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Spatial analysis of paddy field conversion in Purwakarta Regency, West Java, Indonesia

BUDI SAPUTRO[1,2], DOLLY PRIATNA[2,*], ROSADI ROSADI[2], NAORI MIYAZAWA[3]

[1]Direktorat Perluasan dan Perlindungan Lahan, Direktorat Jenderal Prasarana dan Sarana Pertanian, Kementerian Pertanian RI, Jl. Taman Margasatwa Raya No. 3, Ragunan, Jakarta 12540, Indonesia
[2]Graduate School of Environmental Management, Pakuan University, Jl. Pakuan Kotak No. 1, Tegallega, Bogor 16129, Indonesia
[3]Faculty of Social Sciences, Institute for Advanced Social Sciences, Waseda University, Building 14, 1 Chome-6 Nishiwaseda, Shinjuku City, Tokyo 169-0051, Japan

*Corresponding author: *dollypriatna@unpak.ac.idt*

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ABSTRACT

Food is a basic human need. The state must strive to meet the availability of food for people sustainably. One of the efforts is to maintain and develop paddy fields as a food source and a supplier of 95% of national rice production. The conversion of paddy fields is a reason for decreasing food production in Purwakarta Regency, which impacts food availability and security. This research aimed to portray the conversion rate of paddy fields in Purwakarta. This quantitative descriptive research uses spatial analysis to compare the 2013-2017 and the 2017-2021 periods. The results of spatial analysis in the 2013-2017 period showed that Purwakarta Regency experienced a reduction in paddy fields by 195.55 ha (1%) consisting of paddy fields turned into industry 117.99 ha; roads 5.72 ha; settlements of 42.30 ha and housing, trade and services of 29.55 ha. Meanwhile, in 2013-2017, paddy fields turned into industry by 151.72 ha, roads by 23.54 ha, settlements by 196.76 ha, and housing, trade, and services by 29.81 ha. The results of this study reinforce that the reduction in food production in Purwakarta was caused by the conversion of paddy fields into other uses during the 2013-2017 and 2017-2021 periods.

ABSTRAK

Pangan merupakan kebutuhan pokok manusia. Negara harus berupaya untuk memenuhi ketersediaan pangan bagi masyarakat secara berkelanjutan. Salah satu upayanya adalah mempertahankan dan mengembangkan sawah sebagai sumber pangan dan pemasok 95% produksi beras nasional. Alih fungsi lahan sawah menjadi penyebab penurunan produksi pangan di Kabupaten Purwakarta yang berdampak pada ketersediaan dan ketahanan pangan. Penelitian ini bertujuan untuk menggambarkan laju konversi lahan sawah di Purwakarta. Penelitian deskriptif kuantitatif ini menggunakan analisis spasial untuk membandingkan periode 2013-2017 dan periode 2017-2021. Hasil analisis spasial periode 2013-2017 menunjukkan Kabupaten Purwakarta mengalami pengurangan lahan sawah sebesar 195,55 ha (1%) yang terdiri dari lahan sawah berubah menjadi industri 117,99 ha; jalan 5,72 ha; permukiman seluas 42,30 ha dan perumahan, perdagangan dan jasa seluas 29,55 ha. Sedangkan pada tahun 2013-2017, lahan sawah berubah menjadi industri seluas 151,72 ha, jalan raya seluas 23,54 ha, pemukiman seluas 196,76 ha, serta perumahan, perdagangan, dan jasa seluas 29,81 ha. Hasil penelitian ini memperkuat bahwa penurunan produksi pangan di Purwakarta disebabkan oleh alih fungsi lahan sawah menjadi peruntukan lain selama periode 2013-2017 dan 2017-2021.

Keywords: *food production, food sustainability, paddy field conversion, Purwakarta*

INTRODUCTION

Food is a basic human need. The fulfillment of food is a human right. The Government is responsible for the availability of food. This food supply is realized to sustainably meet the needs and consumption of food for the community, households, and individuals. One of the efforts to realize domestic food availability is to maintain and develop productive land (article 12, paragraph 5 letter e of Law 18 of 2012).

Rice is a major component of the national food security system (Permadi and Sunandar, 2013). It is estimated that around 95 percent of national rice production is supplied from paddy fields, and only 5 percent comes from dry land, so paddy fields are still considered very strategic in fulfilling national rice needs in the future (Setyorini et al. 2010). Agriculture and food production save Asia from famine and help the country and provide food for its citizens (Waage, 2022).

Purwakarta Regency topographically has a lowland area reaching 52.60 percent of the Purwakarta Regency area, making it suitable for paddy fields (BPS, 2021). The agricultural sector contributes significantly to the economic structure of Purwakarta Regency by 6.90 percent of the total Gross Regional Domestic Product (GRDP). This is also confirmed in the 2018-2023 Purwakarta Regency Regional Medium-Term Development Plan (RPJMD) document that the

development of the food and agriculture sector is a priority for the development of Purwakarta Regency, as coined by the term "the realization of food security and increasing the competitiveness of agriculture, fisheries and animal husbandry."

One of the challenges in food security in the Purwakarta Regency is the competition for space utilization. Paddy fields are often decreased by other spaces to accommodate the interests of economic development and investment. In 2017-2020, there was a decrease in harvest and rice production in Purwakarta (BPS, 2021). The reduction in rice production in Purwakarta Regency certainly impacts food availability both in Purwakarta Regency and West Java Province and even nationally. This research aimed to provide a portrait of the rate of paddy field conversion to provide input on the policy direction of the Purwakarta Regency Government in realizing food security.

METHODS

Time and Location

The study was conducted in January-April 2022 in Purwakarta Regency, West Java (Figure 1), within the data of the rice field area of Purwakarta Regency in 2013-2017 and 2017-2021.

Tools and Materials

The tools and materials used during the study were computers with the *Microsoft Excel* program, *ArcGIS 10.8*, *Powersim 10*, and *Google Earth Pro*.

Secondary Quantitative Data

The secondary data used in this study are shown in Table 1 below.

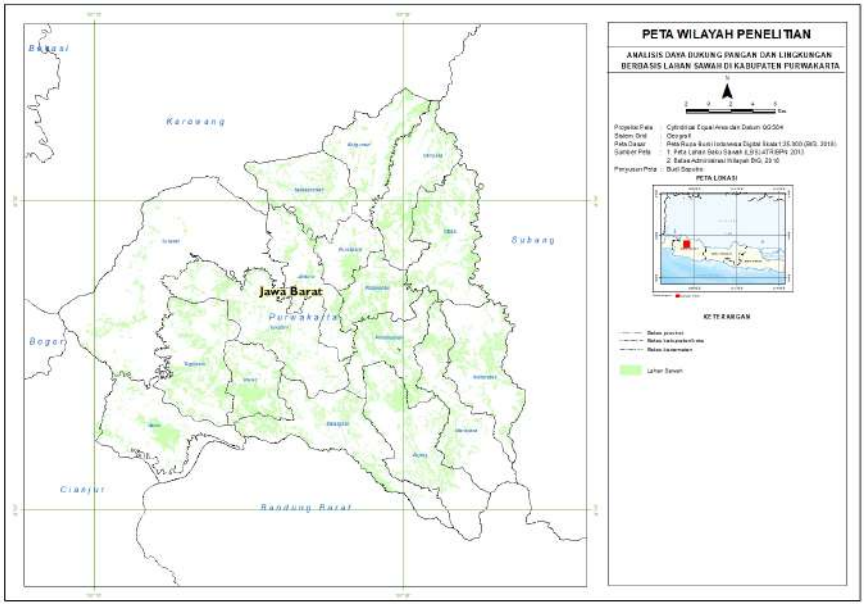

Figure 1. Map of the research area in Puwakarta Regency, West Java.

Table 1. Data types and sources

Data type	Data form	Year	Sources
Paddy field land	Shapefile	2013	ATR/BPN
Paddy field land	Shapefile	2021	Purwakarta Govt.
Land pattern	Shp.	2012	Purwakarta Govt.
High-resolution satellite image	Image	2018	LAPAN
Sentinel satellite image	Image	2017, 2021	European Space Agency
Administrative boundaries	Shp.	2018	BIG

Research Procedures

This quantitative descriptive research uses secondary data, consisting of collecting, processing, and analysis. The method is interpreting overlay between Sentinel image 2013 and a high-resolution satellite imagery SPOTS 6 of 2018, as well as with the 2021 of Sentinel image interpretation, and also *Google Earth* satellite image compilation. According to Irwansyah (2013), the overlay method is a spatial analysis method by combining two or more spatial data to produce a new layer.

The overlay technique uses the *union tool* with the scheme as shown in Figure 2. After overlaying, the subsequent analysis was with the interpretation of SPOTS 6 of 2018 imagery, sentinel imagery, and *Google*

Earth satellite imagery compilation sharpened the interpretation.

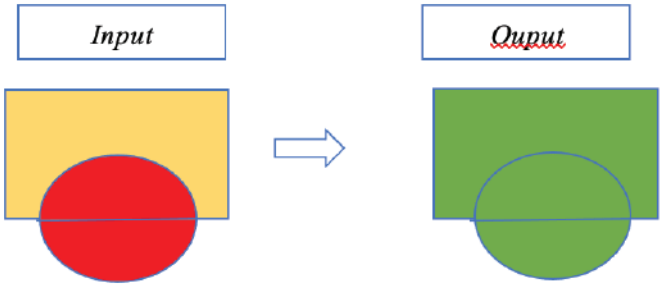

Figure 2. Union tool scheme on overlay method.

The conversion rate of paddy fields uses a two-period approach, namely the 2013-2017 period and the 2017-2021 period, with the same analysis method. In the 2013-2017 period, one of the obstacles was the unavailability of the 2017 spatial data. The 2017 paddy spatial data was then created by overlaying the 2013 data with the 2017 Sentinel image and compiled it with the Google Earth satellite image to help sharpen the imagery interpretation. After that, the working steps are carried out according to Figure 3. Meanwhile, in the 2017-2021 period, the data is available, and the working steps, according to Figure 4.

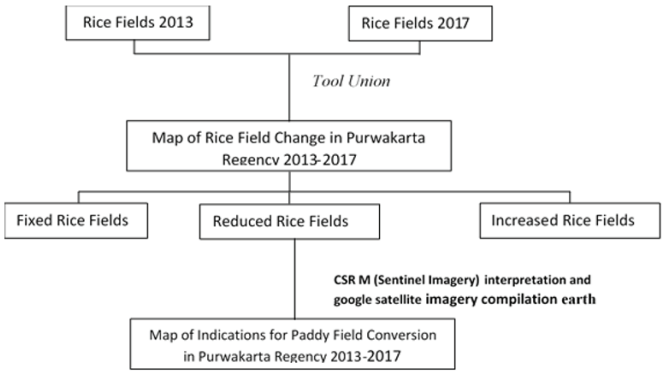

Figure 3. Spatial-based paddy field conversion rate analysis of Purwakarta Regency in 2013-2017.

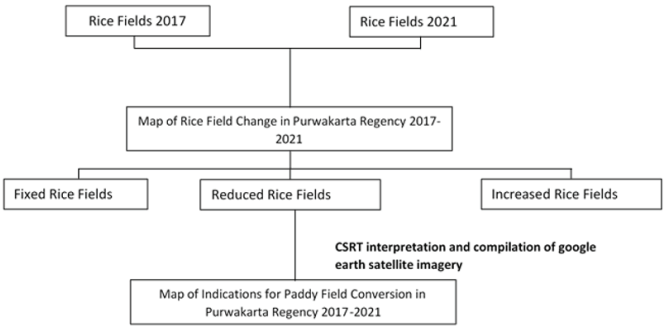

Figure 4. Spatial-based paddy field conversion rate analysis work steps for Purwakarta Regency in 2017-2021.

Spatial-based rice field conversion rate analysis for the 2013-2017 and 2017-2021 periods is expected to describe the rate of paddy field conversion in the four years in Purwakarta Regency. In addition to the rate of conversion of paddy fields, spatial-based analysis with a map scale of 1: 5.000 will also provide an overview of the tendency of changes in allotment from paddy fields to other designations. It would be easier for the Purwakarta Regency government to control the rate of conversion of paddy fields in the following year.

RESULTS AND DISCUSSION

One of the crucial factors in the context of food security in an area is the availability of paddy fields. The larger the rice field, the higher the food production produced. According to Wahyunto and Widiastuti (2014), the conversion of paddy fields on Java Island needs to be controlled because it impacts decreasing national food production and threatens national food security. In other words, paddy fields are the main production factor (Setyorini et al. 2010).

The conversion of paddy fields is a serious threat to food sustainability in Indonesia. The conversion of paddy fields occurred before Indonesia's rapid development. Rice fields were chosen to be the object of conversion because they are easy to reach and highly accessible. From 1981 through 1986, the conversion of paddy fields in Indonesia was 37.708 ha per year, while the ability to add new paddy fields in the same period was only 31.805 ha per year (Hardjoamidjojo, 1997). In that period, 14.54% turned into settlements. Meanwhile, irrigated rice fields in West Java decreased by 90.000 ha in 1991-1994 (Hardjoamidjojo, 1997). In another study, it was reported that in the 1992-1999 period, agricultural land in Bandung Regency, covering an area of 3,134 ha (25 percent), changed its function to hotels, restaurants, housing, villas, offices, vacant land, and other buildings (Ruswandi et al. 2007).

The Rate of Conversion of Paddy Fields for the Period 2013-2017 in Purwakarta

Based on the results of spatial analysis in the 2013-2017 period, Purwakarta Regency experienced a reduction in rice fields by 195.55 ha (1%) consisting of rice fields turned into the industry by 117.99 ha; roads by 5.72 ha; into settlements of 42.30 ha and housing, trade and services of 29.55 ha (Figure 5).

Paddy fields turned into industry place the highest rank of 60% of the total area of paddy field conversion to other for the 2013-2017 period in Purwakarta Regency, followed by settlements of 22% (Figure 6). This discovery strengthens the strategic location of Purwakarta Regency, which is at the confluence between the Jakarta-Bandung and Jakarta-Cirebon, so that it has the potential to develop into a new industrial area.

Changes into built-up land generally dominate the pattern of land use change in developing areas.

Ramadan et al. (2016) reported that the conversion of paddy fields to built-up ranked second place, covering an area of 570 ha (2001-2008) and 874 ha (2008-2015) in Banjarnegara Regency.

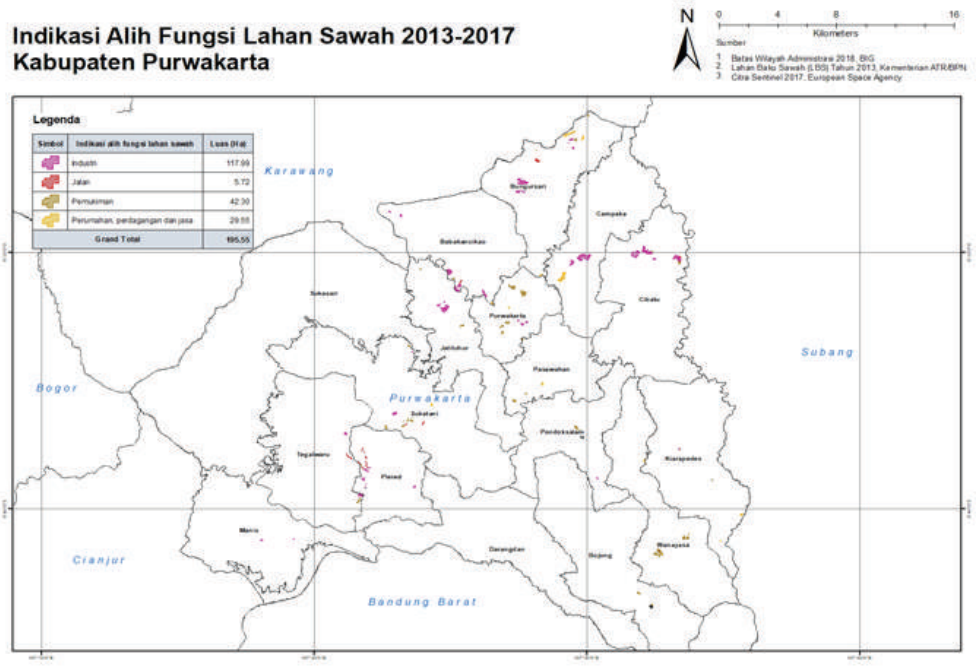

Figure 5. Indications of paddy field conversion for the 2013-2017 period in Purwakarta Regency.

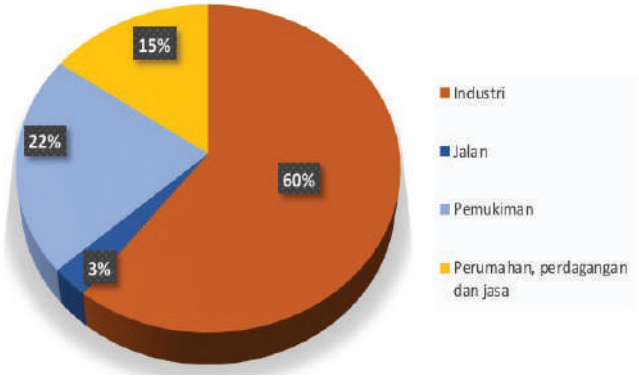

Figure 6. Indications of paddy field conversion for the 2013-2017 period in Purwakarta Regency.

The distribution of paddy field changes in the 2013-2017 period based on sub-districts is shown in Table 2.

Paddy fields turned into the industry happen almost evenly in all districts, and the highest yield is in Cibatu District at 34.38 ha. The same happens with paddy fields that become settlements, housing, trade, and services. As for the paddy fields turned into settlements, the highest yield was in Purwakarta District at 15.05 ha, while the paddy fields turned into housing, trade, and services occurred in Campaka District at 11.05 ha (Table 1.2). The change of paddy fields seriously impacts food sustainability because it is permanent, which means the change is fixed, and the fields will not produce food again. Loss of food production due to the conversion of paddy fields is more detrimental than yield loss due to the impact of drought, floods, or attacks of pests and plant diseases (Pambudi, 2021).

Table 2. The distribution of changes in paddy fields according to sub-districts in Purwakarta Regency for the 2013-2017 period.

District	Industry	Road	Settlement	housing, trade, and services
Babakancikao	16.46	0.44	0.62	2.06
Bojong	1.27	-	1.30	-
Bungursari	16.93	1.94	1.52	9.94
Campaka	24.55	-	-	11.05
Cibatu	34.38	-	1.24	0.18
Darangdan	-	-	-	-
Jatiluhur	10.84	-	1.13	-
Kiarapedes	0.34	-	0.27	1.54
Manis	1.00	-	-	-
Pasawahan	-	-	2.26	1.94
Plered	4.19	1.72	0.21	-
Pondoksalam	0.17	-	3.42	-
Purwakarta	2.16	-	15.05	0.57
Sukasari	-	-	-	-
Sukatani	1.99	0.82	3.61	0.79
Tegalwaru	3.71	0.79	1.82	-
Wanayasa	-	-	9.85	1.47
Grand Total	**117.99**	**5.72**	**42.30**	**29.55**

Rate of Paddy Field Conversion for the 2017-2021 Period in Purwakarta

The results of spatial analysis of the rate of conversion of paddy fields in Purwakarta Regency for the 2017-2021 period showed that the change of paddy

fields into settlements was quite significant, namely 196.76 ha, followed by turning into the industry by 151.72 ha, turned into housing, trade, and services by 29.81 ha, and turned into roads by 23.54 ha (Figure 7).

In the 2017-2021 period, changes of paddy fields turned into housing ranked highest at 49%, followed by industry at 38% of the total area (Figure 8). Interesting results are also shown in the analysis results in the 2017-2021 period, which is the change of paddy fields into shrubs/ thickets reaching 2,123.91 ha or 84.09% of the total rice field area. The conversion of rice paddy fields into shrublands or thickets is a reversible process

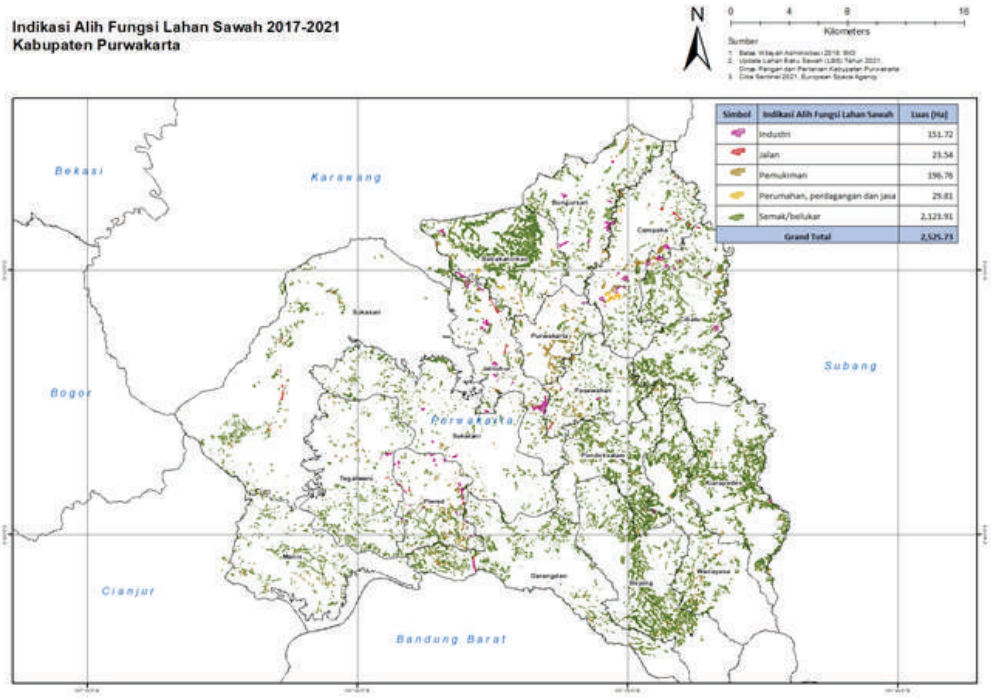

Figure 7. Indications of paddy field conversion for the 2017-2021 period in Purwakarta Regency.

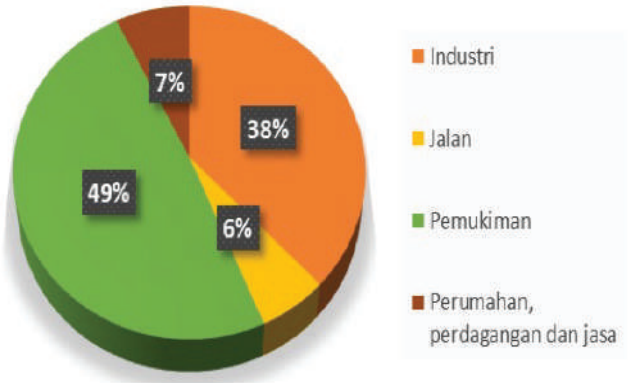

Figure 8. Indications of paddy field conversion for the 2017-2021 period in Purwakarta Regency.

that can be restored to its original state by applying appropriate cultivation techniques. This restoration can effectively contribute to the production of food once again. Several factors cause paddy fields turning into shrubs/thickets, one of which is water availability. Water scarcity prevents the land from being cultivated, while excessive water, such as flooding, yields a similar outcome.

In just four years, the industry sector in Purwakarta Regency overgrew. One example of the above phenomenon is the rise in demand for land set aside for industrial estates, which has led to net growth of 151.72 hectares from 2013 to 2021. This growth has taken over rice fields with a total size of 269.71 hectares. This data shows an increasing trend. The same thing also happened to the rice fields that changed for settlement. In the 2013-2017 period, the rice fields that changed for settlement were only 42.30 ha, but in the 2017-2021 period, the rice fields that changed for settlements increased rapidly by 196.76 ha or 465%. As for housing,

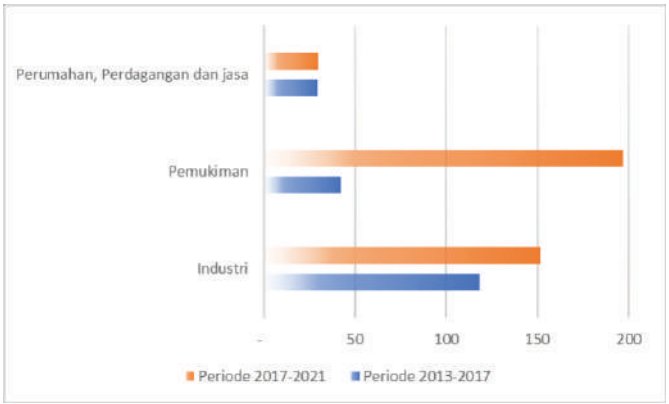

Figure 9. Indications of changes in paddy fields in the 2013-2017 and 2017-2021 periods in Purwakarta Regency.

trade, and services, the increase is relatively small (Figure 9).

Based on a spatial and quantitative analysis reported by Sukiptiyah (2022), the conversion of paddy fields in West Java in the 2013-2018 period is divided into 2 (two) patterns. The first pattern is a conversion in rural areas with high industrialization and urbanization with an area of thousands of hectares. The second is in rural areas with low industrialization and urbanization with a conversion area of only tens or hundreds of hectares. Based on those patterns, Purwakarta has low industrialization and urbanization because land conversion ranges from tens to hundreds of hectares. However, if the trend continues to increase, Purwakarta Regency may develop toward high industrialization and urbanization. This trend must be anticipated because Purwakarta Regency has quite good agricultural potential.

Population growth generally encourages housing needs and consumption of agricultural products, thus encouraging the conversion of paddy fields. The conversion of paddy fields in West Java has turned chiefly into built-up land for settlements/housing, and industry/trade (Sukiptiyah, 2022). Ichwal et al. (2019) reported a similar finding that the conversion of paddy fields into housing and public facilities in Darul Imarah District, Aceh Besar Regency, is due to its strategic location and growing population. This housing development impacts the surrounding rice fields because it hinders irrigation canals which causes these paddy fields to become unproductive, leading to subsequent conversion of paddy fields.

The distribution of paddy field changes in the 2017-2021 period based on sub-districts showed in Table 3. In the 2017-2021 period, paddy fields that turned into industries were also evenly distributed in all districts, although a fairly large area was patterned in several districts, namely Bungursari; Campaka; Cibatu; Jatiluhur; and Plered (Table 1.3). Paddy fields turned into an industry in the 2017-2021 period, found largest in Jatiluhur District, covering an area of 54.24 ha, while turning into the largest housing is in Purwakarta District, covering an area of 28.32 ha, and turned into housing, trade, and services showed largest in Campaka District covering an area of 19.59 ha.

Based on the comparison of the period 2013-2017 with 2017-2021 according to the sub-district, the pattern of the regional development center is coined. Industrial areas are centralized in several sub-districts: Bungursari; Campaka; Cibatu; and Jatiluhur. Plered District in the 2013-2017 period was not an industrial area, but in the 2017-2021 period, it developed into an industrial area with an area of rice fields that turned into an industry of 15.34 ha. Residential development is centralized in Purwakarta District, the capital of Purwakarta Regency, while it also occurs in Campaka District. Campaka Subdistrict is not only turned into a residential development but also a center for housing development, trade, and services.

Campaka Subdistrict was originally an agricultural area before being developed into an industrial area in early 2000. In 2017 Campaka District was growing into an industrial area and home industry handicrafts from industrial waste (https://ppid.purwakartakab.go.id).

Table 3. The distribution of changes in paddy fields according to sub-districts in Purwakarta Regency for the 2017-2021 period.

District	Industry	Road	Settlement	Housing, trade, and services	Bush
Babakancikao	6.67	0.13	11.78	8.75	638.29
Bojong	-	-	6.34	-	147.88
Bungursari	20.67	0.81	9.63	0.33	123.28
Campaka	22.62	6.64	28.25	19.59	87.44
Cibatu	16.55	1.18	12.45	-	194.31
Darangdan	4.34	0.70	5.51	-	83.05
Jatiluhur	54.24	6.27	9.74	1.14	77.75
Kiarapedes	0.37	0.19	6.56	-	186.33
Manis	-	-	4.96	-	36.16
Pasawahan	2.16	1.13	14.91	-	53.48
Plered	15.34	1.98	16.69	-	37.58
Pondoksalam	0.87	-	6.31	-	105.02
Purwakarta	0.97	-	28.32	-	19.51
Sukasari	0.45	3.95	6.49	-	73.05
Sukatani	2.88	0.05	6.74	-	99.32
Tegalwaru	3.11	0.24	5.41	-	52.98
Wanayasa	0.49	0.26	16.66	-	108.48
Grand Total	**151.72**	**23.54**	**196.76**	**29.81**	**2,132.91**

This present state indicates that the rice fields in Campaka District have changed their functions to become centers of industry, settlement, housing, trade, and services.

CONCLUSION

Based on the results of the study, the conclusion is as follows:

1. In the 2013-2017 period, there was a reduction in rice fields to a built-up area of 195.55 ha, and in the 2017-2021 period a reduction in paddy fields to a built-up area of 401.83 ha.
2. In the 2013-2017 period, paddy fields turned into an industry occupying the highest rank of 60%, followed by settlements of 22% of the total area of paddy fields in Purwakarta Regency.
3. In 2017-2021, paddy fields turned into housing ranked highest at 49%, followed by industry at 38% of the total area of paddy fields in Purwakarta Regency.

REFERENCES

Bappenas. (2017). *Terjemahan Tujuan & Target Global Tujuan Pembangunan Berkelanjutan (TPB)/ Sustainable Development Goals (SDGs)*. Kementerian Perencanaan Pembangunan Nasional/ Badan Perencanaan Pembangunan Nasional.

Bappenas. (2021). *Kebijakan Pembangunan Berketahanan Iklim 2020-2045*. Jakarta: Bappenas.

BPS RI. (2018). *Proyeksi Penduduk Indonesia 2015 – 2045. Hasil SUPAS 2015 (Edisi Revisi)*. BPS RI.

BPS RI. (2022). *Produktivitas Tanaman Padi (Satuan Kw) (Kuintal/Hektar), 2020-2021*. Diakses pada: https://jabar.bps.go.id/indicator/53/711/1/produktivitas-tanaman-padi-satuan-kw-.html. Badan Pusat Statistik Provinsi Jawa Barat.

BPS. (2014). *Produksi Padi, Jagung, dan Kedelai (Angka Sementara Tahun 2013)*. Berita Resmi Statistik. No. 22/03/ Th. XVII, 3 Maret 2014.

BPS. (2021). *Statistik daerah Kabupaten Purwakarta 2021*. Badan Pusat Statistik Kabupaten Purwakarta. Purwakarta (ID): BPS Kabupaten Purwakarta.

Firmansyah. (2016). Model Pengendalian Konversi Lahan Sawah di Dalam DAS Citarum [Tesis]. Bogor: Sekolah Pascasarjana, Institut Pertanian Bogor.

Hardjoamidjojo, S. (1997). Peranan irigasi dan permasalahannya dalam swasembada beras di Indonesia. *Buletin Keteknikan Pertanian 11(1): 44-53*.

Ichwal, Z., Romano., & Agus, N. (2019). Conversion of paddy fields and impact on farmers' income in Aceh Besar District of Indonesia: A case study of Darul Imarah Subdistrict. *Russian Journal of Agricultural and Socio-Economic Science (RJOAS) 11(95): 257-262*. DOI 10.18551/rjoas.2019-11.36

Irwansyah, E. (2013). *Sistem Informasi Geografis: Prinsip Dasar dan Pengembangan Aplikasi*. Yogyakarta: Digibooks Printing and Publishing.

Kurniawati, U.F., Handayeni, K.D.M.E., Nurlaela, S., Idajati, H., Firmansyah, F., Pratomoadmojo, N.A., Sianturi, R. & Septriadi. (2020). Pengolahan data berbasis Sistem Informasi Geografis (SIG) untuk kebutuhan penyusunan profil di Kecamatan Sukolilo. *SEGAWATI-Jurnal Pengabdian kepada Masyarakat-DRPM ITS 4(3): 190-196*.

Kustiwan, I. & Almira, L. (2012). Pemodelan dinamika perkembangan perkotaan dan daya dukung lahan di kawasan cekungan Bandung. *Tataloka 14(2): 98-112*.

Munawir. (2018). Dinamika Konversi Lahan dan Keterkaitannya dengan Ketersediaan Pangan di Kabupaten Gowa, Sulawesi Selatan [Tesis]. Bogor: Sekolah Pascasarjana Institut Pertanian Bogor.

Pambudi, A.S. (2021). Overview and evaluation of the Indonesia's water resources management policies for food security. *Indonesian Journal of Applied Environmental Studies 2(2): 84-93*. DOI: 10.33751/injast.v2i2.3586

Permadi, K. & Sunandar, B. (2013). Penerapan berbagai inovasi teknologi yang mendukung Program Peningkatan Produksi Beras Nasional (P2BN) di Kabupaten Purwakarta (review). *AGROTROP 3(1):1-9*.

Priatna, D., Saputro, B., Rosadi, & Kadar, I. (2022). Carrying capacity analysis of paddy field-based food and environment in Purwakarta Regency, West Java. *Proceeding: International Conference Multi-Diciplines Approaches for the Sustainable Development. Denpasar, Bali, Indonesia, 16 December 2022*. Universitas Dwidjendra Press. Pp. 189-198.

Ruswandy, A., Rustiadi, E., & Mudikdjo, K. (2007). Konversi lahan pertanian dan dinamika perubahan penggunaan lahan di kawasan Bandung Utara. *Jurnal Tanah dan Lingkungan 9(2): 63-70*.

Setyorini, D., Rochayati, S., & Las, I. (2010). *Membalik Kecenderungan Degradasi Sumber Daya Lahan dan Air: Pertanian pada Ekosistem Lahan Sawah* (Editor: Suradisastra K, et.al.). Badan Penelitian dan Pengembangan Pertanian, Kementerian Pertanian. Bogor: IPB Press.

Sukiptiyah. (2022). Analisis Dampak Pola Peruntukan Ruang dalam Penempatan Lokasi Kegiatan Ekonomi Melalui Mekanisme Konversi Lahan Sawah di Perdesaan (Studi Kasus: Provinsi Jawa Barat) [Tesis]. Bogor: Ilmu Perencanaan Pembangunan Wilayah dan Perdesaan, Fakultas Ekonomi dan Manajemen, Sekolah Pascasarjana Institut Pertanian Bogor.

Undang-Undang Republik Indonesia Nomor 18 Tahun 2012 tentang Pangan.

Waage, J. (2022). Understanding the relationship between environment, agriculture and health: An interdisciplinary challenge. *Indonesian Journal of Applied Environmental Studies 3(1): 1-4*. DOI: 10.33751/injast.v3i1.5075

Wahyunto & Widiastuti, F. (2014). Lahan sawah sebagai pendukung ketahanan pangan serta strategi pencapaian kemandirian pangan. *Jurnal Sumberdaya Lahan Edisi Khusus: 17-30*.

Yanti, R.T., Ridwan, M., & Rospida, L. (2013). Analisis alih fungsi lahan pertanian tanaman pangan padi sawah ke sektor perkebunan kelapa sawit dan karet serta pengaruhnya terhadap Produksi padi di Kabupaten Seluma Propinsi Bengkulu. *Jurnal Ekonomi dan Perencanaan Pembangunan 5(2): 64-75*.