Analysis of supply chain and added value of rice in west Lombok regency

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Abstract. West Lombok Regency is one of rice production centers in West Nusa Tenggara. Rice millings operate in the Regency to process raw rice into rice (hulled rice), and become a central point in the rice agro-industry and institution that connects actors in the supply chain, starting from raw rice to producing hulled rice as the main product. The aim of this research is to: (1) analyze supply chain mechanisms related to product flows, information flows and financial flows on rice; (2) analyze added value received by actors in the rice supply chain network; and (3) analyze marketing efficiency of rice in West Lombok Regency. This research uses descriptive methods. Data collection was carried out using surveys to the research locations of the districts of Narmada, Lingsar and Gerung, which all are the centers of rice in West Lombok Regency. There were 30 rice farmer respondents and some institutions or individuals involved in the flow of rice from farmers to end consumers. Data were analyzed by applying the analyses of descriptive, added value, and marketing efficiency. The results showed that in the rice supply chain there have been flows of product, finance, and information, amongst marketing actors or institutions. The added value and profit resulting from processing unhulled rice to hulled rice were IDR 6,100/kg and IDR 5,850/kg, respectively. It was also found that in West Lombok Regency there are three patterns of marketing channels and all of the channels operated efficiently.

Keywords: Rice, Supply chain, Added value, Marketing efficiency

1. Introduction

The problem of food, especially rice, is a problem that is always interesting because rice is the staple food. Efforts to increase rice production are faced with considerable challenges, due to the fact that agricultural land (especially in Java and Bali) has decreased from year to year so that the rice harvest area has decreased [1]. Considering its role as the main food commodity for the Indonesian people, achieving adequate national rice production is very important as one of the factors that influence the realization of national food security. This can be seen from the level of consumption in Indonesia which is still above 95%. In fact, it is estimated that the participation rate of rice consumption in both cities and rurals, in Java and outside Java is around 97% to 100%. This means that only about 3% of the total households in Indonesia do not consume rice. The reason why rice remains dominant is

because it is better as a source of energy and nutrition compared to other types of staple food. In addition, rice is also a major source of protein, reaching 40% [2].

As the population increases, the insufficient supply of rice can lead to social, economic and political instability in the country. Therefore, the program to increase rice production has always been a top priority in agricultural development [3]. Apart from the aspect of availability of production, the aspects of distribution and affordable prices are also important components in determining and creating public accessibility to rice [4]. The government's goal is to provide a stable rice supply at all times, evenly distributed and at affordable prices. This condition indicates that it is necessary to apply the concept of supply chain management in meeting consumer demand for rice supply effectively and efficiently [5].

Supply chain management and increased value added is an overview of rice management as a whole and in an integrated manner, and are interrelated from upstream to downstream. The concept of supply chain management is not limited to efforts to integrate supply chain collections, but includes a series of flows of goods or services, finance, information and added value carried out by each business chain actor [6-9]. Nusa Tenggara Barat Province is one of the rice production centers in Indonesia. Rice production in Nusa Tenggara Barat Province exceeds the needs of its population or is surplus. Nusa Tenggara Barat Province's ability to stockpile rice in Bulog's warehouses is currently sixth after the three provinces of Java, South Sulawesi and Lampung. The main rice production centers which have abundant water resources are mainly located in the northern part of West Lombok, Central Lombok and East Lombok, all of which are at the foothills of Rinjani Mountain. In West Lombok Regency, districts that have abundant resources include the districts of Narmada, Lingsar, and Gerung [10]. However, is this abundance of products accompanied by good supply chain management, or has the distribution of rice from farmers to consumers been efficient?

This study aims to: (1) analyze supply chain mechanisms related to product flows, information flows and financial flows on rice; (2) analyze added value received by actors in the rice supply chain network; and (3) analyze marketing efficiency of rice in West Lombok Regency.

2. Research Methods

This section presents method and technique of study, sampling of research locations and respondents, and data analysis.

2.1. Method and technique

This research uses descriptive methods that explore problems aimed at finding facts based on factual symptoms about the behavior of a group or society by collecting data, compiling, processing, analyzing, describing and drawing conclusions. Data collection was carried out using survey techniques, specifically by conducting in-depth interviews with respondents [11].

2.2. Determination of research location and sample

Research area was determined using a purposive method in which the research location was West Lombok Regency. In this study, Narmada, Lingsar and Gerung Districts were the sampled locations for farmers. This is because the three districts are the centers of rice production in West Lombok Regency. The number of rice farmers who became respondents was determined by quota sampling, as many as 30 farmers. The Snowball Sampling technique is used to determine respondents of institutions involved in the rice supply chain. They are traced from the institutions or individuals involved in the flow of rice from farmers to end consumers.

2.3. Data analysis

Collected data in this study are then analyzed, in accordance with paper aims, i.e. to describe supply chain of rice, analyzed added value of rice industry, and efficiency in rice marketing. Descriptive method is applied to determine the supply chain mechanism related to product flow, information flow and financial flows in the rice supply chain. This provides an overview of the mechanism of rice

supply chain management in West Lombok Regency. Hayami Method [12] is applied to analyze added value and profits obtained from rice business. Marketing efficiency is analyzed in several steps. Added value (value added) and profit are consecutively counted with the following formulas:

VA = VPP - (VRM + VSM)

π = VA - LC

Notes:
VA = Value Added (Rp/Kg)
VPP = Value of Processed Products (Rp/Kg)
VRM = Value of Raw Materials (Rp/Kg)
VSM = Value of Supporting Material (Rp/Kg)
π = Profit
LC = Labor Costs

The efficiency of the rice marketing channel is analyzed using the analyses of marketing margin, efficiency index and price share. The marketing margin for rice can be determined by the formula of Rahim and Hastuti [13], as in the following. The margin indicates that the smaller the rice marketing margin, the more efficient the marketing. The efficiency can also be decided in the ways that: (1) If RPmm> RMm, then rice marketing is efficient; and (2) If RPmm < RMm, then rice marketing is inefficient

RMm = RCp - RPmm

Notes:
RMm = rice marketing margin (rupiah/kilogram)
RCp = rice consumer price (rupiah/kilogram)
RPmm= rice price at merchant level milling (rupiah/kilogram)

Efficiency marketing index is the ratio between the total cost and the total value of the product marketed. According to Soekartawi [14] the index can be calculated using the following formula. The criterion for drawing a conclusion is that the smaller the marketing efficiency index is the more efficient the marketing channel.

$$ME = \frac{MC}{TPV} X\ 100\ \%$$

Note:
ME = Marketing efficiency (%)
MC = Marketing costs (Rp / kg)
TPV = Total Product Value (Rp)

Producer share is the share of the price received by the producer against the price paid by the consumer [15]. Producer share can be calculated by using the following formula. Results of this calculation guide decisions to be efficient or not. Marketing is efficient if the ratio of the share of prices received by farmers or producers is more than 60% of the price at the consumer level, whereas if the selling price of producers is less than 60% of the price at the consumer level, rice marketing is not efficient.

$$PS = \frac{PPL}{PLC} X\ 100\ \%$$

Note:
PS = Producer Share
PPL = Price at Producer Level
PLC = Price at the Level Consumer

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3. Results and Discussions

The structure of the rice supply chain in West Lombok Regency showed that there were 3 main streams that formed the rice supply chain in West Lombok Regency, namely the flow of products, the flow of funds and the flow of information. The three findings are discussed in the following sub-topics. Thereafter, results of additional analyses are presented to get more insights from the supply chain.

3.1. Product Flow

The structure of the rice supply chain management in West Lombok Regency can be analyzed through the actors or members who make up the supply chain and the roles of each actor in the supply chain. The rice supply chain actors involved in the study area include: farmers, grain collectors, milled grain collectors (mill traders), wholesalers, retailers and consumers. The flow of rice from farmers to final consumers can be seen in Figure 1.

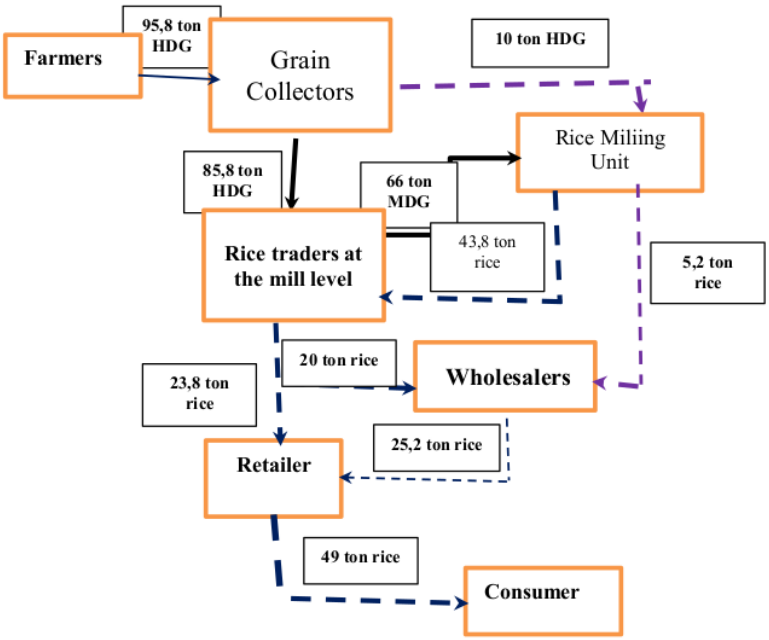

Figure 1. Supply Chain Structure of rice in West Lombok Regency.

Note:
HDG = Harvested Dry Grain
MDG = Milled Dry Grain
Flow of unhulled rice
Flow of hulled rice

The flow of rice supply starts with farmers who are important actors in the rice supply chain. After the harvest, the farmers sell their unhulled rice to village collectors in the form of harvested dry unhulled rice. Small part of unhulled rice is not for sale, but for family daily consumption needs. Figure 1 shows that the production of unhulled rice that the farmer respondents sold to village collectors was 95.8 tons. The purchasing system carried out by collectors is by visiting farmers.

Furthermore, collector traders then sell their unhulled rice to milled rice traders with a sale volume of 85.8 tons of harvested dry grain, and to wholesalers (rice) with a sale volume of 10 tons of harvested dry grain. In this product flow, rice traders at the mill level play a dual role in this rice supply chain. The first is as a grain collector, traders purchase grain from a village collector. The grain purchased from village collectors is then dried in the sun by the milling trader. From 1, it is known that from the harvested dry grain of 85.8 tons after drying, 66 tons of milled dry unhulled rice is produced, or a shrinkage of around 23%. The second role of milling grinding traders is as a rice trader (merchant) who distributes rice to wholesalers and retailers, where from 66 tons of dried milled rice, 43.8 tons of rice are produced. Furthermore, 20 tons of rice is supplied to wholesalers and 23.8 tons to retailers.

The wholesaler referred to in this study is traders who sell rice in relatively large volumes and labeled products in plastic packaging. In addition to milling by themselves, wholesalers obtain rice supplies from rice traders at the milling level. The results showed that the volume of rice sold by wholesalers was 25.2 tons of rice, of which 20 tons sourced from rice traders at the milling level, and 5.2 tons of rice was from the mills themselves. The wholesalers clean the rice and pack it in 10 kg and 5 kg packages and distribute it to relatively large retail shops or kiosks.

A retailer is a trader who distributes rice to the final consumer. The findings in the field show that there are two types of retailers. The first is a retailer in traditional markets, and the second is a retailer in a shop (kiosk). Retailers in traditional markets purchase rice from milling collectors in the form of 25 kg sacks, while retailers at shops or kiosks purchase in the packages (already labeled) of 10 kg and 5 kg packages. Furthermore, these retailers sell the rice to the final consumers.

3.2. Fund Flow

Flow of funds is a flow of finance that occurs in the process of buying and selling transactions starting from farmers to end consumers. In the transaction process, there is a change in the financial value of each actor involved in the rice supply chain. More details on the process of the flow of funds can be seen in Figure 2.

Figure 2 shows that the flow of products from farmers to consumers, involving several marketing agencies, results in different flows of funds or finance. These financial flows are indicated by the prices received by each financial institution. As in the flow of products, the institutions involved in the flow of funds, among others, are farmers, grain collectors, rice traders at the milling level and wholesalers.

At the farmer level, there is a flow of funds from grain collectors to farmers, where these traders buy unhulled rice from farmers at Rp 4 200/kg. This buying and selling system is carried out in cash, meaning that farmers receive cash as much as the proceeds from selling their grain to village collectors. The flow is indicated by the purchase price made by the milling trader at Rp 4,900/kg. The payment system is also done in cash. The flow of funds also occurred between milling traders and mill owners, where there was a flow of funds of Rp. 300,000 per ton of rice. This flow of funds represents the cost of milling or milling machine rent.

After the milling process, funds flow from wholesalers to millers and from retailers to mill traders. The figure shows that the change in shape from paddy to rice causes a significant change in the flow of funds, whereby milling traders receive a cash flow of IDR 9 500 / kg. The payment system is in cash by both wholesalers and retailers.

Financial flows in turn from retailers to wholesalers and millers. There are two types of payment, i.e. straight and delayed. Straight payment occurs in traditional markets, where payments to milling traders is in cash (straight), which is IDR 10 200 per kg. Delayed payment was from store/kiosk retailers, that is delayed until the rice has been purchased by the end consumer, at Rp 11 700/kg. The delayed payment was at a higher price than straight payment.

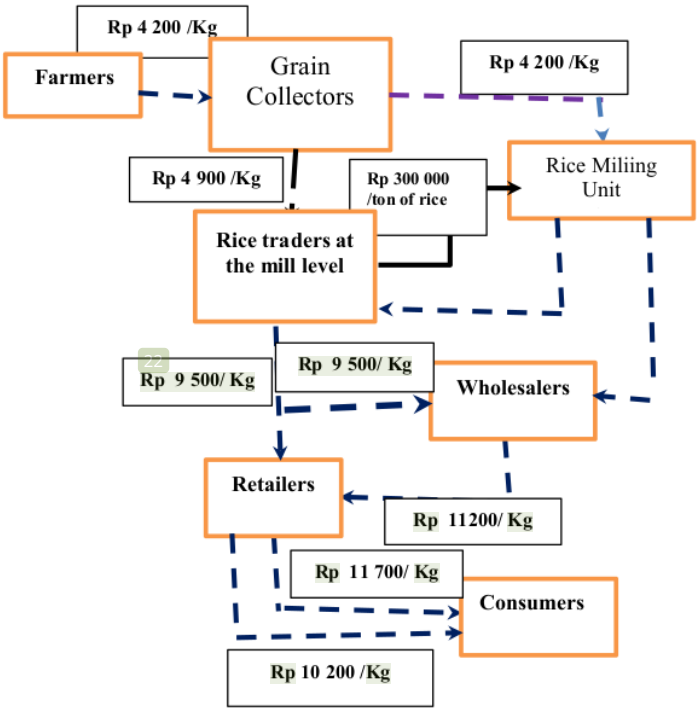

Figure 2. Flow of Funds in the Rice Supply Chain.

3.3. Information Flow

The information obtained by each actor is very important to be passed by the actors in the rice supply chain, as it serves for fulfilling and satisfying the consumers. The results showed that there were three main flows of information that occurred among actors in the rice supply chain in West Lombok Regency, including the flows of information related to product price, quantity and quality.

Information flows between farmers and collectors. The flow of information that occurs between the two actors in the rice supply chain is related to product price, quantity of demand and quality of unhulled rice. The information flows in two directions: farmers inform the quantity and quality of unhulled rice they produce to collectors; collectors provide information about prices to farmers. However, the determination of the price of rice is usually based on an agreement between farmers and collectors by considering price developments in the market and the quality of rice produced by farmers.

Information flow also occurs between traders of unhulled rice and traders of hulled rice. Information that is often needed is related to grain quality, grain moisture content, and grain prices. These three contents of information determine the attitude of the trader in purchasing decisions and subsequent processing of grain. If the required quality of rice is high enough, then traders of milled rice will need a longer time to dry it. Likewise, with information on grain prices, if the price of unhulled rice increases it will become a consideration for traders of milled rice to increase the price of rice.

The next flow of information is between marketing agency actors involving rice traders in mills, wholesalers and retailers. The information needed by wholesalers from rice traders at the mill level is

not only about price but also related to the quality of rice. Information on rice quality is very much needed by wholesalers; this is because the target market segment is a segment of middle-class buyers, that is a segment that prioritizes quality. Price information from traders at milling level is also needed by wholesalers in determining prices to shop retailers.

Meanwhile, for retailers in traditional markets, information relating to rice prices takes precedence over information on product quality. In general, retailers in traditional markets charge lower prices to consumers than prices set by retailers at shops. This is due to the fact that the rice sold by retailers in traditional markets generally sells rice not in packs and of lower quality than retailers in shops.

data in this study are then analyzed, in accordance with paper aims, i.e. to describe supply chain of rice, analyzed added value of rice industry, and efficiency in rice marketing. Descriptive method is applied to determine the supply chain mechanism related to product flow, information flow and financial flows in the rice supply chain. This provides an overview of the mechanism of rice supply chain management in West Lombok Regency. Hayami Method [12] is applied to analyze added value and profits obtained from rice business. Marketing efficiency is analyzed in several steps.

Added value (value added) and profit are consecutively counted with the following formulas:

3.4. Value Added and Profit

Value added is the increased value of a commodity due to processing, transportation or storage in a production process. Value added can be defined as the difference between the value of the product and the value of the cost of raw materials and other inputs, excluding labor [12]. Meanwhile, profit is the difference between the value of the production and the price of raw materials plus other input and labor costs [16-18]. The results of calculation of these two analyses are presented in Table 1.

Based on the analysis, it is known that the added value produced from harvested dry unhulled rice into rice is Rp 610 with a profit rate of Rp 5 850 per kilogram. The results showed that most of the farmers sold their products in the form of harvested dry unhulled rice (harvested dry rice). This means that farmers lose the opportunity to get added value and the profits since they were not involved in the rice trading.

Table 1. Analysis of Added Value and Profits in Rice Supply Chain.

No.	Description of	Value (Rp / Kg)
1.	Price of raw materials (unhulled rice)	4 200
2.	Transportation costs (a)	150
3.	Drying costs (rental space) (b)	100
4.	Packaging costs (c)	50
	Milling costs (d)	300
5.	Value of Supporting Materials (costs) (a + b + c + d)	600
6.	Labor:	250
	Cost of drying	100
	Cost of packaging	150
7.	Value of processed products (rice)	10 900
8.	Value added = 7 - (1 + 5)	6 100
9.	Profit = 8 – 6	5 850

3.5. Rice Marketing Channel

Marketing channel is a system which ensures the distribution of the merchandise from the producer to the consumers by passing it through multiple levels known as middlemen. The marketing channel for agricultural products can be a long, very complex route or a simple one. The results show that there are three rice marketing patterns that occur in the research area, i.e. the pattern I, II, and III. Marketing channel pattern I, i.e. the distribution channel of rice that involves 3 marketing agencies, starting from

traders at the milling level, to wholesalers, to retailers, and to consumers. Marketing channel pattern II, involves two marketing agencies, i.e. rice retailers subsequent to consumers. Marketing channel pattern III, also involves two marketing agencies, i.e. wholesalers to retailers, and then to the consumers.

The findings shows that the distribution process of rice marketing of rice to consumers that occurs in West Lombok is quite simple and only involves 3 marketing institutions, i.e. traders at the milling level, wholesalers and retailers.

3.6. Rice Marketing Efficiency

Marketing is an activity of delivering goods from producer level to consumer level in an effort to obtain the necessary goods [19-22]. A marketing system is efficient when it is able to make a fair share of the total price paid by the end consumers. In a study determining the efficiency of rice was carried out by analyzing the marketing margin, marketing efficiency index and producer share. The results of the analysis of rice marketing efficiency in the study area are presented in Table 2.

Table 2. Analysis of Rice Marketing Efficiency in West Lombok Regency, 2020.

No.	Description	Channel I	Channel II	Channel III
1.	Merchants (Milling Traders)	9 500		
	○ Selling price of rice (Rp/Kg)			9 500
2.	Wholesalers Buying			
	○ Price (Rp/kg)	9 500		
	○ Selling price (Rp/kg)	11 200	11 200	
	○ Marketing Costs (Rp/kg)	350		
	○ Labor Costs (Rp/kg)	75		
	○ Packaging Costs (Rp/kg)	125		
	○ Transportation Costs (Rp/kg)	150		
3.	Retailers			
	○ Buying Price (Rp/kg)	11 200	11 200	9 500
	○ Selling price (Rp/kg)	11 700	11 700	10 200
	○ Marketing cost (Rp/kg)	125	125	125
	○ Labor Costs (Rp/kg)	75	75	75
	○ Other Costs (Rp/kg)	50	50	50
	Total Marketing Costs (Rp/kg)	475	125	125
	Marketing Profits (Rp/kg)	1 725	375	575
	Marketing Efficiency Analysis:			
	1. Margins Marketing (Rp/kg)	2 200	500	700
	2. Efficiency Marketing Index (%)	4	1.5	1.2
	3. Share Price (%)	85	95	93

The analysis indicates that the 3 patterns of distribution channels for rice are efficient marketing channels. This is indicated by the results of the calculation of the measurement of marketing efficiency, i.e. of margin analysis, efficiency marketing index and price share, all have met the criteria of efficiency.

The results of the marketing efficiency analysis using the marketing margin approach, show that the marketing margin value generated by the marketing channel of pattern I is Rp 200/kg of rice, pattern II produces a marketing margin of Rp 500/Kg of rice and pattern III produces a marketing margin of Rp 700/Kg rice. According to Rahim and Hastuti [13] (2007) as long as the selling value of

rice per kilogram is greater than the value of the marketing margin, the marketing channel is categorized as efficient. Thus, it can be said that the 3 patterns of marketing channels in the research area are efficient. Furthermore, Rahim and Hastuti [13] stated that the smaller the marketing margin, the more efficient the marketing. The results of the analysis show that of the 3 patterns of marketing channels, pattern II is the most efficient compared to patterns I and III, this is because the marketing channel pattern II produces the smallest marketing margin value.

The results with the efficiency index show that the three marketing channels in the research area have also been efficient. According to Soekartawi [14], if the marketing efficiency index value is less than 100%, the marketing channel in the supply chain is efficient and the smaller the marketing index produced by the marketing channel is more efficient. The results of the analysis show that of the three rice marketing channels in the research area, pattern III of marketing channels is more efficient than patterns I and III. This is indicated by the value of the marketing efficiency index in the marketing channel pattern II which is smaller than the efficiency index in the marketing distribution patterns of I and III.

The calculation of efficiency using the share price approach also resulted in a decision that the 3 patterns of rice marketing channels at the research location were efficient. The price share shows the comparison of prices at the producer level with prices at the consumer level [19-22]. According to Downer & Erickson [15], if the ratio of the share of prices received by farmers and producers is more than 60% of the price at the consumer level, the marketing channel is efficient. The results of the analysis of the share price of the producers show that all the marketing channels of patterns I, II, and III produce values greater than 60%, with price share of respectively 85%, 95% and 93%. This value also shows that the most efficient pattern is pattern II, because rice producers enjoy the largest share of the price compared to patterns I and III.

The analysis reveals that the marketing channel pattern I has a greater marketing profit than the pattern II or pattern III. The amount of marketing profit contained in the marketing channel pattern I is Rp. 1,725/Kg, the pattern marketing channel II is Rp. 375/Kg and pattern III is Rp. 575/Kg. Although the total profit contained in the pattern marketing channel I is the largest, the marketing channel is also longer than the pattern II or III channel, where the pattern I marketing channel involves three marketing agencies. On the other hand, although pattern II marketing channels have the smallest marketing profit compared to patterns I and III, the marketing networks or distribution are more numerous, so that the total sales volume is also greater and in the end will also get a large total profit.

4. Conclusion

The conclusion from this study is that the rice supply chain management system in the regency has been running quite well, and has produced 3 chains, i.e. product flow, financial flow and information flow. The added value and profit generated from unhulled rice to rice are Rp 6 100 / kg and Rp 5 850 / kg, respectively. There are 3 patterns of marketing channels: Channel I: Trader at Milling→ Wholesaler → Retailer → Consumer; Channel II: Wholesaler → Retailer → Consumer; and Channel III: Trader at Milling→ Retailer → consumer. These three channels of rice marketing were efficient.

Given the large added value and profit from rice agro-industry and at the same time knowing information directly on the level of final consumer satisfaction, it is better if farmers also act as rice traders. Thus, farmers as the main supplier of rice can find out consumer needs and improve their cultivation techniques so that the rice produced can satisfy rice consumers.

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