JOURNAL
OF COMMUNITY ENGAGEMENT
e-ISSN : 2686-1046 | p-ISSN : 2686-1038
JCe

Publisher: Universitas Pakuan *Volume 02, Number 01, March 2020, Page 06-10*

THE EFFECT OF THE BIOPORE SYSTEM TO DEAL WITH INUNDATION AT THE NURUL HUDA ISLAMIC BOARDING SCHOOL, CIMANGGIS, DEPOK

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Article history

Received 15 December 2019
Revised 24 December 2019
Accepted 05 January 2020

Abstract

The problem of inundation is not a simple problem, several factors that must be considered, among others, the amount of flood discharge due to land use change, narrowing and silting of channels due to pressure from settlements and sediment, the problem of high ground water levels and waste problems. For that, the solution for handling inundation is to apply a water conservation system, one of which is by making biopore infiltration holes. The biopore infiltration hole is possible to absorb water into the ground so that it becomes a solution for flooding and maintains the availability of groundwater. The implementation is carried out in 2 stages, namely counseling and biopore infiltration holes implementation. Extension includes the importance of biopore infiltration holes, how to make, as well as maintenance so that biopore infiltration holes is effective. Implementation includes making biopore infiltration holes and filling biopore infiltration holes using organic waste. This service is expected to result in the formation of 50 biopore infiltration holes points in flood-prone locations and is expected to be effective in overcoming floods and the availability of ground water at the Nurul Huda Islamic Boarding School, Cimanggis, Depok.

Keywords: biopore infiltration holes, water inundation.

I. INTRODUCTION

In the rainy season, there are often flood problems in the Nurul Huda Islamic Boarding School, Cimanggis, Depok, after rain with high rainfall strength, it will cause very wide and high inundation, inundation sometimes reaching a maximum height of 20 cm. When there is a puddle, water takes quite a long time, reaching 2 hours to seep out into the ground. A solution that can be done to solve the problem of flooding in densely populated areas with limited water infiltration, then the solution can be to create biopore technology. Biopores can minimize rainwater runoff through infiltration, the volume of rainwater into the soil can be minimized so that inundation does not occur.

With minimal infiltration, the rate of rainwater going to the sewer and exploitation of groundwater will increase, for this it requires efforts to renew groundwater. This effort can anticipate the situation, namely through biopore technology engineering by managing organic waste that is managed through the composter method. The existing study states that if the biopore hole is filled with organic waste, the infiltration surface cannot be clogged because rotting organic waste seeps in water (Widyastuti **[1]**). Even the method of filling the biopore holes through household waste can break down faster when compared to filling with dry leaves alone. The fact in the field is that 70% of household waste is organic waste (Sahwan **[2]**). This has a big impact by piling up and dumping it directly into the TPA and not being processed first, whereas organic waste can be used as compost which is beneficial to households and has a selling value. The results of the study stated that the decomposition process requires microbes that live in an environment that has water, oxygen, carbon and nitrogen content (Sahwan **[2]**)

The biopore system is an engineering solution for water conservation techniques, in the form of holes made on the surface of the earth which act as gateways for rainwater that falls to the earth. This biopore technology can minimize rainwater runoff through infiltration of more rainwater volume into the soil thereby reducing the occurrence of inundation. The system is filled with organic waste to lure microorganisms, microorganisms in the soil make pore grooves to accelerate their absorption of water by the soil then it is stored in the water basin area in the soil.

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e-ISSN: 2686-1046; p-ISSN: 2686-1038

Floods can be caused by the reduced availability of land surface for water absorption (Budi **[3]**). Increasingly dense population growth has resulted in a lot of land being used as housing, road construction and public facilities, which has resulted in a lot of land being covered by asphalt and concrete.

The biopore infiltration hole was discovered by Kamir R. Brata, in his research finding that the newly made biopore biopore infiltration holes that had been filled with organic waste could enter 1.5 liters to 16 liters / minute of water (Brata **[4]**). The biopore infiltration hole is a cylindrical hole made vertically in the soil with a diameter of 10 cm and a depth of 100 cm, it could be less if the groundwater is shallow. So that organisms can work to form biopores, the holes are filled with organic waste so that soil organisms can eat them. The filling of waste is conditioned so that it is not solid so that there is enough oxygen to support soil organisms to form biopores. Named biopores because the activity of fauna in the soil can be utilized with plant roots (bio) which can form small holes (pore) in the soil.

The biopore infiltration hole is a water conservation engineering technique, in the form of a hole made to a certain depth and filled with organic materials. The function of the biopore infiltration hole is the gateway to rainwater that seeps into the soil which fills the pores in the hole. Meanwhile, the advantages of making biopore infiltration holes include; (1) maintaining groundwater reserves, (2) preventing soil subsidence and cracking, (3) inhibiting seawater intrusion, (4) making organic waste turn into compost. (Sibarani **[5]**).

How the biopore infiltration hole works; The microbial biopore infiltration hole in the area of the biopore collection hole can be attracted through the smell of garbage in the cross-sectional hole. This microbial activity leads to the formation of fine holes in the cross-sectional area. This fine hole is called a biopori. When it rains, water fills the cross section. Then the water spreads through the small hole. This is what causes water to be absorbed, it is hoped that flooding can be minimized. The availability of ground water can be fulfilled. The purpose of the biopore infiltration hole is to increase the entry of rainwater in the soil aquifer as infiltration.

Biopore infiltration hole construction; The biopore infiltration hole is made for the surface of the soil with the provisions that have been implemented in the Minister of Environment Regulation No.12 of 2009. The resistant stage makes the biopore infiltration hole, including; (1) prepare a cylindrical hole in the soil with a diameter of 10 cm, with a depth of 100 cm not more than the groundwater. The biopore infiltration hole distance is about 50-100 cm. (2) the base of the hole (the mouth of the hole) to make it strong is made using; (a) a paralon with a diameter of 10 cm, with a minimum length of 10 cm or (b) make a mortar around the mouth of the hole with a width of 2-3 cm, and a thickness of 2 cm. (3) biopore infiltration holes is filled with organic waste, namely from dry leaves or kitchen waste, and (4) covers the biopore infiltration hole with a filter wire.

In principle, biopore infiltration holes is made by expanding the land surface vertically. With the increase in the land surface area, rainwater that falls can be channeled and collected into vertical burrows. The expected result by making this biopore infiltration hole is that it can reduce stagnant water and flooding when it rains, because rainwater can infiltrate the soil through biopore infiltration holes. Apart from being able to absorb water quickly, it is hoped that it will also be able to increase the volume of groundwater as an effort to mitigate the impact of natural disasters from drought (Research and Development Center, Research and Development Agency & Ministry, 2002). The use of organic waste to fill biopore holes can also minimize the scattered organic waste and process it into compost (Karuniastuti **[6]**).

II. METHODS

This activity uses the action research method, which is an activity that focuses on planning, act of observation and reflection. Furthermore, corrective action is carried out after reflection on the program so that it can get solutions to existing problems (Pudjiastuti **[7]**). This action research method is carried out in a focus group discussion to obtain input so that the living environment becomes healthy with sufficient groundwater availability, the involvement of students in the making of composers and biopores which is a way to transfer science and technology for students, and socialization via social media to ensure the continuation of the program. and urged students to participate in this activity. The implementation of this biopori making was carried out on Saturday and Sunday, 26-27 October 2019. The location of the activity was in the Nurul Huda Islamic Boarding School, Kampung Rumbut, Pasir Gunung Selatan Village, Cimanggis Depok. Implementation in the field is carried out before data collection, intended to find out how big the problem is, then it will be done by means of a hand drill.

The location of the community service activities is a densely populated area with limited land. Nurul Huda Islamic Boarding School is in the lowest position in the area. So it is natural that rainwater runoff will be inundated at that location. Solutions to overcome floods and the availability of groundwater using biopore infiltration holes do not have to be on a large yard. In areas that have high rain intensity with a water infiltration rate of 3 liters per minute, every 100 square meters of land area, can require 20 holes. Therefore, biopore technology can be made in all types of areas, and if these biopores are between the trees, the plants

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can thrive. The biopore infiltration holes were made 50 points, with the specified location in the field of the Nurul Huda Islamic Boarding School Foundation which is right at the entrance.

III. RESULTS AND DISCUSSION

In the process of implementing community service, the following activities are carried out;

a. Stage of problem identification through outreach and Focus group discussions (FGD)

Focus group discussions (FGD) were conducted on students to get feedback from the students about the problems they faced and hopes for environmental sustainability. The extension activity contains the importance of making efforts in overcoming floods and improving the quality of groundwater using biopore infiltration holes. As well as how to make and maintain biopore infiltration holes that has been made.

Biopore infiltration holes are an alternative way to absorb rainwater into the soil in limited land. Utilization of biopores can maintain natural balance, organic waste can be used as compost, in addition to storing water during the dry season (Sembel **[8]**). The education program and making biopore infiltration holes are very much needed by the students, because floods often occur when it rains, the small and shallow waterways are not sufficient to drain the water discharge.

FGD were also conducted to; provide understanding of the students about the benefits of biopori; Making biopores aims to get benefits. Following are the benefits of biopore infiltration holes .

1. Reducing Organic Waste

Trash, which has been a dilemma, in making biopore infiltration holes through counseling, it is hoped that the students can sort organic and inorganic waste, thereby minimizing the disposal of organic waste. When making a hole, there are steps taken, namely inserting organic waste into the hole. In general, students do not have clean living habits. The existing habit is throwing garbage in the river / sewer, other people's yards, empty land, by burning it, or handing over the unsorted garbage to the garbage officer / cleaning service. (Pudjiastuti **[9]**)

2. Make the soil fertile

When inserting organic waste into the hole, a biological process occurs, namely processing the waste into compost, that is why the soil around the biopore infiltration hole can be more fertile.

3. Help prevent flooding

The cause of flooding is due to a poor drainage system, especially in areas with densely populated areas, this happens because there is no water infiltration into the ground. By making biopore infiltration holes, it can make water enter the ground more quickly. The organic waste in the hole becomes food for earthworms. These worms can make small holes in the soil into holes that contain organic waste. That is what makes water absorb in the soil faster.

4. Affect the amount of groundwater

The small holes that earthworms make can increase the surface area of the soil. This is what makes the soil capacity to accommodate more rainwater. The biopore infiltration hole can increase the infiltration area to 40 times.

The achievement of the enthusiasm of the students can be seen from the presence of the students at this counseling event. About 50 people attended a counseling program about biopore infiltration holes. Achievement of extension materials can be measured from the application in the field when making biopore infiltration holes.

b. Preparation Stages

1. Making biopori pipes

Making a biopore hole utilizes a 1 meter long paralon pipe which is perforated using a drill that is 3 cm apart to be used as a gap for water to re-enter the ground. This paralon pipe serves to maintain the shape of the hole so that the biopore holes can last longer in its function. Each pipe pipe will be installed with a cover that has been perforated to avoid the possibility of soil entering the pipe.

Tools and Materials is Ground drill, PVC pipe and cover with holes on the sides as shown above, Organic trash, Water

Figure 1. Tools and Materials

2. Composer Making

The composing container was made using an old paint bucket measuring 20 kg which was then cleaned of the remaining paint. In separating the waste from the liquid fertilizer, a filter is made of glass fiber which is perforated and supported by a used pipe

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e-ISSN: 2686-1046; p-ISSN: 2686-1038

measuring 2 inches, so that it can bear the load and can be easily opened inside. For the success of compost that is made is very much determined by the sorting of organic and inorganic waste (Azkha [10]). In addition, a hole is made at the bottom of the container to install a tap to dispense liquid fertilizer for easy removal and reuse. This container must be closed so that the mild odor from the main ingredient, namely organic waste, does not sting.

Figure 2. Composer Making

3. Implementation of Biopore Planting and Composer Socialization

In its implementation, it begins with disseminating information to the students by providing counseling on the function of making biopore holes and implementing composter utilization for the living environment. In this counseling, an explanation was also given for the manufacture and how to use and implement it so that the students were expected to understand and continue the activity.

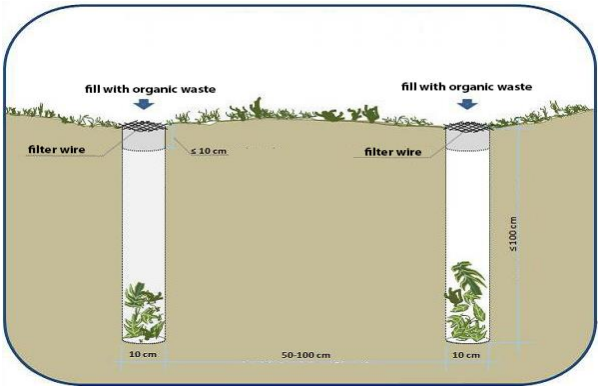

Figure 3. example image of biopore infiltration holes

A biopore infiltration hole is a hole made upright in the soil. This hole has a diameter of 10-30 cm with no shallow groundwater level. This hole is then filled with organic waste which has a function to feed worms and plant roots.

c. Tips and tricks

To make it easier to make biopore infiltration holes, the following tips and tricks can be followed.

1. Each drill bit is completely inserted into the ground, the drill bit is pulled while turning it to the right, clean the soil that follows the drill bit. Next return to drilling the soil.
2. To make it easier to perforate the soil, it is recommended that the soil that you want to drill is watered first.
3. When there are stones or gravel that are blocking them, they can be removed first that are the obstacles.
4. In order for the biopore infiltration hole to last longer, it should be cemented around the biopore infiltration hole.

d. How to Make Biopori

Below are the steps in making a biopore infiltration hole, Steps to Make Biopori :

1. Determine the location where the biopore infiltration holes will be made.
2. Water the soil where the hole will be made, so that the soil is soft, so it is easy to perforate.
3. Through the use of a ground drill, a hole is made perpendicularly.
4. The hole is made at a depth of 1m and a diameter of 10-30 cm.
5. Next the hole is lined with PVC pipe of the same size as the diameter of the hole
6. Next, the hole is filled with organic waste.
7. Finally, the hole is closed using an iron wire, use a PVC pipe cover that has been perforated first.

Figure 4. make biopore infiltration holes

e. Biopori Care

How to treat biopore infiltration holes so that their quality is maintained and can function properly.

1. When filling the biopore hole, do it gradually every five days until the hole is full of organic waste

2. After the biopore infiltration hole is filled with organic waste, leave it for about 3 months so that the organic waste becomes compost.
3. Then the finished compost is removed from the biopori hole, the hole is filled again with new organic waste. Compost can be used to fertilize plants.

IV. CONCLUSION

This program received good enthusiasm from the students. Although the level of achievement is 100% to ensure this program continues, it is necessary to carry out periodic monitoring for the next 6 months. In this time frame, the success rate in absorbing groundwater will be seen and the amount of compost produced can also be measured. With this program, the students can contribute to the return of groundwater that has been taken up too much and at the same time reduce waste. To reduce phobias and change the bad picture about waste, organic waste processing propaganda can be more interesting and published via social media so that other students can follow it.

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