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The Role of Toko Tani Indonesia (TTI) to Supply Chain and The Establishment of Rice Prices in Sragen Regency

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ABSTRACT

This research examines the role of Toko Tani Indonesia (TTI) in the rice supply chain and price determination in Sragen Regency, Central Java, Indonesia. Using a descriptive analysis approach, the study focused on Sragen, a major rice production center. The samples for this investigation were selected purposively from datasets provided by eleven Community Food Business Institutions and Indonesian Farmer's Stores that have been recorded in the Office of Agriculture and Food Security of Sragen Regency. The Food Supply Chain Networking (FSCN) model and rice price formation were analyzed qualitatively, while supply chain performance and value-added (VA) were assessed quantitatively. Results revealed a significant reduction in the rice supply chain stages from 6–7 to just 3, improving efficiency. Margins for partner farmers and TTI were calculated at IDR 1,600 per kilogram (51.13% of total margin share) and IDR 300 per kilogram, respectively. Inventory turnover was 12 times annually, with inventory days of supply for farmer groups at 30 days and a cash-to-cash cycle of 37 days. VA analysis showed farmers contributed 72% of total value (IDR 376,216,168), LUPM 26% (IDR 136,678,955), and TTI 2% (IDR 8,090,000). TTI supports farmers by purchasing grains at fair prices, ensuring effective marketing, maintaining rice availability, and stabilizing prices, thus playing a critical role in the community's food security efforts.

INTRODUCTION

The government strategy to achieve food security is implemented through programs aimed directly at the community, including *Pengembangan Usaha Pangan Masyarakat* (PUPM) or the Development of Community Food Business. A prominent purpose for the introduction of PUPM is realized through *Toko Tani Indonesia* (TTI). This purpose includes maintaining price stability at both the producer (farmer) and consumer levels (Zakia, 2017). The TTI program was launched by the government in 2016 through Decree No.06/KPTS/KN.010/K/02/2016 concerning General Guidelines for the PUPM and Regulation of Minister of Agriculture No.06/KPTS/RC.110/J/01/2017 for the implementation of PUPM.

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The institution fosters the development of producer-level marketing and it collaborates with other groups namely *Lembaga Usaha Pangan Masyarakat* (LUPM), which was developed by the Association of Farmer Groups (Gapoktan) (Sulaiman et al., 2018). Farmer Groups and LUPM collaborate with TTI, an institution that serves as a food distributor, to facilitate efficiency within supply chain (Ministry of Agriculture, 2020). This is also emphasized in a previous investigation where it was stated that the Ministry of Agriculture, through TTI, was in collaboration with Gapoktan or LUPM (Community Food Enterprises Institute) as the solution towards a shorter and more efficient supply chain (Anugrah, 2019).

Sragen Regency was selected as the research location due to its significant potential for sustainable agricultural development, particularly in rice production (Wardani et al, 2011). As a prominent rice-producing center in Java (Suhardedi, 2018), Sragen meets the criteria for food production as outlined in the PUPM program. According to the Food Security Office, the destination has been considered an ideal location for developing the TTI project (Ministry of Agriculture, 2020). Data from the Statistics Indonesia (2020) showed that Central Java is the largest rice-producing province in Indonesia, with a production volume of 9,655,654 tons. Sragen ranks as the second-largest rice producer in Central Java, contributing approximately 766,012.30 tons in 2019. Based on these attributes, Sragen was considered as a fitting case research for TTI research focusing on rice production and distribution.

Rice, as the staple food for most Indonesians, holds a significant potential in maintaining national food stability, particularly considering its continually increasing demand. Disruptions in rice production or distribution can significantly impact the food security of communities, specifically considering the fact that production levels are a key determinant of rice price, as the metric directly influences availability. Setiawati et al. (2018) stated that rice price was strongly shaped by the interplay of supply and demand. However, a significant price disparity exists between farmers and end consumers, largely due to an extended supply chain.

Extensive research has been conducted on rice supply chain. For instance, Saptana et al. (2019) identified 7 key stakeholders in rice supply chain of Central Java, including farmers, rice collectors or middlemen, rice millers, inter-regional wholesalers, market center wholesalers, and retailers. Laras (2018) described an even more intricate distribution network comprising farmers, rice mills, small and large collectors, major traders, BULOG (the Logistic Affairs Agency), large stores, and retailers. Additionally, Pradeka et al (2018) observed that farmers selling crops to middlemen often received lower prices, and this demotivated the farmers from releasing entire harvests

and hampered proper crop absorption in the market. Another research further emphasized that the prolonged marketing chain starting from producers to collectors, wholesalers, retailers, and finally consumers, forces consumers to pay inflated price for rice (Munandar et al., 2020).

The number of parties included in supply chain has been observed to significantly influence its structure by adding layers of complexity, as these parties interact to maximize profits from the final consumer (Mahbubi, 2013). This dynamic often results in inequities, particularly at the farmer level, where farmers face limited bargaining power within the market.

To address the persistent challenges existing within rice sector in Central Java, the government has implemented various initiatives, including the establishment of TTI. This program aims to create a more equitable agricultural trading system in the country. A central feature of TTI is its mechanism to purchase products from farmers at government -set prices and sell the same products below market rates, a strategy that seeks to benefit both producers and consumers (Prahardiantoro, 2018).

This research aims to examine the critical role of TTI in rice supply chain, with a specific focus on the mechanisms of price formation and the added value it introduced by the institution to the system within the Sragen Regency. Considering the status of this commodity as the most widely consumed staple food in Indonesia, the results of the present exploration are expected to offer a comprehensive understanding of supply chain dynamics influenced by TTI. Additionally, it is anticipated to thoroughly emphasize the impact of the program on food security, as well as the contributions of the initiative to improving the welfare of farmers and the broader community.

METHODS

Data Source

The present research was carried out using both primary and secondary data. Primary data were gathered through direct observation and interviews conducted via the administration of questionnaires with respondents across rice supply chain. The research focused on over 1,000 farmers participating as partners in the PUMP program in Sragen. A purposive non-probability sampling method was adopted to select respondents based on the criteria that each individual must be well-informed and actively included in the commodity, financial, and informational flows within rice supply chain.

Among the partner farmers in the PUMP program, eleven were selected as respondents, representing eleven LUPMs (Village Food Barn Institutions) collaborating with TTI in the Sragen Regency. These include all Gapoktan (farmer group associations) associated with the program. The eleven Gapoktan partnering with TTI include Gapoktan Sapto Tani, Sri Luwih, Poktan Sejahtera, Amarta, Ngarum Makmur, Tani Makmur, Margo Mulyo, Trobayan, Taru Mulyo, Karya Mulya,

and Poktan Tememen. Furthermore, 18 TTIs participated in this research, including the shop of Sumpeno, East Gapuro, Shanauf, Kuatno, Pak Harto, Tiga Putri, Arto Moro, Sarwo Edi, Lumayan, Kelik, Sarjito, Tukinah, Margo Rejo, Sutini, Ending, Satunah, Agus, and Amir. Secondary data were sourced from the Statistics Indonesia, the Ministry of Agriculture, as well as the Food Security and Agriculture Office of Sragen Regency.

The primary data collected included information on respondent characteristics, supply chain conditions, rice prices at various stages of supply chain, production costs, and the input and output values for each supply chain member, both with and without the inclusiveness of TTI. These primary data were analyzed comparatively and descriptively, with a major emphasis on the conditions of rice supply chain with and without role of TTI. Direct observation further supported the descriptive analysis by providing a comprehensive view of the dynamics of supply chain and the impact of TTI on its operations.

Data Analysis

A qualitative and quantitative analytical methods was mixed as the research was being conducted. The qualitative data processing include descriptively with the Food Supply Chain Networking (FSCN) framework acting as a guide. The framework was first talked about by Lambert and Cooper and later modified by Van Vorst (Vorst, 2006) and it act as a understanding model for analysis of rice supply chain. It makes up of six very needed elements namely supply chain objectives, structure, management (SCM), resources, business processes, and performance. Additionally, qualitative analysis was also used to evaluate rice price within supply chain.

Quantitative data analysis done to check supply chain performance and joined value. The performance measurement was analysis of marketing and asset management efficiencies. A main focus of the analysis is rice marketing margin, which calculation by minusing the buy price from the sell price of all institution working in rice marketing or by addition the marketing costs and profits of the marketing agency. This margin is a fine indicator of efficiency and can be mathematically put down as follows (Kohls and Uhl, 2002):

$$Mi = Psi - Pbi$$
$$Mi = Ci + \pi i$$
$$Psi - Pbi = Ci + \pi i$$

The profits of i-level marketing agencies are:

$$\pi i = Psi - Pbi - Ci$$

Then the amount of total marketing margin is:

$$MT = \Sigma Mi$$

Where Mi is the marketing margin in i-level markets, Psi the selling price on the i-th level market, Pbi the purchasing price in the i-level market, Ci the cost of i-level marketing agencies, πi the profit of i-level marketing agencies, MT the total margin, and i = 1, 2, 3, ….., n.

Farmer's share has an opposite relationship with the marketing margin. If the marketing margin is low, the share received by the farmer is high, and vice versa. Mathematically, the farmer's share is formulated as follows (Kohls and Uhl, 2002):

$$Fs = \frac{Pf}{Pr} \times 100\%$$

Where Fs is the farmer's share, Pf is price at the farmer level, and Pr is price paid by the final consumer.

After determining the value of the farmer's share, the marketing efficiency of rice supply chain was then assessed. Additional performance metrics, such as inventory turnover, inventory days of supply, and cash-to-cash cycle time, were subsequently used to further evaluate performance.

Efficient asset management within supply chain is an important performance attribute, as outlined in the SCOR (Supply Chain Operations Reference) model. According to research by (Putro et al., 2021), five potential problems and sixteen theoretical solutions exist within rice farming SCM. This form of management, as structured in the SCOR model, includes three primary stakeholders namely focus companies, suppliers, and customers, and comprises five management processes. A new management process, derived from a comprehensive literature review, has also been proposed. However, this research focuses exclusively on analyzing asset management efficiency among supply chain members who serve as the focal or central entities within rice supply chain in the Sragen Regency.

1) Inventory Turnover

Supply chain performance is stated to be better if the value of *inventory turnover* is smaller. The mathematical calculation of *inventory turnover is as follows* (Russell & Taylor, 2000):

$$\textit{Inventory Turnover} = \frac{\text{Cost of Good Sold}}{\text{Average aggregate value of inventory}}$$

2) Inventory Days of Supply

The shorter the *inventory days of supply,* the better supply chain performance. The formula for calculating this metric is as follows (Russell & Taylor, 2000):

$$\textit{Inventory days of supply} = \frac{\text{Average Aggregrate Value of Inventory}}{\text{COGS/365 hari}}$$

3) Cash to Cash Cycle Time

This metric measures the speed at which supply chains convert supply into money. There are three components in this calculation, namely inventory days of supply, average days of accounts receivable, and average days of accounts payable. The formula for calculating the metric includes:

Cash to cash cycle time = inventory days of supply + average days of account receivable – average days of account payable

Value Added (VA) Analysis

The method adopted for measuring the added value in rice supply chain is based on The Firm's VA

approach introduced by Balk in an attempt to evaluate and analyze the added value generated across rice supply chain. The results of the exploration represented the economic value accrued by all participating members. The calculation of VA for each member of rice supply chain follows the formula proposed by (Balk, 2002):

$$VA^{it} = p^{it}.y^{it} - w_{E.}^{it}.x_{E.}^{it} - w_{M.}^{it}.x_{M}^{it} - w_{S.}^{it}.x_{S}^{it}$$

Where VA is the VA (Rp), p is output price (Rp), y represents output quantity (kg), i is the i-th business actor, t is period from 1 to t, w is input price (Rp), x is the number of *inputs* (kg), E is e*nergy cost* (Rp), M is m*aterial cost* (Rp), S is s*ervice cost* (Rp).

RESULTS AND DISCUSSION

The Ministry of Agriculture has made efforts to address food price disparities through the establishment of the *Pengembangan Usaha Pangan Masyarakat* (PUPM) program, which focuses on Community Food Business Development in Indonesia. This initiative aims to stabilize supply and enhance marketing efficiency by streamlining supply chain. Accordingly, the PUPM program was implemented through the LUPM, which are community food business institutions often organized in the form of *gapoktan* or farmer groups. These institutions typically serve as suppliers to TTI. According to the Food Security Agency (2020), the PUPM program has been in operation since 2016 across various provinces in Indonesia. Initially, the program included 493 LUPM across 31 provinces in 2016, 406 LUPM designated in 7 provinces in 2017, 500 LUPM located in 16 provinces in 2018, and 500 LUPM in 22 provinces as of 2019. A region selected during the early stages of PUPM implementation was Central Java, specifically Sragen Regency.

In Sragen Regency, the program includes 11 LUPM and 30 TTI as part of the PUPM initiative. Comprehensively, the research area comprises eleven sub-districts within the regency. Kalijambe sub-districts is home to 2 LUPM and 8 TTI, Masaran sub-district has 1 LUPM, Kedawung sub-district includes 3 LUPM and 3 TTI, Sambirejo sub-district comprises 2 LUPM and 5 TTI, and Sambungmacan sub-district has 1 LUPM. Ngrampal sub -district features 1 LUPM, Karangmalang sub-district hosts 6 TTI, Sragen sub-district includes 4 TTI, Sidoharjo sub-district has 1 LUPM, Gemolong sub-district has 1 TTI, and Karangtengah sub-district also features 1 TTI.

PUPM in Sragen

More than 1,000 farmers have joined as partners in the PUPM program in Sragen Regency. Among these farmers, eleven were selected as respondents for this research, representing the eleven LUPMs included in the program. The data collected represented the eleven Gapoktan, with a sample size comprising eleven farmers identified from the LUPM list. Typically, the LUPM serves as intermediary

institutions or further processors connected to around 18 TTI, which have partnered with the 11 Gapoktan as PUPM implementers. The age range of the farmers was between 45 to 67 years, with most falling between 45 and 50 years of age, and have an average farming experience of 31 to 40 years. The cultivated area per farmer varied from 0.25 to 4 hectares, with the majority managing land in the 0.25–1-hectare range.

TTI was observed to play an important role in the implementation of the Community Food Business Development (PUPM) program. The institution serves as a key identity for the PUPM initiative, leading to the branding of rice produced under the program as "TTI rice." According to data from the Agriculture and Food Security Office of Sragen Regency, there were 11 LUPM and 18 TTI in the region as of 2019. The general supply chain conditions in the research location show a diverse grain supply chain. Supply chain model in this context comprises multiple actors and stages, including farmers, harvesters, grain markets, small rice mills, medium-to-large rice mills, inter-regional traders in production centers, large traders or wholesalers in consumer centers, and retailers in local markets.

Rice Supply Chain of TTI in Sragen Regency

In this research, supply chain conditions were described descriptively in accordance with the FSCN framework, including:

Supply Chain Goals

The objectives of supply chain can be examined from two perspectives namely market targets and developmental goals. The Ministry of Agriculture has harmonized these objectives with the success criteria of the PUPM program, which includes distributing a minimum of 50 tons of rice annually.

The primary market target in this supply chain focuses on delivering rice exclusively to TTI outlets within respective regions. However, one exception exists, a LUPM that supply rice to the Central Java TTI center in Semarang. This shows that the majority of the marketing efforts of supply chain remain localized within respective designated areas. Rice products included in this supply chain generally fall under the medium quality category, with a breakage rate ranging from 5 to 10 percent. Accordingly, the sorting process is typically managed directly by Gapoktan or Poktan. This market segmentation, combined with integrated quality standards and optimized SCM, aims to assist the lower-middle-class community by providing affordable yet high-quality rice. By maintaining this balance, the initiative ensures accessibility for the community while contributing to the stability of rice price in the broader market.

On the developmental side, the program emphasizes the enhancement of the capacities of farmers in order for the demographic to effectively manage and adopt advanced cultivation technologies to achieve

better yields. Additionally, TTI plays role in monitoring rice quality by considering consumer feedback. Field observations showed that consumer complaints regarding TTI rice are minimal, emphasizing the high quality and affordability of the product.

Supply Chain Structure

The PUPM program aims to establish a cohesive network within supply chain by grouping all participating parties to promote collaboration and streamline operations. Farmers, serving as the backbone of chain, are organized under the LUPM framework, to ensure the active participation of each member in the program. This structure reflects the findings of Arbabiun et al. (2022), which describe a two-actor supply chain model. In this model, upstream producers supply products to downstream retailers, with the latter typically holding a stronger bargaining position.

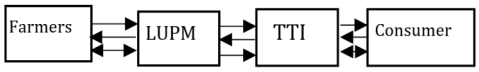

Figure 1. TTI Rice Supply Chain Structure in Sragen District
Source: Primary Data, 2016-2022

LUPM have a formal partnership with TTI to smooth rice supply chain. In the arrangement, LUPM buy dry unhusked rice from the farmer members at an average price of IDR 4,500/kg. This price normally fluctuates because of the planting season and the quality of the grain. After the rice is collected, LUPM sends it to a milling facility for transforming into white rice. During this process, the milled rice is separated into whole grains and broken pieces, and the whole grains are put into 2 kg and 5 kg labeled bags before send to TTI. At TTI, rice is sold directly to consumers at an average price of IDR 8,800/kg. The milling process lead to weight loss of the rice up to 60%, significantly impacting price disparity between the raw grain and the finished rice product. This supply chain structure is follows with findings from similar research, such as the investigation by Putro et al. (2021), which listed a simple rice supply chain that have three key stakeholders namely focus companies, suppliers, and customers. In this simple model, the focus company often represents a group of farmers responsible for processing crops into consumable products. Consumers sometimes are cooperatives, retail outlets, or individual buyers who buy rice for immediate consumption. Meanwhile, suppliers, make available essential agricultural inputs such as seeds, fertilizers, and other tools required for farming activities.

SCM

SCM typically comprises the structure of supply chain, performance measurement, and strategic formulation aimed at improving its entire efficiency. This aspect of management also includes monitoring the conditions of supply chain structures and roles of key actors, as outlined by (Rakhman et al., 2018). Within the TTI rice supply chain,

management includes the selection of partners, establishment of contractual agreements, implementation of transaction systems, provision of external support, and the facilitation of collaboration. In this system, no explicit criteria exist for individual farmers to become TTI partners. In general, farmers within a village are generally organized under a LUPM. Some LUPMs typically impose specific requirements on respective members, such as the obligation to consistently supply rice to ensure the continuity of stock for TTI. In order for a LUPM to establish a partnership with TTI, it must undergo a rigorous application process. This process generally includes meeting the criteria set forth by the Agriculture and Food Security Office of the Sragen Regency.

Supply Chain Resources

Resources is important to maintain the functionality of any supply chain. For farmers, land is the primary resource, and Farmers is normally told to cultivate respective lands with diverse varieties of rice. Additionally, commercial farmers rely on farm laborers, who perform 6 large roles in important farming activities such as soil preparation, planting, weeding, fertilizing, and harvesting. Financial resources from either saved or loans also help to farming operations. LUPM (Farmer-Owned Enterprises) typically have large-scale machinery bought for activities and post-harvest processes, including dryers, rice mills, and other equipment, not like normal farmers,. The enterprise is finding its capital from bought assets and operational funds provided by the government, which drives the enablement to offer facilities for rice production and collection. The facilities in this place is milling, packaging, and sorting capabilities. However, when it comes to looking at information technology, the resources available within the enterprise stay limited to basic communication tools such as WhatsApp and SMS. It is important to comprehend that despite the simplicity of these applications, the platforms effectively connect farmers, LUPM, and TTI.

Supply Chain Business Process

The analysis of business processes in supply chain is shaped by two distinct perspectives namely the cycle view and the push-pull view. Grasping these perspectives is essential for understanding the intricacies of supply chain operations. Processes executed by TTI in response to consumer orders are classified as pull processes, as these processes are typically initiated by actual demand. Meanwhile, processes carried out before order placement are considered push processes, as the activities are designed to anticipate and accommodate fluctuating consumer demand.

As stated in research by Putro et al. (2021), rice farming in Indonesia often excludes suppliers from providing farmers with essential inputs such as equipment, seeds, and fertilizers. Typically, incorporating stakeholders with a streamlined model could enhance the efficiency of

business processes. This finding is in line with field observations, where LUPM was found to play a dual role in supply chain. As a distributor, LUPM engages in the procurement cycle by procuring raw materials from partner farmers. It also serves as a direct processor by operating rice milling units (RMU) and independently processing the grain, which constitutes the manufacturing cycle. LUPM and TTI further contribute to the replenishment cycle by increasing order quantities beyond the initial demand to ensure supply continuity.

End consumers place respective orders with TTI, which responds through a pull process within the order cycle. Meanwhile, farmers and LUPM carry out push processes, ensuring supply chain operates effectively from production to delivery.

Distribution Patterns

Distribution includes more than just delivering products. It also comprises the flow of finances and information. In general, TTI, alongside respective farmer partners collaborate to ensure these flows function effectively for the benefit of all stakeholders. To support progressive sales, LUPM must provide rice of the agreed quality and quantity, which reinforces trust between the two parties. This trust is anchored on the adherence to terms agreed upon, including the proper packaging of rice and its accurate labeling with the variety and name of LUPM. Both parties must also seek to enhance respective performances by taking into account feedback from end consumers and sharing the associated risks proportionately.

Supply Chain Performance Measurement

Marketing Efficiency

Margins in marketing represent both the costs incurred and the profits earned by each member of supply chain based on respective contributions. In rice supply chain, the primary marketing entities include farmers, LUPM, and TTI. Partner farmers collaborate with LUPM to produce high-quality rice, which is then supplied to TTI. Typically, farmers sell dry grain to LUPM at around IDR 4,500 per kilogram, while LUPM processes this grain into packaged white rice ready for consumption and sells it to TTI at approximately IDR 8,500 per kilogram. For consumers, the retail price is generally approximately IDR 8,800 per kilogram. The efficiency of this supply chain can be assessed by examining the profit margin and the farmer's share. The marketing margin value between farmers and LUPM, representing price difference of IDR 4,000 per kilogram, includes the costs incurred in this process. This margin is significant within channel I, where only farmers and LUPM operate. Its significance is invariably due to the various functions performed by LUPM, including exchange, physical, and facility functions.

Following the structure, farmers earn an estimated profit of IDR 1,600 per kilogram of dry grain delivered to LUPM. This satisfactory margin is

achievable due to the simplicity of chain, which includes the participation of only two marketing agents. The second margin, which is earned by TTI, amounts to IDR 300 per kilogram. Regardless of the fact that this amount is relatively small, it remains reasonable. The selling price from farmers in this channel is IDR 7,900, while the purchase price from LUPM is IDR 6,900, a difference which is attributable to a government subsidy of IDR 1,000 per kilogram provided to LUPM for grain purchases.

In other words, the selling price of grain from farmers to TTI is IDR 4,500 per kilogram, while the average retail price paid by end consumers is IDR 8,800. The farmer's share can be calculated by determining the percentage of the selling price received by farmers from TTI relative to the final consumer price, as follows:

$$Fs = \frac{\text{Rp } 4.500}{\text{Rp } 8.800} \times 100\% = 51.13\%$$

Based on the calculations made, the farmer's share in the TTI rice supply chain is 51.13%. This high share can, again, be attributed to the short supply chain. It also proves that the presence of LUPM has improved the welfare of farmer partners.

Asset Management Efficiency

Inventory Turnover

Inventory turnover in this supply chain is evaluated by calculating the Cost of Goods Sold (COGS) by TTI and the average aggregate inventory value held by LUPM. COGS represents the total expenses incurred in the sale of a specific product. This metric comprises the total costs of supplying the end product and typically helps to determine the total value of goods used as supply within chain. The breakdown of the calculation of the average aggregate inventory value held by LUPM in 2019 is calculated as follows:

Average aggregate value of inventory
= average inventory x cost per unit
= 1234.83 x IDR 23.115
= IDR 28,542,754

To find out the inventory turnover calculation, the COGS value was divided by the average aggregate value of inventory. The calculation of the inventory turnover of TTI in 2019 is as follows:

$$\text{Inventory turnover} = \frac{\text{Cost of Good Sold}}{\text{Average aggregate value of inventory}}$$

$$= \frac{Rp\ 342.513.969}{Rp\ 28.542.754} = 12 \text{ times}$$

The TTI rice supply operates on a monthly cycle, amounting to 12 turnovers per year. A higher inventory turnover value shows more efficient performance, as it reflects the rapid movement of goods and effective use of resources. The value of this metric for LUPM was observed to be relatively high, signifying the ability of the initiative to swiftly recover the capital invested in maintaining inventory.

Inventory Days of Supply

Inventory Days of Supply is the second key performance metric used to evaluate the efficiency of the TTI

rice SCM. This metric, which is similar to inventory turnover, relies on the relationship between COGS and the average aggregate value of inventory. However, the distinction lies in how COGS is expressed, which is measured in terms of days rather than as an annual value. In this research, the Inventory Days of Supply for TTI rice in 2019 was calculated as follows:

Inventory days of supply:

$$= \frac{Average\ Aggregrate\ Value\ of\ Inventory}{COGS/365\ days}$$

$$= \frac{\text{Rp } 28.542.754}{\text{Rp } 342.513.969/\ 365\ days}$$

= 30.42 days = 30 days

The Inventory Days of Supply for TTI in 2019 is 30 days. This shows that rice inventory of TTI was sufficient to meet consumer demand for a full month, even without additional supplies from farmer partners. While this value may appear relatively low, it presents certain advantages. For instance, LUPM benefits from reduced storage costs and can efficiently manage the turnover of rice stocks within its warehouses.

Cash-to-Cash Cycle Time

The cash-to-cash cycle time is a critical metric in rice supply chain used to determine how quickly rice supply of TTI is converted into cash. Since LUPM help connect farmers and TTI, the program is help point of measurement for the entire financial turnover in supply chain. The key components used in calculating the cash-to-cash cycle time for TTI rice include inventory days of supply, average days of accounts receivable, and average days of accounts payable. The inventory days of supply that was previously measured at 30 days is the found time TTI held its rice inventory from selling out, and this directly add to the cash-to-cash cycle time for 2019. Accordingly, the average days of accounts payable, based on the payment terms (in the form of proof of bill) of TTI, was approximately 7 days. Meanwhile, the average days of accounts payable from LUPM to its suppliers (the farmers) are calculated based on the payment period after receiving bills from TTI.

As reported in other research, such as Konstantas et al. (2019), the cash-to-cash cycle it is a consideration of consumer-facing costs, such as retailer expenses, transportation, packaging, and storage. However, in this case, LUPM does direct payments to suppliers (farmers), which make in the average number of accounts payable days being zero (0) for LUPM. The following is the calculation of the cash-to-cash cycle time for TTI rice:

Cash to Cash Cycle Time = inventory days of supply + average days of account – average days of account payable

= 30 days + 7 Days + 0 days

= 37 days

The duration between LUPM paying for all inputs and receiving payment from TTI for rice sales was observed to be approximately 37 days.

This measurement emphasizes the essential need for LUPM to manage cash flow effectively in coordination with other supply chain

members. Maintaining financial health, particularly in terms of cash flow, is very important for ensuring smooth capital turnover and sustaining business operations.

Typically, if cash management within rice supply chain remains unchanged, it could potentially disrupt the financial flow and strain relationships among TTI supply chain members. This is specifically concerning given the complexity of processing and distributing agricultural products. These processes, which comprise multiple stages such as harvesting, packaging, transportation, and sales, require careful synchronization. However, the time needed for these stages does not necessarily correlate with the efficiency of farmers in adding value.

Added Value

The cumulative added value was analyzed by summing up all added values incurred in each stage of the TTI rice supply chain for a year to determine the total. Table 1 shows the added value in each stage alongside the cumulative.

From the analysis results, it is evident that farmers contributed the highest added value within rice supply chain, amounting to IDR 376,216,168. LUPM provided the second-highest contribution,

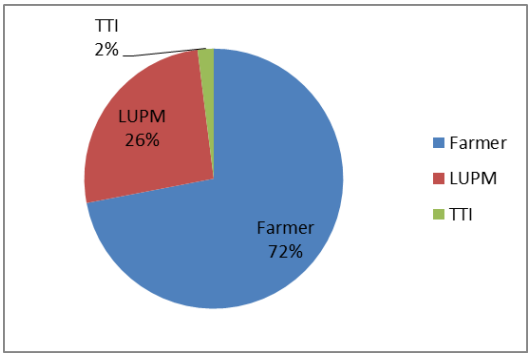

Figure 2. Diagram of Added Value Contribution
Source: Primary Data, 2020

with a value of IDR 136,678,955, while TTI contributed the least, at IDR 8,090,000, serving primarily as a bridge to connect producers with end consumers. Figure 2 is a graphical representation of the percentage distribution of VA in supply chain. VA is an important metric for evaluating economic contributions at both the product and sectoral levels. As defined by (Sutherland & Canwell, 2004), VA represents the difference between the selling price and the COGS, signifying the economic VA through the production process. Additionally, the metric is assessed by considering the life cycle costs incurred up to the sectoral level, where lower VA values signify higher efficiency (Konstantas et al., 2019).

Figure 2 shows that farmers contributed the largest share at 72 percent, followed by LUPM at 26

Table 1. Added Value of TTI Rice Supply Chain in Sragen Regency in 2019

Supply Chain Stage	Average Added Value (IDR)	Total Added Value (IDR)
Farmers	376,216,168	4,138,377,843
LUPM	136,678,955	1,503,468,500
TTI	8,090,000	242,700,000
Total	520,985,122	5,884,546,343

Source: Primary Data, 2020

percent, and TTI at just 2 percent. This significant added value signifies that the TTI rice supply chain was functioning effectively. The high percentage underscores the collective efforts of all stakeholders to deliver quality rice. Although farmers can enhance the value of respective products through diversification or quality improvements, these actions may not necessarily reduce the cash-to-cash cycle time.

Role of TTI on The Establishment of Rice Price in Sragen Regency

The analysis of price formation within the TTI rice supply chain was carried out to examine various levels, including farmers, LUPM, TTI, and consumers. This analysis takes into account factors such as production, supply, demand, market conditions, and government policies. The findings showed that not all these factors significantly influenced the pricing structure established within rice supply chain of TTI.

a.Production Factors

Production factors were analyzed based on the weight of grain produced by farmers for each LUPM. The formation of grain prices at the farmer level did not determined by production volume but determined by regional market prices. This finding is not in correspondence with the finding of Tabe-Ojong et al (2020), where the formation of low prices may be influenced by production and availability in the local market.

At the LUPM level, this research give different findings like the fact that production volume did not determine price formation, as the selling price remained stable at Rp 8,500 throughout 2019. Similarly, price formation at the TTI and consumer levels were unaffected by production, since every any supply shortages for TTI were settled by LUPM through the buy of grain from outside its territory. At these levels, price typically ranged between Rp 8,800 and Rp 9,000.

At the farmer level, TTI plays a significant role in ensuring that grain is sold at a fair price, thereby alleviating the concerns of farmers over unfavorable selling price. These findings are in line with research by Yue & Xu (2023), whose discourse was specifically concerning the dynamics of a monopoly market. The research emphasized that while production factors can be separated from price formation, maintaining consistent production quality and gradually increasing selling price remains possible.

b. Inventory Factor

Supply factor in the TTI rice supply chain did not significantly influence price formation at the LUPM, TTI, or consumer levels. LUPM was observed to maintain a stock of grain purchased from farmers, which is stored as inventory to meet rice demand. However, TTI, was found to carry out minimal inventory and only during specific periods. This

limited inventory approach was influenced by the perishable nature of rice, yet LUPM consistently ensured an adequate supply to meet community or consumer needs. Role of TTI in managing rice supply effectiv addresses the demands of the community by ensuring that Sragen Regency avoids food shortages and remains protected from price fluctuations capable of harmimg consumers. Dissimilar to these findings, Guterding (2021), argued that inventory factors did not impact price dynamics. Li & Liu (2021) also reported that an optimal shared inventory and pricing policy could be modeled as a basic stock policy linked to pricing decisions.

c. Consumption factors

The factors of rice consumption or demand were analyzed based on the weekly rice demand from TTI. At TTI, the demand for rice was observed to remain relatively stable and constant. However, this did not influence price formation at the farmer, LUPM, or TTI levels. Based on the results obtained from previously conducted field research, TTI typically implemented government-regulated pricing across all LUPMs to ensure that consumer demand is consistently met. Dissimilar to the report, research by Boachie et al (2022) suggested a relationship between demand or consumption and price.

d. Market condition factors

Market condition factors were analyzed through an examination of marketing margins and market price competition. Marketing margins at the TTI and LUPM levels did not influence price formation, but at the farmer level, these margins significantly impacted the selling price of grain to LUPM. Furthermore, research by (Gil et al., 2023) reported that global market dynamics were connected to demand-driven price formation. Field research showed that TTI rice prices were not directly influenced by market price fluctuations but contributed to stabilizing market prices. The stability of TTI rice price, achieved through price competition, prevents market surges and ensures consistent pricing. This price stability benefits consumer welfare and corresponds with the findings by Dragasevic et al (2021), who emphasized that price determination was influenced by monopoly power. In this context, the TTI rice program functioned as price controller, leveraging its monopoly-like position to maintain stable price and support broader market equilibrium.

e. Government Policy Factors

Government policy factors significantly influenced price formation within the TTI rice supply chain. The imposition of price caps on each supply chain member ensured equitable marketing margins, which fostered fairness across the system. Any policy

changes enacted by the government directly affect prices established at every level of supply chain, from farmers to consumers. This is in line with the findings by Xie et al (2022), who documented that industrial policies possessed the capability to mitigate the risk of declining stock prices by strengthening company fundamentals, reducing external uncertainties, lowering agency costs, and addressing information asymmetries.

CONCLUSIONS AND SUGGESTIONS

In conclusion, this research presented several key results. First, the establishment of TTI successfully streamlined rice supply chain in Sragen Regency, reducing the chain from six or seven stages to just three. This simplification led to more efficient marketing, while the presence of LUPM was observed to significantly improve the welfare of partnering farmers. Second, the performance assessment of LUPM asset management showed that TTI rice supplies were adequate to meet consumer demands. The investigation further emphasized that farmers contributed the highest added value (72 percent), reflecting the effective use of resources by the demographic.

Based on the results obtained from the research, it was also concluded that price setting in TTI was influenced by market conditions and government policies. These policies directly impacted pricing at the LUPM level, with the Ministry of Agriculture regulating the selling price of LUPM at IDR 8,500 and the TTI selling price ranging between IDR 8,800 and IDR 9,000. TTI played a significant role in safeguarding farmers by ensuring that grains produced were purchased at fair prices. It is also important to state that TTI significantly contributed to food security in the community by guaranteeing a stable rice supply in Sragen. This stability allowed the commodity to remain consistently available at rational and affordable price for consumers.

Several areas were identified for improvement following the observations made during the course of the research. Firstly, farmer partners should strive to further optimize respective production to increase supply of rice for TTI. Establishing effective communication and coordination with LUPM is equally important. Accordingly, farmers should also make the most of government assistance in post-harvest processes to maintain and improve the quality of rice supplied to TTI. The government, in return, should continue providing subsidies to farmers in order to ensure better income levels. These subsidies would also help LUPM manage potential losses when production costs rise but selling price remain fixed. Considering the fact that improving supply chain efficiency may not directly accelerate the cash-to-cash cycle time, efforts to streamline processes, reduce costs, and enhance distribution speed can address this issue effectively. Optimizing the entire supply chain can accelerate cash flow and benefit all stakeholders.

Furthermore, fostering collaboration among farmers, suppliers, traders, and consumers can help reduce inequalities in the agricultural supply chain. These networks can significantly strengthen the bargaining power of farmers and improve respective access to markets and essential information. The government should also conduct regular evaluations and closely monitor the implementation of the PUPM program. Lastly, instances where unsold rice is returned to LUPM in deteriorating condition should be addressed to prevent losses. In these cases, LUPM is often forced to reduce the price of rice and bear the financial burden.

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