

# *Reforestation, an Old but Gold Way to Live in Harmony with Nature*

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**Abstract**—Trees play a big role on our planet and with no doubt, in our lives. Trees produce oxygen, freely, for us and it's our basic necessities. Nowadays, trees have been cut down brutally in a short period of time. Just as fast as snapping our fingers, trees have changed into buildings. Thus, reforestation is one of many ways to save our planet. In Desa Sarimukti, Garut, 34 students (11—15 years old) from SMPN 1 Sukaresmi with the help from almost 20 villagers planted up to 1000 plants in various species. They planted it in the SMPN 1 Sukaresmi's field and surroundings. Since it's drought and there's no rain upon the land for almost 3 weeks, we found out that using bamboo and embed it through the soil for 15-20 cm, with a hole at top of it, make it easy to water the plant. With this method, water will easily reach the root of the plants and keep the plants alive. They

*planted 4 species of plants which are Coffea sp., Toona sinensis, Cinnamomum camphora, Albizia sp. Most of the students felt happy and satisfied after they planted up to 3 plants each. After that, they were also assessed about the plants. Common answers said their plants' height 20-30cm with green to yellowish-green leaves. A lot of them give such positive responses after planted some plants. Reforestation taught them that we couldn't live without trees and how trees impact our lives. The implementation of this reforestation method could be used in any other area.*

**Keywords**—bamboo, reforestation, trees, watering plants.

## I. INTRODUCTION

Environmental problems are the responsibility of various parties including government, academicians, industries, and all stakeholders including the communities. A good environmental condition will support a good life standard, and in turn, the quality of life would be reduced by the improper environmental condition. One of the biggest disasters caused by the poor environmental condition is a flash flood in Garut city, West Java, Indonesia, at the end of 2016. This flash flood ended up with a dozen death of people and many are lost without any further information to date. Not only taking the life of people, but this flash flood has also affected other areas, including education, social, and economy. Economically, the loss caused by this flash flood reached USD 570,000 (Nurdin, 2015: 5) According to the information gained, one of the major causes of the flash flood is because of the environmental problems at the upstream of the Cimanuk river which is located at Sukajaya village, Sukaresmi,

Garut City. Thus, the environmental quality in this area is required to be improved.

The functional replacement from the forest into a farming area or housing turns out to result in the loss of absorption land and thus lead to the flood at the lower land. The acceleration of deforestation in this area is reported by about 10% per year in 2018. Deforestation will impact the reservoir for absorbing the CO<sub>2</sub> (Hastuti and Utami, 2008: 107). According to the above-mentioned problem, one of the ways out to improve the quality of the environment is reforestation. This solution is of great importance especially at Sukajaya Village as a preventive way for the same disaster to happen. In this community engagement program, the villagers, especially junior high school students are empowered to do reforestation together with the stakeholders to recover the environment condition. The main target to be gained in this program is the empowerment of the villagers at Sukajaya village in planting 1000 plants to avoid landslide, erosion, flood, as well as to create a better environment

around. In addition, during this program, the villagers especially high-school students were educated about the significance of maintaining our environment and best practice of carrying out reforestation. The sustainability of the program is expected from the villagers so that the program will be continued in the future and the quality of the environment will be improved as well.

The drought land due to the functional shifting as well as the lack of plants to absorb the water at the upstream of the Cimanuk river are the main problems to be solved at Sukajaya village, Garut. The supports from various stakeholders including academician are crucial to tackling down the problems.

## II. METHOD

The location of the program is at Sukajaya Village, Sukaresmi district, Garut City, West Java, Indonesia. The study was carried out in July 2019. The methods used to gain the data included questionnaires, interviews, and observations. Total respondents are 34 high school students both males and females, with the age ranged 11 to 15 years old. The level of the student and the age of the participants are depicted in Figures 1 and 2 respectively.

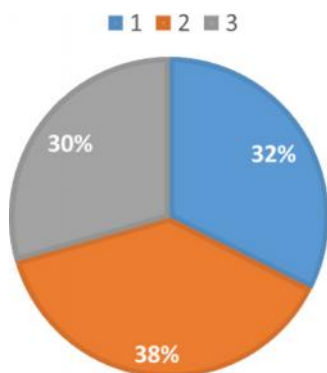


Figure 1. Student's level of junior high school

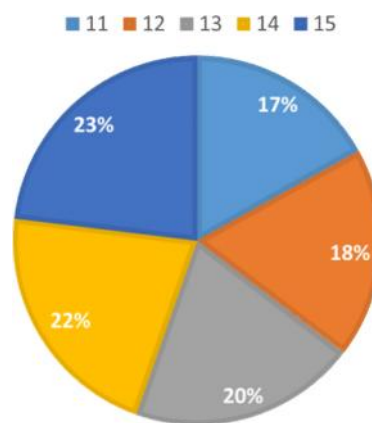


Figure 2. Student's age

The collected data were analyzed and presented descriptively. The data evaluated in this study are the basic information about respondents (gender, age); respondent's prior knowledge about reforestation, respondent's opinion about the program, and the information about the growth of the planted plants (at the time of planting and one month later).

## III. RESULTS AND DISCUSSION

Based on the problems mentioned above, the reforestation of the upstream area of the Cimanuk river, which is located at Sukajaya village to prevent the same disaster occur, is important to be carried out. The villagers, especially high school students were empowered to plant 1000 plants as a tangible way to prevent the flash flood and landslide around the river. The villagers were educated about the significance of environmental maintenance, the choices of the plants which can avoid the landslide, and further thought a system to tackle down the drought of the land caused by the dry season. Planting the seedlings without incorporating the watering system has been challenged because of its very low water level especially in the dry season.

Given the fact that water resources are diminishing, there is a need for innovations to supply the water for the plants as efficient as possible. The decreasing watering interval from daily to a few days would be beneficial for the efficiency of water use when the water is too insufficient. Thus, we implemented a simple drip technique using bamboo as the water reservoir. This

system was built as a simple technology with an affordable means to keep the water for the plants. The use of bamboo as the water reservoir is a good way to solve the drought of the plant because of the season. This system was applied during the program to make sure the sustainability of the plant growth after the program. In addition, this system has been applied in drought countries such as African (Andersson, 2005: 4)

The program was carried out in several areas in Sukajaya Village. In the first session, four hundred plants were planted in the school area. Thus, this particular session encouraged the students to be actively involved in the reforestation program. Prior to the planting, the students were gathered in the classroom, and they were thought about the importance of environment, the biogeochemical cycles, the characteristics of the plants which are potential to be planted due to their ability to absorb the water and fitness with the specific environmental conditions (temperature, pH, water availability, etc.), and also due to their economic value. Most of the villagers' profession at Sukajaya village are landless laborers or cultivators of very small plots with a very low income. Thus, planting a variety of plant that has a high economic value such as *Coffea sp.*, *Toona sinensis*, *Cinnamomum camphora*, and *Albizia sp.* motivated the villagers to continue the reforestation. Figures 3 and 4 show the socialization session and the acceptance of the plants by the government representative respectively.



Figure 3. Education on the environment



Figure 4. The distribution of the plants from the community engagement team to the government representative

After the socialization, the students from SMPN 1 Sukaresmi with the help of 20 villagers planted four different species of plants, *Coffea sp.*, *Toona sinensis*, *Cinnamomum camphora*, *Albizia sp.* Figure 5 shows the students receiving the plants. Each student is responsible for the growth of three different plants.



Figure 5. The plants were distributed to the students

Another problem faced on the planting in this area is the limitation of water supply due to the dry season. It could be seen from Figure 6. The dry condition would not support the growth of the planted plans, and in turn, would be a factor to be aware of for the sustainability of the reforestation.



Figure 6. The drought area of plantation

To overcome this issue, in this program, the students and villagers are not only given the seedlings but also the water retention container made up of bamboo. This simple technique is the modification of the drip system that has been applied in the drought area such as Africa, nevertheless, the application of this technique has never been done in this area. The advantages of the system including efficient water usage and it apply the water very accurately to the plant which results in the optimal growth of the plants (Smith et al., 2014). The bamboo with a length of around 50 cm was put close to the planted plants. Holes were made in each bamboo. The lower part of the bamboo was embedded through the soil for 15-20 cm so that it facilitates the roots to enter the holes and take the water. The top of the bamboo was open with a big hole, make it easy to water the plant. The direction of the bamboo was set to be in the opposite direction of the sunlight to avoid the high evaporation rate. By using this technique, the watering of the plant could be done every three-four days, instead every day. In addition, with this method, water will easily reach the root of the plants and keep the plants alive. Figure 7 shows the student planted *Albizia sp.* the plant with watering bamboo.



Figure 7. The student planted *Albizia sp.* with the watering bamboo.

In the second session, not only in the school area, but the villagers were also actively involved in planting the seedlings around their houses and rice fields. Altogether 1000 plants were successfully planted in the surrounding area at Sukajaya village, Sukaresmi, Garut.

At the end of the program, the respondents were assessed regarding the prior knowledge about the plan's characteristics. According to the data obtained, 100% of students could measure the height of the plant, 100% of students could describe the leaf number of the plant they received. In addition, the students could also describe the color and size of the plants promptly.

The evaluation of the program was also assessed by asking the respondents' opinions about the program. Based on the collected data, the things that students love the most are doing planting by themselves, flushing the plant, and meeting the community engagement team. A hundred percent of the students thought that planting is very fun and said that they are willing to do more planting and take care of the plants. They agreed to do flushing and giving the fertilizer once a month. Furthermore, the student could also give an opinion about another treatment for planting (getting rid of the grass surrounding the plant, etc).

Most of the students felt happy and satisfied after they planted up to three plants each. After that, they also were assessed about the plants. Common answers said their plants' height 20-30 cm with green to yellowish-green leaves. A lot of them gave such positive responses after planted the seedlings. Reforestation taught them that we couldn't live without trees and how trees impact our lives. The implementation of this reforestation method could be used in any other area.

One of the success parameters of a community engagement program is the sustainability of the program. Thus, we encouraged the students and villagers to continue the reforestation program and take care of the planted seedlings. For the students especially, we cooperate with the school side (teachers) and tried to further enhance the responsibility of the students by giving them three seedlings

per student. They are required to take care of their seedlings and they are asked to report the growth of each seedling within the following month. This is an integrated part of the monitoring to evaluate the growth of the seedlings with the watering bamboo and how the reforestation going on in that area.

One month after the planting, we collected the reports about the growth of the planted plant. The results are shown in Figure 8. As can be seen from Figure 8, most of the seedlings were grown up (86%), while only 14% of the planted seedlings did not grow well. The explanation for the plants that are failed to grow is the yellow color, the small size of the leaf, and the attack of the insects.

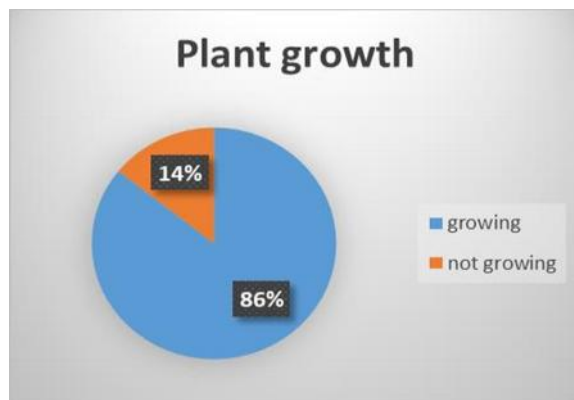


Figure 8. The grown plants

These results suggested that the students and villagers overall were actively involved in the maintenance of the plants. Furthermore, the usage of bamboo as a watering container could successfully help the growth of the plant even in the dry season. This method could further be applied in other areas. The involvement of many parties including government, academicians, a non-profit organization, as well as all communities is another important point for the success of the community engagement program (Rubiantoro and Haryanto 2013: 425).

#### IV. CONCLUSION

Reforestation is one way to prevent the disaster caused by environmental factors. Planting 1000 plants have been conducted in Sukajaya village, Garut, involving students and villagers. The program consisted of socialization about the environment and planting four different species i.e. *Coffea sp.*, *Toona sinensis*, *Cinnamomum camphora*, *Albizia sp.* Considering the sustainability of the plant growth during the dry season, a simple drip technique using bamboo has been implemented. By using this technique, 86% of the plant is growing well.

#### V. SUGGESTION

The use of a big reservoir to collect the water before being used in the drip system would be beneficial to further provide sufficient water for the plants. The drip system could be applied in other areas.

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#### REFERENCES

- [1] Andersson L. 2005. Low-cost Drip Irrigation on farm implementation in South Africa. Sweden: Luleå University of Technology.
- [2] Hastuti, E., and Utami, T. 2008. *Potensi ruang terbuka hijau dalam penyerapan CO2 di permukiman*. Jurnal Permukiman Vol. 3 No. 2.
- [3] Nurdin, M. F. 2015. *Estimasi nilai kerugian ekonomi akibat banjir bandang di Garut tahun 2016*. Bandung: Universitas Katolik Parahyangan.
- [4] Rubiantoro, E. A., and Haryanto, R. 2013. Bentuk keterlibatan masyarakat dalam upaya penghijauan pada kawasan hunian padat di kelurahan serengan – kota Surakarta. Biro Penerbit Planologi Undip Vol. 9 No. 4.
- [4] Smith M., Munoz, G., and Alvarez J. S. 2014. *Irrigation techniques for small-scale farmers: key practices for DRR implementers*. FAO.