Vol. 13 No. 1, 2026
https://ppjp.ulm.ac.id/journal/index.php/jpg

Compling a Database of Agricultural Potential of Nagari Air Manggis Selatan Through Crowdsourching-Based Participatory Mapping

Muhammad Ismail*, Wikan Jaya Prihantarto, Bayu Wijayanto, Sari Nova, Elisa Maiyenti, Hendry Frananda, Yusra Aprilia Putri, Mutiara Amelia Putri
Universitas Negeri Padang, Indonesia
muhammadismail@fis.unp.ac.id

Abstract

Geospatial data and information can be used for potential of villages. Apart from that, village must have data also on the potential of its main area for sectors that are dominant and support the local economy. Based on these problems, it is very important to pay attention to the provision of a spatial database in the form of the potential of the dominant productive sector. Nagari Air Manggis Selatan, Lubuk Sikaping District, Pasaman Regency has large resource potential, one of which is agriculture. However, until now there is no representative data regarding the spatial distribution and extent of agricultural land in the village. Currently, technology is developing rapidly, everyone to contribute voluntarily. This has the potential to be developed to increase technological independence, information and regional development. The aim of this research is to provide assistance to the community in carrying out data collection, building a database, and publishing agricultural potential data independently based on crowdsourching. The activity began with socialization and a focus group discussion to formulate relevant agricultural potential information. Assistance to the community is provided to map agricultural land in a participatory. Utilization of digital forms to update agricultural potential data is also carried out. The collected data is managed in a cloud database and displayed in Web-GIS

Keywords: Database, Agricultural Potential, Crowdsourching, Participatory Mapping

DOI: 10.20527/jpg.v13i1.22149
Received: 18 March 2025**; Accepted:** 3 February 2026**; Published:** 25 March 2026
How to cite: Ismail, M., Prihantarto, W., K., Wijayanto, B., Nova, S., Maiyenti, E., Frananda, H., Putri, Y., A., Putri, M., A. (2026). Compling a Database of Agricultural Potential of Nagari Air Manggis Selatan Through Crowdsourching-Based Participatory Mapping. JPG (Jurnal Pendidikan Geografi), Vol. 13 No. 1. https://dx.doi.org/10.20527/jpg.v13i1.22149
© 2026 JPG (Jurnal Pendidikan Geografi)
**Corresponding Author*
JPG (Jurnal Pendidikan Geografi) is licensed under
a Creative Commons Attribution-NonComercial-NoDerivatives 4.0 International License

1. Introduction

Air Manggis Selatan is one of the villages (nagari) in Lubuk Sikaping District, Pasaman Regency, West Sumatra Province. Geographically, this nagari is located at coordinates 0º10'23.98" to 0º8'1.24" LU and 100º12'19.29 to 100º2'24.46" East. This Nagari is an expansion of Nagari Air Manggis which was legalized in 2017. The area of this nagari is 81.99 Km² where most of the area is forest. Apart from the natural land cover in the form of forests, in general, the dominant land use is agricultural land, both in the form of wetland agriculture (rice fields), dry land (fields) and plantations and other cultivated land. In terms of topography, Nagari Air Manggis Selatan is dominated by hills with steep to very steep slopes spread in the north and south. The central part

of the Nagari is a valley or basin with flat to medium slopes. It is in these areas that land use for settlements develops among productive agricultural land. With the alluvial plain landform, the potential for water resources is great and can support agricultural businesses in the village. Agricultural sector is the main sector and highest contributor to GRDP value to the economy of Pasaman Regency (Syahrial, 2024; BPS Kabupaten Pasaman, 2021).

The residents of Nagari Air Manggis Selatan have agrarian livelihoods, namely in agriculture and plantations. The community economy in Nagari Air Manggis Selatan is still quite low with the Village Development Index (IDM) which is still in the developing category. The average community income is relatively low, especially in the farming profession, which is Rp. 500,000 to Rp. 1,500,000 / month. Diversification of agricultural businesses is also carried out to improve the economy and support food security in this village, one of which is by independent agriculture and commodity enrichment.

Based on data from the Central Bureau of Statistics of Pasaman Regency, this nagari has a population composition with a productive age of at least 32% of the total population. In terms of education, around 26% of the population received education from high school to university level. In line with this data, the dominant occupation owned by the residents of Nagari Air Manggis Selatan is students (10% of the population). The livelihood of farmers alone only records a proportion of one percent of the total population. This is a potential where the possibility of literacy levels and technology literacy rates is high. The potential to improve literacy and technological literacy will produce many useful products that aim to increase reputation and also to improve the image of an agency through digital media packaged in the form of a website (Pamungkas et al., 2023).

Regional development must be supported by good spatial data, including at the village level so that, this spatial data can be used for village developing the potential of villages (Suwondo et al, 2020). Before the development of technology, agricultural data management was still managed manually and unorganized, as a result many parties found it difficult to conduct analysis, because the data were not up-to-date, too scattered, and lacked thematic maps that describe the potential of the region (Ikhwan et al., 2025). Therefore, with the development of information technology, villages are now heading toward digital village transformation. This transformation is an effort to improve the quality of life of the community. Facilitate access to relevant and accurate information that can be an effective decision for the village government and the community (Santi et al., 2024).

The development of information technology which has a tremendous impact on society, there is the term information system. Geographic Information System (GIS) are a source of technology that makes it possible to do mapping and as a technology to manage natural resources effectively (Wahyuni, 2025). By using WebGIS, spatial information related to village potential can be presented with detailed visualizations that are easily accessible to the community. This website can be continuously developed in line with the latest news from the village (Latifah et al, 2023).

The development of GIS technology in Crowdsourching-based participatory mapping, which in this method produces detailed information on an area under study, but this information is not easliy obtained by conventional mapping methods or mapping that takes a long time to complete. The application of GIS technology applications plays a very role in any field, including agriculture, which is the main economic sector of the Indonesian people (Saptari et al., 2021). Currently, the main problem in agriculture is that no one provides information related to the potential of land in the Nagari Air Manggis area, so the role of GIS in the context of WebGIS can be a solution to overcome these problems and become a forum for the community to find out the area, land potential, and potential agricultural commodities in Nagari Air Manggis (Suryanto et al., 2021).

Nagari Air Manggis Selatan has great potential for agricultural resources. However, until now

there has been no representative data on the spatial distribution and extent of agricultural land in the Nagari. In addition, the unrecorded potential and widely developed (dominant) commodities in Nagari Air Manggis Selatan are a challenge in providing information on agricultural potential. Based on coordination with the Nagari Air Manggis Selatan apparatus, data and information were obtained that there are 4 farmer groups that are active in agricultural management. One of the most active farmer groups in Nagari Air Manggis Selatan, namely the Guguak Farmer Group, has an area of 26.04 ha. However, derivative data such as production, productivity, harvest area, planting rotation, and types of management such as irrigation type have not been well documented. In addition, limited information, change in land use, shifts in the growing season, and the threat of climate change are ongoing influences on the agricultural sector (De Beny & Belalawe, 2025).

Apart from these problems, Nagari has good human resource potential. One indicator that can be used as a foothold is a fairly good level of digital literacy. For example, this Nagari has an official website which contains information about the ins and outs of the Nagari. However, data and information on agricultural potential have not been presented. This is a good asset to support the development and development of the local area where credible and reliable data sources sourced directly from the community can be accessed by the public easily through the website. Moreover, the website can display spatial data in the form of maps, opening up opportunities to present information not only quantitatively through tables but also in the form of spatial data. This opens up opportunities to implement a program to improve the community's ability to collect data and build databases independently. In addition, of course, the program will enrich the data on the agricultural potential of the nagari. With this program, it can be provide benefits for the community to find out the distribution of potential areas in Nagari Air Manggis (Rahayu et al., 2018).

The main objective of this activity is to assist the community in Nagari Air Manggis Selatan in carrying out data collection, building a database, and publishing data on the potential of agricultural land in the village independently using the crowdsouching method. The next goal is to represent the database spatially through an interactive map connected directly to a geographic information system that can be accessed and updated directly by village officials and the communities involved. The data and information can also be displayed on a website.

2. Method

The initial stage in this activity is preparation which begins with the collection of basic data related to administrative boundaries in Nagari Air Manggis Selatan, Lubuk Sikaping District, Pasaman Regency. The data used consisted of the Indonesian Rupa Bumi Map (RBI) published by the Geospatial Information Agency (BIG) and Planet scope resolution satellite imagery and ESRI® image service. Administrative boundaries are used as the basis for mapping, supported by indicative maps owned by Nagari Air Manggis Selatan.

The method used is a participatory and collaborative approach. Previously, preparations were carried out in the form of literature studies and coordination with partners (See Fig.1). The proposer works as a companion and presenter in every activity carried out. The stages in community service activities are as follows:

a) *Socialization*
   This stage is the first step that is carried out based on preliminary literature studies and intensive coordination with partners, namely Nagari Air Manggis Selatan. In particular, socialization is an activity that contains explanations of basic material in mapping, database development and about sustainable farming.

b) Focus Group Discussion (FGD)

This activity began with an understanding of the material and what should be mapped and what data should be sought and inputted. In the next stage, the FGD was directed towards participatory mapping. The main objective was to map the boundaries of agricultural land. Participants were divided into small groups guided by a facilitator in discussing and interpreting the boundaries in accordance with the referenced catrometric standards (Prihantarto et al., 2024). Interpretation using image maps by PlanetScope imagery and aerial photos using visual interpretation elements including hue, color, texture, size, shadow, site and association (Kosasih et al., 2019). Mapping can be corrective in nature where if there are errors in location or attributes such as names, they are justified according to the understanding of the participants. In addition, for aspects that have not been mapped, they can be added based on the participants' understanding of the location. The photogrammetric workflow comprises several key processes, such as image orientation, aerial triangulation, bundle adjustment, dense cloud reconstruction, mesh generation, and texture building (Kumar et al, 2017).

c) Data capture training with digital forms

Participants were given material on the use of digital forms to collect data and information supporting agriculture. The facilitator has previously provided an account, username and password as well as a database created to support activities. Participants are tasked with filling in the data independently and reporting the location of the data filling. This process refers to the crowdsourching pattern where participants can voluntarily fill in agricultural data in their respective jorongs. After the transfer of knowledge process, field practice was conducted through a demo survey. Technology is developing rapidly, making it possible for everyone to contribute voluntarily to data collection through personal devices, which is called crowdsourcing (Haltofova, 2018; Roth, 2013)

d) Database Development and Web-GIS Creation

This stage is a stage that is carried out behind the scenes by involving the administrator of the official Nagari Air Manggis Selatan website. The database was built by utilizing services from Google Drive and Google Colabolatory. Data storage is done in Google Sheet using the API to be displayed in the Google sites service as a Web-GIS.

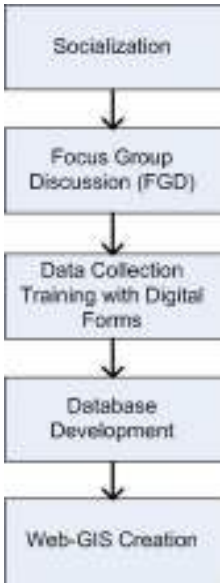

Figure 1. Activity Stages

3. Result and Discussion

Based on the objectives of the implementation of research activities, namely providing assistance to the community in Nagari Air Manggis Selatan in carrying out data collection, building databases, and publishing data on the potential of agricultural land in the village independently using the crowdsouching method. The next goal is to represent the database spatially through an interactive map connected directly to a geographic information system that can be accessed and updated directly by village officials and the communities involved. The data and information can also be displayed in real time on a website.

The participatory mapping stage involves participants in map reading and interpretation of high-resolution satellite imagery. This technology is widely used in basic mapping data. The satellite image used is Planet Scope Image with a specification of 3 meters spatial resolution and covers an area of 100 Km^2 (Planetscope, 2024., Huang et al, 2021., Csillik et al, 2019). The process carried out was accompanied by a facilitator, especially in identifying objects related to agricultural businesses and agricultural land. Furthermore, the use of UAVs also needs to be done as a complement to spatial data needs. The drone used is the DJI Phantom which has an effective flight range of up to 2 km. The drone is integrated with a Global Positioning System (GPS) which is useful for accurately locating shooting points (Martínez-Carricondo et al, 2018). Drones and GPS are used to document key points and support participatory mapping using satellite imagery maps. Communities as beneficiaries will be given the opportunity to demonstrate their use. The existence of drone technology makes mapping process more efficient because the process is fast and more effective (Zulkia et al., 2023). The provision of geospatial information, especially mapping, is very important in the stages of sustainable regional planning (Ismail et al, 2024).

Digital forms are devices for online surveys and can be installed on android smartphones. This form is useful for collecting data related to potential agricultural land. As a form of crowdsourching, the community will carry out the data collection process themselves with their respective android devices. Participants will be given demo material, taught and assisted in its use. Web-GIS is a technology used to represent digital maps. Web-GIS will be connected to the database generated from the survey and participatory mapping. The Web-GIS used uses services from Google My Map where this system is very user friendly and lightweight for various devices. The database also uses Google Drive and Google Collabolator for server processing (Herrick, 2009). Assistance will be provided to ensure that the community as beneficiaries can independently update and utilize the system.

The focus of the activity area is the western part of Nagari Air Manggis Selatan or precisely the agricultural area of the Guguak farmer group (See Fig.2). Based on the results of the FGD, data related to the agricultural management area of the Guguak farmer group was obtained. The management area is around 26,045 ha. The agricultural area consists of 69 agricultural management areas managed by 61 people either independently or leasing land. Based on the status of land ownership, the agricultural area of the Guguak farmer group is private land and customary land (See Fig.3). Information obtained from the Lubuk Sikaping sub-district agricultural extension officer explained that the agricultural production of the Guguak farmer group in this harvest season was around 5 tons/hectare. Agricultural production has increased from the previous harvest, which was 3.9 to 4.2 tons/hectare. The rice variety planted in the agricultural area is a local variety called “Sialuih”.

Figure 2. Interactive Map View of Agricultural Area

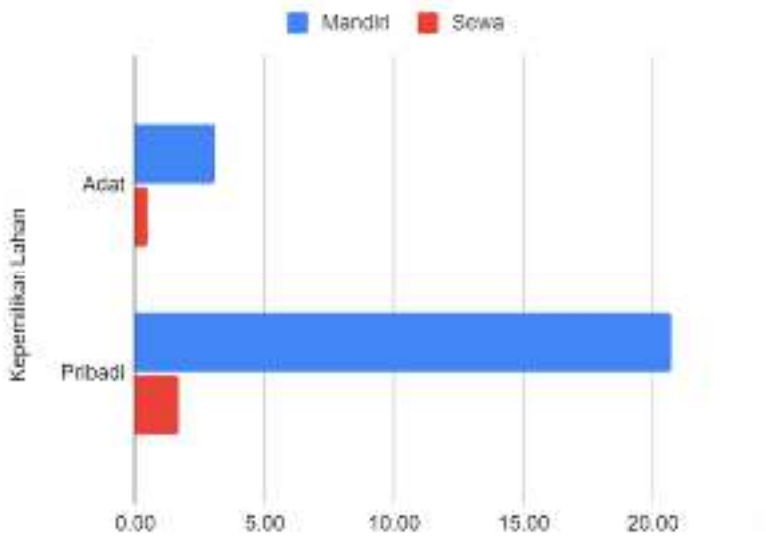

Figure 3. Agricultural Land Ownership Status Chart

Furthermore, articles and videos were prepared and published in the electronic media. Articles about activities that have been carried out are then published in electronic mass media. While the publication of video activities through YouTube media. The data and information were used as input in the preparation of the Web-GIS of agricultural potential using the Google Sites platform (see Fig. 4). The assumption in utilizing the platform is because it is considered easy to use and free in terms of cost. The platform has also provided various templates according to user needs. Some of the data and information that had been collected were then entered into the Google Sites platform. The position and color settings in the Web-GIS are also arranged in such a way as to provide informative, interactive and attractive details for readers. Then the data and spatial information in the form of maps and graphs as well as publication links are then embedded in the

Web-GIS display design that has been made before. The final stage is to publish the Web-GIS through the available links.

The publication of articles and videos through electronic media and YouTube contributed to increasing public awareness and initial engagement with the developed Web-GIS. User responses indicated that the platform was perceived as informative and visually attractive, supporting its potential as a tool for disseminating agricultural spatial information. Future socialization plans include targeted training sessions, community outreach, and collaboration with local stakeholders to enhance user adoption and sustained utilization of the Web-GIS. However, limitations remain, including dependency on the Google Sites platform, restricted customization, and potential constraints in handling large-scale spatial datasets and advanced GIS functionalities. Web-GIS mapping provides significant advantages for communities by facilitating digital map visualization and allowing broad public access to spatial data (Fatimatuzahra et al., 2021)

Figure 4. Web-GIS Visualization of Agricultural Land Database

4. Conclusion

The preparation of an agricultural potential database can be done through participatory-based mapping methods. By using this method, it is expected that the community can understand the importance of geospatial information in agricultural management. Furthermore, the use of Web-GIS in visualizing geospatial-based data and information can provide interactive information so that it can facilitate users. The author provides suggestions for further research, namely the compilation of more varied data so that it can be presented in detail in the Web-GIS of agricultural potential.

5. Acknowledgment

The authors would like to thank the Institute for Research and Community Service (LP2M) of Padang State University (Contract Number: 2137/UN35.15/PM/2024) for funding this tridharma activity so that it was carried out well. In addition, the writing team would also like to thank the Nagari Air Manggis Selatan, Lubuk Sikaping District, Pasaman Regency, West Sumatra Province, Lubuk Sikaping District Agricultural Extension Officer, Guguak Farmer Group and all parties who played a role in this activity.

6. References

BPS Kabupaten Pasaman (2021). Kabupaten Pasaman dalam Angka 2021. Badan Pusat Statistik Kabupaten Pasaman

Csillik, O., Kumar, P., Mascaro, J., O'Shea, T., & Asner G.P. (2019). Monitoring Tropical Forest Carbon Stocks and Emissions using Planet Satellite Data. Sci Rep. 28:9(1):17831. https://doi.org/10.1038/s41598-019-54386-6

De Beny, M. G. S., & Belalawe, B. J. (2025). Pemetaan Lahan Produktif Pertanian di Kabupaten Belu Menggunakan Sistem Informasi Geografis (SIG). Blend Sains Jurnal Teknik, *3*(4), 477-490. https://doi.org/10.56211/blendsains.v3i4.801

Fatimatuzahra, D.T., Nurcahya, H., Anggaeni, R.N., Wendi. (2021). Pemanfaatan WebGIS untuk Pemetaan Persebaran Perguruan Tinggi di Wilayah Sukabumi. Jurnal Restikom: Riset Teknik Informatika dan Komputer, 3(1),18-24. https://doi.org/10.52005/restikom.v3i1.77

Haltofova, B. (2018). Using Crowdsourcing to Support Civic Engagement in Strategic Urban Development Planning: A Case Study of Ostrava, Czech Republic. Journal of Competitiveness. https://doi.org/10.7441/joc.2018.02.06

Herrick, D.R. (2009). Google this! Using Google Apps for Collaboration and Productivity. In: Proceedings of the 37th Annual ACM SIGUCCS Fall Conference: Communication and Collaboration. p. 55–64. https://doi.org/10.1145/1629501.1629513

Huang, H., & Roy, D.P. (2021). Characterization of Planetscope-0 Planetscope-1 Surface Reflectance and Normalized Difference Vegetation Index Continuity. Science of Remote Sensing [Internet]. 3:100014. https://linkinghub.elsevier.com/retrieve/pii/S2666017221000018. https://doi.org/10.1016/j.srs.2021.100014

Ikhwan, A., Ananda, R. A., Adittra, N., Pulungan, M. A., & Prayoga, R. (2025). Sistem Informasi Geografis Pemetaan dan Analisis Lahan Pertanian di Kabupaten Deli Serdang. *Jurnal Penelitian Teknologi Informasi dan Sains*, *3*(1), 01-15. https://doi.org/10.54066/jptis.v3i1.2920

Ismail, M., Prihantarto, W,J., Susetyo, B,B., & Widyastuti. (2024). Pemetaan Estimasi Lahan Terbangun Menggunakan Teknologi Unmanned Aerial Vehicle (UAV) di Kelurahan Jawi-Jawi I Kota Pariaman. Suluah Bendang : Jurnal Ilmiah Pengabdian Kepada Masyarakat [Internet]. 24:1 https://doi.org/10.24036/sb.05370

Kosasih, D,. Saleh, M.B,. Prasetyo, L.B,. (2019). Interpretasi Visual dan Digital untuk klasifikasi tutupan lahan di Kabupaten Kuningan, Jawa Barat. Jurnal Ilmu Pertanian Indonesia. 24(2):101–8. https://doi.org/10.18343/jipi.24.2.101

Kumar, N,S., Ismail, M,A,M., Sukor, N,S,A., Cheang, W. (2018). Method for the Visualization of Landform by Mapping using Low Altitude UAV Application. IOP Conf. Series: Materials Science and Engineering. 352 012032. https://doi.org/10.1088/1757-899X/352/1/012032

Latifah, S,. Idris, M, H,. Setiawan, B,. Valentino, N,. Hidayati, E,. Putra, T, Z,. Wijayanto, O, I,. Hadi, M, A. (2023). Pemetaan dan Pengembangan Data Desa Presisi Untuk Jalur Wisata Berbasis Mobile WebGIS di Lingkar Geopark Rinjani. Jurnal Masyarakat Mandiri. 1271-1287. https://doi.org/10.31764/jmm.v7i2.13487

Martínez-Carricondo, P,. Agüera-Vega, F,. Carvajal-Ramírez, F,. Mesas-Carrascosa, FJ,. García-Ferrer, A,. Pérez-Porras, FJ,. (2018). Assessment of UAV-Photogrammetric Mapping

Accuracy based on Variation of Ground Control Points. International Journal of Applied Earth Observation and Geoinformation [Internet]. 72:1–10. https://www.sciencedirect.com/science/article/pii/S0303243418301545. https://doi.org/10.1016/j.jag.2018.05.015

Pamungkas, M. R. F., Erkamim, M., Wati, V., Wartono., Widarti, E., Rundi, A. U. B., & Khofid, A. N. (2023). Pembuatan Sistem Informasi Geografis Potensi Daerah Berbasis Website: Studi Kasus: Kelurahan Purwodiningratan. *Jurnal Altifani Penelitian dan Pengabdian kepada Masyarakat*, *3*(2), 200-209. https://doi.org/10.59395/altifani.v3i2.359

PlanetScope [Internet]. (2024). Available from: https://developers.planet.com/docs/data/planetscope/

Prihantarto, W,J,. Ismail, M,. Susetyo, BB,. (2024). Pemetaan Partisipatif Batas Korong Nagari dengan Memanfaatkan Teknologi Unmanned Aerial Vehicle (UAV). Suluah Bendang: Jurnal Ilmiah Pengabdian Kepada Masyarakat [Internet]. 24:12–21. https://doi.org/10.24036/sb.05330

Rahayu, S., Hendrawati, T. D., & Rosyidi, M. S. S. (2019). Aplikasi Potensi Wilayah Kabupaten Sukabumi Berbasis Website dan Mobile. JTERA (Jurnal Teknologi Rekayasa), 4(2), 303. https://doi.org/10.31544/jtera.v4.i2.2019.303-312

Roth, S,. Kaivo-Oja, J,. Hirschmann, T,. (2013). Smart Regions: Two Cases of Crowdsourcing for Regional Development. International Journal of Entrepreneurship and Small Business. 20(3):272–85. https://doi.org/10.1504/IJESB.2013.056890

Santi, I., H., Pambudi, H. S., Pradana, Y. O., & Rizaldy, A. (2023). Sistem Informasi Profil Desa dan Pemetaan Blok Tanah Berbasis Web melalui Pendekatan SDLC. Jurnal Teknologi dan Sistem Informasi, 8(2), 123–130. https://doi.org/10.36382/jti-tki.v15i1.523

Saptari, M. A., Trisna, T., & Zakaria, M. (2021). Sistem Informasi Geografis Pemetaan Komoditas Pertanian Berbasis Web Di Kabupaten Aceh Utara. Industrial Engineering Journal, 10(1). https://doi.org/10.53912/iejm.v10i1.625

Suryanto, A. A., Arifia, A., Muqtadir, A., & Basuki, D. K. (2017). Pemetaan Potensi Lahan Pertanian di Kabupaten Tuban Berbasis Sistem Informasi Geografis. *SAINTEKBU*, *9*(2), 47-56. https://doi.org/10.32764/saintekbu.v9i2.119

Suwondo., Syahza, A,. Galib, M,. Oktarianda, R. (2020). Pengembangan Peta Potensi Desa Berbasis Spasial Untuk Mendukung Perencanaan Pembangunan Desa Di Kecamatan bunga Raya Kabupaten Siak. Jurnal Hilirisasi IPTEKS. https://doi.org/10.25077/JHI.V3I2.436

Syahrial,. Dermawan, A,. Putri, SA,. (2024). Potensi Sektor Pertanian dalam Pembangunan Wilayah Kabupaten Pasaman. https://doi.org/10.36728/afp.v24i2.3397

Wahyuni, R. (2025). Implementasi Sistem Informasi Geografis (SIG) untuk Pemetaan dan Pengelolaan Sumber Daya Alam di Kawasan Pertanian. Journal Of Human And Education (JAHE), *5*(1), 545-550. https://doi.org/10.31004/jh.v5i1.2227

Zulkia, D. R., Hartati, L., Fitriansyah, H., & Aldouri, M. A. (2023). Pengembangan Ruang Terbuka Hijau (RTH) Berbasis Pemetaan Menggunakan Drone. Zoning: Journal of Urban and Regional Planning, *1*(1), 37-43. https://doi.org/10.33019/zoning.v1i1.17