Data in Brief

Data Article

Geolocation data of irrigation network in water user association’s operation area under community-based and provider-based network governance

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Abstract

Massive irrigation development has influenced the way farmers govern water user associations (WUAs) in Klambu Wilalung Irrigation District in Central Java, Indonesia. Recently, farmers adopt community-based (swakelola) and provider-based (lelang) network governance to manage the WUAs. The physical conditions of the irrigation network have become the primary driver of WUA’s governance selection. This article provides geolocation data of irrigation network in the operation area of WUAs under community-based and provider-based network governance. The irrigation network consisted of two components, irrigation canal, and structure. Irrigation canal divided into the primary and secondary canal. The data cover GPS Tracks coordinates for 75 secondary canals and seven primary canals. Meanwhile, irrigation structures were grouped into main and support structures and consists of 12 types of structure. The data covers the GPS waypoint coordinates for 194 irrigation structures. The data also provide basic information of 34 WUAs applying community-based (11 WUAs) and provider-based (23 WUAs) network governance. WUAs basic information obtained from

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a survey conducted in 2016 and covers information on the type of governance, number of board, number of member farmers, size of operation area, and administrative location of each WUAs. Finally, the data is useful in planning research aimed to explain the role of irrigation infrastructure in shaping WUAs governance. Also, the information is crucial to planning a field survey in the area of the Klambu Wilalung Irrigation District in Central Java.

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Specifications Table

| Subject                        | Agricultural science                                                                 |
|--------------------------------|---------------------------------------------------------------------------------------|
| Specific subject area          | Irrigation, water user associations governance                                         |
| Type of data                   | Table                                                                                  |
|                                | Graph                                                                                  |
|                                | ESRI shapefiles                                                                        |
| How data were acquired         | GPS coordinates acquired from irrigation officials of the Klambu Wilalung Irrigation District. Then, we used the coordinate data to create the shapefile (.shp) of the irrigation network. QGIS and Google Earth software was used to develop the shapefiles. |
| Data format                    | Raw                                                                                   |
|                                | Analyzed                                                                              |
| Parameters for data collection | We select all irrigation networks (irrigation canals and structures) located in the operation area of WUAs, adopting community-based and provider-based network governance in the Klambu Wilalung Irrigation District in Central Java, Indonesia. |
| Description of data collection | The data collection consists of three stages.                                          |

1. We enumerate all WUAs in Klambu Wilalung. In this stage, we collect basic information on administrative location, the type of governance, number of the board members, WUAs operation area, and number of member farmers.

2. We collect GPS coordinates of the entire irrigation network from irrigation officials. Then we plotted the coordinates using QGIS and locate each irrigation facility (canals and structure) to its corresponding WUA operation area.

3. Then, we create the shapefiles (.shp) for each irrigation facility in each WUA operation area.

Data source location

Institution: Klambu Wilalung Irrigation District
City/Town/Region: Grobogan and Kudus Regency (Kabupaten), Province of Central Java
Country: Indonesia
Latitude and longitude (and GPS coordinates, if possible) for collected samples/data: The GPS coordinates of each WUAs are provided in the dataset with this data article.

Data accessibility

The data is provided with the article.

Related research article

M. Rondhi, A. F. Khasan, Y. Mori, T. Kondo, Absence of legislation and the quest for an effective mode of governance in agricultural water management: An insight from an irrigation district in central java, Indonesia * 1, Irrig. Drain. (2020) 1–12.
https://doi.org/10.1002/ird.2450 [1]

Value of the Data

• The geolocation data of the irrigation network in the WUA operation area facilitate accurate identification of the location of irrigation infrastructure for each WUA. It simplifies the process of tracking and marking irrigation construction that is central in the study of WUA
under community-based (swakelola) and provider-based (lelang) governance in the Klambu Wilalung Irrigation District, Central Java, Indonesia.

- Researchers working on common-pool resource theory, especially on network governance, who are looking for a new case study might use this data as a guide for their new survey. Irrigation practitioners in Indonesia working on strengthening WUA’s organizational capacity might use this data to locate an exemplary WUA model for WUA in other regions or provinces.
- The spatial data of the Klambu Wilalung irrigation network is useful to analyze the motive of WUA’s governance selection. This data is crucial in answering the hypothesis of whether physical conditions of irrigation networks affect WUA’s governance selection.
- Historically, WUA’s governance changed as political and social changes occurred. This spatial data is based on the situation in 2015, representing the period from 1990 to 2015. This data is useful to build a historical construct of WUA’s governance in future researches.
- The data serves as a reference to identify the interrelationship between the presence or absence of irrigation infrastructure and the selection of WUA governance.
- The shapefiles can be used to create the irrigation map on each WUA’s operation area.

1. Data Description

There are three types of data in this data article, (1) the dataset, (2) the map of WUA’s operation area under provider-based and community-based network governance, and (3) the shapefiles of irrigation network in each village.

(1) The dataset

The dataset is in Microsoft excel format. It consists of two worksheets, (1) the WUA and (2) geolocation_data worksheet. The first worksheet provides information on the basic characteristics of WUA and contains twelve variables. The second worksheet provides geolocation data of the irrigation network in each village. Table 1 presents the descriptions of variables in WUA and geolocation_data worksheets.

The geolocation_data worksheet contains the coordinates of each irrigation components in the Klambu Wilalung Irrigation District. There are two irrigation network components, irrigation structure, and canal. Table 2 provides variable descriptions in the geolocation_data worksheet.

(1) The map of irrigation networks

The following data is the map for the village in which the WUA adopted provider-based and community-based governance. The figures provided in this article are examples from two villages, Klambu (Fig. 1) and Medini (Fig. 2) villages. Klambu has one WUA (Mbangun Tani) and adopted a community-based network as its mode of governance. On the other hand, Medini has three WUAs (Kayu Urip, Kandang Rejo, Pingkuk Mulyo), which managed under provider-based network governance. The complete list of WUA is provided in the dataset. The irrigation map similar to Fig. 1 and Fig. 2 are uploaded with this article.

(1) The shapefiles of irrigation networks

The shapefiles from which irrigation map was created are also uploaded with this article. The shapefiles have been grouped by village. A catalogue containing detailed information for each shapefiles is provided in Microsoft Excel format (Shapefiles catalouge.xlsx). The catalogue consists of two worksheet, the line_polygon and point worksheets. The line_polygon worksheet contains information on the shapefiles of village border, Irrigation canals, and irrigated farmland. Table 3 provides the descriptions of the shapefiles.

The point worksheet contains information on the shapefiles of irrigation structures. The irrigation structure in each village are grouped into one shapefile. Table 4 describes each structure in the shapefiles.
Table 1
Descriptions of variables in the WUA worksheet

| No | Name         | Description                                                                 | Code | Measure   | Unit | Source      |
|----|--------------|------------------------------------------------------------------------------|------|-----------|------|-------------|
| 1  | Identity     | Unique ID to each WUA in the Klambu Wilalung Irrigation District             | ID   | Measure   |      | Enumeration |
| 2  | Official name| The official name of WUA as registered in the irrigation offices of Kudus and Grobogan Regency | name | Measure   |      | Enumeration |
| 3  | Province     | The province (Provinsi) in which WUA situated.                               | Prov |           |      | Enumeration |
| 4  | Regency      | The regency/city (Kabupaten/Kota) in which WUA situated.                     | Reg  | Measure   |      | Enumeration |
| 5  | District     | The district (kecamatan) in which WUA situated.                              | Dis  | Measure   |      | Enumeration |
| 6  | Village      | The village (desa) in which WUA is situated.                                 | village | Measure |      | Enumeration |
| 7  | Hamlet       | The hamlet (RW) in which WUA situated                                       | hamlet | Measure |      | Enumeration |
| 8  | Neighborhood | The neighborhood (RT) in which WUA situated                                 | neighborhood | Measure |      | Enumeration |
| 9  | Governance   | The type of WUA governance (1=provider-based network, 2=community-based network) | Gov | Nominal |      | Enumeration |
| 10 | Area         | WUA’s operation area based                                                   | Scale | Measure | ha   | Enumeration |
| 11 | Board Member | The number of WUA’s board member including the chairman                      | board | Scale    | person | Enumeration |
| 12 | Member farmer| The number of farmers belongs to the WUA                                     | member | Scale    | person | Enumeration |

Note:

a The province is the first-level administrative region in Indonesia, followed by regency (Kabupaten/Kota), district (kecamatan), village (desa/keurahan). Province, district, and village headed by official winning the largest popular vote. While kecamatan, although larger than village, led by official selected by Reagent (Bupati) and under district command.

b Hamlet and neighborhood are the administrative areas under village and village command.

2. Experimental Design, Materials and Methods

2.1. Area of data collection

The data presented here represent Klambu Wilalung Irrigation District (KWID). KWID located in Grobogan and Kudus Regency, Province of East Java, Indonesia. The data cover the area of 20 villages and 34 WUAs. Fig. 3 shows the location of KWID.

The data covers twenty villages and 34 WUAs. Four villages located in Grobogan and have four WUAs. The remaining sixteen villages are situated in Kudus and have 30 WUAs. There are 24 WUAs adopted provider-based network governance, and 11 WUAs took community-based network governance.

2.2. Data collection

There are two types of data collected, (1) the WUAs characteristics and (2) the coordinates of irrigation network in KWID. We gathered the first data through enumeration to all WUAs chair-
Table 2
Descriptions of variables in the geolocation_data worksheet

| No | Name       | Description                                                                 | Code | Measure | Unit | Source         |
|----|------------|-----------------------------------------------------------------------------|------|---------|------|----------------|
| 1  | Identity   | Unique ID to each irrigation network component. The ID is the official nomenclature from Klambu Wilalung Irrigation District. | ID   |         |      | Official data  |
| 2  | Name       | The name of each irrigation network component                               | name |         |      | Official data  |
| 3  | Type\(^a\) | The type of component in the irrigation network (1=structure, 2=canal)      | type | Nominal |      | Official data  |
| 4  | Status     | The status of irrigation network components. For structures (1=main structures, 2=supporting structures). For canals (1=primary canal, 2=secondary canal). | stat | Nominal |      | Official data  |
| 5  | X Coordinate\(^b\) | The Easting coordinate in UTM Projection System                             | X    |         |      | Official data  |
| 6  | Y Coordinate\(^b\) | The Northing coordinate in UTM Projection System                           | Y    |         |      | Official data  |
| 7  | WUA        | The WUA for which each irrigation network components situated              |      |         |      | Enumeration    |
| 8  | Village    | The village for which each irrigation network components situated          |      |         |      | Enumeration    |

Note:
\(^a\) The coordinates provided only for irrigation structure
\(^b\) The geodetic datum for UTM coordinates is WGS 84/UTM Zone 49 S

Fig. 1. The irrigation network in Klambu village
Fig. 2. The irrigation network in Medini village

| No | Name                  | Description                                           | Code          | Geometry point |
|----|-----------------------|-------------------------------------------------------|---------------|----------------|
| 1  | Primary canal         | Irrigation canal connected directly to a water source | Primcanal_name| line           |
| 2  | Secondary canal       | Irrigation canal below the primary canal              | Seccanal_name | line           |
| 3  | Irrigated Farmland    | The area of irrigated farmland in each village        | farmland_village | polygon       |
| 4  | Village Border        | The administrative border of each village             | villborder_village | polygon       |

Table 3
Descriptions of the shapefiles in the line_polygon worksheet

man in KWID. This process is similar to the enumeration process in our previous data article [2]. The purpose of this enumeration is to define the location of each WUA and its corresponding operation area. We also collected information on the essential characteristics of WUA, such as presented in Table 1. The result of this enumeration was utilized as a reference in conducting the comprehensive survey presented in our paper [1].

We obtained the coordinates of irrigation networks from irrigation officials in KWID. We then used the coordinates to locate the irrigation networks—all the spatial analysis performed using QGIS software (version 3.12.3). The coordinates data are in UTM format using WGS 84/UTM Zone 49 S. Fig. 4 shows the plotting of the original coordinates data. We then used the original coordinates data to identify irrigation structures and canals. We use Google Satellite images to verify the coordinate points of KWID. We imported the Google Map layer to the QGIS using XYZ tiles. The official village administrative border and farmland layer obtained from the Indonesian Geospatial Information Agency.

The spatial analysis to create shapefiles data consists of four stages. In the first stage, we define the village boundary to locate the operation area of each WUA. The official administrative village border was used in this stage. In the second stage, we select the irrigated farmland in a particular village. We use the clip algorithm of QGIS to create a new layer of farmland specific to a specific village. The official farmland area in Kudus and Grobogan was used as the input

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1 The URL for XYZ tiles function is provided as Supplementary Material with this data article.
2 URL: https://tanahair.indonesia.go.id/portal-web
| No. | Name                   | Indonesian Name                  | Description                                                                 |
|-----|------------------------|----------------------------------|------------------------------------------------------------------------------|
| 1   | Division box           | Bagi                             | Irrigation structure used to divide water between two or more canals          |
| 2   | Division-turnout box   | Bagi-sadap                       | Irrigation structure used to divide the water and divert water to subsequent canals |
| 3   | Turnout                | Sadap                            | Irrigation structure used to divert water to the smaller canal               |
| 4   | Culvert                | Gorong-gorong                    | Irrigation structure used to carry water across the road and located underground |
| 5   | Cross-Culvert          | Gorong-gornong Silang            | Similar to general culvert, the only different is in placement arrangement.   |
| 6   | Pedestrian Bridge      | Jembatan Orang                   | Bridge over irrigation canal (only for pedestrian)                           |
| 7   | Road Bridge            | Jembatan Desa                    | Bridge over irrigation canal (for vehicles)                                  |
| 8   | Flume                  | Talang                           | Irrigation structure used to carry water across gullies or ravines           |
| 9   | Measuring Flume        | Bangunan Ukur                    | Irrigation structure used to measure water flow                              |
| 10  | Siphon                 | Siphon                           | Irrigation structure used to transfer water over a barrier                   |
| 11  | Oncoran                | Oncoran                          | Irrigation structure used to transfer water from sewer to farmland           |
| 12  | Side Weir              | Pelimpah Samping                 | Irrigation structure used to drain water from the central canal when the water surface exceeds the maximum level |

Note: The geometry point of all irrigation structure is point. All irrigation structure in each village are grouped into one shapefile. The shapefile name format is plot_village name.

Fig. 3. The location of data collection (A) Province of Central Java relative to Indonesia, (B) Grobogan and Kudus Regency relative to Province of Central Java (Area highlighted in white).
files. And the village border was used as the overlay layer. In the third stage, we digitized the irrigation structures located in the village. We grouped each structure type into one shapefile. Finally, in the fourth stage, we digitized the irrigation canals. The official coordinate data only provide the reference point (the starting and ending point) for each irrigation canal. We then created a new line connecting these reference points. Google Satellite Imagery was used to verify the line remotely. Fig. 5 shows the workflow of spatial analysis.
Ethics Statement

Implied informed consent was obtained from all participant in this study.

Credit Author Statement

Ahmad Fatikhul Khasan: Conceptualization, Methodology, Software, Writing original draft. Mohammad Rondhi: Conceptualization, Investigation, Review, Supervision, Writing original draft. Yasuhiro Mori: Investigation, Visualization. Takumi Kondo: Supervision, Investigation, Funding.

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Declaration of Competing Interest

The authors declare no competing interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.dib.2020.106168.

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[1] M. Rondhi, A.F. Khasan, Y. Mori, T. Kondo, Absence of legislation and the quest for an effective mode of governance in agricultural water management: an insight from an irrigation district in central java, indonesia *, Irrig. Drain (2020) ird.2450 https://doi.org/10.1002/ird.2450.
[2] M. Rondhi, P.A. Pratiwi, V.T. Handini, A.F. Sunartomo, S.A. Budiman, Data on agricultural and nonagricultural land use in peri-urban and rural area, Data Br 23 (2019) 103804 https://doi.org/10.1016/j.dib.2019.103804.