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Factors affecting the FFB price of independent smallholder oil palm farmers in Jambi Province

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Abstract. Smallholder plantations play an important role in oil palm development in Jambi Province with a contribution of 70.47 percent to the total area and 57.10 to total palm oil production. Most of the smallholder plantations are self-managed by independent smallholders who do not get technical guidance from either government or private sector. Various problems are found in independent smallholders, one of which is the discrimination of the price of fresh fruit bunches (FFB) they produced. Price discrimination does not only occur between independent smallholders and plasma farmers, but also occurs between independent smallholders. This study seeks to express empirically the price differences and analyze the factors that influence it. Data were collected from 240 respondents spread across 12 villages in 3 districts of palm oil production centers and analyzed with a multiple linear regression model. The results of the study concluded that there is a significant difference between prices received by independent smallholders and prices received by plasma farmers and among independent smallholders. The price difference is significantly influenced by the quality factor of the seeds used, the amount of fertilizer use, the experience of farmers in farming and the marketing channels used.

1. Introduction

Palm oil is Indonesia's leading export commodity with various derivative products, which are semi-finished CPO (crude palm oil) and PKO (palm kernel oil) and finished materials (edible and nonedible end products). Palm oil supports the development of the domestic food industry by supplying raw materials for the food industry such as cooking oil, butter, dry / solid oil for snacks and fast food, substitute for butter, chocolate and others. The use of non-food palm oil products can be in the form of fatty acids and glycerin, as well as cosmetic raw materials [1]. Palm oil is the country's biggest contributor to foreign exchange earnings compared to 11 export commodities in Indonesia in view of the export value of Indonesia's plantation commodities [2].

Jambi Province contributed 6.32 percent to the total area of national oil palm plantations and around 5.49 percent to the national oil palm production [3]. Of the total area of oil palm currently available, 70.47% is community plantations which contribute 57.10 percent to oil palm production in Jambi Province. Most of the smallholders' estates are managed independently and do not get technical guidance from the government or the private sector. Under these conditions, community plantations play an important role in oil palm development.

Although independent smallholders' oil palm dominates oil palm plantations in Jambi Province, there are various problems they face [4]. One of the fundamental problems is that the purchase price of fresh



fruit bunches (FFB) they received is unfair compared to prices received by plasma smallholders [5], even though plasma farmers actually face monopsonistic exploitation by the nucleus company [6]. Based on the results of the FGD on the Development of Smallholders Institution conducted by Consortium Study on Smallholder Palm Oil (CSSPO) Universitas Jambi, the basic problem faced by independent smallholders is the low price received by farmers. Some of the reasons for the low price include the low recognition of oil palm mills for the quality of independent smallholders' FFB due to unclear seeds used, and poor application of cultivation techniques including plant maintenance and harvest handling.

Fresh Fruit Bunches (FFB) are primary products from palm oil plants and the main raw materials for processing palm oil (CPO and PKO). Many aspects must be considered in managing oil palm plantations so that they can provide maximum results. Important aspects that will affect plant growth and production are the application of appropriate cultivation techniques [7] including the quality of seedlings [1], fertilization [8] and maintenance of plants from weed, pest and pest disorders, and disease [9]. In addition, the technical aspects, factors that also affect plant growth and production are in terms of management ability (skills), namely the experience of farmers in farming. Many research results prove the effect of experience on the ability of farm management to obtain better results, some of which are [10], [11] and [12].

The factors as described above affect the quantity and quality of crop production. These factors will indirectly influence the price of FFB [13]. While the factor that directly influence the price of FFB is marketing channel in the sale of FFB [14]. If marketing is done through a long marketing channel, the marketing costs will be high, and the prices received by farmers will be low [15]. This is in line with [16] that trading system is considered efficient if it meets two conditions: (1) able to convey the goods to consumers at the lowest cost, and (2) able to make an equitable distribution of the price to all parties participating in the production and trading system of the goods. [17] emphasized that the marketing system is said to be efficient if all marketing activities are running at a minimum cost. More firmly [18] explains that in the absence of other information on which to base valuations, consumers often take prices to indicate the level of product quality. Based on this description, this study aims to study the price variations received by independent oil palm farmers and analyze the factors that influence them.

2. Materials and methods

The study was conducted in Jambi Province by taking a sample in 3 districts, 2 sub-districts in each selected district and 2 villages in each selected sub-district. The research area was determined purposively based on the number of independent smallholders. The study area covers 12 villages with the object of research is independent oil palm smallholders whose plants between 5 and 15 years old. The number of samples in each village was 20 farmers and respondents were taken by using accidental sampling. Quantitative descriptive methods was used to study the variation in prices, while multiple linear regression models was used to analyze the factors that influence the FFB price, as follows:

$$\text{Hrg} = \beta_0 + \beta_1 \text{Ppk} + \beta_2 \text{Plm} + \beta_3 \text{D_bbt} + \beta_4 \text{D1_Sal} + \beta_5 \text{D2_Sal} + \varepsilon \quad (1)$$

Where:

Hrg = price of FFB received by independent oil palm farmers Rp / kg); Ppk = total fertilizer use in oil palm plants (kg / stem / year); PLM = experience of farmers in oil palm farming (years); D_Bbt = type of seed used in the form of dummy variables; D_Bbt = 1 if farmers use certified seeds; D_Bbt = 0 if the seedlings used are not certified); D1_Sal = marketing channel intended by farmers to sell FFB (category 1); D1_Sal = 1 if farmers sell FFB to village traders; D1_Sal = 0 if farmers sell FFB to others; D2_Sal = marketing channel intended by farmers to sell FFB (category 2); D2_Sal = 1 if farmers sell FFB to palm oil mills (PKS); D2_Sal = 0 if farmers sell FFB to others; β_0 = constant value; β_i (for $i = 1, 2 \dots 5$) = estimator parameters or regression coefficients for each i -i variable (for $i = 1, 2 \dots 5$)

Notes:

In this study the marketing channels intended by farmers to sell FFB are divided into 3 categories, namely (1) FFB sales through village-level collectors, (2) direct sales to palm oil mills (PKS) and (3)

FFB sales through other intermediaries such as wholesaler and loading ramp. Therefore in the analysis model two dummy variables are used, namely D1_Sal and D2_Sal.

Model estimation was conducted by ordinary least squares (OLS) method. Accuracy of the model evaluated by the coefficient of determination and F-Test, and t-test was used to test the effect of each independent variable partially. The statistical hypothesis that will be tested is as follows.

$$H_0 : \beta_i = 0 \quad (2)$$

$$H_a : \beta_i \neq 0 \quad (3)$$

The relevant variables have significant effects significantly different between dummy variable categories if they have a probability value less than 0.05.

3. Results and discussion

3.1. An overview of independent smallholder oil palm plantations

Smallholder oil palm plantations can be grouped into two, namely smallholder plantations managed by plasma smallholders and managed by independent smallholders. Independent smallholders are farmers who independently work on oil palm plantations and are not tied to any party so that they have freedom in marketing their production. The number of independent smallholders has increased sharply and now it is estimated around 70% of smallholder plantations in Jambi Province are independent smallholders.

3.1.1. Productive plantation area. In line with the objectives of the study, observations of the area of independent smallholder oil palm focused on the area of mature plantations (productive plants). The distribution of respondents' productive planting area can be seen in the figure 1.

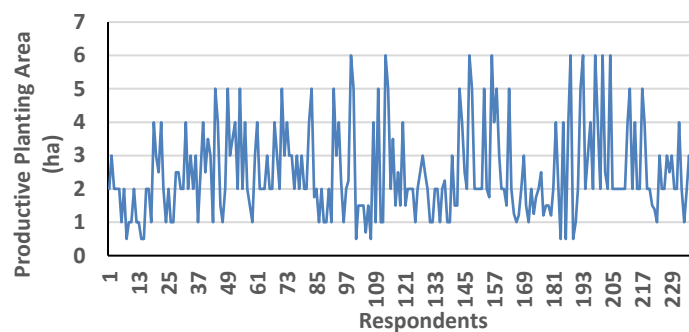


Figure 1. Distribution of productive planting areas (ha).

Figure 1 shows that the distribution of productive planting area is between 0.5 ha to 6 hectares. The largest distribution is between 2 to 4 hectares. A total of 41 farmers (17%) had a productive area of up to 1 hectare at the time of the study. Based on field information, farmers in this group are farmers who have just started oil palm plantations independently. On average, the productive area of the respondents is 2.48 hectares.

3.1.2. Seed used and FFB production. Seedlings are the main factor that must be prepared for the operation of oil palm plantations. Plants derived from high quality palm oil seedlings will provide satisfying yields as long as the plants are alive, while oil palm plants from seed with unclear origins will not provide a guarantee whether they can produce fruit or bunches of large and many oil palm or even may not bear fruit. In general, oil palm seedlings can be categorized as legitimate seedlings which have certifications and illegitimate seeds whose origins are unclear.

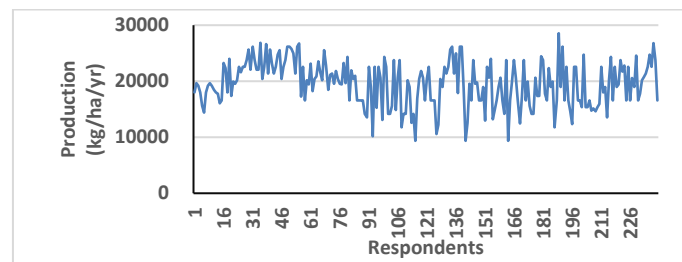


Figure 2. Distribution FFB production (kg/ha/year).

There were 84 people (35%) of respondents in the study area used illegitim seedlings and the remaining 65% used legitimate seedlings that had valid certificates from official sources such as PPKS and Lonsum. Overall FFB production per hectare per year ranges from 9,360 kg to 28,560 kg with an average of 19,589 kg. Figure 2 shows the distribution of production of all respondents in the study area. From this figure the highest FFB production concentration per hectare per year is in the range of 15,000 tons to 20.00 tons with 98 respondents and in the range of 10,000 to 15,000 with 91 respondents.

There is a large difference in FFB production between farmers who use legitimate seedlings and farmers who use illegitimate seedlings, as shown in Figure 3. For farmers who use legitimate seedlings the production distribution is in the range of 10,200 kg to 28,560 kg with an average of 21,226 kg. Most of the production is above 20 tons. For farmers using illegitim seedlings, production spreads from 9,360 kg to 24,720 and the largest production distribution is between 15 to 20 tons with an average production of 16,559 kg per hectare per year of FFB.

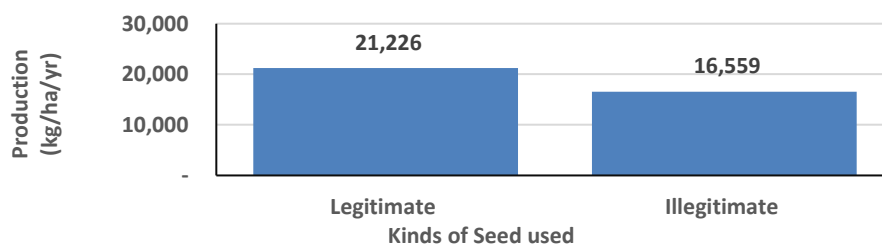


Figure 3. Comparison of FFB production by seed quality (kg/ha/year).

3.1.3. Fertilizing. Economically, farmers believe that the investment spent on the development of oil palm plantations must be accompanied by proper fertilization. However, various limitations of farmers, such as obtaining fertilizer and the availability of capital to buy fertilizers caused variations in use among independent oil palm farmers. [19] explained that the biggest problem in the application of fertilizer lies in the procurement process, especially difficulties in transport of fertilizers which can increase procurement costs by 20-40%. In detail, the distribution of fertilizer use by respondents is presented in Figure 4.

Figure 4 shows a wide range of chemical fertilizers used. It ranges from 2 kg to 13.5 kg with an average of 5.8 kg per plant per year. In this analysis there were no distinguished types of fertilizers used. In fact, there are several types of fertilizers used which include nitrogen, phosphor and potassium fertilizers with various brand variations.

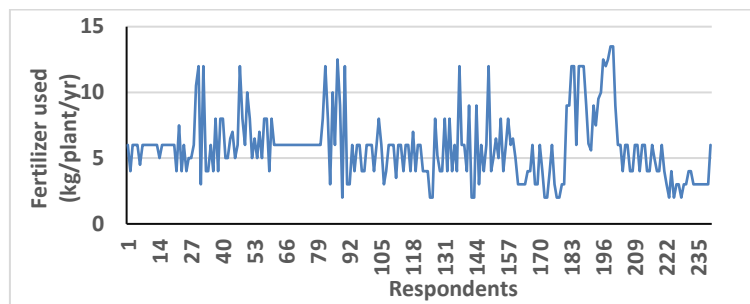


Figure 4. Distribution of fertilizer used (kg/plant/yr).

3.1.4. *Market target and prices of FFB.* Basically, independent smallholders are not tied to plantation companies and palm oil mills. Therefore, there is a freedom for independent oil palm farmers to sell FFB. In general, there is a difference in price at the factory level between FFB from independent smallholders and plasma farmers. Some of the reasons raised are unclear management of oil palm plantations and the company's doubts about the origin of seedlings. As presented in Figure 5, the price ranges between 500 IDR to 1,324 IDR with the average of 764.20 IDR per kg of FFB

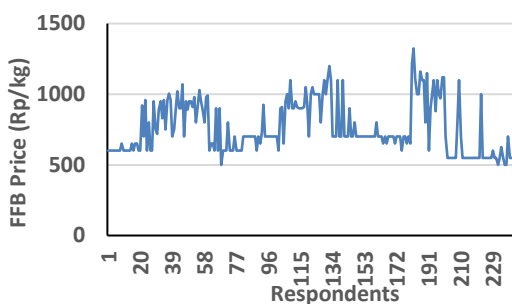


Figure 5. Distribution of FFB prices.

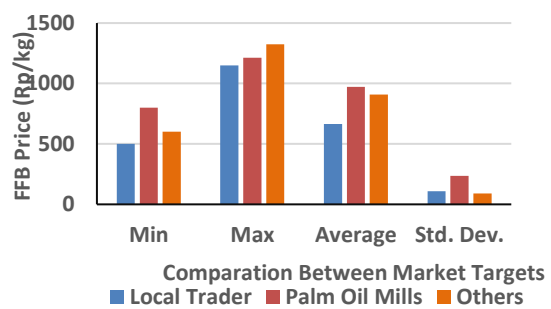


Figure 6. Difference in FFB prices based marketing purposes.

Based on the market target of FFB, most independent smallholders (65.8%) sell FFB through village collectors, 24.16% sell directly to palm oil mills and the remaining 10% percent sell to other places such as loading rigs or other collecting traders. Average prices received by farmers based on market targets are presented in figure 6.

On average, the price of FFB per kg from village or local traders is 665.8 IDR, from Palm Oil Mills is 972.9 IDR and from other intermediary traders is 907.9 IDR. Figure 6 shows that the highest minimum price is from palm oil mills, however the highest price is found in other intermediary traders. This is allegedly because there are independent smallholders who are also plasma farmers, some of whom are partnering with oil palm companies. However, seen from the value of standard deviation, the largest price distribution occurs in palm oil mills. This reflects the striking price discrimination between independent smallholders selling to palm oil mills.

3.2. *factors that affect the price of FFB received by farmers*

Table 1. Summary of the multiple linear regression model.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.843 ^a	.710	.704	99.353

a. Predictors: (Constant), D2_market, Experience, Fertilizer, D_seed, D1_market

The estimation results found that together all variables used in the model had a significant effect on the FFB price. Fertilizer use, farmer experience, seed use and FFB marketing objectives can explain the FFB price changes by 71% percent. This is clearly seen in the estimation results in Table 1.

The accuracy of the model in explaining the effect of the four independent variables on the price of FFB can also be seen from the results of the F-test models presented in the following table.

Table 2. Results of Analysis of Variance (ANOVA).

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	5668318.940	5	1133663.788	114.848	.000 ^b
Residual	2309805.356	234	9870.963		
Total	7978124.296	239			

a. Dependent Variable: Price

b. Predictors: (Constant), D2_market, Experience, Fertilizer, D_seed, D1_market

Table 2 shows that the calculated F value obtained is quite large at 114.848 with a significance value $\alpha < 0.001$. This proves that together all variables affect the price received by farmers. Based on the above results, the model built can proceed with the partial test. The partial test results are presented in the following table.

Table 3. Results of regression coefficient estimates.

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1 (Constant)	616.657	32.758			18.825	.000
Fertilizer	11.181	2.675	.156		4.179	.000
Experience	1.141	1.069	.039		1.067	.287
D_seed	134.575	15.628	.352		8.611	.000
D1_market	-91.086	28.110	-.238		-3.240	.001
D2_market	136.261	30.875	.338		4.413	.000

a. Dependent Variable: Price

According to the results of data analysis as presented in Table 3 above, the interrelationship between variables in this study can be arranged as follows:

$$\text{Price} = 616,66 + 11,18 \text{ Fert} + 1,14 \text{ Expr} + 134,57 \text{ Dseed} - 91,09 \text{ D1market} + 136,26 \text{ D2market} \quad (4)$$

The price of FFB is influenced by the amount of fertilizer used with a regression coefficient of 11.18 and a level of significance $< 0,000$, which means that an increase in fertilizer use of 1 kg per oil palm plant can increase the price of FFB by 11.18 IDR per kg. Fertilization activity is one of the activities of plant maintenance that aims to get the optimal production target of Fresh Fruit Bunches (FFB) and get good oil quality [19], fertilizing oil palm should be done 2-3 times depending on the condition of the land, the amount of fertilizer, age and condition of the plan [20].

The results showed that the average use of fertilizers is still relatively low at 5.8 kg per plant. If it is related to the level of productivity of independent smallholders' oil palm plantations in the study site, which is 19,589 kg FFB per hectare per year, it appears that the use of fertilizer is relatively low. The average plant age is 10.1 years, while based on the recommended fertilizer dosage for plant ages 9 to 13 years is 8.75 kg per tree [21].

[1] argues that oil palm plants should ideally be fertilized periodically four times a year with the composition of N, KCl, and Posphat fertilizer, each 1 kg per plant staple per period. Thus, each plant

should be able to get each 4 kg of N, KCl, and Phosphate fertilizer a year or an average of 12 kg of fertilizer per plant per year. The more sufficient amount of fertilizer needed by oil palm plants, the higher the yield of CPO that can be produced [22].

The variable which also has a significant effect on the price of FFB is the quality of the seeds used. Basically, all independent smallholders try to choose the best seeds to be planted with the hope of obtaining optimal production and better prices. However, limited access and capital resources often cause farmers to be forced to obtain and plant seeds that are not certified.

The results showed that the quality of oil palm seedlings significantly affected the price of FFB received by farmers. The estimation results show that the regression coefficient of the dummy of seed variable is 134.57 with a significance level of 0,000. This shows that farmers who plant certified seedlings are able to obtain a price difference of 134.57 IDR per kg of FFB compared to the price received by farmers who did not use certified seeds.

The results also showed that there were still 65.83% of farmers choosing to market FFB produced through village collector traders. The choice of farmers in marketing the FFB produced as described above turns out to also significantly affect the price of FFB received by farmers. The estimation results show that the sale of FFB through village traders can be smaller by 91.09 IDR per kg FFB, while farmers who choose to market FFB directly to PKS can get a greater price of 136.26 IDR per kg FFB. Significant price differences through PKS Palm Oil Mills are basically still quite adequate although a 4-5% price discount is imposed by the Farmer Group if marketing directly to Palm Oil Mills through farmers association.

4. Conclusions

Self-employed oil palm businesses face various problems both from technical and marketing aspects which ultimately affect the low price of FFB received by independent oil palm farmers. The quality of seedlings used as plant material, the amount of fertilizer used and the marketing objectives of FFB significantly influence the price of FFB received by independent oil palm farmers.

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