Print ISSN: 2288-4637 / Online ISSN 2288-4645
doi:10.13106/jafeb.2021.vol8.no4.0539

The Impact of Oil Palm Farming on Household Income and Expenditure in Indonesia*

Arga RAMADHANA[1], Ferdoushi AHMED[2], Sutonya THONGRAK[3]

Received: November 30, 2020 Revised: February 20, 2021 Accepted: March 02, 2021

Abstract

Indonesia is the largest exporter of palm oil in the world. The province of West Sulawesi is the second-largest palm oil producer in Indonesia. This study examines the contributions of oil palm farming to total household income and the factors affecting the household expenditure of oil palm smallholders in West Sulawesi, Indonesia. This study also identifies the problems related to oil palm production in the province. Primary data were collected from 174 oil palm smallholders using a standardized questionnaire in the Lariang sub-district, Pasangkayu, West Sulawesi, Indonesia. Several statistical tools were employed to analyze the data. The study estimated the average household income of the smallholders at IDR 30,417,441 per year, out of which 85,8% comes from oil palm farming, followed by non-oil palm farming (8%) and off farming (6.2%). On the other hand, the average household expenditure was found to be IDR 23,476,069 per year which 66% goes for food consumption and 34% for non-food consumption. The findings revealed that household expenditure of the oil palm smallholders is strongly and positively affected by a number of factors such as household income, education level, family size, earning members in the family, number of children attending school, and amount of credit taken by the household.

Keywords: Socio-Economic Characteristics, Oil Palm Smallholders, Household Income, Household Expenditure, Indonesia

JEL Classification Code: Q11, Q12, Q13

1. Introduction

Indonesia is the largest exporter of palm oil in the world. It was reported that Indonesia managed to export as much as 34.71 million tonnes of crude palm oil in 2018 (IPOA, 2019). In terms of employment, the oil palm industry employed 17.5 million workers, which contributed to about 4.5 million direct workers and 13 million indirect workers (IPOA, 2019). In addition, the oil palm industry is a significant poverty reduction factor in the country and improves the socio-economic status of the smallholders (Saragih, 2017). Moreover, the oil palm plantation in 2018 has reached 14.32 million ha, consist of smallholders covering 5.8 million ha private, covering 7.88 million ha, and state covering 634,690 ha (Directorate General of Estate Corps, 2019).

The development of oil palm plantations in Indonesia is focused on Eastern Indonesia (Directorate General of Estate Corps, 2019). West Sulawesi Province is the second-largest palm oil producer in Eastern Indonesia, which produced about 584,168 tonnes in 2018 and more than 50% of oil palm plantation managed by smallholders (Directorate General of Estate Corps, 2019). Pasangkayu is one of the districts with the largest oil palm area in this province, which contributed about 80,543 ha (Statistics of West Sulawesi Province, 2019). Nowadays, farmers in Pasangkayu prefer to choose oil palm as the main crop rather than cocoa nor coconut (Hardianti, 2017). In this district, smallholders face several problems in producing and selling their products in the market. The production cost of oil palm has increased. Smallholders can

*Acknowledgments:
The authors are grateful to the Faculty of Economics, Prince of Songkla University, for supporting the research fund. Mr. Arga Ramadhana received financial support from 'Thailand's Education Hub for Southern Region of ASEAN Countries' (TEH-AC) Scholarship of Prince of Songkla University.

[1]First Author. Lecturer, Department of Agro Industry, Politeknik, Negeri Fakfak, West Papua, Indonesia.
Email: ramadhanaarga62@gmail.com
[2]Corresponding Author. Lecturer, Faculty of Economics, Prince of Songkla University (PSU), Thailand [Postal Address: 15 Kanjanavanit Road, Kho Hong, Hat Yai District, Songkhla 90110, Thailand] Email: ferdoushi.a@psu.ac.th
[3]Associate Professor, Faculty of Economics, Prince of Songkla University (PSU), Thailand. Email: sutonya.t@psu.ac.th

survive by reducing the production costs by saving the use of fertilizer, reducing the use of herbicides, and reducing various activities that are considered to have the potential to increase production costs (Hardianti, 2017). Echchabi and Azouzi (2017) analyzed the association of oil prices with the movement of the stock price in Oman. Crude oil has become a foreign exchange mode for exporting nations, leading to a deficit in the balance of payment for the importing country (Alam et al., 2020). Vietnam has maintained rapid economic growth based on a socialist-oriented market economy to participate in many free trade agreements to generate more foreign investment and trade (Nguyen & Do, 2020).

Moreover, the per capita income of West Sulawesi is way below the national per capita income, which is 32 million and 56 million IDR per year, respectively (Statistics of West Sulawesi Province, 2019). This figure illustrates lower welfare in the province compared to the national number. Furthermore, the Government of Indonesia started to focus on farmers' welfare, including oil palm farmers. Welfare is the final goal of the development process of a country. In this context, household income and consumption patterns are considered important factors of a household's well-being. Several factors affect household expenditure. The factors are income, family size, socio-economic, wealth, and other factors (Wuryandari, 2015). So it is necessary to know the factors that affect household expenditure of the farmer household, particularly the oil palm smallholders in Pasangkayu, Indonesia. Several studies related to the oil palm smallholders have been conducted in Indonesia. Most of those studies are conducted in Sumatra and Kalimantan. There are only a limited number of studies about oil palm smallholders in Sulawesi. However, to the researcher's knowledge, no study yet focused on household income and expenditure of the oil palm smallholders in the province.

Therefore, this study aims to examine the contributions of oil palm farming to total household income and the factors affecting the household expenditure of oil palm smallholders in West Sulawesi, Indonesia. The study also identifies the problems related to oil palm production in the province. The study is the first academic attempt in assessing the impact of oil palm farming on household income and expenditure of oil palm smallholders in the study area.

2. Material and Methodology

2.1. Study Area

This study was conducted in three villages (Batu Matoru, Bajawali, and Bambakoro Village) in the Lariang sub-district under Pasangkayu district, West Sulawesi Province, Indonesia (Figure 1). The study area is underdeveloped, and the educational level is categorized as low since 90% are only elementary school graduates or even lower (Statistics of West Sulawesi Province, 2018).

2.2. Survey Design, Sampling Method, and Data Collection

The population of this study was oil palm smallholders who managed less than 25 hectares per farming household, and smallholders have harvested their crops. The total population of oil palm smallholders in the villages mentioned above reached 307 oil palm smallholders. To determine the sample size, this study used the formula as follows (Yamane, 1967):

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

where,

Population (N) = 307 smallholders

Acceptable sampling error = 5%

Representative sample size (n) = 174 smallholders

The study employed a simple random sampling technique to select the sample from the list of oil palm smallholders. In other words, the study selected the required number of respondents randomly from each village without any previous knowledge of the socio-economic and ethnic status of the respondents. A standardized structured questionnaire was used to collect the data. The survey was conducted from October 2019 to January 2020. The respondents provided their unbiased opinions and responses. The study has taken the data from three villages, namely: Batu Matoru (63 samples), Bajawali (57 samples), and Bambakoro (54 samples).

2.3. Data Analysis

After completing the study survey, all the data were coded directly on the questionnaire and entered into a personal computer. Several statistical analyses of the data were carried out in this study.

2.3.1. Descriptive Analysis

The study used descriptive statistics (such as sums, means, percentages, and frequency distributions) to investigate socio-economic characteristics of oil palm smallholders (for example, age, education level, marital status, religion, number of a family member, and number of earning members) as well as the features of oil palm production (such as land area, source of seed, technical training classes and variety of oil palm).

To get the total household income of smallholders, the author calculated each source of income such as oil palm farming, non-oil palm farming, and off farming.

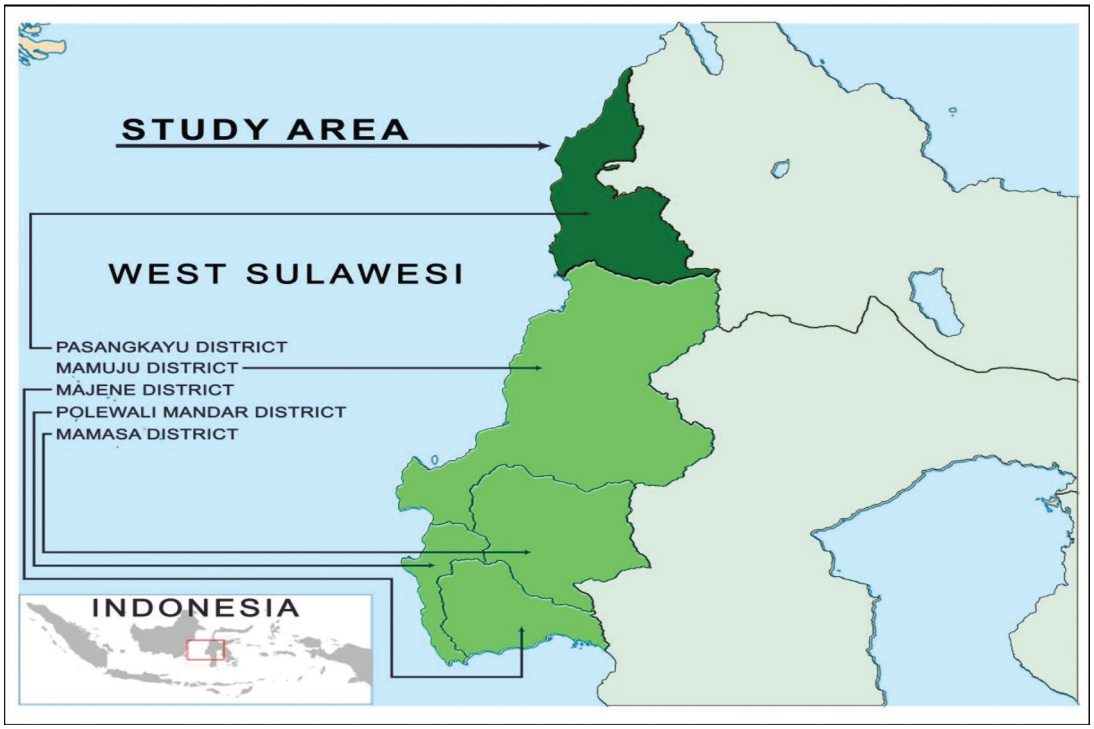

Figure 1: Map of the study area: West Sulawesi in Indonesia

(i) Net oil palm farming income (NOPI)

In general, the economic cost of production is composed of fixed and variable costs. Both fixed and variable costs are divided into cash and non-cash cost. However, in this analysis, the cost production covers only key variables and cash cost. It can still be used as a basis for decision-making at the farm level. To calculate net oil palm farming income, the following formula used as below:

$$NOPI = TR - TC \quad (2)$$

where,

NOPI= Net oil palm farming income (IDR/year)
TR = Total revenue (P × Q) (IDR/year)
TC = Total cash cost (IDR/year)
P = Price (IDR/kg)
Q = Production (kg/year)

(ii) Net non- oil palm farming income (NNOPI)

This study used data about net non-oil palm farming income of smallholders per year such as cocoa, orange, banana, fishing, and coconut.

(iii) Off farming income (OFFI)

This study used data about off farming income of smallholders per year such as street vendor, building construction, tailoring, housemaid, cleaning service, driver, mechanic shop, and government employee.

Then, to analyze the household income of smallholders, the following formula was used:

$$HHI = NOPI + NNOPI + OFFI \quad (3)$$

where,
HHI = Household income (IDR/year)
NOPI = Net oil palm farming income (IDR/year)
NNOPI = Net non-oil palm farming income (IDR/year)
OFFI = Off farming income (IDR/year)

The contribution oil palm farming income in the household income of smallholders was calculated using the following formula (Suratiyah, 2008):

$$\text{contribution} = \frac{NOPI}{HHI} \times 100\% \quad (4)$$

criteria,

Dominant = Net oil palm farming income ≥ 50% of household income

Not dominant = Net oil palm farming income < 50% of household income

The household expenditure of oil palm smallholders was calculated using the following formula:

$$HHE = FE + NFE \quad (5)$$

where,
HHE = Household expenditure (IDR/year)
FE = Food expenditure (IDR/year)
NFE = Non-food expenditure (IDR/year)

2.3.2. Multiple Regression Analysis

The study also used multiple regression analysis to assess the factors affecting the household expenditure of oil palm smallholders. Multiple regression equation was formulated as follows (Berger, 2018):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 e \quad (6)$$

where,
Y = Household Expenditure (IDR/year)
X_{1-8} = Household income of the smallholders (X_1), Education level (X_2), Age (X_3), Family members (X_4), Earning family member (X_5), Children attending school (X_6), Credit of household (X_7), Duration of marriage (X_8)
β_0 = Constant term
β_{1-8} = Regression coefficient to estimate
e = Error term
Description of the variables as follows:

Variables	Type of variable
Y (Yearly household expenditure)	Dependent (continuous and quantitative)
X_1 (Yearly household income)	Independent (continuous and quantitative)
X_2 (Education level of respondent)	Independent (ordinal Categorical)
1 = No Schooling	
2 = Primary school	
3 = Secondary school	
4 = College degree	
5 = Bachelor degree and above	
X_3 (Age of respondent)	Independent (continuous and quantitative)
X_4 (Family members)	Independent (continuous and quantitative)
X_5 (Total earning family members)	Independent (continuous and quantitative)
X_6 (Total children attending school)	Independent (continuous and quantitative)
X_7 (Credit of household)	Independent (continuous and quantitative)
1 = With credit	Independent (dichotomous)
0 = Without credit	
X_8 (Duration of the marriage of respondent)	Independent (continuous and quantitative)

3. Results and Discussion

3.1. Socio-Economic Characteristics of Oil Palm Smallholders

The findings revealed that the average age of oil palm smallholders is 49.3 years old. (Table 1). Most of them (41.9%) are 51 to 60 years old. Furthermore, smallholders aged between 41 and 50 attain 39.6% and rest in the age group more than 60 by 5.2%. It was found that oil palm farming is mainly dominated by the male (98.3%). Only 1.7% of the oil palm smallholders are female because there is no adult man in the family. The marital status of respondents consists of married (98.3%) and widow (1.7%). About 54% of surveyed smallholders have length marriage between 26–35 years. Furthermore, smallholders who have length marriage between 15–25 years attaining 38.5%, between 36–45 years attaining 6.3%, and the rest above 45 years by 1.2%. Moreover, most of the smallholders are Muslims, followed by Hindus**.** The ethnicity of smallholders is Mandarese (69.5%), Balinese (28.7%), and Buginese (2.3%).

One of the crucial aspects concerning the smallholders' decision about their production is the educational level. As for education, most of the smallholders (37.9%) obtained primary school. About 36.2% of oil palm smallholders obtained secondary school. Moreover, 17.8% of smallholders have no education and only 1.2% obtained bachelor's degrees. The average number of household members is 4.5 people. Smallholders have a small household of 8.6%. The small household consisted of a husband-and-wife couple with one child, while 89.6% have medium to large households with at least four family members. Generally, a large household is comprised of up to three-generation living together in the family. On average, one household has 1.7 children attending school and 1.2 people earning members.

3.2. Cost, Revenue, and Income in Oil Palm Farming

Table 2 illustrates the cost, revenue, and income from oil palm production. The total revenue of oil palm production was IDR 16,807,499 per ha per year. In this analysis, the cost production covers only key variables and cash cost. It can still be used as the basis for decision-making at the farm level. The total variable cash cost of oil palm production was IDR 4,198,857 per ha per year. The results show that the labor cost for harvesting contributed to the most significant portion (38.1%) of the total cost. The cost of fertilizer and soil amendment was 34.6% of the total cost, followed by herbicide cost (13.1%). In addition, the fee for local agents contributed 1.9% of the total cost. The estimated income in 2018 was IDR 12,608,642 per ha per year.

Table 1: Socio-Demographic Characteristics of Oil Palm Smallholders

Item	Categories	Frequency (*n* = 174)	Percent (%)
Age (years)	31–40	23	13.2
	41–50	69	39.6
	51–60	73	41.9
	> 60	9	5.3
	Mean	43.5	
Gender	Male	171	98.3
	Female	3	1.7
Marital status	Married	171	98.3
	Widow	3	1.7
Length of marriage (years)	15–25	67	38.5
	26–35	94	54.0
	36–45	11	6.3
	> 45	2	1.2
	Mean	27.0	
Religion	Islam	125	71.8
	Hinduism	49	28.1
Ethnicity	Mandarese	121	69.5
	Balinese	49	28.2
	Buginese	4	2.3
Education	No school	31	17.8
	Primary school	68	39.0
	Secondary school	63	36.2
	College degree	10	5.8
	Bachelor degree	2	1.2
Family members (people)	1–3	15	8.6
	4–6	156	89.7
	> 6	3	1.7
	Mean	4.5	
Children attending school (people)	0	5	2.9
	1	62	35.7
	2	94	54.0
	3	13	7.4
	Mean	1.7	
Earning members (people)	1	136	78.2
	2	38	
	Mean	1.2	

Table 2: Cost, Revenue, and Income in Oil Palm Farming

Item	Average value (IDR/ha/year)	Percent (%)
Revenue	16,807,499	
Total variable cash cost	4,198,857	
• Fertilizer (urea)	836,068	19.9
• Soil amendment (dolomite)	633,385	15.1
• Herbicide	494,482	11.8
• Labor for harvesting	1,634,390	38.1
• Fee for local agents (transporting)	600,533	14.3
Net income (IDR/ha per year)	12,608,642	
Yield (kg/ha per year)	23,839	
The average price of FFB(IDR/kg)	705.04	

Table 3: Problems in Oil Palm Farming

Problems faced by smallholders*	Frequency (*n* = 174)	Percent (%)
• Decrease in price of FFB	174	100.0
• Lack of management knowledge	174	100.0
• The herbicides and fertilizer scarcity	168	96.5
• Increase in production cost	159	91.3
• Lack of credit	81	46.5

Note: *A respondent can give more than one answer.

3.3. Problems in Oil Palm Farming

The problems are faced by smallholders relating to various aspects of oil palm production are presented in Table 3. All of the smallholders (100%) faced the problem of the price of fresh fruit bunches (FFB). Smallholders in the study area mentioned that the price of FFB in 2018 was meager, only at IDR 705.04 per kg. This situation was different in 2017 by an average of IDR 1.050 per kg. The amount of FFB price is very influential on smallholders' income. If the price of FFB increases, smallholders' income will increase too.

Lack of management knowledge is another big problem faced by smallholders (100%), followed by herbicides and fertilizer scarcity (96.5%). This problem occurred because the distance between the city center and the villages is very

Table 4: Household Income and Expenditure of Oil Palm Smallholders

Sources of household income	**Average value (IDR/year)**	**Percent (%)**
Total net income from oil palm farming	26,099,659	
Total net income from non-oil palm farming	2,423,563	
• Cocoa	308,046	12.7
• Orange	158,046	6.5
• Banana	730,456	30.2
• Fishing	824,712	34.0
• Coconut	402,303	16.6
Total income from off farming	1,717,577	
• Street vendor	539,595	31.5
• Building construction	261,494	15.2
• Tailoring	201,149	11.7
• Housemaid	55,172	3.2
• Cleaning service	132,183	7.7
• Driver	155,172	9.0
• Mechanic shop	52,023	3.0
• Government employee	320,789	18.7
Total household income	30,417,441	
Household expenditure	**Average value (IDR/year)**	**Percent (%)**
Expenditure for food consumption	15,582,203	
• Rice	3,795,862	24.4
• Fish and meat	2,815,402	18.1
• Eggs and milk	2,723,724	17.5
• Vegetables	1,874,304	12.0
• Fruits	643,505	4.1
• Cooking oil	590,143	3.8
• Sugar	553,143	3.6
• Coffee and tea	787,712	5.0
• LPG	582,011	3.7
• Cigarettes	322,178	2.1
• Finished drinks and snacks	894,219	5.7
Expenditure for non-food consumption	7,893,866	
• Housing	104,741	1.3
• Electricity	1,522,253	19.2
• Motor vehicle	2,243,505	28.4
• Toiletries and cosmetics	588,592	7.4
• Child education	622,729	7.9
• Medical facilities	40,804	0.5
• Clothes, shoes, and headgear	2391387	30.3
• Party and festivals	71,810	1.0
• Installments	308,045	4.0
Total household expenditure	23,476,069	

far away. Most smallholders (91.3%) mentioned that they need to spend more money on production costs such as fertilizer, herbicides, and labor. In addition, about 46.5% of smallholders faced the problem of lack of credit.

3.4. Contributions of Oil Palm Farming to Household Income and Expenditure

Table 4 summarizes the household income and expenditure of oil palm smallholders. The average total household income of smallholders was IDR 30,417,441 per year. The income is still categorized as low due to below national income, which is 55,456,544 per year (Statistic Indonesia, 2019). In the study area, the total income of households derived from oil palm farming, non-oil palm farming, and off farming. The average net income from oil palm farming was IDR 26,099,659 per year. The average net income from non-oil palm farming was IDR 2,423,563 per year and derived from fishing (34%), banana (30.2%), coconut (16.6%), cocoa (12.7%), and orange (6.5%). The average household income from off farming was IDR 1,717,577 per year and derived from working as a street vendor (31.5%), building constructions (15.2%), tailoring (11.7%), housemaid (3.2%), cleaning service (7.7%), the driver (9%), government employee (18.7%) and mechanic shop contributed the lowest portion (3%).

On the other hand, the average household expenditure was IDR 23,476,069 per year. Household expenditure is distinguished by food consumption and non-food consumption. Total expenditure for food consumption was, on average, IDR 15,582,203 per year. Rice contributed the greatest portion (24.4%) of total food consumption. The preference for rice is high, which is assumed to be the main source of calories and protein. Moreover, rice is also considered to have a better social image of food (Statistics Indonesia, 2018). Fish

and meat contributed 18.1%, followed by vegetables (12%), cooking oil (3.8%), and cigarettes (2.1%).

Total expenditure for non-food consumption was, on average, IDR 7,893,866 per year, on average. Clothes, shoes, and headgear contributed the greatest portion (30.3%) of total non-food consumption. The second greatest was motor vehicles, which contributed 28.4% of total non-food consumption. Most of the surveyed smallholders have at least one motor unit. The vehicles owned by the smallholders were used to support daily activities such as taking children to school, to the market, to the farm, and other activities. It was very difficult to find public transportation in the study area, so if smallholders did not have a motorbike, they would walk either to the market or farm. Electricity contributed 19.2% of total non-food consumption. Electricity is available for their housing, but they only used it during nighttime due to the high cost. Otherwise, the contribution of child education was IDR 622,729 per year or 7.9% to total non-food consumption. The average education level of a smallholder child was a primary school and secondary school level, so the tuition fees were still not too high. Education costs in this study were the costs of tuition fees and stationery supplies. In the study area, oil palm smallholders have their own water resources so that they do not have to spend money on daily water needs.

3.5. Factors That Affect Household Expenditure of Oil Palm Smallholders

The multiple regression analysis was carried out to examine factors affecting household expenditure in oil palm smallholders. The result shows that the model passes the test of normality, heteroscedasticity, and multicollinearity test. Table 5 presents the details of the regression analysis. The coefficient determination ($R^2 = 0.767$) of multiple regression indicated that 76% of the variation in household expenditure (dependent variable) is explained by the independent variables. The rest 24% of the variation was due to other variables not included in the model**.** The overall regression result was significant $\alpha = 0.01$. This provides evidence that the combination of household income, education level, age, family members, and number of earning family members, number of children attending school, credit, and duration of marriage have an impact simultaneously on household expenditure.

Household income (X_1) has positive and significant effects on household expenditure at $\alpha = 0.01$**.** Household income is essential as it determines how much can be spent on various needs of the household. Household expenditures increase along with the value of household income. These results are consistent with those of Sekhampu and Niyimbanira (2013), who noted that household income significantly affects total monthly expenditure and important to determine the amount of expenditure on the various need of the household.

Education is an essential factor for the creation of quality human resources for the development of a country. The result of the study shows that education level (X_2) has a statistically significant and positive effect on household expenditure at $\alpha = 0.01$. This study is also consistent with Sekhampu and Niyimbanira (2013), who reported that educational attainment significantly affects total monthly expenditure.

Table 5: Summary of the Multiple Regression Analysis

Variables	Coefficient	Standard Error	Sig.	VIF
Constant	7421539.982	1770313.808	0.000*	
X_1 (Household income)	0.103	0.019	0.000*	1.715
X_2(Education Level)	872834.547	214761.890	0.000*	1.618
X_3 (Age)	–47880.715	65654.516	0.467^{NS}	8.893
X_4 (Family size)	1850382.334	195085.570	0.000*	1.625
X_5 (Earning family member)	990598.699	425578.692	0.021**	1.423
X_6 (Children attending school)	907474.701	242819.723	0.000*	1.169
X_7 (Credit of household)	1141125.434	363047.486	0.002*	1.163
X_8 (Length marriage)	70064.283	68188.500	0.306 ^{NS}	8.873
$F_{statistic}$	67.939			
R	0.876			
R^2	0.767			
Adjusted R^2	0.756			
Kolmogorov-Smirnov Test	0.200			

Note: 1. *Indicate significant at α 0.01. 2. **Indicate significant at α 0.05. 3. ^{NS} Indicate not significant at α 0.1.

The age of head household (X_3) has a negative and not significant effect on the household expenditure of oil palm smallholders in the study area at $\alpha = 0.1$. It means that the age of the smallholders has no impact on the household expenditure. This is consistent with empirical data where the age of smallholders is not proportional to increasing expenditure. However, this is more indicated by the social status of the community. The results are consistent with Marnisah et al. (2019), who noted that the age of farmers did not affect the household expenditure of farmers.

Family members (X_4) has a positive and significant effect on household expenditure at $\alpha = 0.01$. The increase in household expenditure in accordance with the increase in the number of a family member. The more family members, the more daily consumption will be spent on food and non-food consumption. This result is consistent with those of Davis et al. (1983), who concluded that household income and household size exert a significant positive impact on household expenditure.

Similarly, the number of earning members (X_5) has a positive and significant effect on household expenditure at $\alpha = 0.05$. In other words, the more number of earning members in a household will increase income, so that it will impact expenditure as well. Ahmed (2011) mentioned that if the more earnings members of the household, the amount of the household income also higher. In addition, the results are consistent with Sekhampu and Niyimbanira (2013), who noted that the number of people employed and employment status significantly affect total monthly expenditure.

The number of children attending school (X_6) has a positive and significant effect on the household expenditure at $\alpha = 0.01$. In the study area, the number of children attending school affects household expenditure due to smallholders needing to buy such as uniforms, tuition fees, and stationers. The result is also consistent with Veronica and Bakce (2017), who reported that the dominant factors that affect the expenditure were the number of educated children and education investment.

Variable of credit (X_7) has a positive and significant effect on household expenditure at $\alpha = 0.01$. Credit could be increasing the production and income, which in turn helps increase consumption as well. The results are consistent with Rosmiati (2012), who reported that the variable credit has a positive and significant influence on food and non-food consumption. In addition, Khandker and Faruqee (2003) noted that on a small scale, credit could significantly help in reducing poverty level of vulnerability or resolution to poverty.

The variable of marriage (X_8) has a positive and not significant effect on the household expenditure at $\alpha = 0.1$. Even though households have a long duration marriage, household income is still limited, so households could only allocate their income to limited food needs. Simbolon (2011) also noted that the duration of marriage has no significant effect on household expenditure.

4. Conclusion and Recommendations

This study assesses the impact of oil palm farming on household income and expenditure of oil palm smallholders in West Sulawesi, Indonesia. This study also identifies the problems related to oil palm production in the province. The analyses revealed that oil palm farming was the main occupation for all respondents (100%) in the study. However, around 39% of the respondent households have a secondary occupation. Some households have more than one secondary occupation (i.e., non-oil palm farming and off farming). The household income of smallholders was found to be, on average, IDR 30,417,441 per year. It was also found that 85.8% of total household income comes from oil palm farming, followed by non-oil palm farming (8%) and off farming (6.2%). The average household expenditure was estimated to be IDR 23,676,069 per year. Food consumption and non-food consumption constitute 66 and 34% of the total household expenditure, respectively.

The findings show that most smallholders cultivate a particular variety (i.e., Marihat) of oil palm. The smallholders harvest nearly 24 times (the second week and last week every month) in a year. From the viewpoint of FFB yield, the average production was estimated to be 23,839 kg/ha per year. The smallholders receive, on average, IDR 705.04 kg of FFB sold. The study identified several problems faced by smallholders in oil palm farming in the province. Decrease in the price of FFB is one of the main problems reported by respondents. Lack of knowledge of farm management is another big problem faced by smallholders. The other problems include scarcity of herbicides and fertilizers, increased production cost, and lack of credit. Based on the findings, the study proposes several recommendations that might be useful for oil palm smallholders and the government to ensure sustainable oil palm production in the province as well as in the country. The recommendations as highlighted below:

- Oil palm smallholders should improve the oil palm yield and reduce the operating cost to increase net income from oil palm farming.
- Oil palm smallholders should take proper care of farming equipment (particularly the expensive items) to be used in the long run, and the fixed operating cost of farming can be reduced.
- Oil palm smallholders should find secondary occupation (from non-oil palm farming or off farming) to get more household income.
- Oil palm smallholders should keep a record of all the transactions and activities (such as income, expenditure, usage of chemical fertilizer and

herbicide, etc.) related to oil palm plantation, which can be used for their quality of household welfare.
- The government should arrange various training programs for the oil palm smallholders to provide adequate farm management knowledge.
- The government should take some control measures of FFB price from local agents.
- The government should arrange to provide loans to oil palm smallholders at a low-interest rate through the nearest bank at their locality.
- Moreover, the government should provide education scholarships/facilities for children from low-income smallholder families.

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