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Local Wisdom And its Implications in Plant Diversity Conservation in Springs Area (Study Case In Ngenep Village, Karangploso District, Malang Regency)

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Abstract

Water from springs in Ngenep Village has an important role in people's lives. As an effort to protect the springs, the community sacred the springs. This study aims to analyze the local wisdom of the community in the conservation of springs and its implications for plant diversity in the spring area. Information related to local wisdom in the preservation of springs is done by searching the literature, spring area surveys and in-depth interviews. The diversity of plants in the spring has been done by plotting. Analysis of plants found in the spring is calculated relative density, relative frequency, relative dominance and plant value index for each spring. The Ngenep community divides springs into two terms namely springs with the terms "*umbulan*" and "*belik*". In Ngenep Village three springs are still maintained because they are springs that have cultural values in the community. Springs are Ngenep, Nyolo and Soko Springs. Each of these springs is located in a specific area of land with relatively natural vegetation. This spring is different from other regions in the rural landscape. this spring is a land that is not used for agricultural cultivation or settlement, but is a land that is conserved so that it is relatively natural. Among the plants of this type of tree that have the highest importance index value are the plants of S. *pycnanthum*, F. *annulata*, F. *benjamina* and S. *indica*. these plants can only be found in the spring area and on the river cliffs. .

Keywords: plant, sacred, plant value index, Shannon-Wiener diversity index

INTRODUCTION

A spring is a place where natural groundwater emerges to the ground or due to the local landscape. In general, springs appear on hillsides, hills, and in plains [1]. Springs are also upstream from river water. Springs have an important role in supporting community life such as for bathing, washing, agriculture, fisheries and others. Spring degradation due to an increasing population occurs everywhere. One of them is in the spring of upstream Brantas River Basin which is the upstream of the Brantas River [2].

Brantas River is a river that has an important role for the people in East Java that stretches from Malang to empties into Surabaya, passing through a number of regions such as Blitar, Tulungagung, Kediri, Jombang, Mojokerto and Sidoarjo Regency. But now the quality and quantity of water in the Brantas River is decreasing. River water quality in the Brantas Hulu watershed area in Malang has been degraded due to organic waste and many industries that are located close to the river and even become a landfill [3]. The decrease in the quality and quantity of water is also caused by a change of function of the land around the spring [4].

The existence of a spring needs to be carried out for conservation. One of the conservation strategies is to approach local wisdom in the community itself. Ngenep Village, Karangploso district, Malang Regency is an area that has several springs. The spring area in Ngenep Village is a spring area that has remained sustainable in the midst of land use for agriculture and settlement.

One of the things that support the preservation of springs in this region is. the existence of local wisdom of the community in preserving the spring area, especially the presence of vegetation in the spring area. Local people's wisdom in environmental conservation efforts is widely recommended in national policies [5]. The existence of Vegetation in water areas plays an important role, one of which is maintaining the quality and quantity of water around it [6]. The purpose of this study is to explore local wisdom in the community in the

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preservation of springs and their implications for conserving plant biodiversity in the spring.

MATERIAL AND METHOD

Study Site

This research was conducted in Ngenep Village, Karangploso District, Malang Regency. in the village of Ngenep there is a large spring that emerges from the ground and is an upstream of a tributary which by the local community is called an umbulan spring. The spring water in Ngenep Village includes Nyolo, Ngenep and Soko springs.

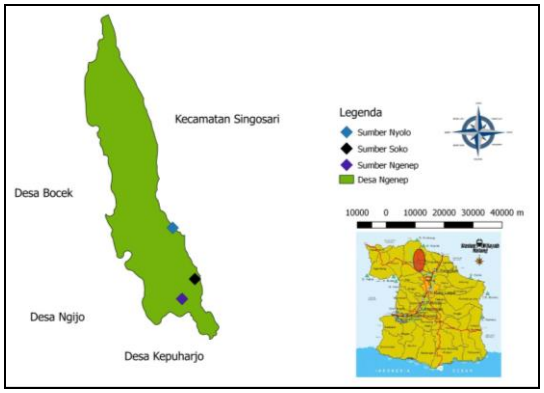

Figure 1. Location of Data Collection

Data Collection

The method used to explore information related to local wisdom in the preservation of springs has been carried out by searching literature, surveying spring springs and in-depth interviews. Springs survey is carried out by direct observation in the field, recording, and describing the findings objectively. Furthermore, other information related to the phenomenon was examined through interviews with local communities.

The implication of local wisdom in the conservation of plant diversity in the spring has been done by plotting. Plots were made measuring 20 x 20 meters for analyzing tree vegetation, 10 x 10 meters plots for analyzing pole vegetation, 5 x 5 meters for analyzing saplings and 2 x 2 meters for seddling vegetation.

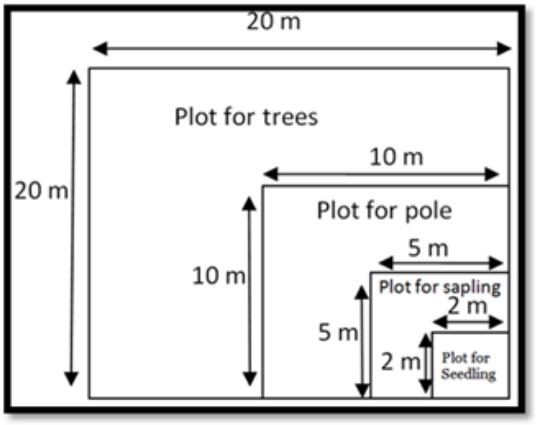

Figure 2. Plant plots in the spring area

Data Analysis

Data from interviews to find out the forms of local community's wisdom in the management of the spring were done by data reduction. Data reduction is done by making a summary, and sorting the data. So the research results are easy to present and easy to draw conclusions. The data presentation has been done in a descriptive form.

Data from the analysis of plants that have been found in the spring area are calculated using relative density, relative frequency, relative dominance and plant value index in each spring. Calculation of relative density, relative frequency, relative dominance and index of plant values [7,8,9]. The formula of relative density, relative frequency, relative dominance and plant value index are as follows :

$$\text{Relative density(RD)} = \frac{\text{density of species} \times 100\%}{\text{density of all plant species}}$$

$$\text{Relative dominance (RDm)} = \frac{\text{Dominance of species} \times 100\%}{\text{Dominance of all plant species}}$$

$$\text{Relative frequency (RF)} = \frac{\text{Frequency of species} \times 100\%}{\text{Frequency of all plant species}}$$

$$\text{Important Value Index (IVI)} = \text{RD} + \text{RDm} + \text{RF}$$

In addition, there has also been a calculation of species diversity index. The species diversity index is an index that states community structure and ecosystem stability [10].

RESULT AND DISCUSSION

Description of spring in Ngenep Village

The Ngenep community divides springs into two terms namely springs with the terms "*umbulan*" and "*belik*". *Umbulan* is a large spring that emerges from the ground, is in a region that is not privately owned but belongs to individuals, around which there is a lot of vegetation, has a

large water discharge and is upstream from the river channel. While *belik* is a small spring around the river, arising from seepage of water from the cliff ground around the river flow. Springs are usually believed to have guards guarding the spring area, the spring area is also one of the areas that is sacred by rural communities. The description of springs in this study is as follows:

A) Ngenep Springs
   Located at an altitude of 625 m above sea level so that plants in the spring area are plants that are classified as lowland plants. The area in the of Nyolo is around 544 m².
b) Nyolo Springs
   Located at an altitude of 645 m above sea level so that plants in the spring area are plants that are classified as lowland plants. The area in the source of this nyolo is around 15,900 m².
c) Soko Springs
   Located at an altitude of 625 m above sea level so that plants in the spring area are plants that are classified as lowland plants. The area in the source of Nyolo is around 544 m².

Local Wisdom of Communities in Preserving Springs

In the village of Ngenep there are three types of springs, namely the source of nyolo, the source of ngenep and the source of soft drink. Each of these springs is located in a certain area of land with relatively natural vegetation. This spring is different from other regions in the rural landscape. Where the spring area is a land that is not used for agricultural cultivation or settlement, but is a land that is conserved so that the spring area has different types of vegetation from agricultural cultivation areas and settlements.

At present the three springs are used for various community needs. The Nyolo springs which is in the highest position of the topography of the village, besides being used for washing and bathing, the water is taken to be channeled to people's homes through pipes, the Nyolo springs is a part of the smooth water from a hill gap believed to have medicinal properties. This Nyolo springs on certain days many people from Ngenep and other villages conduct cultural rituals. Ngenep springs located in the middle of the village is currently used for bathing, washing the people who live in the vicinity. Whereas the Soko springs are also the same as the Ngenep springs.

The Ngenep, Nyolo and Soko springs areas are considered sacred by the people of Ngenep Village. the sacralization of springs in the community is influenced by the philosophy of life of the Javanese people. This makes the water area a place that has springs that will always be remembered and visited as a place that is saved. The implementation of this philosophy is adjusted to people's trust, customs and knowledge gained from interactions with the natural environment. the sacralization of springs is basically to protect certain areas that are possible to have important values related to the spiritual realm and are sacred. Therefore, the values of beliefs, customs and local knowledge are important elements in formulating local wisdom in a community. These three elements are the unity of the system that underlies the social order, to ensure the sustainability of natural resources, especially water sources, for a long time.

The spying of a spring is a form of biodiversity conservation, including efforts to preserve natural spring ecosystems so that they continue to function by involving stakeholders, namely the local community [11]. The existence of sacred springs can be used as learning and as a form to save the spring and protect the surrounding environment. springs must always be maintained and respected as well as the message of ancestral thought of local communities for generations. Because it is expected in the next generation that water is always maintained, because water is one of the basic daily needs that need to be protected and preserved.

The local wisdom of the community in preserving springs by the sacralization of the area around them has been proven to be able to maintain the area of springs and biodiversity in them to remain sustainable. As well as a form of community adaptation in the management of the surrounding area. The determination of the community to hold the values of the tradition of conserving water sources seems to be maintained in the midst of modernity. The sacralization of springs in society is a form of conservation based on experience and knowledge that has been passed down from generation to generation and continues today.

Implications of Local Wisdom of Communities in Preserving Springs

The existence of local wisdom causes the area around the springs is relatively maintained, this is due to the fact that the spring is not used by the

community to become an agricultural or residential area. Land in the springs area is village-owned land and does not become privately owned. This has implications for the diversity of plants in the spring area having different types from other land units. Based on the inventory in the spring area, 63 plant species were obtained, consisting of 29 families. As for the types of plants are as follows:

Table 1. Plants in the spring area

No	Spesies	Local name	Family	Habitus	Name of springs		
					Ngenep	Nyolo	Soko
1	*Ageratina riparia* (Rengel) king & H.Rib	Teh-tehan	Asteraceae	S			v
2	*Aleurites Moluccana* L. Willd	Kemiri	Euphorbiaceae				
3	*Arenga pinnata* Merr.	Aren	Palmae	t	v	v	
4	*Artocarpus altilis* (Parkinson) Fosberg	Kluwih	Moraceae	p, sap			v
5	*Artocarpus elasticus* Reinw. Ex Blume	Bendo	Moraceae	t		v	
6	*Artocarpus heterophyllus*	Nangka	Moraceae	p, sap		v	
7	*Bambusa blumeana*	Bambu ori	Poaceae	p	v	v	
8	*Barleria cristata*	-	Acanthaceae	s	v	v	
9	*Calophyllum inophyllum*	Nyamplung	Calophyllaceae	t			v
10	*Centella asiatica* L.	Pegagan	Mackinlayaceae	s			v
11	*Codiaeum variegatum*	Puring	Euphorbiaceae	sap	v	v	
12	*Coffea canephora*	Kopi	Rubiaceae	sap	v		
13	*Cordyline fruticosa*	Andong	Asparagaceae	sap	v	v	
14	*Dalbergia latifolia*	Sono keeling	Fabaceae	t		v	
15	*Deris* sp.	Jenu	Fabaceae	s			v
16	*Digitaria* sp.	-	Poaceae	s			v
17	*Dimocarpus longan*	Kelngkeng	Meliaceae	sap	v		
18	*Dracaena angustifolia*	Andong	Asparagaceae	sap	v		
19	*Dracontomelon dao* Blanco	Dao	Anacardiaceae	t	v	v	
20	*Dysoxylum gaudichaudianum*	Kedoyo	Maliaceae	t	v		
21	*Elatostema sp.*		Urticaceae	s	v	v	v
22	*Erythrina variegate*	Dadap	Fabaceae	p			v
23	*Euphorbiaceae*		Euphorbiaceae	p		v	
24	*Ficus ampelas*	Amplasan	Moraceae	p		v	
25	*Ficus annulata*	Bulu	Moraceae	t		v	
26	*Ficus benjamina*	Beringin	Moraceae	t	v		
27	*Ficus calosa*	Ilat-ilat	Moraceae	t	v		
28	*Ficus racemosa*	Lo	Moraceae	t	v		
29	*Ficus retusa*	Ara	Moraceae	t	v		
30	*Ficus septica*	Awar-awar	Moraceae	sap	v	v	v
31	*Gigantochloa apus*	Bambu apus	Poaceae	p	v	v	
32	*Gmelina arborea*	Gmelina	Fabaceae	sap		v	
33	*Handroanthus sp.*	Tabrbuya	Bignoniaceae	sap			v
34	*Hibiscus tiliaceus*	Waru	Malvaceae	t			
35	*Homalomena javanica*	Nampu	Araceae	s	v	v	v
36	*implisminus sp.*		Poaceae	s			
37	*Justicia sp.*		Acanthaceae	s			
38	*Lagerstroemia speciosa*	Bungur	Lythraceae	t, p		v	
39	*Laportea sinuata*	Kemaduh	Urticaceae	p, sap	v	v	
40	*Macaranga taurinum*	Mahang	Euphorbiaceae	t		v	
41	*Mikania cordata*	Pas-pasan	Asteraceae	s		v	v
42	*Momordica sp.*	Pare-parean	Cucurbitaceae	s			v
43	*Musa acuminatisima*	Pisang	Musacee	s			v
44	*Neolamarckia cadamba*	Gempol	Rubiaceae	t	v		
45	*Paederia foetida*	Sembuan	Rubiaceae	s			v
46	*Pangium edule*	Kluwek	Achariaceae	t		v	
47	*Peperomia pellucida*	Sirih cina	Piperaceae	s	v	v	v
48	*Pinanga mooreana*	Palem piji	Palmae	p		v	
49	*Piper sp.*	Sirih hutan	Piperaceae	s	v	v	v
50	*Polystichum sp*	Paku	Dryopteridoideae	s	v	v	v

51	*Pometia pinnata*	Matoa	Sapidanceae	sap		v	v
52	*Psidium guajava*	Jambu biji	Mirtaceae	p		v	
53	*Pteris* sp.	Paku	Peteridaceae	s	v		v
54	*Salacca zalacca*	Salak	Palmae	p, sap			v
55	*Saraca indica* L.	Soko Jawa	Fabaceae	t, p, sap and s		v	v
56	*Smilax* sp.	Gadung cina	Smilacaceae	s			v
57	*Swietenia macrophylla*	Mahoni	Meliaceae	T			
59	*Syzygium racemosum* Merr.	Jambu Alas	Mirtaceae	t	v	v	v
60	*Tacca palmata*	Gadung tikus	Dioscoreaceae	s			
61	*Tbernaena montana*	Kalak antong	Apocynaceae	p, sap	v	v	v
62	*Zamioculcas zamifolia*	Daun dolar	Araceae	s			v
63	*Zingiber zerumbet*	Lempuyang	Zingiberaceae	s		v	v

(information : T= tree, P= Pole, Sap= sapling, and S=seddling and ground cover)

Based on the above data, plants in the spring are endemic plants. In addition, based on field observations, plants in springs are a special type of plant that can function as spring conservation plants and are not found in other land units. Plants in the spring have complete stratification from A to E.

The highest Important value index (IVI) of plants in the tree category at Ngenep springs is F. *annulata* with IVI value 72, S. *pycnanthum* with IVI 63, F. *benjamina* with IVI 47, D. *dao* with IVI 35, F. *racemosa* with IVI 23, D. *gaudichaudianum* with IVI 16 and other vegetation with IVI 44. In Nyolo springs the highest important value of tree category is S. *pycnanthum* with IVI 44, S. *indica* with IVI 37, A. *moluccanus* with IVI 29, G. *arborea* with value of IVI 28, D. *dao* with IVI 23, F. *retusa* with IVI 18 and other vegetation with IVI 121. While the index of the highest importance of tree category plants in the Soko springs is S. *indica* with IVI 64, S.*pycnanthum* with IVI 47, F. *benjamina* with IVI 38, C. *inophyllum* with IVI 35, F. *racemoca* with IVI 35, A. elasticus with IVI 34 and other vegetation with IVI 47 (Figure 3.)

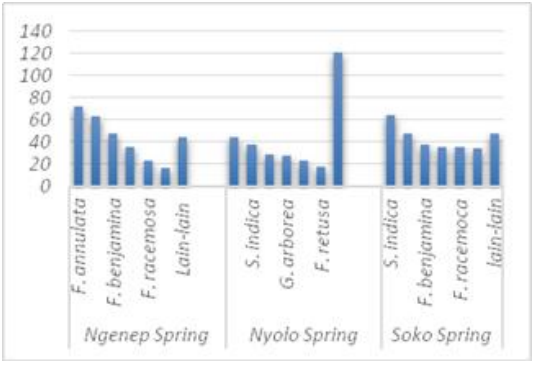

Figure 3. IVI of tree habitus plants in three springs of Ngenep Village

The highest importance index of pole habitus category in Ngenep spring is G. *apus* with IVI 108, T. montana with IVI 55, B. *blumeana* with IVI 43, H. tiliaceus with IVI 20, F. *septica* with IVI 19, D. *gaudichaudianum* with IVI 15 and other vegetation with IVI 34. IVI category of pole habitus plant in Nyolo spring is S. *pycnanthum* with IVI 62, A. pinnata with IVI 27, Euphorbiaceae with IVI 79, A. heterophyllus with IVI 24, F. amphalas with IVI 29, S. indica with IVI 52 and T. montana with IVI 27. INP of the category of habitus plants in Soko springs is H. tiliaceus with IVI 60, B. blumeana with IVI 60, S. indica with IVI 54, S. pycnanthum with IVI 38, F. septica with IVI 37, *Handroanthus* sp. with IVI 27 and E. *variegata* with IVI 24 (Figure 4)

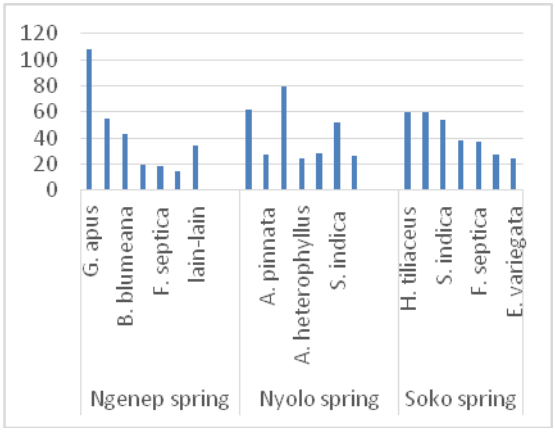

Figure. 4. IVI of pole habitus plants in three springs of Ngenep Village

The highest important index value of saplings habitus plant category in Ngenep springs is C. *variegatum* with IVI 81, S. *pycnathum* with IVI 48, F. *septica* with IVI 46, H. *tiaceus* with IVI 44, L. *sinuata* with IVI 36, T. *montana* with IVI 28 and S. *macrophylla* with IVI 16.The highest important index value of saplings in Nyolo springs is S. *indica* with IVI 56, A. *heterophyllus* with IVI 27, D. *latifolia* with IVI 34, P. *guajava* with IVI 24, P. *mooreana* with IVI 24 , P. *pinnata* with IVI 23 and Euphorbiaceae with IVI 23. The highest important

index value of stakes in Soko springs is H. tiliaceus with IVI 60 S. *pycnanthum* with IVI 50. F. *septica* with IVI 45, S. *indica* with IVI 45, A. *altilis* with IVI 41 , S. *zalacca* with IVI 30 and *Handroanthus* sp. with IVI 30 (Figure 5).

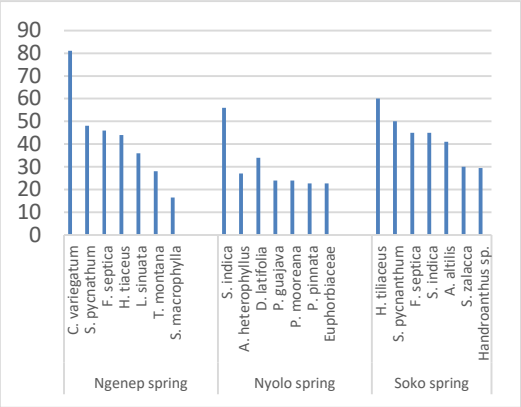

Figure. 5 IVI of sapling habitus plants in three springs of Ngenep Village

The highest important index of plants in the category of shrubs and herbaceous plants in Ngenep springs is C. *asiatica* with IVI 59,, *Elatostema* sp. with IVI 42, S. *pycnanthum* with IVI 37, *Piper* sp. with IVI 33, A. *macrorrhizo* with IVI 30, P. *pellucida* with IVI 27 dan lain-lain with IVI 72. The highest important index of plants in the seed and herb category at Nyolo springs is B. *cristata* with IVI 65, *Momordica* sp. with IVI 47, S. *indica* with IVI 35, *Piper* sp. with IVI 32, Z. *zerumbet* with IVI 25 dan others with IVI 96. The highest important index of plants in the category of shrubs and herbaceous plants in soko springs is A. *riparia* with IVI 44, *Implisminus* sp. with IVI 37. M. *cordata* with IVI 26, *Deris* sp. with IVI 26. M. *acuminatisima* with IVI, *Justicia* sp. with IVI and other vegetation with IVI 122 (Figure 6).

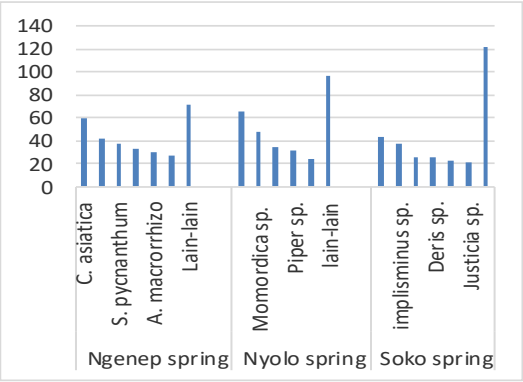

Figure 6. IVI of seddling habitus plants in three springs of Ngenep Village

Among the plants of this type of tree which have the highest importance index value are the plants of S. *pycnanthum*, F. *annulata*, F. *benjamina* and S. *indica*. S. *pycnanthum* F. *annulata*, F. *benjamina* and S. *indica* which are naturally grown in Indonesia. Based on observations of these plants can only be found in the springs and on the river cliffs, this plant is not found in community cultivation land. The types of plants cultivated by the community such as sengon cane, mahogany and other agricultural crops. The types of plants in the spring are native species of this region which have slightly changed in other areas so that the existence of these plants needs to be conserved and become an ecotype or as a type of greening plant recommendation around the area.

CONCLUSION

The existence of local wisdom causes the area around the spring is relatively maintained, this is due to the area of the spring not being used by the community to be an agricultural or residential area, the land in the springs area is land owned by the village and does not become privately owned by the community. This has implications for the diversity of plants in the springs area having different types from other land units. Based on an inventory in the area of the springs obtained 63 species of plants, consisting of 29 families. As for the types of plants are as follows: S. pycnanthum, F. *annulata*, F. *benjamina* and S. *indica*. S. *pycnanthum* F. *annulata*, F. *benjamina* and S. *Indica*.

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