

Increasing Farmers' Productivity in Critical Land in Lokapaksa Village in Bali Through The Application of Water Harvesting Technology and Hydrants Towards a Green Economy

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ABSTRACT

Buleleng Regency, in Bali, is one of the areas with the longest drought in 2023. The use of water for tourism also has an impact on farmers, some water sources have dried up. Critical and barren land, in addition to being difficult to cultivate into agricultural land and plantations, is also prone to fire hazards and is a factor causing poverty. The purpose of this research is to increase the productivity of farmers on critical land by using simple technology of water harvesting and hydraulic pumps towards a Green Economy. The implementation of service was carried out in Lokapaksa by involving the participation of the village community. This service program that has been implemented is in the form of the application of simple technology for water harvesting and empowerment of village communities through the installation of hydrant pumps and the planting of moringa and durian trees. The output produced from this community service project is a KEREN agro-edutourism pilot garden as an effort to realize an example of sustainable tourism and green economy.

Keywords: Green Economy, Critical Land, Farmer Productivity, Hydraulic Pumps.

Received:
15.10.2025

Revised:
20.10.2025

Accepted:
25.10.2025

Available online:
03.11.2025

Suggested citations:

Putu Indah Rahmawati, I Gede Rasben Dantes & Anak Agung Ngurah Surya Putra. (2025). Increasing Farmer's Productivity in Critical Land in Lokapaksa Village in Bali Through The Application of Water Harvesting Technology and Hydrants Pumps Toward a Green Economy. *International Journal of Community Service*, 4 (2), 537-543. DOI: 10.55299/ijcs.v4i2.1313

INTRODUCTION

Bali is a small island that is very vulnerable to the impacts of climate change. The IPCC (2013) stated with very high confidence - at least 90% probability of being correct - that small islands are "especially vulnerable to the impacts of climate change, sea level rise, and extreme events" (p. 689) due to several characteristics of the country such as being exposed to the sea and being in a lowland area. Bali has faced a water crisis. The Java-Bali region has experienced a water balance deficit (ICCSR, 2009). The water crisis has

occurred in several tourist destinations in Bali as reported by several local newspapers and online media. In several areas, people cannot get clean water for their household needs. So, they have to queue to get clean water from the government.

In 2019, the Meteorology, Climatology, and Geophysics Agency (BMKG) has reported drought in several areas of Indonesia. Buleleng Regency, Bali is one of the areas with the longest drought, namely 206 days (Suryana, et.al, 2024). The water crisis has an impact on farmers in Bali. Several Subak, agricultural irrigation systems used in Bali can no longer be run because the water sources have dried up. Not only that, the drought that hit Bali also forced residents to buy water at high prices for daily needs and for agriculture. Dry and barren land is not only difficult to cultivate into agricultural land or plantations, it is also prone to fire hazards and is a factor causing poverty in Buleleng Regency.

This community service program is an initiative to save water availability in Bali by planting Moringa and Aren trees in Lokapaksa Village. This village is located in Buleleng Regency, Bali, which is geographically located in a hilly area ranging from 7 - 300 M above sea level. In the southern part of Lokapaksa Village, it borders Ularan Village, an area that has difficulty getting water Rahmawati, P. I., Nugraha, I. G. P., Saskara, G. A. J., Andi, P., & Wirasetia, D. C. L. (2021). This village was chosen because it has a wide area and many are not reached by clean water. Plantations in this area rely on rainwater so that the community's economic level is still low. The agriculture and plantations there only rely on rainwater so that the community's economic conditions are still poor. The condition of the land and houses of the residents in Lokapaksa Village in the Bukit area is certainly very different from the glittering life of the Balinese people in South Bali (Kuta, Nusa Dua and Denpasar) and even very different from the conditions of the people in the same village in the lower areas. The main obstacle faced is the geographical conditions that cause the flow of water in the river below to not be able to be raised to the top because it requires a very long pipe and expensive costs to reach this location (Rahmawati, Nugraha, Saskara Andi & Wirasetia, 2021). The economic gap is very high between the people of South Bali and the people in this area.

This community service project provide water solutions to the community to meet the water needs of the community. In addition, we will also plant trees in this area. The trees chosen are Moringa and Durian trees. Moringa trees are very well known for their health benefits. Moringa leaves contain vitamin A, vitamin B1 (thiamine), vitamin B2 (riboflavin), vitamin B3 (niacin), vitamin B6, and vitamin C (Abdull Razis, A. F., Ibrahim, M. D., & Kntayya, S. B., 2014; Silva, M. F., Nishi, L., Farooqi, A., & Bergamasco, R., 2014). Moringa leaves also have other important contents such as calcium, potassium, iron, magnesium, phosphorus, zinc, and are low in calories. All of these compounds are essential for body health. By planting moringa trees, it can help the government's program, namely Indonesia free from stunting. In addition, moringa trees when

planted from seeds will grow well and can store water in their roots. So that in the long term, this area will not experience drought and can even become a water source storage area for Buleleng Regency. The application of hydram pumps is intended as a form of effort to minimize droughts that often occur in Lokapaksa Village. Efforts to empower village communities are intended as a form of effort to improve the welfare of village communities.

This community service program implemented in Lokapaksa Village with the aim to:

- 1) increasing the productivity of dry land in Lokapaksa Village to then be upgraded to agriculture whose harvest can be processed into various small businesses that provide economic benefits for the local community.
- 2) overcoming water problems in Lokapaksa Village. By planting trees, the stability of water availability is maintained.
- 3) developing the potential of Lokapaksa Village resources to form an agro-tourism model for moringa and durian cultivation that can be packaged in the form of educational tourism for students/university students/civil servants who are about to retire;
- 4) overcoming poverty problems with various economic empowerment efforts through moringa and durian cultivation in Lokapaksa Village with an intercropping system.

Benefits of Activities

This community service project is very beneficial for the farmers of Lokapaksa Village who have survived for years by relying on rainwater that comes once a year. This social project is needed by the villager. By planting trees, the village area becomes sustainable and in the long term will become a water source area for Buleleng Regency.

METHOD

The community mentoring activities to be carried out refer to the 7D Approach, which emphasizes balance, participation, profit orientation, and focus on the community as the subject (Dhamoratham, 2007). According to Dhamotharan (2009), the 7D Approach consists of the following systematic stages:

- D1 - Developing relations
- D2 - Discovering capacities
- D3 - Dreaming of community future
- D4 - Directions of community actions
- D5 - Designing community actions
- D6 - Delivering Planned Activities

D7 - Documenting Outputs, Outcomes and Learning

This approach focuses on achieving short-term improvements in community life and developing long-term community capacity. The key to this 7D approach is enabling communities to develop a collective vision, analyze and appreciate previous achievements, discover existing community potential, agree on specific directions for action and develop a systematic implementation plan of activities to achieve agreed goals.

The 7D approach is an innovative and unique model developed in the fields of human psychology, community development, productivity development and capacity development. The strength of 7D is in providing a holistic and pragmatic perspective on community development and offering a methodological design that is easy to apply to the two alternating goals of capacity development and productivity enhancement. The 7D model is used for the development of tourism in Lokapaksa Village.

RESULTS AND DISCUSSION

Activities in Lokapaksa Village have been carried out in several parts. In the initial stage, FGD was carried out related to the moringa agrotourism development strategy and in relation to mitigating the water crisis disaster in Bali. This FGD involved various parties, namely: the Buleleng Regency Government, the Village Head, the Village Secretary and the Lokapaksa Village Community, LPPM Undiksha, the Kinarya Foundation and the Beyond Moringga Indonesia Foundation. There were several things that were agreed upon in this FGD, namely:

- 1) For the first stage, the installation of the hydram pump
- 2) For the next stage, the Kinarya Foundation agreed to find funding for some locations
- 3) All parties agreed to support the development of water reservoir in Lokapaksa village.
- 4) Undiksha agreed to support tree planting and give funding for building water reservoir.

After carrying out the FGD, the team conducted a location survey to install the hydram pump.



Figure 1. Pump installation location

The installation of a hydram pump in Lokapaksa Village was continued with the construction of a reservoir to accommodate water during the rainy season and as a place to store water from the hydram pump. The construction of this reservoir includes several activities, namely:

1. Carrying out observations to determine the location of the reservoir
2. Measuring the area for the reservoir and then continuing with calculating the amount of materials needed to make the reservoir.
3. The material needed for the reservoir was geomembrane. This material will be very good for accommodating water during the rainy season.
4. The installation of this geomembrane requires a lot of human resources so that the farmer in Lokapaksa Village work together to install this reservoir.
5. Testing the hydram pump to the reservoir location after casting several parts on the pipe supports.
6. Welding the geomembrane at the reservoir location



Photo 2. Tree Planting in Lokapaksa Village

The last stage was planting trees. This activity was carried out together with the Undiksha LPPM team and local farmers. The trees planted were coconut, moringa and durian according to the initial plan. Plants planted on this critical land will function as water absorbers and erosion preventers, so that rainwater can be absorbed properly and does not flow down quickly. Planting these trees is effective for long-term disaster mitigation. Planting trees not only functions to prevent erosion and maintain water absorption, but also brings economic value to the community.

CONCLUSION

This community service activity has been carried out according to plan, namely aiming to revitalize critical land in Lokapaksa Village. Making water reservoirs using hydram pumps is a very good strategy to reduce farmers' costs in irrigating plantations. Lokapaksa Village has been very dry and has a lot of critical land. With the revitalization of this critical land, it is hoped that it can help prevent flooding and landslides and at the same time increase the economic potential of the local community. The farmers are very grateful for the assistance in implementing the community service activities in Lokapaksa Village.

Funding Statement

This research gratefully received the generous funding from the Ministry of Higher Education Indonesia and Universitas Pendidikan Ganesha, Bali, Indonesia.

Ethical Compliance

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Data Access Statement

The data that support the findings of this study are available upon request from the corresponding author.

Conflict of Interest declaration

The authors declare that they have no affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

Acknowledgment

This research would not be possible without the generous funding from the Ministry of Higher Education Indonesia and Universitas Pendidikan Ganesha, Bali, Indonesia. We are also grateful for support from tourism stakeholders in the north of Bali and all respondents for their time, expertise, and energy to support this research.

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