



EMPOWERMENT OF VILLAGE OFFICIALS IN REALIZING A DIGITAL VILLAGE THROUGH ASSISTANCE WITH A GIS-BASED DIGITAL VILLAGE INFORMATION SYSTEM IN BUDDAGAN VILLAGE, PAMEKASAN REGENCY

Aang Kisnu Darmawan^{1*}, Eko Daryanto², Zaiful Muqaddas³, Kartini⁴, Anik Anekawati⁵, Busro Akramul Umam⁶, Muhsi⁷

^{1,6,7}Universitas Islam Madura, Pamekasan, Indonesia

²Universitas Indonesia, Depok, Indonesia

³Politeknik Negeri Madura, Sampang, Indonesia

⁴Universitas Pembangunan Nasional "Veteran" Jawa Timur, Surabaya, Indonesia

⁵Universitas Wiraraja, Sumenep, Indonesia

Email: ak.darmawan@gmail.com¹

Abstract

Villages face challenges in the digital age due to weak governance, poor data quality, and conventional record-keeping methods. Initiatives like digital villages, integrated criminal justice systems, and online platforms address these issues. Digital GIS mapping enhances precision agriculture, sustainable food production, and decision-making by assessing soil quality, infrastructure, and weather. It also aids in land management and remote sensing data. However, Digital villages in Indonesia face challenges due to poor data quality, lack of knowledge, and inadequate technology integration, hindering community services and maximizing potential. Buddagan Village, situated in Pademawu sub-district, East Java, faces challenges such as weak management of village archives, lack of a village potential map, and inadequate digital-based archives, which could hinder community access and decision-making. This community service activity aims to (1) build a GIS-based Digital Village Information System (SIDD) in Buddagan Village, (2) create a digital map of village potential, (3) train village officials, and (4) conduct workshops and FGDs to improve governance, public services, and community welfare. The output of this activity produces (1) a Web-based digital village information system (SIDD), (2) a Buddagan Village official website, (3) a digital map of agricultural potential, and (4) a Monograph book: GIS-based digital village information system. The study evaluated Buddagan Village's community service activities, revealing significant improvements in officials' understanding and skills. Post-training, officials' skills increased from 20% to 80%, and community participation in managing potential increased from 40% to 70%. Transparency and accountability increased with an official website and adequate information system.

Keywords: Digital village, Digital map, Digital village information system, Agriculture potential

INTRODUCTION

In the digital age, **villages encounter challenges** in managing information and enhancing public services due to weak governance (Gufran et al., 2023; Hamka et al., 2023). Poor data quality, limited information on village potentials, and conventional record-keeping methods hinder progress and community welfare (Amsikan et al., 2023; Moch. Lutfi & Gourab Nath, 2023). Initiatives like developing digital villages, implementing integrated criminal justice systems, and creating online platforms for population administration services aim to address these challenges (Putri et al., 2023). Successful cases, such as Lawatan Village, showcase the benefits of digitalization, supported by collaborative governance, sufficient resource management capacity, and government backing. To overcome obstacles, fostering cooperation between the government, village communities, and the

private sector, enhancing digital skills through training, and implementing innovative solutions are crucial for advancing village development in the digital era.

Digital mapping of agricultural potential based on GIS is crucial for enhancing precision agriculture and sustainable food production.(Oymatov et al., 2023; Reimov et al., 2023). Using geospatial analysis and thematic mapping, factors like soil quality, groundwater levels, infrastructure, and weather can be assessed to optimize agricultural activities.(Latkin, 2023). This approach enables the creation of electronic agricultural maps that provide reliable information about territories, aiding in the analysis of natural, socioeconomic, and agricultural issues for informed decision-making.(Ghosh & P. Kumpatla, 2022). Moreover, using remote sensing data in GIS allows for identifying key parameters like vegetation indices and moisture availability, facilitating the development of digital maps and models for effective land management.(Maskun et al., 2021). Overall, digital mapping through GIS plays a pivotal role in maximizing agricultural productivity, addressing challenges like limited resources, and supporting sustainable agricultural practices.

However, The development of digital villages in Indonesia faces several challenges. Firstly, poor data quality and limited information on village potentials hinder information services to the community.(Hamka et al., 2023). Secondly, village officials' lack of knowledge and skills in information technology affects the optimal utilization of technological facilities and infrastructure.(Fakhrurrazi et al., 2022). Additionally, the failure to integrate technology for mapping village potential and optimizing its use poses a challenge in realizing its full potential.(Darman et al., 2022). Moreover, internal factors like incomplete village administrative data and lack of human resources for managing village information systems, along with external factors such as the unpreparedness of local governments in implementing information systems, further impede the development of digital villages in Indonesia.(Subagyo et al., 2022).

Buddagan Village is located in the Pademawu sub-district, Pamekasan, East Java. Geographically, Buddagan Village is located at -7.148077, 113.504884 to -7.172596, 113.498637 and also located at -7.160841, 113.496909 to -7.158613, 113.514509. Administratively, Buddagan Village is located in Pademawu District, Pamekasan Regency; neighboring villages limit its position. To the north is Larangan Tokol Village, to the east, is Barurambat Timur Village, to the south is Pademawu Timur Village and to the west is Nanggoran Village. The distance from Buddagan Village to the sub-district capital is 1 km, and it can be reached in about 10 minutes. Meanwhile, the distance to the district capital is 2 km, which can be reached in around 20 minutes.



Figure 1. Map of Buddagan Village, Pademawu District, Pamekasan Regency, East Java

Based on the needs analysis in Buddagan Village, several main problems were found, namely (1) weak management of village archives, (2) not having a village potential map, (3) weak skills of village officials in managing digital-based archives, and (4) weak services and management of village potential. These problems can hinder access to information for the community, inappropriate village decision-making, and the development of village potential.

To overcome this problem, the proposed solution offered in this community service activity is (1) to build a GIS-based Digital Village Information System (SIDD), (2) to create a digital map of village potential, (3) to carry out training and mentoring for village officials, and (4) carry out workshops and FGDs. SIDD will contain village information, such as population data, village profiles, public services, village potential, and digital maps of village potential. GIS will be used to visualize village spatial information, such as agricultural, tourism and MSME potential maps. The digital map of village potential will help villages identify and better manage their village potential. Village officials will be trained to use SIDD and manage digital archives. Workshops and FGDs will be held to increase community understanding of the importance of SIDD and managing village potential digitally.

This community service activity aims to build a GIS-based SIDD in Buddagan Village, create a digital map of Buddagan Village potential, improve the skills of village officials in managing digital-based archives, and improve services and management of village potential by building SIDD and village potential maps. This activity is hoped to benefit Buddagan Village by improving village governance, public services, village potential management, and community welfare.

Table 1. Linkage of Specific Solutions with Partner Problems

No	Problems	Specific Solutions	Program Targets	Outcome Indicators
1	Weak governance of village archives	Building a GIS-based Digital Village Information System (SIDD).	- Have a SIDD that contains complete and structured village information. - Village officials can use SIDD to manage	- Availability of SIDD, which village officials and the community can access. - Village officials have received training and

No	Problems	Specific Solutions	Program Targets	Outcome Indicators
			village archives digitally.	assistance regarding the use of SIDD. • Village archives have been migrated to SIDD.
2	Do not have a village potential map yet	• Create a digital map of agricultural potential	• Have an accurate and informative digital map of agricultural potential. • People can easily access digital maps of agricultural potential.	• Availability: A digital map of agricultural potential can be accessed online and offline. • Digital maps of agricultural potential have been socialized to the public.
3	Weak skills of village officials in managing digital-based archives	• Carrying out training and mentoring for village officials	• Improve the skills of village officials in using information technology to manage village archives. • Village officials can manage village archives digitally well.	• Village officials have received training and assistance regarding SIDD and digital archive management. • An evaluation has been carried out on the ability of village officials to manage digital archives.
4	Weak services and management of village potential	• Carrying out workshops and FGDs	• Increase public understanding of the importance of SIDD and managing village potential digitally. • Increase community participation in managing village potential.	• Workshops and FGDs have been held regarding the importance of SIDD and managing village potential digitally. • Formation of community groups who care about managing village potential.



Figure 2. How The Transfer of Science and Technology will Work for Community Partners

Community service activities in Buddagan Village produce **several outcomes** that are beneficial for the village, namely (1) the GIS-based Digital Village Information System (SIDD), which can be accessed at the URL <https://website.desa.id/> and contains village information, (2) a Digital Map of

Agricultural Potential which can be accessed at the URL <https://website.desa.id/> and contains information on soil types, land types, plant types and irrigation types, (3) Monograph Book: GIS-Based Digital Village Information System which contains explanations about SIDD and digital maps, (4) Village Official Training on the Use of SIDD and Digital Maps of Agricultural Potential to increase the capacity of village officials in managing village archives and digital maps, and (5) Workshops and FGDs on the Importance of SIDD and Digital Village Potential Management to increase community understanding of the importance of SIDD and managing village potential. These outcomes have provided real benefits for villages, such as improving village governance, improving public services, managing village potential, and increasing community participation in managing village potential.

METHOD AND PROCEDURES

This community service activity was carried out over two and a half months, from July 1 to September 15, 2023, in Buddagan Village, Pademawu District, Pamekasan Regency, East Java. The implementation method for this activity consists of ten (10) stages, namely (1) Identification of problems and survey of partners' conditions, (2) Coordination with partners, (3) Socialization of activities with partners, (4) Creation of a digital village information system (SIDD) based on website, (5) Making digital maps of agricultural potential, (6) Carrying out training for village officials for SIDD, (7) Carrying out workshops on managing digital maps of agricultural potential, (8) Preparing Monograph Books, (9) Evaluation of Activities, (10) Preparing Reports Activity. The steps for implementing this community service activity are presented in the following flow diagram:



Figure 3. Stages of Community Service Activities: Empowerment of Village Officials in realizing a Digital Village through Assistance with a GIS-based Digital Village Information System

Community service activities in Buddagan Village use a structured and collaborative approach, starting with (1) Problem identification and partner condition surveys to understand the village's needs

in depth. Furthermore, (2) Coordination with partners is carried out to establish effective communication with village officials and the community, ensuring that activities align with village policies and needs. (3) Socialization of activities is carried out to convey information about the objectives, benefits, and plans of activities to the community and build understanding and active participation.



Figure 4. The Steps of Community Service: (1) Identify problems and survey partner conditions, (2) Coordination with partners, (3) Socialization of activities with partners

Then (4) a web-based Digital Village Information System (SIDD) was created using the Laravel framework and MySQL database, containing various important village information such as profiles, population data, public services, village potential, and digital maps of agricultural potential. (5) A digital map of agricultural potential was created using Google Maps and the Quantum GIS application, providing information on soil, land, plant, and land irrigation types.



Figure 5. The Steps of Community Service: (4) Creation of a web-based digital village information system (SIDD), (5) Making digital maps of agricultural potential

(6) Village apparatus training is carried out to improve skills in using SIDD and digital maps of agricultural potential and knowledge about village governance, public services and village potential management. (7) Workshops and FGDs were held to increase community understanding of the importance of SIDD and managing village potential, encouraging active participation in village development.





Figure 6. The Steps of Community Service: (6) Implementation of village apparatus training for SIDD, (7) Implementation of a workshop on managing digital maps of agricultural potential

(8) A monograph book is prepared to document the activity process, solutions developed, and results achieved to become a reference for other villages and related parties. (9) Evaluation of activities is carried out periodically to determine the effectiveness of activities and their impact on the village, becoming a basis for improving future activities. (10) The preparation of activity reports is carried out comprehensively to document the entire activity process, results achieved, and recommendations for further village development. This method ensures that community service activities are structured, effective and sustainable, providing real benefits for the village and community.



Figure 7. The Steps of Community Service: (8). Preparation of Monograph Books, (9). Evaluation of Activities, (10). Preparation of Activity Reports

RESULTS

This community service activity produced four outputs: a web-based digital village information system (SIDD), the official Buddagan Village website, a digital map of agricultural potential, and a monograph book: a GIS-based digital village information system.

1. Web-Based Digital Village Information System (SIDD)

The Digital Village Information System (SIDD) application is a comprehensive digital village management tool that enables village officials to manage and oversee all digital village information

effectively. The presentation of SIDD is as follows:



Figure 8. Application for the Digital Village Information System (SIDD)

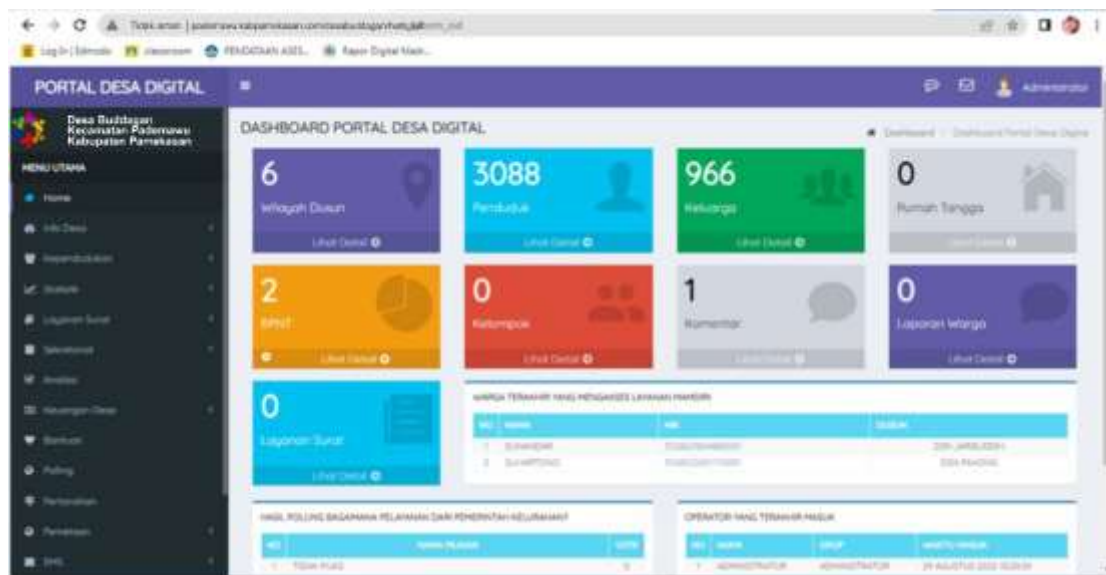


Figure 9. Display of the Digital Village Information System (SIDD) Dashboard

The SIDD Training Module guides village officials regarding implementing the previously established SIDD. In the past, this module was utilised to instruct and direct village officials in implementing SIDD. A draft of the monograph book has been completed and is currently undergoing its last round of editing before submission to the publisher. Development of a Digital Village Information System and GIS-based Agricultural Potential Mapping is the title of the resulting monograph.

2. Buddagan Village Official Website

Buddagan Village has launched an official website, <http://buddaganhebat.my.id/>, providing vital village information like profiles, news, and activities. This website is the village's official communication platform, enhancing transparency and accountability.

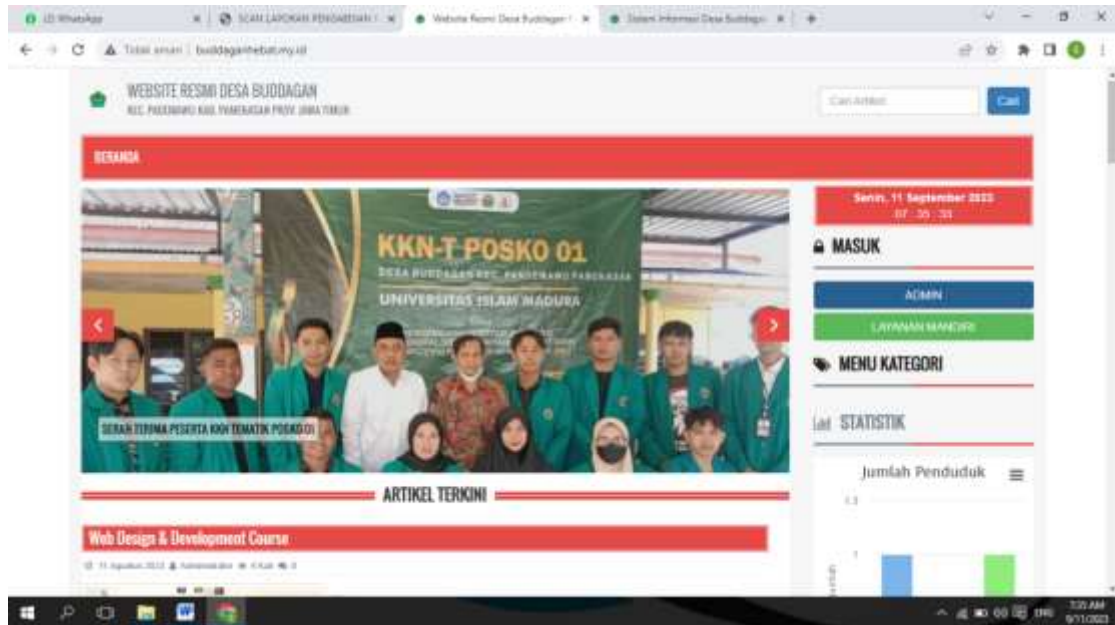


Figure 10. Buddagan Village Official Website Display

3. Digital Maps of Agricultural Potential

A digital map of agricultural potential has been created using Google Maps and Quantum GIS application. The map provides soil, land, plant, and irrigation types information. It is crucial for developing the agricultural sector in villages, aiding in identifying potential, planning land use, managing resources, monitoring plant growth, and developing infrastructure. The resulting digital map display is as follows:

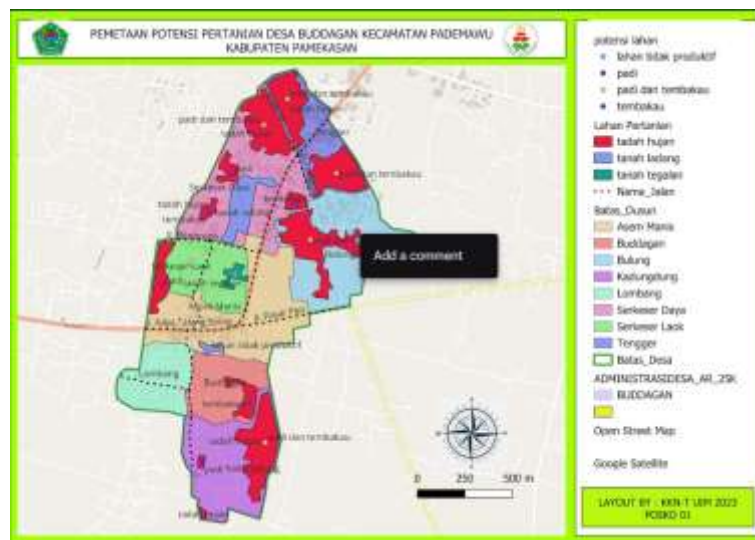


Figure 11. Digital Map of The Agricultural Potential of Buddagan Village, Pademawu Subdistrict, Pamekasan District

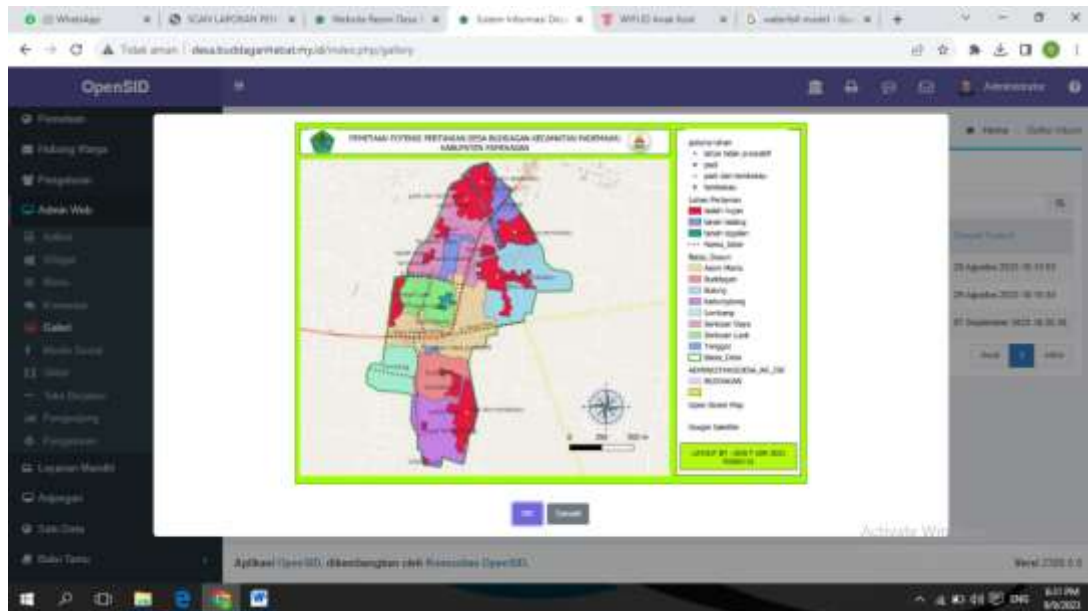


Figure 12. Digital Map Display of Buddagan Village Agricultural Potential

4. Monograph Books

A monograph book, "GIS-Based Digital Village Information System," explains SIDD and digital maps of agricultural potential created in community service activities. It is a reference for other villages and related parties aiming to build SIDD and digital maps.



Figure 13. Display of Monograph Books

Evaluation of Partner Workshop Activities and Assistance:

The evaluation of community service activities in Buddagan Village revealed significant improvements in the village's understanding and apparatus skills. The average understanding of village officials about the importance and benefits of using SIDD and digital maps of agricultural potential

increased from 38% to 86% post-training and mentoring. The training and assistance provided significantly improved the skills of village officials, from 20% to 80%. Community participation in managing village potential increased from 40% to 70%, indicating increased involvement from the community.

Village transparency and accountability increased, as the village now has an official website and adequate information system for managing village data. The SIDD has also improved the effectiveness of public services, as an inefficient manual system hampered the manual system. The digital map of agricultural potential has helped identify village potential and develop development strategies, demonstrating the effectiveness of community service activities in Buddagan Village. The activities have significantly contributed to the village's growth and development.

Table 2. Evaluation of Community Service Activities in Buddagan Village

Aspect	Pre-test	Post-test	Ascension
Understanding Village Apparatus	38%	86%	48%
Village Apparatus Skills	20%	80%	60%
Society Participation	40%	70%	30%
Village Transparency and Accountability	Low	High	-
Public Service Effectiveness	Less efficient	More efficient	-
Village Potential	Not Yet Identified	Identified	-

CONCLUSION

This community service activity aims at four (4) things : (1) creating a web-based digital village information system, (2) creating a digital map of agricultural potential, (3) increasing the skills of village officials in managing digital-based archives, and (4) improving services and managing village potential by building a digital village information system and agricultural potential maps. The output of this activity produces (1) a Web-based digital village information system (SIDD), (2) a Buddagan Village official website, (3) a digital map of agricultural potential, and (4) a Monograph book: GIS-based digital village information system. The evaluation of community service activities in Buddagan Village showed significant improvements in understanding and skills. Village officials' understanding of SIDD and digital agricultural potential maps increased from 38% to 86% post-training and mentoring. Training and assistance improved officials' skills from 20% to 80%. Community participation in managing potential increased from 40% to 70%. Village transparency and accountability increased with an official website and adequate information system. The SIDD improved public service effectiveness. The digital map of agricultural potential helped identify potential and develop development strategies.

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