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Price Determination of Palm Oil Fresh Fruit Bunches on Imperfect Competition Market in Central Kalimantan Province, Indonesia

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Abstract

The inequilibrium between the supplies of palm oil fresh fruit bunches (FFB) and the availability of palm oil mill causes the exploitation of palm oil fresh fruit bunches prices of farmers' production, especially supply from estate smallholders (independent and plasma farmers). The exploitation of prices occur because of: a) market structure of palm oil fresh fruit bunches is oligopsony market, b) the value of conjectural elasticity is high, and c) the price elasticity value of supply and demand are small (0.19 and 0.048 are inelastic). This condition shows that oligopsony market power has sizeable and dominant influence on price determination of palm oil fresh fruit bunches in the input market. As the result, income, productivity and production of farmers are low. However, if farmers join in a cooperative institutional use oligopoly market power, so farmers can sell palm oil fresh fruit bunches at higher price or up to 34.86% of farmers' real prices. Therefore, the price policy of government should consider to the elements of market power (conjectural elasticity) and the factors that influence market power (demand and supply price elasticities). The approach of bilateral monopoly market model can be an alternative solution of oligopsony market structure.

Keywords: palm oil fresh fruit bunches, price, oligopsony, oligopoly, bilateral monopoly

1. Introduction

Central Kalimantan is one of the seven provinces of palm oil production centres in Indonesia and ranks fourth after Riau, North Sumatra and South Sumatra Provinces. Approximately 16.06% of palm oil plantation area and 11.62% of palm oil production in Indonesia is located in this province, the land and production shares are 27.68% (Ministry of Agriculture Republic of Indonesia, 2012). However, there is inequilibrium between supply of palm oil fresh fruit bunches and the availability of palm oil mill, especially the supply from estate smallholders (independent and plasma farmers) (Syazda, 2013). The marketing system of palm oil in Indonesia is based on the dualistic economic system between economic democracy and economic conglomeration which have capacity and accessibility differences (Gumbira Sa'id, E dan Harizt Intan. A, 2001). This matter causes the exploitation of palm oil fresh fruit bunches prices of farmers' production, because the firm of palm oil mill is the only buyer (as prices determinant), then the market structure is tended to imperfect competition which leads to monopsony or oligopsony market. In addition, inequilibrium between the relationships of supply and demand cause the price to fluctuate.

Furthermore, Faisal Basri (1997) also stated, inequilibrium between productive resources supply with demand (processing industrial) will causes the low competitiveness, this condition will raise the price deviations. Due to price deviation on farm level, it leads to lower prices of palm oil fresh fruit bunches, then resulting low income of farmers. In this condition, the farmers cannot do much, because the price is determined by buyer (the nucleus firm or branch or subsidiary companies). In this position, farmers deal with market power of palm oil fresh fruit bunches that tends to be monopsonistic / oligopsonistic, so that farmers are always disadvantaged. The management of palm oil plantations in Central Kalimantan is mostly collaborated with Nucleus Estate Smallholders.

Based on the field informations, there is matters which not in accordance with the expected goals. So far, the implementation of the Nucleus Estate Smallholders of palm oil plantations, often appear incompatibility of the relationships between plasma farmers and the nucleus firms, especially in terms of price determination transparency of palm oil fresh fruit bunches, scales measurement and rendement calculations (Irma, 1999, Bamin, 2000; Didu, 2000 and Andy Mulyana 2003). In order to protect farmers, government issued policy series to

determining prices of palm oil fresh fruit bunches, but the implementation is actually distorted with aim to uniform the price of palm oil fresh fruit bunches of farmers production both plasma and non-plasma.

This term becomes potentially behaviour which opposite with the principles of fair competition. The current problem is how the price determination of palm oil fresh fruit bunches on imperfect competition market, so the aim of this research is to identify the market structure of palm oil fresh fruit bunches, to analyze price determination of palm oil fresh fruit bunches on imperfect competition market power, to analyze the factors that influence to the imperfect competition market power in price determination of palm oil fresh fruit bunches, to analyze price determination of palm oil fresh fruit bunches with approach of bilateral monopoly market structure model, to recommend the policy which required to increase the income and productivity of farmers.

2. Theoretical Frameworks

Market structure has quite important role in the production factor market equilibrium, taking into calculation of product market structure which related with those factor market (Hirshleifer, 1985). Generally, market structure is divided into: perfect competition and imperfect competition markets. Imperfect competition market structure of seller side, such as monopoly, oligopoly and monopolistic competition markets (Miller and Meiners, 1993; Sukirna, 1994).

Furthermore, Henderson and Quandt (1980) added imperfect competition market structure of buyer side: monopsony and oligopsony market structures. In the economic concept, price determination of a firm is determined by market structure. Commonly, perfect competition market can only reach a normal profit, where firm obtains profit from average fixed cost (AFC) or price equals to average total cost (ATC). Whereas, the firm which on the imperfect competition market can reaches pure profit, firm can determines prices above the average total cost (Anindita, 2008). Either monopoly or monopsony is represented imperfection in competition and they will provide a certain impact, such as in the input market, towards input price, input usage and economic welfare (Miller, 1983).

Market power is realized as the ability to hold prices above marginal production cost. Market power is the most frequently issues discussed in the industrial organization, because it produces the welfare and inefficiency losses. According to Diana, Chalil and Fredoun Ahmadi-Esfahani, (2005 and 2006), there are multiple approaches toward market power modelling in input and output markets on the palm oil production processing chain in Indonesia. Market power modelling can be divided into several approaches, such as model which only measures monopoly / oligopoly powers or only measure monopsony / oligopsony powers or both.

To measure the parameters of monopoly / oligopoly market power is obtained from first-order conditions of upstream firms profit function (Appelbaum 1982 and Iwata, 1974), seller power parameter is called as conjectural elasticity, which is conjectural variation elasticity. Conjectural variation is a parameter which estimates the reaction of other competitors if the firm changes the output quantity or price. Whereas, to measure the parameters of monopsony / oligopsonistic market power is obtained from first-order conditions of buyer profit functions or downstream companies (Muth et al., 1999, Koontz and Philip, 1997), and in the same way, the buyer power parameters can also be presented as conjectural elasticity.

Model of two sides behaviour are divided into two groups, namely the composite (combined) and dominant models. In the composite model (Schroeter et al.2000), both buyer and seller are considered as single integration firm which chooses the optimal levels of input and output to maximize profit. While, the dominant model (Buschena and Perloff, 1991, 1996 and Murniningtyas Azzam, 2000), each buyer or seller choose the optimal levels of input and output to maximize profit.

In Indonesian palm oil industry, growers or industrial estates are treated as upstream industries and processor (crude palm oil) or CPO industries, as the downstream industries. The growers are assumed to purchase inputs from competitive market, and end consumers and retailers are assumed have no market power. Following the model and the modified model of Karp and Perloff (1993), then the cost adjustment as dynamic variable, quadratic linear oligopoly model is to measure seller power and buyer power can be built. In the input market (fresh fruit bunches), growers and processors interacted. Because both of them have the possibility to show the market power, then the model of two sides behaviour is used to test the market power.

3. Research

This research conducted in Central Kalimantan Province, with time series secondary data from 1998 to 2012 and

it also supported by primary data. The time series data is assumed stationary spread. To fulfils this assumption, the data is tested with Augmented Dickey-Fuller Test (ADF Test) using Eviews program to determine the stationary data.

Market structure analysis uses two approaches, namely: (1) Concentration Ratio for Biggest Four (CR4) Approach; (2) Herfindahl Hirschman Index (HHI) Approach. The formula to determine CR4 as follows:

CR4= (The sum of market share for biggest four firm)/(The sum of market share in overall market) x 100%

The criterions are:

0% ⩽ CR4 <50%, low concentration, the market structure is competitive

50% ⩽ CR4 < 80%, moderate concentration, the market structure is oligopsonistic

80% ⩽ CR4 ⩽ 100%, high concentration, the market structure is monopsony

Whereas, HHI is determined using formula as follows:

$$HHI = \sum_{i=1}^{n} (MS)^2$$

Where, HHI is Hirschman Herfindahl Index, n is sum of companies in product market area, and Si is share of purchase commodities from firm by- i (i = 1,2,3, ..., n).

The criterions are:

HHI <100, the market competitive level is high

HHI <1000, the market is not concentrated

1000 ⩽ HHI ⩽ 1800, the market is concentrated

HHI> 1800, the market is highly concentrated

Price determination analysis of palm oil fresh fruit bunches starts from the assumption that the price is formed when supply equals to demand, and then conducted the estimation of supply and demand of palm oil fresh fruit bunches.

The supply function of palm oil fresh fruit bunches is:

$$Ln(Qs) = \ln(\alpha o) + \alpha_1 \ln(P_{FFB}) + \alpha_2 \ln (At) + \alpha_3 \ln(Yt) + \alpha_4 \ln (CH) + \alpha_5 \ln(Te) + \varepsilon$$

Where, P_{FFB} is FFB prices, At is plant plantation area, Yt is productivity, CH is rainfall, and Te is time trend

Hypothesis of estimated parameters: α1, α2, α3, α4, α5 > 0.

The demand function of palm oil fresh fruit bunches as raw material of crude palm oil processing is:

$$Ln\ QFFB^D = \ln (\beta_0) + \beta_1 \ln (P_{CPO}) + \beta_2 \ln (P_{FFB}) + \beta_3 \ln (Q_{CPO}) + \varepsilon_0$$

Where, P_{CPO} is CPO prices, P_{FFB} is FFB prices, and Q_{CPO} is Productivity of CPO

Hypothesis of estimated parameters: β1, β3, > 0; β2< 0

The function of product processing cost of crude palm oil is:

$$TC = \omega_0 + \omega_1 M$$

Where, ω1 is marginal cost of non-material inputs instead of palm oil fresh fruit bunches, which is the result of equation differentiation of TC towards output (M) or equal to the marginal cost (MC).

Price determination analysis of palm oil fresh fruit bunches on imperfect competition market power uses modified model of Karp and Perloff (1993), the function of plantation farmers target and the function of firm target to maximize each profit as follows:

$$\Pi mp = \sum_{t=1}^{\infty} \beta^{t-1}[(P_t - C_t)\, q_{it} - (\gamma_i + \delta/2\, \mu_{it})\, \mu_{it}] \text{ and,}$$

$$\pi mn = \sum_{t=1}^{\infty} \beta^{t-1}[(Po_t - w_t)\, q_{oit} - (\gamma_i + \delta/2\, \mu_{it})\, \mu_{it}]$$

First-order conditions of plantation farmers profit function (πmp) as seller contributes up price (P_t^u); the price of palm oil fresh fruit bunches that desirable by farmers, if they demonstrate market power:

$$P_t^u = (1 + \theta^i \varepsilon^i)^{-1} (p^j + \theta^i \eta^i p^j + c^i)$$

First-order conditions of firms profit function (πmp) as buyer contributes down price (P_t^d); the price of palm oil fresh fruit bunches that desirable by firms, if they use market power:

$$P_t^d = (1 + \theta^j \eta^j)^{-1} (p^j + \theta^{j\,\varepsilon j\,j} p^i + c^j)$$

Where, θ^j is Conjektural elasticity, ε is demand price elasticity, η is supply price elasticity, p is input prices, and c is marginal cost.

To calculate both sides of market power usage, this price is combined (Pi) into a single equation to determine the dominant market power:

$$Pi = \alpha P_t^d + (1- \alpha) P_t^u$$

If, $\alpha < 0.5$, the upstream firms dominate the downstream firms, $\alpha > 0.5$, the downstream firms dominate the upstream firms, $\alpha = 0$, monopoly market power, $\alpha < 0.5$, oligopoly market power, $\alpha = 0.5$, market competition, $\alpha > 0{,}5$, oligopsony market power, $\alpha = 1$, monopsony market power.

To complement market power conditions, the conjectural elasticity should be identified, conjectural elasticity defined as follows:

$$\theta = \theta_0 + \theta_1 PPI + \theta_2 r$$

Where, θ is (dY/dY^i) (Y^i/Y), PPI is Producen price index, and r is rate interest.

Analysis of bilateral monopoly model approach in the price determination is assumed that farmers and firms realize the mutual dependence of approval implementation to produce the equal quantity and price productions. The profit functions of monopoly or oligopoly (Πmp) and monopsony or oligopsony (Πms) (Debertin, 1986; Koutsoyiannis, 1987, Andy Mulyana 2003) are:

$\Pi = \Pi mp + \Pi ms = (P_{FFB} * Qs - C(FFB) + (Q_{CPO}.P_{CPO} - PFFB * Qs)$

$= Q_{CPO}.P_{CPO} - C(FFB)$

$d\Pi/dQs = P_{CPO}.Dq_{CPO} - d\,C(FFB) = 0$

$P_{CPO}.Dq_{CPO}$ = d C(FFB) or MR of firms = MC of farmers

4. Result and Discussions

4.1. Market Structure

The analysis of Concentration Ratio for Biggest Four Firm (CR4) shows that market structure of palm oil fresh fruit bunches in Central Kalimantan has moderate level of concentration, it means that the type of market structure is oligopsony, because the CR4 value is 0.7325 (73.25%) or the value ranges between $50\% \leqslant 73.25\% < 80\%$. Whereas, the analysis of Herfindahl Hirschman Index (HHI) shows that market structure of palm oil fresh fruit bunches in Central Kalimantan has high level of concentration, it means that the type of market structure is oligopsony, because the HHI value is 3912 greater than 1800. There are only a few processing companies of palm oil fresh fruit bunches that controls the purchases, because of the limitations of palm oil mills availability.

4.2. Price Determination of Palm Oil Fresh Fruit Bunches on Imperfect Competition Market

The result shows that if farmer (as the seller) joins the farmer groups institution (or cooperative) uses oligopoly market power, then the farmers can sell the palm oil fresh fruit bunches at higher price, which is IDR 1,715.026 per kg of palm oil fresh fruit bunches or prices increase by 34.86 % of farmers' real price (IDR 1,271.675 per kg of palm oil fresh fruit bunches). Conversely, if the firm (as the buyer) uses oligopsony market power, then the firm would only buy palm oil prices at lower price, which is IDR 1,270.835 per kg palm oil fresh fruit bunches, or prices decrease by 1.97 % of farmer's real price (IDR 1,271.675 per kg of palm oil fresh fruit bunches.

4.3. The Factors that Influence Market Power

The result shows that the supply and demand price elasticity values are smaller than one and negative (0.19 and 0.048 are inelastic). This term shows that monopsony or oligopsony market power has sizeable influence towards price determination of palm oil fresh fruit bunches in input markets, means that processing firm of palm oil fresh fruit bunches is more dominant in price determination.

4.4. Price Determination of Fresh fruit Bunches by Bilateral Monopoly Model Approach

The analysis result uses market power as point 4.2 indicates that price ranges of palm oil fresh fruit bunches that agreed between farmers (as oligopoly sellers) and firms (oligopsony buyers) are IDR 1,715.026 to IDR 1,270.835. The result that uses maximum profit approach (Debertin, 1986; Koutsoyiannis, 1987, Andi Mulyana, 2003) indicates the agreed market price is the price at marginal revenue of firms equals to marginal cost marginal of farmers (IDR 1,280.601). Although the price is under the perfect competition market price, the agreed price is above the oligopsony and government prices. This condition described as follows:

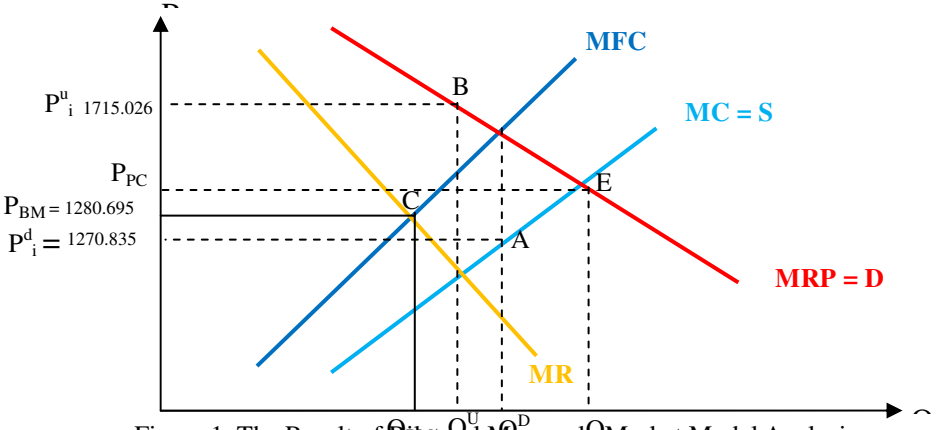

Figure 1. The Result of Bilateral Monopoly Market Model Analysis

P^u_i = Oligopoly prices; P^d_i = Oligopsony prices; P_{BM} = Bilateral monopoly prices; P_{PC} = Perfect competition market prices

5. Conclusions

The market structure of palm oil fresh fruit bunches in Central Kalimantan is oligopsony; the values of supply and demand price elasticities are smaller than one and negative (0.19 and 0.048 are inelastic). This result shows that oligopsony market power (firm as buyer) has sizeable influence and more dominant towards price determination of palm oil fresh fruit bunches in input markets.

If firm (as buyer) uses oligopsony market power, so that firm would only buy palm oil fresh fruit bunches at lower price or the price decrease by 1.97 % of farmers' real price. Nevertheless, if farmers (as sellers) who join farmer groups institutions (cooperatives) use oligopoly market power, then the farmers can sell the palm oil fresh fruit bunches at higher price, or price increase by 34.86 % of farmers' real price. The approach of market power and bilateral monopoly market models show that there is agreement price range and agreement price between farmers and processing industry enterprises.

6. Recommendations

The price determination policy of palm oil fresh fruit bunches from government which has been benchmark of determination price system of palm oil fresh fruit bunches in Central Kalimantan; it can still proceed with improvements to increase prices in farmer level. Based on this research, we need to consider the element calculation of market power (conjectural elasticity) and factors that influence market power, such as supply and demand price elasticities in price determination formula. The approach of bilateral monopoly market model can be one of solutions to face the oligopsony or monopsony market structures, this should be followed by strengthen policy of non-profit oriented institutions of partnership farmers that have legal power, and its implementation requires supervision in the field.

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