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Economic, Social and Environmental Impacts of Sultan Thaha Syaifuddin Forest Park Due to Oil Palm Plantation Expansion in Bungku Village, Batanghari Regency, Jambi Province

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ABSTRAK

Kelapa sawit (*Elaeis guineensis*) merupakan komoditas perkebunan strategis yang berkontribusi terhadap perekonomian Indonesia, namun ekspansi perkebunannya berpotensi menimbulkan dampak sosial dan lingkungan. Penelitian ini bertujuan menganalisis dampak ekonomi, sosial, dan lingkungan akibat ekspansi perkebunan kelapa sawit terhadap masyarakat petani di sekitar kawasan Taman Hutan Raya Sultan Thaha Syaifuddin (Tahura STS), Kabupaten Batanghari, Provinsi Jambi. Penelitian menggunakan metode *random sampling* dengan penentuan responden secara *purposive*. Analisis pendapatan digunakan untuk mengestimasi manfaat ekonomi, sedangkan analisis deskriptif digunakan untuk mengidentifikasi dampak sosial dan lingkungan. Hasil penelitian menunjukkan bahwa ekspansi perkebunan kelapa sawit meningkatkan rata-rata pendapatan petani sebesar 47% pada sektor *on-farm*, serta memberikan tambahan pendapatan pada sektor *off-farm* sebesar 21% dan *non-farm* sebesar 32%, dengan rata-rata total peningkatan pendapatan sebesar 23%. Di sisi lain, ekspansi perkebunan memunculkan konflik sosial antara masyarakat lokal dan pendatang, serta berdampak pada lingkungan berupa penurunan volume air tanah, meningkatnya risiko kebakaran hutan, dan berkurangnya biodiversitas pohon.

Kata kunci: Dampak Ekonomi, Dampak Lingkungan, Dampak Sosial, Ekspansi, Kelapa Sawit

ABSTRACT

Oil palm (*Elaeis guineensis*) is a strategic plantation commodity that contributes significantly to Indonesia's economy; however, the expansion of oil palm plantations may generate social and environmental impacts. This study aims to analyze the economic, social, and environmental impacts of oil palm plantation expansion on farming communities surrounding the Sultan Thaha Syaifuddin Forest Park (Tahura STS), Batanghari Regency, Jambi Province. The study employed a *random sampling* method with respondents selected purposively. Income analysis was used to estimate economic benefits, while descriptive analysis was applied to identify social and environmental impacts. The results indicate that oil palm plantation expansion increased farmers' average income by 47% in the *on-farm* sector and provided additional income in the *off-farm* (21%) and *non-farm* (32%) sectors, resulting in an average total income increase of 23%. However, plantation expansion also triggered social conflicts between local communities and migrants and generated environmental impacts, including reduced groundwater availability, increased forest fire risk, and declining tree biodiversity.

Keywords: Economic Impact, Environmental Impact, Expansion, Oil Palm, Social Impact

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1. INTRODUCTION

The development of oil palm plantations in Indonesia is currently growing rapidly. Oil palm (Elaeis guineensis) is one of the main plantation commodities that is important in the Indonesian economy as a source of foreign exchange (Ambiyah 2012). Based on the Central Statistics Agency (2007), oil palm development provides benefits in increasing farmers' income and contributing to regional revenues. The increasing demand for crude palm oil (CPO) commodities in the

world vegetable oil trade has encouraged the development of oil palm plantation areas (PUSDATIN 2014). The increasing area of oil palm plantations has caused CPO production in Indonesia to increase every year. Indonesia's opportunities to increase production are still very large, this is due to the availability of land for oil palm development, climate suitability, availability of labor, and relatively cheap construction and maintenance costs per hectare compared to other CPO producing countries (Ramadhan 2014).

One of the regions in Jambi Province that serves as a center for oil palm plantations is Batanghari Regency. The total area of oil palm plantations in Batanghari Regency was 178,483 ha in 2023 and decreased to 177,034 ha in 2024. Oil palm production in Batanghari Regency reached 519,076 tons in 2024 and increased to 521,021 tons in 2025 (Statistics Indonesia, 2026).

The expansion of oil palm plantations in developing countries is carried out as one of the economic development policies. In addition to economic progress in the expansion of oil palm plantations, previous research conducted by Moreno-Penaranda et al. (2015) on sustainable palm oil production and consumption in Indonesia shows that the palm oil sector can have significant social, economic, and environmental impacts. General production practices such as monoculture land expansion, expansion in forest areas, land clearing by burning, palm oil mills can damage the environment and threaten biodiversity. Previous studies have shown that oil palm expansion contributes to biodiversity decline and ecological simplification in tropical landscapes (Azhar et al., 2011), and more recent studies continue to report social–ecological trade-offs associated with plantation expansion. Driven by plans to generate economic income, large-scale plantations that have emerged in Southeast Asia, Africa and the Brazilian Amazon have actually had a negative ecological impact due to the unpreparedness of the management system so that conservation measures are needed. The purpose of this study is to analyze the economic, social and environmental impacts on communities and farmers located outside and inside the Tahura STS area due to oil palm expansion.

Previous studies on oil palm plantation expansion have generally focused on economic or environmental impacts separately and were conducted in conventional plantation areas. The novelty of this study lies in its integrated assessment of economic, social, and environmental impacts on farming communities surrounding the Sultan Thaha Syaifuddin Forest Park (Tahura STS), a conservation area experiencing pressure from oil palm expansion. Based on these conditions, the research problems are formulated as follows: (1) how does oil palm plantation expansion affect changes in farmers' household income around the Sultan Thaha Syaifuddin Forest Park (Tahura STS); (2) what social impacts emerge from oil palm plantation expansion on communities located inside and outside the Tahura STS area; and (3) how do local communities perceive the environmental impacts of oil palm plantation expansion surrounding the Tahura STS area? Therefore, this study aims to analyze the economic, social, and environmental impacts of oil palm plantation expansion on farming communities around the Tahura STS area. In addition, this study examines household income changes across on-farm, off-farm, and non-farm sectors, providing a more comprehensive understanding of the consequences of plantation expansion on community livelihoods.

This study is based on the assumption that oil palm plantation expansion generates economic benefits through increased household income while simultaneously creating social and environmental consequences around the Tahura STS area.

2. METHODOLOGY

2.1. Location and Time of Research

The research was conducted in Sultan Thaha Syaifuddin Forest Park (Tahura STS) in Bungku Village, Bajubang District, Batanghari Regency, Jambi Province. This research focuses on Bungku Village as a buffer village for the Tahura STS area. This research was conducted for 2 months, namely in December 2019 - January 2020.

2.2. Data Sources

This study uses primary and secondary data. Primary data were obtained through direct interviews with respondents from farming communities from outside and inside the area, and oil palm farmers from outside and inside the area. Interviews for respondents from farming communities from outside and inside the area, as well as oil palm farmers from outside and inside the Tahura STS area were conducted using a questionnaire. Secondary data were obtained from library studies, journals, and government offices, such as the Central Statistics Agency, the Environmental Service, the Batanghari Regency Plantation Service, and other agencies or institutions related to the research.

2.3. Types and Techniques of Data Collection

The sampling technique employed a combination of *purposive sampling* and *simple random sampling*. The research location, Bungku Village, Bajubang District, Batanghari Regency, was selected purposively because it represents a buffer area of the Sultan Thaha Syaifuddin Forest Park (Tahura STS) experiencing oil palm plantation expansion. The study population consisted of farming communities and oil palm farmers located both inside and outside the Tahura STS area. The sample size was determined using the Slovin formula with a 10% margin of error, resulting in 180

respondents. Subsequently, respondents were selected using *simple random sampling* from eligible populations, including farmers affected by oil palm expansion, both with and without expansion practices. The respondents comprised 86 oil palm farmers and 94 farming community members, categorized based on their location inside and outside the Tahura STS area.

The sample size was determined using the Slovin formula to obtain a representative sample of the study population with a 10% margin of error (Consuelo et al., 1993; Prasetyo et al., 2006). This approach was adopted because the study population was heterogeneous, consisting of farming communities and oil palm farmers located both inside and outside the Tahura STS area, while information regarding population variability was limited. Based on this calculation, a total of 180 respondents was obtained and considered adequate to represent the study population and support comparative analysis across respondent groups based on location and plantation activities. Systematically, the sample size for the Slovin equation is formulated as follows:

$$n = \frac{N}{1 + N(e^2)}$$

Where n is the number of samples (KK), N is the number of population (KK), and e is the critical value (accuracy limit) used 10%. The number of respondents in this study can be seen in Table 1.

2.4. Data Analysis Method

The data in this study were analyzed quantitatively and qualitatively. Analysis of economic benefits for oil palm farmers using income analysis and identification of social and environmental perceptions using descriptive analysis.

2.4.1. Income Analysis

Farm income analysis is a method used to see the income generated by farmers. Farm income is the total of farmers' income from farming minus the cost of farming production within a certain period of time (Hernanto, 1989). This study uses income analysis at the household level of oil palm farmers to see the economic benefits of oil palm expansion on Tahura STS. In this study, total farmer income is seen from three sectors, namely on-farm, off-farm and non-farm. The total economic benefits obtained by oil palm farmers are the difference between total income with and without oil palm expansion. Income analysis can be mathematically formulated as follows (Soekartawi, 1995):

$$\pi = TR - TC$$
$$\Delta\pi = \pi_0 - \pi_1$$
$$\sum\pi = \pi_a + \pi_b + \pi_c$$
$$\sum\Delta\pi = \Delta\pi_a + \Delta\pi_b + \Delta\pi_c$$

Where π is the income of farmer households (Rupiah/KK/Year), TR is the total income (Rupiah/KK/Year), TC is the total cost (Rupiah/KK/Year), π0 is the income without expansion (Rupiah/KK/Year), π1 is the income with expansion (Rupiah/KK/Year), πa is the on-farm income "Palm Oil or Rice Fields, etc." (Rupiah/KK/Year), πb is the off-farm income "Farm Laborers, etc." (Rupiah/KK/Year), and πc is the non-farm income "Builders, Employees, Self-Employed, stalls, etc. (Rupiah/KK/Year).

The calculation of income changes from the three on-farm sectors (πa), off-farm (πb), and non-farm (πc), each sector is analyzed mathematically using the following formula:

Without expansion

$$\pi_0 = (P_0 \times Q_0) - (FC_0 + VC_0)$$
$$\pi_0 = TR_0 - TC_0$$

With expansion

$$\pi_1 = (P_1 \times Q_1) - (FC_1 + VC_1)$$
$$\pi_1 = TR_1 - TC_1$$

Where π0 is the revenue of the sector without expansion (Rupiah/KK/Year), π1 is the revenue of the sector with expansion (Rupiah/KK/Year), P0 is the production price without expansion (Rupiah/KK/Year), Q0 is the amount of production without expansion (Rupiah/KK/Year), FC0 is the fixed cost without expansion (Rupiah/KK/Year), VC0 is the variable cost without expansion (Rupiah/KK/Year), TR0 is the total revenue without expansion (Rupiah/KK/Year), TC0 is the total cost without expansion (Rupiah/KK/Year), P1 is the production price with expansion (Rupiah/KK/Year), Q1 is the amount of production with expansion (Rupiah/KK/Year), FC1 is the fixed cost with expansion (Rupiah/KK/Year), VC1 is the variable cost with expansion (Rupiah/KK/Year), TR1 is the total revenue with expansion (Rupiah/KK/Year), and TC1 is the total cost with expansion (Rupiah/KK/Year).

Then the difference in economic benefits measured from changes in income mathematically uses the following formula:

$$\Delta\pi = \pi_1 - \pi_0$$
$$\Delta\pi_a = \pi_{a1} - \pi_{a0}$$
$$\Delta\pi_b = \pi_{b1} - \pi_{b0}$$
$$\Delta\pi_c = \pi_{c1} - \pi_{c0}$$

Table 1. Description of Research Respondents

No	Respondent	Total
1	Palm oil farmers	86
	Oil palm farmers from outside the area	34
	Oil palm farmers from within the area	52
2	Farmer Community	94
	Farming communities from outside the area	38
	Farming communities from within the area	56
	Total	180

Where π0 is income without expansion (Rupiah/KK/Year), π1 is income with expansion (Rupiah/KK/Year), πa0 is on-farm income without expansion (Rupiah/KK/Year), πa1 is on-farm income with expansion (Rupiah/KK/Year), πb0 is off-farm income without expansion (Rupiah/KK/Year), πb1 is off-farm income with expansion (Rupiah/KK/Year), πc0 is non-farm income without expansion (Rupiah/KK/Year), πc1 is non-farm income with expansion (Rupiah/KK/Year).

Before obtaining income from farming, the income (TR) must first be known. Mathematically, the calculation of income is formulated as follows:

$$TR = Q \times P$$

Where TR is the total income of farmer households (Rp/KK/Year), Q is the amount of production (Kg/KK/Year) and P is the production price (Rp/Kg).

The cost structure (TC) of farming is classified into two forms, namely fixed costs (FC) and variable costs (VC). Mathematically, the cost calculation is formulated as follows:

$$\mathrm{TC} = \mathrm{FC} + \mathrm{VC}$$

Where TC is the Total cost of agricultural production (Rp/KK/Year), FC is the fixed cost of agricultural production (Rp/KK/Year), and VC is the Variable cost of agricultural production (Rp/KK/Year).

The costs calculated in this study as fixed costs are the depreciation costs of agricultural equipment and land taxes/levies. The depreciation costs of equipment can be estimated using the formula:

$$D = \frac{Nb - Ns}{U}$$

Where D is depreciation cost (Rp/Year), Nb is new value (Rp), Ns is residual value (Rp), and U is economic value (Year).

Farming is said to be efficient if the R/C value is more than one. R/C ratio analysis is a comparison between income and costs incurred. Mathematically it can be written as follows (Soekartawi, 1995).

$$\mathrm{a} = \mathrm{R/C}$$

Where R is revenue and C is cost.

2.4.2. Descriptive Analysis

Descriptive analysis is a problem-solving process by describing the current state of the subject and object of research based on facts in the field. Descriptive analysis was used to assess community perceptions regarding the social and environmental impacts of oil palm plantation expansion. To strengthen interpretation, perception-based findings were triangulated with relevant literature and secondary information from government reports and previous studies related to groundwater availability, biodiversity change, and forest fire risks in oil palm expansion areas. On local communities and migrants in the Tahura STS area due to oil palm expansion. The initial stage is collecting data related to the social and environmental impacts of oil palm expansion on the community, then identifying and interpreting the data. The next stage is analyzed according to the data findings at the research location. then the formulation of the identification results related to the social and environmental impacts of oil palm expansion is carried out.

3. RESULTS AND DISCUSSION

3.1. Impact of Oil Palm Plantation Expansion in the Sultan Thaha Syaifuddin Forest Park Area

Oil palm plantation expansion has positive and negative impacts. The impact of oil palm plantation expansion in this study was studied from three aspects, namely 1) the economic impact on oil palm farmer households outside and inside the Sultan Thaha Syaifuddin Forest Park (Tahura STS), 2) the social impact on farming communities outside and inside the Tahura STS area and 3) the environmental impact on farming communities outside and inside the Tahura STS area. The number of farmers who carried out the expansion was 52 respondents, the average area expanded into oil palm was 3 ha/farmer, and the average length of time farmers carried out the expansion was 14 years.

3.1.1. Economic Impact of Oil Palm Farmers Due to Oil Palm Plantation Expansion in Sultan Thaha Syaifuddin Forest Park Area

The economic impact of oil palm plantation expansion is indicated by changes in farmer household

income from the on-farm, off-farm and non-farm sectors. The expansion of oil palm plantations in Bungku Village, which is one of the areas of Sultan Thaha Syaifuddin Forest Park (Tahura STS), has resulted in farmers gaining economic benefits in the form of increased income, on the other hand, the expansion has resulted in a reduction in land area in the Tahura STS area which has an impact on changes in the off-farm and non-farm sectors. According to Syahza (2011), oil palm plantation development activities have had an impact on accelerating community economic development in an effort to alleviate poverty in rural areas. Other studies have suggested that the economic impact of oil palm expansion can increase diverse investment opportunities and increase income (Unjan et al. 2013). Income is the difference between revenue and total costs used during the production process (Shinta, 2011).

The income of farmer households in this study includes the income of farmer households who carry out oil palm expansion and without oil palm expansion in the Tahura STS area, while to determine the value of the benefits of oil palm expansion, it is seen from the changes in farmer income due to the expansion of oil palm plantations. To conduct an analysis of farm income, data on farm income and farm production costs are needed (Soekartawi, 1995).

a) Household Income of Oil Palm Farmers

According to Suparman (2013), the amount of income obtained by farmers depends on the amount of production and the selling price of the product. In this analysis, farmer income is calculated with and without oil palm expansion. This expansion results in farmers replacing some or all of the rubber commodity with oil palm in their plantations. Table 2 presents farmer income with and without oil palm expansion.

Income from oil palm is the result of the multiplication of Fresh Fruit Bunches (FFB) production and the price of FFB. Oil palm productivity in Bungku Village reached 463.58 kg of FFB/ha or 0.463 tons of FFB/ha in 2019 with an average plant age of 14 years, for the selling price of oil palm plants in 2019 of IDR 1,600/Kg (Table 2), and oil palm productivity in Bungku Village is still relatively low. Oil palm productivity has increased and reached a maximum at a plant age of 8-12 years, after which it will slowly decrease according to the age of the plant which is getting older until it reaches an economic age of 25 years (Yohansyah and Lubis, 2014). The cause of the low productivity of oil palm in Bungku Village is due to the type of seeds used by farmers which are not superior seeds and poor plant maintenance such as the type and dosage of fertilizers and medicines that are not considered. The productivity of oil palm plants is influenced by three factors, namely the selection of superior seeds, plant maintenance and harvesting technology used (Pahan 2010; Siradjuddin 2015). Oil palm plants are harvested once every two weeks, so that in one month there are two harvests. The average production in each harvest is 1.33 tons/ha, and production in one month is 2.66 tons/ha.

Rubber production by farmers in Bungku Village without expansion is 87,900 kg/year and has decreased to 86,200 kg/year, the decrease is due to the addition of new commodity crops, namely oil palm. However, the income obtained by farmers due to expansion has increased by IDR 4,940,778/ha compared to farmers without expansion of IDR 3,281,725/ha. The amount of income received by farmers by expanding is due to the structure of income changing from only rubber income to income from rubber and oil palm.

Based on the results of the study, it can be indicated that farmers who expand their income are greater than farmers who do not expand oil palm. However, in the field conditions of farmers who expand oil palm for oil palm plant productivity is still very low compared to rubber plants, the cause of low oil palm plant production is due to poor planting treatment. Inappropriate selection of superior seeds, inappropriate administration of fertilizer doses and drugs that are not considered.

b) Farmer Household Cost Structure

Aside from the amount of farmer income, it is important to note how much the farming production costs will be. Total production costs are obtained by adding fixed costs and variable costs. Fixed costs are costing whose value is not determined by the amount of production, while operational costs are costing whose value is influenced by the amount of production (Shinta, 2011).

Table 2. Household Income of Farmers with and without Oil Palm Expansion in Bungku Village

Component	Description	Without Expansion	With Expansion	
		Rubber	Rubber	Palm Oil
Respondent's land area (Ha)	a	197	157	173
Production (Kg)	b	86.200	87.900	80.200
Productivity (Kg/Ha)	c	437,56	559,87	463,58
Selling price (Rp/Kg)	d	7.500	7.500	1.600
Revenue (Rp)	e = b x d	646.500.000	659.250.000	128.320.000
Average revenue (Rp/Ha)	f = e / a	3.281.725	4.199.044	741.734

Source: processed data

Table 3. Household Production Cost Structure of Farmers Without and With Expansion in Bungku Village (Rp/ha)

Cost Components	Without Expansion		With Expansion			
	Rubber		Rubber	Palm Oil	Total With	
	Cost	%	Cost	Cost	Cost	%
A. Fixed Costs						
Tool preparation	1.134.722	48	780.650	920.306	1.700.956	45
Land tax	52.376	2	41.473	49.277	90.750	2
Total Fixed Costs	1.187.098		822.123	969.583	1.791.706	
B. Operational Costs						
Input Costs	1.047.513	44	829.458	985.533	1.814.991	48
Labor Costs	143.000	6	177.500	5.867	183.367	5
Total Ops. Costs	1.190.513		1.006.958	991.400	1.998.358	
C. Production Cost						
A + B	2.377.611	100	1.829.081	1.960.983	3.790.064	100

Table 4. Income and Benefit Value of Farmer Households Due to Oil Palm Plantation Expansion in Bungku Village 2019

Component	Information	Without Expansion	With Expansion
A. Revenue (Rp/ha)	a	3,281,725	4,940,778
B. Production costs (Rp/ha)	b	2,377,611	3,790,064
C. Income (Rp/ha)	c = a - b	904,114	1,150,714
D. Total income (Rp)	d = c x LL*	178,110,458	382,037,048
E. Average income (Rp/KK)	e = d/KK**	2,968,508	6,367,284
F. Benefit value (Rp/KK)	f = d2 - dl		203,926,590
G. RC ratio	g = a/b	1.38	1.30

Description: (*) Land Area (LL) = rubber (2019) 197 ha, rubber (2019) 157 ha, oil palm (2015) 175 ha, (**) Head of Family (KK) = rubber farmers (2019) 60 KK, rubber farmers (2019) 60 KK, oil palm farmers (2019) 60 KK.

The costs calculated in this study as fixed costs are the depreciation costs of agricultural equipment and land levies, while operational costs are the costs of production facilities (fertilizers and medicines) and labor costs. The costs that are not taken into account in this study are 1) the cost of seeds, rubber and oil palm plants that have an economic life of more than 15 years so that they are included in investment costs and the limitations in this study do not calculate investment costs, 2) land rent, because the land used is privately owned, and 3) family labor (TKDL), because it is included in non-cash costs. The estimated production costs of farmers without and with expansion in Bungku Village can be seen in Table 3.

Based on Table 3, the depreciation cost of equipment is the largest cost incurred by farmers without expansion. The percentage of depreciation cost of equipment without expansion is 48% of the total production cost. Meanwhile, the depreciation cost of equipment with expansion for rubber plantations is 43% and oil palm plantations is 47% of the total production cost. The depreciation cost of equipment in this study is calculated by dividing the difference between the estimated residual value and the economic life of the equipment. The method used is the straight-line method, assuming the amount of depreciation of equipment each year is considered constant. The estimated depreciation cost of equipment for rubber plantations without expansion is IDR 1,134,722/ha/year or 48% of the total production cost (Table 3). Meanwhile, the depreciation cost of equipment in rubber plantations with expansion is 43% and in oil palm plantations it is 47% of the total production. Judging from the farming efforts carried out, in oil palm plantations the percentage of equipment depreciation costs is greater than the percentage of rubber plantations, this is due to the number of tools needed in oil palm plantations being more with an average economic life of one year. While for rubber plantations, there are fewer tools and the average economic life of the tools reaches three years.

The difference in total production costs without and with oil palm expansion, in addition to being influenced by the type of agricultural tools and different labor wage systems, is also influenced by the use of production facilities (inputs). In the use of inputs such as fertilizers and medicines, rubber plantations are relatively lower compared to oil palm plantations, where the cost of inputs in rubber plantations without expansion is IDR 1,047,513/ha/year. While the cost of inputs in rubber plantations with expansion is IDR 829,458/ha/year and oil palm plantations is IDR 985,533/ha/year (Table 3). The cost of agricultural inputs in oil palm plantations is higher than in rubber plantations, because the fertilizer used in oil palm plantations is more than in rubber plantations. In addition, the frequency of fertilizer application used in oil palm plantations is twice a year, while for rubber plantations it is only done once a year.

c) Farmer Household Income

In general, income is obtained from receipts minus costs incurred by farmers in production activities. There was an increase in farmer income by expanding oil palm from IDR 904,114/Family Household/year to IDR 1,150,714/Family Household/year. The value of benefits obtained by farmers due to expansion is

calculated based on the difference in income as seen in Table 4.

Based on the results in Table 4, it can be seen that farmers with oil palm expansion have higher incomes compared to farmers without oil palm expansion. The average income of farmers with oil palm expansion is IDR 6,367,284/Family, while without oil palm expansion it is IDR 2,968,508/Family in 2019. The change in farmer income with oil palm expansion is because farmers have two plantation commodity businesses that are managed simultaneously. Although in terms of economic value, the income from oil palm plants obtained is not that large compared to rubber plants. Some farmers with oil palm expansion, some have other side jobs too, such as personal businesses, namely stalls, workshops. In addition, there are also family members of several oil palm farmers who work as porters and oil palm drivers.

This study also conducted an analysis of the efficiency of the farming business carried out. Farming efficiency is an effort made to reduce production factors but to obtain maximum production. Farming efficiency is a comparison between total income and total costs incurred in farming (R/C ratio). The farming business is said to be efficient if the R/C value is more than one (Soekartawi, 1995). The R/C value of farming without expansion is 1.38 and with expansion the R/C value is 1.30 (Table 4). This means that farming without and with expansion is efficient, but when compared to conditions without expansion it is more efficient. Because the production costs with expansion are greater than the production costs without expansion. Efficiency is a condition where great benefits can be obtained from small sacrifices (Mubyarto 1994; Maryam 2009). In addition to the production costs with expansion being greater than without expansion, income from farming with expansion comes from two plantation commodities, namely rubber and oil palm, while without expansion only comes from rubber commodities.

The background of the many farmers who change rubber commodities to oil palm commodities, is carried out descriptively with perception analysis. Based on the perception of farmers in Bungku Village, 85% stated that oil palm farming is easier than rubber farming. The intensity of oil palm harvesting is carried out every two weeks, while rubber harvesting is carried out at least three times a week, it is not uncommon for farmers to also tap rubber sap every day to avoid theft. In addition, during the rainy season, farmers cannot tap rubber, because the collected rubber sap can be submerged in rainwater. In line with Anggreany et al. (2013) who stated that most farmers' perceptions of oil palm commodities are profitable from a technical aspect on the grounds that oil palm cultivation techniques are relatively easy, harvesting is only carried out once every 2 weeks and saves more time so that farmers can work on other activities and businesses as an effort to increase family income such as trading, tapping rubber and so on. According to Lesmana et al. (2011) stated that there is a relationship between perception and socio-economic factors that influence farmers in carrying out their farming efforts. In addition to having an impact on the on-farm sector, expansion has resulted in changes in the off-farm and non-farm sectors. Data on farmer employment in the off-farm and non-farm sectors are presented in Table 5.

There is an increase in farmer jobs by expanding, namely the off-farm sector from 15% to 28% this is because people who do not have oil palm plantations or have oil palm plantations with small areas will look for other jobs to meet their living needs. While in the non-farm sector from 11% to 17%. The expansion of oil palm plantations has an impact on local economic growth, this is indicated by the growth of business units or stalls which have changed by 6%. The jobs held by farmers in the off-farm and non-farm sectors also contribute to farmers' income. Data on farmers' income in the off-farm and non-farm sectors is presented in Table 6.

The change of agricultural commodities from rubber to palm oil will result in changes in farmers' income in the on-farm, off-farm and non-farm sectors. Table 6 presents the total change in farmers' income without and with expansion. Plantation expansion resulted in an increase in farmers' income, the change in income experienced by farmers in the on-farm sector was IDR 1,481,974/Family Household/Year or 47%. In the off-farm sector, there was a change in income of IDR 659,143/Family Household/Year or 21% and for the non-farm sector, there was a change in income of IDR 985,000/Family Household/Year or 32%. The total change in income from all sectors was IDR 3,126,117/Family Household/Year or 23%. Data on changes in farmers' income are presented in Table 7.

Table 5. Household Side Jobs of Farmers in Bungku Village 2019

Sector	Without Expansion			With Expansion		
	Work	Total			Work	Total
Off-farm	Transportation	3	9	Transportation	5	10
	Rubber Tauke	2	6	Rubber Tauke	3	6
				Palm Oil Tauke	3	6
				Company driver	2	4
				Company employees	1	2
Non-farm	Workshop	1	3	Workshop	2	4
	Shop	3	9	Shop	7	13

Table 6. Household Income of Farmers in Bungku Village 2019

Sector	Income Without Expansion		Income With Expansion	
	Rp/Year	Rp/KK/Year	Rp/Year	Rp/KK/Year
Off-farm	27,360,000	5,472,000	72,240,000	5,160,000
Non-farm	24,300,000	6,075,000	64,440,000	7,160,000
Total	51,660,000	11,547,000	136,680,000	12,320,000

Table 7. Changes in Farmer Household Income Without and With Oil Palm Expansion in Bungku Village 2019

Sector	Income (Rupiah)		Change	
	Without Expansion	With Expansion	Rupiah	%
On-farm	2,382,353	3,864,327	1,481,974	47
Off-farm	4,908,000	5,567,143	659,143	21
Non-farm	6,075,000	7,060,000	985,000	32
Total	13,365,353	16,491,470	3,126,117	23

Description: Rupiah/KK/Year

The expansion has a positive impact on the economy of the community in Bungku Village. This economic value is what makes farmers replace rubber plantation commodities with oil palm plantations. This economic value is what drives the conversion of a landscape with other vegetation (Nurrochmat et al. 2010), including rubber plantations into oil palm plantations. According to Astuti et al. (2011) stated that of the three aspects that are factors for farmers to convert land/replace it into oil palm plantations, namely the economic aspect of 58.4%, the environmental aspect of 22.2% and the technical aspect of 19.4%.

3.1.2. Social Impacts of Oil Palm Plantation Expansion in the Sultan Thaha Syaifuddin Forest Park Area

The social impacts in this study are seen based on public perceptions of social conditions due to the expansion of oil palm plantations in the Sultan Thaha Syaifuddin Forest Park (Tahura STS) area. The impact variables measured in this study are land conflicts between farmers and the government and conflicts with oil palm plantation companies.

Based on public perceptions of land conflicts due to oil palm plantation expansion in the Tahura STS area, 72 respondents or 69 percent stated that there had never been a land conflict around the Tahura STS land. On the other hand, several other respondents stated that there were still several land conflicts. Based on the results of interviews in the field, what actually happened was a land conflict between oil palm farmers and the company, and land conflicts between oil palm farmers who expanded in the Tahura STS land and the government were less frequent. The conflict that occurred between oil palm farmers and oil palm plantation companies was caused by environmental pollution. Meanwhile, the conflict between farmers and the government is only around the overlapping issue of land ownership letters issued by the RT or Village Head. In line with the research results of Amalia et al. (2019) that plasma farmers as well as independent and independent farmers are often involved in conflicts with local communities and private oil palm plantation companies. The conflicts experienced by oil palm farmers have different characteristics depending on the conflict opponents they face, such as between farmers, the government and private oil palm plantation companies. The characteristics of this conflict can be distinguished based on the depth of the conflict, the extent of the conflict, the impact of the conflict and the involvement of external actors.

3.1.3. Environmental Impacts of Oil Palm Plantation Expansion in the Sultan Thaha Syaifuddin Forest Park Area

The impact on the environment in this study is seen based on community perceptions of environmental conditions due to the expansion of oil palm plantations in the Sultan Thaha Syaifuddin Forest Park area (Tahura STS). The environmental impact of the expansion of oil palm plantations in question is the conversion of land, either conversion from forests or rubber plantations to oil palm. According to Amalia et al. (2019) that the rampant expansion of oil palm also has an impact on ecology, especially changes in forest land cover which result in changes in air temperature, loss of biodiversity, flooding, soil erosion and environmental services. Changes in environmental conditions experienced by the community due to changes in land to oil palm plantations are the quantity or amount of groundwater being reduced and the reduction in animal populations. Along with the increasing area of oil palm plantations, the use of fertilizers and medicines to provide care for oil palm trees is increasing. Azhar et al. (2011) the use of fertilizers and pesticides in large quantities will cause environmental damage and threaten biodiversity. In line with Obidzinki et al (2012) analyzing the environmental impacts of oil palm, and the results of the study stated that the development (expansion) of oil palm resulted in externalities such as water pollution, soil erosion, and air pollution.

Based on respondents' perceptions regarding tree biodiversity due to the expansion of oil palm plantations in the Tahura STS area, there were 80 respondents or

85% who stated that the reduction in tree biodiversity was less than 5 types of trees, where before it was converted into an oil palm plantation there were many populations of bulian trees, terap, medang darah, medang jahe, kantong semar, meranti, sungkai, rambutan, pasak bumi forest, and orchids around the plantation, but now they are rare or even non-existent. The high level of theft of bulian wood in the Tahura STS area makes bulian wood a type of wood that needs to be protected and its status is threatened with extinction (DLH Batanghari, 2018). In addition, before the existence of oil palm plantations, people could easily utilize forest and river products, but now due to expansion, some forests have turned into monoculture plantations because they are only planted with one type of tree, namely oil palm, making it difficult to utilize forest products anymore. Petrenko et al. (2016) studied the ecological impacts of expansion in Indonesia, their findings stated that the existence of oil palm plantations has a serious impact on biodiversity, climate change and natural resources. In line with that, according to Amalia (2016) stated that the expansion of oil palm plantations has an impact on ecological changes in an area, such as changes in air temperature, flooding, loss of biodiversity and environmental services.

The impact of the expansion of oil palm plantations is the reduction in the quantity of groundwater, so that when the dry season arrives, drought often occurs. Based on the results of the study, there were 88 respondents or 96% of the community who relied on water sources from their own dug wells, and there were 6 respondents or 6% of the community who relied on their water sources from drilled wells. The community also stated that their well water had to be dug deeper since they were neighbors with oil palm plantations, because during the long dry season they had difficulty getting clean water for their daily needs. Even during the long dry season they had to buy clean water from the neighboring village, namely Mekar Jaya Village at a price of IDR 100,000 / Tedmond. Mekar Jaya Village is a village whose environmental conditions are still relatively good, the forest area from oil palm expansion compared to Bungku Village. So that during the long dry season in Mekar Jaya Village, the availability of water is quite stable. Based on the results of the study during the long dry season, there were 50 respondents or around 53% who bought clean water between 1-2 times each month. And there are 3 respondents or around 3% who buy water more than 6 times a month.

The community affected by the decreasing quantity of groundwater, requiring them to buy clean water, is inseparable from their own family's ability or needs for daily use during long dry seasons. So that people can buy clean water more than 2 times a month. According to Taufiq et al. (2013) stated that more than 30% of land use in the Landak Sub-DAS is used as an oil palm plantation area, this has a major impact on water balance because the water requirement for oil palm is very large. It is known that the percentage of the effect of reducing water discharge due to planting oil palm plants ranges from 30-40%. In addition, oil palm has a fairly high evapotranspiration rate (water evaporation). Dufrene et al. (1993) said that evapotranspiration in oil palm plants reaches 81% of the potential evapotranspiration that can occur. Evapotranspiration is a combination of evaporation from the soil surface and transpiration of plants that experience evaporation so that it affects the availability of groundwater (BMKG 2006; Pasaribu et al. 2012). In line with Widodo and Dasanto (2010) the increasing area of oil palm plantations has an impact on the environment, including the decreasing availability of groundwater, where in their study the water discharge before the oil palm plantation was 2,708 m3/s, after the oil palm plantation became 2,359 m3/s, for the water needs of oil palm plants in Dayun District of 42,728 liters/ha/day.

The next impact that occurs due to the expansion of oil palm plantations is forest fires, so that when the dry season arrives, forest fires often occur which can spread widely. Based on the results of the study, there were 79 respondents or 84% who said that fires often occur 1-2 times in every long dry season, and there were 13 respondents or 14% who said that fires occur 3-5 times, and 2 respondents or 2% who said that fires occur 5-8 times in every long dry season.

The consequences received by the community due to forest fires are air pollution, public health, and daily activities of the community in Bungku Village are disrupted. According to Rasyid (2014), there are two losses due to forest fires, namely economic losses and ecological losses. Economic losses are in the form of loss of vegetation that can be used as food, building materials, medicinal materials and loss of animal populations that can be used as food sources, as well as the loss of a natural environment that has the potential for tourist locations. Meanwhile, ecological losses are the loss of forest function as a provider of clean air, water retention, and erosion prevention. According to Faisal et al. (2012) stated that the impact of haze can disrupt human health with asthma attacks, Upper Respiratory Tract Infections (URTIs), lung cancer, and cataracts. In addition to the air pollution caused, forest fires in peatlands will also cause: (1) changes in the physical and chemical quality of peat, (2) disruption of the soil decomposition process due to the loss of microorganisms, (3) reduced biodiversity, and (4) damage to the hydrological cycle.

4. CONCLUSION

Oil palm plantation expansion around the Sultan Thaha Syaifuddin Forest Park (Tahura STS) generated economic benefits by increasing farmers' household

income by 23%, derived from the *on-farm* (47%), *off-farm* (21%), and *non-farm* (32%) sectors. Socially, plantation expansion contributed to land-related conflicts involving local communities, migrants, and relevant stakeholders. From an environmental perspective, communities perceived declining tree biodiversity, reduced groundwater availability during the dry season, and increased land fire risks. These findings indicate that oil palm expansion provides economic benefits while also generating social and environmental consequences that require sustainable management.

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