REKA ELKOMIKA: Jurnal Pengabdian kepada Masyarakat
ISSN(p): 2723-3235 | ISSN(e): 2723-3243 | Vol. 4 | No. 3 | Pages 215 - 222
DOI : 10.26760/rekaelkomika.v4i3.215-222 October 2023

Implementation of Water Level Measuring Instruments as Flood Indicator in the Rice Fields of Teluklada Village

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Received 29 August 2023 **|** Revised 20 October 2023 **|** Accepted 23 October 2023

ABSTRACT

Flooding in rice fields often occurs as a result of overflowing rainwater or overflowing river water. In addition, irrigation also often overflows and inundates farmers' fields. The way that is often done to overcome this is usually done every few minutes to the fields. An automatic tool is needed that can be used to be able to monitor water level activities that occur in rice fields. In that case farmers can make the best and timely decisions when rice fields will be flooded. The design process of this tool is carried out in 2 stages, namely the area analysis stage and the design of the tool design which will be carried out with the characteristics of rice fields in Teluklada village. The Water Level Measuring Tool as a Flood Indicator in Rice Fields is designed as a flood indicator by utilizing the HCSR04 sensor work function to detect water rise that occurs. Residents who received the notification message were surprised when they first received the flood warning message and felt helped by the presence of this water level measuring instrument because it can monitor rice fields remotely.

Keywords *: Flood, Flood measuring instrument, HCSR04 Sensor, rice field, telegram*

1. INTRODUCTION

Floods can occur due to natural factors and the influence of community treatment of nature and the environment **(Irnawati et al., 2023)**. In the diagram of the mechanism of floods and disasters, it can be seen that the main natural factor is rainfall **(Sambas, 2017)**. Other natural factors are erosion and sedimentation of river capacity, inadequate drainage capacity, tidal flooding, changes in watershed conditions **(Hutauruk et al., 2020)**. Meanwhile, non-natural factors that cause flooding are the construction of housing complexes or the opening of an area for even well-intentioned business land, without being based on the right arrangements will cause large surface flows or erosion that causes silting of river flows **(Adina, 2022)**. As a result, the river drainage discharge that occurs will be greater than the capacity of river water drainage so that flooding occurs **(Fadillah et al., 2023).**

Rice fields are a form of analogy from a swamp, as a swamp then rice fields are temporary parking lots. When rainwater that falls exceeds the height of the rice paddy field, the rice field cannot be used as a water storage reservoir **(Hidayat et al., 2023)**. Rainwater falling on rice fields will be temporarily accommodated, so that surface flow discharge (runoff) will decrease **(Madhatillah & Har, 2020).** Excess water that cannot be accommodated by rice fields will be a source of water and a cause of flooding for the surrounding environment, especially the downstream areas of the river **(Kasanah et al., 2021).** Two types of full baths that can occur in rice cultivation are long-term stagnant floods that commonly occur in Lebak swamps, and short-term water baths (flash floods) that occur in shallow Lebak swamps and rice fields with poor water management when rainfall is high **(Santhiawan & Suwardike, 2019).** The degree of impaired growth and yield of rice crops depends on the level of inundation and resistance of the rice plants concerned to excess water **(Nurhijjah et al., 2019)**. When there is waterlogging in rice fields, water will fill the pores of the soil, air is pushed out, gas diffusion is reduced and toxic compounds accumulate due to anaerobic conditions (lack of oxygen) **(Ekopranoto, 2019).** All these changes greatly affect the ability of paddy rice plants to survive.

Flooding in rice fields often occurs as a result of overflowing rainwater or overflowing river water **(Tone et al., 2022).** In addition, irrigation also often overflows and floods farmers' rice fields **(Wiryono et al., 2019)**. The way that is often done to overcome this is usually done every few minutes to the fields. This is not effective because usually when checked, the rice field has not been flooded, but after a while it is allowed to return, the rice field has been flooded. Flooding of rice fields has a negative impact on rice crops **(Hanifah &; Princess, 2022).** This flood disaster caused damage in the form of material and soil damage. One form of land damage caused is rice fields that have been buried in mud, this results in rice plants experiencing crop failure due to mud **(Sihaloho &; Sembiring, 2019)**.

Therefore, an automatic tool is needed that can be used to be able to monitor water level activities that occur in the rice fields. In that case farmers can make the best and timely decisions when rice fields will be flooded. Timely handling rice fields that will be affected by flooding is the best step to prevent the phenomenon of crop failure that often occurs in Teluklada village, therefore the design and implementation of water level measuring instruments as an indicator of flooding in Teluklada village rice fields.

2. IMPLEMENTATION METHOD

In the process of designing tools for flood notification in Teluklada village, there are several stages carried out, including the following.

1. Field Survey. This activity is carried out to determine the characteristics of the land area. The benefit of this activity is to determine the form of tools that are suitable for implementation on the land. In addition, several conditions are considered such as the closest distance to the house, the level of equipment security, and reliability that must be considered so that the tool is not easily damaged by external influences.

2. Implementation of the tool. In this activity, adjustment wase made to the design of the tool in accordance with the conditions of the area to be used for research material. Of course, the shape and durability of the tool are adjusted to the data that has been obtained from previous survey activities. Then the tool was tested in the rice fields by one of the resident.

3. PROBLEM ANALYSIS

Referring to the release of the Central Statistics Agency (BPS) on March 1, 2021, Banten Province occupies the top nine (9) national rice producers in 2020. With a harvest area of 325,333 ha, Banten Province is able to produce 1655 Kilo tons of GKG (Dry Grain Mill) or equivalent to 937,815 tons of rice. With this increase in rice producers, it affects the increase in farmers' income as measured by the Farmer Exchange Rate (NTP) indicator, during the January-February 2021 period the NTP of Banten Province is the highest in Java Island **(Banten Province, 2021).**

One of the first largest rice producing areas in Banten is Pandeglang Regency, and one of the rice-producing villages in Pandeglang Regency is Teluklada Village, Sobang District, Pandeglang Regency, Banten. In line with this, there are many factors that make the people of Teluklada have to feel the lack of maximum harvest in 2023. One of them is flooding in community rice fields which coincides with the rainy season like today. The water that inundates the community's rice fields is not controlled so that farmers are often late in regulating the abundant water to their fields. This is due to the limited observation distance of farmers to see their rice fields

Flooding in rice fields is one of the problems being faced by the people of Teluklada village. Therefore, an alarm device is needed to prevent water overflow on community land. With community service, the design and implementation of the Water Level Measuring Tool as an indicator of flooding in rice fields in Teluklada Village, Sobang District, Pandeglang Regency, Banten.

4. DISCUSSION

This service program is a step to overcome crop failure due to flooding on farmers' land. Rainwater and floods make rice fields have excess water volume. By letting the water enter the field, the rice field is filled with water so that the rice roots can be lifted and then tossed and cause crop failure. This problem is caused by farmers who do not know the level of water that is already dangerous for rice. Usually to overcome this, farmers always check back and forth to ensure that rice fields do not experience flooding.

With the water level measuring instrument that will be made in this community service, it will make it easier for farmers to check rice fields. Farmers only need to wait for information from tools that will provide information when there is a flood in the rice fields. With this automatic alert, farmers can take steps to regulate water as soon as possible so that rice fields are not exposed to excess water or flooded.

The design process of this tool is carried out in 2 stages, namely the area analysis stage and the design of the tool design that will be implemented with the characteristics of rice fields in Teluklada village. The explanation is as follows.

4.1. Analyzes Area

The activities carried out in this land survey are to determine the characteristics of the tool to be designed. In the survey activities were carried out. The survey was conducted on one of the community's lands as shown in figure 1 and carried out various permits. Among them are permits for the use of tools on land, and permits to use land for research so that tools and rice fields remain safe even though in the surrounding area treatment is carried out in the form of land clearance, or land processing to plant rice and water level treatment is maintained in accordance with the research to be carried out.

Figure 1. Overview of the distance of rice fields stored by flood notification tools with the

This survey activity is also to gather information from the community related to natural conditions in teluklada village. Information was obtained that the rice field area is an area that is quite prone to lightning. This information is very important related to the design of tools and equipment materials to be designed and implemented. Therefore, the equipment used needs to pay attention to these factors so that the tool can avoid the threat of lightning that occurs in the field or surrounding area.

4.2. Tool Implementation in Teluklada Village

After conducting a field survey, the tool is designed in such a way as to meet the requirements of the land to be tested. The flood detection device was placed at one end of the rice field of one of the residents and tested. The results of the trial are as follows.

4.3. Tool Assembly

Figure 2. Tool assembly

Before being used in rice fields, the tool is separated in several parts, namely, the tool foot, and also the tool casing. Therefore, before the tool is used, the legs of the tool need to be installed first as shown in figure 2.

4.4. Installation of tools in residents' rice fields

After being installed properly, the tool was installed in one of the rice fields of the residents of Teluk Lada Village. The installation of tools is done carefully to keep the rice plants safe.

Figure 3. Tools attached to rice fields

The display of the flood detector is shown in figure 3. The detector is installed in the middle of the rice plant. However, the tool does not interfere with rice growth. After that, experiments were carried out by activating the tool using telegram social media.

4.5. Sending messages to Citizens' cellphones

Figure 4. Notifications via telegram

Figure 4 shows the message received by the villagers of teluklada. The message is in the form of a description of a distance of 10 cm. Which in the setting, the distance between the tool and the water level of the rice field is categorized as flooded. Therefore, residents immediately go to the rice fields that have been installed with tools to drain water from the fields.

4.6. Socialization of Flood Notification Via Telegram

After the device was installed in the rice field, several citizen contacts were inputted on the NBX21 device so that when experimenting on the tool by conducting flood condition experiments, messages were automatically sent to the community. Therefore, there are some residents who express their impressions when receiving warning messages as shown in figure 5 until 7.

Figure 5. Mrs. Tarwi

When Mrs. Tarwi received the flood notification message, she felt shocked and confused. Because he have never received a message like that message before. In Teluklada village, especially in residential areas, floods rarely occur. Therefore, the flood notification message read on the mobile phone made Mrs. Tarwi confused her for a while. Our team when visiting Mrs. Tarwi was welcomed and after getting an explanation that happened finally Mrs. Tarwi understood what messages came through her mobile phone.

Figure 6. Mr Untung

Mr Untung is one of the residents who is very close to the rice fields installed with NBX21 equipment. The first impression when his mobile phone received a flood warning message was shock. According to him, direct checks were carried out around his house. But no flooding was found. After the team explained about the trial of a tool that can provide flood notification messages and his cellphone was one that was used as a sample recipient of the message, Mr. Untung immediately understood and had time to give his impressions.

Figure 7. Mr Supri

Mr Supri was one of the residents who received a message in the form of a flood warning notification. The first impression he felt was shock and also immediately checked the area around the house. After that, the team explained that they were conducting a tool experiment. That way Mr. Supri felt relieved and also wondered how such a small tool could provide a message in the form of a flood notification. While there is no cable connected in the tool. Therefore, the team gave an explanation in the form of a simple review of how the message was finally obtained by Mr. Supri through one of the social media on his cellphone.

5. CONCLUSION

Based on the results of the analysis of the development of the Water Level Measuring Instrument Design as a Flood Indicator in Rice Fields in Teluklada Village, it was found that the design of a water level measuring instrument as a flood indicator utilizes the working function of the HCSR04 sensor to detect water rise that occurs. The delivery of information utilizes the internet network and through telegram social media so that farmers do not need to wait and pay attention to the rice fields at the location at any time, but can be done inside the house. Residents who received the notification message were surprised when they first received the flood warning message and felt helped by the presence of NBX21 because it could monitor rice fields remotely.

LIST OF REFERENCES

Adina, B. N. (2022). *Strategi Penanggulangan Bencana Banjir Wilayah Sekitar Kecamatan Tempe Kabupaten Wajo*. Universitas Bosowa Makassar.

Ekopranoto, A. H. (2019). Pengaruh Genangan Air Terhadap Produksi Jagung Di Kelompok Tani "Tani Makmur" Desa Kaliwungu Kecamatan Kaliwungu Kabupaten Kudus. *Prosiding Konser Karya Ilmiah Nasional*, 96–102.

Fadillah, N., Rusdi, R., & Padli, F. (2023). Analisis Potensi Bencana Alam Banjir Rob Di Kota Benteng Kabupaten Kepulauan Selayar. *Indonesia Journal of Geography*, *1*(1), 01–10. https://doi.org/10.26858/ijag

Hanifah, M., & Putri, N. E. (2022). Dampak Banjir pada Lahan Sawah terhadap Pendapatan Usahatani Padi di Desa Ibul Besar I Kecamatan Pemulutan Kabupaten Ogan Ilir. *Prosiding Seminar Nasional Lahan Suboptimal*.

Hidayat, S., Leksono, S. M., & Jamaludin, U. (2023). Kearifan Lokal dalam Menjaga Kelestarian Lingkungan Hidup di Cagar Alam Rawa Danau (CARD). *Jurnal Biologi Dan Pendidikan Biologi*, *8*(1), 1–5. https://doi.org/10.23969/10.23969/biosfer.v8i1.8405

Hutauruk, T. R., Kusuma, A. R., & Ningsih, W. (2020). Estimasi Kerugian Ekonomi Akibat Banjir Pada Kawasan Pemukiman Penduduk Di Bantaran Sungai Karang Mumus Kota Samarinda. *Jurnal Riset Inossa*, *2*(1), 47–59.

Irnawati, I., Dwangga, M., & Hasa, M. F. (2023). Sosialisasi Peran Hutan dan Lingkungan dalam Penanggulangan Banjir di Kota Sorong. *Papua Journal of Community Service*, *5*(1),

26–33.

Kasanah, N., Bashit, N., & Hadi, F. (2021). Analisis Lahan Sawah Tergenang Banjir Menggunakan Metode Change Detection Dan Pppm (Phenology and Pixel Based Paddy Rice Mapping) (Studi Kasus : Kabupaten Demak). *Jurnal Geodesi Undip*, *10*, 259–268.

Madhatillah, & Har, R. (2020). Analisis Debit Air Limpasan Permukaan (Run Off) Akibat Perubahan Tata Guna Lahan Pada DAS Kuranji Dan DAS Batang Arau Kota Padang. *Jurnal Bina Tambang*, *5*(1), 178–189.

Nurhijjah, N., Kuswardhani, R. A., & Kardhinata, E. H. (2019). Dampak Serangan Organisme Pengganggu Tanaman dan Perubahan Iklim terhadap Produksi dan Pendapatan Petani Padi Sawah di Sumatera Utara. *Jurnal Ilmiah Magister Agribisnis*, *1*(1), 79–88. https://doi.org/10.31289/agrisains.v1i1.220

Provinsi Banten. (2021). *Provinsi Banten Sembilan Besar Produsen Beras Nasional*. Biropemerintahan.Bantenprov.Go.Id.

Sambas, A. M. (2017). *Kajian Kawasan Berpotensi Banjir dan Mitigasi Bencana Banjir pada Sub Daerah Aliran Sungai (DAS) Walanae Kecamatan Dua Boccoe Kabupaten Bone*. Universitas Islam Negeri Alauddin Makassar.

Santhiawan, P., & Suwardike, P. (2019). Adaptasi Padi Sawah (Oryza sativa L.) Terhadap Peningkatan Kelebihan Air Sebagai Dampak Pemanasan Global. *Jurnal Agro Bali*, *2*(2), 130–144.

Sihaloho, N. K., & Sembiring, D. S. P. S. (2019). Evaluasi Kesesuaian Lahan Sawah Pasca Banjir Bandang Pada Tanaman Padi Di Kabupaten Aceh Tenggara. *Jurnal Agroteknosains*, *3*(1), 81–95.

Tone, R., Syafriny, R., & Tarore, R. (2022). Kajian Kawasan Berpotensi Banjir Dan Mitigasi Bencana Banjir Pada Daerah Aliran Sungai (Das) Sangkub Di Kecamatan Sangkub Kabupaten Bolaang Mongondow Utara. *Jurnal Fraktal*, *7*(2), 10–19.

Wiryono, B., Suwati, & Marianah. (2019). Evaluasi Sistem Irigasi Tersier Pada Daerah Irigasi Meninting Di Desa Jatisela Kecamatan Gunung Sari Kabupaten Lombok Barat. *Agrotek Ummat*, *6*(2), 51–56.