

The Effect of Price Fluctuations and the Pricing System on the Income of Oil Palm Farmers in Bunde Village, Sampaga District, Mamuju Regency

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Abstract

This research was undertaken to examine how price fluctuations and the pricing system, both separately and jointly, shape the income earned by oil palm growers in Bunde Village, Sampaga District, Mamuju Regency. Adopting a quantitative associative research design, the study treated the entire body of oil palm farmers in the village – whose precise number could not be ascertained (an infinite population) – as its target population, from which 50 respondents were drawn by means of accidental sampling in accordance with the Roscoe guideline. Information was gathered through field observation, direct interviews, documentary review, and the distribution of a questionnaire measured on a five-point Likert scale, and was subsequently processed through multiple linear regression, partial (t) testing, simultaneous (F) testing, and the coefficient of determination, after the measuring instrument had passed validity and reliability screening. The analysis reveals that price fluctuations exert a positive and statistically significant partial influence on farmers' income ($t = 2.693$; sig. 0.010), while the pricing system likewise produces a positive and significant partial influence ($t = 2.443$; sig. 0.018). Taken together, the two variables significantly determine farmers' income ($F = 14.773 > 3.195$; sig. 0.000), accounting for 38.6 percent of its variation, with the residual 61.4 percent attributable to determinants lying beyond the model. These results imply that stabilizing prices and instituting a transparent and equitable pricing arrangement constitute strategic levers for improving the welfare of smallholder oil palm farmers.

Keywords: Price fluctuations; pricing system; farmers' income; oil palm; fresh fruit bunches.

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INTRODUCTION

Within the architecture of the national economy, oil palm occupies a position of considerable strategic weight, functioning simultaneously as a generator of export earnings through crude palm oil shipments and as a foundation upon which the livelihoods of rural households are built. A substantial portion of the country's oil palm estates is not controlled by large corporations but is instead cultivated by smallholders, who therefore act as the principal suppliers of fresh fruit bunches (FFB) that feed the downstream processing industry. Given this reality, the income secured by these farmers serves as a meaningful barometer of how successful their farming enterprises are, since it is intimately connected to the standard of living of their families (Handyani et al., 2025; Rasihen et al., 2025).

Among the determinants that govern the earnings of oil palm farmers, the volatility of fresh fruit bunch prices stands out as particularly influential. Because the selling price of FFB rarely remains constant, the revenue stream reaching farmers is inherently unpredictable and prone to sudden contraction. Such volatility is not an isolated local phenomenon; it is instead tightly bound to shifts in worldwide supply and demand, which are transmitted to the farm gate primarily through movements in the international price of Crude Palm Oil (CPO), the principal derivative of the oil palm fruit (Ariyanto et al., 2024; Sujarwo, 2021). The same pattern is discernible in West Sulawesi Province, where recorded FFB prices exhibited pronounced swings across the 2025 to 2026 period. Reinforcing this observation, Ikhsan and Ismoyojati (2023) documented that alterations in the FFB selling price feed directly into the income ultimately received by oil palm cultivators.

Beyond the matter of price volatility, the manner in which FFB prices are formally established represents a second determinant that materially conditions farmer earnings. In essence, the pricing system is the institutional mechanism through which the selling value of FFB is derived from the economic worth of the palm's downstream products (Directorate General of Plantations, 2023; Judijanto & Pamungkas, 2024). Difficulties associated with this mechanism frequently originate in the excessive length of the marketing chain: constrained by limited market access, numerous farmers are obliged to dispose of their harvest through intermediaries or middlemen, an arrangement that tends to depress the price they obtain and to obscure the basis on which it is calculated (Sarkum & Harahap, 2025). Circumstances of this kind call for pricing policies capable of safeguarding both balance and equity for the producers.

Bunde Village, located in Sampaga District of Mamuju Regency, exemplifies a locality in which the oil palm plantation sector operates as the mainstay of community livelihood. Preliminary field observation indicates that the FFB prices reaching farmers there are frequently subject to marked variation, and a segment of the farming community perceives those prices as insufficiently transparent and not entirely just. Although the broader body of literature points to both price volatility and the pricing system as plausible influences on farmer income, the empirical record remains far from unanimous, and this inconsistency constitutes a genuine research gap. Certain investigations report a statistically significant relationship (Sartika et al., 2025; Periyadi, 2021), whereas others conclude that the effect is negligible (Kurniati et al., 2022).

The persistence of these divergent findings, coupled with the concrete grievances voiced by farmers in the study locality, lends urgency to a fresh empirical inquiry. Positioning price fluctuations (X_1) and the pricing system (X_2) as independent variables that jointly bear upon the income of oil palm farmers (Y), the present study seeks to test their partial and simultaneous effects in the specific setting of Bunde Village. The originality of this work lies in its combined examination of the two determinants within a West Sulawesi context that has thus far received little scholarly attention, thereby extending an evidence base that remains sparse for the Mamuju region.

Accordingly, this study is directed toward two intertwined objectives. Theoretically, it aspires to enrich the discourse of agricultural economics by clarifying the degree to which price volatility and pricing arrangements co-determine

smallholder income. Practically, it is intended to furnish farmers, regional authorities, plantation firms, and other stakeholders with an empirical foundation for crafting pricing policies that are more transparent and more equitable, so that the welfare of oil palm producers in Bunde Village can be meaningfully strengthened.

LITERATURE REVIEW

Farmers' Income

In its most general sense, income denotes the aggregate of monetary receipts or assets that an individual or a household acquires from engaging in economic activity over a defined interval of time (Hidayanti, 2023; Siahaan & Renol, 2024). When the concept is transposed to the domain of agricultural enterprise, however, its meaning becomes more precise: farm income is best understood as the surplus that remains once the totality of production expenditures has been subtracted from the gross receipts a farmer earns (Soekartawi, as cited in Rasihen et al., 2025). This distinction is far from trivial, for it implies that the prosperity of a farming household cannot be judged from sales revenue alone; the efficiency with which inputs such as fertilizer, labor, and capital are deployed is equally decisive in shaping the net return that finally accrues to the cultivator.

A considerable body of scholarship has sought to identify the factors that regulate the level of farm income. Febriani (2021), for instance, enumerates land area, availability of capital, adoption of technology, the legal status of land ownership, the intensity of fertilization, the prevailing selling price of the harvest, and the supply of labor as variables that jointly govern how much a farmer ultimately earns. Land area and productivity tend to set the ceiling on potential output, whereas capital and technology determine the extent to which that potential can be realized; the selling price, meanwhile, translates physical output into monetary value. Because the present study concentrates on the price dimension, it treats the remaining determinants as contextual factors that operate outside the boundary of the estimated model.

For the purpose of measurement, farmers' income in this study is operationalized through a set of observable indicators, namely the magnitude of farm receipts, the level of net income after costs, the household's capacity to satisfy its everyday needs, the stability of income across harvest cycles, and the presence of income growth over time. These indicators collectively capture not merely the quantity of earnings but also their adequacy and dependability, dimensions that are especially pertinent for smallholders whose economic security is sensitive to external shocks.

Price Fluctuations

Price fluctuation refers to the upward and downward movement in the price of a good or service over a particular span of time, a movement that arises from the interaction of economic forces such as shifts in demand and supply, evolving market conditions, and the intervention of government policy (Ismiati & Lubis, 2023; Sukowati, 2021). In the case of oil palm, the price of fresh fruit bunches is inherently mobile, responding to seasonal variation in yield, to changes in the world price of CPO, and to the broader dynamics of the commodity market (Hamdilah et al., 2024).

Because the domestic FFB price is ultimately anchored to international CPO quotations, disturbances that originate in distant markets are transmitted, sometimes with amplification, down to the level of the individual grower (Sujarwo, 2021).

From the standpoint of the farmer, such volatility is experienced primarily as risk and uncertainty. When prices rise, the same physical harvest yields a larger income; when they fall, revenue contracts even though production costs remain largely fixed, thereby squeezing the margin on which the household depends. This asymmetry helps explain why price instability is so consequential for welfare and why studies such as Faradila and Putra (2025) and Sukowati (2021) have repeatedly linked FFB price movements to fluctuations in farmer prosperity. Following Sartika et al. (2025), the variable is measured in this study through five indicators: the extent of price change over time, the frequency with which prices rise and fall, the size of the price differential between periods, the degree of price instability or uncertainty, and the perceived impact of price fluctuation on income.

The FFB Pricing System

The pricing system for fresh fruit bunches constitutes the formal mechanism by which the value that farmers receive for their harvest is calculated on the basis of the economic worth of the palm's derivative products (Directorate General of Plantations, 2023). In the Indonesian setting, this task is entrusted to a Price-Setting Team that brings together representatives of regional government, plantation companies, and the farming community, with the intention of producing a reference price that reflects the shared interests of these parties. The figures that emerge from this process are shaped by several technical inputs, among them the prevailing CPO price, the price of palm kernel, the rendement or oil-extraction rate of the fruit, and the costs associated with processing and transportation.

Despite the existence of this institutional apparatus, the pricing of FFB at the farm level continues to attract criticism on grounds of fairness and transparency. Judijanto and Pamungkas (2024) argue that formulating a genuinely equitable price for smallholder-produced FFB remains an unresolved challenge, while Sarkum and Harahap (2025) trace much of the difficulty to the convoluted supply chain that separates the farmer from the mill. Efforts to render pricing more objective have included the application of computational approaches such as fuzzy-logic modeling (Amriana et al., 2022), yet the everyday experience of many growers is still one of limited bargaining power and incomplete information. Drawing on Nesti et al. (2021), the pricing system is assessed in this study through five indicators: the transparency of price determination, the fairness of the price ultimately received by farmers, the correspondence between price and FFB quality, the influence exerted by other parties in setting the price, and the ease with which farmers can access price information.

Previous Studies and Research Gap

A review of prior empirical work reveals a pattern of partial convergence punctuated by notable disagreement. On one side, Ikhsan and Ismoyojati (2023) and Sartika et al. (2025) demonstrate that fluctuations in FFB prices are significantly associated with the income of oil palm farmers, while Periyadi (2021) shows that the regulation of FFB pricing bears directly on the earnings of independent (swadaya)

growers; Agustina et al. (2025), in a related vein, find that land area, fertilizer prices, and selling prices jointly influence smallholder income. On the other side, Kurniati et al. (2022) report that the price of oil palm, taken partially, does not significantly affect farmer income, a discrepancy plausibly rooted in differences of location, marketing structure, and farmer characteristics.

Two observations follow from this survey. First, the literature has not settled the question of whether, and how strongly, price volatility and the pricing system shape farmer income, leaving a substantive gap that invites further testing. Second, studies that examine the two determinants in combination remain uncommon, and those situated in West Sulawesi – and specifically in Mamuju – are scarcer still. The present research addresses both shortcomings by jointly modeling price fluctuations and the pricing system as predictors of income within a locality whose empirical record has hitherto been thin.

Conceptual Framework and Hypotheses

Building upon the theoretical exposition and the review of earlier findings, this study advances a conceptual framework in which price fluctuations (X_1) and the pricing system (X_2) function as independent variables that act upon the income of oil palm farmers (Y). Price volatility is expected to govern the stability of the revenue farmers receive, whereas a pricing system marked by transparency and fairness is expected to guarantee a reasonable and defensible price for the harvest. The two determinants are further presumed to operate not only in isolation but also in concert, jointly conditioning the level of farmer income.

On the basis of this reasoning, three hypotheses are proposed: (H1) price fluctuations exert a significant effect on the income of oil palm farmers; (H2) the pricing system exerts a significant effect on the income of oil palm farmers; and (H3) price fluctuations and the pricing system, taken simultaneously, exert a significant effect on the income of oil palm farmers in Bunde Village, Sampaga District, Mamuju Regency.

METHODOLOGY

This investigation was conducted using a quantitative approach paired with an associative design, a combination chosen because the central aim is to establish and measure the relationships that obtain among the variables under study rather than merely to describe them. The fieldwork was situated in Bunde Village, Sampaga District, Mamuju Regency, in the Province of West Sulawesi, and was organized in successive phases extending from preliminary observation through data collection to the final reporting of results.

The population of the study encompassed the whole community of oil palm farmers residing in Bunde Village, a group whose exact size could not be determined with certainty and which is therefore treated analytically as an infinite population. In the absence of a precise sampling frame, the number of respondents was fixed at 50 by reference to the Roscoe guideline, which holds that a sample of between thirty and five hundred is generally adequate for correlational and regression-based research. Respondents were recruited through accidental sampling, whereby farmers

who happened to be available and willing at the time of data collection were enrolled in the study (Sugiyono, 2022).

The data employed comprised primary data, obtained directly from respondents by means of a structured questionnaire, supplemented by secondary data drawn from relevant documents, records, and prior literature. Data collection proceeded through four complementary techniques—observation, interview, documentation, and questionnaire distribution—so that the quantitative responses could be contextualized by qualitative insight gathered in the field. The questionnaire itself was constructed from the operational indicators of each variable and was scored on a five-point Likert scale ranging from one (strongly disagree) to five (strongly agree), as summarized in Table 1.

Table 1. Operational Definition of Variables

Variable	Conceptual Definition	Indicators
Price Fluctuation (X_1)	The rise and fall of the FFB price over time driven by demand, supply, market conditions, and CPO price movements.	Price change over time; frequency of price movement; spread between periods; price instability; impact on income.
Pricing System (X_2)	The mechanism used to set the selling value of FFB received by farmers based on derivative value and institutional arrangements.	Transparency of pricing; fairness of price; price-quality suitability; influence of other parties; access to price information.
Farmers' Income (Y)	The net return remaining after production costs are deducted from farm receipts within a given period.	Farm receipts; net income; ability to meet needs; income stability; income growth.

Source: Adapted from Febriani (2021), Sartika et al. (2025), and Nesti et al. (2021).

Before the questionnaire was used for hypothesis testing, its quality as a measuring instrument was verified through validity and reliability testing; an item was retained as valid when its calculated correlation exceeded the tabulated critical value, and a variable was judged reliable when its Cronbach's Alpha coefficient surpassed the conventional threshold of 0.60. In addition, the regression model was subjected to the standard classical-assumption checks—covering normality of residuals, absence of multicollinearity among predictors, and homoscedasticity of error variance—so as to ensure that the estimates would satisfy the Best Linear Unbiased Estimator criteria.

The core analytical technique was multiple linear regression, expressed through the model $Y = a + b_1X_1 + b_2X_2 + e$, in which a denotes the constant, b_1 and b_2 the regression coefficients of the two predictors, and e the error term. The estimated model was then interrogated by means of the partial t-test, which gauges the individual contribution of each independent variable; the simultaneous F-test, which

evaluates their joint contribution; and the coefficient of determination (R^2), which quantifies the proportion of variance in income explained by the model. All computations were performed with the assistance of the SPSS statistical package (Ghozali, 2021).

RESULTS AND DISCUSSION

Results

General Overview of the Research Location

Bunde Village is one of the administrative villages within Sampaga District, Mamuju Regency, West Sulawesi Province, and it holds the status of district capital, covering an area of approximately 17.37 square kilometers. The livelihood of its inhabitants is dominated by agriculture and plantation activity, with oil palm, cocoa, and coconut standing as the leading commodities. Among these, oil palm occupies a place of particular economic prominence, both because of its comparatively high market value and because it functions as a principal pillar supporting the household economy of local farming families.

Respondent Characteristics

The fifty respondents enrolled in the study were profiled according to gender and age in order to convey a clear picture of the population from which the data were drawn. The distribution of these characteristics is presented in Table 2.

Table 2. Respondent Characteristics

Characteristic	Category	Frequency (People)	Percentage (%)
Gender	Male	44	88
	Female	6	12
Age	30–39 years	17	34
	40–49 years	24	48
	< 30 and ≥ 50 years	9	18
Total		50	100

Source: Primary data after processing, 2026.

As shown in Table 2, an overwhelming majority of respondents—88 percent—were male, a composition that mirrors the reality that oil palm cultivation in Bunde Village is generally undertaken by men in their capacity as heads of household. With respect to age, the largest cohort fell within the 40 to 49 year bracket (48 percent), followed by those aged 30 to 39 years (34 percent); the concentration of respondents within these productive age ranges suggests that the sample is composed largely of experienced cultivators who are actively engaged in the management of their farms.

Instrument and Assumption Test Results

The validity examination confirmed that every statement item associated with price fluctuation (X_1), the pricing system (X_2), and farmers' income (Y) recorded a calculated correlation greater than the corresponding critical value, so that all items were retained as valid. The reliability examination, in turn, yielded Cronbach's Alpha coefficients above the 0.60 benchmark for each variable, establishing that the instrument was internally consistent and fit for further analysis. The classical-

assumption checks were likewise satisfied: the residuals approximated a normal distribution, no serious multicollinearity was detected between the two predictors, and the variance of the errors was found to be homogeneous, indicating that the regression model met the prerequisites for unbiased estimation.

Multiple Linear Regression and Partial Test (t-Test) Results

Multiple linear regression was employed to quantify the influence of price fluctuation and the pricing system upon farmers' income, and the outcome of this estimation is displayed in Table 3.

Table 3. Results of Multiple Linear Regression and the Partial t-Test

Variable	Coefficient (B)	t-count	Sig.	Description
(Constant)	8.780	–	–	–
Price Fluctuation (X_1)	0.481	2.693	0.010	Significant
Pricing System (X_2)	0.382	2.443	0.018	Significant

Source: Primary data after analysis, 2026 (t -table = 2.012; N = 50).

On the strength of Table 3, the estimated regression equation may be written as $Y = 8.780 + 0.481X_1 + 0.382X_2 + e$. The constant of 8.780 signifies that even if price fluctuation and the pricing system were both reduced to zero, farmers' income would still register a positive baseline value. The positive signs attached to the coefficients of X_1 (0.481) and X_2 (0.382) indicate that an improvement in either variable would be accompanied by an increase in income, with price fluctuation exercising the more dominant influence of the two.

The partial t-test lends statistical support to these relationships. Price fluctuation returned a t-count of 2.693, comfortably exceeding the critical value of 2.012, at a significance level of 0.010, which is below the 0.05 threshold; the first hypothesis (H_1) is therefore accepted. The pricing system produced a t-count of 2.443, again surpassing the critical value of 2.012, at a significance of 0.018, likewise below 0.05, so that the second hypothesis (H_2) is accepted. In sum, each of the two variables exerts a positive and significant partial effect upon the income of oil palm farmers.

Simultaneous Test (F-Test) and Coefficient of Determination Results

To ascertain whether the two predictors act jointly upon income, a simultaneous F-test was carried out, the results of which—together with the coefficient of determination—are set out in Table 4.

Table 4. Results of the Simultaneous F-Test and the Coefficient of Determination

Model	F-count	F-table	Sig.	R Square
Regression	14.773	3.195	0.000	0.386

Source: Primary data after analysis, 2026 (F -table = 3.195).

Table 4 shows that the F-count of 14.773 far exceeds the F-table value of 3.195 at a significance of 0.000, which lies well below 0.05; the third hypothesis (H_3) is accordingly accepted, confirming that price fluctuation and the pricing system jointly exert a significant effect on farmers' income. The R Square value of 0.386 further reveals that the two variables together account for 38.6 percent of the variation in

income, while the remaining 61.4 percent is attributable to factors situated outside the model, such as land area, capital, productivity, and production costs.

Discussion

The Effect of Price Fluctuations on Farmers' Income

The empirical results establish that price fluctuation carries a positive and significant partial influence on farmers' income (t-count 2.693; sig. 0.010) and, indeed, emerges as the more dominant of the two predictors. This outcome affirms that movement in the FFB price feeds directly into the earnings farmers realize: the higher and the more stable that price, the greater the income that flows to the household. The finding resonates with the conclusions of Ikhsan and Ismoyojati (2023) and Sartika et al. (2025), both of which identified a tangible link between FFB price volatility and farmer income. It diverges, however, from the results reported by Kurniati et al. (2022), who found the price effect to be statistically insignificant—a contrast most plausibly explained by differences in geographic setting, marketing arrangements, and the characteristics of the farming population studied.

The Effect of the Pricing System on Farmers' Income

The pricing system, too, proves to have a positive and significant partial bearing on farmers' income (t-count 2.443; sig. 0.018). The interpretation is straightforward: the more sound the pricing system—judged by its transparency, its fairness, the correspondence between price and FFB quality, and the ease with which farmers can obtain price information—the higher the income farmers are able to secure. This conclusion accords with Periyadi (2021), who observed that the manner in which FFB prices are regulated is directly connected to the earnings of independent growers. It follows that strengthening transparency and fairness within the pricing system represents a strategic avenue for advancing farmer welfare.

The Simultaneous Effect of Price Fluctuations and the Pricing System

When considered together, price fluctuation and the pricing system exert a significant joint effect on farmers' income (F-count 14.773; sig. 0.000), explaining 38.6 percent of its variance. This result underscores that farmer earnings are shaped not by price movements alone but also by the institutional arrangement through which prices are determined. Where FFB prices are comparatively stable and where the pricing system operates transparently, equitably, and with due regard for harvest quality, farmer income tends to rise and to become more dependable. The residual 61.4 percent of unexplained variance signals the presence of additional determinants lying beyond the present model—among them land area, capital, productivity, production costs, and the configuration of marketing channels (Febriani, 2021; Handyani et al., 2025).

Research Implications

From a theoretical standpoint, the study reinforces the field of agricultural economics by confirming that price volatility and the pricing system stand among the salient determinants of smallholder oil palm income. From a practical standpoint, its findings suggest that farmers would benefit from monitoring FFB price developments more closely and from managing their farm finances with greater discipline, while regional governments, plantation companies, and allied institutions

bear responsibility for enhancing the openness of the pricing system. The study is nonetheless bounded by certain limitations—its confinement to a single village, its reliance on accidental sampling, and its inclusion of only two independent variables—and future research is therefore encouraged to widen the geographic scope and to incorporate additional explanatory factors.

CONCLUSION

Drawing together the evidence presented above, three conclusions may be stated. First, price fluctuation exerts a positive and significant partial effect on the income of oil palm farmers in Bunde Village ($t\text{-count } 2.693 > t\text{-table } 2.012$; sig. 0.010) and constitutes the dominant predictor. Second, the pricing system likewise exerts a positive and significant partial effect on farmer income ($t\text{-count } 2.443 > t\text{-table } 2.012$; sig. 0.018). Third, price fluctuation and the pricing system, acting simultaneously, exert a positive and significant effect on farmer income ($F\text{-count } 14.773 > F\text{-table } 3.195$; sig. 0.000), jointly accounting for 38.6 percent of its variation.

Recommendations

In light of these findings, oil palm farmers in Bunde Village are advised to track the movement of FFB prices attentively before deciding to sell and to exercise sounder management of their farm finances, so that the adverse consequences of price shifts may be cushioned. Regional authorities, plantation companies, and related stakeholders, for their part, are encouraged to strengthen the openness and fairness of the FFB pricing system and to communicate more clearly the basis on which prices are determined. Finally, researchers who pursue this line of inquiry in the future would do well to introduce additional variables—such as productivity, land area, production costs, FFB quality, or marketing channels—in order to illuminate the 61.4 percent of income variation that the present model leaves unexplained.

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