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Monitoring and Evaluation of Oil Palm Plantation Block Productivity Under Various Topographic Conditions at Peranap Estate, PT. Rigunas Agri Utama

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ABSTRACT

The productivity of oil palm is influenced by various factors, including land topography. Flat land tends to have higher productivity compared to hilly or mountainous terrain due to easier access and management. This study aims to map the productivity of oil palm plantation blocks based on actual production data and budget under various topographical conditions at Peranap Plantation, PT. Rigunas Agri Utama. The method used is a GIS-based descriptive analysis by comparing actual production and budget data from 2019 to 2023. The results show variations in productivity between blocks, where topographical differences are not the main factor in determining production levels. Other factors, such as fertilization management, rainfall, and maintenance techniques, play a more significant role in influencing harvest yields. Some blocks with hilly and mountainous topography still demonstrated high productivity when optimal care was applied. The productivity map provides a spatial and temporal overview of productivity achievements in blocks with different topographies in the oil palm plantation.

1. INTRODUCTION

Monitoring and evaluation of oil palm plantation productivity are crucial activities to ensure the achievement of predetermined productivity targets. This process can be conducted through mapping to obtain information on plantation conditions both spatially and temporally (Ihsan et al., 2024). Monitoring and evaluation are necessary from the planting stage to the replanting process to optimize production. In general, oil palm plants have a productive lifespan of approximately 25 years (Asian Agri, 2024). However, if productivity remains high and yields are optimal, the plants can be maintained for a longer period before replanting is carried out.

9 Oil palm productivity is influenced by several internal and external factors. Internal factors include seed quality, cultivation techniques, fertilization management, and pest and disease control. Meanwhile, external factors include climate conditions, rainfall, soil fertility, and topography. The combination of these factors determines the yield level obtained in each plantation block. Therefore, regular monitoring and evaluation are essential to ensure that productivity remains optimal and aligns with the established targets (Irawan & Purwanto, 2020).

In the palm oil industry, the comparison between budgeted and actual productivity is a crucial factor in evaluating plantation performance. Budgeted productivity refers to the planned yield target based on census, historical analysis, land conditions, fertilization, weather, and implemented agronomic strategies. Meanwhile, actual productivity reflects the real yield obtained in the field, which can be influenced by factors such as weather changes, pest and disease attacks, labor availability, and the effectiveness of cultivation practices. The difference between budgeted and actual productivity serves as an indicator of the success of implemented strategies and as a basis for evaluation to improve efficiency and the sustainability of palm oil production (Li, 2015).

One important method for estimating future productivity is the Black Bunch Count (BBC). BBC is the process of counting black fruit bunches to estimate the number of harvestable bunches in the next four months. This census helps

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plantation management predict yield trends and make informed decisions regarding labor allocation, harvesting schedules, and resource management. To ensure accurate census data, census workers must have a solid understanding of fruit physiology. Therefore, the Estate Assistant and Supervisor must ensure that workers have undergone proper training and fully comprehend the physiological aspects of the fruit being surveyed. By implementing an accurate BBC, palm oil plantations can enhance productivity forecasting and optimize operational efficiency (Putri et al., 2020).

6 The suitable topography for oil palm cultivation ranges from flat to undulating areas with a slope of 0-8%. In rolling areas with a slope of 8-15% and hilly areas with a slope of 15-30%, oil palm can still produce well. However, in areas with a slope of more than 36%, oil palm cultivation is not recommended as it requires intensive management (Pranata et al., 2017). Hilly land is prone to erosion, which can lead to soil fertility degradation. This is one of the factors that cause lower growth and production of oil palm planted in undulating terrain. For oil palm cultivation on hilly land and sloping topography, land preparation techniques such as contour terracing can be implemented (Aditya et al., 2022).

Geographic Information System (GIS) enables the visualization of productivity data on a map, providing both spatial and temporal insights. By understanding the productivity conditions of a specific block, evaluations and monitoring can be conducted to identify the factors influencing its high or low productivity (Apriatama & Zahrotun, 2024). With this information, plantation managers can develop data-driven strategies to enhance yield by optimizing fertilization, irrigation, pest control, and harvesting schedules. Additionally, GIS allows for historical trend analysis, helping to predict future productivity patterns and mitigate potential risks associated with climate variability, soil degradation, or disease outbreaks. By integrating GIS with remote sensing technologies and real-time field data, decision-makers can improve efficiency, reduce operational costs, and ensure more sustainable plantation management (Saliu & Deari, 2023).

7 2. MATERIALS AND METHODS

2.1. Research Time and Materials

This research was conducted on one of the plantations owned by Asian Agri, specifically at the Peranap Plantation of PT. Rigunas Agri Utama, Semelinang Tebing, Peranap District, Indragiri Hulu Regency, Riau, from December 2024 to January 2025. The tools used in this research included a laptop, ArcGIS software, and Google Earth software. The materials used consisted of an estate map, complete plantation harvest production data, and area composition data (land suitability).

2.2. Data Analysis

3 The method used to analyze secondary data is the descriptive analysis method. Descriptive analysis is used to analyze data by describing or illustrating the collected data. The productivity map was created using data from the years 2019–2023.

2.3. Productivity Classification

The productivity level of each oil palm plantation block is classified into high, medium, and low categories based on the SOP of Asian Agri Group:

1. High Productivity: If the actual productivity exceeds 100% of the budget, it will be visualized in green.
2. Medium Productivity: If the actual productivity reaches 90% - 99.9% of the budget, it will be visualized in yellow.
3. Low Productivity: If the actual productivity is less than 90% of the budget, it will be visualized in red.

3. RESULTS AND DISCUSSION

3.1. DEM Mapping

1 Digital elevation models (DEMs) provide fundamental depictions of the three-dimensional shape of the Earth's surface and are useful to a wide range of disciplines. Ideally, DEMs record the interface between the atmosphere and the lithosphere using a discrete two-dimensional grid, with complexities introduced by the intervening hydrosphere, cryosphere, biosphere, and anthroposphere. The treatment of DEM surfaces, affected by these intervening spheres, depends on their intended use, and the characteristics of the sensors that were used to create them (Guth et al., 2021).

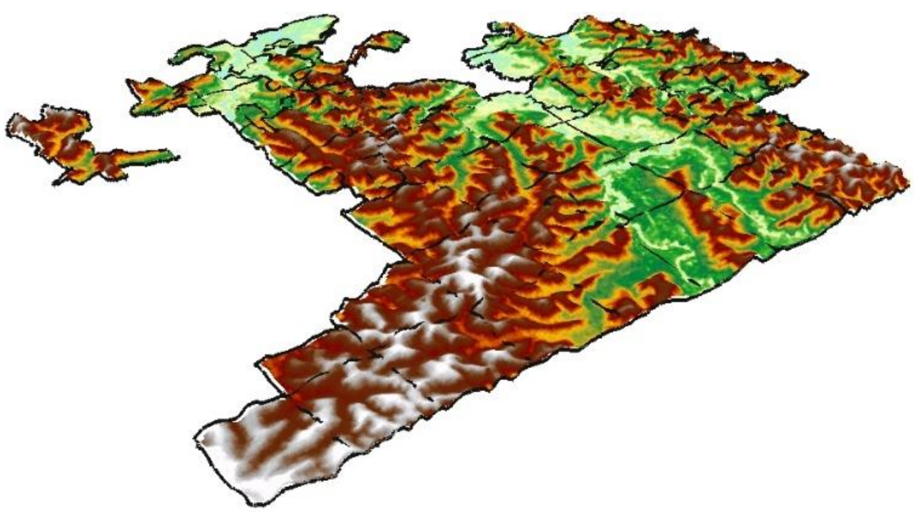

Figure 1. DEM Peranap Estate.

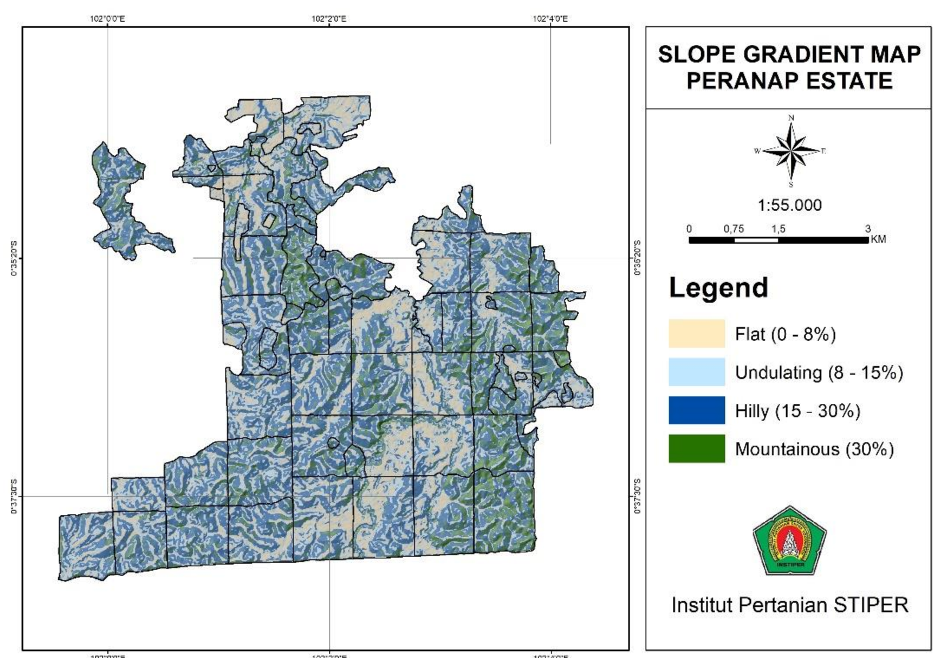

Figure 2. Slope gradient map Peranap Estate.

Peranap Estate has four different slope classes, ranging from flat to mountainous terrain, which significantly influence plantation management strategies. The land distribution consists of 24.5% flat topography, 8% undulating topography, 34.2% hilly topography, and 33.3% mountainous topography. Each type of topography presents its own

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challenges in terms of accessibility, maintenance, and operational efficiency in cultivation and harvesting activities. In flat topography, plantation management is easier due to better accessibility and more efficient use of mechanical equipment. Meanwhile, in undulating and hilly topographies, obstacles such as erosion potential, uneven drainage, and difficulties in fertilizer distribution and harvesting need to be addressed with proper soil conservation techniques. On the other hand, mountainous topography poses the greatest challenges, as it is not only difficult to access but also prone to landslides, nutrient leaching, and limitations in using heavy machinery. Therefore, areas with mountainous terrain should ideally be designated for conservation purposes to maintain environmental balance and ensure plantation sustainability (Kartawisastra, 2022).

3.2. Productivity Data per Block

Actual productivity and budget data in oil palm plantations are essential for evaluating operational efficiency and financial planning. Actual productivity refers to the harvested yield based on factors such as weather conditions, crop maintenance, and cultivation techniques used. Meanwhile, the budget includes planned expenditures allocated for various aspects, including fertilization, labor, infrastructure maintenance, and other operational costs (Abrori, 2023). Comparing actual productivity data with the established budget allows management to identify potential efficiencies, address deviations, and develop strategies to improve yields and optimize production costs. With proper analysis, companies can ensure business sustainability and enhance the profitability of oil palm plantations.

Tabel 1. Block productivity achievement.

Block	YOP	HA	SPH	Topography	2019			2020			2021			2022			2023		
					Kg		%	Kg		%	Kg		%	Kg		%	Kg		%
					Actual (kg)	Budget (kg)	Percentage	Actual (kg)	Budget (kg)	Percentage	Actual (kg)	Budget (kg)	Percentage	Actual (kg)	Budget (kg)	Percentage	Actual (kg)	Budget (kg)	Percentage
A92a	1992	81	115	Flat - Hilly	24.055	24.081	99,89%	22.921	25.958	88,30%	24.399	27.445	88,90%	24.462	23.317	104,91%	23.186	23.929	96,89%
A92b	1992	97	134	Hilly	23.699	26.330	90,01%	24.459	28.091	87,07%	27.766	28.448	97,60%	26.723	24.570	108,76%	25.303	25.429	99,50%
A93a	1993	26	116	Hilly	23.666	24.977	94,75%	21.524	25.135	85,63%	19.977	25.845	77,29%	21.411	22.559	94,91%	21.100	21.490	98,19%
A93b	1993	34	123	Flat - Hilly	29.450	30.257	97,33%	25.674	29.595	86,75%	24.496	30.645	79,94%	27.425	26.987	101,62%	25.479	26.181	97,32%
A93c	1993	10	122	Hilly	28.659	28.067	102,11%	25.951	28.381	91,44%	28.604	30.501	93,78%	24.780	27.768	89,24%	25.270	25.362	99,64%
A93d	1993	99	135	Hilly	25.912	27.479	94,30%	24.859	27.791	89,45%	26.366	27.915	94,45%	26.987	25.320	106,58%	25.963	24.799	104,69%
A93e	1993	51	110	Hilly	25.492	27.934	91,26%	24.919	28.271	88,14%	23.657	27.732	85,31%	26.016	24.834	104,76%	22.856	23.868	95,76%
A94a	1994	36	148	Flat - Hilly	24.943	24.530	101,68%	23.982	26.904	89,14%	27.407	25.992	105,44%	27.323	25.050	109,07%	22.212	26.814	82,84%
A94b	1994	101	120	Flat - Mountainous	26.377	24.547	107,45%	24.814	27.034	91,79%	23.977	26.088	91,91%	25.942	24.304	106,74%	22.431	25.659	87,42%
A95a	1995	48	132	Flat	32.394	31.132	104,05%	29.031	29.202	99,42%	28.104	31.515	89,17%	31.303	28.341	110,45%	30.256	29.827	101,44%
A95b	1995	94	117	Flat	25.407	29.026	87,53%	24.658	27.326	90,24%	24.431	27.695	88,21%	29.599	24.551	120,56%	25.956	25.686	101,05%
A95c	1995	119	111	Hilly	25.662	25.647	100,06%	24.396	23.939	101,91%	25.201	25.745	97,88%	27.012	23.491	114,99%	23.690	24.392	97,12%
A95d	1995	14	138	Hilly	30.362	29.708	102,20%	30.241	27.874	108,49%	28.351	30.001	94,50%	29.130	27.228	106,98%	20.559	27.763	74,05%
A95e	1995	73	123	Hilly	27.133	28.442	95,40%	27.519	26.845	102,51%	27.030	29.080	92,95%	29.435	26.605	110,63%	24.703	27.548	89,67%
A96a	1996	4	120	Flat	27.050	25.390	106,54%	25.254	24.197	104,37%	25.461	25.204	101,02%	26.668	23.584	113,08%	18.821	24.282	77,51%
A96b	1996	83	127	Flat - Hilly	26.070	28.719	90,78%	24.329	27.364	88,91%	28.093	28.372	99,02%	29.248	26.348	111,01%	25.630	27.192	94,26%
A96c	1996	8	100	Hilly	25.280	25.693	98,39%	25.708	24.621	104,42%	23.933	25.790	92,80%	27.836	23.599	117,95%	21.392	24.598	86,96%
B93a	1993	103	123	Mountainous	27.046	29.288	92,35%	23.960	28.964	82,73%	27.400	29.211	93,80%	25.097	26.406	95,04%	25.377	26.907	94,31%
B93b	1993	104	107	Flat	25.211	27.411	91,97%	23.507	27.088	86,78%	23.346	27.089	86,18%	22.072	24.105	91,57%	21.555	24.285	88,76%
B95a	1995	86	116	Flat	26.251	28.974	90,60%	24.846	26.765	92,83%	26.214	26.941	97,30%	27.943	24.878	112,32%	25.781	25.916	99,48%
B95b	1995	33	129	Flat - Mountainous	27.166	33.776	80,43%	22.859	31.220	73,22%	27.681	29.072	95,21%	26.887	26.219	102,55%	26.604	26.834	99,14%
B96a	1996	40	124	Flat - Mountainous	26.316	28.657	91,83%	24.693	27.779	88,89%	24.740	27.648	89,48%	23.564	26.012	90,59%	23.136	25.178	91,89%
B96b	1996	98	127	Flat - Hilly	25.280	27.247	92,78%	24.943	26.366	94,60%	24.978	26.957	92,66%	24.838	25.640	96,87%	22.672	25.391	89,29%
B96c	1996	30	108	Hilly	26.794	30.691	87,30%	25.763	29.724	86,67%	22.746	28.142	80,83%	27.039	26.069	103,72%	25.071	26.140	95,91%
B96d	1996	50	112	Mountainous	27.299	29.909	91,27%	27.078	28.860	93,82%	26.675	28.428	93,83%	27.918	27.015	103,34%	22.834	26.860	85,01%
B96e	1996	96	126	Flat - Mountainous	27.346	28.198	96,98%	24.241	27.189	89,16%	26.003	27.761	93,67%	27.122	26.369	102,86%	25.481	26.149	97,44%
B96f	1996	63	115	Hilly	24.291	26.984	90,02%	25.849	26.140	98,89%	25.561	26.715	95,68%	29.081	25.800	112,72%	25.680	26.107	98,36%
B96h	1996	10	99	Flat	22.858	22.187	103,03%	27.041	21.489	125,84%	21.460	22.649	94,75%	19.695	22.203	88,70%	17.256	22.477	76,77%
B96j	1996	52	116	Flat - Mountainous	26.582	26.916	98,76%	25.440	25.989	97,89%	25.742	27.597	93,28%	25.726	25.946	99,15%	22.939	25.591	89,64%
B97a	1997	39	133	Mountainous	28.179	24.707	114,05%	25.827	26.661	96,87%	26.188	28.135	93,08%	25.494	26.740	95,34%	27.043	26.666	101,42%
B97b	1997	59	115	Flat - Hilly	25.605	25.939	98,71%	23.669	28.013	84,50%	24.142	27.783	86,89%	26.933	25.348	106,25%	24.662	25.348	97,30%
B97c	1997	15	122	Mountainous	21.685	22.067	98,27%	25.670	23.898	107,41%	22.247	24.738	89,93%	22.197	22.874	97,04%	19.057	23.069	82,61%
C92a	1992	142	128	Undulating	26.912	27.452	98,03%	25.378	28.222	89,92%	25.370	29.970	84,65%	26.381	25.466	103,59%	25.122	25.413	98,85%
C92c	1992	96	127	Mountainous	23.729	24.390	97,29%	22.044	25.115	87,77%	24.321	25.192	96,54%	26.012	21.831	119,15%	25.385	23.262	109,13%
C93a	1993	93	119	Flat	27.331	26.196	104,33%	24.954	27.998	89,13%	25.190	29.176	86,34%	23.225	27.080	85,76%	21.465	25.937	82,76%
C93b	1993	102	124	Flat	24.620	25.564	96,31%	24.507	27.256	89,91%	24.844	28.765	86,37%	23.959	26.324	91,02%	21.356	25.061	85,22%
C93c	1993	80	130	Mountainous	22.461	23.229	96,69%	22.476	24.785	90,68%	23.817	24.478	97,30%	22.518	23.069	97,61%	20.416	23.115	88,32%
C93d	1993	136	125	Flat	24.560	24.014	102,27%	24.808	25.601	96,90%	24.346	26.770	90,95%	25.365	25.226	100,55%	23.175	24.982	92,77%
C93e	1993	133	123	Flat - Mountainous	25.262	24.346	103,76%	25.272	25.948	97,40%	23.581	28.166	83,72%	24.940	25.589	97,46%	21.912	25.091	87,33%
C93f	1993	136	129	Mountainous	25.370	23.664	107,21%	20.178	25.286	79,80%	23.749	25.709	92,38%	25.602	24.169	105,93%	21.163	24.318	87,03%
D92a	1992	116	128	Undulating - Hilly	27.701	25.525	108,53%	25.109	28.523	88,03%	26.032	28.530	91,24%	26.952	25.823	104,37%	25.688	25.747	99,77%
D92b	1992	93	128	Mountainous	24.591	24.251	101,40%	21.889	26.871	81,46%	21.732	26.864	80,90%	22.892	23.508	97,38%	21.038	22.883	91,94%
D92c	1992	99	123	Hilly	23.238	23.300	99,73%	21.536	25.951	82,99%	21.684	25.647	84,55%	19.541	22.568	86,58%	16.953	21.471	78,96%
D92d	1992	89	125	Hilly	25.279	23.321	108,39%	22.194	25.964	85,48%	22.933	26.455	86,69%	22.069	23.594	93,53%	19.291	23.144	83,35%
D92e	1992	51	130	Mountainous	25.146	24.673	101,92%	21.670	27.342	79,26%	22.843	27.487	83,10%	21.272	24.237	87,76%	18.841	23.316	80,81%
D93a	1993	104	129	Hilly - Mountainous	26.228	25.245	103,90%	27.728	26.211	105,79%	25.823	25.976	99,41%	26.992	24.257	111,28%	25.282	24.701	102,35%
D93b	1993	105	127	Mountainous	28.958	28.563	101,38%	27.313	29.815	91,61%	26.698	28.351	94,17%	28.703	26.233	109,41%	25.731	26.664	96,50%
D94a	1994	119	125	Mountainous	26.982	25.527	105,70%	24.395	27.000	90,35%	24.726	27.003	91,57%	26.631	24.500	108,70%	25.870	26.043	99,33%
D95a	1995	108	123	Undulating	23.449	25.247	92,88%	22.916	28.000	81,84%	25.917	28.714	90,26%	29.365	25.250	116,30%	24.717	24.882	99,34%

Mapping productivity spatially and temporally offers greater advantages compared to manual recording or conventional tables in oil palm plantation data analysis (Eka Zulfiakhoir & Umaidah, 2022). Data presented in table form is often static and makes it difficult to identify patterns or long-term trends, which hinders a comprehensive productivity evaluation. In contrast, spatial mapping enables data visualization based on specific locations, helping to detect productivity differences across various plantation blocks or divisions. Meanwhile, temporal analysis allows for monitoring productivity changes over time, providing insights into seasonal trends, weather impacts, or the effectiveness of agronomic interventions. With this approach, management can make faster and more accurate decisions, optimize crop maintenance strategies, and improve operational efficiency compared to manual or tabular recording methods, which are less flexible for long-term analysis.

3.3. Productivity Mapping

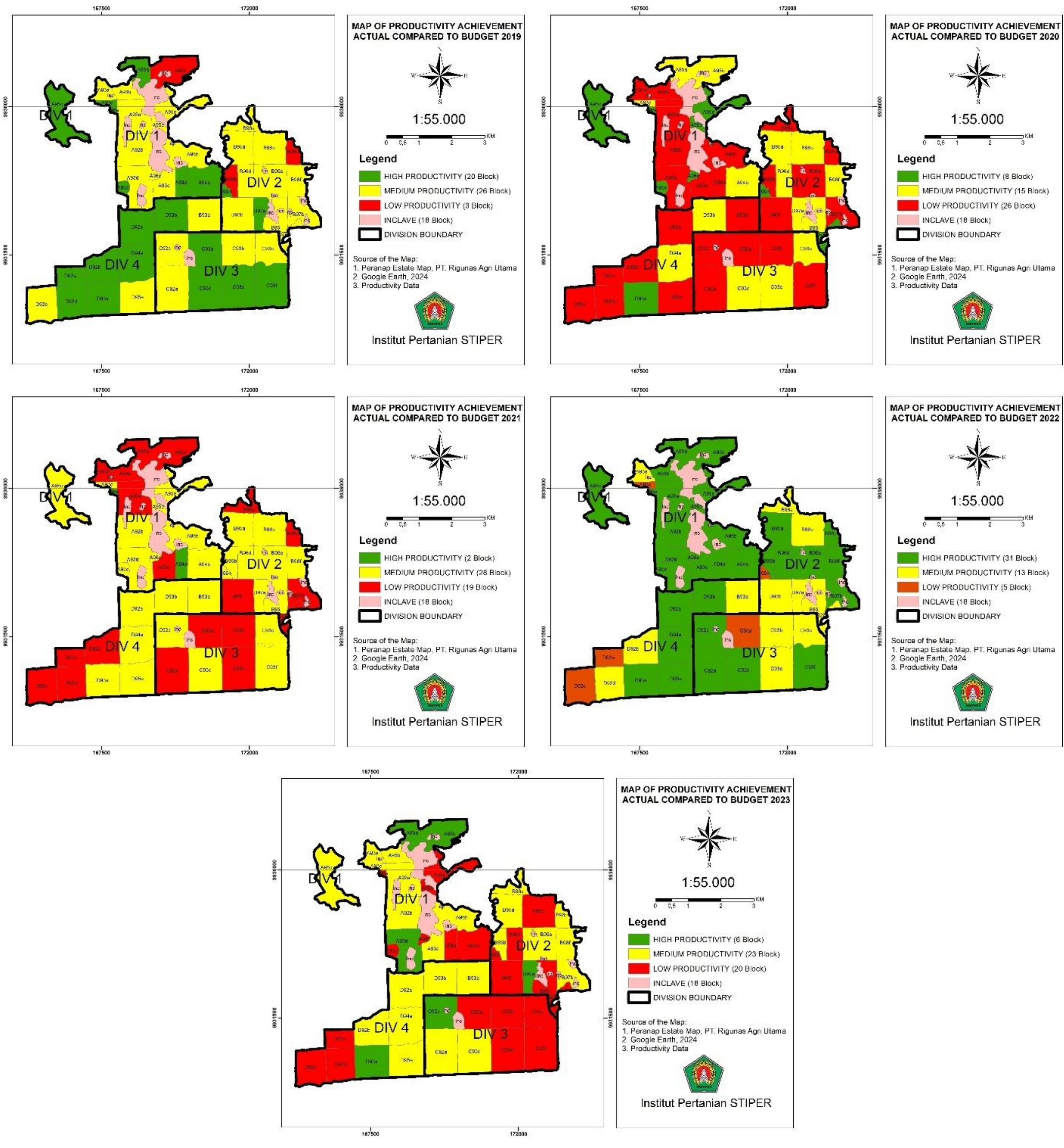

Figure 3. Comparison of actual productivity achievement map against budget 2019-2023.

From the information obtained from the five budget against. actual maps for 2019–2023, it can be seen that 2020 was the year with the lowest productivity due to the El Niño climate conditions that occurred in 2019 (Yuniasih et al., 2023). However, in the following two years, conditions improved, leading to increased productivity. In 2023, productivity declined again due to several blocks no longer receiving fertilizer in preparation for a replanting program. The production budget across different topographic conditions shows slight variations. In flat and undulating topographies, the production budget is higher compared to hilly and mountainous topographies. To minimize losses in hilly and mountainous areas, harvesting stairs and terraces are constructed to facilitate maintenance and harvesting processes.

In flat terrain, such as blocks A95a and A95b, productivity continuously increased due to easier maintenance. However, block A95b experienced fruit theft several times, leading to unmet productivity targets in the first three years. In undulating topography, such as blocks D95a and C92a, productivity continued to increase in 2022. The productivity levels were not significantly different from flat topography because maintenance was still manageable in these blocks. In hilly terrain, such as blocks A95c and D92c, production trends were contrasting. Block A95c, being an outer block frequently passed through, allowed for easier detection of issues, contributing to better productivity. Meanwhile, block D92c, with its hilly terrain, had lower productivity due to less optimal maintenance. In mountainous terrain, such as blocks C93c and C93f, productivity remained relatively stable. However, greater attention was required to ensure the planned production was achieved. Mountainous areas are not ideal for palm oil cultivation due to risks of erosion, fertilizer leaching, uneven drainage, and worker safety hazards. Instead, such areas should be designated as conservation zones (Hasibuan et al., 2018).

Different topographies with the same planting density (SPH) result in varying productivity levels, where flat topographies produce higher yields. To optimize productivity, the budget should be adjusted based on slope classification, and maintenance efforts should be maximized in hilly and mountainous terrains.

4. CONCLUSION

The productivity map provides both spatial and temporal insights into the productivity achievements of blocks with different topographies in the oil palm plantation. The temporal comparison of oil palm productivity from year to year at Peranap Estate, PT. Rigunas Agri Utama, shows fluctuations influenced by climate factors and plantation management.

REFERENCES

Abrori, M. K. (2023). Analisis Faktor – Faktor Produktivitas pada Tanaman Kelapa Sawit *(Elaeis guineensis Jacq.)* di PT. Dinamika Multi Prakarsa Kalimantan Barat.

Aditya, A., Madusari, S., & Kuvaini, A. (2022). Telah Hasil Produksi Tandan Buah Kelapa Sawit dengan Penerapan Jalan Selendang. *Jurnal Pertanian, 13(2), 98-103.*

Apriatama, D., & Zahrotun, L. (2024). Sistem Informasi Geografis Pemetaan Lahan Pertanian Daerah Bantul Berbasis Web. *JURNAL ILMIAH FIFO*, *15*.

Asian Agri. (2024). Asian Agri's Topaz seeds result in higher incomes for smallholders. *Asian Agri*.

Eka Zulfiakhoir, F., & Umaidah, Y. (2022). Pemetaan Daerah Produksi Perkebunan Kelapa Sawit Pada Provinsi Indonesia Menggunakan Algoritma K-Medoids. *Jurnal Ilmiah Wahana Pendidikan*, *8*(16), 195–208. https://doi.org/10.5281/zenodo.7067527

Guth, P. L., Van Niekerk, A., Grohmann, C. H., Muller, J. P., Hawker, L., Florinsky, I. V., Gesch, D., Reuter, H. I., Herrera-Cruz, V., Riazanoff, S., López-Vázquez, C., Carabajal, C. C., Albinet, C., & Strobl, P. (2021). Digital elevation models: Terminology and definitions. *Remote Sensing*, *13*(18). https://doi.org/10.3390/rs13183581

Hasibuan, B. R., Rahayu, E., & Astuti, Y. T. M. (2018). Kajian Pengaruh Topografi Terhadap Produksi Kelapa Sawit di PT. Gunung Sejahtera Yoli Makmur (GSYM) Kecamatan Arut Utara, Kabupaten Kotawaringin Barat, Kalimantan Tengah. *JURNAL AGROMAST*, *3*.

Ihsan, F., Yuniasih, B., & Wirianata, H. (2024). Pemetaan Sistem Monitoring Keragaan Produksi Berbasis Blok. *AGROISTA : Jurnal Agroteknologi*, *8*(1), 29–35. https://doi.org/10.55180/agi.v8i1.431

Irawan, U. S., & Purwanto, E. (2020). *Profile of Smallholder Oil-palm Plantation in Ketapang District. Tropenbos Indonesia. Bogor*.

Kartawisastra, S. (2022). Pengelolaan Lahan Berkarakter Khusus. https://www.researchgate.net/publication/360182212

Li, T. M. (2015). *Social impacts of oil palm in Indonesia: A gendered perspective from West Kalimantan. Occasional Paper 124. Bogor, Indonesia: CIFOR.* https://doi.org/10.17528/cifor/005579

Pranata, H., Nugraha, T., Santosa, B., & Sastrowiratmo, S. (2017). Perbandingan Produktivitas TBS Kelapa Sawit di Lahan Datar dan Bergelombang. In *JURNAL AGROMAST* (Vol. 2, Issue 1).

Putri, R. R., Rusmianto, R., & Makhsun, A. (2020). Keakuratan Metode Black Bunch Count (BBC) dalam Estimasi Produksi Tandan Buah Segar (TBS) pada PT Gawi Bahandep Sawit Mekar. *Jurnal Ilmiah ESAI*, *14*(2), 125–134. https://doi.org/10.25181/esai.v14i2.2391

Saliu, F., & Deari, H. (2023). Precision Agriculture: A Transformative Approach in Improving Crop Production. In *International Journal of Research and Advances in Agricultural Science Abbreviated Key Title: Int J Res Adv Agri Sci Journal homepage* (Vol. 2, Issue 3).

Yuniasih, B., Harahap, W. N., & Wardana, D. A. S. (2023). Anomali Iklim El Nino dan La Nina di Indonesia pada 2013-2022. *AGROISTA : Jurnal Agroteknologi*, *6*(2), 136–143. https://doi.org/10.55180/agi.v6i2.332