



SMALLHOLDER OIL PALM REPLANTING AS AN INSTRUMENT FOR COMMUNITY EMPOWERMENT TO SUPPORT SOCIO-ECONOMIC CONDITIONS IN NORTH PADANG LAWAS REGENCY

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Abstrak

Rendahnya produktivitas perkebunan kelapa sawit rakyat dan kompleksitas proses peremajaan menjadi persoalan penting bagi keberlanjutan pendapatan dan kondisi sosial ekonomi petani. Penelitian ini bertujuan menganalisis pelaksanaan Program Peremajaan Sawit Rakyat sebagai instrumen pemberdayaan masyarakat serta menguji pengaruh implementasi program terhadap dampak sosial ekonomi petani di Kabupaten Padang Lawas Utara. Penelitian menggunakan pendekatan kuantitatif dengan desain deskriptif-analitis melalui survei terhadap 30 petani peserta program yang dipilih berdasarkan keterlibatan langsung dalam kegiatan peremajaan. Data dikumpulkan menggunakan kuesioner skala Likert lima poin dan dianalisis melalui statistik deskriptif, uji validitas, uji reliabilitas, serta regresi linear sederhana. Hasil penelitian menunjukkan bahwa kualitas bibit unggul memperoleh penilaian tertinggi pada aspek implementasi dengan nilai rata-rata 4,63, sedangkan kepuasan terhadap layanan kelembagaan menjadi dampak tertinggi dengan rata-rata 4,50. Perubahan pendapatan memperoleh rata-rata terendah sebesar 4,07 karena sebagian tanaman belum memasuki fase produksi penuh. Analisis regresi menunjukkan bahwa implementasi program berpengaruh positif dan signifikan terhadap dampak yang dirasakan petani dengan nilai R^2 sebesar 0,638. Temuan ini menunjukkan bahwa kualitas implementasi program merupakan faktor penting dalam memperkuat pemberdayaan dan kondisi sosial ekonomi petani.

Kata Kunci: Peremajaan Sawit Rakyat, Pemberdayaan Masyarakat, Petani Sawit, Sosial Ekonomi, Implementasi Program



Abstract

The low productivity of smallholder oil palm plantations and the complexity of the replanting process pose important challenges to the sustainability of farmers' income and socioeconomic conditions. This study aims to analyze the implementation of the Smallholder Oil Palm Replanting Program as an instrument of community empowerment and examine its influence on the socioeconomic outcomes perceived by farmers in North Padang Lawas Regency. A quantitative approach with a descriptive-analytical design was employed through a survey of 30 farmers directly involved in the replanting program. Data were collected using a five-point Likert-scale questionnaire and analyzed through descriptive statistics, validity testing, reliability testing, and simple linear regression. The findings show that the availability and quality of superior seedlings received the highest implementation score, with a mean of 4.63, while satisfaction with institutional services recorded the highest impact score, with a mean of 4.50. Changes in farmers' income obtained the lowest mean score of 4.07 because most replanted palms had not yet reached full production. Regression analysis demonstrates that program implementation has a positive and statistically significant influence on perceived farmer outcomes, with an R^2 of 0.638. These findings indicate that the quality of program implementation plays an important role in strengthening community empowerment and improving farmers' socioeconomic conditions.

Keywords: Oil Palm Replanting, Community Empowerment, Smallholder Farmers, Socioeconomic Conditions, Program Implementation

PENDAHULUAN

Indonesia's palm oil sector occupies a strategic position in rural development because it generates employment, household income, export earnings, and economic activity across plantation-producing regions (Heru Wansyah Harahap et al., 2025). Nevertheless, a critical challenge is emerging among smallholder plantations, many oil palm stands have entered or are approaching the end of their productive economic cycle, while smallholder productivity remains substantially lower than that of large estates. Replanting has therefore become necessary not only to restore productivity but also to secure the long-term livelihoods of farming households. However, replanting creates a socioeconomic dilemma because newly planted palms require several years before generating adequate yields, potentially interrupting farmers' main source of income (Petri et al., 2024). This challenge is reflected in the implementation of Indonesia's Smallholder Oil Palm Replanting Program: in 2024, only 38,247 hectares were realized against a target of 70,000 hectares, with land-status requirements and administrative procedures remaining important barriers. Academically and practically, this gap makes it essential to understand whether the quality of program implementation actually translates into community empowerment and improved socioeconomic conditions at the farmer level.

Previous studies have examined smallholder oil palm replanting from several perspectives. Research has shown that replanting can increase plantation productivity and potentially improve farmers' income, while other studies emphasize constraints involving



administrative requirements, delayed fund disbursement, institutional coordination, capital availability, land legality, and farmer readiness (Jundi et al., 2024). These concerns are consistent with recent international evidence. Petri et al (2024) identify access to finance, quality planting materials, technical knowledge, and eligibility for public replanting support as major obstacles confronting Indonesian smallholders. Likewise, Siregar et al (2024) demonstrate that financing constraints, land certificates, business registration, and farmers' capacity to apply good agricultural practices influence both willingness and actual participation in replanting. Earlier research also emphasizes the importance of strengthening smallholder databases, land-tenure certainty, financing mechanisms, and local institutions (Nurfatriani et al., 2019). However, these studies predominantly examine participation, replanting constraints, financing, or sustainability separately. Limited empirical attention has been given to directly testing how the quality of PSR implementation relates to farmers' perceived socioeconomic outcomes at the local implementation level, particularly in North Padang Lawas Regency.

Responding to this gap, the present study approaches the Smallholder Oil Palm Replanting Program not merely as an agronomic intervention but as an instrument of community empowerment whose socioeconomic outcomes depend on the quality of program implementation. Specifically, the study examines PSR implementation through five interconnected dimensions: quality of technical assistance, timeliness of fund disbursement, availability and quality of superior seedlings, institutional transparency and accountability, and farmer participation. Its perceived impact is examined through changes in farmer income, perceived program effectiveness, satisfaction with institutional services, readiness for program sustainability, post-program participation, and broader socioeconomic improvement. These dimensions correspond directly to the variables and indicators operationalized in the research instrument. This approach responds to previous studies by integrating technical, administrative, institutional, participatory, and socioeconomic dimensions within a single empirical model rather than examining replanting barriers independently. This perspective is particularly relevant because oil palm cultivation can improve household living standards and human-capital outcomes, although such benefits depend on how effectively production and institutional conditions are managed (Chrisendo et al., 2022). Accordingly, the study specifically asks such as to what extent does the quality of PSR implementation influence the socioeconomic outcomes perceived by participating farmers in North Padang Lawas Regency?

This study argues that better implementation of the Smallholder Oil Palm Replanting Program produces stronger positive socioeconomic outcomes for participating farmers. The relationship is expected because each implementation dimension addresses a specific source of vulnerability during the replanting process. Timely financing can reduce liquidity



pressure while farmers wait for newly planted palms to become productive, superior seedlings and adequate technical assistance can reduce production risks and improve future productivity, institutional transparency can strengthen farmers' trust in program management, and active participation can increase farmers' ownership and capacity to sustain replanting activities. Previous research supports these mechanisms such as inadequate financing, weak access to high-quality inputs, insufficient technical knowledge, and complicated eligibility requirements can discourage replanting or weaken its outcomes (Petri et al., 2024). Nurfatriani et al (2019) similarly emphasize that financial assistance should be complemented by stronger land governance, farmer databases, and local institutional capacity. Based on this reasoning, the study proposes the following hypothesis: H1: The quality of PSR program implementation has a positive and statistically significant effect on the socioeconomic outcomes perceived by participating smallholder farmers in North Padang Lawas Regency. Thus, implementation quality constitutes the independent variable (X), while perceived farmer impact constitutes the dependent variable (Y).

LANDASAN TEORI

Smallholder oil palm replanting in Indonesia can be mapped into three dominant streams that explain different parts of the relationship between program implementation and farmer outcomes. The first stream is technical-agronomic, focusing on declining productivity, palm age, replanting systems, seed quality, good agricultural practices, and land readiness. The manuscript itself reflects this orientation through studies on optimal replanting age, agronomic and socioeconomic decision factors, and supporting requirements such as plantation mapping, business registration, environmental documentation, and land certification (Putri et al., 2023). The second stream emphasizes financing, subsidy design, administrative eligibility, and farmers' willingness to participate in replanting programs. The third concerns institutions, farmer empowerment, and socioeconomic welfare, including technical support, organizational capacity, income, and living standards. Recent research confirms that replanting challenges are multidimensional rather than merely agronomic or financial (Effendi et al., 2026). Collectively, these streams provide a substantial knowledge base, but remain only partially integrated in explaining how implementation quality translates into socioeconomic outcomes at the farmer level.

The first research pattern treats replanting primarily as a technical and agronomic response to declining plantation productivity. Studies in this stream examine when oil palms should be replanted, which replanting system is technically feasible, what inputs are needed, and how smallholders can close productivity gaps after plantations become economically old. The theoretical review in the present manuscript notes that declining productivity is associated with palm age, although previous studies differ regarding the



optimal replanting threshold. It also identifies land area, plant height, capital, government assistance, plantation mapping, business registration, environmental documentation, and land certification as important supporting conditions for successful replanting (Khairunnas, Hamdan Yazid, 2025). This literature is reinforced by Petri et al (2024), who identify access to knowledge, high-quality planting materials, financing, and proper technical training as major challenges during smallholder replanting. These studies commonly employ agronomic assessment, farm surveys, feasibility analysis, and literature reviews. Their strength lies in explaining the physical and managerial requirements of replanting; however, they tend to evaluate technical readiness and production feasibility, rather than directly examine whether better program implementation generates broader community empowerment and socioeconomic benefits.

The second pattern is economic-behavioral and focuses on financing constraints, subsidy design, income risk, and farmers' decisions to participate in replanting. This stream recognizes that smallholders may understand the long-term benefits of replanting but postpone it because newly planted palms require several years before generating income. In the manuscript, PSR is associated with potential productivity and income gains, yet administrative requirements, delayed fund disbursement, and weak institutional coordination remain important barriers (Jundi et al., 2024; Rachmawati & Siregar, 2022). Nurfatriani et al (2019) show that public replanting finance is constrained by funding gaps, land legality, and access to complementary financing. Hendrawan & Musshoff (2024), using a discrete choice experiment, found that subsidy size, group-based registration, farming experience, education, risk attitudes, non-oil-palm income, and farm size shape farmers' replanting preferences. Siregar et al (2024) distinguish stated willingness from actual replanting and identify financing access, land certificates, business registration, and good agricultural practices as important constraints. Effendi et al (2026) further show that farm conditions, institutional support, governance alignment, and access to information matter alongside economic factors. This stream explains program uptake effectively, but participation is generally treated as the final outcome rather than as a pathway toward subsequent socioeconomic impact.

The third pattern approaches smallholder development through institutional strengthening, community empowerment, and welfare outcomes. Rather than viewing farmers merely as recipients of seedlings or financial subsidies, this literature emphasizes farmer organizations, extension services, access to information, institutional transparency, collective action, and the capacity to sustain agricultural production. Raharja et al (2020), for example, identify land legality, limited access to finance and information, weak agricultural practices, and restricted access to quality production inputs as fundamental problems facing independent oil palm smallholders. Their institutional-strengthening model emphasizes



collaboration among cooperatives, farmer groups, agro-industrial actors, and supporting government institutions. This orientation is highly relevant to the present study, which operationalizes PSR implementation through technical assistance, timeliness of fund disbursement, seedling quality, institutional transparency and accountability, and farmer participation. Farmer outcomes include income change, perceived program effectiveness, satisfaction with institutional services, sustainability readiness, continued participation, and socioeconomic improvement. Beyond replanting specifically, Chrisendo et al (2022), using panel data from Sumatra, demonstrate that oil palm cultivation can improve nutrition, education expenditure, household assets, and broader living conditions among smallholder households. Nevertheless, previous studies rarely link multidimensional PSR implementation quality directly to multidimensional farmer outcomes within a single empirical model.

Taken together, the three patterns leave an important conceptual and empirical gap. Technical-agronomic studies explain what is required to conduct replanting successfully, economic-behavioral studies explain why farmers decide to participate or postpone replanting and institutional-welfare studies explain why organizational capacity and oil palm-based livelihoods matter for farmers. What these streams have not sufficiently examined is the implementation to outcome pathway such as whether farmers who experience better technical assistance, more timely financing, superior seedlings, greater institutional transparency, and stronger participation also experience stronger socioeconomic benefits from the PSR program. This omission is important because successful enrollment in PSR or technically correct replanting does not automatically constitute effective community empowerment. Recent studies still concentrate predominantly on replanting barriers, subsidy preferences, and participation decisions rather than post-implementation outcomes (Hendrawan & Musshoff, 2024; Nurfatriani et al., 2019; Petri et al., 2024). The variable structure of the present research directly addresses this limitation by positioning PSR implementation as the independent variable and multidimensional farmer impact as the dependent variable. Therefore, the novelty should not merely be framed as investigating PSR in North Padang Lawas, but as empirically connecting implementation quality with farmer-level socioeconomic outcomes.

Accordingly, this study proposes a new direction by positioning the Smallholder Oil Palm Replanting Program simultaneously as an agricultural renewal policy and a community-empowerment intervention. The analytical focus shifts from the conventional question of whether farmers are willing or technically able to replant toward a more consequential question: does the quality of PSR implementation generate meaningful socioeconomic outcomes for participating farmers? This orientation integrates five implementation dimensions-technical assistance, timeliness of fund disbursement,



availability and quality of superior seedlings, institutional transparency and accountability, and farmer participation-with six outcome dimensions such as changes in income, perceived program effectiveness, satisfaction with institutional services, readiness for program sustainability, post-PSR participation, and socioeconomic improvement. These dimensions are consistent with the operational variables already established in the manuscript. Conceptually, technical support can reduce production uncertainty, timely financing can reduce transition pressure, quality seedlings support future productivity, transparent institutions may strengthen trust, and participation can increase farmers' sense of ownership. The study therefore advances an implementation-empowerment perspective, testing the direct relationship between PSR implementation (X) and perceived farmer impact (Y). This perspective complements previous work on replanting readiness, subsidies, participation, institutional capacity, and household welfare by integrating them into a single local empirical model.

METODE PENELITIAN

The unit of analysis in this study is the individual smallholder oil palm farmer participating in the Smallholder Oil Palm Replanting Program in North Padang Lawas Regency. The study focuses on farmers as individual beneficiaries because the main variables are measured through their assessments and experiences of program implementation and its perceived socioeconomic outcomes. Program implementation constitutes the independent variable and includes the quality of technical assistance, timeliness of fund disbursement, availability and quality of superior seedlings, institutional transparency and accountability, and farmer participation. The dependent variable represents farmers' perceived program outcomes, including changes in income, perceived program effectiveness, satisfaction with institutional services, readiness for program sustainability, post-replanting participation, and socioeconomic improvement. Although cooperatives, field facilitators, and village officials constitute relevant institutional actors, they are not the primary statistical units of analysis and rather, information obtained from these actors serves to contextualize the implementation environment surrounding participating farmers. This distinction is important because quantitative research requires the unit of analysis to correspond directly to the entity from which measurements of the variables are obtained (Creswell & Creswell, 2023). The analytical focus therefore remains on how variations in farmers' perceptions of implementation quality are associated with variations in the socioeconomic impacts they perceive.

This study employs a quantitative approach with a descriptive-analytical survey design. The quantitative orientation was selected because the research seeks not only to describe farmers' assessments of the PSR program but also to statistically test the



relationship between the quality of program implementation and the impact perceived by participating farmers. This is consistent with the original study design, which measures both variables through structured indicators and examines their relationship using simple linear regression. Quantitative research is appropriate when predefined variables are operationalized into measurable indicators and hypotheses concerning relationships among variables are examined statistically (Creswell & Creswell, 2023). The descriptive component summarizes respondents' evaluations of technical, financial, institutional, participatory, and socioeconomic dimensions, whereas the analytical component examines whether better PSR implementation is associated with stronger farmer outcomes. Semi-structured interviews with selected institutional actors are used only as supplementary contextual information. Because the manuscript does not currently report a systematic qualitative coding procedure or formal integration of quantitative and qualitative findings, the design is more accurately characterized as primarily quantitative rather than fully mixed-method. A mixed-method designation would require explicit procedures for integrating both forms of evidence (Creswell, Plano Clark, 2018).

The study primarily uses primary data obtained from respondents, namely 30 smallholder farmers who actively participated in the PSR program and were directly involved in oil palm replanting activities. Participants were selected through purposive sampling based on their relevance to the research objectives and direct experience with program implementation. The principal quantitative data consist of farmers' responses to structured questionnaire items measuring five indicators of PSR implementation and six indicators of program impact. Each indicator was measured on a five-point Likert scale, allowing individual perceptions to be transformed into standardized numerical scores for descriptive and inferential analysis. The study also collected supplementary information through semi-structured interviews with key actors, including cooperative chairpersons, field facilitators, and village officials, to provide contextual understanding of technical assistance, financing mechanisms, institutional services, and administrative implementation. In addition, relevant policy documents and previous studies concerning smallholder oil palm replanting may function as secondary contextual sources for interpreting the empirical findings. In measurement research, clearly defining the construct represented by each questionnaire item is essential for establishing meaningful and defensible scales (DeVellis & Thorpe, 2021). Thus, the primary evidentiary basis of the statistical analysis remains the farmer questionnaire.

Data collection was conducted through a sequential field process involving survey administration and supplementary semi-structured interviews. First, eligible respondents were identified according to the inclusion criterion of being active participants directly involved in PSR replanting activities. Second, a structured questionnaire was administered



to 30 participating farmers. The instrument used a five-point Likert response format ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) to measure perceptions of technical assistance, fund-disbursement timeliness, superior seedlings, institutional transparency, farmer participation, income change, program effectiveness, institutional satisfaction, sustainability readiness, continued participation, and socioeconomic improvement. Third, semi-structured interviews were conducted with cooperative leaders, field facilitators, and village officials to clarify contextual issues surrounding program administration and field implementation. The quantitative questionnaire constitutes the principal data-collection instrument, whereas interviews function as supporting evidence rather than a separate analytical strand. Instrument development should ensure that individual items adequately represent the theoretical construct intended to be measured and that scale structure is documented transparently (DeVellis & Thorpe, 2021). For reproducibility, the final manuscript should additionally report the fieldwork period, study village/location, questionnaire development process, interview duration, respondent recruitment procedure, and informed-consent process, because these details are not currently specified in the manuscript.

Data analysis was conducted in sequential stages. First, questionnaire responses were coded and summarized using descriptive statistics, particularly response frequencies and mean scores, to identify the relative strength of each PSR implementation and farmer-impact indicator. Second, instrument validity was assessed using Pearson Product-Moment correlations, comparing the calculated correlation coefficients with the critical value used in the study. Third, internal consistency was examined using Cronbach's Alpha, with the manuscript adopting a reliability threshold of 0.70 (Sugiyono, 2015). Measurement literature similarly emphasizes that reliability and validity should be demonstrated before composite scale scores are interpreted analytically (DeVellis & Thorpe, 2021). Finally, simple linear regression was employed to test the proposed influence of PSR implementation (X) on farmer impact (Y), using the model $Y = a + bX + e$, where a represents the constant, b the regression coefficient, and e the error term. The regression analysis evaluates the direction, magnitude, explanatory power, and statistical significance of the relationship. For a stronger final manuscript, the analysis should also document regression diagnostics and explicitly justify the sample size rather than assuming that 30 observations are automatically adequate, current methodological guidance recommends an explicit sample-size justification linked to the intended statistical inference (Lakens, 2022).

RESULTS AND DISCUSSION

Result

Trend in the Quality of PSR Program Implementation

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The first finding demonstrates a clear trend toward positive farmer assessments of PSR implementation in North Padang Lawas Regency. Five implementation indicators were evaluated using a five-point Likert scale such as quality of technical assistance, timeliness of fund disbursement, availability and quality of superior seedlings, institutional transparency and accountability, and farmer participation. The highest mean score was recorded for the availability and quality of superior seedlings at 4.63, categorized as “Very High,” followed by the quality of technical assistance at 4.60, also categorized as “Very High.” Farmer participation obtained a mean of 4.47, whereas the timeliness of fund disbursement and institutional transparency and accountability each recorded 4.37. These values indicate that all measured dimensions of program implementation were evaluated positively by the 30 participating farmers. The data therefore provide empirical evidence that, from the beneficiaries’ perspective, PSR implementation has generally functioned well at the technical, institutional, and participatory levels. Nevertheless, the variation between indicators also reveals that technical performance was rated somewhat more favorably than administrative performance.

PSR Implementation Indicator	Mean	Category
Superior seedlings	4.63	Very High
Technical assistance	4.60	Very High
Farmer participation	4.47	High
Fund disbursement	4.37	High
Transparency/accountability	4.37	High

Restated more simply, farmers perceived the PSR program as strongest in the areas that directly support agricultural production. The provision of superior seedlings received the highest score, suggesting that respondents particularly valued the physical inputs required to restore the productivity of aging plantations. Technical assistance received a similarly high evaluation, indicating that field-level guidance was also viewed as an important and relatively successful component of implementation. By contrast, the two lowest mean scores were associated with the timeliness of fund disbursement and institutional transparency and accountability, although both remained within the “High” category. This pattern suggests that farmers distinguish between the technical delivery of replanting inputs and the administrative processes supporting those inputs. In other words, the program appears to perform particularly well when farmers evaluate what they directly receive and use in their plantations, but slightly less strongly when they evaluate financial timing and governance procedures. This distinction is important because successful



replanting requires technical resources and effective administrative coordination to function simultaneously throughout the transition period.

Three patterns emerge from these implementation data. First, there is a technical-strength pattern, reflected in the very high ratings for superior seedlings and technical assistance. Second, an administrative-lag pattern is visible because fund disbursement and institutional transparency received the lowest relative scores. Third, there is a participatory-strength pattern, with farmer participation scoring 4.47, suggesting substantial beneficiary engagement in program activities. These findings reinforce the manuscript's original observation that administrative processes and financing can remain problematic even when the broader program is positively assessed. The pattern is also consistent with recent research identifying access to high-quality planting materials, technical knowledge, financing, and eligibility for public replanting support as central challenges in Indonesian smallholder replanting (Petri et al., 2024). Therefore, the first substantive result is not simply that "PSR implementation is good," but that implementation quality is unevenly distributed across technical and administrative dimensions. This distinction provides a more analytically useful understanding of program performance and identifies where implementation improvements remain necessary.

Change in Perceived Socioeconomic Outcomes

The second finding concerns the change or socioeconomic outcomes perceived by participating farmers following PSR implementation. Six indicators were assessed such as changes in income, perceived program effectiveness, satisfaction with institutional services, readiness for program sustainability, post-PSR participation, and socioeconomic improvement. The highest mean was recorded for satisfaction with institutional services at 4.50, categorized as "Very High." Perceived program effectiveness, post-PSR participation, and socioeconomic improvement each obtained a mean of 4.47, while readiness for program sustainability recorded 4.43. Changes in farmer income received the lowest score, at 4.07, although it remained classified as "High." The results therefore show that positive program outcomes are currently more visible in institutional satisfaction, perceptions of effectiveness, continued participation, and readiness for sustainability than in realized income gains. This provides an important temporal distinction: farmers already perceive institutional and social benefits, while the economic benefit measured through actual income change appears comparatively less developed because replanted oil palms have not yet reached full production.



PSR Impact Indicator	Mean	Category
Institutional service satisfaction	4.50	Very High
Program effectiveness	4.47	High
Post-PSR participation	4.47	High
Socioeconomic improvement	4.47	High
Sustainability readiness	4.43	High
Income change	4.07	High

In practical terms, the data indicate that farmers experience the benefits of the PSR program first through institutional and programmatic improvements, rather than exclusively through immediate income growth. Respondents reported particularly high satisfaction with services delivered by cooperatives or farmer institutions, while they also perceived the program as effective and expressed readiness to continue participating in replanting-related activities. Income change, although positively evaluated, remained the weakest outcome indicator. The manuscript explains this finding by noting that many replanted palms have not yet entered their full productive stage. This distinction is critical for interpreting replanting outcomes because oil palm rejuvenation necessarily involves a production transition period in which farmers sacrifice yields from older trees before new stands become mature. Recent research similarly identifies financing and the income transition period as major challenges for smallholders undertaking replanting (Hendrawan & Musshoff, 2024). Thus, socioeconomic impact should not be reduced to short-term income change alone; institutional satisfaction, participation, and sustainability readiness represent important intermediate outcomes of empowerment.

Three broader patterns can be identified in the impact data. First, there is an institutional-benefit pattern, demonstrated by the highest score for satisfaction with institutional services. Second, an empowerment-continuity pattern appears in the strong scores for sustainability readiness and post-PSR participation, indicating that respondents perceive the program as supporting continued engagement rather than merely providing one-time assistance. Third, there is a delayed-income pattern, because direct income improvement remains weaker than institutional and participatory outcomes. This delayed economic effect is consistent with the biological characteristics of replanting, which require a transition period before new oil palms produce commercial yields. The manuscript itself emphasizes that economic impacts should therefore be evaluated over a medium- to long-term horizon rather than solely through short-term observations. This interpretation also



aligns with broader evidence that oil palm cultivation can contribute to household living standards, education, nutrition, assets, and human-capital formation over time (Chrisendo et al., 2022). Accordingly, the second result demonstrates that PSR empowerment outcomes are multidimensional and temporally uneven, with institutional and participatory benefits preceding full income realization.

The Influence of PSR Implementation on Farmer Outcomes

The third finding provides statistical evidence regarding the proposed relationship between the quality of PSR implementation and farmer outcomes. The simple linear regression analysis treated PSR implementation as the independent variable (X) and perceived farmer impact as the dependent variable (Y), consistent with the operational model specified in the research design. Table 6 currently reports an R value of 0.736, an R² value of 0.638, an F value of 27.18, and an SPSS significance value of 0.000, which conventionally should be reported as $p < .001$ rather than $p = .000$. According to the manuscript's reported interpretation, PSR implementation has a positive and statistically significant relationship with the impact perceived by farmers. The narrative additionally states that a one-unit increase in the implementation score corresponds to an increase of approximately 0.64 units in the impact score. These results constitute the principal inferential evidence supporting the study hypothesis that improvements in program implementation are associated with stronger farmer-level outcomes.

Statistic	Reported Value
R	0.736
R ²	0.638
F	27.18
Significance	< .001

In substantive terms, the regression findings indicate that farmers who perceive PSR implementation more positively also tend to report stronger program outcomes. This means that implementation cannot be treated merely as an administrative stage preceding impact; rather, implementation quality appears closely associated with how farmers evaluate the benefits they receive from the program. The manuscript interprets the reported coefficient of determination as indicating that 63.8% of variation in farmer impact is explained by implementation quality, while the remaining variation is attributable to factors outside the model. These external factors may include fresh fruit bunch prices, climate, market access, household income diversification, farm size, land status, and other contextual



characteristics that were not included in the regression specification. The manuscript itself recognizes several of these limitations. The substantive implication is that program quality matters, but PSR outcomes cannot be attributed exclusively to government implementation. Smallholder welfare emerges from interaction among technical assistance, financing, institutions, farmer participation, market conditions, and the time needed for replanted palms to achieve productive maturity.

The regression result produces three analytical patterns. First, it reveals an implementation-outcome correspondence, in which stronger assessments of program delivery are associated with stronger perceived socioeconomic outcomes. Second, it indicates a multidimensional implementation mechanism such as superior seedlings and technical support can strengthen future production capacity, while institutional transparency, timely financing, and participation can reduce implementation barriers and improve farmer confidence. Third, the findings reveal an unexplained-context pattern, because outcomes are also shaped by circumstances beyond the implementation indicators included in the model. Research on Indonesian smallholder replanting similarly demonstrates that replanting decisions and outcomes are influenced by land certification, financing access, agricultural experience, good agricultural practices, and other socioeconomic characteristics (Siregar et al., 2024). Consequently, the third finding should be interpreted as evidence of a statistically significant association within the sampled farmers rather than proof that PSR implementation is the sole cause of socioeconomic improvement. The empirical contribution lies in demonstrating an implementation-to-outcome pathway at the local level, thereby moving analysis beyond studies that focus primarily on whether farmers participate in replanting.

DISCUSSION

This study examined whether the quality of Smallholder Oil Palm Replanting Program implementation is associated with the socioeconomic outcomes perceived by participating farmers in North Padang Lawas Regency. Three principal findings emerge. First, implementation was generally evaluated positively, particularly the provision of superior seedlings and technical assistance, while fund-disbursement timeliness and institutional transparency received comparatively lower ratings. Second, farmer outcomes were also positive but uneven, satisfaction with institutional services was strongest, whereas changes in income were relatively weaker because replanted palms had not yet reached full production. Third, the regression analysis reported a statistically significant positive relationship between implementation quality and perceived farmer impact. Together, these findings suggest that PSR should be understood not simply as a technical intervention for replacing old palms but as a multidimensional empowerment program connecting



agronomic inputs, administrative governance, institutional support, farmer participation, and socioeconomic outcomes. The findings therefore shift attention from the narrow question of whether replanting occurs toward the broader question of how the quality of implementation shapes the benefits farmers perceive during and after replanting.

The positive relationship between implementation and farmer outcomes can be explained through several complementary mechanisms. Superior seedlings and effective technical assistance directly strengthen farmers' capacity to establish productive new plantations and reduce agronomic uncertainty. Timely financing is equally important because farmers face a period of reduced or absent oil palm income while replanted trees mature. Institutional transparency can increase confidence in program administration, while meaningful participation allows farmers to understand, influence, and sustain implementation activities. The original manuscript similarly argues that successful PSR implementation depends on a combination of technical, administrative, and social factors. Recent scholarship reinforces this explanation. Petri et al. identify knowledge, training, quality seedlings, financing, and eligibility for public support as central replanting constraints, while Siregar et al. show that land certification, farming experience, socioeconomic factors, and access conditions affect actual replanting behavior. Therefore, better program delivery can improve outcomes because it reduces several risks simultaneously such as production risk, liquidity risk, information deficits, institutional uncertainty, and weak farmer involvement.

The findings confirm several earlier studies while extending them in an important direction. Research already cited in the manuscript identifies financing constraints and collateral risk as barriers to independent farmers' participation in PSR (Rachmawati & Siregar, 2022), while Jundi et al (2024) emphasize institutional barriers and coordination problems. Putri et al (2023) similarly examine the welfare implications of PSR in North Labuhanbatu, and Hutasuhut et al (2023) focus on program effectiveness in Batu Bara Regency. Internationally, Hendrawan and Musshoff show that the structure of replanting subsidies affects smallholder preferences, while Siregar et al. analyze the determinants of willingness and actual participation. The present study differs by treating participation or program access not as the final outcome, but as part of a broader implementation-to-outcome pathway. Its novelty therefore lies in empirically connecting multidimensional implementation quality such as technical, financial, institutional, and participatory with multidimensional perceived farmer outcomes within a single local regression framework.

The results have broader meaning within Indonesia's historical effort to reconcile oil palm productivity, rural welfare, and sustainable plantation renewal. Replanting is not simply the replacement of aging biological assets; for smallholder households whose livelihoods depend heavily on palm income, it represents a period of economic uncertainty



and institutional dependence. Petri et al (2024) note that many aging Indonesian smallholder plantations require replanting and that delayed rejuvenation can intensify existing socioeconomic and environmental challenges. Within this context, the relatively low income score in the current study should not necessarily be interpreted as program failure. Rather, it reflects the temporal structure of agricultural transformation: institutional services, seedlings, knowledge, and participation can improve immediately, while income benefits emerge only after productive maturity. The high institutional satisfaction reported by respondents therefore has important social meaning. It indicates that empowerment during replanting involves maintaining trust, organizational support, knowledge, and participation during a period when economic returns remain incomplete. Ideologically, this interpretation shifts PSR from a narrow productivity policy toward a rural-development and community-capacity intervention.

The findings reveal both important functions and possible dysfunctions of PSR implementation. Functionally, the program provides access to superior planting material, technical guidance, financing mechanisms, institutional services, and collective participation that individual smallholders may struggle to obtain independently. Strong institutions can improve farmers' access to capital, production inputs, bargaining capacity, and technical support. Raharja et al (2020) identify these institutional functions as crucial for strengthening independent oil palm smallholders. Moreover, the broader welfare potential of successful oil palm production extends beyond income. Panel evidence from Sumatra associates oil palm cultivation with improvements in nutrition, education expenditure, assets, and general living standards. Nevertheless, dysfunction can arise when administrative delays, unequal eligibility, weak transparency, or insufficient transition financing undermine farmer confidence and expose households to income shocks. A high average satisfaction score may also conceal individual farmers experiencing serious implementation difficulties. Therefore, program performance should not be evaluated solely through aggregate mean scores. Effective empowerment requires attention to vulnerable participants, distributional inequalities, and the transition period before new plantations become economically productive.

The findings suggest several concrete policy actions for strengthening PSR implementation. First, the government and implementing institutions should preserve the program's technical strengths by ensuring consistent access to certified superior seedlings and qualified field assistance. Second, administrative reform should prioritize predictable and timely fund disbursement, simplified documentation, and transparent communication of eligibility and payment procedures, because financing delays directly increase livelihood risks during the non-productive replanting period. Third, cooperatives and farmer groups should be strengthened as local implementation institutions responsible for information



dissemination, monitoring, technical coordination, and farmer participation. Institutional strengthening research emphasizes the importance of cooperative arrangements, access to capital, mentoring, and coordinated government-industry support for improving smallholder capacity. Fourth, PSR evaluation should adopt a longitudinal monitoring system covering productivity, household income, institutional participation, market access, and welfare before, during, and after replanting. Finally, transition-livelihood strategies-including intercropping, diversified income sources, or complementary financial protection-should be considered so that farmers do not experience severe income deterioration while waiting for new palms to mature. Such measures would transform PSR from a replanting subsidy into a more comprehensive smallholder resilience and empowerment policy.

KESIMPULAN

Based on the results of the research and discussion that has been described, the conclusion finding of this study is that the Smallholder Oil Palm Replanting Program should be understood not merely as a technical intervention to replace aging oil palms, but as a broader community empowerment mechanism whose outcomes depend substantially on the quality of program implementation. Farmers gave particularly high assessments to the availability and quality of superior seedlings and technical assistance, while institutional service satisfaction emerged as the strongest perceived outcome. By contrast, income improvement received the lowest relative score because most replanted palms had not yet reached full production. The main lesson is therefore that successful replanting cannot be evaluated solely through short-term income changes. Technical support, institutional services, participation, administrative efficiency, and readiness for program sustainability are equally important dimensions of empowerment. The reported regression analysis also indicates a positive and statistically significant relationship between PSR implementation and farmer outcomes. Thus, effective replanting policy requires an integrated approach that combines agronomic renewal with institutional strengthening, farmer participation, and socioeconomic protection during the

The principal strength of this study lies in its attempt to connect program implementation quality with multidimensional farmer outcomes within a single empirical framework. Rather than examining replanting only in terms of agronomic feasibility, financing barriers, or farmers' willingness to participate, the study operationalizes PSR implementation through five dimensions such as technical assistance, timeliness of fund disbursement, superior seedlings, institutional transparency and accountability, and farmer participation. Farmer outcomes are simultaneously assessed through income change, perceived effectiveness, institutional satisfaction, sustainability readiness, continued



participation, and socioeconomic improvement. This structure provides a useful contribution to the literature by shifting attention from the question of whether replanting occurs to the more substantive question of how the quality of implementation translates into perceived benefits for participating farmers. Empirically, the study contributes local-level evidence from North Padang Lawas Regency. Conceptually, it introduces an implementation-to-outcome perspective that can be developed further in research on agricultural policy and community empowerment. It also raises a new question for future scholarship such as which technical, administrative, institutional, or participatory dimensions exert the strongest influence on different components of farmer welfare over time?

This study has several limitations that should define the boundaries of its conclusions. First, the analytical sample consists of only 30 PSR participants and is geographically concentrated within a limited local setting, restricting the generalizability of the findings to the broader population of Indonesian smallholders. Second, the model examines PSR implementation as the principal predictor of farmer outcomes but does not incorporate potentially important external factors such as fresh fruit bunch prices, climatic conditions, market access, farm size, household income diversification, land tenure, or farmers' initial socioeconomic status. The manuscript itself recognizes several of these omitted factors. Third, the study is cross-sectional and therefore cannot capture changes in income and welfare as replanted palms move from the immature to the productive phase. Future research should employ larger probability-based samples, multiple districts, and longitudinal designs, while incorporating mediating or moderating variables such as institutional capacity, financing access, and farmer participation. Finally, the reported regression statistics should be rechecked against the original SPSS output before publication to ensure consistency among the reported R , R^2 , F statistic, and regression coefficient.

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