**peusing/trenggiling** = *Manis javanica*), the Java porcupine (**landak** = *Hystrix javanica*), the stink badger (**teledu/sigung** = *Mydaus javanicus*), the mouse deer (**peucang/kancil** = *Tragulus javanicus*), the barking deer (**mencek** = *Mutiacus muntjak*), **heulang hideung** (*Ictinaetus malayensis*), **heulang ruyuk** (*Spilornis cheela*), **heulang brontok** (*Spizaetus cirrhatus*), **cekahkeh** (*Halcyon chloris*), **manuk hurang** (*Halcyon cyanovertris*), **sriganti** (*Nectarinia jugularis*) and **kalaces**

(*Arachnothera longirostra*). In addition, some places, such as *Arca Domas* and *Sasaka Domas* in the forest are considered sacred and can only be visited at special times to perform annual rituals.

#### Reuma vegetation

*Reuma* is a man-made forest that is fallowed swidden namely as soon as the swidden plot has been abandoned, regrowth vegetation rapidly takes hold. Based on plant surveys of the *reuma* plot of both Outer Baduy and Inner Baduy, it was recorded 79 plant species. Of these species, some species such as **congkok** (*Curculigorecurvata* W.T Alton), **koneng gede** (*Curcuma xanthorrhiza* Roxb), **sempur** (*Dillenia aurea* Smith), **durian** (*Durio zibethinus* Murr), **beunying** (*Ficus brevicuspis* Miq), **kasu** (*Saccharum spontaneum* L), **seuhang** (*Ficus grassularoides* Burm.f), **hamerang** (*Ficus fulva* Reinw), **kitambaga** (*Flemingia lineata* Roxb), **mara** (*Macaranga tanarius* (L) M.A), **kiseureuh** (*Piper aduncum* L), **kaweni** (*Mangifera odorata* Griff), **picung** (*Pangium edule* Reinw), **petai** (*Parkia speciosa* Hassk), and **jengkol** (*Pithecellobium jeringa* (Jack) Prain ex King) are predominantly recorded (Figure 6). Therefore, although *reuma* is technically fallow it still provides useful foods and materials, including those contributing to cash income.

#### The vegetation of hamlet

The Baduy hamlet is commonly encircled by anthropogenic forest, *dukuh lembur* or what Terra (1958) calls *talun* (see also Christanty et al. 1986, Iskandar et al. 2016). The *dukuh lembur* is planted mainly with medicinal species, fruit trees, and plants providing materials. According to plant species survey in the sample plots of *Dukuha Lembur* of Outer Baduy, it was recorded 79 species. Some species such as **kawung/aren** (*Arenga pinnata* (Wurmb) Merr), **kalapa/kelapa** (*Cocos nucifera* L), **kadu/durian** (*Durio zibethinus* Murr), **andul** (*Elaeocarpus obtusus* Bl), **awi/bambu gombang** (*Gigantochloa verticillata* (Willd) Murr), **cariang** (*Homalonema pendula* (Bl) Bakh.F.), **kiray** (*Metroxylon sagu* Rottb), **cau/pisang** (*Musa paradisiaca* L), **rambutan** (*Nephelium lappaceum* L), **ki leho** (*Saurania bracteosa* DC), **kecibeling** (*Sericocalyx crispus* (L) Bremek), **pisitan** (*Lansium domesticum* Corr), **binglu/kemang** (*Mangifera cesia* Jack ex Wall), **picung** (*Pangium edule*), **petai** (*Parkia speciosa* Hassk), and **kaweni** (*Mangifera odorata* Griff) are predominantly recorded (Figure 7). The vegetation structure resembles a mature forest. A rich species diversity index with different maturation times for each species means that *dukuh lembur* can be harvested throughout the year. This product mainly fulfills daily consumption needs, but some surpluses, such as fruit, can be sold to obtain additional income. These species include **durian**, **peuteuy**, **kaweni**, **kelapa**, **aren**, and **picung**.

#### Vegetation of swidden field (*huma*)

Various crops planted in the Baduy swidden field, the most important is rice (**pare** = *Oryza sativa* L), which is considered to be sacred. This belief can be related to old Sundanese traditions. In the past, most Sundanese believed



**Figure 5.** Structure vegetation of mature forest of Cibeo, Inner Baduy. (Photo: J. Iskandar 2004)



**Figure 8.** The vegetation structure of the swidden (*huma*) of the Outer Baduy Community. (Photo: J. Iskandar 2004)



**Figure 6.** Secondary forest (*reuma*) of Outer Baduy Community. (Photo: J. Iskandar 2004)



**Figure 7.** Vegetation structure of hamlet forest (*dukuh lembur*) of Outer Baduy Community (Photo: J. Iskandar 2004)

that rice was originally created by the rice goddess *Nyi Sri Pohaci* (*Dewi Sri* in Javanese) (Soeganda 1982). This myth legitimates the respect held by pre-Islamic Sundanese farmers for the rice goddess. Rice was commonly called *Nyi Sri* or *Kersa Nyai* (the wish of *Nyai*), while rice cultivation was punctuated from beginning to end with various rituals (Suganda 1982; Locher-Scholten 1987; Mustapa 1996). Similar beliefs and practices are still found in Baduy today. A number of local rice varieties are planted annually in Baduy swiddens (*huma*). According to Baduy informants, at least five local rice varieties that should be planted in each swidden field. Three are considered particularly sacred: *pare koneng*, *pare siang*, and *pare ketan langgasari*. These varieties must be planted in separate part of the swiddens. Some households, who don't own enough land (less than 0.50 hectares), are unable to plant these varieties. As a result, they do not have a *pungpuhunan* (sacred place in a swidden field) and ritual must be undertaken by other households, and sacred rice seed for planting must be borrowed.

On the basis of plant survey of thirty plots the swiddens of both Outer Baduy and Inner Baduy, it was recorded 79 species of plant composing rice and non-rice crops. Various plants such as **pare/padi** (*Oryza sativa* L), **hanjeli** (*Coix lacryma-jobi* L), **kumili** (*Plectrathus rotundifolius* (Poiret Sprengel), **jeungjing** (*Albizia chinensis* (Osborne) Merr), **kawung/aren** (*Arenga pinnata* (Whurmb) Merr), **pisitan** (*Lansium domesticum* Corr), **petai** (*Parkia speciosa* Hassk), **kacang hiris** (*Cajanus cajan* (L) Huth), **waluh** (*Cucurbita moschata* (Duch) Poir), **hui manis** (*Dioscorea alata* L), **kacang roay** (*Dolichos lablab* L), **kadu/durian** (*Durio zibethinus* Murr), **sempur** (*Dillenia aurea* Smith), **cau/pisang** (*Musa paradisiaca* L), **jaat** (*Psophocarpus tetragonolobus* ), **tiwu/tebu** (*Saccharum officinarum* (Bl) K.Schum), **jirak** (*Symplocos fasciculata* Zall), are predominantly recorded (Figure 8). These species have been an important role for fulfilling subsistence economic and some surpluses, such as vegetables and fruits can be sold. The rice product, however, based on the Baduy tradition has been prohibited from trading.

### Traditional Baduy conservation

As described above, it can be seen that various landscape of Baduy people has been traditionally by managed by TEK which has four interrelated levels: local knowledge of land, flora, fauna etc.; land and resource management systems; social institutions; and worldview (cf. Berkes 2008). In other words, the Baduy have managed various landscapes dealing with a knowledge-practice-belief complex and in important role to adaptive with their environment. According to Baduy tradition, they have some prohibitions based on customary (*pikukuh*). For example, they have been prohibited from cultivating protected mature forests, to dig soil, to make irrigation and cultivate rice in the irrigated rice fields (*sawah*), to raise large livestock, including cow, buffalo, goat, and sheep. In the swiddening, Baduy have followed the their agricultural calendar, and it has been forbidden to hoe soil or zero soil tillage, to use modern high-yield rice varieties, to apply inorganic fertilizers, and to employ synthetic pesticides. In other words, they have practice swiddening by applying the

organic farming system and LEISA (Low-external-input and sustainable agriculture) system (Reijntjes et al. 1992). In addition, they have been prohibited from cultivating monoculture commercial crops, such as teak, rubber, and clove. These traditional prohibitions can be considered as an adaptive strategy to their environment with their specific local environments, and an important role for natural resource conservation (cf. Reijntjes et al. 1992; Ichwandi and Shinohara 2007; UNEP 2008; Maninkandan et al. 2011) (Table 2).

It can be concluded that the Baduy people have traditionally manage the local ecosystem, mainly particularly forest for the swidden farming based on the traditional ecological knowledge and belief and cosmos, such as to establish some forest areas as a sacred place and prohibited to cultivate for the swidden farming system. As a result, the Baduy have continuous been able to practice traditional swidden cultivation, despite population growth and the depletion of the forest around them.

**Table 2.** Some taboos or prohibitions (*emic view*) of the Baduy and ecological functions (*ethical view*) (field notes, 2004)

| Some taboos of the Baduy people ( <i>emic view</i> )   | Ecological functions ( <i>ethical view</i> *)   |
|--|---|
| Prohibited to cultivate protected mature forest ( <i>teu wasa ngahuma di leweung titipan</i> )   | To conserve forest ecosystem and various flora and fauna  |
| Prohibited to dig soil ( <i>teu wasa ngagali-gali taneuh</i> )   | To avoid soil erosion and landslide   |
| Prohibited to raise large live stocks, including cow, buffalo, goat, and sheep ( <i>teu wasa miara sapi, kebo, kambing dan domba</i> )                     | To avoid high risk of soil erosion cause of big livestock grazing   |
| Prohibited to introduce commercial monoculture crops, such clove garden, and rubber garden ( <i>teu wasa ngebon cengkeh jeung kebon karet</i> )            | To avoid high risk of pests and market economic fluctuation, and applying the agroforestry system more resistant, protect soil erosion, and to pests and provide socio-economic functions   |
| Prohibited to hoe soil or the applying soil tillage ( <i>teu wasa macul taneuh</i> )   | To improve soil condition, soil structure, water-holding capacity, aeration, infiltration capacity, temperature, and evaporation  |
| Prohibited to cultivate new modern rice varieties ( <i>teu wasa melak pare anyar modern</i> )  | To conserve local rice varieties and the modern rice varieties need high inputs of chemical fertilizers, adequate synthetic pesticides, and water supply.   |
| Prohibited to use chemical pesticides ( <i>teu wasa ngagunakeun racun hama pabrik</i> )  | It works quickly and effectively. However, it has serious disadvantages, such as environmental pollution, kill natural enemies of pests, and expensive and difficult to obtain  |
| Prohibited to use artificial/inorganic fertilizer ( <i>teu wasa ngagunakeun pupuk pabrik</i> )   | It may disturb soil life and soil balance; continuous use of only artificial NPK fertilizers lead to depletion of micronutrients, such as zinc, iron, copper, manganese, magnesium, molybdenum, boron which may influence plant, animal, and human health; and lack of supply and expensive |
| Prohibited to swiddening cultivation that is not followed the traditional calendar of Baduy ( <i>teu wasa ngahuma bari henteu ngilupananggalan Baduy</i> ) | To synchronize the planting and harvesting rice and to cut life cycle of insect pests   |

Note: \*) cf. Reijntjes et al. (1992); Ichwandi and Shinohara (2007); UNEP (2008); Maninkandan et al. (2011)

## REFERENCES

- Albuquerque, UP, L.VFC da Cunha, RFP de Lucena, RRN Alves (eds) 2014. *Methods and Techniques in Ethnobiology*. Springer Science-Business Media, New York.
- Anderson MK 2005. *Tending the Wild. Native American Knowledge and the Management of California's Natural Resources*. University of California Press, Berkeley, California.
- Berkes F. 2008. *Sacred Ecology*. Routledge, New York.
- Carlson TJS, L Maffi. 2004. Introduction: Ethnobotany and Conservation of Biocultural Diversity. In: Carlson TJS and L Maffi (eds), *Ethnobotany and Conservation of Biocultural Diversity*. The New York Botanical Garden Press, Brooklyn, NY.
- Christanty L, Abdoellah OS, Marten G, Iskandar J. 1986. Traditional agroforestry in West Java: the *pekarangan* (homegarden) and *kebuntalun* (annual-perennial rotation) cropping systems. In: GG Marten (ed), *Traditional Agriculture in Southeast Asia*. Westview, Boulder.
- Cotton CM. 1996. *Ethnobotany: Principles and applications*. John Wiley & Sons, Chichester.
- Danasasmita S, A Djatisunda. 1986. *The Tradition of Kanekes Community*. Research Center For Sundanese Culture (Sundanologi), Directorate General of Culture, Bandung. [Indonesian].
- Ellen RF (ed). 2007. *Modern Crises and Traditional Strategies: Local Ecological Knowledge in Islands Southeast Asia*. Berghahn Books, New York-Oxford.
- Ellen RF, H Harris. 2000. Introduction. In: Ellen RF and P Parkes, A Bicker (eds), *Indigenous Environmental Knowledge and its Transformation: Critical Anthropological Perspective*. Harword and Academic Publishers, Amsterdam.
- Groenfelt D 1991. Building on tradition: indigenous irrigation knowledge and sustainable development in Asia. *Agriculture and Human Values* 8:114-20.
- Ichwandi I, T Shinohara 2007. Indigenous practices for use of and managing tropical natural resources: A case study on Baduy community in Banten, Indonesia. *Biotrop* 16 (2):87-102.
- Iskandar J. 1991. *An Evaluation of the Shifting Cultivation of the Baduy Community in West Java Using System Modeling*. [M.Sc Thesis]. Chiang Mai University, Thailand.
- Iskandar J. 1998. *Swidden Cultivation As a form of Cultural Identity: The Baduy Case*. [Dissertation]. University of Kent, Canterbury, UK.
- Iskandar J. 2009. Conservation of Mandala Area and Biodiversity undertaken by Baduy People. In: Soedjito H, YPurwanto, E Sukara (eds), *Natural Sacred Place: The role of Culture in Conservation of Biodiversity*. Yayasan Obor Indonesia, Jakarta. [Indonesian].
- Iskandar J 2010. *Human Ecology and Sustainable Development*. PSMIL, Unpad, Bandung [Indonesian].
- Iskandar J. 2012a. *Ecology of swidden cultivation: sustainable forest management based on culture*. Penerbit PT Alumni, Bandung. [Indonesian].
- Iskandar J. 2012b. *Ethnobiology and Sustainable Development*. AIPI Bandung, Puslitbang KPK LPPM Unpad Bandung and M63 Foundation Bandung [Indonesian].
- Iskandar J. 2014. *Human and Environment with various changes*. Graha Ilmu, Yogyakarta [Indonesian].
- Iskandar J, OS Abdoellah 1988. *Agroecosystem Analysis: A Case Study in West Java*. In: Rerkasem, AT Rambo (eds), *Agroecosystem Research for Rural Development*. Chiang Mai University and Southeast Asian Universities Agroecosystem Network (SUAN), Chiang Mai, Thailand.
- Iskandar J, RF Ellen. 2000. The Contribution of Parasierianthes (*Albizia falcata*) to Sustainable Swidden Practices among the Baduy of West Java. *Human Ecology* 28 (1):17.
- Iskandar J, BS Iskandar 2011. *Agroecosystem of Sundanese People*. Buku Kiblat Utama Press, Bandung [Indonesian].
- Iskandar J, BS Iskandar, R.Partasasmita. 2016. Responses to Environmental and Socioeconomic Changes in Karawangi Agroforestry System, South Cianjur, West Java. *Biodiversitas* 17 (1):332-341.
- Johanes RE 1993. Traditional Ecological Knowledge of Fisheries and Marine Hunters. In: Williams NW, Baines (eds), *Traditional Ecological Knowledge: Wisdom for Sustainable Development*. Center for Resource and Environmental Studies, Australian National University, Canberra.
- Lochter-Scholten E 1987. Female Labor in twentieth century Java. European nations-Indonesian practice. In Locher-Scholten E, Niehof (eds) *Indonesia women in focus*. Florish Publication, Leiden.
- Maninkandan P, DR Venkatesh, K Mutchu-Chelian. 2011. Conservation and management of sacred grove in Theni District, Tamil Nadu, India. *J.Biosci.Res* 2 (2):76-80.
- Martin GJ. 1995. *Ethnobotany: A Methods Manual*. Chapman & Hall, London.
- Mueller-Dombois H, H Ellenberg 1974. *Aims and Methods of Vegetation Ecology*. John Wiley & Sons, New York Chichester Toronto.
- Newing, H., Eagle, CM., Puri, R.K, Watson, C.W 2011. *Conducting research in Conservation: Social Science Methods and Practice*. Routledge Taylor & Francis group, London.
- Keraf S. 2002. *Environmental Ethic*. Penerbit Buku Kompas, Jakarta. [Indonesian].
- Kools JF 1935. *Swidden, Swidden Block and Forest Reservation in Banten Residency*. [Dissertation]. H Veenman & Zonen, Wageningen [Duch].
- Marten GG 2001. *Human Ecology: Basic Concepts for Sustainable Development*. Earthscan, London.
- Mustapa RHH 1996. *Priangan People Traditions and Other Sundanese people*. Penerbit Alumni, Bandung (in Sundanese translated to Indonesia by Sasrawijaya). [Indonesian].
- Posey DA (ed). 1999. *Cultural and Spiritual Values of Biodiversity*. Intermediate Technology Publication and UNEP, London.
- Pretty J, B.Adams, F.Berkes, SF de Athayde, N.Dudley, E Hunn, L. Maffi, K.Milton, D. Rapport, P.Robbins, E. 2009. The Interaction of Biological Diversity and Cultural Diversity: towards integration. *Conservation & Society* 7 (2): 100-112.
- Sterling, S.Stolton, A.Tsing, E.Vintiner, S.Pilgrim.2009. The Intersections of Biological Diversity and Cultural Diversity: Towards Integration, *Conservation* 7 (2):100-112.
- Reijnjntjes C, B.Haverkort, A Waters-Bayer. 1992. *Farming the future: An introduction to Low-External-Input and Sustainable Agriculture*. The MacMillan Press Ltd, London.
- Schultes RE 1989. Reasons for ethnobotanical conservation. In: Johannes RE (ed), *Traditional Ecological Knowledge: A Collection of Essays*. International Conservation Union (IUCN), Gland, Switzerland.
- Soedjito H (ed). 2004. *Guide for Management of Biosphere Reserve in Indonesia*. Man and Biosphere, Indonesian Institute of Science, Jakarta. [Indonesian].
- Soeganda AP.1982. *Traditional Ritual in Pasundan*. Penerbit Sumur Bandung, Bandung [Indonesian].
- Terra GJA. 1958. Farm systems in Southeast Asia. *Netherlands Journal of Agricultural Science* 6 (3):157-182.
- Toledo VM 1992. What is ethnoecology?. *Origins, scope and implications of rising discipline*. *Ethnoecologica* 1 (1):5-21.
- Toledo VM.2000. *Indigenous people and biodiversity*. Vol 1 ed.Levin, pp.118-1 to 1181-13 Academic Press, Princetion.
- UNEP 2008. *Indigenous knowledge in Disaster Management in Africa*. Nairobi, Kenya.
- Warren DM, LJ Slikkerveer, D.Brokensha (eds). 1995. *The Cultural Dimension of Development: Indigenous Systems*. Intermediate Technology Publications, London.