DIVERSITY OF BAMBOOS AROUND SPRINGS IN MALANG EAST JAVA

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ABSTRACT

Bamboos have important roles to people in the villages area. They are planted and used by the people for making houses, food, buckets, fences, ropes, fuels, musical instruments and plaits. The root distribution of Bamboos is large and fibrous, also the growth of their new clumps is ascendant so the Bamboos has good potency for water and soil conservation on river banks, around the springs, hillsides and scarps. The survey to invent the bamboos growing around the springs was conducted in Singosari, Lawang, Karangploso, Dau and Lowokwaru Malang East Java in May 2009. The Bamboos invented at 0-100 m from the springs. The results Showed that there were four Bamboos founded around the springs namely ***Bambusa blumeana,Dendrocalamus asper, Gigantochloa atter*** *and* ***Gigantochloa apus. Dendrocalamus asper*** *was the most dominant species founded around the springs with relative frequency, relative density and important value index is 45.83 ; 58.49 and 104.32 respectively.*

Key words: bamboo, diversity, inventory, spring

INTRODUCTION

Bamboos has an important role in people's lives, both in the social, economic, cultural and ecological lives. Therefore, there are many species of the bamboo planted in their yards, moor, river banks or cliffs, ravines or other sloping areas.

The bamboos contribute ecologically to soil and water conservation, prevent the soil erosion, landslides and increasing the catchment area to increase ground water. Kaleka (2011) reported that the bamboos has ability to absorb rain water to 90%. The bamboo rod is also able to store as much as 1 liter of water per day (Machfudin, 2012). Thus, their conservation and development is very important.

The bamboo forest is able to increase water absorption into the soil up to 240 percent compared to the pine forest; reforestation with the bamboos in the former coal mine in India can increase the ground water 6.3 meters in just four years; the falling leaves in the bamboos forest is most efficient to retain moisture in the ground and have a lower the most erosion index than 14 other forest types (Syuhada, 2012).

The need of clean water for domestic and agriculture uses tends to increase every year. In 1990, the domestic water need for cities and industries in East Java, about 547 m^3/year later in 2015 estimated at about 1365 m^3/year (Hehanusa, 1998). While threatening to the water resources tends to increase due to the increasing environmental degradation such as deforestation, loss of green land, reduced water catchment areas, land conversion for residential and agricultural impact on water sources such as the springs or debit reduction. The springs can die if there is no supply of water flowing from the surrounding area or elsewhere. Closing the springs due to landslides, sand or stone hoard the springs can also cause blockage and die the springs.

The conservation of the area around the springs by planting varies of the plants, such as the bamboos is essential to keep flowing the springs. The bamboos are included the species plants that have potential for the conservation of the area around the springs. The plants conservation around the springs is very important to conserve and for sustainable utilization of water resources.

This study aims to invent the bamboos around the springs in Malang East Java in the hope that the results can be used as information to manage the springs.

MATERIALS AND METHOD

The study were conducted in May 2009 by observing on 21 springs located in Districts of Lowokwaru, Dau, Singosari and Lawang. To determine distribution and domination of the bamboo species growing in the range 0-100 m around the springs were inventored and determined the relative frequency, relative density and Important Value Index. Identification were done directly in the fields by using the book "Bamboo Edintikit in Java" (Widjaja, 2001). Interviews with local people were also conducted to study the use of the bamboos by the locals. Relative frequency (RF), Relative Density (DR) and Importance Value Index (IVI) were calculated by the formula:

$$RF = \frac{\text{frequency of a species}}{\text{frequency of all species}} \times 100\%$$

$$RD = \frac{\text{density of a species}}{\text{density of all species}} \times 100\%$$

IVI = RF + RD

$$\text{Frequency} = \frac{\text{number of species found}}{\text{number of plots observed}}$$

$$\text{Density} = \frac{\text{clumps number of clumps species}}{\text{number of spring being observed}}$$

RESULTS

Based on the observation on the 21 springs in the 14 villages of the 4 districts in Malang were found four species of the bamboos growing around the springs (Table 1). Relative Frequency (RF), Relative Density (RD) and Important Value Index (IVI) some species of bamboo around the spring are as follows (Table 2).

Table 1. The clump number of the bamboo species around the springs in Malang

No	The spring	Location (village,district)	A	B	C	D
1	Belik	Princi, Dau	2	2	0	0
2	Botorubuh	Gunungrejo,Singosari	0	3	0	3
3	Kali lo	Kucur,Dau	0	4	1	0
4	Kalibiru	Sumbersuko, Lawang	0	0	0	0
5	Kelampok	Kucur, Dau	0	2	1	0
6	Kendedes	Candirenggo, Singosari	0	3	0	0
7	Ketoan	Kucur, Dau	0	4	0	2
8	Metro 1	Merjosari, Lowokwaru	1	0	0	0
9	Metro 2	Merjosari, Lowokwaru	0	3	0	0
10	Petungsewu	Petungsewu, Dau	0	0	0	0
11	Polaman	Polaman, Lawang	0	0	0	0
12	Sumber Bendo	Kucur, Dau	0	0	0	0
13	Sumberawan	Sumberawan, Singosari	0	0	0	0
14	Sumbersuko	Sumbersuko, Lawang	0	0	0	0
15	Tegalweru 2	Tegalweru, Dau	0	3	0	2
16	Tegalweru1	Tegalweru, Dau	0	0	0	0
17	Telogo	Princi, Dau	0	2	0	0
18	Tempur 1	Merjosari, Lowokwaru	1	1	1	2
19	Tempur 2	Merjosari, Lowokwaru	0	0	0	0
20	Tempur 3	Merjosari, Lowokwaru	0	0	0	1
21	Watugede	Watugede, Singosari	0	0	0	2

Table 2. Relative Frequency (RF), Relative Density (RD) and Important Value Index (IVI) of the Bamboo Species

No.	Bamboo type	Local name	RF (%)	RD (%)	IVI (%)
1	*Bambusa blumeana* J.A.& J.H. Schult	*Pring ori*	16,67	9,434	26,10
2	*Dendrocalamus asper*(Schult.) Backer ex Heyne	*Pring petung*	45,83	58,49	104,32
3	*Giganrtochloa apus* J.A.&J.H. Schultes) Kurz	*Pring apus*	12,50	7,547	20,05
4	*Gigantochloa atter* (Hassk.) Kurz	*Pring jawa*	25,00	24,53	49,53

Description to identify and distinguish the four Bamboo species are as follows:

1a. Spinose branch ..... ***Bambusa blumeana* J.A. & J.H. Schult.**

b.Branchs is not spinose 2

2a. Young culm covered with a layer of brown wax or light green velvety silvery, aerial roots exist on the base to middle of the internode culms …. ***Dendrocalamus asper* (Schult.) Backer ex Heyne**

b. Young Culms are not covered with a layer of wax. The roots air only on the base of the culms ……..... 3

3a. Young culms purplish green covered black hairs. The leaf sheets covered with bleach feathers, rarely dense, easily shed. Branching at the top of the culms green …….. ***Gigantochloa atter* (Hassk.) Kuzz**

b. Young culms are green and covered by brown or black feathers. Leaf sheets is not easily shed, covered black or brown fur, a bit dense. Skin culms bluish green. Bran-

ching about 1.5 m from the surface soil … ***Gigantochloa apus* (J.A & J.H. Schultes) Kurz**

***Bambusa blumeana* J.A. & J.H. Schult.**

Synonyms: *Bambusa spinosa* Bl. ex Nees, *Ischirochloa spinosa* (Bl.ex Nees)Buse;

Local names: '*Pring ori*'; Bambu duri (Indonesia)

Simpodial plants, stool, erect, clum 10-25 m tall with thorny branches. Young culms covered with a layer of white wax and brown feathers but a layer of wax and feathers lost during the old age and change to be green, sometimes shiny, internodes 25-30 cm, 5-10 cm dimeter, the wall thickness 10-20 mm. The leaf sheats covered brown fur, easily shed, auricules small, widely lobed, sometimes wrinkled to the base leaf sheat, ligule short petioled, 3 mm length fur, leaf sheats upright. Lower foliage surface slightly hairy, ligule jagged.

This species is native to Java that grows well in a cliff or riverbank and scattered throughout the Java below 1000 m above sea level (Wijaya, 2001). The young shoot edible; the mature culms are used to make houses, fences and baskets. The water in a bamboo culm believed to cure eye inflammation or back pain (Heyne, 1987). Theyoung leaves can be used as animal feed (Sudarnadi, 1996).

Figure 1. *Bambusa blumeana* J.A & K.H. Schult

***Dendrocalamus asper* (Schult.) Backer ex Heyne**

Synonym : *Bambusa aspera* Schult, *Gigantochloa aspera* (Schult.) Kurz, *Dendrocalamus flagellifer* Munro

Local names: '*Pring petung*'; bambu betung (Indonesia)

Sympodial plants, stool, erect, purplish black culms, covered with brown to blackish feather. The culms height 10-30 m, internodes length 30-50 cm, diameter 10-20 cm, thick of Culm wall 1-2 cm, the outside is green, purple or green discharge, at nodes usually grow aerial roots. The leaf sheets easily shed, hairy black or dark brown, the auriculars is rounded sometimes perming, hair lank with 7 mm height reaches 5 mm, irregular serrated ligules, steeper 7-10 mm. Leaves 20-30 x 2.5-4 cm, the bottom hairy, auricules are small, 1-2 mm tall and glabrous.

This bamboo originate from Taiwan and spread in Java. This plants is grow well in the moist and fertile soil. The bamboo are found grew well at an altitude of 800-1900 m above sea level on the ground with a loose structure, sandy and rocky (Pratiwi, 2006).

It was usually planted in the river bank, hillside or around the spring. The young stems was made as vegetable and the mature culms used for building materials (Heyne, 1987).

Figure 2. *Dendrocalamus asper* (Schult.) Backer ex Heyne

***Gigantochloa apus* (J.A. & J.H. Schultes) Kurz**

Synonyms: *Bambusa apus* J.A. & J.H. Schultes, *Schizostzchium apus* (JA & J.H. Schultes) Steud, *Gigantochloa apus* Gamble

Local names: '*pring apus*'; bamboo rope (Indonesia)

Sympodial plants, stool, erect. The young shoots covered in brown and black feathers. The culms 10-25 m high and 4-15 cm diameter, wall stem thickness from 0.8 to 1.5 cm. The young culms covered un brown fur scattered light, turn black when older. The leaf sheets is not easily shed, covered in black or brown, ligules serrate, height 2-4 mm glabrous. Leaves 3-49 x 2-9 cm, the bottom hairy, auricles of leaf sheaths are small and rounded, 1-2 mm high and glabrous.

This bamboo is originated in Japan and Spread throughout in the java island. The mature culms for rope and woven materials, such as walls, floors, ceilings, baskets

and hats. The culms has a bitter taste and can be used for worming disease (Heyne, 1987).

Figure 3. *Gigantochloa apus* (J.A & J.H Schultes) Kurz

***Gigantochloa atter* (Hassk.) Kurz**

Synonyms: *Bambusa thouarsii* Kunth. *Gigantochloa verticillata* (Willd. Munro

Local names: '*pring Jawa*'; *bambu ater* (Indonesia)

Sympodial plants, stool, erect, and the culms 10-20 m high. The young shoots green to purplish and covered black fur. The Culm is cylinder, diameter 5-10 cm, wall thickness 5-10 mm, internodes 30-50 cm long. Leaf sheets covered black hair, simple entire, auricles rounded, height 3-7 mm. leaves 20-44 x 3-9 cm, glabrous, flat leaf ligules 2 cm high.

This bamboo comes from Japan and spreading to Java island from lowland to highland on dry or slightly moist soil. The mature culms are used to make home, chopsticks, toothpick, *angklung* musical instrument and *calung*.

Figure 4. *Gigantochloa alter* (Hassk.) Kurz.

DISCUSSION

The bamboos location found around the springs are generally higher than those on the springs; the ground slopes approximately 30-80 degrees. The springs sometimes out of the sidelines of the bamboos roots. This show that the bamboos has an important role in the presservation of the springs. As reported by EBF (Environment Bamboo Foundation) that the planting of bamboos in the region over the past few years improved the flow of water ground and brings new springs (Widnyana, 2012).

The bamboo species found around the springs consists of three genera namely *Bambusa, Dendrocalamus* and *Gigantochloa*. This can be caused by the three genera have a high stature (up to 30 m) and a very important role for the community to utilize a variety of purposes, such as home building, home furnishings, wicker, crafts, ropes, bridges, water pipes and other other, as reported by Gilliland *et al.,* 1971).

The most dominant bamboo species that found around the springs was *Dendrocalamus asper* (Schult.) Backer ex Heyne with the value of RF, RD and IVI was 45.83; 58.49 and 104.32, respectively. This may be caused by that species was suitable and planted at ≥ 400 m asl where the springs found; its young Culm are edible, and it often to be used as building construction. It also has potency to serve and to hold land slat ides, erosion of river banks, ravines, and area around the springs. This related to a strong and widespread the roots and seedling growth continuously and tends to increase.

The bamboos have ability to absorb rain water reached 90%, whereas only 30-40% of the trees so that the bamboo has the potential to increase the underground water (Widnyana, 2012).

This research can be cocluded that the species of bamboo found around the springs in Malang is *Bambusa blumeana, Dendrocalamus asper, Gigantochloa atter* and *Gigantochloa apusr*. *Dendrocalamus asper* is the most dominant species than other species with relative frequency, relative density and Importance Value Index 45.83; 58.49 and 104.32, respectively. The bamboo generally grow on the edges, cliffs or rivers with a slope between 30-80 degrees that is important for the soil and water conservation around the springs. The residents used the bamboos for food, building materials, woven materials and musical instruments, fences, water lines and ropes.

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