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Conservation of Water Resources Around Rivers as an Effort to Empower the Community in Kalong Liud Village

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***Abstract*:** Program Penguatan Kapasitas Kemahasiswaan team (PPK Ormawa) of Himpunan Mahasiswa Kimia (HIMASKA) of the Faculty of Mathematics and Science, Pakuan University has implemented a water resource conservation program to overcome floods and droughts that occur every year in Kalong Liud Village, Nanggung District, Bogor Regency, West Java Province. Water resource conservation with green ampel bamboo (*Bambusa vulgaris Schrad. ex. J.C*) uses a combination of vegetative and agronomic methods with the aim of maximizing erosion control and surface flow of the Cikaniki River. This program began with a survey of village locations, socialization and education to maximize the sustainability of the implementation of the program by holding *pre-tests* and *post-tests* for community groups and residents around the Cikaniki River. After that, green ampel bamboo was planted on the cleared and dug land 50 cm deep with a hole diameter of 15 cm. The growth of green ampel bamboo is monitored and evaluated once a week to find out how to optimize its growth. As a result, young leaves grow from bamboo books after 3 (three) weeks of planting and maintenance. In addition, the provision of education and scientific approaches can increase public understanding and awareness of climate change that can cause flood disasters.

Keywords: *Green Ampel Bamboo; Flood; Water Source Conservation*

1. INTRODUCTION

Natural disasters that occurred in Indonesia from 2010 to 2020 were dominated by hydrometeorological disasters including landslides, tornadoes, and floods (Azizah et al., 2022). During 2021, the National Disaster Management Agency (BNPB) recorded 5,402 disaster events, including 1,321 landslides, 1,577 extreme weather, and 1,794 flood disasters in Indonesia (Muhamad Hilmi Rozaldi & Muhammad Khoirul Anwar, 2024). Floods generally occur due to high rainfall intensity in areas with poor water infiltration (Gustian et al., 2020), garbage that is thrown carelessly so that it clogs the flow of rivers, and or water discharge that exceeds the capacity of the plains around the river flow to accommodate water (Hamas Hafizha et al., 2023).

Kalong Liud Village is one of the villages located in Nanggung District, Bogor Regency, West Java Province. Several villages in Kalong Liud Village are directly adjacent to the Cikaniki River which is commonly used by the community as the main source of water for agriculture (irrigation), river sand mining

and daily needs, the main source of sanitation in daily life (Sujarwanta & Zen, 2023). Based on the disaster data in Kalong Liud Village that we obtained, it was recorded that in 2020 there was a flood disaster that caused the houses and land of residents living in the watershed to be submerged and the damage to the Cibongas dam. The impact of all of this is siltation in downstream areas which causes a decrease in water production capacity in the watershed, especially during the dry season, as well as floods that are increasing during the rainy season (Taufikurrohman & Rahman, 2024).

Until now, of course, the flood disaster is still one of the dangerous natural disasters for Kalong Liud Village. This is because there are still many people living in the watershed, increasing the percentage of casualties and material losses, considering the frequent increase in the volume of water in the Cikaniki River in the event of high-intensity rain. Based on the data that has been collected, we as the team that compiled the Program Penguatan Kapasitas Organisasi Kemahasiswaan (PPK Ormawa) on behalf of the Himpunan Mahasiswa Kimia (HIMASKA) Faculty of Mathematics and Natural Sciences, Pakuan University presented solutions to existing problems to educate the community to be able to mitigate and adapt to climate change through the planting of green ampel bamboo (*Bambusa vulgaris Schrad. ex. J.C*) in the watershed, especially in Liud Village RT 03 RW 03 and Babakan Liud Village RT 01 RW 10.

In recent years, the planting of bamboo trees has become one of the efforts made by various parties to improve the quality of the environment and face various challenges that exist in natural resource management. Bamboo has the ability to maintain environmental balance and prevent the negative impact of the greenhouse effect because bamboo has a root system that can prevent erosion, regulate water systems, and can grow on marginal land. Water source conservation activities using bamboo are beneficial for the community in the future, because bamboo plants can prevent soil erosion along the river banks which can cause flooding (Sujarwanta & Zen, 2023). Green ampel bamboo (*Bambusa vulgaris Schrad. ex. J.C*) was chosen which is suitable for use in efforts to conserve water sources and sloped areas for soil and water conservation purposes (Hani, 2019). Based on research that has been conducted by Azizah and Maslahat in 2021, the Cikaniki River contains heavy metal mercury (Hg), so the selection of green ampel type bamboo is considered suitable for

use in efforts to conserve water sources along the Cikaniki River because it can improve the quality of river water.

2. METHOD

The method used to solve the problems that occurred in Kalong Liud Village in the PPK Ormawa activities to minimize casualties and material losses due to the overflow of the Cikaniki River which had an impact on the submersion of land and houses of residents in the watershed consisted of socialization and education to community leaders and the community of Kalong Liud Village, the implementation of green ampel bamboo planting, and evaluation.

2.1 Time and Location

The water source conservation program will be carried out from August to July 2024. The planting location is in 2 (two) different places, namely in Liud Village RT 03 RW 03 and Babakan Liud Village RT 01 RW 10 Kalong Liud Village, Nanggung District, Bogor Regency, West Java Province.

2.2 Socialization and Briefing of Water Source Conservation Information

We held a program socialization that aims to provide information related to the identification of problems faced by village communities, present solutions through planned programs, and convey a series of implementation to treatment. At the same time, during the socialization, we also educate people living in the watershed in an effort to increase knowledge about how to care, protect, and benefit from water source conservation by planting green ampel bamboo. Education is provided in the form of socialization and scientific approaches to the community and target groups.

Water conservation can be done in many ways. It is mainly divided into 4 (four) main groups, namely: agronomy, vegetative, structure, and management (WASWC, 1998 in Sallata, 2017). Planting timber and adjusting the distance between plants on land with a slope of < 8% is one of the vegetative group methods that can be used and has been proven to minimize the occurrence of erosion and poor surface flow control which can increase the potential for flooding (Sallata, 2017). In addition, agronomic water resource conservation methods are also used by planting methods that follow soil contours and fertilization. By paying attention to

the contours of the soil at the planting site, the use of water source conservation methods agrononomy is considered very necessary, with consider the area of the planting location, the distance between bamboo shoots, and the distance to the river bank. Vegetative and agronomic conservation methods are combined to maximize the control of erosion and surface flows which are currently catastrophic because they are poorly controlled.

2.3 Implementation Procedure

a. Excavation Hole Manufacturing

The green ampel bamboo used is a bamboo shoot with a height of 50 – 100 cm and a diameter of 5 – 10 cm. Cleaning was carried out around the bamboo planting with an irregular circle shape that was given a minimum distance of 2 (two) meters (Maqdan et al., 2019) for each excavation hole. The excavation pit is made with approximately the same depth and width, namely with a depth of about 30 – 50 cm and a width of about 10 – 15 cm.

b. Maintance and Nutrition

Bamboo that has been planted is watered with water in 2 (two) times a day in the morning and evening to avoid the death of bamboo plants. Maintenance of green ampel bamboo also includes cleaning grass and wild plants around the bamboo once every 2 (two) weeks. The application of liquid organic fertilizer (POC) is given after 1 (one) month of planting, watered on the soil around the bamboo with a maximum distance of 15 cm from the bamboo.

2.4 Monitoring and Evaluation

We carry out monitoring that is carried out in conjunction with regular watering to pay attention to the growth of bamboo shoots that we have planted in 2 (two) different locations. Then the method used ended with an evaluation of the community's understanding of climate change mitigation and adaptation and the benefits of water resource conservation using a combination of vegetative and agronomic methodsby giving questionnaires to residents who live near the river and several community leaders to find out their understanding of the importance of maintaining and maintaining water source conservation that has been carried out.

3. RESULT AND DISCUSSION

The implementation of socialization and education by the PPK Ormawa HIMASKA team on July 8, 2024 received good attention from every element of the village community. The socialization was attended by the village community, the Head of the Chemistry Study Program, Chemistry Lecturer FMIPA UNPAK, the Village Head and his staff, and the General Manager of CSR of PT. Antam, Tbk., UBPE Pongkor and his staff yang dapat dilihat melalui **Figure 1**.

Figure 1. Socialization and Education by the PPK Ormawa Team

The team made presentations and discussions together about the programs that have been carried out based on data obtained through field surveys. Information during the socialization includes problems found, solutions presented, a series of program implementations, as well as monitoring and evaluation. Therefore, community groups are needed to assist the team in monitoring and evaluation for the sustainability of the program. To ensure the implementation of all series of programs until the end, we collaborate with Kalong Liud Village by issuing a Decree (SK).

Figure 2 shows how the steps and process of implementing the water resources conservation program which begins with socialization and providing *pre-tests* regarding water resources conservation to community groups. Education is carried out during the program, one of which is by answering questions given by both community groups and local communities. This joint discussion aims to provide understanding to the community about water source conservation programs, including the reason for choosing bamboo plants as one of the ways implemented for Kalong Liud Village.

After that, a series of programs were carried out which began with clearing the land around the excavation. Weeds and wild plants are removed before soil excavation with the aim of marking the distance of excavation and efforts to maximize water absorption and nutrients due to competition between plants (Febriyono et al., 2017). Healthy bamboo shoots are positioned in the middle of the excavation hole and then filled back with soil. The excavation hole is filled without compaction, so that water can still flow well at the time of watering. The series of implementation of this program involves community leaders, village volunteers, and target groups.

At the time of treatment, actually bamboo plant care does not require pesticides, insecticides, fungicides, or other materials as other special treatments in its growth (Illya & Bali, 2021). However, because planting is carried out in the dry season, fertilization is carried out using liquid organic fertilizer (POC) from goat manure to increase plant resistance to disease attacks and keep the amount of plant nutrients met (Kahar et al., 2022). Good fertilization is carried out in the afternoon (Mustafa et al., 2023). Meanwhile, watering using water is carried out regularly in the morning and evening (Mustafa et al., 2023) until young leaves grow from bamboo plant book segments.

We monitor along with the implementation of regular watering in the morning and evening to pay attention and find out the development of each bamboo plant. After planting and maintaining green ampel bamboo for 21 days, young leaves grow on 2 (two) bamboos planted in Liud Village RT 03 RW 03, while for bamboo planted in Babakan Liud Village RT 01 RW 10, it takes 2 (two) days longer, that are estimated to grow after 23 days of planting.

Figure 2. (a) Socialization; **(b)** Program Implementation; **(c)** Growing young leaves; and **(d)** Bamboo Plant Maintenance

All water source conservation program activities that we have carried out ended with an evaluation of the communities that live near the Cikaniki River, especially the community groups that we have formed. Based on the questionnaire data that has been given before and after the implementation of the program, it proves that with socialization and a scientific approach, it can increase public understanding of water resource conservation by using green ampel bamboo and community awareness of climate change that can cause flood disasters. The improvement of public understanding can be seen through **Table 1**. Based on the results obtained by the team during the implementation of the program, socialization and education using scientific approach methods can increase public understanding of climate change factors that can increase the potential for flood disasters and efforts that can be made to minimize the occurrence of flood disasters.

Table 1. Questionnaire Questionnaires Before and After the Implementation of the Program

Counseling Questionnaire Before the Implementation of the Program			
Question	**Answer**		**Number of Answers**
	Yes	**No**	
Do you know what water conservation is?	3	7	10
Do you know the benefits of planting bamboo trees in water conservation?	4	6	10
Can bamboo tree cultivation help water conservation?	4	6	10
Do you know how planting bamboo trees can improve water quality?	2	8	10
Can water resource conservation increase water reserves?	4	6	10

Counseling Questionnaire After the Implementation of the Program			
Question	**Answer**		**Number of Answers**
	Yes	**No**	
Do you know what water conservation is?	10	-	10
Do you know the benefits of planting bamboo trees in water conservation?	10	-	10
Can bamboo tree cultivation help water conservation?	10	-	10
Do you know how planting bamboo trees can improve water quality?	10	-	10
Can water resource conservation increase water reserves?	10	-	10

4. CONCLUSION

After socialization and a series of program implementations with community leaders and target groups living around the Cikaniki River, it can be concluded that the community understands and is able to implement water resource conservation programs by planting green ampel bamboo as an effort to adapt and mitigate climate change. In addition, the community can also understand that the preservation of simple green ampel bamboo is very important for the sustainability of the ecosystem. Green ampel type bamboo (*Bambusa vulgaris Schrad. ex. J.C*) was chosen because it can handle toxic waste due to mercury poisoning.

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