Importance of *kabuyutan* sacred natural sites as biodiversity hotspots in West Java Province, Indonesia

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摘要: 本研究はインドネシアの Ciomas 村における 33 箇所の自然聖地である *kabuyutan* の生物多様性ホットスポットとしての重要性を明らかにすることを目的とした。深層インタビューや参与観察を通じた民族植物学のアプローチおよび植生調査により、対象地の植物種を明らかにした。合計 332 種の植物が確認され、そのうち 38.5%が *kabuyutan* に分布した。生物多様性ホットスポットとしての重要性が示された一方、半数が外来種となり、絶滅の恐れのある種もあった。予防的な措置により、外来種を取り除き、住民が伝統儀式の中で外来種を植栽しないといった対策を進める必要がある。その上では、*kabuyutan* の管理者が環境保全と地域性に関して持続可能な知識の共有が求められる。

キーワード: カブユタン, 自然聖地, 生物多様性ホットスポット, 知識の共有, 管理者の役割

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Abstract: We aimed to highlight the current condition and the potential of 33 *kabuyutan* in Ciomas Village, Indonesia. The ethnobotanical approaches were used to identify plant species. Through the free listing method, about 332 plant species were reported and a third four of them existed in *kabuyutan*. The findings strengthened the potential of *kabuyutan* to be local biodiversity hotspots which would support the global conservation strategy. However, more than half of species were exotic. We suggested that dissemination of knowledge is essential to nourish people's awareness in dealing with locality and environmental conservation by encouraging and strengthening the custodian's role.

Key words: *kabuyutan*, sacred natural sites, biodiversity hotspot, knowledge sharing, custodian's role

1. Introduction

As one of the sacred natural sites that exist in a worldwide, *kabuyutan* are perceived having a potential to safeguard the biodiversity (Vodouhê *et al.*, 2010). Historically, Sundanese philologist and archeologist report that the term of *kabuyutan* was used to define the sacred place that specified for the center of religious and education activities, settlement of priests, or conservation areas (Kartakusuma, 2006; Wessing, 1999). The evidence can be found in the ancient Sundanese manuscript such as *Amanat ti Galunggung* which explains their existence as a numinous place for respecting deities or ancestors (Kartakusuma, 2006). Physically, *kabuyutan* can be clearly distinguished from their surrounding landscape because a dense vegetation mainly covers it or characterized by particular sacred elements such as grave, spring, stone, lake, river, or even mountainous region. Local people have sanctified *kabuyutan* due to their believes that deities or

spirits occupied these places and provided people certain powers such as the miraculous power to cure illness or to improve people's life with a blessing (Wessing, 1999).

Besides, the sacredness of *kabuyutan* shows the power of custodian in dealing with the ancestors' mandate to shield its importance. As a consequence, significant physical elements and associated historical and cultural values are remaining over periods. Recently, Sundanese scholars mostly put their attention into the historical artifact rather than natural element. This shows an excellent opportunity to reveal the ecological functions of *kabuyutan*. Therefore, this study was aimed to highlight the current condition and the potential of *kabuyutan* within the Sundanese landscape. Through this study, some adaptive strategies in dealing with challenges of *kabuyutan* are recommended.

2. Materials and methods

2.1 Study site

This study was carried out in Ciomas Village, Panjalu

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District, Ciamis Regency, West Java Province. Thirty-three *kabuyutan* were explored with *Kabuyutan Panghulu Gusti* (KPG) as the largest and most respected which entitled by “heart of the village” due to its role in facilitating an annual *nyepuh* ceremony. As a part of the Sawal volcanic mountain (1762 m above sea level; hereafter masl), *kabuyutan* scattered within the village with the average elevation of 767 masl, more than half of them located on a very gentle slope (1-3%) and only two *kabuyutan* placed on moderately sloping (5-15%). Besides, the climatic condition is suitable for agricultural activities with the 25 °C of average daily temperature and wet season almost in a whole year with the average annual precipitation is about 2000 mm. Most of the *kabuyutan* were placed close to water bodies and mainly covered by a dense vegetation. Sacred graves, springs and several sacred tree species existed (Figure 1a).

2.2 Data collection

The ethnobotanical approach was used through several methods to identify plant species within *kabuyutan*. First, key informants were asked to explain the plant species with their local names, habitat distribution, a variety of

uses, used part of the plant, as well as their appearance, condition, and utilization through the free listing method. Then, participant observation was conducted with key informants for deeper understanding the existence and the function of plant species that mentioned earlier. Besides, plots (20 x 20 m²) were laid randomly to identify plant species that exist within *kabuyutan* as well as to verify what have been reported by informants. To avoid ‘edge effects’ distorting the data, peripheral areas, 3 m along the boundary or pedestrian track were excluded from the analysis except for *kabuyutan* which one or two plots per site. Tree species measuring ≥ 10 cm diameter at breast height (DBH), woody lianas, and other plant habitus with a height ≥ 1 m were enumerated (Figure 1b). All methods were applied during February 2015 and continued in March 2016.

2.3 Data analysis

Plant species database that obtained from participatory activity was verified by using The Plant List database (The Plant List, 2013) to check nomenclatural information. Also, the IUCN Red List and Indonesia protected plant database were used to verify whether the species was protected or common. Since the term of native species perceived by local people as species that have been existed in their location for long period regardless of the understanding about the origin of those plant species, we used the scientific definition of native proposed by Tallamy (2009) as species that have been observed particular place or ecosystem and existed for generations due to natural process. Based on those databases, native species were ascribed to Indonesia and West Java region in particular.

The cultural significance analysis of plant species was conducted by the quantitative assessment of important plant species in the ethnobotanical study. This analysis was necessary as a basis for considering the importance of particular plant species, their potential for both ecological conservation and social-economic purposes preservation (Turner, 1988). Also, this quantitative assessment is complementary to qualitative data that useful to deal with the environment issues, especially regarding plant species diversity (Hoffman and Gallaher, 2007). The Index of Cultural Significance (ICS) proposed by Turner (1988) was used to analyze the data. Turner (1988) suggested three necessary parameters in the cultural evaluation of plants which estimates of quality (q), intensity (i), and exclusivity value (e) of each plant of significance to the community (Table 1) with the following formula:

$$ICS = \sum_{i=1}^n (q \times i \times e) u_i$$

Fig. 1 Distribution of 33 *kabuyutan* (a) and 21 plots on the KPG (no. 1 in map) in Ciomas Village (b)

where, subscript u_i shows i -th use type, and ICS is the sum of scores of use types from u_1 to u_n , with n representing the last use described. We assumed that plant species with high ICS value have a potential to enrich plant diversity due to their relation to the local culture which regularly manages those plants. Further, the native species with high ICS value were assumed to have importance both in cultural and ecological aspect to support conservation strategy in biodiversity. Finally, results were discussed qualitatively to describe the phenomena.

3. Results

3.1. Informant characteristics

Five key informants of custodian's family, average age 44 years, participated in the study. They were native, Muslim, and none had a higher education grade than senior school. Agricultural activity was a primary source for their income. Also, they have been mandated to manage the *kabuyutan* and associated religious activities such as pilgrimage. The key informants were selected due to their status as the leading custodian of *kabuyutan* in Ciomas Village and KPG in particular. Local people respected them as an authorized person to deliver knowledge about *kabuyutan*.

3.2. Ethnobotanical plant species in Ciomas Village

According to informants' knowledge, a total of 332 different species were reported to exist in Ciomas Village which belongs to 100 families. Most of the families (50%) have only one species, and Poaceae is a family that has the most species of 21 plant species (1.0%). Plant species were majority identified as tree species (43.4%) while epiphyte species were listed as the fewest (0.3%) compare to others plant habitus. About three-quarter of plant species (71.7%) was identified as exotic species, while 94 plant species (28.3%) were recognized as native species. Five species were identified as threatened species by IUCN (1.6%), while ten plant species were recognized as nationally protected species by Indonesia government due to their rarity in nature and difficulty in cultivation.

Informants reported about 24 combinations were identified to indicate habitat distribution of plant species. About 78 plant species (23.5%) existed within *kabuyutan*, natural forest, and artificial forest area. About 11 plant species (3.3%) were identified as ubiquitous plant species that live in all the habitat types (*kabuyutan*, natural forest, artificial forest, crop field, paddy field, and settlement area). Other findings showed that some unique plant species existed only in the natural forest (0.3%), artificial forest (1.5%), and settlement area (5.4%). Regarding uses

of the plant, informants reported that most of the plants were used for medicine (15.7%) and environmental conservation purposes (14.7%). A few number of species were used for fiber (0.2%) such as *Pinus mercurii* and four species (0.4%) such as *Oryza sativa* which majority of people use as staple food. Other utilizations were reported as for daily consumption such as fruits (9.3%), vegetables (8.3%), and spicy (4.1%); for supporting household activities such as construction (9.4%), fuel (8.2%), industrial (2.2%), and ornamental (4.8%); as well as for supporting agriculture activities such as organic fertilizer (4.7%), organic pesticide (3.0%), and fodder (8.7%). A whole part of plant species (22.1%) was mainly used to fulfill local people's needs, especially for conservational purposes that require all part of the plant. Besides, people also used leaves (21.6%) for daily consumption such as for cooking or curing the ailments; branches (11.8%) for mainly used as firewood and charcoal; and stems (14.5%) for construction materials as well as for industrial purposes.

Furthermore, Index of Cultural Significance (ICS) obtained for the 332-plant species useful for the Ciomas people ranged from 1 to 250. The highest value was for *tisuk* (*Hibiscus macrophyllus* Roxb. Ex. Hornem), while the lowest was dominated by the rare tree species such as *angsana* (*Pterocarpus indicus* Willd). Table 1 shows that only 8.1% of plant species were considered the very high significance and many species (35.5%) were identified very low significance.

The highest value of ICS (Table 2) was dominated by trees function as timber for a specific use such as building material or furniture. For example, *tisuk* (*Hibiscus*

Table 1 Five groups of species based on ICS's analysis

Value	Species	Important species (origin)
Very high significance (ICS ≥ 100)	27	<i>Tisuk</i> (<i>Hibiscus macrophyllus</i> Roxb. Ex. Hornem.) (E); <i>jati</i> (<i>Tectona grandis</i> L.f.) (N); <i>jati bodas</i> (<i>Gmelina arborea</i> Roxb.) (E); <i>afrika</i> (<i>Maesopsis eminii</i> Engl.) (E); <i>alba</i> (<i>Albizia falcataria</i> (L.) Fosberg) (E)
High significance (ICS 50-99)	45	<i>Jagung</i> (<i>Zea mays</i> L.) (E); <i>padi</i> (<i>Oryza sativa</i> L.) (E); <i>nangka</i> (<i>Artocarpus heterophyllus</i> Merr.) (N)
Moderate significance (ICS 20-49)	54	<i>Awai haur</i> (<i>Bambusa tuldoidea</i>) (E); <i>padi huma</i> (<i>Oryza</i> sp.) (E); <i>jengkol</i> (<i>Pithecellobium lobatum</i> Benth.) (N)
Low significance (ICS 5-19)	88	<i>Cecenet</i> (<i>Physalis angulata</i> L.) (E); <i>dalima</i> (<i>Punica grandum</i> L.) (E); <i>awai hideung</i> (<i>Gigantochloa atrovioacea</i>) (N)
Very low significance (ICS 1-4)	118	<i>Anggrek</i> (<i>Phalaenopsis javanica</i> Blumei.) (N); <i>angsana</i> (<i>Pterocarpus indicus</i> Willd.) (N); <i>antan</i> (<i>Centella asiatica</i> (L.) Urban.) (N)

Abbreviation: Origin of plant species, native (N) or exotic (E)

Table 2 Calculation of species with the highest ICS's value

Species	Detailed calculation	ICS
<i>Tisuk</i> (<i>Hibiscus</i>	$(4 \times 5 \times 2)_{u_5} + (3 \times 5 \times 2)_{u_6} + (4 \times 5 \times 2)_{u_7} +$	250
<i>macrophyllus</i> Roxb. Ex. Hornem.)	$(4 \times 5 \times 2)_{u_8} + (2 \times 5 \times 2)_{u_{11}} + (2 \times 5 \times 2)_{u_{12}} +$ $(2 \times 5 \times 2)_{u_{13}} + (4 \times 5 \times 2)_{u_{14}}$	
<i>Jati</i> (<i>Tectona grandis</i>	$(4 \times 5 \times 2)_{u_5} + (3 \times 5 \times 2)_{u_6} + (4 \times 5 \times 2)_{u_7} +$	210
L.f.)	$(4 \times 5 \times 2)_{u_8} + (2 \times 5 \times 2)_{u_{11}} + (4 \times 5 \times 2)_{u_{13}}$	
<i>Jati bodas</i> (<i>Gmelina</i>	$(4 \times 5 \times 2)_{u_5} + (3 \times 5 \times 2)_{u_6} + (4 \times 5 \times 2)_{u_7} +$	210
<i>arborea</i> Roxb.)	$(4 \times 5 \times 2)_{u_8} + (2 \times 5 \times 2)_{u_{11}} + (4 \times 5 \times 2)_{u_{13}}$	
<i>Afrika</i> (<i>Maesopsis eminii</i>	$(4 \times 5 \times 2)_{u_5} + (3 \times 5 \times 2)_{u_6} + (4 \times 5 \times 2)_{u_7} +$	200
Engl.)	$(4 \times 5 \times 2)_{u_8} + (4 \times 5 \times 2)_{u_{13}} + (4 \times 5 \times 2)_{u_{14}}$	
<i>Alba</i> (<i>Albizia falcata</i>	$(4 \times 5 \times 2)_{u_5} + (3 \times 5 \times 2)_{u_6} + (4 \times 5 \times 2)_{u_7} +$	200
(L.) Fosberg)	$(4 \times 5 \times 2)_{u_8} + (4 \times 5 \times 2)_{u_{13}} + (4 \times 5 \times 2)_{u_{14}}$	

Note: subscript u_i shows the individual use of plant species for food (u_1), fruit (u_2), vegetable (u_3), spicy (u_4), fodder (u_5), construction (u_6), industrial (u_7), fuel (u_8), fiber (u_9), ornamental (u_{10}), medicine (u_{11}), spiritual (u_{12}), conservation (u_{13}), organic fertilizer (u_{14}), and organic pesticide (u_{15})

macrophyllus Roxb. Ex. Hornem) that used for construction material (u_6) and industrial (u_7) has a very high intensity of use ($i=5$) which used regularly ($q=4$) and more preferred over other plant use options ($e=2$). Informants reported that after Indonesia government proclaiming the program of *One Million Tree for Indonesia* in 2010, government encouraged timber tree plantation such as *tisuk*, *jati*, *jati bodas*, *afrika*, dan *alba* (Table 2) to increase the prosperity in addition to environmental conservation purposes. To date, people have been planting those tree species in their forest garden, mixed garden, or even home garden as a deposit for future needs.

3.3 Plant species in *kabuyutan*

Informants reported that 249 plant species exist in *kabuyutan* and about 96 plant species belong to 47 families have been clarified within 33 *kabuyutan* (Table 3). Most species were identified as tree (77.1%) following by herb (5.2%), bamboo (4.2%), liana (4.2%), palm tree (4.2%), pandanus (2.1%), shrub (2.1%), and fern (1.0%) respectively. About 58 species (60.4%) were exotic, and the majority of species were not designated as a protected plant species both by IUCN (97.9%) and national regulation (94.8%). Concerning utilization, most species were found in nature as a wild plant (65.6%), and none were regularly cultivated. A half of species indicated rarity while 28.1% of species were abundant. As for utilization, more than half of species (56.3%) were used in a little amount which considered as a sufficiency.

Results showed that some endangered plant species existed in *kabuyutan*. For example, a native and IUCN's threatened *tanglar* tree (*Aglaia elliptica* Blume, Bijdr

Table 3 Vegetation survey of 33 *kabuyutan*

<i>Kabuyutan</i> (number in map)	TA	LS	NP	NS (N, E)	NT
<i>Panghulu Gusti</i> (1)	6.6	G	21	58 (25,33)	45
<i>Kawis</i> (2)	3.3	G	7	9 (5,4)	7
<i>Ciomaslandeuh</i> (3)	2.2	G	3	10 (6,4)	7
<i>Sereh</i> (4)	2.1	G	6	23 (11,12)	17
<i>Mangkubumi</i> (5)	1.7	G	2	15 (5,10)	10
<i>Kituak</i> (6)	1.2	P	1	6 (3,3)	2
<i>Galogor</i> (7)	1.1	P	2	7 (3,4)	6
<i>Borogojol</i> (8)	1.1	P	3	10 (5,5)	8
<i>Makambaros</i> (9)	1.0	G	4	18 (7,11)	16
<i>Cikutuk</i> (10)	1.0	P	2	7 (2,5)	4
<i>Semang</i> (11)	0.8	P	4	21 (8,13)	13
<i>Ranjeng</i> (12)	0.7	G	2	10 (6,4)	7
<i>Pasirjambu</i> (13)	0.7	G	3	18 (9,9)	13
<i>Embungcidarma</i> (14)	0.7	P	2	3 (0,3)	3
<i>Hulusitu</i> (15)	0.6	P	3	7 (2,5)	3
<i>Seureuhbeureum</i> (16)	0.5	G	3	8 (2,5)	2
<i>Wargabangsa</i> (17)	0.4	G	1	4 (2,2)	3
<i>Gencoy</i> (18)	0.3	P	1	8 (4,4)	3
<i>Pasucian</i> (19)	0.3	P	1	11 (2,9)	8
<i>Kijoho</i> (20)	0.3	P	2	14 (5,9)	10
<i>Cipambuangan</i> (21)	0.2	P	2	16 (5,11)	10
<i>Batudatar</i> (22)	0.2	P	1	2 (1,1)	0
<i>Cipanyusuhan</i> (23)	0.2	G	1	2 (0,2)	2
<i>Cidarma-Cigarunggang</i> (24)	0.2	P	1	11 (4,7)	7
<i>Pangauban</i> (25)	0.2	P	1	4 (1,3)	2
<i>Baros</i> (26)	0.2	G	1	9 (0,9)	6
<i>Gunungsari</i> (27)	0.1	P	1	5 (1,4)	3
<i>Awilarangan</i> (28)	0.1	P	1	4 (2,2)	1
<i>Picung</i> (29)	0.1	P	1	8 (1,7)	6
<i>Cigondok</i> (30)	0.0	P	1	1 (0,1)	0
<i>Nusakutu</i> (31)	0.0	P	1	2 (1,1)	1
<i>Kitiwu</i> (32)	0.0	P	1	2 (1,1)	1
<i>Kimulud</i> (33)	0.0	P	1	3 (0,3)	2

Abbreviation: Elevation (E) in masl; total area (TA) in hectare; land status (LS) owned by government (G) and private (P); number of plot (NP); number of species (NS) with number of native (N) and exotic species (E); and number of trees (NT)

(Pannell, 1998) was perceived has a high cultural significance due to its existence for an extended period and well known as the main symbol of KPG. The rarity has caused this species to be sacred and restricted to its utilization. In contrast with *tanglar*, *kawung* (*Arenga pinnata* (Wurmb) Merr.) were found in a nearly half of *kabuyutan*. This species was also perceived as a culturally significant species for Sundanese people who has obtained its benefits for generations. Informants stated that *kawung*

Fig. 2 Condition of *Kabuyutan Cigondok* (a); and a rite of tree plantation in the annual *nyepuh* ceremony (b)

is essential for environmental conservation due to its capability to catch and store water as well as to maintain the structure of the soil. However, they found some difficulties to cultivate this species because of the extinction of *careuh*, or the common palm civet (*Paradoxurus hermaphroditus*) which perceived has a mutual symbiosis with *kawung*. Informants said that the seeds would be easier to grow after the fermentation process through civet's digestion. They also mentioned that the decreasing number of *careuh* in line with the increasing of the coffee plantation to produce *kopi luwak* (civet coffee). Furthermore, IUCN listed as least concern species (Duckworth et al., 2016).

In addition to the endangered species, an interesting result was found that *kalapa ciung* (*Ailanthus triphysa*) and *pasang* (*Lithocarpus elegans* (Blume) Hastus. Ex Soepadmo) were distributed almost over the whole *kabuyutan* which counted fifteen plots and ten plots respectively. Informants reported that similar with *kawung*, *kalapa ciung* also perceived as both culturally and ecologically significant tree. This tree was perceived for marking the lands susceptible to a landslide as well as for identifying the sacredness of *kabuyutan*.

Concerning the importance of tree as a dominant species without compromising other plant habitus, at least 74 trees existed within *kabuyutan* (Table 3). The majority of tree species were found in KPG as the largest *kabuyutan* in Ciomas Village and other *kabuyutan* located on government lands such as *Sereh* and *Mangkubumi*. Informants reported that annual ceremony of *nyepuh* in the KPG which requires tree plantation as a part of rituals has a potential to increase the number of species (Figure 1b and 2b). Recently, at least three tree species, namely *sirsak* (*Annona muricata* L.), *palahlar* (*Dipterocarpus retusus* BI.), and *matoa* (*Pometia pinnata* J.R. Forst&G. Forst.) were planted during *nyepuh*. Since 2016, selection of plant species was conducted to ensure the origin of species. In addition, the national afforestation program has been actively encouraged people to plant tree species regardless

of their origin. As a consequent, five species with the highest ICS value were also found within *kabuyutan*.

As for other large *kabuyutan*, natural succession followed by the sacredness of such places led to maintain the number tree species. On the contrary, *Kabuyutan Cigodok* has lost its surrounding area which previously covered by trees (Figure 2a). Other results found that *kabuyutan* located on private lands showed the less number of species due to the landowner's interest. Some informants stated that people are usually utilizing their land based on their wish to fulfill their basic need which mainly to produce a staple food such as rice or other complementary crops. Thus, most of privately *kabuyutan* were surrounded by paddy or crop field area. Consequently, the area of *kabuyutan* was gradually fragmented and some of them existed only with their single elements such as graves, stones, plants, or spring.

4. Discussion

Results revealed that 249 (75%) of 332 plant species were reported to exist in *kabuyutan* according to local people's knowledge and 96 (38.5%) of them have been verified based on vegetation survey. It is assumed that *kabuyutan* is potential to be hotspots of plant diversity. This finding supports other studies that proposed a function of sacred natural sites as a preferable habitat for abundant plant species (Dudley et al., 2010). In addition, regardless of survey's result, the presence of all fifteen endangered plant species as well as 32.9% of native species reported by informants, indicating the importance of *kabuyutan* towards biodiversity conservation. The presence of endemic and threatened species is important in designating a biodiversity hotspot that leads to making up conservation priorities (Myers et al., 2000). It shows a potential for *kabuyutan* to be acknowledged as local biodiversity hotspot to support regional or further global conservation efforts.

The existence of plant species highly depends on the cultural aspect that influences the management of *kabuyutan*. The tradition which held in *kabuyutan* plays an important role to maintain the plant species. An annual ceremony of *nyepuh* that owned by local people in KPG, for instance, requires some tree species to be planted as a part of rituals regardless of plant origin. Consequently, the number of exotic species might be increasing in line with the implementation of ceremony such as shown in the KPG with the 33 exotic plant species compared to 25 native species (Table 3). However, a change of perception according to native species led to prevent the introduced

species. As a result, two native tree species (*matoa* and *palahlar*) have been planted during *nyepuh* in 2016. Moreover, *palahlar* tree is assessed as a vulnerable species by IUCN due to decreasing of the population within its habitat (Ashton, 1998).

Similar to other studies (Vodouhè *et al.*, 2010), this study stresses that dissemination of knowledge is essential to change people's perception that will influence their awareness to protect their valuable properties. Furthermore, this effort is also essential to increase the landowner's awareness (Honig *et al.*, 2015) in managing *kabuyutan*, especially according to the importance of trees in land and water conservation. Therefore, this study emphasizes that the availability of related information needs to be prepared in advance and encouraging their participation (Vodouhè *et al.*, 2010) is also important, especially to deal with the locality (Cook *et al.*, 2015).

Furthermore, a sufficient knowledge may strengthen the essential role of custodian through their customary laws to encourage local people and government to use local species in the *nyepuh* ceremony as well as during afforestation program. Consequently, this effort can revitalize the cultural significance of native plant species and also can improve the capability of *kabuyutan* and their buffer zone as local biodiversity hotspots.

Conclusion

The finding that a third four of plant species in Ciomas Village exist in *kabuyutan* reinforce the potential of *kabuyutan* to be local biodiversity hotspots. However, some preventive efforts should be applied to eliminate the dominance of exotic species such as strengthened the selection of plant species when performing *nyepuh* tradition as well as when implementing afforestation in and around *kabuyutan*. We suggested that dissemination of knowledge related to the importance of *kabuyutan* and its element is essential to increase local people's awareness by strengthening the custodian's role. Moreover, there is a potential to combine customary laws and official regulations in the management strategy to ensure the sustainability of *kabuyutan*. Finally, a further analysis on vegetation is essential for deeper understanding about the importance of *kabuyutan*.

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References

- 1) Ashton, P. (1998) *Dipterocarpus retusus*. The IUCN Red List of Threatened Species 1998: e.T32400A9702185. <http://www.iucnredlist.org/details/32400/0> (Accessed: 24-Jan-2017).
- 2) Cook, N. A., Sarver, E. A., Krometis, L. H., and Huang, J. (2015) Habitat and water quality as drivers of ecological system health in Central Appalachia. *Ecol. Eng.*, 84:180–189.
- 3) Duckworth, J. W., Timmins, R. J., Choudhury, A., ... Xu, W. (2016) *Paradoxurus hermaphroditus*. The IUCN Red List of Threatened Species 2016: e.T41693A45217835. <http://www.iucnredlist.org/details/41693/0> (Accessed: 21-Feb-2017)
- 4) Dudley, N., Bhagwat, S., Higgins-Zogib, L., Lassen, B., Verschuuren, B., and Wild, R. (2010). Conservation of biodiversity in sacred natural sites in Asia and Africa: a review of the scientific literature. In: *Sacred natural sites: conserving nature and culture* (eds. B. Verschuuren, R. Wild, J. McNeely, and G. Oviedo) pp. 19–32, London & Washington, DC: Earthscan.
- 5) Hoffman, B., and Gallaher, T. (2007) Importance indices in ethnobotany. *Ethno. Res. & App.*, 5: 201–218.
- 6) Honig, M., Petersen, S., Shearing, C., Pintér, L., and Kotze, I. (2015) The conditions under which farmers are likely to adapt their behaviour: A case study of private land conservation in the Cape Winelands, South Africa. *Land Use Pol.*, 48: 389–400.
- 7) Kartakusuma, R. (2006) *Situs (Kabuyutan) Kawali di Ciamis, Jawa Barat: Ajaran Sunda di dalam Tatanan Tradisi Megalitik*. In: *Konferensi Internasional Budaya Sunda Jilid 1* pp. 254–271, Bandung: YKR.
- 8) Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B., and Kent, J. (2000) Biodiversity hotspots for conservation priorities. *Nature*, 403(6772): 853–858.
- 9) Pannell, C. M. (1998) *Aglaia elliptica*. The IUCN Red List of Threatened Species 1998: e.T33726A9805994. <http://www.iucnredlist.org/details/33726/0> (Accessed: 21-Feb-2017).
- 10) Tallamy, D. W. (2009) *Bringing nature home: how you can sustain wildlife with native plants*. Timber Press, UK.
- 11) The Plant List (2013) *The Plant List Version 1.1*. <http://www.theplantlist.org/> (Accessed: 1-Jan-2017).
- 12) Turner, N. J. (1988) The importance of a rose: Evaluating the cultural significance of plants in thompson and lilloet interior salish. *J. American Anthropol.*, 90(2): 272–290.
- 13) Vodouhè, F. G., Coulibaly, O., Adégbidi, A., and Sinsin, B. (2010) Community perception of biodiversity conservation within protected areas in Benin. *For. Policy & Econ.*, 12(7): 505–512.
- 14) Wessing, R. (1999) The sacred grove: founders and the owners of the forest in West java. *L'homme et La Foret Tropicale*, 59–74.

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