Water Conservation through Biopore Implementation in PT. PJB UP Gresik- Indonesia

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***Abstract*—Nowadays, becoming green is a matter of responding to the expectations and demands of our world, country, community, stockholders, customers, employees and competitors as well as a matter of compliance with regulations. PT PJB UP Gresik has been committed to preserving the environment by reforestation programs and other environmental protection, including water conservation program. This paper describes the development of Biopore Absorption Hole (BAH) for water conservation and improve the quality of soil. 1000 BAH have been built in PT. PJB UP. Gresik Indonesia to reduce surface water and convert it into ground water. Composting the waste inside BAH increase the essential soil nutrition increase and good green practice in waste management and reduce carbon footprint due to waste transportation free. The quality of soil and it reduce water consumption for watering the plant. The highest rate of BAH water is on February 2016 due to highest rain intensity in the related month is about 3.963,22 liter/hour. It can be conclude that the total additional water reserve is about 22.422,66 liter/hour due to perform BAH in PT PJB UP Gresik.**

***Index Terms*—Water conservation, Biopore, Absorption Hole, Green**

I. Introduction

In the total water volume in the earth, fresh water content is estimated only 3% of total water. Moreover, 2% of water are ice and glatzer and only 1% of the water can be used for domestic and industrial fresh water purposes. Water conservation aims to increase 1% of soil water by retaining rainwater or minimizing surface and seawater. In order to realize PT PJB UP Gresik commitment as a green and clean power company, the management perform reforestation in plant area. There are an obstacle in reforestation due to the hard texture of soil, hence it dry in dry season and flooding in rainy season. This conditions tend to unsatisfied soil conditions for the plant. It motivate the green team of PT PJB UP Gresik to build biopore.

Biopore is the hole in the soil that could be formed by plant root, worm, etc. The structure of biopore is permeable that very useful for ground water and air transportations and serve as water reservation. The biopore size increase as the increase in the number and size of plant root or plant growing, as well as the number and activities of soil organism [1]. Biopore absorbing hole (BAH) is effective technology and environmental friendly [2]. It is a hole with diameter 10 cm and 80 to 100 cm depth. The hole will be filled by organic waste for soil fauna nutrition, and finally biopore was be formed due to root and fauna life activities.

The porous BAH has capability to transporting water from surface to bottom of the hole and permeate to surrounding the hole. It very useful to reduce surface water and increase underground water, hence it keep soil still wet in dry season and avoid flooding at the surface [3,4]. Biopore structure is a porous media that can transport the water, oxygen, and essential soil nutrition from waste decomposition [5]. It content of rich essential neutrinos that very useful for plant and soil fauna, including the microorganism for decomposing [6,7]. This PT. PJB UP Gresik BAH program aims to improve the soil texture and nutrient, adsorb the surface water to avoid flooding, increase ground water as reserve water in dry season, and efficient domestic waste management.

II. Biopore Absorbing Hole

Biopore technology have been used to increase the rate of water absorption in soil. It has diameter 10 cm^2 and length 80-100 cm^2. The hole will fill up by organic waste. The waste in water will decompose become essential soil substance [5]. In Gresik- Indonesia, the rainy season usually start in month of November, hence the biopore should be made in this month.

This effort reduce surface water and save it as groundwater. The amount of converted rain water to the ground water is depend on the number of biopore hole, size, rate of rainy water and soil characteristic. The biopore decompose essential organic waste insitu. It reduce transportation cost and carbon footprint, as fertilizer, improve soil structure and water conservation [5].

III. Method

In order to obtain the conditioned soil, hole of biopore (BAH) is built using PVC pipe in 80-100 cm depth with some hole at the bottom of pipe for water drainage as shown in Figure 1. 1000 BAHs had been built in PT. PJB UP Gresik power plant area.

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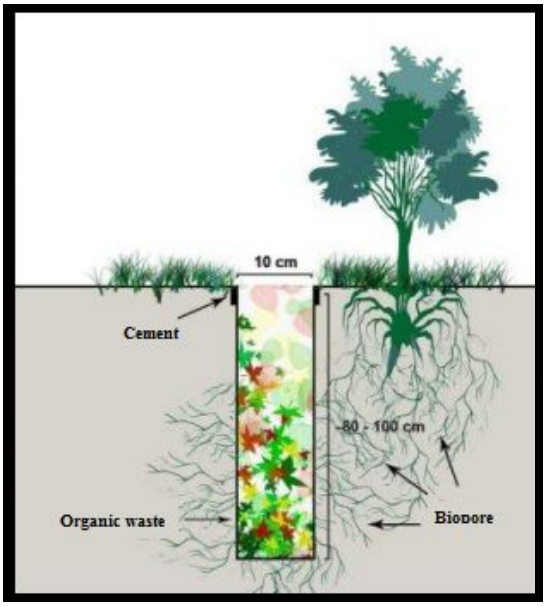

Figure 1. Biopore absorbing hole

Rate of water in each BAH are estimated using equation 1.

Rate of water in BAH = Rain intensity x building area / Number of BAH (1)

The rain intensity in Gresik – Indonesia in rainy season November 2015 - June 2016 is tabulated in Table 1

Table 1. Rain intensity in Gresik Indonesia

No	Month	Rain intensity (mm/hour)
1	November	170
2	December	182
3	January	216
4	February	251
5	March	231
6	April	141
7	May	125
8	June	102

IV. Results and Discussions

Based on equation (1), rate of water BAH in whole area PT PJB UP Gresik during November 2015 until June 2016 can be estimated. The results show the rate of water in BAH have variations for each months. It depend on rain intensity in Gresik Indonesia. 1000 BAHs are located in 7 area. Each areas have different number of BAH. The graphical information regarding the results are shown in Figure 2 and the detail data are tabulated in Table 2.

Table. 2. Estimated rate of water BAH in whole area PT PJB UP Gresik between November 2015 until June 2016

No	Location	Estimated rate of water BAH (liter/hour)							
		Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16
1	Surrounding stadium	348,50	373,10	443,31	513,53	472,53	289,05	256,25	209,10
2	Behind warehouse I -VI	373,12	399,45	474,63	549,80	505,90	309,47	274,35	223,87
3	Front garden	389,03	416,49	494,87	573,24	527,48	322,66	286,05	233,42
4	Side garden	361,76	387,30	460,18	533,06	490,50	300,05	266,00	217,06
5	CCB PLTGU garden	457,90	490,22	582,47	674,72	620,85	379,78	336,69	274,74
6	Front garden of PLTU 3 &4	385,71	412,93	490,64	568,35	522,97	319,91	283,61	231,42
7	Switchyard area	373,61	399,98	475,25	550,52	506,57	309,87	274,71	224,16
TOTAL		**2.689,61**	**2.879,47**	**3.421,34**	**3.963,22**	**3.646,80**	**2.230,80**	**1.977,66**	**1.613,77**
Total BAH		**22.422,66**							

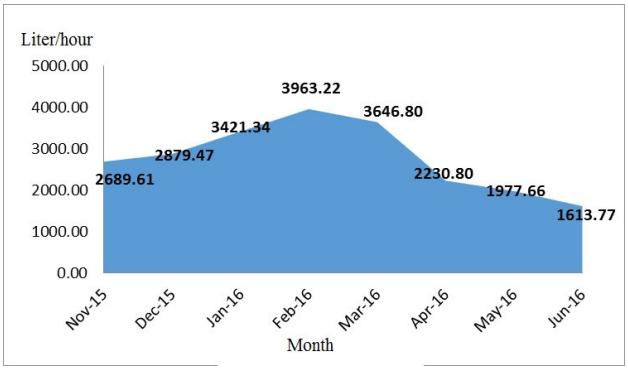

Figure 2. Estimated rate of water BAH between November 2015 until June 2016

Refer to the Figure 4, the highest rate of BAH water is on February 2016 due to highest rain intensity in the related month is about 3.963,22 liter/hour. It can be conclude that the total additional water reserve is about 22.422,66 liter/hour due to perform BAH in PT PJB UP Gresik.

V. Conclusion

1000 BAH have been built in PT. PJB UP. Gresik Indonesia to reduce surface water and convert it into ground water. Composting the waste inside BAH increase the essential soil nutrition increase and good green practice in waste management and reduce carbon footprint due to waste transportation free. The quality of soil and it reduce water consumption for watering the plant. It can be conclude that the

total additional water reserve is about 22.422,66 liter/hour due to perform BAH in PT PJB UP Gresik.

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