Diversity and Utilization of Bamboo Plants in The Area of Hotel in Kedewatan Village, Ubud, Bali

N W F Utami[1] and N L M Pradnyawathi[2]

[1]Landscape Architecture Study Program, Faculty of Agriculture, Udayana University
Jl. P.B. Sudirman Denpasar, Bali, INDONESIA 80232
[2]Agroecotechnology Study Program, Faculty of Agriculture, Udayana University
Jl. P.B. Sudirman Denpasar, Bali, INDONESIA 80232

E-mail: wayan_febriana@unud.ac.id

Abstract. Bamboo or *tiying* (Balinese language) is a widely used non-timber plant in Indonesia especially in Bali. The presence of bamboo appertains to its ethno-botanical function of bamboo especially for rituals. However, there are other utilization of bamboo which is naturally grown or intentionally planted. Kedewatan as a famous place in northern Ubud, Bali have many lavish hotels with its natural environment and appealing place. The aims of this study is to invent bamboo species diversity and bamboo utilization on private areas of hotel in Kedewatan. Methods used in this study was field survey with observation and interview technic. Observation was implemented by purposive sampling methods by selecting hotel which adjacent to Ayung and Wos rivers. Interview was conducted with some key persons in charge on managing hotel garden. In addition, bamboo species identification was established through literature study. The results show that there are eleven bamboo species found on the survey area with most commonly employed species in the area were *tiying tali* (*Gigantochloa apus* (J.A. & J.H. Schultes) Kurz.) and *tiying gading* (*Phyllostachys sulphurea* (Carr.) A. e.t. C. Riv.) which were belong to exotic species. The areas which bamboo cultivated were welcome area as a hedgerow and near hotel lobby, between, outside and inside villa buildings, and naturally grown in the riverbanks with a good landscaping arrangement. Bamboo plantations were utilized to adorn and support the quality of the hotel building as well as to conserve soil and water along Ayung and Wos river canyons. The other utilization of bamboo was to facilitate ritual activity in Kedewatan village. They are allowed to ask for limited amount of bamboo culms with condition not to damage the physical appearance and function that desired by the hotel manager or hotel owner.

1. Introduction

Bali as one of famous tourist destinations locally and internationally has numerous tourist accommodation such as hotels, cottages and bungalows. The hotel growth rate in Bali was reaching up to 65% during five years since 2009 [1]. The existence of the hotel in tourist industry becomes a necessity for tourists who come and stay in Bali for specified period of time. There are several factors for tourist to determine the rate of accommodation facilities such as hotels. One of them is the quality of service and facilities. Therefore, the ability to maintain the quality of the environment, in this case is arrangement of landscape in the hotel, become major component to attract tourist to stay. The Environmental factors, particularly visual quality, has separate image for tourists especially for new visitors to determine lodging accommodation [2].

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Ubud district is an area that has many lavish hotel accommodations which is equal to thirteen five-star hotels and 336 non-star hotel. The number was highest among the other districts in Gianyar. And Kedewatan village as part of Ubud district is also acknowledge to hotel landscaping to improve the quality of services for tourists. The hotel landscaping are composed by hardscape and softscape elements. Bamboo as type of softscape element has important involvement to the hotel beautification in general.

Bamboo or *tiying* in Balinese language is one of non-timber plantation that widely used by Indonesia people and Balinese community in particular. The presence of bamboo in Bali is essential for Balinese Hindu's ritual. There are at least 49 types offering product that utilize bamboo [3] or nearly 55 types of bamboo were utilized in the rituals of Balinese Hindu ceremony [4]. However, there are also other functions of bamboo plantation in addition to the functions mentioned above. It is interesting because of the abundant of bamboo found in Bali either deliberately grown on private land or naturally grown.

The focus of this study was to inventory bamboo plantations that are deliberately planted on private land of hotel and also to identify the function of bamboo plantation as softscape element in hotel, particularly for physical, ecological, and aesthetics functions. By composing the landscape, especially the utilization of bamboo be able to support the quality of the existing hotel. Besides, the geographical location of the village of Kedewatan ecologically appropriate for the growth of bamboo plants.

2. Methods

Kedewatan village is situated in northern of Ubud district, Gianyar regency, Bali province with geographical locations at latitude 8◦27'15" LS - 8◦27'50" S and longitude 115◦14'20" E - 115◦15'30" E (Figure 1).

Kedewatan is stretched from north to south and flanked by two big rivers namely Ayung river and Wos river. The village covered about 4,35 ha of land which is almost of area was agricultural land (56% of the total area). There is no forest found in Kedewatan, but the growing plants were forming small forest adjacent to both river [5].

There were three phase implemented in this study. First was pre-inventory and inventory phase. This phase begin by conducting interviews with local government officer of area (head of the village or *perbekel* and head of sub-village or *kelian banjar*) to determine the location of observations. Once the location was determined then it continued by selecting the sites. Later it followed by conducting visual observations in hotel and interviews with hotel managers to obtain information about the types of bamboo planted, recording morphological and ecological characteristics of observed bamboo as well as its function in the hotel landscape. Bamboo botanical names were checked through literature study.

The next step continued by recording ecological data for bamboo evaluation and assessment by recording bamboo functions in term of amenities (temperature, humidity, wind, glare), architectural (forming space, curtain, privacy), engineering quality of the environment (erosion, hydrology, air, aroma, wildlife) and aesthetic (complementary, unite, put pressure, welcoming, soften, framing). Data presented in tabulation and then analyzed descriptively. The last phase was synthesis which undertake to develop conclusions based on research objectives that have been made at the beginning of the study. Figure 2 describes briefly in respect to research framework base on phase 1, 2 and 3.

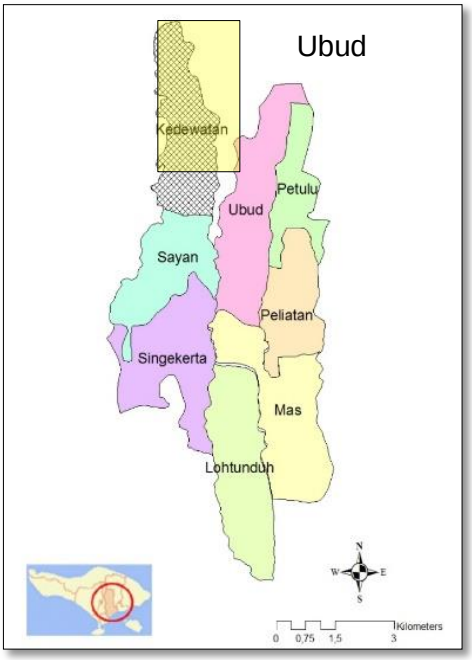
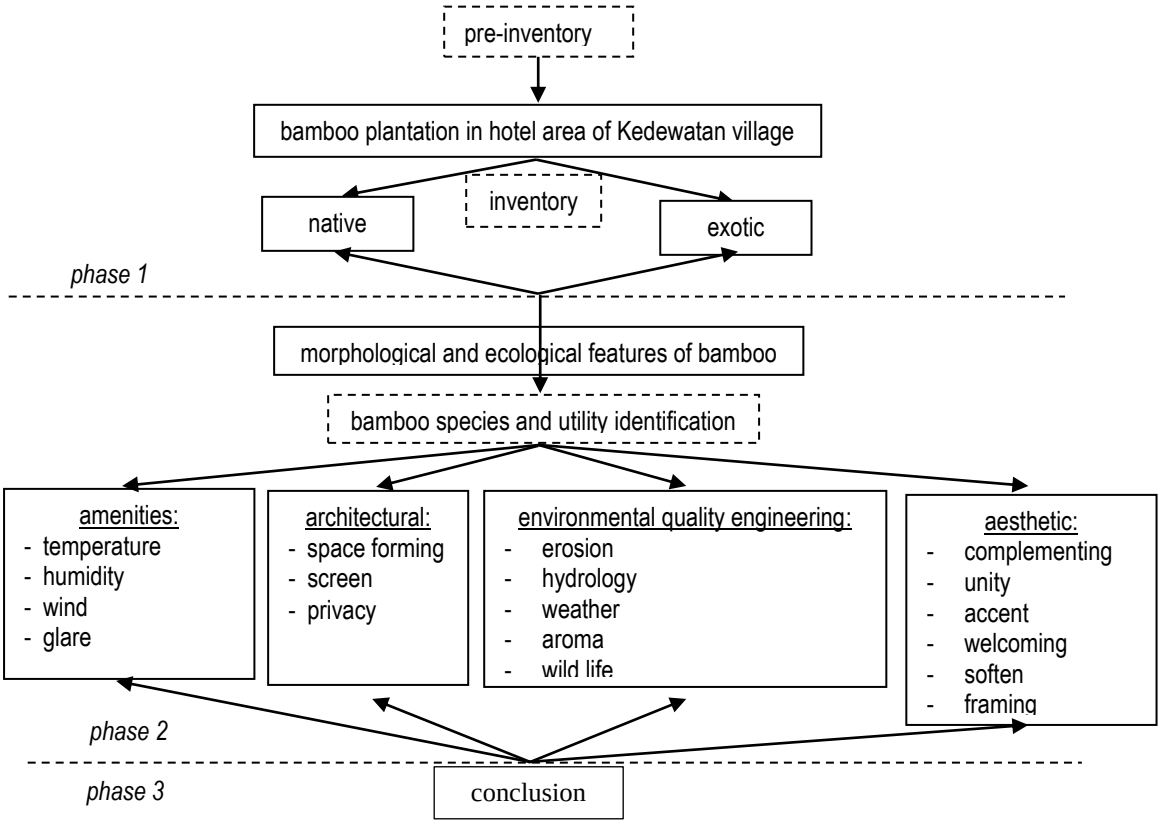


Figure 1. Location of the Kedewatan Village on the Ubud Dist



phase 1= inventory; phase 2= analysis; phase 3= synthesis

Figure 2. Research Framework

3. Results and Discussions

3.1. Study area and local people of Kedewatan

The population in Kedewatan village was reaching as much as 6.812 which 611 people constituted to productive age group (ranging from 35 to 39 years old). The main livelihood of the people were traders (1.197 people) and farmers (1.004 people). Because almost half of the people were farmer, it shaped the landscape of village become a rural agricultural landscape. Beside agriculture, forming small forest adjacent to the river had potential to support tourism industry of the village (Figure 3).

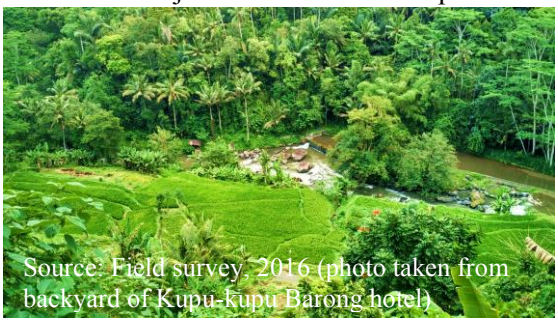


Figure 3. Natural and Agricultural Landscape View of Kedewatan village

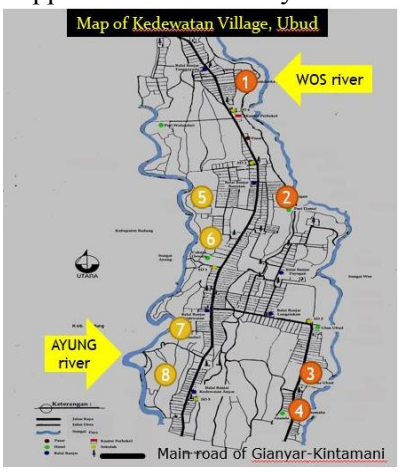


Figure 4. Bamboo Observation Site Selection

Observations showed that there were number of supporting infrastructure such as lodgings and other tourist facilities found in Kedewatan village. It categorized into four groups based on the amount of payments to the village government (Table 1).

Table 1. Hotel Classification Based on Amount of Payment

Hotel Category			
A	B	C	D
Hotel Amandari*	Komaneka*	Kori Ubud	Allison
Uma Ubud Resort*	Pitamaha*	Kirana Spa	Amir Rabik
Sobek Bali Utama	Puri Bunga	Ananda Cottages	
The Royal Pita Maha*	The Payogan Resort*	Botanika Spa	
Mandapa*	Ulun Ubud Hotel	Rest Pulau Kelapa	
	Bali Rich Kupu-Kupu Barong*		
	Bar		

Table 1 illustrates that there were twenty tourism businesses in the form of hotels, home stays, as well as lodgings and bars that grouped into four categories, namely category A to category D. The category A contributed more than other categories and so on. From these groupings, then we selected eight hotels which represents hotel which has bamboo plantation also and the location also represent geographical location of the village which was adjacent to Wos river and Ayung river (Figure 4). Finally eight hotels were selected, four hotel located on eastern of the village or adjacent to Wos river (Komaneka, The Payogan, Uma Ubud, and Pitamaha) and the others were located on western of the

village or adjacent to Ayung river (The Royal Pitamaha, Kupu-kupu Barong, Amandari, and Mandapa).

3.2. Inventory and function of bamboo in hotel area

Overall, eleven bamboo species were identified and used by hotels in specific arrangement for managing the hotel landscape. The species found respectively: *bambu tali* (*Gigantochloa apus* (JA & JH Schultes) Kurz.), *bambu Jakarta* (*Bambusa glaucescens* (Willd.) Merr), *bambu kuning* (*Phyllostachys sulphurea* (Carr.) A. et C. Riv.)) , *bambu ampel gadang & ampel gading* (*Bambusa vulgaris* Schrad. ex JC Wendl.), *bambu Cina var. kuning/sudamala* (*Phyllostachys aurea* Carr. Ex.A.et C.Riv.), *bambu Jepang var. kuning* (*Pseudosasa japonica* (Siebold & Zucc. ex Steud.) Makino ex Nakai), *bambu kelisik/bambu Cina var. hijau* (*Bambusa multiplex* Lour. Raeusch. ex Schult), *bambu Cina var. varigata* (*Arundinaria auricoma*), *bambu hitam/selem* (*Gigantochloa atroviolacea* Widjaja), and *bambu ater/santong* (*Gigantochloa atter* (Hassk.) Kurz) (Table 2).

Table 2. Bamboo Inventory on Eight Observed Hotel in Kedewatan

No	Species and location	
1	Common name: Bambu tali (ID)/*tiying tali* (Balinese) Scientific name: *Gigantochloa apus (J.A. & J.H. Schultes)* Kurz. Location: 1, 3, 4, 5, 6, 7, 8	 *tiying tali* at the Royal Pitamaha Hotel
2	Common name: Bambu Jakarta (ID)/*tiying Jakarta* (Balinese) Scientific name: *Bambusa glaucescens* (Willd.) Merr Location: 1, 2, 3, 4, 7, 8	 *tiying Jakarta* at the Payogan Hotel
3	Common name: Bambu kuning (ID)/*tiying gading* (Balinese) Scientific name: *Phyllostachys sulphurea* (Carr.) Location: 1, 3, 4, 5, 6, 7, 8	 *tiying gading* at Komaneka Hotel
4	Common name: Bambu ampel hijau (ID)/*tiying ampel gadang* (Balinese) Scientific name: *Bambusa vulgaris* Schrad. ex J.C. Wendl. var. vulgaris Location: 1, 2, 4, 5, 6, 8	 *tiying ampel gadang* at Mandapa Hotel
5	Common name: Bambu ampel kuning (ID)/*tiying ampel gading* (Balinese) Scientific name: *Bambusa vulgaris* Schrad. Ex J.C. Wendl. var. striata Location: 1, 5	 *tiying ampel gading* at the Royal Pitamaha

No	Species and location	
6	Common name: Bambu Jepang var. kuning (ID)/*tiying Jepang* (Balinese) Scientific name: *Pseudosasa japonica* (Siebold & Zucc. ex Steud.) Makino ex Nakai Location: 4, 5, 6, 7	 *tiying Jepang* at Amandari Hotel
7	Common name: Bambu cina kultivar kuning (ID)/*tiying sudamala* (Balinese) Scientific name: *Phyllostachys aurea* Carr. Ex.A.et C.Riv. Location: 6	 *tiying sudamala* at Kupu-kupu Barong Hotel
8	Common name: Bambu Kelisik/bambu cina var hijau (ID)/*tiying Cina* (Balinese) Scientific name: *Bambusa multiplex* (Lour.) Reauschel ex J.A. & J.H. Schultes Location: 5	 *tiying Cina* at Kupu-kupu Barong Hotel
9	Common name: Bambu varigata (ID)/*tiying parigata* (Balinese) Scientific name: *Arundinaria auricoma* Location: 6	 *tiying parigata*[3]
10	Common name: Bambu hitam (ID)/*tiying selem* (Balinese) Scientific name: *Gigantochloa atroviolacea* Widjaja Location: 7	 *tiying selem* at Amandari Hotel
11	Common name: Bambu ater (ID)/*tiying santong* (Balinese) Scientific name: *Gigantochloa atter* (Hassk.) Kurz Location: 2	 *tiying ater* at the Payogan Hotel

1=Komaneka; 2=The Payogan; 3=Uma Ubud; 4=Pitamaha; 5=The Royal Pitamaha; 6=Kupu-kupu Barong; 7=Amandari; 8=Mandapa

The results confirm that the presence of *tiying tali* species and *tiying gading* species were the highest among other species found in the observed hotel, except at the Payogan hotel. *Tiying tali* were common species planted in the hotel with adjacent to Ayung river and the Wos river. The function of the bamboos mainly to maintain the stability of the ground in a steep area. This finding corroborate results of other studies [6] that bamboo plants suitable to utilized in area with steep contours. Additionally, other studies shown that *tiying gading* species (*Phyllostachys sulphurea* (Carr.)) is usually used as an ornamental plant [7]. This findings suggests that *tiying gading* become important species for the aesthetic aspect of the landscape in hotel area such as complementing (*Bambusa*

vulgaris Schrad. ex J.C. Wendl. var. vulgaris; *Phyllostachys sulphurea* (Carr.) A.et C.Riv), accent (*Bambusa vulgaris* Schrad var.striata; *Phyllostachys sulphurea* (Carr.) A.et C.Riv; *Pseudosasa japonica* (Siebold & Zucc. ex Steud.) Makino ex Nakai; *Arundinaria auricoma; Gigantochloa atroviolacea* Widjaja, welcoming (*Bambusa vulgaris* Schrad var.striata; *Phyllostachys sulphurea* (Carr.) A.et C.Riv; *Pseudosasa japonica* (Siebold & Zucc. ex Steud.) Makino ex Nakai; *Bambusa multiplex* (Lour.) Reauschel ex J.A. & J.H. Schultes; *Phyllostachys aurea* Carr. Ex.A.et C.Riv), and soften (*Bambusa multiplex* (Lour.) Reauschel ex J.A. & J.H. Schultes; *Phyllostachys aurea* Carr. Ex.A.et C.Riv; *Phyllostachys sulphurea* (Carr.) A.et C.Riv; *Arundinaria auricoma; Bambusa glaucescens* (Willd.) Merr; *Pseudosasa japonica* (Siebold & Zucc. ex Steud.) Makino ex Nakai; *Bambusa vulgaris* Schrad var.vulgaris; *Bambusa vulgaris* Schrad var. striata).

At observed hotel, diversity of bamboo then calculated using Shannon's-Wiener diversity index (H'). From the calculations, the index equal to 2.106. It represent that the value were moderate (1 <H '<3) or the site has moderate distributed bamboo species across the observed location. However, nine out of eleven bamboo species were belong to exotic species. Considering to the results, it can be understood that the main objective to planted bamboo was to arrange the hotel landscaping. The arrangement of the species, quantity and design patterns applied has been set by desires of the hotel owner or hotel manager. Some species were planted for aesthetic purpose while others were planted for river banks conservation. Consequently, the utilization of existing bamboo plants in protecting the and maintaining steep area of Ayung and Wos river banks was clarified by other study [8] that efforts to maintain the quality of the environment, in this case was maintaining the river banks, in the perception of international tourists as users provide satisfying reliability toward hotel service quality to factor of attributes of hotel surroundings and environmental.

3.3 Relation between bamboo and Balinese culture

It was inevitable that the presence of bamboo become basic requirement for the Balinese Hindu's community. There were three types of plants whose existence was essential to the sustainability of Balinese Hindu's rituals, namely coconut, banana and bamboo [9]. The other considering was bamboo become important and obligatory present in rituals such as in room decoration in religious ceremonies, in temporary construction of offerings buildings, in funerals, and other utilization [4]. In other word, people in Bali were highly dependent on this non timber commodities. Other study confirm [10] that there were two dominant species of bamboo used in Balinese Hindu rituals, one of which was *tiying tali*. This plant also has potential as traditional medicine because *tiying tali* has been known and used to treat a variety of diseases based on the book of traditional Balinese medicine of *Lontar Usada* [11].

From interviews, it can be inferred that bamboo plantations in the hotel were possible to use to facilitate the religious activities of community in the village of Kedewatan. For those purpose, people were allowed to ask for particular bamboo culms in limited quantities with condition not to damage physical appearance and function of bamboo that intended by the owner or hotel manager. With the result that the needs of particular bamboo culms for ritual activities can be satisfied from existing bamboo plantations at the hotel. However, the diversity of bamboo planted in hotel was not entirely species that obligatory used in the rituals. Further, some approach to vary the bamboo species, especially species that used for rituals, should be taken in to order increase diversity of ethno-botanical bamboo plantation on private lands including hotel area as an efforts to conserve genetic resources of bamboo in Bali and preserved the culture at once.

4. Conclusion

As concluding note to this study that there are eleven species of bamboo has been found in hotel. Nine of them are classified to exotic species i.e. *Gigantochloa apus* (JA & JH Schultes) Kurz., *Bambusa glaucescens* (Willd.) Merr, Phyllostachys sulphurea (Carr.) A. et C. Riv.), *Bambusa vulgaris* Schrad. ex JC Wendl, *Phyllostachys aurea* Carr. ex. A.et C.Riv., *Pseudosasa japonica* (Siebold & Zucc. ex Steud.) Makino ex Nakai, *Bambusa multiplex* Lour. Raeusch. ex Schult, *Arundinaria auricoma*. In contrary, *Gigantochloa atroviolacea* Widjaja is the native species to West Java, Indonesia and *Gigantochloa atter* (Hassk.) Kurz) is unknown species but widely cultivated in Java and several

locations in Indonesia. The primary purpose for planting bamboo in hotel area is to achieve aesthetic function in addition to ecological functions in order to maintain the stability of the Ayung and Wos river banks. Moreover, bamboos which planted in the hotel area are possibly able to facilitate requirement of Balinese Hindu's religious rituals of community in the village of Kedewatan.

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