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Changes in Agricultural Land Use to Non-Agricultural Land in Grogol District of Sukoharjo Regency In 2001 – 2018

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ABSTRACT

This research was conducted in Grogol Sub-District of Sukoharjo Regency. This research aims to: (1) find out the land use in Grogol Sub-District in 2001 and 2018 (2) to find out the changes in land use in Grogol Sub-District in 2001 - 2018. The methods used in this study are: (1) using the land use map in 2001 obtained from the Indonesian Earth View Map (RBI), while the land use map in 2018 was obtained from digitization of Quickbird satellite imagery published from Maxar Technologies by regulating the year of publication on September 05, 2018. (2) overlay method isused todetermine land use changes in 2001-2018. The results obtained in this study are the land use of Grogol Sub-District in 2001 covering an area of 3,116 hectares which includes 1,718 hectares of rice fields, 1,242 hectares of residential land, and 156 hectares of vacant land. Meanwhile, land use in Grogol Sub-District in 2018 was 3,116 hectares which includes 1,230 hectares of rice fields, 1,816 hectares of residential land, and 70 hectares of vacant land. The change in land use of Grogol Sub-District in 2001 - 2018 amounted to 1,186 hectares and the area of land that was not changed by 1,930 hectares. Grogol sub-district in 2001 and 2018 the pattern of land use change is elongated following the road, elongated following the river, and radial (thorough).

KEYWORDS

Land Use
Land Change
Image Interpretation

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1. Introduction

Since humans first occupied the earth, land has been one of the main elements in supporting survival. Land is functioned as a place of human activity to maintain its existence. The first activity is the use of land for farming. As the population grew and human civilization grew, land ownership and use began to continue. This perdorability eventually led to the complexity of the problem due to the increasing population, the discovery and utilization of technology, as well as the dynamics of development. The land that originally served as a suitable medium of planting (agriculture), gradually turned into multifunctional utilization. The fertile farmland is then turned into housing, industry, and infrastructure that is much larger than the area of new rice fields. This caused the area of rice fields to experience considerable depreciation.

Spatial planning related to efforts to use natural resources efficiently and effectively, spatial planning includes structure planning and spatial utilization patterns that include land use, water use, air use and other natural resource systems (Campbell, J. E., & Shin, M, 2011). The product of a spatial plan is the integrated utilization of resources to achieve development goals including increased revenue, expansion of employment opportunities, preservation of natural resources to meet basic needs such as food, clothes, and settlement (Thenkabail, P. S. ,2016).

Grogol sub-district is an area with an area covering 14 villages in Sukoharjo Regency bordering Surakarta to the north, Baki sub-district to the west, Sukoharjo sub-district to the south and Mojolaban and Polokarto sub-districts to the east, with an area of 3,000 ha or about 6.43% of the area of Sukoharjo

Regency. Grogol sub-district has an agricultural area of 934 ha or (31.13%) (Grogol Sub-District In Numbers 2019).

The population of Grogol sub-district in 2001 was 93,081 while in 2018 the population was 140,050. Within 17 years the population growth of Grogol sub-district was relatively rapid at 46,969 people and the intensity of development developed in certain areas, leading to an increase in land needs. (CPM. Grogol Sub-District in Numbers 2001 and 2019). Grogol sub-district is traversed by transportation between Solo City - Wonogiri, this causes people to prefer this area as a center of activity in both economic, social and industrialization activities 3 so that Grogol sub-district has rapid growth potential. In addition, the position of Grogol Sub-District bordering Surakarta and Klaten Regency is very strategic for the development of the city, and can increase the pace of economic growth and trade that will later have a huge effect on other sectors.

Therefore, this research has contribution in spatial planning management of Sukoharjo Regency in developing its region since it gives information on the landuse change for almost 2 decades. The result of this study gives more insight on the change of landuse, particularly along the flowing rivers in the study area that can be used as the basic information for stakeholders to make decision regarding urban planning management.

2. Method

The method used in this study is a descriptive statistical research method used to analyze data using a descriptive approach to provide an overview of the phenomena found in the study. This research was conducted in Grogol Sub-District of Sukoharjo Regency. In this study, the presentation of data used the maximum value and the minimum value displayed in the form of a table.

The collection technique in this study using land use map in 2001 was obtained from Peta Rupa Bumi Indonesia (RBI) on a scale of 1: 25,000 with three types of land such as rice fields symbolized in green, residential land symbolized in orange, and vacant land symbolized in white. While the land use map in 2018 was obtained from digitization of Quickbird satellite imagery published by Maxar Technologies by opening Google Earth Pro and then searching for grogol sub-district location, setting the issue date of imagery 05 September 2018, setting a scale of 1: 25,000, then digitization according to the type of land taken. The type of land taken in 2018 is rice fields symbolized in green, residential land symbolized in orange, and vacant land symbolized in white. Land use change map in 2001 and 2018 obtained by overlaying land use map in 2001 and land use map 2018.

3. Results and Discussion

Grogol sub-district land use in 2001 was dominant because Grogol sub-district passed through Bengawan Solo and Kali Samin rivers that de-sourced the main source of irrigation of rice fields in Grogol sub-district. Over time and the importance of fulfilling land needs in Grogol sub-district resulted in continuous land changes in Grogol sub-district. The fulfillment of land needs led to changes in land use in Grogol Sub-district, for example changes in land use that used to be farmland turned into buildings.

3.1. Land Use

3.1.1. Land Use Year 2001

Grogol sub-district land use map in 2001 was obtained from digitization results sourced from Peta Rupa Bumi Indonesia (RBI). On the land use map in 2001 has an area of 3,116 hectares that can be known for three types of land use, namely rice fields, residential land, and vacant land. Grogol sub-district in 2001 has an area of 1,718 hectares of rice fields, 1,242 hectares of residential land, and 156 hectares of vacant land. From the three types of land use in 2001 can be seen in figure 1 that Grogol Sub-District in 2001 dominant rice fields scattered in all villages in Grogol Sub-district.

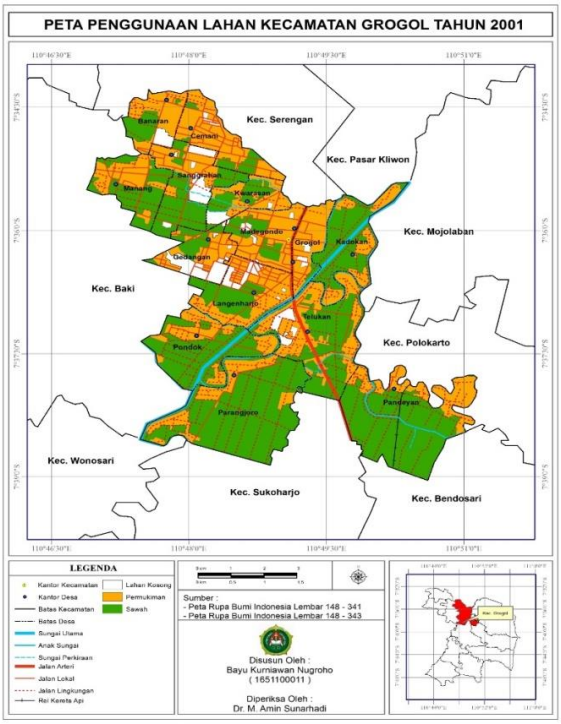

Fig. 1 Grogol Sub-District Land Use Map in 2001

The village that has the larger rice fields is Parangjoro Village with an area of 386 hectares and the village that has the least rice fields is Grogol Village which has an area of 8 hectares. While the village that has the largest residential land is Telukan Village which is an area of 149 hectares and the village that has the least residential land is Kadokan Village which has an area of 59 hectares. Grogol sub-district in 2001 has vacant land spread across 9 villages in Grogol sub-district with an area of 156 hectares. Meanwhile, villages that do not have vacant land are Pondok Village, Village, Parangjoro, Pandeyan Village, Kadokan Village, and Manang Village. Details of grogol sub-district land use in 2001 can be seen in table 1 as follows.

Table 1. Grogol Sub-District Land Use Year 2001

No	Village	Rice fields (ha)	Settlements (ha)	Vacant Land (ha)	Total Land Per Village (ha)
1	Pondok	188	80	-	268
2	Parangjoro	386	82	-	468
3	Pandeyan	320	102	-	422
4	Bayan	182	149	18	349
5	Gift	150	59	-	209
6	Grogol	8	86	5	99
7	Madegondo	40	110	6	156
8	Langenharjo	75	115	21	211
9	Gedangan	38	56	42	136
10	Sanity	53	60	12	125
11	Sanggrahan	119	69	35	223
12	Manang	96	70	-	166
13	Banaran	37	75	13	125
14	Cemani	26	129	4	159
	Total	1.718	1.242	156	3.116

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3.1.2. Land Use Year 2008

Grogol sub-district land use map in 2018 was obtained from digitization results sourced from ikonos satellite imagery by regulating the year of publication in 2018. On the land use map in 2018 has an area of 3,116 hectares that can be known for three types of land use, namely rice fields, residential land, and vacant land. Grogol sub-district in 2018 has an area of 1,230 hectares of rice fields, 1,816 hectares of residential land, and 70 hectares of vacant land. From the three types of land use in 2018 can be seen in figure 2 that Grogol Sub-District in 2018 is dominant residential land.

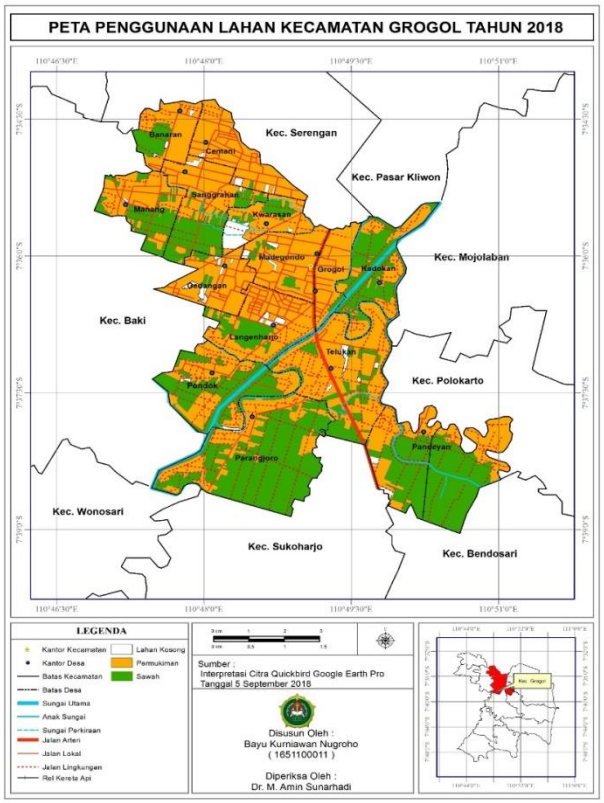

Fig. 2 Grogol District Land Use Map in 2018

The village that has the larger rice fields is Parangjoro Village with an area of 334 hectares and the village that has the least rice fields is Cemani Village which has an area of 1 hectare. While the village that has the largest residential land is Telukan Village which is an area of 261 hectares and the village that has the least residential land is Kadokan Village which has an area of 79 hectares. Grogol sub-district in 2018 has vacant land spread across 11 villages in Grogol sub-district with an area of 70 hectares. Meanwhile, villages that do not have vacant land are Kadokan Village, Grogol Village, and Manang Village. Details of grogol sub-district land use in 2018 can be seen in table 2 as follows.

Table 2. Grogol Sub-District Land Use Year 2018

No	Village	Rice fields (ha)	Settlements (ha)	Vacant Land (ha)	Amount Land PerDesa (ha)
1	Pondok	138	127	3	268
2	Parangjoro	334	133	1	468
3	Pandeyan	271	147	4	422
4	Bayan	79	261	9	349
5	Gift	130	79	-	209

6	Grogol	4	95	-	99
7	Madegondo	8	142	6	156
8	Langenharjo	47	156	8	211
9	Gedangan	7	123	6	136
10	Sanity	20	82	23	125
11	Sanggrahan	92	128	3	223
12	Manang	65	101	-	166
13	Banaran	34	88	3	125
14	Cemani	1	154	4	159
	Amount	1.230	1.816	70	3.116

3.2. Land Use Changes 2001 - 2018

Land use change is a global phenomenon that is of concern to researchers in various countries of the world. Studies of land use change are growing very quickly and produce many approaches. Land use changes can be interpreted as a process from previous land use to temporary or permanent new land use. Such changes can be said as a tangible form of growth and transformation of socioeconomic structure changes in developing societies. The use of rice fields that switch functions into residential or industrial land can be said that the type of change that is permanent and cannot return to the original land use, as well as vice versa when switching functions to plantations then the change is only temporary can be seen in figure 3 as follows.

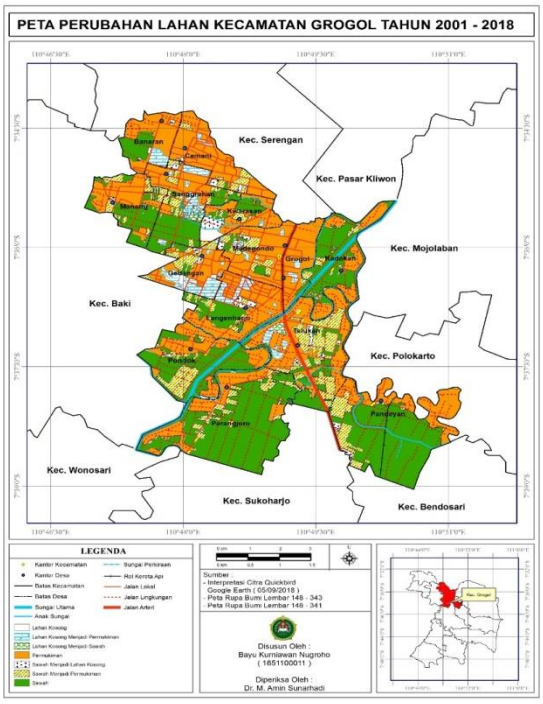

Fig. 3. Map of land use changes in Grogol Sub-District 2001 – 2018

The result of the preparation of changes in land use grogol sub-district in 2001 - 2018 can know the area of land use that has changed by 1,186 hectares and the area of land that has not changed by 1,930 out of the total area of Grogol sub-district of 3,116 hectares. Details of the changes in usage of each land use area are presented in figure 4 as follows.

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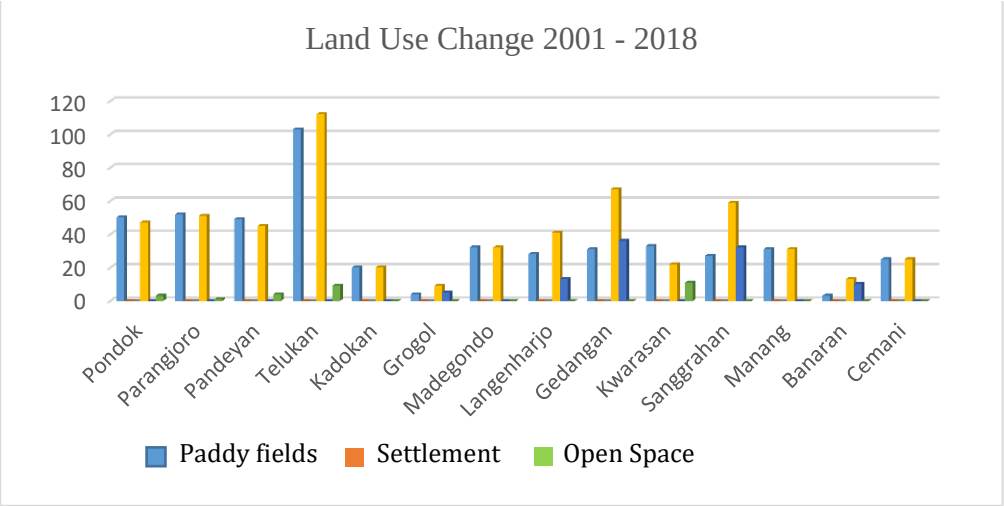

Fig. 4. Land Use Change Diagram 2001 – 2018

The pattern of distribution of changes in land use of Grogol sub-district is to extend following the path, elongated following the river, and radial (thorough). Grogol sub-district land use change pattern is dominated by radial land change pattern (thorough). Villages that have a pattern of changing land use extending along the river are Kadokan and Grogol villages, villages that have a pattern of changing land use elongated following the road are Parangjoro and Pandeyan Villages, while villages that have a pattern of radial land use change (thoroughly) are Pondok Village, Telukan, Madegondo, Langenharjo, Gedangan, Kwarasan, Sanggrahan, Manang, Banaran, and Cemani. Details of the pattern of changes in land use of Grogol Sub-District in 2001 - 2018 can be seen in table 3 as follows.

Table 3. Changes in Land Use of Grogol Sub-District in 2001 and 2018

No	Village	Rice fields		Settlements		Vacant Land	
		Reduced (ha)	Increased (ha)	Reduced (ha)	Increased (ha)	Reduced (ha)	Increased (ha)
1	Pondok	50	-	-	47	-	3
2	Parangjoro	52	-	-	51	-	1
3	Pandeyan	49	-	-	45	-	4
4	Bayan	103	-	-	112	-	9
5	Gift	20	-	-	20	-	-
6	Grogol	4	-	-	9	5	-
7	Madegondo	32	-	-	32	-	-
8	Langenharjo	28	-	-	41	13	-
9	Gedangan	31	-	-	67	36	-
10	Sanity	33	-	-	22	-	11
11	Sanggrahan	27	-	-	59	32	-
12	Manang	31	-	-	31	-	-
13	Banaran	3	-	-	13	10	-
14	Cemani	25	-	-	25	-	-
	Total	488			574	96	28

Changes in the use of Grogol Sub-District in 2001 – 2018 in table 3 above, there is a reduction and increase in the amount of land use area. The land use that has been added is residential land. Rice fields have decreased and residential land has been added and reduced in parts of Grogol Sub-District Village.

Land use that is undergoing a considerable change in land use is a type of residential land with an additional land area of 574 hectares. Rice fields decreased by 488 hectares from the previous land area and vacant land increased by 28 hectares and a reduction of 96 hectares of land.

4. Conclusion

Based on the findings resulting from this study, it can be concluded that land use in Grogol Sub-District in 2001 covered an area of 3,116 hectares covering 1,718 hectares of rice fields, 1,242 hectares of residential land, and 156 hectares of vacant land. Meanwhile, land use in Grogol Sub-District in 2018 was 3,116 hectares which includes 1,230 hectares of rice fields, 1,816 hectares of residential land, and 70 hectares of vacant land.

Changes in land use of Grogol Sub-District in 2001 and 2018 can determine the area of land use that has changed by 1,186 hectares and the area of land that has not changed by 1,930 out of the total area of Grogol sub-district of 3,116 hectares. The pattern of change in land use of Grogol sub-district extends along the road, extends following the river, and radial (thorough) with dominated by radial land change patterns (thoroughly).

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