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Value Chain Analysis on Pigmented Rice: A Case Study in Sleman Regency, Special Region of Yogyakarta, Indonesia

Kilana Putri Anindita, Dyah Ismoyowati*, Endy Suwondo

Department of Agro-industrial Technology, Faculty of Agricultural Technology, Universitas Gadjah Mada, Jl. Flora No. 1, Bulaksumur, Yogyakarta 55281, Indonesia
*Email: dyah_ismoyowati@ugm.ac.id

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ABSTRACT

White rice has become the main source of carbohydrates, but in the last few years, red and black rice are getting more popular. Red and black rice can be an alternative food for people who wish to reduce the risk of diabetics due to its low glycemic index. Pigmented rice demand in Yogyakarta is continuously increasing. However, farmers are reluctant to plant pigmented rice because of their lower yields. Value chain analysis on pigmented rice is performed to provide the condition of the business' performance for farmers who are not willing to work on pigmented rice yet. The objective of this study was to identify the main activities and to measure the performance of the value chain. The value chain performance was measured by calculating profit, marketing margin, and farmer's share. In the business of pigmented rice nowadays, there are 5 actors involved, i.e. farmer, farmers group, association of farmers groups, distributor, and retailer. These five actors formed 5 value chains for red rice and 4 value chains for black rice. The main activities were cultivating, cropping, milling, sorting out, packing, and selling. The performance of the pigmented rice was as follows: on the red rice value chain, farmers earned the highest profit in each chain, except on the chain where the association of farmers groups was involved. The largest marketing margin was found on the farmer – association of farmer groups – retailer – end-user consumer chain. On the black rice value chain, farmers earned the highest profit in each chain, except on the chain where the farmers group was involved. The largest marketing margin found on the farmer – farmers group – distributor – retailer – end-user consumer chain. For both the red and the black rice value chain, the farmer's highest share was obtained on the farmers – distributor – end-user consumer chain.

Keywords: Black rice; red rice; value chain analysis

INTRODUCTION

Rice is the staple food for most of Indonesian. According to Damayanti (2015), there are generally three kinds of rice namely white rice (*Oryza sativa*), red rice (*Oryza glaberrima*) and black rice (*Oryza sativa L. indica*). White rice is rice whose bran is removed. Generally, rice needs to be ground to remove all layers (husks and bran) to get white rice (Sulaksono, 2015). Meanwhile, pigmented rice is rice whose bran contains antioxidant-pigment-producing genes to give red or purple color. It is different from white rice, brown rice is pound rice (only the husk needs to be removed). The benefits of brown rice are preventing cancer. Rui Hai Liu from Cornell University, United States, states that brown rice contains many anti-cancer essences, fiber, selenium, frenula, and lignin. Like brown rice, black rice is rich in the bran that contains purple anthocyanin pigments. Because of the higher pigment, the color is dark purple to black. Black rice can be used as a source of anthocyanins for antioxidants (Purwasasmita and Sutaryat, 2014).

In another study, it was found that black rice has a lower glycemic index than the glycemic index of red and white rice (Isa, 2016). The glycemic index of black rice is 19.04, lower than brown rice (43.30) and white rice (97.58). So, from their glycemic index value, red and black rice can be an alternative food for people who wish to reduce the risk of diabetes.

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Pigmented rice production is currently still low. Although pigmented rice promises higher prices, many farmers are still resisting to plant pigmented rice. This is because the pigmented rice market is still uncertain. Those who consume pigmented rice are still limited to people who go on certain diets.

However, in recent years, the popularity of pigmented rice as a healthy food has become increasingly popular and has encouraged several actors to produce pigmented rice. Nowadays, pigmented rice with various brands is widely sold in modern retail in DIY. This shows that the pigmented rice market is growing.

A series of activities done by the actors of each tier of business will establish a value chain. Value chain analysis on pigmented rice can describe the business actor's character, their activities, and their business performance. Therefore, value chain analysis on pigmented rice is done in order to give a description of pigmented rice business, especially to the farmers who don't will to plant pigmented rice yet. The results can be considered for them to participate in the pigmented rice business. So the objectives of this research are to measure and to analyze the value chain of pigmented rice's performance using the following indicators: profit, marketing margin, and farmer's share.

Value Chain

According to Porter, the value chain is a series of connection activities creating value from raw products to supply finish products for end-user consumers, and maybe continued until recycle and create a new value chain. Porter also described that value is money in which customers are willing to buy the product. So, value is the conversion of benefit or value's product in the money unit. Higher value from product or service makes a higher willingness of a customer to pay. Therefore, success key in the competition is to create value continuously for the customer, as the corporation must be customer-oriented (Mildawati, 2006).

In fact, the value chain is started from the production stage (physical and services change), shipment to customers, until waste banishment. Value chains are integrated activities in which products and services are arranged, manufactured, and send to customers with support from marketing agents (Sinaga *et al*., 2014). The concept explained that systematic activities are done by corporate and how marketing agents can interact with each other. The concept of value chain played the main role in describing complex network, connection, and incentive with adding activities to increase the value of the product in the supply chain. Using the value chain framework, the corporate can gain a footing in the market and relate with supplier, buyer, and competitor.

Value Chain Analysis

According to Chandra (2011), the value chain analysis is a strategic analytical tool used to identify an area where value can increase or decrease cost. It helps an organization to get a competitive advantage. Value chain analysis centers on product and service, except to get a competitive advantage.

In-depth value chain analysis explains many aspects. The mapping value chain is an important step in value chain analysis. There is not a map of the value chain which is comprehensive. There are many potential dimensions of the value chain that can be introduction mapping: product channel, actors, cost and profit, etc. One aspect that can be explained and be used to learn about value chain is cost and profit (Kusumawardani, 2012).

A marketing channel is also formed in the value chain. Each chain has a different efficiency level of marketing. Marketing margin and farmer's share analysis are ways to understand the efficiency level of marketing. According to Muqtadir (2016), the marketing margin can be defined as a quarrel between the price in the market and production cost. A short length of marketing channel can affect the profit. The longer the marketing channels, the greater the marketing margin because the more marketing agents included. The greater the marketing margin, the smaller the farmer's share. So, the longer the marketing channel will be more inefficient.

MATERIALS AND METHODS

This research was done in Special Region of Yogyakarta with the sample taken from the actors of pigmented rice business namely farmer, farmers group, and association of farmer's groups, distributor, and retailer. Purposive and snowball sampling were used to take samples. Purposive sampling was used based on the criterion that the actors had to distribute their product in the Special Region of Yogyakarta. Snowball sampling was used because there was an unknown number of population of a pigmented rice farmer. In addition, that technique was done by moving in one stage to the final stage. It was used to understand the pigmented rice product's flow from farmer to end user.

The data in this research were obtained directly from actors of pigmented rice business, including types of rice produced and sold by the actors, business activities done by the actors, the role of each actor in pigmented

rice business, kinds of product, operational cost which is needed to producing and marketing product, the number of production and disposal pigmented rice, and the price of product. Direct observation and depth interviews were used to gather the data.

The data were analyzed qualitatively and quantitatively. The qualitative method was used to explain the pigmented rice business system and its players. The maps of the value chain of pigmented rice were used to describe the structure of pigmented rice business' actors, and also describing their roles. Furthermore, all activities in the value chain done by actors then identified and classified according to its performance. Some indicators were calculated including calculation of cost and profit, calculation of marketing margin and farmer's share.

Calculation of Cost and Profit

Profit (π) was obtained by actors, included decompression between total revenue (TR) and total cost (TC) (Equation 1, 2 and 3).

$$\pi_i = TR_i - TC_i \quad (1)$$

$$TR_i = Y_i \times Py_i \quad (2)$$

$$TC_i = FC_i + VC_i \quad (3)$$

where:

Y : volume of sold product
Py : product price
FC : fixed cost
VC : variable cost
j : actor

Calculation of Marketing Margin

The calculation of the marketing margin was done in each chain. Mathematically, as shown in Sutarno (2014), the number of marketing margin can be calculated according to the Equation 4 and 5.

$$MP_j = Pr_j - Pf_j \quad (4)$$

$$MP_j = \sum Bi_j + \sum Ki_j \quad (5)$$

where:

MP : marketing margin
Pr : price in retails
Pf : price in farmer level
$\sum Bi$: total cost for marketing
$\sum Ki$: total revenue obtained by marketing agents.
j : chain

Farmer's Share

The calculation of farmer shares was done in each chain. The number of farmer's share can be calculated according to the Equation 6.

$$Sp_j = \frac{Pf_j}{Pr_j} \times 100\% \quad (6)$$

where:

Sp : farmer's share
Pf : price in farmer level
Pr : price in retails

RESULTS AND DISCUCCION

Pigmented rice (red and black rice) is one of the commodities which its market is growing rapidly in Yogyakarta. The growth of pigmented rice supply in its market is affected by the performance of its actors. The number of respondent actors of pigmented rice business in this research is presented in Table 1.

Maps of Pigmented Rice Value Chain

The value chain of pigmented rice was formed according to the result of the interview with respondents. The number of chains was formed using importance degree, high frequency and volume of pigmented rice sales.

There are 5 value chains of pigmented rice (Figure 1). According to its chain, the actors of pigmented rice business are farmers, farmers group, and association of farmer groups, distributor and retailer.

Table.1. Pigmented rice business' respondents

No.	Actors	People/organization
1.	Farmer	25
2.	Farmers group	3
3.	Association of farmer groups	1
4.	Distributor	2
5.	Retailer	8
Total	39	

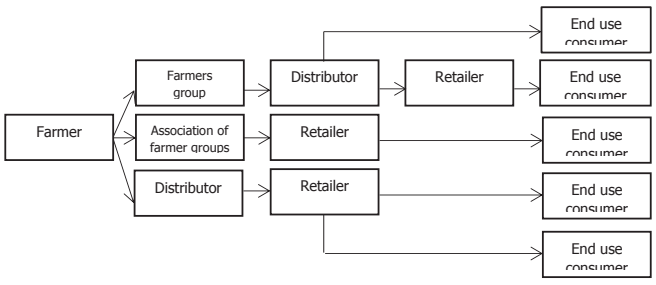

Figure. 1. Value chain of pigmented rice

Farmer

Farmer is the main actor because he is the one who plants the paddies. Some channels chosen by farmers to sell their products are farmer's group, an association of farmer's groups, distributor and directly to the customer. Some farmers chose the farmer's group to sell their product because they would get some benefits. Farmer's group laid its farmers to choose a market to sell their product freely, so it did not bound the farmers to give all their products to farmer's group and in certain quantity and time.

Other farmers sold their product to an association of farmers groups because, in some areas, there was an active organization to coordinate farmer's business. Moreover, there are other farmers who did not join in farmer groups or an association of farmers groups. They chose to sell their products to a distributor or directly to the end-user consumers. The choice of selling directly to the distributor is because there is no element of competition among farmers, and they can send all their products to the distributor in a certain quantity and time. Farmers also chose to sell their products direc to the customer but rarely be found.

Farmers group

The farmers' group was the second chain in the value chain of pigmented rice. Generally, it was an organization which coordinate farmer in order to do farming. In addition, it had a role to supply seed, fertilizer and other tools to do farming. Farmers group sold its product (rice) to some channels: distributor, retailer, and directly to the consumer. It sold in a huge amount of rice to a distributor, but sold to the retailer and directly to the consumer in few volumes.

Association of farmers groups

The association of farmers groups is in the secc chain of pigmented rice. It had a similarity role as a farmers group, but it had clearer organization structure and coordination than the farmer's group. This association also had its own product brand. It sold its products through retailers and directly to the end-user consumers. However, the frequency and volume of sales which sold directly to the end-user consumer were quite small.

Distributor

The distributor is the third and second agent in the value chain of pigmented rice. Generally, th distributor bought rice from a farmer or farmers group They have a brand to its products and sold them. It sold its products to a retailer or end-user consumer. It had an alliance with the farmer or farmers group, so it got pigmented rice from them in huge amounts easily. It sold to retailers in order to increase the market and facilitating end-user consumers**.**

Retailer

The retailer was the third and fourth stage in the value chain of pigmented rice. Generally, retailers bought and packaged pigmented rice at certain volumes. They sold their products directly to end-user consumers. Due to the direct delivery of the product to end-user customers, the retailer becomes an interesting choice for other actors to sell their products. The value chains as shown in Figure 1 have their respective characteristics. The explanation of each identified value chain as shown in Figure 2 to 6.

The first chain is found in business in red and black rice. Farmers sold their product (dry-mill rice) to farmers group. Farmers group paid them in cash (Figure 2). The distributor bought rice from farmers group in cash or non-cash and sold it to the end-user consumer.

Figure 2. The first chain of actors in the pigmented rice business

The second chain was done business on red and black rice. It has a similarity with the previous chain. However, in this chain, distributor sold their product through a retailer (Figure 3). The distributor bought rice from farmers group in cash or non-cash; it depended on the payment system in the retailer. Distributor use consignment to its marketing system to a retailer where the retailer would pay a product if the product had bought by the end-user consumer.

Figure 3. The second chain of actors in the pigmented rice business

The third chain is a type of value chain presented in Figure 4, is found specifically in business on red rice. Farmers sold their product (milled dry rice) to the association of farmers group. The association will pay them in cash. Next, the association did consignment to retailers that would pay the product when it sold to the end-user consumer.

Figure 4. The third chain of actors in the pigmented rice business

The fourth chain involves 3 actors (Figure 5). Farmers sold their product to the distributor, which, in turn, sold it to the end-user consumer. This type of chain is found in both red and black rice businesses.

Figure 5. The fourth chain of actors in the pigmented rice business

As in the fourth chain, the fifth chain was also found in both the red and black rice businesses. It had a similarity with the previous chain. However, in this chain, distributors sold their products for end-user consumers through a retailer (Figure 6). Distributor use consignment system to its marketing system to a retailer that would pay if the product sold to the end-user consumer.

Figure 6. The fifth chain of actors in the pigmented rice business

From the mapping results presented in Figure 1, which are divided into 5 value chains, there are 5 chains that have been identified for the red rice business and 4 chains in the black rice business. The five value chains of red rice business are identical to the pigmented rice value chain presented in Figure 1, while the four value chain of black rice presented in Figure 7.

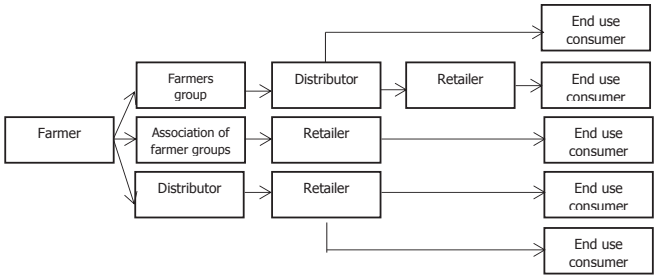

Figure 7. The value chain of black rice

Identification of Activities in Pigmented Rice Value Chain

The result of value chain mapping on pigmented rice could describe activities done by actors in each chain. The main activities that usually done in the chain are cultivating, cropping, milling, sorting, packaging and selling (Figure 8).

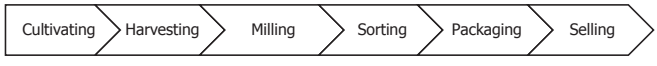

Figure 8. The main activities in the value chain of pigmented rice

Farmer is the actor in the first chain that has most activities. They do cultivate, harvesting, milling (include threshing), and selling to the following chain. Selling activity is done by all actors in the value chain. Meanwhile farmer groups usually only do raw packaging of milled dry rice and do milling, before selling activity. More activities are carried out by farmer group associations and distributors. They can do grinding, sorting, packaging, and selling. For retailers, what is usually done is repacking it in smaller packages as needed to be sold to end consumers.

Analysis of Value Chain on Pigmented Rice Supply Chain Performance

Measurement on the value chain of pigmented rice's supply chain performance used indicator: profit, marketing margin and farmer's share. Because all actors did not do business with both red and black rice, the measurement was done for red rice and black rice respectively.

Analysis of cost and profit

Cost to cultivate paddies until they were ready to deliver to consumers included: procurement the seeds and fertilizer, conversion cost of mill rice, packaging, transporting and wage to the worker who plowing up the field, cropping, milling, sorting out, and marketing. The amount of cost also depends on the actors' activities. There are 5 value chains of red rice. Profit and percentage of profit obtained by farmers for all chain are shown in Figure 9. The highest profit in each chain was obtained by the farmer, except on the third chain. Association of farmers groups is only included in the value chain of red rice. In the third chain, the association of farmers groups obtained the highest profit.

In the case of black rice business, there are 4 value chains. Profit and percentage of profit obtained by farmers for all chain are shown in Figure 10.

Generally, the highest profit in each chain of red rice is obtained by the farmer. However, there is one chain in which the association of farmers groups obtained the highest profit (Figure 9). In the value chain of black rice, there are two chains in which farmers group obtained the highest profit. The highest profit should be obtained by the farmer to increase their prosperity.

As shown in Figure 9 (first, second and third value chain) for red rice and Figure 10 (first and second value chain) for black rice, the farmer sold their products in dry-mill rice. In the case of the fourth and fifth value chain of red rice and the third and fourth value chain of black rice, the farmer also does milling and sorting out so they sell their products in form of rice.

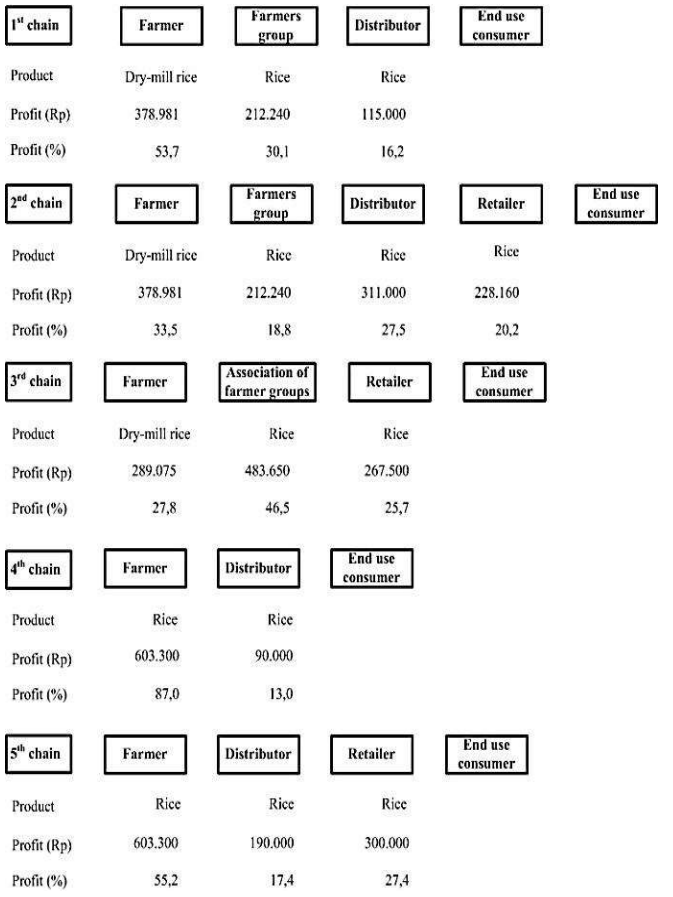

Figure 9. Profit on value chain of red rice

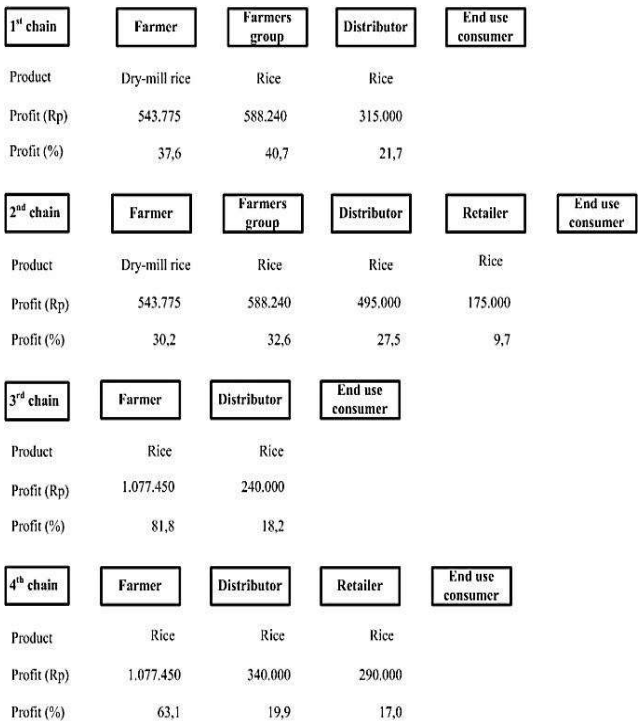

Figure 10. Profit on value chain of black rice

As a consequence, the farmers get more value to their products. The greater value was given, the greater the profit was obtained.

Marketing margin

The marketing margin was calculated in order to find out the difference between prices at the retail level and the price at the farmer level in each chain. The amount of marketing margin was affected by some cases. In the value chain of red rice, the greatest marketing margin was in the third chain (farmer – the association of farmer groups – retail – end-user consumer) and the smallest is in the fourth chain (farmer – distributor – end-user consumer). The marketing margin in the value chain of red rice is shown in Figure 11.

In the value chain of red rice, the greatest marketing margin was in the second chain and the smallest is in the third chain. The marketing margin in the value chain of black rice is shown in Figure 12. Theoretically, the greater number of actors who are in the chain will affect the marketing margin in that chain, but this is not happening in the value chain of red rice. In that chain, the greater marketing margin is not resulted by the greater number of actors but due to the actor's decision that determines the high price. However, in the value chain of black rice, the greater marketing margin was affected by the greater number of actors in the chain. The marketing margin will affect farmer's share, it matches with the theory to both red and black rice. The theory is the greater the marketing margin, the smaller farmer's share, and the smaller the marketing margin, the greater the farmer's share.

Farmer's share

Farmer's share is used to compare prices at farmer level and retail level in each chain (Figure 13).

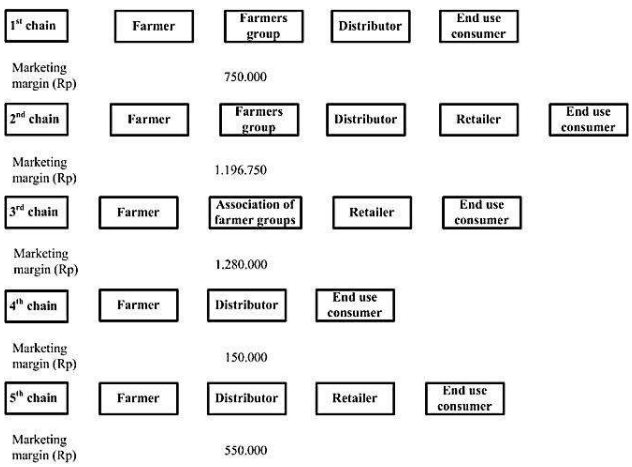

Figure 11. Marketing margin on value chain of red rice

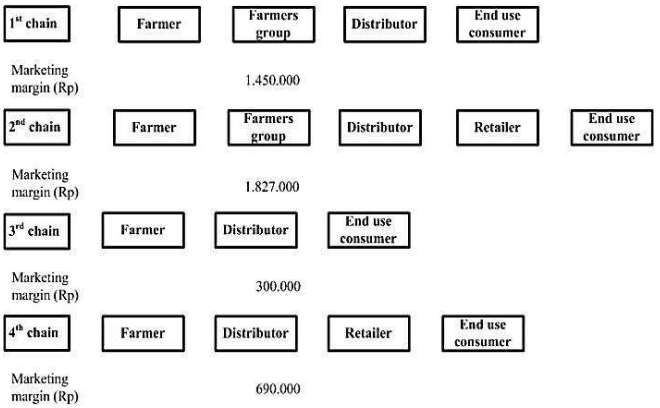

Figure 12. Marketing margin on value chain of black rice

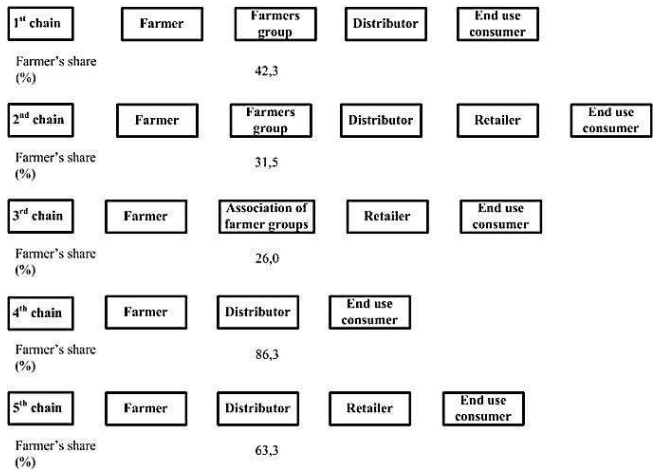

Figure 13. Farmer's share on the value chain of red rice

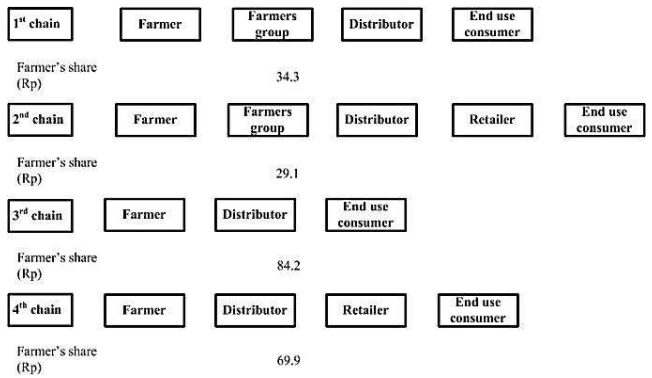

Figure 14. Farmer's share on the value chain of black rice

In the value chain of red rice, the greatest farmer's share is in the fourth chain and the smallest was in the third chain. However, the greatest farmer's share on the value chain of black rice is in the third chain and the smallest was in the second chain. Farmer's share in the value chain of black rice is shown in Figure 14.

CONCLUSION

The five actors in pigmented rice business establish 5 kinds of value chains for red rice and 4 kinds of value chains for black rice, with the main activities are cultivating, harvesting, milling, sorting, packing and selling. On a value chain of red rice, farmers earn the highest profit in each chain, except on a chain in which association of farmers groups involved in it. Furthermore, for black rice, farmers earn the highest profit in each chain, except on a chain in which farmers group involved in it. The largest marketing margin on the chain is the chain that consisted of the farmer, association of farmer groups, retailers, and the end-user consumer. On both of red and black rice, the highest farmer's share was obtained on the chain that consisted of the farmer, distributor, end-user consumer.

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CONFLICT OF INTEREST

Authors declare no conflict of interest.

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