



Household Economic Capacity for Sustainable Oil Palm Replanting Costs

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ABSTRACT

Oil palms have significant growth potential owing to their favorable prospects in domestic and international markets, serving as a primary source of income for local communities. As oil palm farming serves as the main source of income for local communities, its sustainability must be ensured. However, there are challenges, notably the declining production of oil palm crops as plantations reach a certain age. To address this, the government launched the People's Oil Palm Replanting Program (PSR), aimed at improving the efficiency and effectiveness of managing oil palm farming activities. However, the high costs associated with replanting often impose financial burdens on farmers. This study proposes an income set-aside system for smallholder farmers during the productive life of their plantations to alleviate the financial burden of replanting the palms. This article discusses the calculation of farmers' remaining household income and the amount of savings they need to accumulate funds for oil palm replanting activities. The data were quantitatively processed, including calculations of household income, expenditures, and remaining household income, and the value of savings for oil palm replanting preparation using the Sinking Fund Factor method. The study results revealed that most oil palm farmers (72%) have a sufficient amount of remaining household income that can be set aside as savings to prepare funds for oil palm replanting. Farmers need to allocate only 6.07% of their total household income, equivalent to IDR 678,165 per plantation area per month, to save for replanting oil palms.

Keywords: farmers' savings, oil palm farming, replanting fund

INTRODUCTION

Plantation commodities are superior products that serve as a major factor in sustaining the development of Indonesia's national economy (Topan & Ifrani 2021). Oil palm is a plantation commodity that plays a significant role in Indonesia's economy (Feni & Marwan 2023). The island of Sumatra, in particular, contributes substantially to the Gross Regional Domestic Product (GRDP), especially through the development of the agricultural sector (Cili & Alkhaliq 2022).

Smallholder oil palm plantations significantly contribute to Indonesia's economic growth (Barus & Ernah 2024). Therefore, it is crucial to maintain the sustainability of oil palm farming activities as a livelihood source for farmers, as oil palm farming constitutes an important source of household income for them (Ngadi & Meilianni 2020). However, after reaching approximately 20 years of age, which marks the end of their productive lifespan, oil palm plants must be replanted as soon as possible to maintain their productivity (Mulyani *et al.* 2023). According to Suhartono *et al.* (2023), who applied a quadratic regression model, the fresh fruit bunch (FFB) tonnage

and average bunch weight increased annually from 3 to 13 years of age.

The government initiated the People's Oil Palm Replanting (PSR) program to enhance the productivity of community-owned oil palm plantations, thereby simultaneously increasing farmers' income (Anggraini *et al.* 2022). However, the high cost of replanting often imposes financial burdens on farmers. To mitigate this issue, this study proposes the implementation of a contribution system for farmers during the productive period of their oil palm plantations, which is intended to alleviate the financial challenges associated with replanting activities (Fasa *et al.* 2023).

Based on the previous research by Ngadi & Meilianni (2020), it was found that farmers have prepared funds through savings specifically allocated for oil palm replanting to sustain the continuity of oil palm plantations. Savings are an important aspect of agricultural activity. They allow farmers to directly influence developments and changes in their economic activities and serve as a crucial element of financial security in the event of unforeseen events (Wieliczko *et al.* 2020).

Reviewing prior studies, Jenahar & Hildayanti (2017) reported that advanced farmers' households accumulate savings of approximately IDR3,022,000 annually, compared to IDR2,024,000 for traditional farmers. Considering that traditional and advanced farmers are required to save IDR184,600 and IDR170,000 per year, respectively, over a 15-year

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period, it can be inferred that farmers are unlikely to face significant challenges in securing funds for plantation replanting. This is attributable to the fact that the self-financed replanting cost constitutes only 8% of their annual savings.

Furthermore, previous research conducted by Mariyah *et al.* (2018) revealed that 46.02% or 52 households have plans to rejuvenate their aging crops and have begun saving a portion of their income. Approximately 29.20% of households saved regularly, whereas 16.81% saved irregularly. The capacity of smallholder farmer households in Paser Regency to independently undertake the rejuvenation of old oil palm plantations remains relatively low, amounting to only 10.81%.

Although no significant problems were identified in the study area, local oil palm farmers reported that the savings program to prepare funds for plantation replanting has not yet been implemented and remains in the planning stage. They emphasized the need for accurate calculations of the amount of savings required to ensure the program's effectiveness. This situation forms the basis for this study to determine a realistic saving calculation for replanting costs that is applicable to farmers.

Based on the foregoing, it can be stated that saving practices to prepare for oil palm replanting costs are not a new concept for oil palm farmers. However, few studies have analyzed both the estimated costs of upcoming oil palm replanting and farmers' capacity to accumulate funds prior to the scheduled period of replanting. Against this background, the researcher is interested in conducting a study entitled "Household Economic Capacity for Sustainable Oil Palm Replanting Costs". This study aims to quantify the potential household income that farmers can save for oil palm replanting funds and estimate the savings required to finance oil palm replanting.

METHODS

This study was conducted in Suka Damai Baru Village, Sungai Lilin Subdistrict, Musi Banyuasin Regency. The research method employed in this study is the survey method, which aims to obtain evidence of existing phenomena and gather information related to economic, social, or political institutions from a particular area or group (Roosinda *et al.* 2021). This research is expected to provide valuable information to farmers for planning savings to prepare funds for oil palm replanting.

Sampling in this study was conducted among oil palm farmers who own plantations and are members of the KPKS Suka Makmur. The sample was selected using Simple Random Sampling, drawn randomly from a population of 386 oil palm farmers who are members of KPKS Suka Makmur residing in Suka Damai Baru

Village. The total sample size was 50 respondents. The simple random sampling method is the simplest sampling procedure that is carried out fairly, meaning that each unit has the same opportunity to be selected (Sumargo 2020).

The data processing method used in this study was quantitative analysis. Quantitative analysis was conducted to calculate the income and expenditures of farmer households, estimate the future cost of replanting, and determine the monthly savings that farmers should allocate in preparation for oil palm replanting.

Household Income Potentially Available for Savings

Mathematically, the household income potentially available for savings is formulated as:

$$IP = R - AAI$$

Where:

- IP = Household Income Potentially Available for Savings (IDR/month)
 R = Remaining Household Income (IDR/month)
 BA = Ideal Budget Allocation by the Financial Services Authority (OJK) (IDR/month)

According to the Ideal Budget Allocation by the Financial Services Authority (OJK), 25% of household income can be allocated into: 1) Zakat, Infaq, and Charity at 5%, 2) Savings and Emergency Funds at 10%, and 3) Children's needs and Education at 10%. Mathematically, the remaining household income is formulated as:

$$R = I \text{ total} - E \text{ total}$$

Where:

- R = Remaining household income (IDR/month)
 I total = Total income of household (IDR/month)
 E total = Total expenditure of household (IDR/month)

Mathematically, the total income of a household is formulated as:

$$I \text{ total} = I \text{ on-farm oil palm} + I \text{ on-farm non-oil palm} + I \text{ off-farm} + I \text{ non-farm}$$

Where:

- I on-farm oil palm = Oil Palm On-Farm Income (IDR/month)
 I on-farm non-oil palm = Non-Oil Palm On-Farm Income (IDR/month)
 I off-farm = Off-Farm Income (IDR/month)
 I non-farm = Non-Farm Income (IDR/month)

Mathematically, the total expenditure of a household is formulated as:

$$E \text{ total} = E \text{ food} + E \text{ non-food}$$

Where:

E food= Food Expenditure (IDR/month)

E non-food= Non-Food Expenditure (IDR/month)

Savings Value for Oil Palm Replanting Preparation

To determine the amount of savings that farmers must save to prepare funds for oil palm replanting, it is calculated using the Sinking Fund Factor formula.

$$A = FV \times r / [(1+r)^n] - 1$$

Description:

FV = Future Value (IDR/hectare)

A = Annuity (IDR/month)

r = interest rate (%)

n = savings period (years)

The future value is the nominal money of the oil palm replanting fund in the future, calculated from the money saved today plus a certain interest rate.

$$FV = PV \times [(1+i)^N]$$

Description:

PV = Present Value (IDR/hectare)

I = inflation rate (%)

N = year spacing of replanting (years)

RESULTS AND DISCUSSION

Total Income of Farmer Household

The total household income of farmers is calculated as the aggregate yield obtained by the farmer households within one month, minus the operational costs incurred for each activity. This study found that farmers' household income is derived from several sources: cooperatively managed oil palm farming (on-farm), privately managed oil palm farming (on-farm), non-oil palm farming, such as rubber cultivation, off-farm income, and non-farming income.

Based on Table 1, it is evident that each activity contributes differently to the income of the farmer households. Generally, it can be analyzed that oil palm farming activities, particularly those managed cooperatively, contribute the highest proportion to total household income compared to other sources, accounting for 61.38% or IDR 6,855,656 per month. Oil palm production, both managed by KPKS Suka Makmur and self-managed, is harvested twice a month. To ensure that the harvested fruit complies with

harvesting procedures, oil palm harvesting laborers are supervised by field assistants, foremen, and field clerks (Pratama *et al.* 2024).

In addition to oil palm farming, farmer households have other sources of farm income, including rubber farming. However, not all households derive income from rubber farming; only 19 farmer households have this source of income. Farmers receive income from rubber farming once or twice a month.

The frequency of income from the off-farm subsector can occur more than once a month, depending on the type of job held by the farmers. Eight farmer households derived income from the off-farm subsector. Specifically, seven households have one type of off-farm employment, including farm laborers, poultry farming, and oil palm trading. Meanwhile, one household has two types of off-farm employment: farm labor and farm equipment rental.

Based on the study, 26 out of 50 farmer households had income sources from the non-farm subsector. Non-farm refers to occupations outside farming and unrelated to agriculture. According to the research, non-farm jobs held by farmer households include construction laborers, tent rental business, teachers, employees, mining workers, drivers, entrepreneurs, as well as pension fund recipients. This study aligns with Mudatsir's (2021) research, which categorized farmer income sources into three subsectors: on-farm, off-farm, and non-farm.

Total Expenditure of Farmer Household

The total income of oil palm farmer households is used to fulfill the basic needs of the households, which are categorized into food and non-food expenditures. Based on Table 2, it can be observed that non-food expenditures exceed food expenditures. This finding is consistent with Vaulina *et al.* (2019), who reported that oil palm farmer households allocate 68.25% of their total household expenditure to non-food items, amounting to IDR 3,753,758 monthly.

In this study, food expenditures included purchases of staple foods such as rice, complementary foods comprising tubers, seafood, meat, eggs, milk, vegetables, nuts, fruits, cooking oil, beverage ingredients, and spices, instant noodles, and cigarettes. The largest share of food expenditure was

Table 1 Average total income of farmer household

Income type	Revenue (IDR/ month/household)	Operational cost	Income (IDR/ month/household)
Oil palm on-farm income (cooperative managed)	10,206,069	3,350,413	6,855,656
Oil palm on-farm income (self-managed)	5,563,909	1,702,231	3,861,678
Non-oil palm on-farm income	3,199,474	1,257,472	1,942,002
Off-farm income	2,468,750	337,031	2,131,719
Non-farm income	4,585,192	1,632,308	2,952,884
Total income			11,169,331

Source: Primary Data (2024).

allocated to complementary foods, totaling IDR 1,363,300 or 76.21% of the total food expenditure. Similar results were reported by Putri *et al.* (2022), who found that side dishes constituted the highest portion of food expenditure, ranging from 26.92%–33.02%.

Non-food expenditures represent the costs incurred to meet households' living needs over one month. These expenditures include household facilities, vehicles, fuel, telecommunications, various goods and services, medical services, medicine costs, education, social dues, installments, insurance, land and building taxes, and motor vehicle taxes. The largest non-food expenditure was for social dues, installments, and insurance, amounting to IDR 1,593,233 or 40.12% of the total non-food expenditure.

Cost Estimation of Oil Palm Replanting

The replanting process incurs costs, such as production costs, which encompass all expenses related to activities from cutting down old plants until the oil palm plants begin to produce. The estimated replanting cost was calculated based on 2018 and projected to 2045 as the target year for oil palm replanting. By 2045, the plantation will be 27 years old, indicating that replanting is necessary.

Present Value (PV) refers to the cost of replanting oil palm plantations in 2018. The time interval or period (N) used to calculate the estimated future replanting costs was 27 years. Based on the results of the Future Value formula presented in Table 3, the cost of oil palm replanting in 2045 is estimated at IDR 78,066,922 per hectare.

Savings Value for Oil Palm Replanting Preparation

Future Value (FV) represents the estimated replanting cost per hectare in 2045, amounting to IDR 78,066,922. Currently, the oil palm plantations managed by KPKS Suka Makmur are 7 years old. Considering the optimal lifespan of oil palm plants, farmers have approximately 18 to 20 years to prepare for replanting. Therefore, the saving period (n) for farmers to accumulate replanting funds is 240 months or 20 years.

Based on Table 4, the average monthly savings required to prepare for oil palm replanting costs in 2045, with an average cultivated area of 2.31 ha, is IDR 678,165 per month or IDR 293,969 per hectare per month. Chalil & Barus (2024) found that, in managing replanting costs, farmers need to allocate between IDR 250,000 and IDR 350,000 per harvest. Similarly, Fasa *et al.* (2023) reported that farmers prepare for replanting by making contributions for 216 months or 18 years, with an average monthly contribution of IDR 144,950.

Remaining Income of Farmer Household

According to Suryadi *et al.* (2020), saving capacity refers to the potential of households to save or set aside money for future use. Based on Table 5, the average remaining household income of farmers is IDR 5,409,589, which accounts for 48.43% of the total household income. This value represents the remaining income after deducting the household expenditures.

Table 2 Average Total Expenditure of Farmer Household

Expenditure Type	Average (IDR/month)	Percentage (%)
Food Expenditure	1,788,960	31.06
Non-Food Expenditure	3,970,782	68.94
Total Expenditure of Farmer Household	5,759,742	100.00

Source: Primary Data (2024).

Table 3 Cost Estimation of Oil Palm Replanting

Replanting Cost in 2018 (per hectare)	Inflation Rate (i) in 2014 - 2023	Period (years)	Replanting Cost in 2045 (per hectare)
30,279,570	3.57 %	27	78,066,922

Source: Primary Data (2024).

Table 4 Savings Value for Oil Palm Replanting

Replanting Cost in 2045 (per hectare)	Interest Rate (per year)	Savings Period (years)	Savings (IDR/ hectare/month)	Average (IDR/ land area/month)
78,066,922	0.08%	20	293,970	678,165

Source: Primary Data (2024)

Table 5 Average Remaining Income of Farmer Household

Description	Value (IDR/month)	Percentage (%)
Income of Farmer Household	11,169,331	100.00
Expenditure of Farmer Household	5,759,742	51.57
Remaining Income of Farmer Household	5,409,589	48.43

Source: Primary Data (2024)

Household Income Potentially Available for Savings

The remaining household income (R) indicates that a portion of the total household income can be allocated by farmers to other household needs. However, this remaining income (R) does not fully represent the potential income available for savings (PI) intended as funds for oil palm replanting, since farmers are likely to use the remaining income to cover other primary household needs. Based on Table 6, the average household income potentially allocable as savings for oil palm replanting amounting is IDR 2,617,256. Considering the required monthly savings for replanting preparation, which is IDR 678,165 per month or IDR 293,969 per hectare per month, it can be concluded that farmers possess the capacity to save for oil palm replanting funds.

Of the 50 farmer households, only 36 (72%) have the capacity to save in accordance with the size of their plantation land, whereas the remaining 14 households do not have the potential to save. This is due to the fact that some farming activities owned by the farmers are still in the maintenance phase, resulting in no income being generated from those farming activities. Conversely, farmers incur production costs related to these activities. Additionally, some farmers still have to pay installments on outstanding debts. Based on their current total household income and expenditures, these farmers do not have the capacity to allocate a portion of their income for savings.

Within a period of 18 to 20 years, price increases or cost escalations may occur in one or more variables, including fertilizer prices, labor costs, household goods prices, etc. These changes may increase operational costs, while income and remaining income may

decline. Therefore, this study conducts a scenario analysis to examine how variations in these variables may affect farmers' capacity to save. This analysis aims to provide a more realistic depiction of the impact of changes in operational costs, household expenditures, and household revenue on the financial welfare of farmers, thereby serving as a basis for better planning and decision-making in the future. In this study, the analysis focuses on determining how many farmers still have the capacity to save when changes occur in several variables, including increases in operational costs across various subsectors (on-farm, off-farm, and non-farm), increases in household expenditures, and decreases in household revenue across various subsectors (on-farm, off-farm, and non-farm).

Assumption 1: The operational costs for each livelihood activity (on-farm, off-farm, and non-farm) increase by 10% to 50%, while household revenue (on-farm, off-farm, and non-farm) and household expenditures remain unchanged (Table 7). Assumption 2: Household expenditures increase by 10% to 50%, whereas the revenue and operational costs for each livelihood activity (on-farm, off-farm, and non-farm) remain unchanged (Table 8). Assumption 3: Household revenue (on-farm, off-farm, and non-farm) decreases by 5% to 25%, whereas operational costs (on-farm, off-farm, and non-farm) and household expenditure remain unchanged (Table 9).

The results of the analysis of the three assumptions show a trend of decreasing number of households able to save as operational costs and household expenditures increase, as well as household revenue decreases. The decrease in household revenue appears to have a greater impact on farmers' ability to

Table 6 Household income potentially available for savings

Description	Average (IDR/month)	Caption
Total Income of Farmer Household	11,169,331	Average total income of farmer households
Remaining Income of Farmer Household	5,409,588	Average remaining income of farmer households
Ideal Budget Allocation	2,792,333	Ideal Budget Allocation (25% of total income)
Household Income Potentially Available for Savings	2,617,256	Amount of household income that can be saved for replanting preparation

Source: Primary Data (2024)

Table 7 Scenario analysis based on increase in operational costs

Assumption	E total	R	BA	IP	Household Capable of Saving
Initial Value	5,759,742	5,409,589	2,792,333	2,617,256	36
10%	10,621,335	4,861,593	2,655,334	2,206,259	36
20%	10,073,339	4,313,597	2,518,335	1,795,263	35
30%	9,525,343	3,765,601	2,381,336	1,384,266	33
40%	8,977,347	3,217,605	2,244,337	973,269	30
50%	8,429,351	2,669,610	2,107,338	562,272	26

Source: Primary Data (2024)

Table 8 Scenario Analysis Based on Increase in Household Expenditures

Assumption	E total	R	BA	IP	Household Capable of Saving
Initial Value	5,759,742	5,409,589	2,792,333	2,617,256	36
10%	6,335,716	4,833,615	2,792,333	2,041,282	34
20%	6,911,690	4,257,641	2,792,333	1,465,308	27
30%	7,487,664	3,681,667	2,792,333	889,334	22
40%	8,063,638	3,105,692	2,792,333	313,360	15
50%	8,639,613	2,529,718	2,792,333	- 262,614	13

Source: Primary Data (2024)

Table 9 Scenario Analysis Based on Decrease in Household Revenue

Assumption	E total	R	BA	IP	Household Capable of Saving
Initial Value	5,759,742	5,409,589	2,792,333	2,617,256	36
5%	10,336,866	4,577,125	2,584,217	1,992,908	36
10%	9,504,402	3,744,660	2,376,100	1,368,560	31
15%	8,671,937	2,912,196	2,167,984	744,211	27
20%	7,839,473	2,079,731	1,959,868	119,863	24
25%	7,007,008	1,247,267	1,751,752	- 504,485	18

Source: Primary Data (2024).

save than changes in the other variables. Increases in household expenditures also affect households' ability to save, but the impact is not as large as the decrease in revenue. Meanwhile, the increase in operational costs has the smallest impact compared with the other two variables. These findings provide important insights into the sensitivity of farmers' household saving capacity to changes in different economic conditions, particularly in the context of preparing funds for oil palm replanting costs.

CONCLUSION

The estimated cost of oil palm replanting in 2045 is IDR 78,066,922/hectare. Therefore, the savings that farmers must allocate as preparation for oil palm replanting costs amount to IDR Rp293.970 per hectare per month. Based on the potential household income available for saving, which is IDR 2.617.256 per month, 36 farmer households are considered capable of setting aside a portion of their income as savings for replanting funds.

Future research should focus on the knowledge and ability to perform replanting activities by independent oil palm farmers who have not yet undertaken replanting activities. The results of such a study are expected to provide an overview of the availability and obstacles faced by farmers in implementing oil palm replanting. This can serve as a guide for formulating programs or policies related to oil palm replanting activities that can be properly implemented by farmers.

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