Utilization of geospatial technology for land use planning and sustainable agricultural mapping in Aceh Province, Indonesia: a case study

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Abstract. Geospatial technology has developed rapidly and is widely used for various purposes related to geographic location. Aceh is one of the provinces in Indonesia as rice producer provinces. Aceh province contributes about 2 million tons of rice every year, with local consumption of about 650,000 tons. However, rice fields to support sustainability agriculture mapping in Aceh province are still not yet well verified. The shift of land use for non-agriculture is alarming; coincidently, spatial planning to meet the demand for agriculture activities for every regency in Aceh is another crucial issue. With this current situation, the use of geospatial technology is an essential tool. This article presents a geospatial technology for land use planning and sustainable agricultural mapping in Aceh Province, Indonesia, as a case study. Geospatial analysis combined with descriptive using existing spatial data supported by ground-truthing was carried out for this study. The result shows that geospatial technology, a combination of remote sensing data, a global positing system, and a Geographic Information tool, can represent comparison results from different data sources obtained from other studies. The result can also verify the existing data of paddy rice field to land use planning and agriculture mapping activities in Aceh Province.

1. Introduction
Spatial planning is an integral part of local, regional, and national development in Indonesia. Indonesia has enacted a regulation to regulate the spatial planning process, namely, regulation number 26, 2007[1]. This regulation guides the provinces and the regencies and cities level Indonesia by adopting its regulation to the local ordinance. One of the efforts in realizing good local, regional, or even national planning is by organizing land use as optimally as possible as set out in the regional spatial planning. However, many land uses are not aligned with the local spatial plan, especially when dealing with land use planning for agriculture. Land use planning is a systematic assessment of the potential of land and alternative land use and socio-economic conditions to select the best use of land to meet
human life needs. Besides, markets and competition in land uses will continue to rise for agricultural production and other purposes. Thus, it needs careful thinking in planning and decision-making to land use planning. Therefore, useful information about physical factors, including the nature and potential of land through land resource evaluation activities, is required [2].

In the last two decades, geospatial technology to map Indonesia has well adopted for spatial and land use planning and sustainability agricultural mapping from national to the local level, shifting the technique from traditional method to geospatial technology application. Geospatial technology has developed rapidly and is widely used for various purposes related to geographic location. Nowadays, there is a large number of geospatial technology applications in use. Organizations, agencies, and companies worldwide use geospatial technology to convert manually produced maps and associated descriptive records into influential digital records [3]. Eighty percent of current information is related to a spatial or geographic component, and research shows that approximately 80% of all public sector decisions are based on geo-referenced data [4]. By definition, all information is related to the location or place of geographical position or spatial data. It can be treated as an entity that can be managed by dizzy geospatial technology. It cannot be denied that the utilization of geospatial data is currently entering an era of not very rapidly, not only limited to utilization to geography, however other fields, especially on the areas related to the utilization of natural resources and territorial. Thus, geospatial technology is a powerful and efficient technique for the long-lasting benefits in land use planning and sustainable development. It can assess, explore, evaluate, analyse, monitor, and manage land use planning, primarily agricultural land use.

Aceh is one of the provinces in Indonesia as a rice producer province in Sumatra. This province contributes about 2 million tons of rice every year, with local consumption of about 650,000 tons [5]. However, rice field area data to support sustainable agriculture practices in Aceh province are still not yet well verified. Even a recorded-data shows that agricultural land for paddy rice fields in Aceh Province reaches 300,808 ha [6], but other recorded statistics show different numbers. Besides, it has been an issue that the shift of land use for non-agriculture is alarming. Coincidently, the need for spatial planning to meet the demand for agriculture activities for every regency in Aceh is another crucial issue. With this condition, the use of geospatial technology is an essential tool. This paper presents a review and utilization of geospatial technology for land use planning and sustainable agricultural mapping in Aceh Province, Indonesia to verify the various studies obtained previously in order to challenge the geospatial technology usefulness.

1.1. Geospatial technology and land use planning
Geospatial technology, or sometimes called geospatial information, has developed rapidly and is widely used for various geographic locations. Geospatial technology is a term used to define the variety of modern tools contributing to the geographic mapping and analysis of the Earth and human societies. These technologies have been evolving since the first maps were drawn in prehistoric times. Some of the widely used Geospatial technologies are the Global Positioning System (GPS), Geographic Information System (GIS), and remote sensing technology. Geospatial technology also has been used for land-use planning as a significant tool for reducing risks from natural hazards, in turn aiding sustainability and increasing resilience [7].

Various geospatial technologies can ease land-use planning and sustainable development [8] by utilizing remote sensing data and GIS. A series of software for mapping and analyzing geo-referenced data on the Earth’s surface is well adopted. GPS satellite network, for example, can give you the exact coordinates of the location to the civil and military users with the proper receiver equipment and internet mapping technologies. Software programs such as Google Earth and web features like Microsoft virtual earth have changed our perception of the world. In many aspects, the concept of Geospatial technology, including in recent development in web-based technology, has been
revolutionary developed in many parts of applications. Figure 1 shows the idea of the geospatial development workflow.

**Figure 1.** Concept geospatial technology workflow.

### 2. Research method

#### 2.1. Location, geospatial data, and spatial analysis

This study was conducted throughout the districts in Aceh Province. Aceh Province is at the very end of Sumatra Island, Indonesia. Aceh province has an area of 5,677,081 Ha. Geographically the study area is located between 06° 58' 37.2" – 06° 04' 33.6" latitude and 94° 57' 57.6" – 98° 17' 13.2" longitude. In this research, some existing geospatial data were utilized to verify the current agricultural land. The spatial planning pattern then is referred to as RTRW, the spatial planning pattern of the district, referred to as RTRW District/Regency, shape file extension (Shp) format file from of the Spatial Planning Board (ATR/BPN), Shp file from Agriculture Services of Aceh Province (Distan Aceh) of 2016/2017 and, the data from the Ministry of Agriculture (Shape file format called as PSP2012 data) were utilized to compare the results of existing data paddy rice field of Aceh Province.

Spatial analysis of existing rice field data using union, called v1 and v2 data, and clip with data criteria or legal aspects with land changes were examined. Spatial analysis was conducted using the area's remote sensing data and then converted to vector-based mapping using geographic information systems. Image analysis was performed with visual classification techniques onscreen to obtain the existing rice field areas. The current rice field data are then overlaid with the union's concept against the spatial planning data called RTRW data and legal licensing land such as regular land use permits such as Business Use Rights / Building Rights (HGU/HGB).

Upon finishing the spatial analysis, the data editing and drawing activities in sustainable agriculture land mapping were conducted by editing and digitizing vector data. Field collection data were carried out twice, namely pre-survey and post-survey. Pre-survey activities aim to analyze data and prepare data for field surveys, such as setting up sample maps of rice fields for surveys. Meanwhile, post-survey activities are more to input and analyze the survey results and edit and digitize data for the final data sustainability agricultural mapping in Aceh Province.
3. Results and discussion

3.1. Land use and functional conversion of land
After conducting the land use/land cover analysis for all Aceh districts, we obtained the land use and land cover of Aceh Province. As shown in Figure 3 and also in Table 1. Table 1 shows that the dominant land use in Aceh Province is forest, counting for more than 47% of Aceh land area, followed by agriculture and shrub. The smallest land use is for the port. This result indicates that even though the dominant land use is forest, recent spatial data show some land-use changes for the entire Aceh region.
Table 1. Land cover/land use of Aceh Province.

| No. | Land Use       | Hectare | Percentage |
|-----|----------------|---------|------------|
| 1   | Water Body     | 52.118  | 0.918      |
| 2   | Forest         | 2.688.950 | 47.365    |
| 3   | Open Land      | 119.476 | 2.105      |
| 4   | Port           | 64      | 0.001      |
| 5   | Estate         | 14,000  | 0.247      |
| 6   | Settlement     | 34,565  | 0.609      |
| 7   | Mining         | 110.653 | 1.949      |
| 8   | Agriculture    | 1,232.835 | 21.716    |
| 9   | Peat swamp     | 71,331  | 1.256      |
| 10  | Rice Field     | 188,525 | 3,321      |
| 11  | Shrub          | 1,027,096 | 18,092    |
| 12  | Pond           | 137,466 | 2,421      |
|     | Total          | 5,677,081 | 5,677,081 |

Figure 3. Land use map of Aceh.

Meanwhile, it has converted functional land use based on data obtained (Figure 4). Table 2 presents that the area of existing rice fields calculated in Aceh Province is 210,507.60 hectares. To get the result of how widespread the conversion of land functions or land-use shift, a comparison among data is considered. If using tabular data, then there is a land conversion of land use of 103,082.77 hectares. If using PSP data reference of 2012, then there has been a land converted up to 95,742.4 hectares. If the reference data from the ATR BPNs, it occurs minus -17,133.53 hectares. This means that the information is corrected according to the latest results. From this study, different land functions were obtained according to the initial reference data.
Figure 4. Different data sources to examine the separate area obtained from field rice mapping, an example of Aceh Besar District.

Table 2. Land use change: a comparison of results among the data sources.

| No. | District        | Tabular (Ha) | PSP 2012 (Ha) | ATR BPN (Ha) | Dislan (ha) | Existing (Ha) |
|-----|-----------------|--------------|---------------|--------------|-------------|---------------|
| 1   | Banda Aceh      | 114          | 82.33         | 79.50        | -           | 27.78         |
| 2   | Aceh Besar      | 31,970       | 24,725.40     | 17,749.85    | 17,198.46   | 24,288.01     |
| 3   | Pidie           | 29,734       | 27,238.42     | 23,975.72    | 25,182.63   | 25,260.64     |
| 4   | Pidie Jaya      | 8,946        | 8,208.65      | 8,358.65     | 8,480.89    | 8,077.33      |
| 5   | Bireuen         | 22,601       | 18,206.89     | 15,064.94    | 15,179.92   | 15,122.27     |
| 6   | Aceh Utara      | 46,000       | 40,951.24     | 36,912.20    | 36,639.14   | 37,454.01     |
| 7   | Lhokseumawe     | 2,070        | 1,757.96      | 1,760.25     | -           | 1,520.95      |
| 8   | Aceh Timur      | 33,073       | 26,842.65     | 18,450.25    | 15,075.10   | 18,112.23     |
| 9   | Langsa          | 1,654        | 1,781.84      | 1,201.22     | -           | 1,161.55      |
| 10  | Aceh Tamiang    | 16,488       | 17,052.47     | 7,757.80     | 7,732.93    | 7,854.62      |
| 11  | Aceh Jaya       | 13,276       | 12,319.34     | 3,945.69     | 5,874.21    | 8,307.85      |
| 12  | Aceh Barat      | 17,582       | 11,858.58     | 8,985.77     | 8,342.28    | 11,392.20     |
| 13  | Nagan Raya      | 15,239       | 18,100.15     | 5,808.62     | 6,879.12    | 5,606.62      |
| 14  | Aceh Barat Daya| 10,289       | 18,680.23     | 7,078.23     | 7,107.18    | 7,214.68      |
| 15  | Aceh Selatan    | 13,531       | 13,405.58     | 7,010.22     | 7,288.73    | 6,556.22      |
| 16  | Subulussalam    | 2,980        | 1,578.10      | 118.46       | -           | 167.08        |
| 17  | Aceh Singkil    | 1,747        | 2,428.20      | 323.21       | -           | 338.19        |
| 18  | Bener Meriah    | 887          | 4,053.85      | 1,723.52     | -           | 3,853.46      |
| 19  | Aceh Tengah     | 4,963        | 5,560.19      | 6,351.82     | 6,246.59    | 6,494.58      |
| 20  | Gayo Lues       | 7,890        | 4,673.46      | 4,775.21     | 4,588.94    | 4,524.24      |
| 21  | Aceh Tenggara   | 14,101       | 15,592.72     | 8,742.67     | 10,040.61   | 9,253.61      |
| 22  | Simeulue        | 11,114       | 6,605.74      | 7,344.33     | 7,677.38    | 7,919.47      |
| 23  | Sabang          | 0            | 0             | 35.96        | -           |               |
|     | TOTAL           | 306,250      | 281,703.99    | 193,374.07   | 189,534.11  | 210,507.60    |
Table 2 and Table 3 present the area of existing rice fields obtained based on some sources. If referring to the comparison of land-use conversion with different databases, then the paddy fields refer to the effects of existing rice field studies compared to each district's spatial pattern. There will be a so-called black design (Table 2). From table 2, it appears that the area of rice fields exists compared to the existing data from the spatial planning data (RTRW) for each district are shown. However, the district authority provides different terminology, and then there is a difference between the existing rice fields and the RTRW data. A difference of -35,214.75 hectares was obtained from this comparison, with some district records not explicitly mentioning the rice field area in the RTRW. This minus number means that the existing rice fields are more than in RTRW data. However, this data still needs to be corrected, considering that some districts do not include data in RTRW related to rice fields, such as Banda Aceh City and Pidie Regency.

Our result confirms that geospatial data has been useful for verifying the exiting spatial data from different sources that have not verified accordingly. The use of geospatial data as a data source is one element that should be considered to achieve global development goals effectively and efficiently. The availability of complete and spatially accurate data will improve the quality of local and national development. For example, improving the quality of spatial planning, in turn, will affect the right decision on land use planning and sustainability of growth. Besides, to reduce the risk of misuse of land use and information about the land statutes also can be reduced. Thus, the availability of geospatial data plays an essential role. In this case, the Geospatial Information Board is a crucial agency in providing geospatial data.

Table 3. Variation of data obtained with different results.

| No | Regency       | Table. (ha) | LUC Actual | PSP 2012 (ha) | LUC Actual | ATR BPN (ha) | LUC Actual | Dinas 16/17 (ha) | LUC Actual | Existing (ha) |
|----|---------------|-------------|------------|--------------|------------|--------------|------------|-----------------|------------|--------------|
| 1  | Banda Aceh    | 114         | 86         | 82.33        | 55         | 79.50        | 52         | -               | -          | 27.78        |
| 2  | Aceh Besar    | 31,970      | 7,682      | 24,725.40    | 437        | 17,749.85    | -6,538     | 17,198.46       | 17,171     | 24,288.01    |
| 3  | Pidie         | 29,734      | 4,473      | 27,238.42    | 1,978      | 23,975.72    | -1,285     | 25,182.63       | 895        | 25,260.64    |
| 4  | Pidie Jaya    | 8,946       | 869        | 8,208.65     | 131        | 8,358.65     | 281        | 8,480.89        | -16,780    | 8,077.33     |
| 5  | Bireuen       | 22,601      | 7,479      | 18,206.89    | 3,085      | 15,064.94    | -57        | 15,179.92       | 7,103      | 15,122.27    |
| 6  | Aceh Utara    | 46,000      | 8,546      | 40,951.24    | 3,497      | 36,912.20    | -542       | 36,639.14       | 21,517     | 37,454.01    |
| 7  | Lhokseumawe   | 2,070       | 549        | 1,757.96     | 237        | 1,760.25     | 239        | -              | -          | 1,520.95     |
| 8  | Aceh Timur    | 33,073      | 14,961     | 26,842.65    | 8,370      | 18,450.25    | 338        | 15,075.10       | 13,554     | 18,112.23    |
| 9  | Langsa        | 1,654       | 492        | 1,781.84     | 620        | 1,201.22     | 40         | -              | -          | 1,161.55     |
| 10 | Aceh Tamiang  | 16,488      | 8,633      | 17,052.47    | 9,198      | 7,577.80     | -277       | 7,732.93        | 6,571      | 7,854.62     |
| 11 | Aceh Jaya     | 13,276      | 4,968      | 12,319.34    | 4,011      | 3,945.69     | -4,362     | 5,874.21        | -1,980     | 8,307.85     |
| 12 | Aceh Barat    | 17,582      | 6,190      | 11,858.58    | 466        | 8,985.77     | -2,406     | 8,342.28        | 34         | 11,392.20    |
| 13 | Nagan Raya    | 15,239      | 9,632      | 18,100.15    | 12,494     | 5,808.62     | 202        | 6,879.12        | -4,513     | 5,606.62     |
| 14 | Aceh B. Daya  | 10,289      | 3,075      | 18,680.23    | 11,466     | 7,078.23     | -136       | 7,107.18        | 1,501      | 7,214.68     |
| 5  | Aceh Selatan  | 13,531      | 6,975      | 13,405.58    | 6,849      | 7,010.22     | 454        | 7,288.73        | 74         | 6,556.22     |
| 16 | Subulussalam  | 2,980       | 2,813      | 1,578.10     | 1,411      | 118.46       | -49        | -              | -          | 167.08       |
| 17 | Aceh Singkil  | 1,747       | 1,409      | 2,428.20     | 2,090      | 323.21       | -15        | -              | -          | 338.19       |
| 18 | Bener Meriah  | 887         | -2,966     | 4,053.85     | 200        | 1,723.52     | -2,130     | -              | -          | 3,853.46     |
| 19 | Aceh Tengah   | 4,963       | -1,531     | 5,560.19     | -934       | 6,351.82     | -143       | 6,246.59        | 2,393      | 6,494.58     |
| 20 | Gayo Lues     | 7,890       | 3,366      | 4,673.46     | 149        | 4,775.21     | 251        | 4,588.94        | -1,906     | 4,524.24     |
| 21 | Aceh Tenggara | 14,101      | 4,847      | 15,592.72    | 6,339      | 8,742.67     | -511       | 10,040.61       | 5,516      | 9,253.61     |
| 22 | Simeulue      | 11,114      | 3,195      | 6,605.74     | -1,314     | 7,344.33     | -575       | 7,677.38        | -1,576     | 7,919.47     |
| 23 | Sabang        | 0           | -2         | -            | -35.96     | -36          | -          | -              | -          | -            |

TOTAL 306,250 95,743 281,703.99 71,196 193,374.07 -17,134 189,534.11 49,574 210,507.60
Geospatial data for land-use change has been widely used in many countries, such as in India [9], by using geospatial techniques to develop a spatial database on forest vegetation for devising suitable science technology-based interventions for forest ecosystem management. Using empirical analysis of geospatial classification for agriculture monitoring has been utilized [10] for the modelling decision tree. Meanwhile, monitoring the Sendai Framework's progress using a geospatial model, an example of people affected by agricultural droughts in Eastern Cape, South Africa [11]. In short, geospatial data approaches using earth observation data combined with other spatial data such as soil characteristics, climate data, irrigated agriculture, population, and other resources have been developed in the context of agricultural land resources.

3.2. Sustainable agricultural mapping result

The rice fields area exists based on spatial data, obtained by geoprocessing from the data of various spatial data comparison data obtained from different sources revealed the inconsistency data among the heads of geospatial data obtained, especially from tabular and PSP 2012 (Table 4). This process receives data in a union process that generates called union v1 in Table 5. Union v1 data combines spatial vector data from PSP in 2012, ATR/BPN vector, and Agriculture Service office vector-based data in 2016/2017. Editing union V1, using the latest high-resolution base raster satellite imagery, produces the existing rice field's 2019 v2, as shown in table 5.

Table 4 presents the different results of agricultural land mapping from an additional source of data obtained. When this data was overlaid, we found the existing rice field mapping called the union mapping process in the Geographic information system (Table 5). Union V1 and union V2 result revealed a considerable different area between the existing calculation with the current situation (union v2) with the previous analysis (union v1), even though with varying data of data obtained (Figure 5).

Table 4. Comparison of different result of the overlay proses of agricultural land mapping in Aceh.

| No | Regency /City     | Tabular (ha) | PSP 2012 (ha) | ATR BPN (ha) | Service office (ha) |
|----|-------------------|--------------|---------------|--------------|---------------------|
| 1  | Banda Aceh        | 114          | 82,33         | 79,50        | No data             |
| 2  | Aceh Besar        | 31,970       | 24,725,40     | 17,749,85    | 17,198,46           |
| 3  | Pidie             | 29,734       | 27,238,42     | 23,975,72    | 25,182,63           |
| 4  | Pidie Jaya        | 8,946        | 8,208,65      | 8,358,65     | 8,480,89            |
| 5  | Bireuen           | 22,601       | 18,206,89     | 15,064,94    | 15,179,92           |
| 6  | Aceh Utara        | 46,000       | 40,951,24     | 36,912,20    | 36,639,14           |
| 7  | Lhokseumawe       | 2,070        | 1,757,96      | 1,760,25     | No data             |
| 8  | Aceh Timur        | 33,073       | 26,842,65     | 18,450,25    | 15,075,10           |
| 9  | Langsa            | 1,654        | 1,781,84      | 1,201,22     | No data             |
| 10 | Aceh Tamiang      | 16,488       | 17,052,47     | 7,577,80     | 7,732,93            |
| 11 | Aceh Jaya         | 13,276       | 12,319,34     | 3,945,69     | 5,874,21            |
| 12 | Aceh Barat        | 17,582       | 11,858,58     | 8,985,77     | 8,342,28            |
| 13 | Nagan Raya        | 15,239       | 18,100,15     | 5,808,62     | 6,879,12            |
| 14 | Aceh Barat Daya   | 10,289       | 18,680,23     | 7,078,23     | 7,107,18            |
| 15 | Aceh Selatan      | 13,531       | 13,405,58     | 7,010,22     | 7,288,73            |
| 16 | Subulussalam      | 2,980        | 1,578,10      | 118,46       | No data             |
| 17 | Aceh Singkil      | 1,747        | 2,428,20      | 323,21       | No data             |
| 18 | Bener Meriah      | 887          | 4,053,85      | 1,723,52     | No data             |
| 19 | Aceh Tengah       | 4,963        | 5,560,19      | 6,351,82     | 6,246,59            |
| 20 | Gayo Lues         | 7,890        | 4,673,46      | 4,775,21     | 4,588,94            |
| 21 | Aceh Tenggara     | 14,101       | 15,592,72     | 8,742,67     | 10,040,61           |
| 22 | Simeulue          | 11,114       | 6,605,74      | 7,344,33     | 7,677,38            |
| 23 | Sabang            | 0            | 0             | 35,96        | No data             |
| TOTAL |              | 306,250     | 281,703,99    | 193,374,07   | 189,534,11          |
3.3. Critical points of geospatial technology in place

The Government will soon publish a policy map (one folder policy). One policy-map integrating 85 thematic maps that had the responsibility of 19 ministries and agencies. This policy starts from the publication of presidential Regulation (Regulation) number 27 years 2014 National Geospatial Information about the network, called JIGN. This President Decree then followed the publication of Regulation No. 9 the Year 2016 on the acceleration of implementing the policy on One Map at the level of accuracy of a map scale of 1:50,000.

One policy-map would make the overall economic activities more efficient. Even with this, there is one Map, which will facilitate the process of licensing effort. This makes the popular indexes such as the ease of doing business or ease of trying. Based on the data's accuracy, these policies can reduce overlapping granting permission that is often the cause of conflicts. "One Map can be likened to such infrastructure in drawing up the procedure [12].

| No | Regency/City       | Union v1 2019 (ha) | Rice Field 2019 v2 (ha) |
|----|--------------------|--------------------|-------------------------|
| 1  | Banda Aceh         | 118.69             | 67.25                   |
| 2  | Aceh Besar         | 28.538.14          | 24.288.01               |
| 3  | Pidie              | 30.990.28          | 25.260.64               |
| 4  | Pidie Jaya         | 9.891.02           | 8.077.33                |
| 5  | Bireuen            | 20.622.19          | 15.122.27               |
| 6  | Aceh Utara         | 46.399.89          | 37.454.01               |
| 7  | Lhokseumawe        | 2.199.36           | 1.520.95                |
| 8  | Aceh Timur         | 31.649.32          | 18.112.23               |
| 9  | Langsa             | 1.977.33           | 1.161.55                |
| 10 | Aceh Tamiang       | 19.690.80          | 7.887.15                |
| 11 | Aceh Jaya          | 14.556.72          | 8.307.85                |
| 12 | Aceh Barat         | 14.880.02          | 11.392.20               |
| 13 | Nagan Raya         | 18.998.71          | 5.606.62                |
| 14 | Aceh Barat Daya   | 19.183.96          | 7.214.68                |
| 15 | Aceh Selatan       | 15.253.76          | 6.556.22                |
| 16 | Subulussalam       | 1.604.66           | 303.20                  |
| 17 | Aceh Singkil       | 2.538.79           | 338.19                  |
| 18 | Bener Meriah       | 4.675.64           | 947.15                  |
| 19 | Aceh Tengah        | 8.638.88           | 6.494.58                |
| 20 | Gayo Luces         | 7.197.03           | 5.000.61                |
| 21 | Aceh Tenggara      | 17.422.24          | 8.325.41                |
| 22 | Simeulue           | 11.362.27          | 7.919.47                |
| 23 | Sabang             | 35.96              | No data                 |
| TOTAL |                   | 328.425.67        | 207.357.57              |
3.4. Challenge of Geospatial Technology in future

The challenge facing related geospatial technologies for the current situation is the readiness of human resources and technologies. Both humans and technology can drive an acceleration in creating entrepreneurship following the demands of national development within the mission of long-term national growth 2020-2030. Several points can be expressed using geospatial data to accelerate land use planning and sustainable development, including planning the future and utilizing Geospatial Data in integrated land use planning-based spatial data. To meet the above challenges, the necessary studies are associated with the utilization of geospatial technologies. Thus, in the future geospatial technology will have to deal with the integration of unstructured and structured data extracting geospatial knowledge such as data and patterns from the contact of unstructured data such as text messages or tweets [13]. Geospatial data management can solve those problems about a geospatial technology milestone and advance in topology, 3D/4D modeling, and visualization, even in massive Geospatial Features on web platforms. This technology can bridge the gap between modern information technology concepts and the geo-related sciences such as geography, geosciences, or civil engineering to provide tools and models to ease geo-related work across all disciplines [14].

4. Conclusions

The result shows that verified data can be obtained using geospatial technology for land use planning and sustainable agriculture mapping in Aceh Province. The comparison results from different data sources obtained from various studies have proven that the paddy rice field in Aceh Province varies. The closest data to the current research is data from the ATR/BPN. Meanwhile, other sources provide a large number of differences. This result confirms that the existing data of paddy rice fields for land use planning and agriculture mapping activities in Aceh Province need to be verified for land use and agricultural mapping according to the current situation. Thus, the use of geospatial technology could
accurately correct misleading information about the spatial location. Geospatial technology has proved the easiness and readiness to use land-use change and sustainability of Agricultural Mapping in Aceh.

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