Price transmission after the determination of rice ceiling price in South Sumatra Province: analysis of secondary and empirical data

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Abstract. Price transmission becomes an important issue because it is useful in measuring the distribution of welfare between producers and consumers as well as indicators of the efficiency of a marketing system. This study aimed to analyze the vertical transmission of the rice prices from consumers to farmers after the determination of rice ceiling price by the government in September 2017. The study was conducted in South Sumatra Province as one of the centers of rice production in Indonesia. Price transmission was analyzed using price transmission elasticity, on weekly time series secondary data of rice price for 100 weeks, from September 2017 to July 2019. Besides, primary data of the price, production, and cost of production of rice also collected in an empirical study in South Sumatra province to compare before and after the situation. The results showed that the price transmission of premium and medium rice at consumer-level to the price of harvested dried grain has an elasticity value not equal to one, but rather less than one for premium quality rice and more than one for medium quality. This shows that the rice market in South Sumatra Province is still inefficient because the prices are transmitted asymmetrically both for premium and medium rice. Results from the empirical study have also supported the same phenomena which showed an average increase of rice cost production and then the decrease of farmer income in 2018, one-year implementation of the ceiling price policy, especially in lowland swamp.

1. Introduction

The price of a commodity is a very important factor in a market economy because it coordinates the decisions of producers and consumers in behaving under perfectly competitive conditions [1]. According to Rahmi and Arif [2], each price formed should be able to satisfy all market participants, farmers, traders, and consumers.

The phenomenon of price transmission has attracted the attention of many researchers in several commodity markets. In recent years, many types of research have been done to analyze the relationship between farmers, wholesalers, and retail markets. The main topics are oriented to the estimation of elasticity and the speed of price shock transmitted at different levels in the rice marketing chain [3]. Several studies related to price transmission both horizontally and vertically have been carried out [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] and [15].

Research on price transmission elasticity is important because it is useful for policymakers in measuring the welfare distribution between producers and consumers as well as an indicator of price efficiency in a marketing channel. Asymmetrically transmitted prices can cause farmers, who are generally the ones who suffer losses and will always live in poverty lines [16].
According to Bakucs et al. [17], prices which are transmitted asymmetrically between farmers and retailers generally occur in countries with fragmented agricultural structures, high government intervention, and strict price control regulations at the retail level. In Indonesia, the government has just established regulation of the ceiling price [HET] of rice, namely as the Regulation of the Trade Minister of Indonesia Number 57/M-DAG/PER/8/2017. The HET policy, which effectively implemented on September 1, 2017, is aimed to maintain the stability and certainty of rice prices, as well as the affordability of rice prices for consumers. But whether price control at the consumer level is transmitted perfectly to producers, certainly relevant research is needed not only nationally, but also at the provincial market.

In 2018, rice production of South Sumatra reached 2.7 million tons, making the province at sixth rank the largest of rice producers in Indonesia [18] [19]. The ceiling prices were determined by the government based on producer or consumer centers of rice marketing regions. For South Sumatra Province as one of the producer centers, the ceiling price was set at IDR12,800 for premium rice and IDR9,450 for medium rice. With this provision, rice retailers should not sell rice above the ceiling price. Therefore, it is relevant to conduct research related to the transmission of rice prices in South Sumatra Province after the determination of the ceiling of rice. Information analysis on the transmission of rice prices between consumers and producers vice versa, and empirical data analysis of the actual situation in the fields would be as inputs for the government in evaluating and determining policies of rice price control at the national level, or especially in different regions.

Also, this study tried to find out the short-run outcome of the HET determination to the rice price at farmers’ level and so the farm profits by comparing those values in the harvesting period of 2017 and 2018.

2. Material and method
The study was conducted in South Sumatra Province which was determined purposively because it is one of the centers of rice production in Indonesia. The study used time-series data on the retail price of premium and medium rice and the price of harvested husk rice [GKP] every week, starting from the first week of September 2017 to the fifth week of July 2019 [100 weeks]. The secondary data was needed to analyze price transmission. Data obtained from the Price Panel Information System of the Food Security Agency of Indonesia.

Besides, primary data collected from ninety samples on three representatives of the rice agroecosystem in South Sumatra, namely tidal swamp, lowland swamp, and irrigated rice areas, were interviewed using questionnaires. The primary data was needed to calculate the outcomes of rice price and farm profitability.

The price transmission analyzed is the vertical price transmission between the price of rice at the consumer level and the GKP price at the farm level, which is measured using the elasticity of price transmission. Price has a linear relationship in which $P_f$ is a function of $P_r$ with the following mathematical formula:

$$P_f = a + bP_r$$

[1]

Where

$$\frac{\partial P_f}{\partial P_r} = b$$

[2]

Furthermore, Azzaino in Rahmi and Arif [2] stated that the elasticity of price transmission is the ratio of the relative change from retail prices to the change in relative prices at the producer level, which is formulated as follows:
From equations [2] and [3], we get:

\[ Et = \frac{\partial Pr}{\partial Pf} \frac{Pf}{Pr} \]  \hspace{1cm} [3]

So from equations [2] and [3], we get:

\[ Et = \frac{1}{b} \frac{Pf}{Pr} \]  \hspace{1cm} [4]

Where:

- \( Et \) = the transmission elasticity of the price of premium or medium rice
- \( \delta Pr \) = changes in the price of premium or medium rice at the consumer level
- \( \delta Pf \) = changes in grain prices at the producer level
- \( Pr \) = the average price of premium or medium rice at the consumer level
- \( Pf \) = the average grain price at the producer level

With criteria as mentioned in [20]:

- If \( Et = 1 \), then [1] the rate of price change at the farm level is the same as the rate of price change at the consumer level [2] the prevailing market is perfectly competitive [3] the marketing system is efficient.
- If \( Et < 1 \), then [1] the rate of price change at the farm level is smaller than the rate of price change at the consumer level [2] the prevailing market is an imperfectly competitive market [3] the marketing system is not efficient yet.
- If \( Et > 1 \), then [1] the rate of price change at the farm level is greater than the rate of price change at the consumer level [2] the prevailing market is imperfectly competitive [3] the marketing system is not efficient yet.

Therefore, the primary data of the price, production, and cost of production of rice was processed and analyzed using standard t-test statistics for comparing two-period performances.

3. Results and discussion

3.1. Rice and GKP prices development in South Sumatra Province

The graph of the retail rice price of the premium, medium, and GKP in South Sumatra Province after the determination of the HET of rice can be seen in figure 1.

![Graph showing rice prices](image)

**Figure 1.** Development of premium rice prices, medium rice prices, and GKP prices after the determination of HET of rice in South Sumatra Province, September 2017-July 2019.

Figure 1 shows that the retail price of premium rice, medium, and GKP in South Sumatra Province has changed in relatively similar directions before 2019. However, after that, there is a fairly wider
disparity between the price of GKP at the farm level and the retail price of rice at the consumer level. This shows the existence of a larger margin between the price received by farmers and the price paid by consumers, and become an indicator of inefficiency in the rice market of South Sumatra Province. One of the causes of the phenomenon is the long chain of marketing. The inefficient marketing channel will affect negatively the welfare of producers and consumers [21]. It seems that the determination of the HET of rice also has not been able to reduce the magnitude of the margin differences or narrow the price disparities. This can be seen from the graph of rice retail prices that have not declined after the determination of the HET of rice. Even for medium rice, retail prices have exceeded the HET. That is after 100 weeks were determined, the rice HET could not be implemented effectively.

3.2. Transmission elasticity of premium rice prices
A simple linear regression of premium rice price at the consumer level to the price of GKP at the farm level in South Sumatra Province yielded the equation:

\[ Pf = -1298.745 + 0.482Pr_{premium} \]

Based on the results of secondary data analysis, the average GKP price at the farm level was IDR 4,605.41 and the average price of premium rice at the consumer level was IDR 12,257.91. Thus, the transmission elasticity of premium rice prices at the consumer level to the price of GKP at the farm level was 0.780 or \( Et < 1 \). It means that the rate of price change at the farm level was smaller than the rate of price change at the consumer level, or an asymmetrical price transmission happened.

3.3. Transmission elasticity of medium rice prices
A simple linear regression of the medium rice price at the consumer level to the GKP price at the farm level in South Sumatra Province yielded the equation:

\[ Pf = 479.324 + 0.379Pr_{medium} \]

The average price of medium rice at the consumer level is IDR 10,901.07. Thus, the elasticity of transmission of medium rice prices at the consumer level to the GKP price at the farm level is 1.11 or \( Et > 1 \). The value of the transmission elasticity of more than one indicates that the market system was not efficient or did not compete perfectly.

The rice market was generally not symmetrical, where a rise in rice prices at the consumer level did not increase rice prices at the farm level at the same percentage. Conversely, if the price of rice at the consumer level falls, causing the price of grain at the farm level will also go down [22]. In Karawang Regency, West Java, the price relationship between farmers and traders was asymmetrical, where farmers get lower net profits compared to traders [23]. Likewise in OKI Regency, South Sumatra, the transmission of premium and medium price of rice between consumers to farmers and between farmers to consumers occurs asymmetrically, which was shown by the elasticity of price transmission that is not equal to one [24].

The low price transmission from the consumer market to the producer market in the marketing of agricultural commodities is one indicator of the power of monopsony or oligopsony at the trader levels. These types of traders can control the purchase price of rice from farmers. Thus, even though prices at the consumer level are relatively fixed [for example controlled by HET], traders can reduce the purchase price at the farm level so that profits remain maximum. Conversely, if there is an increase in prices at the consumer level, traders can pass the price increase to farmers imperfectly, where farmers receive prices lower than what consumers pay. The asymmetrical price transmission is certainly detrimental to farmers because farmers cannot fully enjoy the price increases that occur at the consumer level [25]. In line with this, Aryani [26] stated that the variations and fluctuations in grain prices are wider at the farm level, so farmers do not have the power to determine rice prices.
Collectors and large traders who buy rice directly from farmers play an important role in shaping the price of rice. Retail traders, who are in the final sequence in the distribution of rice up to the hands of consumers, practically do not have the power to influence the price of rice. Rice price movements at the retail level follow price movements set by large traders.

In South Sumatra, it turns out that the transmission elasticity of premium rice prices was lower than the transmission elasticity of medium rice prices \(0.780 < 1.11\). This means that changes in prices at the premium rice consumer level were transmitted more slowly to producers. On the contrary, the price transmission of the medium rice flowed faster to producers. Field observations showed that at the farm level, there was no grouping of rice-based on premium and medium quality. Almost all farmers’ rice seemed to be evenly distributed and its quality was categorized as medium rice, except for some amount which was low quality processed. Rice is grouped based on premium and medium quality when processed in medium and large mills. Premium rice has a higher price according to its better quality. Moreover, the HET rules that classify the rice price into HET premium rice and HET medium rice with a price difference of IDR 3,350 make traders want to sell more premium rice than medium rice. So that rice which should be categorized as medium rice should be processed to become premium rice. The price transmission elasticity of more than one on medium rice \([E_t > 1]\) is thought to be caused in its implementation, the determination of the selling price of grain and rice is only determined by a few marketing institutions [27]. Price transmission cannot occur perfectly if there are policies that affect prices in one market. With similar reasons, Khudori [28] concluded that the HET of rice policy caused many problems and was not effective, so it is needed to be evaluated.

### 3.4. Outcomes of rice price and farm profitability

Empirical data collected from the three locations of rice farming systems showed that there were revealed increasing rice prices at farmer level from 2017 to 2018. In tidal swamp, lowland swamp and irrigation area, the price was consecutively from IDR 4,900, IDR 4,600 and IDR 4,905 increased become IDR 5,100, IDR 4,960 and IDR 5,200. However, as presented in Table 1, the profit of rice farm in lowland swamp was decreased although not significant due to the decrease of the yields from 5.19 tons to 4.48 tons and a slight increase in its production cost. Unsurprisingly, the profits of rice farms in two other agroecosystems were increased at least until 2018. The comprehensive review revealed some causes of the situations, that were [1] last floor price policy in 2015, which set the price of dry husk rice at IDR4,600 has effectively prevented the price to decrease, even maintained it above floor price setting since more than 5 years ago [2] increasing demand for rice by big rice mills to raise the process and supply premium price which more profitable than the medium ones and [3] rice outflow from the tidal swamp [Banyuasin District] and irrigation area [Musi Rawas and OKU Timur] as rice surplus producers to neighboring provinces still high that make local prices increased. The facts of increasing rice prices at farmer levels were the same as those revealed by Rahman et al. [29] in three provinces in Java for similar reasons.

| Variable   | Location and nominal values [in million rupiahs per Ha] |
|------------|--------------------------------------------------------|
|            | Tidal swamp | Lowland swamp | Irrigation |
| Revenue    | 22.76       | 25.91         | 23.87       | 22.24       | 23.15       | 26.78       |
| Production cost | 6.78       | 7.19         | 4.55        | 4.49        | 5.67        | 6.07        |
| Profit     | 16.98       | 18.72        | 19.32       | 17.75       | 17.48       | 20.71       |
| Profit difference | 1.74       | -1.57        | 2.73        |
| Significant status | Insignificance | Insignificance | Significance |

Table 1. Revenue, cost, and profits in three rice agroecosystem of South Sumatra
4. Conclusion
The price transmission of rice after the determination of ceiling price policy in 2017 showed in the imperfect and inefficient market of rice in South Sumatra, especially for premium rice. The government needs to find a solution to overcome the asymmetrical price transmission. Inefficient marketing systems must be improved to prevent wide price disparities between producers and consumers. Then, income and welfare between producers and consumers can be distributed evenly. Besides, the HET policy also needs to be reviewed.

Some results of empirical field studies have supported the price transmission analyses showing the imperfect and inefficient markets of rice, but others tend to be not the same so far until 2018. Therefore, a further study is needed to capture more mid and long-run impacts of combination policies of ceiling price of and floor price, especially in the case of premium rice at the consumer level versus uncategorized rice at the producer level.

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