BHUMI: Jurnal Agraria dan Pertanahan *ISSN: 2442-6954*
Volume 9, Number 1, May 2023 *e-ISSN: 2580-2151*

Doi: https://doi.org/10.31292/bhumi.v9i1.600

Validity and Reliability of Cadastral Map for Complete Systematic Land Registration in Kalisari and Tlogopandogan Villages, Demak Regency, Indonesia

Tanjung Nugroho
Sekolah Tinggi Pertanahan Nasional, Yogyakarta, Indonesia
Jl. Tata Bhumi No 5, Banyuraden, Gamping, Sleman, Indonesia
Corresponding Author: tj.groho@stpn

Receieved 9, 2022; Reviewed: November 30, 2022; Accepted: May 25, 2023.

Abstract: PTSL is a national strategic program aimed at achieving complete land certification in Indonesia. Starting in 2017, it is expected that by the end of 2024, all land parcels will be registered, and a reliable land information system will be established for public services. One of the key components in realizing a reliable land information system is the development of a valid and reliable cadastral map. This study aims to assess the validity and reliability of the cadastral maps created under the PTSL program in Kalisari village and Tlogopandogan village of Demak Regency. The research method employed in this study is a descriptive method based on a quantitative approach. The study is conducted in two PTSL villages, namely Kalisari and Tlogopandogan. PTSL implementation in Kalisari started in 2018, before the issuance of the Complete Systematic Land Registration regulation for the Regency/City in 2019. On the other hand, PTSL implementation in Tlogopandogan commenced in 2020. The validity of cadastral map content was analyzed using Pearson's correlation technique. The reliability of the map was tested using the Cronbach's alpha technique. In general, the findings revealed that the level of validity and reliability of the cadastral map in Kalisari village was assessed as low or less reliable, while the cadastral map in Tlogopandogan village received a high rating in terms of validity and reliability. The high validity and reliability of the cadastral map in Tlogopandogan can be attributed to its adherence to the regulations of the Complete Systematic Land Registration for Regency/City.

Keywords: PTSL, Complete Systematic Land Registration regulations for Regency/City, validity and reliability of cadastral maps

INTRODUCTION

Land registration aims to ensure legal certainty for land rights holders and establish an efficient land administration system, including a comprehensive land information system that facilitates various public services on a daily basis. This land public service is expected to contribute to the development of an inclusive economy within the community.

As of the end of 2016, out of the 126 million land parcels spread across Indonesia, only 46 million were registered and certified. Considering this achievement as unsatisfactory, the government, through the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN), initiated the Complete Systematic Land Registration (PTSL) program to expedite the process of land registration. The target is to have all land parcels in every region of Indonesia registered by 2025. PTSL was initiated in 2017 with a target of

5 million land parcels, followed by a target of 7 million land parcels in 2018, 9 million land parcels in 2019, and 10 million land parcels in 2020 (Wahyudi, E 2020). The target for land registration is set to increase in the subsequent years. During the national working meeting of the Ministry of ATR/BPN in 2022 (Rakernas 2022) on July 26, 2022, the Minister of Agrarian Affairs and Spatial Planning/ the Head of National Land Agency announced that land certification had been achieved in 74.6% of the total 126 million land parcels in Indonesia.

Land data from land registration activities, including PTSL, are collected and stored in a database within the Computerized Land Activities (KKP) system. The data include spatial data of land parcels and textual data. In order to establish a robust land information system, it is essential that both types of data are of high quality and undergo thorough validation. The spatial representation of land parcel data is manifested in the form of a cadastral map, which delineates the boundaries of land ownership parcels. The cadastral map, known as the Parcel Boundaries Map (PBT), is stored in digital format, along with textual data/attributes, within the KKP system.

According to Law Number 4 of 2011 concerning Geospatial Information, cadastral maps (PBT) are classified as thematic maps. Thematic maps present data or information on a particular concept/theme (Subagio, 2003). On the cadastral map, the data/information presented is directly associated with the land parcel. Upon reviewing the accuracy of spatial data for land parcels listed on the current cadastral map, it is observed that not all fields are deemed reliable and properly linked to the KKP system. During the national working meeting in 2022, it was reported that approximately 15.7 million land parcels have not been successfully mapped. Furthermore, the issue of overlap/gaps between neighboring land parcels, inaccuracies in mapping land parcels, and discrepancies between the spatial data on cadastral maps and other land registration documents are significant challenges that need to be addressed. These challenges have resulted in the inability of cadastral maps in numerous areas to function as spatial data in establishing a reliable land information system. Consequently, they are considered unreliable as a fundamental infrastructure that is relied upon in the development process.

The Ministry of ATR/BPN has taken significant steps to enhance the quality of land parcel data, with a particular focus on addressing the problems regarding cadastral maps (PBT) and validating all land data. These efforts include the implementation of Complete Systematic Land Registration regulations for Regencies/Cities in 2019. The regulation stipulates that PTSL encompasses all land parcels, including those that have already been registered, in order to enhance the overall quality of land data (Hardiyanti, R 2020). In this Complete Systematic Land Registration activity, it is not only crucial to accurately map all land parcels, but also to "adjust" village administrative boundaries. This adjustment is done in accordance with agreements between villages/sub-districts and through the involvement

of Village Apparatuses from neighboring villages. Subsequently, the determination of village boundaries will be undertaken by the Regional Government. Consequently, the Complete Regency/City will comprise Complete Villages/Subdistricts.

Prior to the cadastral mapping activity, a survey of cadastral measurements was conducted as a preliminary step. Cadastral measurement surveys are distinct and specialized activities, differing from other surveys that solely rely on measurement and mapping theories and techniques. The survey of cadastral measurements is based on a juridical fact, which requires the agreement of the interested parties, namely the owners and neighboring land parcel owners, regarding the boundaries of the respective fields. Based on the agreement and establishment of these boundaries, the process of boundary determination and cadastral measurement of land parcels is conducted. During the measurement of land parcel boundaries, the surveyor prepares a measurement document known as a Measurement Document (GU). The recorded measurements serve as technical data for the creation of cadastral maps (PBT) and can be utilized to calculate the area of the land parcel and generate a Measurement Letter (SU).

In the process of creating digital cadastral maps, as mentioned earlier, there are still significant challenges that are apparent in the electronic Land Sector Map (KKP). Cadastral maps in the KKP system still exhibit issues such as overlapping land parcels and gaps. This problem arises due to various factors, including the process of transitioning from analog maps to digital maps, sporadic measurement of land parcels in the past, the use of non-standardized measurement methods and boundaries, as well as insufficient or incomplete survey metadata. As a result, the accuracy and quality of land parcel data obtained from sporadic land registration are compromised (NSPK Peningkatan Kualitas Data Spasial Bidang Tanah dengan *Block Adjustment*, 2022). These issues will inevitably impact the validity and reliability of the cadastral map.

The objective of this study is to assess the validity and reliability of PTSL cadastral maps created prior to the implementation of the 2019 Complete Systematic Land Registration regulation compared to those created afterward. Several quantitative studies have been conducted to evaluate the quality of cadastral maps. First, in the thesis by Kariyono (2018), the quality of spatial data in land parcel information maps resulting from participatory mapping conducted by the community was evaluated. Comparative size data was used as a reference to assess the quality of participatory cadastral maps. Secondly, in his paper, Nugroho, R (2020) conducted a test to evaluate the quality of spatial data on land parcels in Pangkahan village, Klaten Regency, focusing on the improvements made to cluster 4 (K4) in the GeoKKP system. Both studies employed field measurement comparison techniques to test the spatial accuracy of the position, side distance, shape, and area of land parcels on cadastral maps, aiming to validate the cadastral map spatial data. This study differs in terms of evaluating cadastral maps based on research objectives,

research methods, non-spatial analysis techniques, research locations, and the data derived from land registration documents used to analyze the validity and reliability of cadastral maps.

Black and Van Nederpelt (2020) defined data validity as the extent to which data values align with their respective domain. This validity test of cadastral maps is conducted to evaluate the accuracy and validity of land parcels depicted on the cadastral map in comparison to the corresponding information found in land registration documents, namely GU (Measurement Drawing) and SU (Measurement Letter), which hold evidential value. According to Nurwiyanti (2021), the implementation of certificate checking through an electronic system has made the validity of the checking results dependent on the data information contained within the application system. However, it is frequently observed that the data information provided in the ATR/BPN application differs from the data on the original physical certificate. This issue ultimately leads to a lack of legal certainty and renders the information on land activities invalid.

The ISO 19152 Geographic Information-Land Administration Domain Model (LADM) specifies a reference model that encompasses the fundamental components of land-related data, including those pertaining to water and soil, as well as elements below and above the Earth's surface. According to the Complete Systematic Land Registration Technical Guidelines for Regencies/Cities (2019), land parcel data on the cadastral maps is considered valid if it satisfies the correct aspects of relative position, location, shape, and area of the land parcels, and if there are no gaps or overlaps with neighboring fields. The variables chosen for this study include the relative position, location, shape, and area of land parcels, as well as the presence or absence of gaps and overlaps, in accordance with the Technical Guidelines.

ISO 19157 establishes the elements of spatial data quality, which include completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy, and usability. Annex E of ISO 19157 states that the reliability of a cadastral map is assessed based on its positional accuracy. This study examines the cadastral map not only in terms of positional accuracy, but also considers the location, shape, area of land parcels, and the presence of gaps/overlaps between neighboring fields, as specified in the Complete Systematic Land Registration Technical Guidelines for Regencies/Cities in 2019. Monte Carlo (2023) states that data reliability refers to the level of trustworthiness in terms of data completeness and accuracy. Meanwhile, Eurostat (2015) as cited in Black and Van Nederpelt (2020) defines reliability as the degree of similarity or closeness between the original data and the corresponding subsequent data. Data reliability is an essential foundation for establishing data trustworthiness across organizations and institutions. The reliability test of the cadastral map aims to ensure that the information provided by the map regarding land parcels is consistent with the spatial data mentioned in the land registration

document. This applies to both the archived hardcopy documents and the electronic data in the KKP system.

METHODS

The descriptive method with a quantitative approach is employed to evaluate the validity and reliability of the cadastral maps (PBT) of Kalisari village, Sayung sub-district (PTSL 2018 products), and Tlogopandogan village (PTSL 2020 products). The cadastral maps in both villages have differences in the formulation of the rule. The Kalisari cadastral maps were created before the implementation of the Complete Systematic Land Registration regulation for Regencies/Cities in 2019, while the Tlogopandogan cadastral maps were made following these regulations.

Cadastral maps are the product of measuring land parcels. Land parcels have spatial entities in the form of location, shape, and area, which can be measured and studied to evaluate the cadastral map. The study involves testing these three entities of the land parcels. The three entities that constitute the content of land parcels on the cadastral map are the results of surveys, field measurements, and data processing documented in land registration records.

Proofread: The spatial entities that constitute the content of land parcels on the tested cadastral map are extracted from the KKP database system of the Demak Regency Land Office (Kantah). The reference data used to test these entities are obtained from land registration documents, specifically, the GU and SU, which hold evidential value and are stored in the Kantah. A total of 30 soil field samples were randomly collected in each village for data collection purposes. Some of the variables used to test the validity and reliability of cadastral maps in this study include: a) the administrative location of land parcels; b) the relative location of land parcels; c) the shape of land parcels; d) the area of land parcels; and e) the presence of any gap/overlap issues with neighboring fields

In the validity test of cadastral map content, a content is considered valid if it receives strong support based on the total score. The scores assigned to each content item contribute to the overall total score, which can be either high or low. A content item is considered to have high validity if its score is consistent with the total score. This parallelistic is assessed through correlation analysis, where correlation techniques are employed to determine the validity of the content. The technique utilized in this study to assess the validity of the content on the cadastral map in relation to the reference data from GU/SU is the product-moment correlation technique, as proposed by Pearson (UNDIP, 2018):

$$r_{xy} = \frac{N.\Sigma xy - (\Sigma x).(\Sigma y)}{\sqrt{(N.\Sigma x^2 - (\Sigma x)^2).\sqrt{(N.\Sigma y^2 - (\Sigma y)^2)}}} \quad \dots (1)$$

Description:

r_{xy} = correlation coefficient of variables X and Y (validity score)
N = the number of samples
Σxy = the number of multiples of variables X and Y
Σx^2 = sum of the squares of X
Σy^2 = the sum of the squares of Y
$(\Sigma x)^2$ = squared sum of X values
$(\Sigma y)^2$ = squared sum of Y values

The objective scoring of the ground field for cadastral map content is assigned a value of 1 for correct content and 0 for incorrect content. The total score is then calculated as the sum of the scores for all content, which determines the validity of the cadastral map. When applying the correlation formula mentioned above, for instance, to calculate the validity of the land parcel area on the cadastral map, the content score of the field area is denoted as variable X, and the total score is denoted as variable Y.

The correlation coefficient always has a value between -1 and +1. A negative coefficient indicates an inverse relationship, while a positive coefficient indicates a direct relationship or slope. The interpretation of the magnitude of the product moment coefficient to assess the level of validity of cadastral map content is carried out by considering the value of r_{xy} using the following criteria:

- between 0.800 to 1.000 considered as high validity;
- between 0.600 to 0.799, considered as moderately high validity;
- between 0.400 to 0.599 considered as moderate validity (not enough);
- between 0.200 to 0.399 considered as low validity;
- between 0.000 and 0.199, considered as very low validity.

The next test is the reliability test of the cadastral map. The reliability test refers to the assessment of whether the cadastral map can be trusted as a reliable instrument or medium to accurately represent the content of land parcels, consistently matching the spatial information in the land registration documents, such as GU and SU, which carry legal validity. The empirical reliability test is demonstrated by the reliability coefficient (α_{xx}) value, also known as Cronbach's Alpha coefficient (UNDIP, 2018):

$$\alpha_{xx} = \frac{n/(n-1)}{1 - \Sigma\sigma^2/\sigma_t^2} \quad \dots (2)$$

description:

α_{xx} = reliability coefficient
n = number of contents tested
$\Sigma\sigma^2$ = the number of variants of each content
σ_t^2 = total variance

The reliability coefficient is always between 0 and 1. High reliability is indicated by the value of α_{xx} close to the number 1. Reliability is considered satisfactory if $\alpha_{xx} \geq 0.800$. This indicates that cadastral maps are reliable and consistently demonstrate strong reliability on a global scale. To assess the reliability of the cadastral map, the value of α_{xx} is considered according to the following criteria:

- ≥ 0.900 considered as very strong reliability;
- between 0.800 – 0.899 considered as high/strong reliability;
- between 0.700 – 0.799 considered as sufficient reliability;
- between 0.600 – 0.699 considered insufficient reliability;
- between 0.500 – 0.599 considered as low reliability;
- < 0.500 considered as not reliable.

RESULTS AND DISCUSSION

Cadastral Map Validity

The validity of the cadastral map can be proven by the suitability of its content with the land registration document, otherwise known as the content validity test. Validity states the degree of accuracy of a content/variable on the cadastral map to the content/variable in the existing land registration document. The validity test assesses the degree of alignment between the content on the cadastral map and the corresponding content of the land registration document. A content on a cadastral map is considered to have high validity if it accurately reflects the information documented in the land registration process, specifically GU and SU. The following is a validity test of the cadastral map content for Kalisari village and Tlogopandogan village.

Validity of the Cadastral Map in Kalisari Village

From the random sampling of 30 land parcels from the cadastral map (PBT) of Kalisari Village and the corresponding GU and SU documents, the data can be observed in Appendix 1. Furthermore, the data is converted into a score value. A value of 1 is assigned if there is corresponding data or falls within the tolerance, indicating correctness. On the other hand, a value of 0 is assigned if the data is inappropriate, outside the tolerance, or judged as incorrect. The grading for the 6 items of cadastral map content tested for validity is as follows:

1) If the land parcel on the cadastral map is defined as located within the administrative boundaries of the village in question, it is given a value of 1. If the location is not clearly defined, it is given a value of 0.
2) If the land parcel on the cadastral map is defined relative to its neighboring parcels as the same as the GU and/or SU documents, it is given a value of 1. If it is not the same, it is given a value of 0.

3) If the number of land parcels on the cadastral map is the same as in the GU and SU documents, it is given a value of 1. If it is not the same, it is given a value of 0.
4) If the area of land on the cadastral map can be determined with GU data and the area meets the 5% tolerance as outlined by the Complete Systematic Land Registration for Regency/City in 2019, it is given a value of 1. If it is not the same, it is given a value of 0.
5) A value of 1 is assigned if the deviation in land area between the cadastral map and SU data is within a 5% threshold or if there is no difference at all. If the difference exceeds 5%, a value of 0 is assigned.
6) If there is no overlap or *gap* on the land parcel depicted on the cadastral map, a value of 1 is assigned. If there is an overlap or gap on the land parcel depicted on the cadastral map, a value of 0 is assigned.

Table 1. presents the data scores for Kalisari Village used for the analysis of content validity and reliability of cadastral maps.

Table 1. Kalisari Village Data Score Value

No	Administrative location	Relative Location	Shape GU/SU	Area GU	Area SU	Gap/ Overlap	Total
1	1	1	1	0	1	0	4
2	1	0	1	0	1	0	3
3	1	0	1	0	1	0	3
4	1	1	1	0	1	0	4
5	1	0	1	0	1	0	3
6	1	1	1	0	1	1	5
7	0	0	1	0	1	0	2
8	1	1	1	0	1	1	5
9	1	1	1	0	1	0	4
10	1	1	1	0	1	0	4
11	1	1	1	0	1	1	5
12	1	0	1	0	1	1	4
13	1	1	1	0	1	0	4
14	1	1	1	0	1	1	5
15	0	1	1	0	1	1	4
16	1	0	1	0	1	0	3
17	1	0	1	0	1	0	3
18	0	0	1	0	1	0	2
19	1	0	1	0	1	1	4
20	1	0	1	0	1	1	4
21	0	0	1	0	1	1	3
22	1	0	1	1	1	0	4
23	1	0	1	0	1	0	3
24	1	0	1	0	1	1	4
25	1	1	1	0	1	1	5
26	1	0	1	0	1	0	3
27	1	1	1	0	1	1	5
28	1	0	1	0	1	1	4
29	1	0	0	0	0	0	1

30	0	0	0	0	0	0	0

Source: Research Data Processing (2022)

The calculation of the validity test using equation (1) for the content of the location of the land plots in Kalisari village, including the relative location of the parcels to neighboring plots, the suitability of the plot shape to the shape in GU/SU, the suitability of the plot area to the area in GU, the suitability of the plot area to the area in SU, and whether there is overlapping of fields with their neighbors, is presented in Table 2.

Table 2. Validity Test Results of Kalisari Village Cadastral Map Content

No	Tested Cadastral Map Content	Validity Score	Category
1	Location of land parcel in the village	0.631	moderately high
2	The relative location of the land parcel to the neighboring parcels	0.678	moderately high
3	Suitability of the land parcel shape with GU/SU	0.888	high
4	Conformity of Area with GU	0.077	very low
5	Conformity of Area with SU	0.888	high
6	Whether or not there is an overlap or *gap*	0.642	moderately high

Source: Research Data Processing (2022)

The validity score of the content of land parcels on the Kalisari village cadastral map is 0.631, indicating that the location of land parcels in Kalisari as listed on the cadastral map has a moderately high level of validity. The relatively high validity of the administrative content of Kalisari village land parcels can be explained by the fact that during the PTSL process in 2018, there was no clear determination and affirmation of the administrative boundaries of Kalisari village with adjacent villages. As a result, the land parcels on the cadastral map along the village border are less clearly defined. However, the doubt or ambiguity regarding the location of the land parcels in this village is not significant. It mainly concerns the land parcels located close to the village's administrative boundaries. Therefore, overall, the validity of the cadastral map in Kalisari village is still relatively high, as indicated by the results of the statistical test mentioned above.

The content validity score of the relative location of land parcels to neighboring land parcels on the Kalisari cadastral map, which is 0.678, indicates that the representation of the relative location of land parcels to neighboring land parcels in Kalisari, as shown on the cadastral map, has a relatively high level of validity. This can be attributed to the utilization of Basic Maps, which consist of satellite images with a resolution of 60 cm. However, due to the incomplete and non-systematic nature of the PTSL measurements in Kalisari Village, there is still a possibility of overlapping or gaps in some land plots on the cadastral map. The validity score of 0.888 for the shape of land parcels on the Kalisari cadastral map indicates a high level of validity. The consistency between the shape of land parcels on the cadastral map and those in the GU and SU documents indicates that the measurements of

the land parcels have been conducted in accordance with the actual shape of the land parcels in the field.

The relatively high validity of the location and shape of the land parcels on the cadastral map in Kalisari village is attributed to the effective planning and execution of work by the Demak Regency Land Office (Kantah). The materials and information on the land parcels were prepared by the Kantah prior to fieldwork. Sourced from the Land and Building Tax Map (PBB), exposure was made to the community at the local Village Office. From this exposure, Kantah receives feedback and corrections regarding the displayed land parcels. Corrections encompass adjustments in terms of the land parcels' relative location, shape, and ownership. With these corrections, the relative location of land parcels on the working map has become more aligned with the actual situation in the field.

The validity score of the land area content on the cadastral map, compared to the area based on GU, is 0.077, indicating very low validity. If the r-table is referred to (with degrees of freedom = 30-2 and a significance level of 5%) of 0.3061, it can be observed that 0.187 < 0.3061. This indicates that the land area listed on the cadastral map exhibits very low accuracy when compared to the area in the GU of Kalisari village. This very low validity is closely related to the methodology used for field measurements. The measurement methods used, which rely on terrestrial methods with measuring tape equipment and only consider the sides of the plane without considering the diagonals or conducting auxiliary measurements, result in incomplete data that cannot directly correspond to the information in the GU. The following Figure 1 is an example of GU where the majority of land parcels are only measured for their side distances.

Figure 1. Illustration of Village PTSL product measurement
Source: Demak Regency Land Office

The area of the field is then determined based on the shape of the field, which is actually not a precise representation of the actual field. The area of the field is then determined based on the shape of the field, which is actually not a precise representation of the actual field.

From the depiction of fields that are no longer valid, the field area is derived using the broad calculation facility from the depiction software.

The validity test conducted on the suitability of the land area content on the Kalisari cadastral map with the field area in the SU document resulted in a validity score of 0.888, indicating high validity. The cadastral area data on the PTSL product cadastral map is consistent with the field area in SU because the land area is calculated based on this cadastral map before being recorded in SU. However, for land parcels that were certified before PTSL, there may be differences in field area between the cadastral map and SU map. Although the differences are not significant, there are cases where the differences in area exceed the 5% tolerance limit. This significant difference of more than 5% is commonly referred to as a "wide anomaly" in the process of creating a "Complete Village."

The validity test on the content, specifically related to the presence of overlapping fields and gap issues, resulted in a score of 0.662, indicating sufficient validity (not high). This can be explained by the fact that despite the implementation of PTSL, the cadastral mapping in Kalisari is still incomplete, with many areas of land that have not been measured and mapped. PTSL in Kalisari Village, which was conducted in 2018, was not implemented systematically and comprehensively. Many land parcels in Kalisari Village are not accurately georeferenced, leading to significant issues on the cadastral maps, including overlapping and gaps between neighboring land parcels. These problems can be observed in various areas.

Validity of the Cadastral Map in Tlogopandogan Village

As in Tlogopandogan village, data sampling was conducted randomly on 30 land plots. Sample data of 30 land plots from the cadastral map (PBT) of Tlogopandogan village and the corresponding GU and SU documents can be found in Appendix 2. Furthermore, the data is converted into score values (Table 3), which will be used for the analysis of the validity and reliability of the cadastral map.

Table 3. Tlogopandogan Village Data Score Value

No	Administrative Location	Relative Location	Shape GU/SU	GU Area	SU Area	Gap/ Overlap	Total
1	0	0	0	0	0	0	0
2	1	1	1	0	1	1	5
3	1	1	1	0	1	1	5
4	1	0	1	0	1	1	3
5	1	1	1	0	1	1	5
6	1	1	1	0	1	1	5
7	1	1	1	0	1	1	5
8	1	1	1	0	1	1	5
9	1	1	1	0	1	1	5
10	1	1	1	0	1	1	5
11	1	1	1	0	1	1	5
12	1	1	1	0	1	1	5
13	1	1	1	0	1	1	5
14	1	1	1	0	1	1	5
15	1	1	1	0	1	1	5
16	1	1	1	0	1	1	5
17	1	1	1	0	1	1	5
18	1	1	1	0	1	1	5
19	1	1	1	1	1	1	6
20	1	1	1	0	1	1	5
21	1	1	1	0	1	1	5
22	1	1	1	0	1	1	5
23	1	1	1	0	1	1	5
24	1	1	1	0	1	1	5
25	1	1	1	0	1	1	5
26	1	1	1	0	1	1	5
27	1	1	1	0	1	1	5
28	1	1	1	0	1	1	5
29	1	1	1	0	1	1	5
30	1	1	1	0	1	1	5

Source: Research Data Processing (2022)

The results of the validity test calculation using equation (1) for the content of the land parcel located in Tlogopandogan village, including the relative location of the parcels to neighboring parcels, the suitability of the parcel shape to the shape in GU/SU, the suitability of the parcel area to the area in GU, the suitability of the parcel area to the area in SU, and the presence of overlap or *gap* in the cadastral parcels are presented in Table 4.

Table 4. Validity Test Results of Tlogopandogan Village Cadastral Map

No	Tested Cadastral Map Content	Validity Score	Category
1	Location of land parcel in the village	0.930	very high
2	The relative location of the land parcel to the neighboring parcels	0.792	high
3	Suitability of the land parcel shape with GU/SU	0.930	very high
4	Conformity of Area with GU	0.375	low
5	Conformity of Area with SU	0.930	very high
6	Whether or not there is an overlap or *gap*	0.930	very high

Source: Research Data Processing (2022)

In Table 4, it can be observed that the validity score of the land parcel administration content on the Tlogopandogan cadastral map is 0.930, indicating a very high level of validity. Tlogopandogan Village, which has been recognized as a 'Desa Lengkap (Integrated Village)' in 2021, has undergone the process of establishing and affirming its administrative boundaries with neighboring villages, as outlined in the Regulation of the Head of the Geospatial Information Agency Number 15 of 2019. With the village's administrative boundaries clearly defined and affirmed in the field through a legal process, the location of the land parcels within the village has also been determined. However, there is still one land parcel that remains undefined, as the cadastral data does not specify the location of the plot of land within a specific village. Certainly, this is an administrative error, and therefore the data needs to be corrected.

The content validity score of the relative location of the land parcels on the cadastral map, which is 0.792, indicates a high level of validity. The results of testing the relative location of land parcels on the cadastral map to GU documents demonstrate the consistency of the boundaries of the land parcels on the cadastral map with the previously established GU documents. These GU documents serve as reference data to assess the location of the land parcels in relation to neighboring land parcels. This conformity must be strictly adhered to as it pertains to the establishment of boundaries rather than individual land parcels. If these conditions are not met, it indicates an inconsistency in defining the boundaries of the land parcels with neighboring ones.

The validity score of the land parcels on the Tlogopandogan cadastral map, which is 0.930, indicates a very high level of validity. The high validity of the relative location and the very high validity of the shape of the land parcels can be attributed to the disclosure of information on the land parcels sourced from the Land and Building Tax Map prior to the implementation of PTSL. As in Kalisari village, input in the form of corrections from the community of PTSL participants regarding their land parcels was received through the exposure process.

The validity test results for the conformity of land area content on the cadastral map to the land area based on GU, as presented in Table 4 above, obtained a validity score of 0.375. This indicates that the land area on the Tlogopandogan cadastral map has low validity when compared to the GU documents. GU documents, which are supposed to provide authentic measurement data and serve as the basis for mapping and calculating field area, are not supported by reliable measurement data. The land parcels listed in the GU are typically measured only in terms of the side distances, as shown in Figure 2.

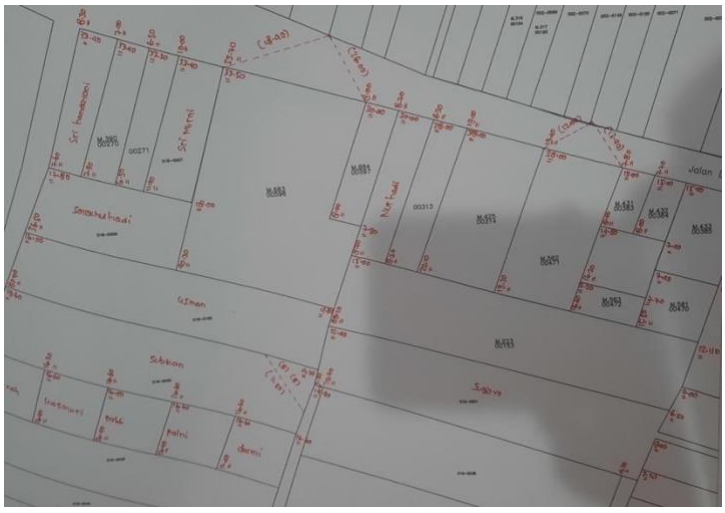

Figure 2. Sample image of Tlogopandogan Village PTSL product measurement
Source: Demak Regency Land Office

From the GU, the land parcels and their areas are determined based on the descriptions of the parcels, resulting in an area that is not precisely defined. The method used to determine the field area in this manner introduces uncertainty regarding the position of the field boundaries, as they are not directly tied to a reference point. Consequently, the cadastral map reflects an uncertain value for the field area. In other words, the measurement data, obtained with the assistance of field drawings, cannot be reliably used to calculate the field area because it leads to undefined values.

The validity score for the conformity of the field area content on the Tlogopandogan cadastral map with the SU data as a reference is 0.930, indicating a high level of validity. This indicates that the land area on the Tlogopandogan cadastral map has very high validity when compared to the SU documents as a reference. This can be explained by the fact that for land parcels that have been issued certificates before PTSL, the majority of fields in SU have a difference of less than 5% compared to the results of calculations based on PTSL measurements. In order for Tlogopandogan village to be officially recognized as a fully established village, the land parcels are required to adhere to a tolerance difference of 5% with the field area data recorded in SU. As for the land parcels that were measured during the PTSL process, the field area recorded in SU must be consistent with the field area depicted on the cadastral map.

The validity test of the cadastral map regarding the presence of land parcel overlaps and gap issues resulted in a score of 0.930, indicating a very high level of validity. This can be explained that PTSL in Tolopandogan Village has been systematically implemented, covering all land parcels in the village, resulting in complete cadastral measurements and mapping. In implementing PTSL, efforts are made not only to conduct measurement and mapping on uncertified land parcels but also to enhance the quality of land data, including spatial data quality, in order to achieve the goal of a "Desa Lengkap (Integrated Village)" as mandated by the Complete Systematic Land Registration Regulations for Regencies/Cities (2019). Thus, issues related to overlaps and gaps between neighboring land parcels on cadastral maps are minimized.

Cadastral Map Reliability

The reliability test using Cronbach's Alpha on the Kalisari and Tlogopandogan cadastral maps, considering variables such as field administration location, relative location, shape, GU area, SU field area, and the presence of overlap or gap, is presented in Table 5.

Table 5. Cadastral Map Reliability Test Results

No	Cadastral Map	Reliability Score	Category
1	Kalisari Village	0.520	low
2	Tlogopandogan Village	0.847	high

Source: Research Data Processing (2022)

Table 5 indicates that the reliability score of the Kalisari village cadastral map is 0.520. This indicates that the reliability of the Kalisari village cadastral map PTSL products in 2018 (prior to the issuance of Complete Systematic Land Registration regulations for Districts/Cities) falls into the low category. When referring to the Alpha Cronbach test table, which is 0.361, the calculated α is still greater than the table α. Therefore, despite its low reliability, the cadastral map of Kalisari village can still be used to provide information on some of the registered land parcels.

Meanwhile, the reliability score of the Tlogopandogan village cadastral map PTSL products in 2020 is 0.847. This indicates that the reliability of cadastral maps made with a systematic approach and data quality improvement, following the Complete Systematic Land Registration regulations for Districts/Cities, is in the high or good category. If referred to the Alpha Cronbach test table with a value of 0.361, α calculated >> α table, indicating that the cadastral map of Tlogopandogan village can be considered reliable for providing information about land parcels.

CONCLUSION

The validity of the Kalisari village cadastral map, which is a product of the PTSL in Sayung sub-district in 2018, is generally categorized as insufficient. This low level of validity leads to a low reliability of Kalisari cadastral maps in providing information about land parcels. The lack of high validity and reliability in this cadastral map is due to the lack of systematic implementation of PTSL, which does not cover the entire village area. The sporadic implementation of PTSL, focusing only on unregistered land parcels, without accompanying improvements in the quality of spatial data for previously registered land parcels, has led to problems on the cadastral map.

In general, the cadastral map of Tlogopandogan village in the Gajah sub-district, which was created through PTSL in 2020, demonstrates a high level of validity. The significant content validity of the cadastral maps in Tlogopandogan village has a positive influence on their reliability, thereby establishing them as dependable source of information regarding land parcels. The high validity and reliability of the cadastral map of Tlogopandogan village can be attributed to the systematic implementation of PTSL, which involved the comprehensive re-measurement of all land parcels, including both unregistered and certified ones. Spatial data quality improvement is implemented specifically for certified land parcels, aiming to minimize potential issues during the cadastral map creation process.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are suggested:

1. The validity of the cadastral map (PBT) depends on its conformity with the spatial data of land parcels as specified in the land registration document, which carries substantial evidential value. Therefore, it is crucial to enhance or improve the quality of spatial data for non-conforming land parcels.
2. PTSL should adhere to the regulations set forth in the Complete Systematic Land Registration for Regencies/Cities in 2019. Cadastral maps that have been created without adhering to the regulations need to be revised and their data quality improved.
3. The Ministry of ATR/BPN can utilize Pearson correlation techniques and Alpha-Cronbach techniques for *quality control* (QC) in the production of land parcel maps (PBT).

REFERENCES

Artika, I.G.K. & Utami, W. (2020). Percepatan pembenahan data bidang tanah kluster 4 melalui survei data pertanahan, *Bhumi*:*Jurnal Agraria dan Pertanahan*, 5 (1), May.

Black, A. & Van Nederpelt, P. (2020). *Dimension of data quality*, DAMA NL Foundation.

Carlo, M. (2023) Data observability: What is data reliability?. Accessed May 21 2023 from https://montecarlo.data.com.html.

Darma, B. (2021). *Statistika penelitian menggunakan SPSS (Uji validitas, uji reliabilitas, regresi linier, uji t, uji F, R2)*, Regular Edition, Guepedia, Bogor.

Geospatial Information Agency. (2011). *Undang-Undang Nomor 4 Tahun 2011 Tentang Informasi Geospasial*, Bogor.

Geospatial Information Agency. (2019). *Peraturan Kepala Badan Informasi Geospasial Nomor 15 Tahun 2019 tentang Metode Kartometrik pada Penetapan dan Penegasan Batas Desa/Kelurahan*, Bogor.

Hardiyanti, R (2020). *Peningkatan kualitas data spasial (KW 4, 5, 6) di Kantor Pertanahan Kabupaten Bantul: Studi di Desa Seloharjo dan Girirejo* (Undergraduate Thesis STPN), Yogyakarta.

ISO (2012) *ISO 19152 Information geographic – Land administration domain model (LADM)*, ISO. Switzerland.

Kariyono. (2018). *Evaluasi kualitas data spasial peta informasi bidang tanah desa/kelurahan lengkap hasil pemetaan partisipatif'* (Thesis, UGM), Yogyakarta.

Konsultan Patrastatistika. (2021). *Apa itu uji validitas dan reliabilitas? Begini penjelasannya.* Accessed August 2022 from www.patrastatistika.com.

Kusmiarto. (2017). *Problematika Pembenahan Data Spasial Bidang Tanah di Kementerian Agraria dan Tata Ruang/Badan Pertanahan Nasional*, Prosiding Seminar: Problematika Pertanahan dan Strategi Penyelesaiannya, 87 Sekolah Tinggi Pertanahan Nasional dan Pusat Studi Hukum Agraria - Fakultas Hukum Universitas Trisakti, Jakarta.

Larsson, G. (1991). *Land Registration and Cadatral Systems: Tools for Land Information and Management*, Reprinted 1996, Longman Group, UK.

Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) (1997) *Peraturan Pemerintah Nomor 24 Tahun 1997 tentang Pendaftaran Tanah*, Jakarta.

Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) (1997) *Petunjuk Teknis Peraturan Menteri Negara Agraria/Kepala Badan Pertanahan Nasional Nomor 3 Tahun 1997: Materi Pengukuran dan Pemetaan Pendaftaran Tanah*, Jakarta.

Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) (2018) *Petunjuk Teknis Pendaftaran Tanah Sistematik Lengkap 2018*, Jakarta.

Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) (2019) *Petunjuk teknis pendaftaran tanah lengkap untuk Kota/Kabupaten*, Jakarta.

Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) (2020) *Petunjuk teknis pendaftaran tanah sistematik lengkap 2020*, Jakarta.

Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN). (2022). *NSPK peningkatan kualitas data spasial bidang tanah dengan Block Adjustment*, Jakarta.

Ministry of Internal Affairs. (2016). *Peraturan Menteri Dalam Negeri Nomor 45 Tahun 2016 tentang Pedoman Penetapan dan Penegasan Batas Desa*, Jakarta.

National Standarization Agency of Indonesia. (2015). *Informasi Geografis – Kualitas Data (SNI: ISO 19157: 2013, IDT)*, BSN, Jakarta.

Nugroho, R. (2020). *Uji kualitas data spasial peta bidang tanah hasil peningkatan kluster 4 (K4) pada sistem GeoKKP di Kantor Pertanahan Kabupaten Klaten: Studi di Desa Pakahan, Kecamatan Jogonalan* (Undergraduate Thesis), Yogyakarta.

Nurwiyanti, D. (2021). Keabsahan validitas data hasil pengecekan sertipikat elektronik dan pengecekan langsung, *Otentik's: Jurnal Hukum Kenotariatan*, 3(2), July, p-ISSN 2655-5131 e-ISSN 2685-3612.

Parsaulian, A.P. & Sudjito. (2019). Masalah tumpang tindih sertipikat hak milik atas tanah di Kota Banjarbaru (Putusan Nomor: 24/G/2014/PTUN.BJM), *Bhumi: Jurnal Agraria dan Pertanahan Bhumi*, 5 (1).

Qomariyah, N. (2022). *Upaya penyelesaaian bidang-bidang tanah kluster 4 dalam rangka mempercepat perwujudan kelurahan lengkap di Kantor Pertanahan Kabupaten Cilacap* (Undergraduate Thesis), Yogyakarta.

Sudjana. (1986). *Metode statistika*, 4th Edition, Bandung, Tarsito.

Subagio. (2003). *Pengetahuan Peta*, ITB, Bandung, ITB

Tadu, I. (2021). *Peningkatan kualitas data bidang tanah K4 dari Kw4 – Kw6 Menjadi Kw1 – Kw3 pada PTSL di Kantor ertanahan Kabupaten Sleman*. (Undergraduate Thesis). Yogyakarta.

Teknik Geodesi FTSP-ITB. (1997). *Buku petunjuk penggunaan proyeksi TM-3 dalam pengukuran dan pemetaan kadastral*, Jurusan Teknik Geodesi FTSP-ITB, Bandung.

Universitas Diponegoro. (2018). *Modul uji validitas dan reliabilitas*. Accessed December 1, 2022 from researchgate.net/publication.

Wahyudi, E. (2020). PTSL 2020, BPN Targetkan sertipikasi 10 Juta bidang tanah, Tempo, February 26, 2020.

Wahyuntari, MY. (2020). *Uji akurasi pemetaan bidang tanah dengan mengacu pada peta dasar di Kulonprogo* (Undergraduate Thesis). Yogyakarta.

Appendix

Table 1. Sample Data of Land Parcels in Kalisari Village

No	NIB	No. Rights	SU Year	Village Administration Location	Relative Location		Land Shape		GU/SU Area			Gap / Overlap
					PBT	GU	PBT	GU/SU	PBT	GU	SU	
				relevant/ irrelevant	(Neighboring lands)		(square.total)		(m^2)	(m^2)	(m^2)	
1	00089	M.211	2008	relevant	4	4	5	5	376	?	360	Gap
2	04553	M.19	1990	relevant	0	4	5	5	1,512	?	1,511	Gap
3	02037	M.781	2018	relevant	0	4	4	4	78	?	78	Overlap
4	O3265	M.791	2018	relevant	6	6	4	4	232	?	232	Gap
5	03671	M.851	2018	relevant	0	4	4	4	138	?	138	Overlap
6	02967	M.876	2018	relevant	7	7	4	4	430	?	430	No
7	04089	M.907	2018	irrelevant	0	4	4	4	154	?	154	Overlap
8	02301	M.966	2018	relevant	6	6	7	7	210	?	210	No
9	03190	M.1027	2018	relevant	5	5	4	4	285	?	285	Gap
10	01036	M.1084	2018	relevant	3	3	4	4	155	?	155	Gap
11	01154	M.128	2018	relevant	4	4	4	4	182	?	182	No
12	01788	M.1177	2018	relevant	0	4	6	6	163	?	163	No
13	02156	M.1234	2018	relevant	4	4	4	4	451	?	451	Overlap
14	01329	M.1288	2018	relevant	5	5	4	4	282	?	282	No
15	01460	M.1358	2018	irrelevant	7	7	5	5	352	?	352	No
16	00120	M.287	1993	relevant	0	4	4	4	149	?	149	Gap
17	00500	M.607	2015	relevant	0	5	4	4	173	?	173	Gap
18	01000	M.1012	2018	irrelevant	0	4	4	4	647	?	647	Gap
19	01564	M.2273	2018	relevant	0	5	4	4	319	?	319	No
20	00125	M.248	2008	relevant	0	4	4	4	743	?	743	No
21	00201	M.323	2011	irrelevant	0	4	4	4	97	?	97	No
22	00350	M.486	2014	relevant	0	4	4	4	210	209	209	Gap
23	00355	M.493	2014	relevant	0	4	4	4	227	?	227	Overlap
24	00601	M.696	2018	relevant	0	4	4	4	841	?	841	No
25	01469	M.1548	2018	relevant	3	3	4	4	124	?	124	No
26	00260	M.382	2011	relevant	0	4	4	4	224	?	213	Gap
27	00233	M.355	2011	relevant	7	7	6	6	928	?	904	No
28	00270	M.390	2012	relevant	0	5	4	4	247	?	258	No
29	00242	M.364	2011	relevant	0	6	4	5	248	?	2,230	Overlap
30	03633	M.1723	2018	irrelevant	0	4	0	5	0	?	800	Gap

Source: KKP Data (seen May 23 - June 3, 2022), GU and SU Kantah archives, Demak Regency

Notes: ? = the area of a land parcel in GU cannot be calculated

Table 2. Sample Data of Land Parcels in Tlogopandogan Village

No	NIB	No.Rights	SU Year	Village Administration Location	Relative Location		Land Shape		GU/SU Area			Gap / Overlap
					PBT	GU	PBT	GU/SU	PBT	GU	SU	
				relevant/ irrelevant	(Neighboring lands)		(square.total)		(m^2)	(m^2)	(m^2)	
1	00011	M 1	2009	irrelevant	0	4	4	6	714	?	754	Gap
2	00022	M.18	2010	relevant	4	4	4	4	167	?	181	No
3	00025	M.20	2011	relevant	3	3	4	4	1,198	?	1,155	No
4	00061	M.56	2012	relevant	2	7	6	6	450	?	475	No
5	00089	M.83	2013	relevant	7	7	6	6	2,967	?	3,149	No
6	00097	M.90	2014	relevant	4	4	5	5	1,239	?	1,119	No
7	00099	M.94	2015	relevant	4	4	6	6	1,937	?	1,958	No
8	00118	M.111	2016	relevant	4	4	4	4	130	?	137	No
9	00120	M.114	2017	relevant	3	3	5	5	594	?	606	No
10	00123	M.117	2018	relevant	2	2	4	4	369	?	370	No
11	00127	M.121	2019	relevant	6	6	6	6	344	?	338	No
12	01238	M.166	2020	relevant	3	3	4	4	655	?	655	No
13	01459	M.207	2020	relevant	5	5	6	6	4,433	?	4,433	No
14	00959	M.237	2020	relevant	5	5	6	6	484	?	484	No
15	02857	M.267	2020	relevant	6	6	6	6	392	?	392	No
16	00131	M.278	2020	relevant	5	5	5	5	2,392	?	2,392	No
17	00901	M.290	2020	relevant	4	4	4	4	269	?	269	No
18	01534	M.507	2020	relevant	5	5	4	4	917	?	917	No
19	00886	M.569	2020	relevant	5	5	4	4	342	342	342	No
20	01405	M.619	2020	relevant	4	4	4	4	841	?	841	No
21	01151	M.655	2020	relevant	4	4	4	4	116	?	116	No
22	00301	M.718	2020	relevant	4	4	5	5	257	?	257	No
23	01112	M.778	2020	relevant	6	6	6	6	450	?	450	No
24	01497	M.941	2021	relevant	4	4	4	4	2,494	?	2,494	No
25	01432	P.26	2021	relevant	8	8	4	4	8,721	?	8,721	No
26	00972	W.6	2021	relevant	3	3	4	4	100	?	100	No
27	00848	P.50	2021	relevant	2	2	4	4	193	?	193	No
28	01039	P.51	2021	relevant	7	7	8	8	2,441	?	2,441	No
29	00173	M.1181	2021	relevant	5	5	4	4	205	?	205	No
30	00971	M.1204	2021	relevant	5	5	10	10	777	?	777	No

Source: KKP Data (seen May 23 - June 3, 2022), GU and SU Kantah archives, Demak Regency
Notes: ? = the area of a land parcel in GU cannot be calculated