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Comparative Analysis of Social Economic and Ecological Progress of "Oil Palm Village" and "Non-Oil Palm Village" Communities

Analisis Komparatif Sosial, Ekonomi, dan Ekologi antara Komunitas Desa Sawit dan Desa Non Sawit

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ABSTRACT

This study aimed to analyze the level of social, economic, and ecological progress of the Oil Palm Village communities and compare the level of social, economic, and ecological progress between the Oil Palm Village and Non-Oil Palm Village communities. Indonesia is one of the major palm oil-producing countries in the world. Palm oil has brought economic benefits nationally and also to local communities. However, in its development, there has been a controversy surrounding the palm oil commodity, namely in the case of Indonesian palm oil which is related to the issues of deforestation and territorialization due to the economic interests of palm oil versus the existence of forest areas. This study used a Quantitative Approach with Secondary Data Methods from primary sources (Ministry of Village, Development of Disadvantage Region, and Transmigration, BPS, and Directorate General of Plantation) with the village communities as the unit of analysis. As many as 524 village communities were selected from the population of Oil Palm Villages and Non-Oil Palm Villages in eight provinces of Indonesia's oil palm centers with a combination of Purposive Multistage Sampling and Propensity Score Matching methods. Descriptive analysis, comparative analysis, analysis of the difference in progress using the Difference in Difference (DID) model, and the binary logistic regression method were carried out in this study. The results of the study revealed the facts that there has been an increase in social, economic, and ecological progress in various Oil Palm Village communities. The level of social, economic, and ecological progress of Oil Palm Village communities is higher than that of Non-Oil Palm Village communities. These facts indicate that the community sustainability level of the Oil Palm Village communities is superior to that of the Non-Oil Palm Village communities.

Keywords: *palm oil, village community, sustainability*

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INTRODUCTION

The oil palm plantations in Indonesia have grown. From an area of 300 thousand hectares in 1980, it increased to 14.46 million hectares in 2019 (Directorate General of Plantation, 2021). During this period, the smallholder oil palm plantations increased from 2 percent to 41 percent of the total area of Indonesian oil palm plantations. The area of oil palm plantations increased from 30 percent to 55 percent, while the state's oil palm plantations decreased from 68 percent to 4 percent. The oil palm plantations in Indonesia, which were originally only in one province (North Sumatera) have also spread to 235 districts in 25 provinces, all the way to West Papua Province. However, in the development, there has been a controversy surrounding the palm oil commodity, namely in the case of Indonesian palm oil which is related to the issue of deforestation and is marginalized by the economic interests of palm oil vis a vis the existence of forest areas (Brad et al., 2015).

Indonesia is one of the major palm oil-producing countries in the world (Santosa, 2008). There is no denying that palm oil has indeed brought economic benefits nationally and also to local communities. A study conducted at the village community level in Jambi Province over a period of 20 years by Gatto et al., (2017), for example, concluded that oil palm development through a contract system between companies and smallholders has a significant economic development impact. Even households that are not involved in the contract receive benefits, as a result of infrastructure development. Furthermore, oil palm development also reduces economic inequality between villages. Gatto et al., (2017) said: "Another interesting finding from our data is that contracts with palm oil companies have contributed to decreasing inter-village inequality". A study conducted by Santika et al., (2019) in all parts of Kalimantan in Indonesia showed the same thing, in that “We show that the oil palm monoculture sector across Kalimantan brought significant economic benefits to village communities…” (Santika et al., 2019).

Oil palm plantations have also contributed socially, such as in poverty alleviation in rural areas (Sayer et al., 2012) (Kasryno, 2015) (Bou Dib et al., 2018) (Syahza, 2013). Poverty alleviation in oil palm centers in rural areas is relatively faster than in non-oil palm centers (Edwards, 2019; Kasryno, 2015; PASPI, 2014; Susila, 2004; Susila & Munadi, 2008; World Growth, 2011). Oil palm village communities have more access to education and health facilities because of the availability of educational infrastructure (elementary, middle, and high schools) and health infrastructure (hospitals and other medical services) (Budidarsono et al., 2012). Infrastructure development such as health facilities and schools (middle school level) has improved in Oil Palm Villages compared to Non-Palm Villages, especially at the beginning of the development of oil palm plantations (Santika et al., 2019).

On the other hand, the development of oil palm plantations in Indonesia also has various negative impacts, both socially and environmentally. Socially, at the on-farm level, the expansion of oil palm plantations often triggers conflicts, especially between local communities and oil palm plantation companies and the government (Abram et al., 2017; Afrizal, 2015). Agrarian conflicts have become a social risk that has attracted the attention of external parties in the last decade (Li, 2017; McCarthy, 2010). There are various issues stating that oil palm plantations actually create various social, economic, and ecological problems in village and rural communities. So far, no study has been carried out on the contribution of oil palm plantations at the village community level, such as the “Oil Palm Village” versus “Non-Oil Palm Village” with a national scope. In fact, village communities play an important role in the village community empowerement process as well as reflect spillovers (Gatto et al., 2017) due to the existence of oil palm plantations that create benefits for all village communities, whether directly or indirectly involved.

The question is, to what extent does the presence of oil palm plantations provide a level of social, economic and ecological progress for the village communities concerned? What are the comparison and social, economic, and ecological progress between the “Oil Palm Village” and “Non-Oil Palm Village" communities in Indonesia?

METHODS

Referring to the Statistics Indonesia (BPS), "Oil Palm Village" is a village community that produces oil palm as the main village commodity, produced by the oil palm plantations owned by village community residents (smallholders) or business entities (state-owned and private) in the village. On the other hand, a village community in this study is categorized as a "Non-Oil Palm Village" community because most of the population cultivates agricultural commodities other than oil palm or there is no oil palm plantation company in the village.

This study was conducted in 524 villages consisting of 262 Oil Palm Villages and 262 Non-Oil Palm Villages in the Top Eight Provinces of Indonesia's Oil Palm Centers, namely Riau, West Kalimantan, Central Kalimantan, North Sumatera, East Kalimantan, South Sumatera, Jambi and Aceh. The determination of the sample villages was carried out using the Purposive Multistage Sampling and Propensity Score Matching (PSM) methods. By using the Propensity Score Matching method (Figure 1), a sample of 262 Oil Palm Villages and 262 Non-Oil Palm Villages was obtained, bringing a total of 524 villages (Table 1).

Table 1. Distribution of "Oil Palm Village" and "Non-Oil Palm Village" Community Samples

Provinces of Indonesia's Oil Palm Centers	Total of Village Communities	Sample of Village Communities
Riau		
Oil Palm Villages	41	41
Non-Oil Palm Villages	34	22
North Sumatra		
Oil Palm Villages	34	33
Non-Oil Palm Villages	38	38
West Kalimantan		
Oil Palm Villages	29	29
Non-Oil Palm Villages	37	37
Central Kalimantan		
Oil Palm Villages	36	33
Non-Oil Palm Villages	30	30
South Sumatera		
Oil Palm Villages	33	32
Non-Oil Palm Villages	34	34
East Kalimantan		
Oil Palm Villages	42	21
Non-Oil Palm Villages	35	29
Jambi		
Oil Palm Villages	31	29
Non-Oil Palm Villages	35	24
Aceh		
Oil Palm Villages	46	44
Non-Oil Palm Villages	49	48
National		
Oil Palm Villages	292	262
Non-Oil Palm Villages	292	262
Total	584	524

To measure social, economic and ecological progress in Oil Palm Villages and Non-Oil Palm Villages, the indicators of the Building Village Index (IDM) used consisted of: Economic Progress Index (IKE), a composite of 12 indicators; Social Progress Index (IKS), a composite of 38 indicators; and Environmental Progress Index (IKL), a composite of 4 indicators.

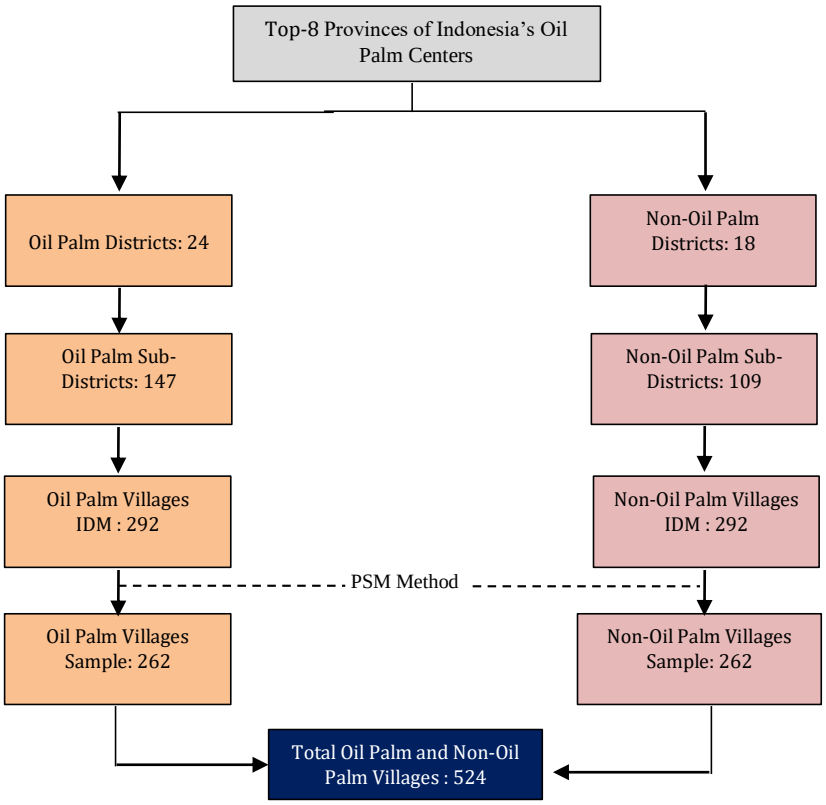


Figure 1. Purposive Multistage Sampling Method of "Oil Palm Village" Vs "Non-Oil Palm Village" Communities

This study collected and used primary data from secondary sources in various publication years, namely: (1) the Ministry of Village, Development of Disadvantage Region, and Transmigration which included the IDM data for 2015/2016, 2020, and 2021; (2) BPS which included the Village Potentials for 2011, 2014, 2018, and 2020, Provinces in Figures for 2020, Districts in Figures for 2020, Subdistricts in Figures for 2016 and 2020, and Directory of Oil Palm Plantation Companies; and (3) the Directorate General of Plantation of the Ministry of Agriculture in the form of a Plantation Statistics Book for the 2019-2021 Period.

The analysis in this study used the following methods: (1) The descriptive analysis described the data on the progress of Oil Palm Villages and Non-Oil Palm Villages in terms of economic progress, social progress and ecological progress which were sourced from IDM data; (2) The comparative analysis of economic progress (IKE), social progress (IKS) and ecological progress (IKL) between Oil Palm Villages and Non-Oil Palm Villages in the period of 2016-2021 also used econometric models; and (3) The analysis of the difference in progress between Oil Palm Villages and Non-Palm Villages and the difference between 2014 (baseline) and 2021 (endline) periods used the Difference in Difference (DID) model specification with binary logistic regression method.

The results of the regression were tested based on statistical criteria as a first order test. The statistical criteria were related to the correlation coefficient and the standard error of the estimation parameters (Sitepu & Sinaga, 2006), so the statistical criteria indicators could be seen from the F-test and t-test. In addition to the F-test and t-test statistics, the Chi-Squared test was also carried out.

RESULTS AND DISCUSSION

One indicator of the success of oil palm plantations in increasing village development progress is the development of the social, economic and ecological progress values which are compositely shown by IDM. The national average IDM of Oil Palm Village indicated an increase from 0.54 in 2016 to 0.68 in 2021 (Figure 2).

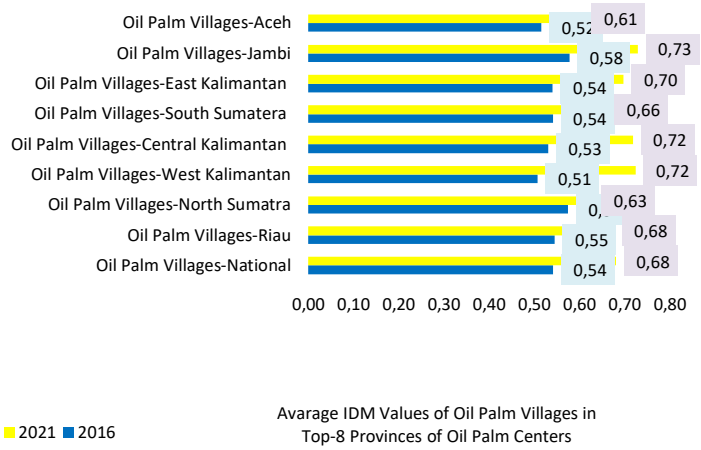


Figure 2. The Increase of Average IDM Values of Oil Palm Villages at the National Level and in the Top-8 Provinces of Oil Palm Centers in 2016 and 2021

The National IDM growth rate of Oil Palm Villages reached 25.67 percent per year during this period (Figure 3). The highest IDM growth rate of Oil Palm Villages (42.72 percent) was in the Oil Palm Villages of West Kalimantan Province. Meanwhile, the lowest IDM growth rate of Oil Palm Villages (9.75 percent) was in the Oil Palm Villages of North Sumatera Province.

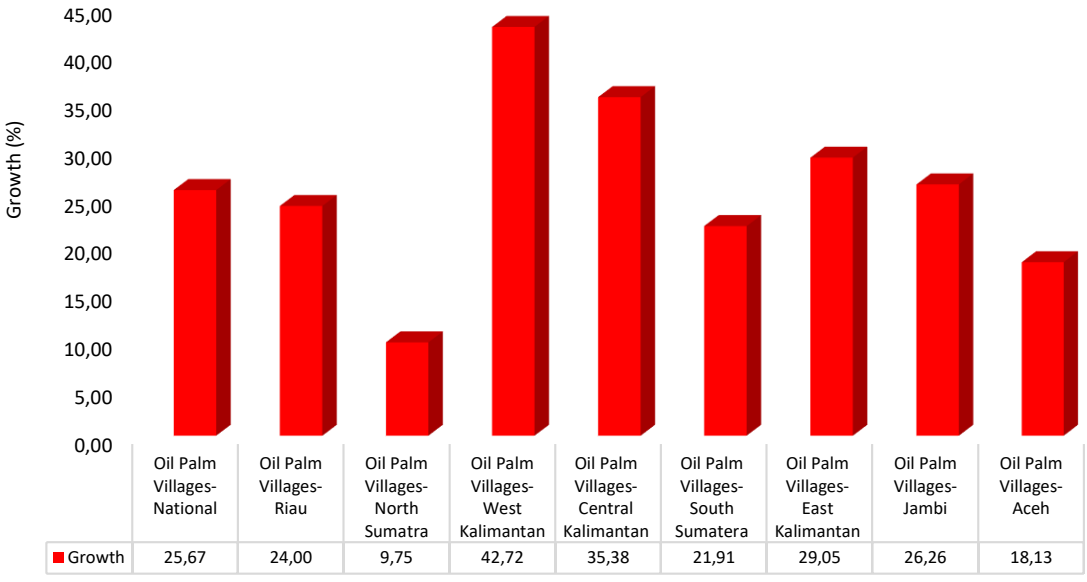


Figure 3. IDM Growth of Oil Palm Villages in National and in the Top-8 Provinces of Oil Palm Centers in 2016 and 2021

The national IDM of Non-Oil Palm Villages in 2021 reached a value of 0.64, an increase from 0.53 in 2016 (Figure 4), or grew by around 21 percent (Figure 5). Meanwhile, in the same period, the national IDM of Oil Palm Villages increased from 0.54 to 0.68, or grew by around 25.67 percent.

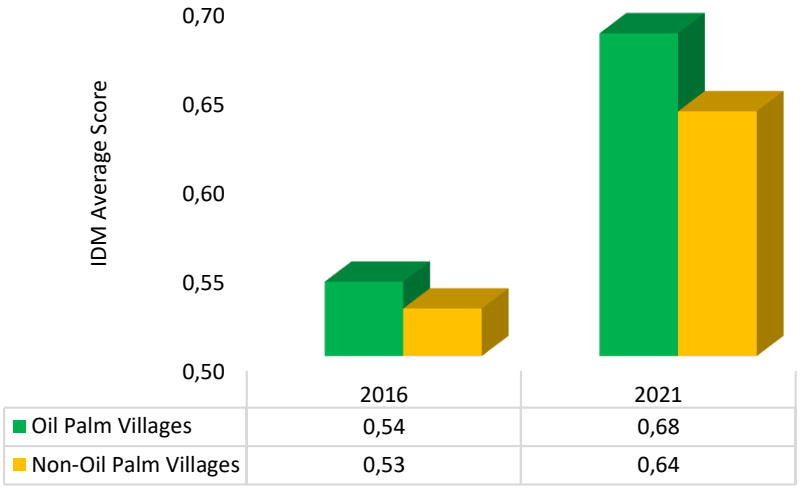


Figure 4. Comparison of the IDM Average Values of Oil Palm Villages and Non-Oil Palm Villages in 2016 and 2021

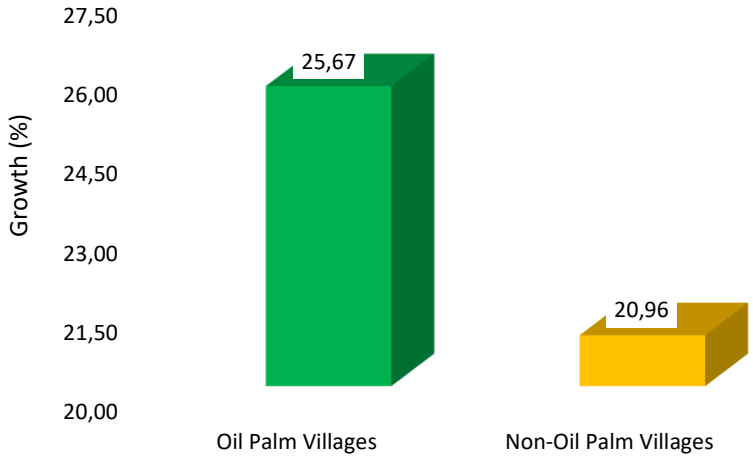


Figure 5. IDM Value Growth of Oil Palm Villages and Non-Oil Palm Villages in 2016 and 2021

This shows that the composite progress (social, economic and ecological) of Oil Palm Villages is higher than that of Non-Oil Palm Villages. Likewise, the composite growth (social, economic and ecological) of Oil Palm Villages is faster than that of Non-Oil Palm Villages.

Based on the statistical test (Table 2), the IDM of Oil Palm Villages was higher and more significant ($P < 0.01$) compared to that of Non-Oil Palm Villages. This means that the presence or adoption of oil palm plantations in rural areas increases the social, economic and ecological progress of the villages concerned.

Table 2. Oil Palm Village and Non-Oil Palm Village IDM Statistical Test Results

	Coef. Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.634008	0.005003	126.714***	< 2e-16
TREATSAWIT	0.040992	0.007076	5.793***	1.19E-08
F-statistic: 33.56***				

Note: *** significant at 0.01 percent significance level Number of samples (n) = 524 villages (262 Oil Palm Villages and 262 Non-Oil Palm Villages)

The results of the analysis have confirmed previous empirical studies PASPI (2014), Susila (2004), Varkkey (2012), World Growth (2011) which revealed that the presence of oil palm plantations significantly affects the socio-economic development of rural areas in Indonesia. Likewise, from the ecological aspect, oil palm plantations provide ecological benefits including the soil and water conservation function in rural areas (Harahap, 2007; PASPI-Monitor, 2021).

Table 3. Changes in Village Development Status by Number of Oil Palm Villages and Non-Oil Palm Villages from 2016 to 2021

Village Status	Oil Palm Villages		Non-Oil Palm Villages	
	2016	**2021**	**2016**	**2021**
Sangat Tertinggal	139	1	156	1
Persentase (%)	*53.1*	*0.4*	*59.5*	*0.4*
Tertinggal	99	32	90	80
Persentase (%)	*37.8*	*12.2*	*34.4*	*30.5*
Berkembang	17	155	12	143
Persentase (%)	*6.5*	*59.2*	*4.6*	*54.6*
Maju	7	55	4	28
Persentase (%)	*2.7*	*21.0*	*1.5*	*10.7*
Mandiri	-	19	-	10
Persentase (%)	-	*7.3*	-	*3.8*
Jumlah	262	262	262	262
Persentase (%)	*100.0*	*100.0*	*100.0*	*100.0*

In the period of 2016-2021, there has been a change in the status of village development (in accordance with the village progress classification of the Regulation of the Ministry of Village, Development of Disadvantage Region, and Transmigration Number 2 of 2016) in Oil Palm Villages and Non-Oil Palm Villages. The increase in the status of the Oil Palm Village communities is higher than that of the Non-Oil Palm Village communities (Table 3).

Economic Aspect

In the IDM measurement, village economic progress was measured by IKE which was a composite of 12 indicators of rural economic development. The increase in the economic progress of Oil Palm Villages occurred at the national level and in every province in the Top-8 oil palm plantation centers in Indonesia. The IKE value of Oil Palm Villages in 2016 nationally was 0.41, and it increased to 0.58 in 2021 (Figure 6).

The Economic Progress Increase of Oil Palm Villages at the National Level and in the Top-8 Provinces of Indonesia's Oil Palm Centers in 2016 and 2021

The oil palm center provinces that had the highest economic progress in Oil Palm Villages in 2016 were Jambi (0.49) and Riau (0.48).

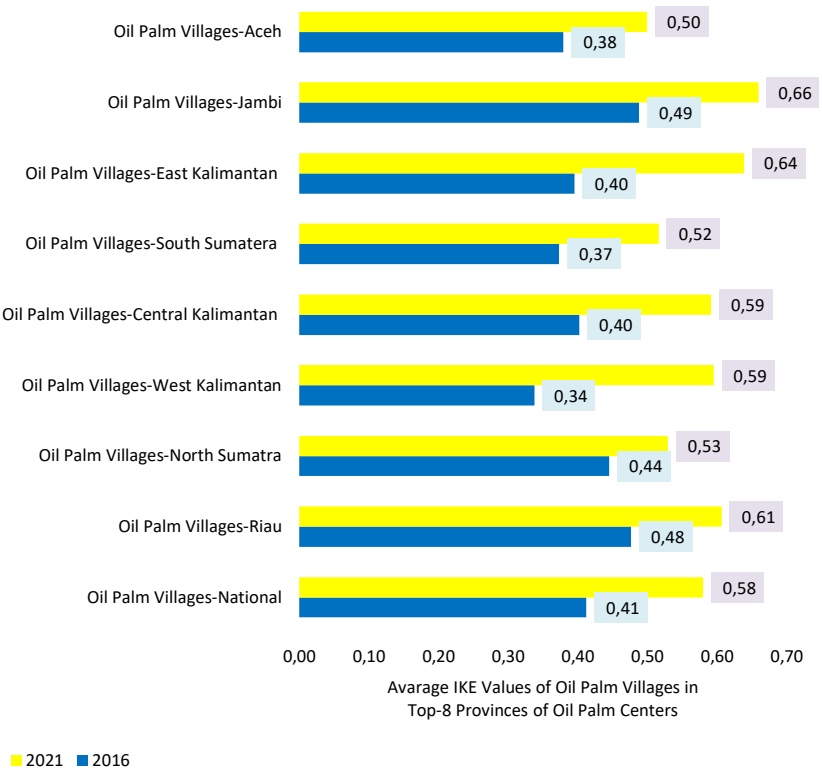


Figure 6. The Economic Progress Increase of Oil Palm Villages at the National Level and in the Top-8 Provinces of Indonesia's Oil Palm Centers in 2016 and 2021

Based on the growth rate, the economic progress of Oil Palm Villages at the national level reached 40.64 percent during the 2016-2021 period. The highest economic progress increase rate in Oil Palm Villages was in West Kalimantan, and the lowest was in North Sumatera (Figure 7).

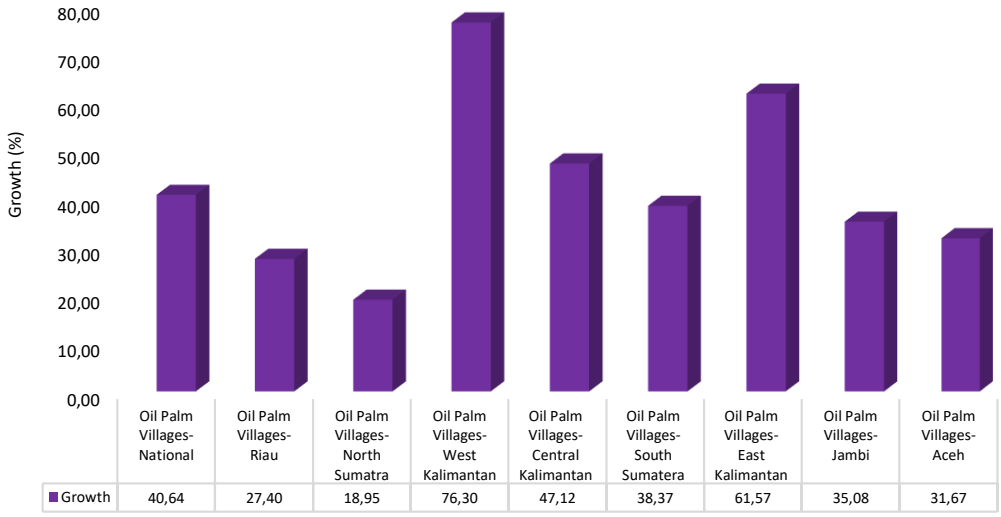


Figure 7. Oil Palm Village Economic Progress Growth at the National Level and in the Top-8 Provinces of Indonesia's Oil Palm Centers in 2016 and 2021

Based on the average value of the economic progress, the economic progress of Oil Palm Villages was higher than that of Non-Oil Palm Villages for the 2016-2021 period (Figure 8). The level of economic progress of Oil Palm Villages in 2016 was 0.41 and of Non-Oil Palm Villages was 0.40. The level of

economic progress of the two village groups experienced an increase in 2021; 0.58 for Oil Palm Villages and 0.53 for Non-Oil Palm Villages.

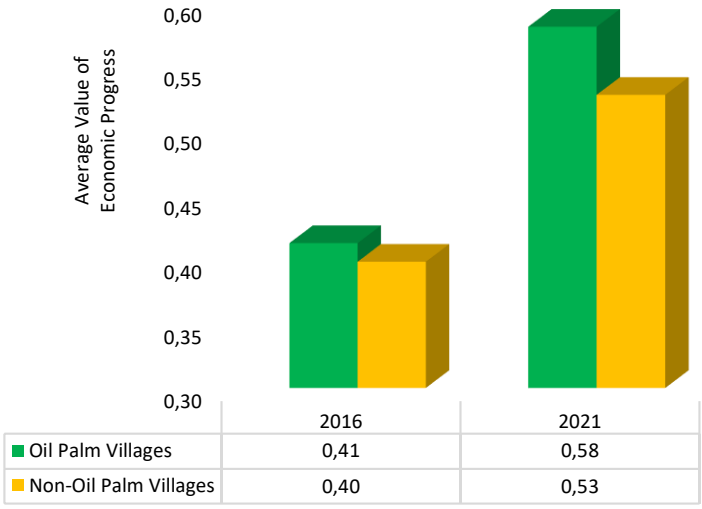


Figure 8. Comparison of Economic Progress of Oil Palm Villages and Non-Oil Palm Villages in 2016 and 2021

The presence of oil palm plantations and related activities are able to drive economic progress in the village communities concerned. Statistically (Table 4), the economic progress of Oil Palm Villages was higher and more significant ($P < 0.01$) compared to Non-Oil Palm Villages. This means that oil palm plantation activities in Oil Palm Villages generate higher economic progress than Non-Oil Palm Villages.

Table 4. Statistical Test Results of Economic Progress Values of Oil Palm Villages and Non-Oil Palm Villages

	Coef. Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.523663	0.007913	66.174***	< 2e-16
TREATSAWIT	0.049429	0.011191	4.417***	1.22E-05
F-statistic 19.51***				

Note: *** significant at 0.01 percent significance level Number of samples (n) = 524 villages (262 Oil Palm Villages and 262 Non-Oil Palm Villages)

The development of oil palm plantations in villages empirically creates a multiplier effect so it can encourage the growth of other economic sectors such as trade, financial institutions, as well as logistics and transportation services (PASPI, 2014; Rifin, 2011; Syahza et al., 2021). Villages with oil palm plantations enjoy improvement in financial (economic) aspects compared to villages without oil palm plantations (Budidarsono et al., 2013; Santika et al., 2019). This means that the presence of oil palm plantations and their activities are able to drive economic progress in the villages concerned, even exceeding villages that do not have oil palm plantations.

To strengthen the results of the analysis, a comparative analysis was carried out on the increase of the number of KUDs as an economic institution at the village community level. The development of the number of KUDs in Oil Palm Villages was more significant than that of Non-Oil Palm Villages, and it showed a downward trend during the period of 2014 and 2020 (Figure 9).

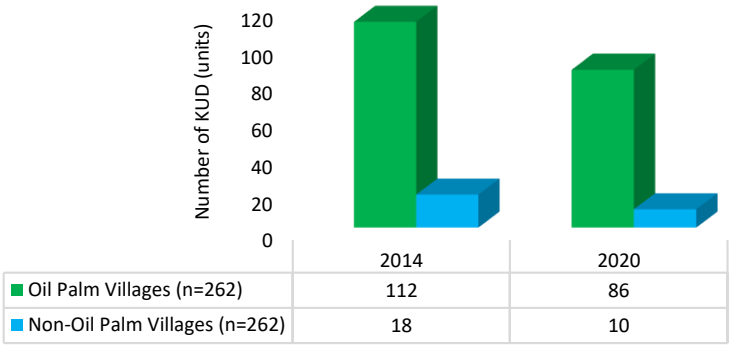


Figure 9. Comparison of the Number of KUDs in Oil Palm Villages versus Non-Oil Palm Villages in 2014 and 2020 (Source: BPS, 2014, 2020)

The results of the DID statistical analysis showed that the number of KUDs in Oil Palm Villages was more significant ($p < 0.05$) compared to non-oil palm villages. However, the number of KUDs in both Oil Palm Villages and Non-Oil Palm Villages showed a downward trend in the number of KUDs (Table 5).

Table 5. Linear Regression Statistical Test Results for the Number of KUDs in Oil Palm Villages and Non-Oil Palm Villages for the 2014 and 2020 Period

	Coef. Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.06870	0.02759	2.490**	0.0129
TREATSAWIT	0.35878	0.03902	9.194***	< 2e-16
POST	-0.03053	0.03902	-0.782	0.4341
DID	-0.06870	0.05519	-1.245	0.2135
d.f = 3, 1044; F-statistic = 48.44***				

Note: significance *** at 0.01 percent significance level; **at the 0.05 percent level of significance

The decline in the number of KUDs in both types of communities is understandable. Cooperatives play an important role in the development of oil palm plantations in Indonesia. KUD played a role in the implementation of the PIR KPPA (Primary Cooperative Credit for Its Members) pattern in the 1995-1998 Period (Budidarsono et al., 2013; Kasryno, 2015; PASPI, 2014). The important role of cooperatives is as an intermediary between oil palm plantation companies and smallholders related to buying and selling contracts (Gatto et al., 2017). Another function is that KUD plays a role in the procurement and distribution of production inputs, community consumption needs, savings and loans and transportation (Syahza et al., 2021).

In addition, the decrease in the number of KUDs is an implication of the development of Village Owned Enterprises (BUMDesa) as an economic institution for villages and rural communities. The purpose of developing BUMDesa is to increase and strengthen the village economy in order to improve the welfare of rural communities.

In the oil palm plantation sector, the involvement of BUMDesa with business units such as production input providers, service providers for transporting FFB to company-owned mills or palm oil waste management and even sustainable certification, is starting to develop. The Village Potential data (BPS, 2020) showed the number of BUMDesa formed in Oil Palm Villages in 2020 was 321 units, while the number of BUMDesa in Non-Oil Palm Villages was 251 units. The analysis showed that the development of cooperatives and BUMDesa is mostly carried out in Oil Palm Villages than in Non-Oil Palm Villages.

Social Aspect

In the social aspect, the social progress (IKS) of Oil Palm Villages increased from 0.6 to 0.78 which was higher and more significant than that of Non-Oil Palm Villages which increased from 0.57 to 0.72. This means that the presence of oil palm plantations is able to improve the social welfare of the villages concerned and the social welfare is relatively higher compared to villages that do not have oil palm plantations (Figure 10).

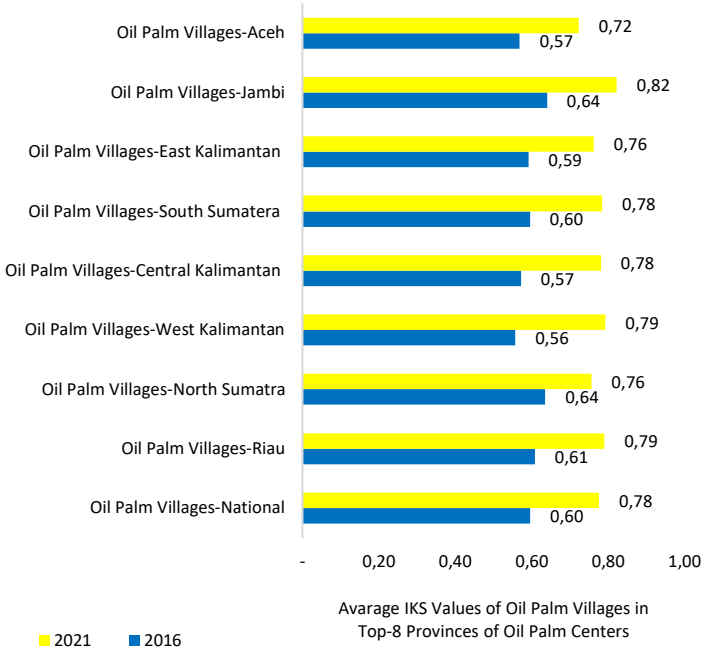
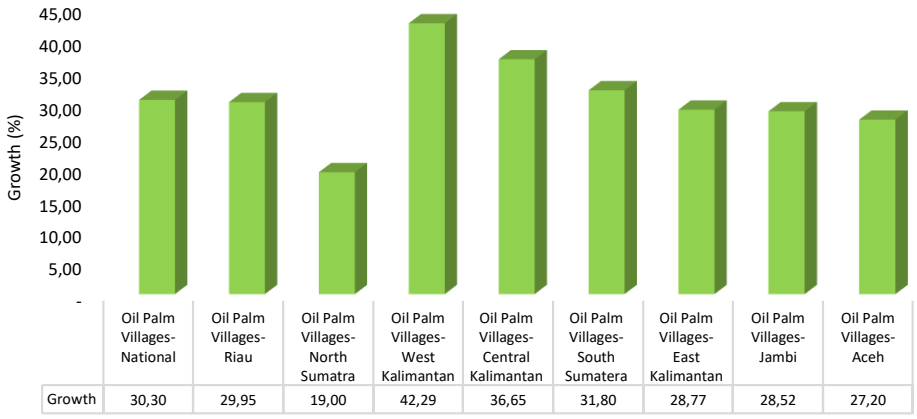


Figure 10. IKS Improvement in Oil Palm Villages at National Level and in the Top-8 Provinces of Indonesia's Oil Palm Centers in 2016 and 2021

The growth rate of social progress in Oil Palm Villages at the national level reached 30.3 percent during the 2016-2021 period. The highest rate of social progress improvement in Oil Palm Villages was in West Kalimantan, and the lowest was in North Sumatera (Figure 11).



	Oil Palm Villages-National	Oil Palm Villages-Riau	Oil Palm Villages-North Sumatra	Oil Palm Villages-West Kalimantan	Oil Palm Villages-Central Kalimantan	Oil Palm Villages-South Sumatera	Oil Palm Villages-East Kalimantan	Oil Palm Villages-Jambi	Oil Palm Villages-Aceh
Growth	30,30	29,95	19,00	42,29	36,65	31,80	28,77	28,52	27,20

Figure 11. Oil Palm Village Social Progress Growth at the National Level and in the 8 Provinces of Indonesia's Oil Palm Centers in the 2016 and 2021 Period

The social progress of Oil Palm Villages was higher than that of Non-Oil Palm Villages for the 2016 and 2021 periods (Figure 12).

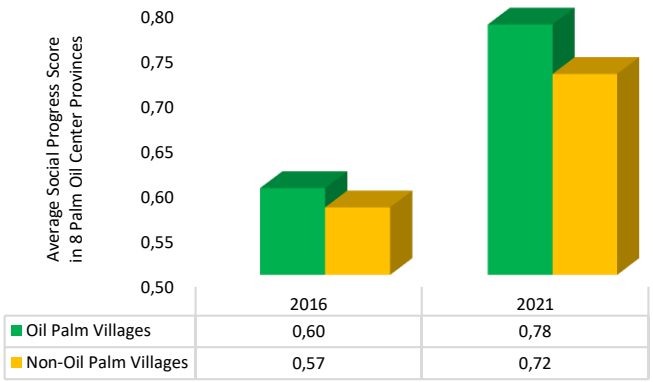


Figure 12. Comparison of Social Progress of Oil Palm Villages with Non-Oil Palm Villages in 2016 and 2021

The statistical test results (Table 6) showed that the higher level of social progress of Oil Palm Village compared to that of Non-Oil Palm Village was caused significantly ($p < 0.01$) by the presence of oil palm plantations. The presence of oil palm plantations in rural areas significantly increases rural social progress.

Table 6. Statistical Test Results of Oil Palm Village and Non-Oil Palm Village Social Progress Values

	Coef. Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.720674	0.004681	153.951 ***	< 2e-16
TREATSAWIT	0.054048	0.006620	8.164***	2.45e-15
F-statistic 66.65 ***				

Note: *** significant at 0.01 percent significance level Number of samples (n) = 524 villages (262 Oil Palm Villages and 262 Non-Oil Palm Villages)

The IKS dimension in measuring IDM as a proxy for social progress includes health, education, social capital and housing (the Ministry of Village, Development of Disadvantage Region, and Transmigration, 2021). This is relevant to several studies which state that oil palm plantations in rural areas contribute to the development of rural infrastructure such as education (kindergarten, elementary, middle, and high schools) and health infrastructure as well as supporting facilities such as school buses or ambulances. The availability of various basic facilities (education and health) in village areas around oil palm plantations increases village community access to the fulfillment of these basic needs/rights (Baihaqi, 2019; Edwards, 2019; Euler et al., 2016; Krishna et al., 2017; Marwan et al., 2016; PASPI, 2014; Satria, 2017). Studies at the village level (Budidarsono et al., 2013; Santika et al., 2019) also revealed the same thing. Villages with oil palm plantations enjoy physical benefits/infrastructure built by oil palm plantation companies.

To strengthen the results of the IKS analysis, a detailed analysis of ethnic diversity (ethnicity) in the "Oil Palm Village" and "Non-Oil Palm Village" communities was carried out. Ethnic diversity and the formation of a heterogeneous society are also reflected as an indicator in the dimension of social capital that reflects social resilience (IKS) (Ministry of Village, Development of Disadvantage Region, and Transmigration, 2021).

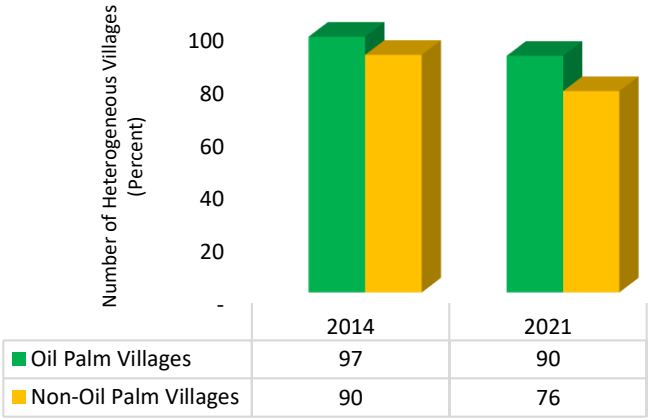


Figure 13. Comparison of Heterogeneity Percentage between Oil Palm Villages and Non-Oil Palm Villages in 2014 and 2021 (Source: BPS, 2014; Ministry of Village, Development of Disadvantage Region, and Transmigration, 2021)

The results of the analysis showed that based on ethnic diversity there are more heterogeneous Oil Palm Villages than Non-Oil Palm Villages (Figure 13). Chi-Square statistical test was conducted to examine the relationship between ethnic heterogeneity or diversity and Oil Palm Villages. The test results showed that there is a significant relationship between ethnic diversity (heterogeneity) and Oil Palm Villages, with a Chi-Square value of 25.13 and a p-value of 5.359e-07 (significant at the 1 percent level of significance).

The ethnic diversity in Oil Palm Villages is inseparable from various policies in development, such as the transmigration program and the development of oil palm plantations carried out by the community, state plantation companies, and private plantation companies which have led to the ongoing in-migration of various ethnics into the oil palm plantation areas, whether in plantation farming community units or rural communities. The development of oil palm plantations with the transmigration program through the implementation of the PIR-Trans pattern (Gatto et al., 2017; Kasryno, 2015; PASPI, 2014; Varkkey, 2012) became the forerunner to the formation of heterogeneous ethnic and community diversity in Oil Palm Villages. In addition, spontaneous migration from an area to the area for developing oil palm plantations has also intensively occurred since 2000, whether as labor, business suppliers, food traders or smallholders. The development of this diversity in the Oil Palm Village communities is the contribution of oil palm plantations to socio-cultural aspects, namely as the glue and unifier of the nation (PASPI-Monitor, 2021). Studies at the village level (Budidarsono et al., 2013; Santika et al., 2019) also revealed the same thing. Villages with oil palm plantations enjoy physical benefits/infrastructure built by oil palm plantation companies.

From the perspective of Rural and Agricultural Sociology, especially from the perspective of social capital, the degree of ethnic heterogeneity in Oil Palm Villages indicates that the “bridging” social capital forms, in the form of cross-ethnic collective actions, which may also be followed by interfaith, in Oil Palm Villages are getting stronger. A study conducted by Colletta et al., (2000) showed that the strengthening of the "bridging" social capital forms (horizontal social capital) will be followed by the development of "linking" social capital forms (vertical social capital), which in the context of oil palm plantations in Indonesia indicates that in Oil Palm Villages, the pattern of relations and cooperation between government and private institutions and the Oil Palm Village communities is growing.

In addition, still with the same perspective, higher degree of ethnic heterogeneity also has the potential to cause conflict, especially horizontal conflict. Therefore, in the Oil Palm Village communities, good governance for community development of Oil Palm Villages is needed. Good governance in community development in Oil Palm Village has been implemented, for example through a corporate

social responsibility (CSR) scheme based on community participation and multi-stakeholder participation.

Ecological Aspect

The level of ecological progress at the village level was analyzed based on the IKL contained in the IDM. This index is a composite index of 4 environmental progress indicators set by the government.

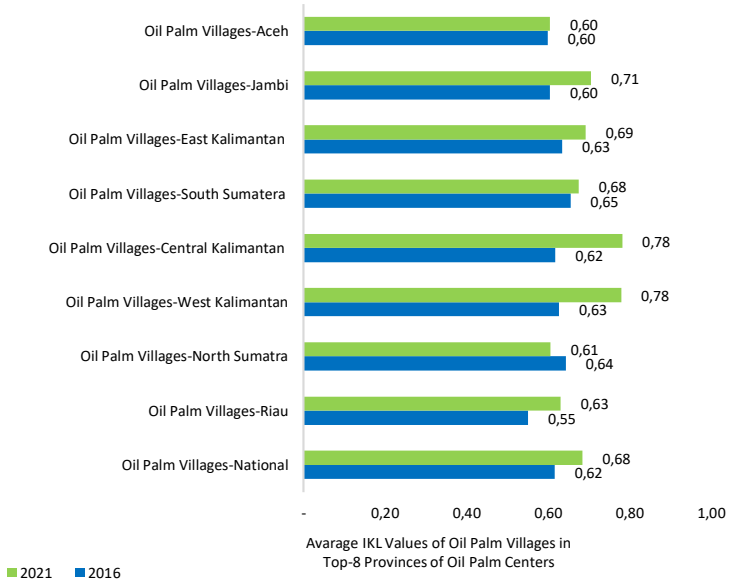


Figure 14. Ecological Progress Increase in Oil Palm Villages at the National Level and in the Top-8 Provinces of Indonesia's Oil Palm Centers in 2016 and 2021

The ecological progress value in Oil Palm Villages nationally has increased from 0.62 in 2016 to 0.68 in 2021 (Figure 14). The growth rate of ecological progress in Oil Palm Villages at the national level reached 11 percent during the 2016-2021 period (Figure 15).

	Oil Palm Villages-National	Oil Palm Villages-Riau	Oil Palm Villages-North Sumatra	Oil Palm Villages-West Kalimantan	Oil Palm Villages-Central Kalimantan	Oil Palm Villages-South Sumatera	Oil Palm Villages-East Kalimantan	Oil Palm Villages-Jambi	Oil Palm Villages-Aceh
Growth	11,0	14,5	-5,8	24,3	26,57	3,1	9,1	16,8	0,9

Figure 15. Ecological Progress Growth of Oil Palm Villages at the National Level and in the Top-8 Provinces of Indonesia's Palm Oil Centers in the 2016-2021 Period

The ecological progress of Oil Palm Villages was higher than that of Non-Oil Palm Villages for the 2016-2021 period (Figure 16). The ecological progress index of Oil Palm Village in 2016 was 0.62, while the level of ecological progress of Non-Oil Palm Villages was 0.61 in the same year. The index of ecological progress in these two village groups experienced an increase in 2021, raising the level of ecological progress in Oil Palm Villages to 0.68, while the level of ecological progress in Non-Oil Palm Villages was only 0.66.

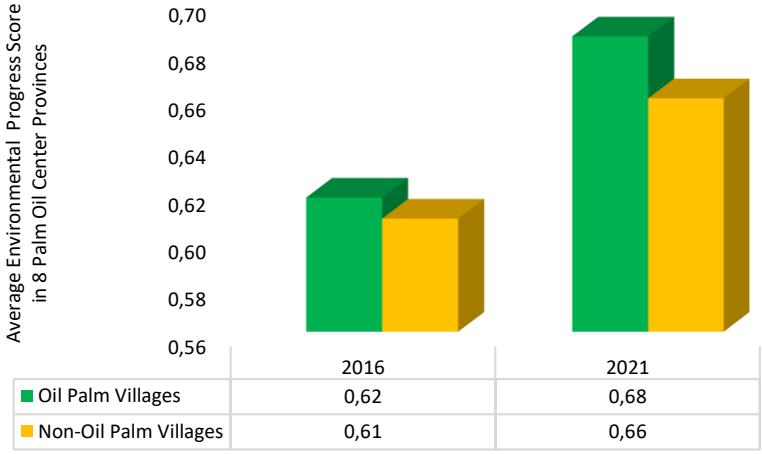


Figure 16. Comparison of Ecological Progress (IKL) of Oil Palm Village and Non-Oil Palm Villages in 2016 and 2021

The results of statistical test (Table 7) showed that the higher ecological progress of Oil Palm Villages compared to that of Non-Oil Palm Villages was due to the presence of oil palm plantations ($p < 0.1$). The results of this analysis can be evidence to refute the view that the presence of oil palm plantations has a negative impact on the village environment/ecology. Even the presence of oil palm plantations in rural areas improves and enhances the progress of rural ecology.

Table 7. Statistical Test Results of Oil Palm Village and Non-Oil Palm Village Ecological Progress Values in 2021

	Coef. Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.656242	0.007936	82.693***	<2e-16
TREATSAWIT	0.021119	0.011223	1.882*	0.0604
F-statistic 3.541				

Note: *** significant at 0.01 percent significance level; * at the 0.1 percent level of significance Number of samples (n) = 524 villages (262 Oil Palm Villages and 262 Non Palm Oil Villages)

However, to strengthen the analysis, a comparative analysis was carried out between the number of floods in Oil Palm Villages and Non-Oil Palm Villages.

The results of the analysis showed that the number of floods in Oil Palm Villages in 2013 decreased 133 times to 128 times in 2019. Meanwhile, the number of floods in Non-Oil Palm Villages increased from 95 times to 131 times in the same period (Figure 17).

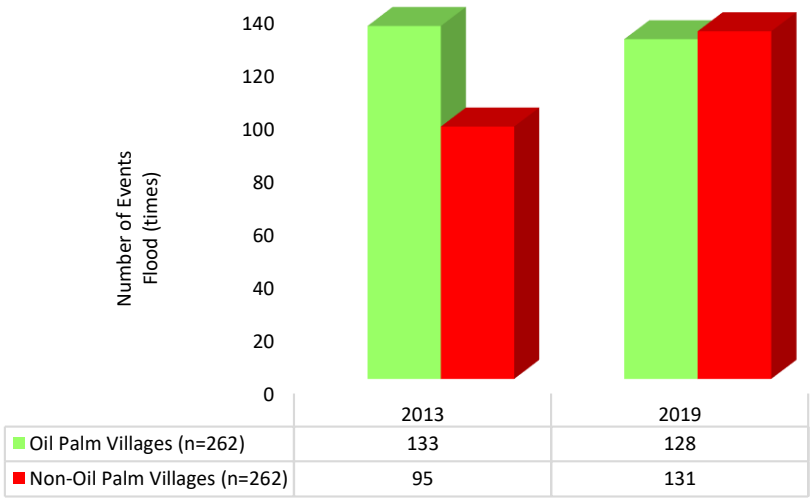


Figure 17. Comparison of the Number of Floods in Oil Palm Villages and Non-Oil Palm Villages in 2013 and 2019 (Source: BPS, 2014, 2020)

Next, an analysis was carried out to find out whether the decrease in the number of floods in Oil Palm Villages was caused by the presence of oil palm plantations or not. The results of the DID statistical test (Table 8) showed that the flood phenomenon cannot be explained by the variables of oil palm plantations or non-oil palm plantations. The flood phenomenon that continues to increase every year is part of global climate change as a result of global warming (Hirabayashi et al., 2021; PASPI, 2017; Tabari, 2020). Global warming and climate change occur in all countries in the world, in all regions, and systematically are not based on whether an area has oil palm plantations or not.

Table 8. Linear Regression Statistical Test Results for the Number of Floods in Oil Palm Villages and Non-Oil Villages in 2013 and 2019

	Coef. Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.36260	0.06487	5.590***	2.9e-08
TREATSAWIT	0.14504	0.09174	1.581	0.114
POST	0.13740	0.09174	1.498	0.134
DID	-0.15649	0.12974	-1.206	0.228
d.f = (3, 1044); F-statistic = 1.116				

Note: *** significant at 0.01 percent level of significance

However, there is a tendency for the number of floods in Oil Palm Villages to decrease from time to time when compared to Non-Oil Palm Villages. This may be related to the soil and water conservation function of oil palm plantations which improves along with the increasing age of oil palm plantations.

Apart from flood as a phenomenon of global climate change, the occurrence of flood is caused by surface water flow (water run-off). Oil palm plantations naturally or inherently (built-in) have the ability to become soil and water conservation plants with a canopy cover mechanism, a root system mechanism for oil palm plants, and the application of Good Agricultural Practices/GAP on soil and water (man-

made conservation), making oil palm plantations an important part of the soil and water conservation system and minimizing floods and landslides.

CONCLUSION

The social, economic and ecological progress of the Oil Palm Village communities is superior and significant compared to that of the Non-Oil Palm Village communities. The economic progress of the Oil Palm Village communities is significantly superior to that of the Non-Oil Palm Village communities. The social progress of the Oil Palm Village communities is significantly superior to that of the Non-Oil Palm Village communities. The ecological progress/resilience of the Oil Palm Village communities is significantly better than that of the Non-Oil Palm Village communities.

Business opportunities and economic institutions in the Oil Palm Village communities are increasing and developing more than business opportunities and economic institutions in the Non-Oil Palm Village communities. "Bridging" social capital forms (horizontal social capital) in the form of collective actions of cross-ethnic communities are growing in the Oil Palm Village communities. "Bridging" social capital forms will be followed by the development of relations and cooperation between government and private institutions and the Oil Palm Village communities (linking-vertical social capital). Ecologically, oil palm plantations are an important part of the soil and water conservation system which can minimize floods and landslides.

It can be indicated that the level of sustainability of the Oil Palm Village communities is higher than that of the Non-Oil Palm Village communities.

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