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**Webmap Application Training As An Effort For
Flood Mitigation In The Agricultural Sector In
Dlanggu Village, Lamongan Regency,
East Java, Indonesia**

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Abstract.

Natural conditions are increasingly uncertain and difficult to predict due to changes in rainfall patterns and climate. Excessive rainfall can cause flooding which is detrimental to the agricultural sector. Flooding is a natural challenge that is often faced in the agricultural sector. This challenge is faced by most of the agricultural land in Lamongan Regency, including in Dlanggu Village. The impact of flooding on rice fields in certain locations which is increasingly widespread and intensive from year to year has caused considerable losses for farmers. The purpose of this activity is to map flood-affected agricultural land in a participatory manner with the help of the WebMap application. The method of implementing this activity includes the preparation stage, implementation stage, and monitoring and evaluation stage. The results of the activity showed that participants were very enthusiastic about this activity program, as evidenced by the positive response in the form of the presence of 96% of the training participants and active discussion activities during the socialization and training took place. After the training, the participants also expected a follow-up in the form of assistance from the service team to improve skills with WebMap applications in other fields. This activity is expected to be a solution that can be offered to provide an early warning system based on mapping so that the delivery of information about floods can be conveyed more quickly to the community, especially people who have agricultural livelihoods to be aware of flood disasters.

Keywords: WebMap, Flood Mitigation, Agricultural Sector, Lamongan Regency

I. INTRODUCTION

Food security is the ability of a country to ensure the availability of food and the ease of public access to food in a stable manner [1]. The measure of food security in terms of self-sufficiency (independence) can be seen from the dependence of national food availability on domestic food production [2]. Agricultural systems, especially in the food crop sector, are influenced by interacting factors, such as climate change [3]–[5], population growth, agricultural land conversion, natural disasters such as floods. Lamongan Regency has advantages in agriculture and has a big role in supplying agricultural products for national needs. Administratively, Lamongan Regency is divided into 27 sub-districts and 476 villages. The mainland of Lamongan Regency is divided by the Bengawan Solo River, and broadly the land is divided into 3

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types. The Central South is a relatively fertile lowland. The southern and northern parts are rocky limestone mountains with moderate fertility. The North Central part is the Bonorowo area which is a flood-prone area. Flooding is a natural challenge that is often faced in the agricultural sector. The impact of flooding on paddy fields in certain locations is increasingly widespread and intensive from year to year, has caused significant losses for farmers [6].



Fig 1. Dlanggu Village, Deket District, Lamongan Regency.

(Source: Author's Personal Documentation)

Dlanggu Village is one of the villages in Deket District. The area of Dlanggu Village is 326,690 Ha, based on the location of the altitude at ± 200 m above sea level [7]. Most of the land in Dlanggu Village is agricultural land, this situation encourages some of the population to farm, both in rice fields and in ponds. The rainy season usually occurs from November to April with an average rainfall of 2000 mm. In certain seasons, there is the potential for disasters to occur with a significant impact on the agricultural sector.



Fig 2. The area of agricultural land in Dlanggu village that was flooded.

(Source: Author's Personal Documentation)

Natural conditions are increasingly volatile and difficult to predict due to changes in rainfall patterns and climate, including in Dlanggu Village. Excessive rainfall can lead to catastrophic flooding which is detrimental to the agricultural sector. Flooding is a natural challenge that is often faced in the agricultural sector. The impact of flooding on paddy fields in certain locations is increasingly widespread and intensive from year to year, has caused significant losses for farmers [6]. Efforts to mitigate rain that comes with high intensity are difficult to predict by the community.

This situation is getting more difficult with the lack of physical infrastructure for flood management. In addition, the low level of public knowledge on flood mitigation has implications for the low preparedness of farmers against flood disasters. To support successful development in agriculture, one of which requires the availability of accurate data and information for the decision-making process and program planning. Law Number 19th of 2013 concerning Protection and Empowerment of Farmers Article 67 paragraph 1 states that the Government and Regional Governments in accordance with their respective authorities are obliged to provide easy access to science, technology, and information to achieve quality standards of agricultural commodities. Observing this problem, it is necessary to adopt knowledge for farmers for mitigation and community preparedness against floods [8], [9]. As an initial step to improve mitigation and community preparedness, participatory mapping of agricultural land areas affected by flooding is carried out.

Flood mapping is considered as an early warning system that is given to the public about when a dangerous natural event can be identified its possible impact on a certain area [10], [11]. WebMap based GIS is a system used to process geographic information. Utilization of WebMap-based GIS applications can explain and present objects of flood-prone areas from the real world which are transformed in digital form [12], [13]. Determination of flood-prone zones using remote sensing satellites and GIS can be done by combining flood phenomena and satellite capabilities [13]. So that this WebMap application can be used as a solution in flood disaster mitigation [14]. So that early warnings are delivered immediately to all parties, especially those who have the potential to be affected by flooding in their respective places.

II. METHODS

The WebMap application training activity as an effort to mitigate flood-prone agricultural land in the Dlanggu Village Community is a form of the role carried out by universities, in this case the Community Service Team of the Faculty of Science, Technology and Education (FSTP) of Universitas Muhammadiyah Lamongan (UMLA) to create a Disaster-Resilient Indonesia.

As it is known that government policies that have been implemented in realizing Disaster Resilient Indonesia, are through Disaster Resilient Villages (Destana), which are villages that have the independent ability to adapt and deal with disaster threats, and recover quickly from the adverse impacts of disasters. (Perka BNPB No.1 Tahun 2012) [8], [9]. The implementation of this service program involves several related parties who can fully support the implementation of this service activity, including the FSTP, UMLA, Regional Disaster Management Agency (BPBD) Lamongan Regency and the Dlanggu Village Government as the target of community service activities.

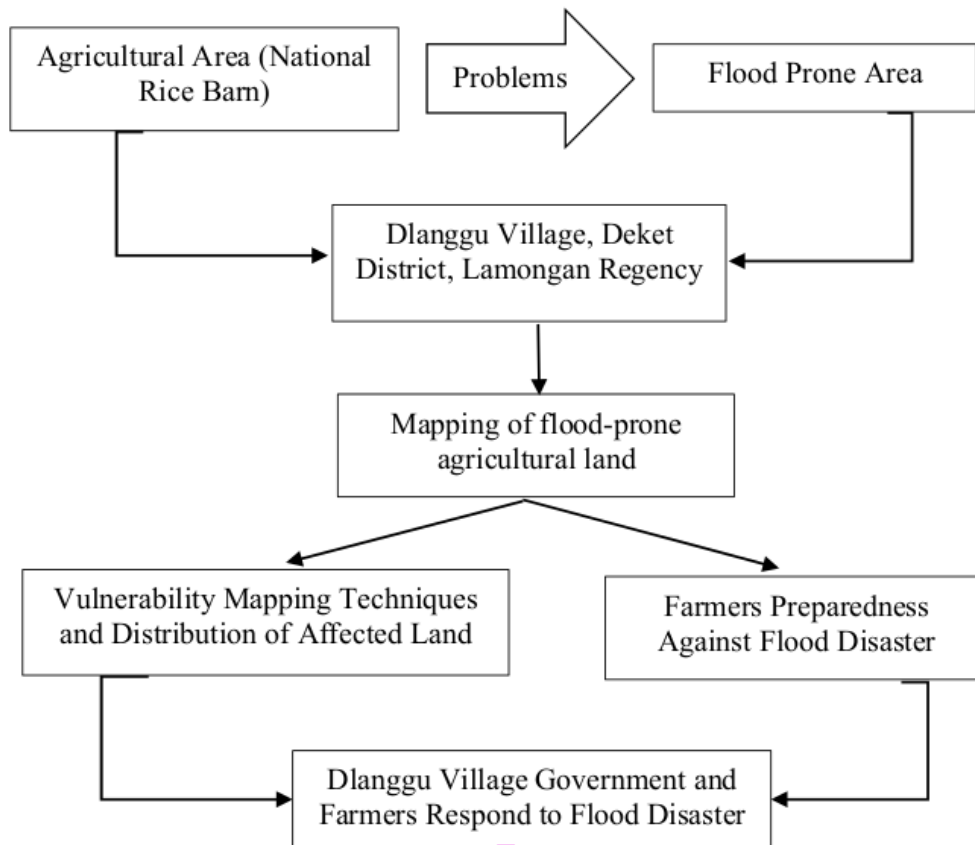


Fig 3. Thinking Framework for Web Map Application Training Activities as an Effort for Mitigation of Flood-Prone Agricultural Land.

This activity was carried out in Dlanggu Village, Deket District, Lamongan Regency. The method of activity is carried out in the form of socialization and training to Village Government officials (PemDes) related to participatory mitigation efforts. The target is all village government officials, including representatives of farmer groups in Dlanggu Village (25 people). The methods used in the implementation of community service program activities are as follows: (1) coordination with government institutions, village government and farmer representatives, where the community service activities are carried out, (2) coordination with target audiences for field observations, (3) preparing materials, tools and materials used, as well as resource persons who will deliver the training. Tools and materials prepared include training modules and media needed for implementation.

At the implementation stage, the approach used in this activity is a theoretical pragmatic approach and a practical pragmatic approach as well as the delivery method in accordance with the training material, namely various lectures, and practice. The theoretical pragmatic approach is used so that the material about flooding in agricultural land and mapping the potential for flood disasters on agricultural land can be more easily understood by the trainees. At the implementation stage, the approach

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III. RESULT AND DISCUSSION

3.1 Stages of Preparation and Debriefing

On December 9, 2021, the Community Service Team coordinated with the Dlanggu Village Government. On December 22, 2021, the team will conduct a site survey or field survey to find that the affected agricultural land can use as a reference in mapping the flood distribution area in Dlanggu Village, which is then expected to use the map output as well as possible. In the field survey process, the technical equipment used is a GPS, camera, or cellphone to take pictures and document the situation in the field. During the field survey, the team assisted by students who served as field assistants and representatives of village officials to take coordinates and determine the surface elevation of the surveyed area.

The team coordinates with the Village Head to determine the target audience for community service activities. The activity will invite \pm 25 participants from village government officials, farmer representatives, field assistant lecturers and students. The number of participants who attended were 28 participants and those who took part in this activity from beginning to end. In the preparation stage, the service team also coordinates with the Lamongan Regency BPBD as a government agency that handles disaster cases. Furthermore, the team prepared the materials, tools and materials used, as well as the presenters who would provide training including from BPBD and leader of team. Tools and materials prepared include training material books, stationery needed by training participants, as well as media in the form of LCD projectors, ArcGIS 10.3 software. The teaching materials and resource persons presented can be seen in Table 1. below.

Tabel 1. Teaching Materials and Speaker

No	Training materials	Speaker	Hour
1	The causes of floods, losses caused by flood disasters, and flood management with conservation methods.	Muhammad Muslimin - BPBD Kabupaten Lamongan	2
2	Mapping the WebMap application as an effort to mitigate flood-prone agricultural land	Mala Rosa Aprillya – Universitas Muhammadiyah Lamongan	2
3	Map preparation training on the WebMap application	Tim Pengabmas	15

3.2 Implementation Stage

The implementation of the socialization activity on December 24, 2021 was held by the Dlanggu Village Hall. At this socialization event, speaker from BPBD provided material related to the causes of flooding in agricultural land. Speaker from BPBD explained about the flood disaster, the consequences of flooding, and the steps that must be taken when a flood disaster strikes. This community service activity is carried out using the lecture method and question and answer discussion so that there is no gap between participants and speakers. The goal is that participants can receive the material well and do not hesitate to ask questions if they do not understand. Speaker also conveyed what must be done to solve the problem of flooding in agricultural land.



Fig 4. Socialization with speaker from BPBD who provided material related to the causes of flooding in agricultural land.

After the presentation, a question and answer session was held between the community and the resource persons. The question and answer session went smoothly and enthusiastically and some of the questions asked by the community were answered by the speakers. All team members, both lecturers and students, helped accompany village officials in this activity. It is hoped that this socialization event will continue until the output of this program is completed, namely a map of flood-prone areas on agricultural land in the form of a WebMap and its mitigation. Furthermore, the lead of the PkM activity team conducted socialization and training on the WebMap application. After that, the moderator presented a mapping of flood-prone agricultural land areas. The resource person explained about the WebMap application, the participants seemed very enthusiastic to see the results of mapping flood-prone agricultural land areas.

Dlanggu Village every year experiences flooding in agricultural land but in the moderate category. They are also interested in knowing which areas are affected by flooding because so far they only know about a few areas. In the training activity for compiling maps on the WebMap application, the PkM team assisted village government officials in using the WebMap application. The activity begins with determining the coordinates of flood-prone agricultural land based on the results of field surveys, interviews and discussions with the village government. The next step is to determine the map elements consisting of settlements, public roads, agricultural

land, rivers, buildings or public facilities such as schools, village halls, health centers, places of worship, village boundaries, and population data. After that, do data entry on each element of the map, including the entry of flood-prone agricultural land areas. After that, proceed with the geoprocessing layer with buffer, union and intersect layers to produce a geoprocessing layer with ArcGIS Desktop Software.



Fig 5. Web Map application training as an effort to mitigate flood-prone agricultural land.

The result of this training is a mapping in the form of a WebMap that can be used to deliver information quickly about flooding of agricultural land to the community, especially people who have a livelihood in agriculture to be more alert to flood disasters. By looking at the implementation of this service activity, it appears that mapping is one solution to flood disaster mitigation. Dlanggu Village, which incidentally is a village where the majority of the population works as farmers, really needs this thematic map. The goal is expected to be able to provide information and vigilance to the people in Dlanggu Village against flooding in the agricultural sector because it can cause considerable losses. In addition, the Dlanggu Village Government can cooperate with the Regional Disaster Management Agency (BPBD) to resolve the flood problem in Dlanggu Village in the future.

3.3 Evaluation Stage

The evaluation carried out includes evaluation of program implementation and evaluation of training substance. Implementation of the program can be considered good because it was attended by 24 people from the 25 invited participants. The obstacle to the attendance of participants was that some participants did not focus on listening to the material as a whole because at the time this activity was being carried out there were various other activities that the participants had to do. In the context of substance, due to time constraints, not all materials can be delivered in detail, especially the introduction of GIS terms in using WebMap applications. Therefore, at the beginning of the practical activity, there were still some participants who did not fully understand the instructions given by the speaker. This was a bit of an obstacle at

the beginning of the training implementation but could be overcome with assistance by the implementing assistant team.

Even though there were obstacles at the beginning of the training, judging by the enthusiasm of the participants during the discussion on flooding in agricultural land and the mapping training using the WebMap application as expected by the speaker, this shows that the achievement of the objectives of this training can be considered good. Although the backgrounds of the participants are different, in general the participants, apart from being village officials, also have the same other livelihood, namely in the agricultural sector. This condition makes it easier to understand the material about flooding in agricultural land so as to produce interactive discussions. At the end of the training, participants hoped that this kind of activity could be carried out again in the future. Some participants also hoped that computer-based soft skills training would not only be carried out with the theme of mapping but also cover various other forms of computer skills. Participants were also enthusiastic about following up on the results of the training because the mapping skills they had acquired could also be applied in other fields, such as helping with village development planning mapping, and so on.

IV. CONCLUSION

Through this training, training participants who are Village Government officials have been able to master skills in mapping flood-prone agricultural land areas in Dlanggu Village with the help of the WebMap application. The success of making maps is also inseparable from the basic skills of the trainees in operating computers. Based on the material provided by the service team in the form of a WebMap application, the training participants also took the initiative to follow up on the results of the training by applying mapping skills in other fields in Dlanggu Village. This mapping training activity is a form of supplement to increase community capacity in non-structural disaster mitigation carried out at the pre-disaster stage, as well as to improve the soft skills of village officials so that they can increase their role in local villages.

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