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Community empowerment with the contruction of biopori absorption holes as a mini project SDGs action of effort to overcome flooding in Paya Geli, Sunggal

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ABSTRACT
Floods are disasters that often occur in the community. Floods are often caused by high levels of rainfall, overflowing rivers, and so on. Community empowerment is an activity to create community participation in overcoming community problems independently through making biopore infiltration holes which is one of the efforts to overcome flood inundation in Paya Geli Village, Sunggal District. The aim of making biopore holes is to increase the soil's ability to absorb water, reduce surface flow which can cause floods, and maximize the role of soil organisms in recycling organic material. This activity involves the active participation of the Paya Geli Village community. The implementation method is through Focus Group Discussion (FGD), method demonstrations, and discussions in making biopore holes. Based on the results of community empowerment activities, it shows that 90 percent of PKK women have a good understanding of how to make biopore infiltration holes, while the other 10 percent do not understand, but they video the demonstration of the method so that they can do it themselves with their husbands and the effectiveness of infiltration holes is proven to be 80 percent effective in reducing flooding in the area.Apart from that, this activity also encourages the formation of community self-help groups that are committed to maintaining and preserving the biopore holes that have been created. Thus, community empowerment through the creation of biopore absorption holes has proven to be able to solve the flooding problem in Paya Geli Village in a sustainable manner.
Keyword: Biopore, Community empowerment, Flooding, SDGs

ABSTRAK
Banjir merupakan bencana yang sering terjadi di lingkungan masyarakat. Banjir seringkali diakibatkan oleh tingginya tingkat curah hujan, air sungai yang meluap, dan sebagainya. Pemberdayaan masyarakat merupakan kegiatan menciptakan partisipasi masyarakat dalam menanggulangi permasalahan masyarakat secara mandiri melalui pembuatan lubang resapan biopori yang menjadi salah satu upaya penanggulangan genangan banjir di Desa Paya Geli, Kecamatan Sunggal. Pembuatan lubang biopori bertujuan untuk meningkatkan kemampuan tanah dalam menyerap air, mengurangi aliran permukaan yang dapat menyebabkan genangan banjir, serta memaksimalkan peran organisme tanah dalam daur ulang bahan organik. Kegiatan ini melibatkan partisipasi aktif masyarakat Desa Paya Geli. Metode pelaksanaan melalui Focus Group Discussion (FGD), demonstrasi cara, dan diskusi dalam pembuatan lubang biopori. Berdasarkan hasil kegiatan pemberdayaan masyarakat menunjukkan bajwa 90 persen ibu-ibu PKK memiliki pemahaman yang baik mengenaik cara pembuatan lubang resapan biopori, sedangankan 10 persen lainnya kurang paham, namun mereka memvideokan demonstrasi cara tersebut agar bisa dilakukan sendiri bersama suaminya dan efektivitas lubang resapan terbukti 80 persen efektif dalam mengurangi genangan banjir di wilayah tersebut. Selain itu, kegiatan ini juga mendorong terbentuknya

kelompok swadaya masyarakat yang berkomitmen untuk memelihara dan melestarikan lubang biopori yang telah dibuat. Dengan demikian, pemberdayaan masyarakat melalui pembuatan lubang resapan biopori terbukti mampu mengatasi permasalahan banjir di Desa Paya Geli secara berkelanjutan.
Keyword: Biopori, Genangan Banjir, Pemberdayaan Masyarakat, SDGs

1. Introduction

Indonesia is a country known for its rich natural resources, one of which is water resources [5]. However, Indonesia does not have adequate water storage capacity so it cannot avoid natural disasters such as floods. Based on BNBP data, in the 2019-2024 period it became the most frequent natural disaster in Indonesia. One of the areas prone to flooding is Deli Serdang Regency, North Sumatra Province. Paya Geli Village has 7 hamlets with a population of 21,265 people who are members of 4,923 families [8]. The population density in Paya Geli Village and the overflowing Kerio River which has become shallow so that its capacity is not sufficient to accommodate large water discharge. Therefore, hundreds of houses in Paya Geli Village are inundated by water. If there is no mitigation from the community or local government, Paya Geli Village will often experience flooding. The causes of flooding that occur in Paya Geli Village include high rainfall and its intensity for too long causing the area to be submerged in rainwater, the sloping topography of the area makes it difficult for water to flow and accumulate, garbage that collects in ditches and drainage channels inhibits the flow of rainwater, the drainage system or underground water channels that are irregular or not well maintained so that rainwater is difficult to channel. If these conditions are allowed to occur without any handling, what was initially a puddle of water will become a continuous flood. This will also make the air more humid. This high humidity makes it easier for various disease-causing microorganisms, such as viruses, bacteria, parasites, and fungi, to thrive in various places. These humid environmental conditions can increase the risk of spreading diseases caused by these pathogens. This is due to high rainfall and rivers that are unable to hold large volumes of water. In addition, dates that are less strong or broken down cause a poor drainage system [10]. One effort that helps the drainage system run smoothly is to empower local communities to manage flood prevention in the area.

Empowerment is the process of working with people to support them in making positive decisions in their lives, in pursuing social justice in society. Community empowerment is an effort to prepare communities along with institutional strengthening efforts, so that they can have the capacity to achieve progress, independence, and welfare in the context of sustainable social justice [2]. Community empowerment be a process, method, and activity that aims to enable the community. This empowerment involves efforts to improve the community's ability to act and make decisions to meet their own needs. The context of community empowerment is very appropriate to be applied in situations where the community needs assistance or assistance from outside parties to be able to empower themselves. The goal is the community become more independent and can manage available resources to improve their quality of life. State that empowerment is an effort to re-position local communities as environmental managers by showing strength through a community-based management approach [7]. Therefore, local community initiative in activities has an important role to facilitate the development of the community itself. Empowerment entails processes that facilitate positive self-perception, thereby enabling individuals to participate effectively in the development process. In this sense, empowerment entails a holistic approach that enables changes in social structures and relationships. Empowerment entails social processes that enable people to gain power and control over their own lives within communities and societies. Individuals can participate in activities on their own terms and with the aim of improving their own lives. In this sense, empowerment is more than just individuals and communities gaining control over decision-making processes, but expands its meaning from a multi-dimensional perspective. Community empowerment activities are one of the good steps for flood prevention, namely by making biopore infiltration holes.

Based on Figure 1 shows that the biopore structure has three dimensions. Coating is the top of the blue cylinder, which may represent a protective layer or additional material used to improve the function of biopores. Soil Matrix is the orange part around the cylinder is the soil matrix, indicating the main components that provide structural support and nutrients. Biopores interact with soil and other components in the ecosystem. The scale of the size listed shows a dimension of 10 mm for each side [3]. Biopore is holes in the soil that are formed due to various activities of organisms in them such as worms, plant roots, termites, and other soil fauna [7]. Biopores function as pathways that facilitate plant root growth to reach deeper soil layers

so as to increase nutrient absorption and deeper soil layers [4]. Biopore surfaces have properties that can influence the mass exchange process between macropores (large pores) and the soil matrix (the part of the soil outside the macropores) during preferential water flow (flow that occurs primarily through macropores). The surface characteristics of biopores, such as surface area, roughness, and hydrophilic or hydrophobic properties, govern how effectively mass exchange (e.g., oxygen, water, nutrients) can occur between the macropores and the soil matrix as water flows through the macropores. This biopore infiltration pit is a simple innovation that can increase water absorption, reduce rainwater runoff, and utilize organic waste as compost material. This innovation is environmentally friendly and suitable for implementation in densely populated areas such as Paya Geli Village [5].

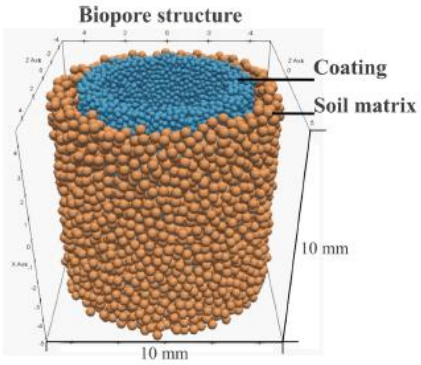

Figure 1. The Model of Biopore structure.
Source: [3].

The approach used in community empowerment activities in Paya Geli Village is FGD, providing demonstrations on how to make biopore water infiltration, and holding discussions with the community so that they can help solve problems and provide solutions to the community. Based on the conditions and situations of the village, the researcher conducted community empowerment activities on the use of biopore infiltration holes to overcome these conditions by making biopore water infiltration in Paya Geli Village.

2. Methods

This program was carried out for three (3) weeks starting on November 22 to December 23, 2022 in Paya Geli Village, Sunggal District, Deli Serdang Regency, North Sumatra Province. This research was conducted using descriptive qualitative methods through documentation and interviews. The targets of this research were the PKK women of Paya Geli Village, totaling 15 people. The methods used in the implementation of this program are Focus Group Discussion (FGD) and training with lecture and discussion methods conducted to PKK women to find out the problems faced by the people of Paya Geli Village.

The materials used in making biopore absorption holes are 3-inch PVC pipe and organic waste. The first method is to survey the location of empowerment. The location survey was conducted with the Paya Geli Village government. In addition, the location survey was also carried out by conducting interviews with village officials, namely with the village head regarding community empowerment activities that will be carried out by the community empowerment team.

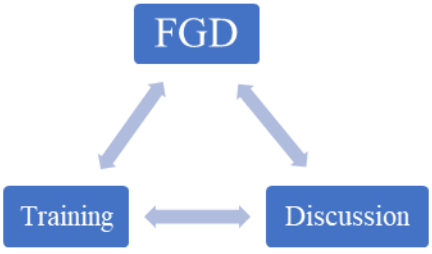

Figure 2. Process of community empowerment activities.

This empowerment activity stage includes three as shown in Figure 2, as follows:

2.1. Focus Group Discussion (FGD)

Focus Group Discussion (FGD) is used in research usually using storyboards and other tools to focus the discussion especially designed to evaluate the effectiveness of media messages. This method used to explore the problems and challenges faced by PKK mothers in Paya Geli Village in starting a community empowerment program. This method aims to encourage the participation and involvement of other women in the activity [9]. In addition, FGD also functions to foster aspirations and active participation from PKK mothers.this method aims to deepen the understanding of the use and utilization of biopore infiltration holes and determine solutions in the management of waterlogging that befalls the houses of the Paya Geli Village community. This activity was designed as a means for the community, stakeholders and facilitators to share knowledge and experiences and discuss potential common ground. This FGD was conducted on the first day.

2.2. Method demonstration

The method demonstration is a method that is carried out directly by the facilitator so that the PKK women participants can make direct observations so that they can understand the empowerment material more easily. Accompanied by the use of media, namely real objects. Through this demonstration method, it is hoped that it can accelerate and improve participants' understanding of applying biopores as water absorption for flood inundation in Paya Geli Village. The demonstration method also allows the facilitator to directly practice the concept or process taught to participants, so that students can make direct observations. The use of real objects can help support demonstrations to facilitate student understanding.

2.3. Discussion

Discussion is a process of sharing opinions between two or more people with the aim of reaching a common understanding or view of a problem faced together. Discussions allow for the exchange of ideas, viewpoints, and information among participants, so that they can gain a more comprehensive understanding of an issue or problem. This discussion forum aims to discuss the problems and challenges faced by the community and then the facilitator provides solutions for the common interest

3. Results and Discussion

This empowerment activity is very useful for the community. The making of biopore infiltration holes is useful for reducing the discharge of water on the surface of the ground that is stagnant. With this community empowerment, it is hoped that the community can take advantage of it, because it is very possible to be installed in the Paya Geli Village area to overcome flooding and as water absorption and storage in Paya Geli Village.

3.1. Focus Group Discussion (FGD)

FGD activities were carried out on November 30, 2022 at the Paya Geli Village Office, Sunggal District as shown in figure 2. The activity began with remarks by the facilitator who organized the community empowerment activity. Then the facilitator socializes what activities will be carried out and develops a joint action plan. In this case, the targets of empowerment take part in proposing programs that can help the community in overcoming problems that generally occur in Paya Geli Village, Sunggal District. This aims to create mutual awareness and understanding of empowerment activities. The technical implementation of FGDs is carried out in the following stages:

- Distribute sticky notes and stationery to FGD participants (community members present).
- Ask the participants to write down the problems that occur and are felt in their current environment.

“Our house is often flooded, especially when it rains heavily, rainwater enters our house until it is flooded for several days so that we have difficulty doing activities, what activities can prevent and reduce flooding in our house?” [Ibu H, a head of PKK Women] (FGD, 30 November 2022).

- Collecting the sticky notes that have been written by the participants, then recording them on a carton paper that is taped in front of the FGD room, as a summary of the problems.
- Asked the participants to write down the kinds of activities they would like to have in the park.

- Recorded the activities proposed by the participants on the summary paper.

Based on discussion with PKK women, the results of FGD are PKK women understand the community empowerment activities that will be carried out and according to the problems they face, namely making biopores and 100 percent of the community agreed to make biopores to reduce flooding when it rains.

Figure 3. Focus Group Discussion (FGD).

3.2. Method demonstration

Figure 4 shows a demonstration activity on how to make biopores. The stages carried out in the demonstration use media, namely real objects. The stages of making biopori infiltration holes are as follows:

- Biopore infiltration holes are made by installing holes with a diameter of 10-30 cm and a length of 30-100 cm filled with organic waste. Its function is to trap flowing water so that it can become an underground water reserve.
- The main component is a soil drill to make the holes.
- Insert 3-inch PVC pipe, cement, and organic waste as filling material. Making holes is done by drilling the soil with a diameter of 10-30 cm and a depth of 30-100 cm, with a distance of 50-100 cm between holes.
- The top of the hole is given a layer of cement 2 cm thick and 2-3 cm wide and is given a safety guard so as not to endanger it. The pit is then filled with organic waste that has been prepared. The waste in the hole will shrink at the end of the dry season so it needs to be refilled. The number of biopore infiltration holes is determined based on the land area, which is 10 holes per 50 m2 of land.
- The effectiveness is calculated based on rain intensity with return periods of 2, 5, 25, 50 and 100 years. Biopore pits are suitable for densely populated settlements because they do not require large areas of land. In the case of Paya Geli Village, biopore holes are 10 cm in diameter and 100 cm deep, with a distance of 7-11 meters between holes and 9-11 holes per house.
- Making biopores is done at 4 points per house, namely in the front yard, left and right sides, and back of the house. This is because rainwater absorption can be evenly distributed throughout the area and reduce puddles.

Figure 4. Demonstration on how to make biopore infiltration holes.

3.3. Discussion

Discussion activities are facilities used by the community present in the community empowerment activities to find solutions to the challenges and problems faced by the community. Participants also asked the facilitator several questions about the biopore infiltration pit.

Figure 5. Discussion forum.

Based on discussion as shown in figure 5, 90 percent of the PKK women had a good understanding of how to make biopore infiltration holes, while the other 10 percent did not understand, but they videoed the demonstration so they could do it themselves with their husbands.

4. Conclusions

Community empowerment activities in making biopore infiltration holes to overcome floodwater inundation that occurs in Paya Geli Village are effective. Based on the results of community empowerment activities, it was found that 90 percent of PKK mothers had a good understanding of how to make biopore infiltration holes, while the other 10 percent did not understand, but they videoed the demonstration of the method so that they could do it themselves with their husbands. The benefits of making biopore infiltration holes are to increase the soil's ability to absorb water, as a channel for rainwater to enter the soil and seep, so as to reduce surface flow that can cause flood inundation, reduce environmental pollution with the use of organic waste that is put into biopore holes can be decomposed naturally by soil organisms, so as to reduce waste piles in the environment, improve soil structure, increase soil porosity, making it easier for water and air to enter the soil. This can improve soil structure and increase soil fertility and increase groundwater reserves. All stages in the activity are very important. The Focus Group Discussion (FGD) stage is a planning process that provides positive input. The demonstration stage can change the cognitive, affective, and psychomotor of each individual present because the facilitator provides knowledge about the benefits of using biopore infiltration holes, provides ways to practice how to implement biopore infiltration holes. The discussion stage became a forum for exchanging knowledge and information and discussing the confusion that occurred in the community.

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