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ANALYSIS MARKETING AND FORECASTING RICE PRICE IN THE MEKONG DELTA OF VIETNAM

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ABSTRACT

Rice is considered to be the most important crop in Vietnam. In 2009, Vietnam exported approximately 5.6-6.0 million tonnes of milled rice. Most of the rice follows mainly channels: (i) Producers–Assemblers – Millers – Polishers – Wholesalers – Retailers – Consumers. (ii) Producers – Assemblers/ Milling/ Polishing – Wholesalers – Retailers – Consumers. (iii) Producers – Millers/ Polishers – Wholesalers – Retailers – Consumers. Analysis marketing and price spread of normal rice in the first and second channels indicated the producers who sold their produce could realize 43.26 per cent of the consumer's price. The rest, 56.74 per cent, was shared by other market functionaries. In channel III, producers share higher of the consumer's price was high than in all the other channels discussed earlier, about 48.70 per cent of consumer's price. Total price spread in this accounted for 51.30 per cent of the consumer's price. Forecasting price of HQR in CanTho market from September, 2010 to August, 2011 indicated that the HQR price is forecasted to be VND 13,718 per kg in September, 2010, which increases to VND 15,488 per kg in December, 2010. The model was also given HQR price in January, 2011 (15,502 vnd per kg) which will be increasing to VND 16,350 per kg in August, 2011. The government should establish wholesale markets together with build storage, warehouse with biggest reserve capacity in each province along with procurement center to make rice cultivation more remunerative through increased share of consumer recipes to the produces. There is a need to reduce the taxes and fees for the traders and their business activities, which may lead to reduction in the price spread and thus benefit the rice producer.

Key word: HQR (high quality rice)

INTRODUCTION

Rice is considered to be the most important crop in Vietnam. It has a long traditional history and makes a great impact on the life of rural people in Vietnam. With market reform, the proportion of rice in food production, in terms of output (unhusked rice equivalent), has increased from 80.80 per cent in 1980 to 97.60 per cent in 1996 (SDAFF 2001).

Since 1989, Vietnam has become the world's second largest rice exporter. Rice production reached 32.9 million tones a year for the period 2000 – 2002 with annual exports touching 3.5 million tonnes. Vietnam supplied rice to more than 120 countries over the world. Most of Vietnam's rice export is classified by the percentage of broken grains. In 2009, Vietnam exported approximately 5.6-6.0 million tonnes of which Philippines (34.47%), Malaysia (9.29%), and Singapore (5.18%), Taiwan (3.16%), Iraq (2.76%), Russia (1.48%), Hongkong (0.72%), South Africa (0.63%), Ukraine (0.63%), Indonesia (0.28%) (MARD 2009). Although low quality rice represents a high rate, high quality rice (5% broken) occupies more than 25 per cent of the total export volume. About 10 per cent of exported rice is not classified by grades or quality. In the recent past, Vietnam's rice quality has also considerably improved (http://www.molisa.gov.vn /new/).

Area under High Quality Rice (HQR) is increasing in Mekong Delta. The HQR always command high price in the market and the domestic consumers prefer to use HQR. The study attempts to analyze marketing of normal rice and forecast price of HQR at Can Tho city in the future. It is fundamental for policy makers to encourage farmers in the region to increase area under HQR, and augment the productivity of HQR. Further, the study find out the market channel for rice analyses efficiency for each of channel.

METHODS

1 Marketing analysis

Marketing margin refers to the difference between prices at different levels in the marketing system. The total marketing margin is the difference between the price the consumer pays and what the producer/farmer receives for his paddy or rice. In other words it is the difference between retail price and farm price. A wide margin usually means high prices to consumers and low prices to producers. The total marketing margin may be subdivided into different components: all the costs of marketing services and the profit margins market were earned owner. The cost of marketing includes all the costs involved in the creation of place, time, and form utilities. Such costs should be recovered and earn a reasonable return to investment Costs vary depending upon the services rendered. The marketing costs usually include wages as return to labour; interest as return to borrowed capital; rent as return to land and buildings; and profit as return to entrepreneurship and risk capital. An analysis of marketing costs would estimate how much expenses are incurred for each marketing activity. It would also compare marketing costs incurred by different actors in the channel of distribution. Paddy/rice marketing margins or profit margins are computed as follows:

Profit margin of each type of rice trader = Gross marketing margin of each type of rice trader - Total marketing cost incurred for each type of rice trader

2 Price spread: The term price spread has been variously defined and understood according to its usage. Commonly, the term means the difference between the price paid by the ultimate consumer and the price received by the producer/ seller or farmer. This difference is often called farm retail spread or price spread. In this present study the price spread was worked out by taking the different between the consumers' price and the net price received by the producers.

Channel I: Producers – Assemblers – Millers – Polishers – Wholesalers – Retailers – Consumers.

Channel II: Producers – Assemblers/ Milling/ Polishing – Wholesalers – Retailers – Consumers.

Channel III: Producers – Millers/ Polishers – Wholesalers – Retailers – Consumers.

3 Box-Jenkins model: Time series models should serve the twin objectives of identifying the stochastic process of the series and predicting the future values accurately. The Box-Jenkins model developed by Box and Jenkins (1968 and 1969) fulfills these two conditions. This model is based on auto-regressive integrated moving average (ARIMA) process. Auto-regression (AR) and moving average (MA) and mixed auto-regressive moving average models have been studied for many years. However, Box and Jenkins demonstrated how these could be used to analyzed non-stationary and seasonal data. Thus the ARIMA models have come to be generally referred to as "Box-Jenkins models".

If a given set of observation Y(t) are the realization of a random variable Y(t) and has the density function $f_{Y(t)}$, t=1,2,…T.

In time series analysis, differencing of the series is a widely accepted procedure to achieve stationery. First differencing involves subtracting successive Y (t) terms. The resulting series is usually denoted as Z(t). Thus,

$$\mathbf{Z\ (t) = Y\ (t) - Y\ (t\text{-}1)}$$

Which is parsimoniously denoted as (1-B)Y(t).

If after first differentiation, the series does not become stationary, second differencing is done as follows:

$$\mathbf{Z\ (t) = Y\ (t) - 2\ Y\ (t\text{-}1) + Y\ (t\text{-}2)}$$

The Box – Jenkins procedure is concerned with fitting ARIMA models to a given set of data. The fitting of the Box – Jenkins model primarily consists of four stages:

Model identification: The purpose of the identification phase is to select a specific ARMA model from the general class of ARMA (p, q) processes as:

$$\mathbf{Y_t = (\Phi_1\ Y_{t-1}) + (\Phi_2\ Y_{t-2}) + \ldots + (\Phi p\ Y_{t-p}) + e_t - (\theta_1\ e_{t-1}) - (\theta_2\ e_{t-2}) - \ldots - (\theta_q\ e_{t-q})}$$

Where, Y_t = independent variable, Y_{t-1}, Y_{t-2} = past value of the independent variables Y_t, p = order of Auto Regressive (AR) process, q = order of Moving Average (MA) process, e_t = error term, e_{t-1}, e_{t-2} = past values of error term, Φ_1, Φ_2 and θ_1, θ_2 = parameters to be estimated

The main aim of identification is to determine which model best explains the structure of the data. The choice of the appropriate p and q values requires examining the Auto-correlation (ACF) and Partial auto correlation coefficients (PACF) calculated for the data.

Identifying the order of an AR process can be done by examining their partial auto correlations. The order will simply be equal to the number of partial auto correlations significantly different from zero. The partial auto correlations up through p time lags will be significant, while the remaining will be close to zero. This cut off p, will be the order of the AR process.

By examining the Auto-correlation function, the order of the MA process can be identified. If the q auto-correlation is significantly different from zero and if the others are not, then q is the order of the MA process.

Yet another application of the auto-correlation function is to determine whether the data consists of a strong seasonal component. This phenomenon is established if the auto-correlation coefficients at lags between t and t – 1 are significant. If not, these coefficients will not be significantly different from zero. These properties of the auto-correlation function can be used to understand the following aspects on data. Randomness of the data, Stationary of the data, Non–stationary and if so, the level at which they become stationary, Seasonality of the data, If seasonal, the length of the seasonality.

Though the identification may not be precise to begin with, it only commits one to a model, which on estimation is subjected to diagnostic checks and amenable for further modification thereafter. **Estimation:** the parameters are estimated by maximum likelihood procedure. **Diagnostic checking:** Diagnostic checks are then employed to the model to check whether the estimated model is adequate or not. Diagnostic checking provides the goodness of fit. According to Box and Pierce (1970), the fitted ARIMA model is adequate if

$$Q = n\sum r_i^2$$

is not significant where Q is approximately distributed as Chi-square with (k-p-q) degree of freedom. Where: r_i^2 = cross correlation coefficients, n = number of observations, p = order of auto regression (AR) process, q = order of moving average (MA) process, k = number of lags. **Modification:** the diagnostic checking helps to identify the deficiencies in the model, so that the model could be subjected to modifications and alterations incorporated in the model if necessary. The residuals obtained from the above two filters were analyzed in order to make inferences concerning causality.

2.4 Data

Marketing information, 20 wholesale traders, 20 retailers and 10 millers dealing in processing and trade of Normal rice were considered in the study for further investigation. Area, yield, analysis cost of high quality rice were investigation. The price of high quality rice from 1998 to 2010 in Can tho city, Vietnam was collected

3 Results and Discussion

3.1 Marketing analysis

The analysis of price spread in the channel I indicates the producers who sold their produce could realize 43.26 per cent of the consumer's price with a gross price of VND 3.12 million per ton (Table 1). The rest, 56.74 per cent, was shared by other market functionaries. Thus, the assemblers in the channel I accounted for 10.19 per cent of the consumer's price. The marketing costs accounted for 8.52 per cent and profit margin for 1.67 per cent by assemblers accounted for VND 0.73 million / ton. The millers received 17.68 per cent of the consumer's price. The marketing cost incurred was 6.36 per cent and profit margin 11.32 per cent.

The polishers, wholesalers and retailers received 10.60, 10.72 and 7.55 per cent of the consumer's price, respectively. The total market costs incurred 6.44, 5.31 and 6.28 per cent, respectively. Profit margin of the polishers incurred was 4.16 per cent,

wholesalers incurred 5.42 per cent and retailer incurred 1.27 per cent of the consumer's price. The total price spread in this channel was 4.09 million and it accounted for 56.74 per cent of the consumer's price.

The analysis of price spread in the channel II indicates the producers who sold their produce could realize 43.26 per cent of the consumer's price with a gross price of VND 3.12 million per ton (Table 1). The rest, 56.74 per cent, was shared by other market functionaries. Thus, the assemblers in the channel II accounted for 35.38 per cent of the consumer's price. The marketing costs accounted for 12.54 per cent and profit margin 22.84 per cent by the assemblers which accounted to VND 1.65 million / ton. The wholesalers received 13.81 per cent of the consumer's price. The total market costs and profit margin by wholesaler incurred 5.31 and 6.08 per cent, respectively. Retailer received 7.75 per cent of the consumer's price. The total market costs incurred was 6.28 per cent and profit margin incurred was 1.30 per cent of the gross market margin of the retailers. The total price spread in this channel was 4.09 million and it accounted for 56.74 per cent of the consumer's price.

Table 1. Price spread in processing and marketing of Normal Rice in channels

(in VND 1,000 / ton)

SL. No.	Particulars	Cost and price in Channel I	Cost and Price in Channel II	Cost and Price in Channel III
I	**Producers**	**3,120.00 (43.26)**	**3,120.00 (43.26)**	**3,421.53 (48.70)**
II	**Assemblers**	**734.87 (10.19)**	**2,551.83 (35.38)**	**-**
1	Assembers purchase price	3,120.00	3,120.00	-
2	Marketing costs	614.64	611.52	-
3	Milling cost	-	141.25	-
4	Polishing cost	-	151.52	-
5	Assemblers selling price	3,854.87	5,671.83	-
III	**Millers/Polishers**	**1,274.96 (17.68)**	**-**	**2,250.30 (32.03)**
1	Millers purchase price	3,854.87	-	3,421.53
2	Cost incurred by millers	458.60	-	146.69
3	Milling cost	-	-	151.52
4	Polishing cost	-	-	313.30
5	Millers selling price	5,129.83	-	5,671.83
IV	**Polishers**	**764.52 (10.60)**	**-**	**-**
1	Polishers purchase price	5,129.83	-	-
2	Cost incurred by polishers	464.82	-	-
3	Polishers selling price	5,894.35	-	-
V	**Wholesalers**	**773.28 (10.72)**	**995.80 (13.81)**	**809.65 (11.52)**
1	Wholesalers purchase price	5,894.35	5,671.83	5,671.83
2	Marketing costs	382.64	382.64	382.64
3	Wholesalers selling price	6,667.63	6,667.63	6,481.48
VI	**Retailers**	**544.78 (7.55)**	**544.78 (7.55)**	**544.78 (7.75)**
1	Retailers purchase price	6,667.63	6,667.63	6,481.48
2	Marketing costs	453.23	453.23	453.23
3	Retailers selling price	7,212.41	7,212.41	7,026.26
VII	**Consumers purchase price**	**7,212.41 (100.00)**	**7,212.41 (100.00)**	**7,026.26 (100.00)**
VIII	**Price spread**	**4,092.41 (56.74)**	**4,092.41 (56.74)**	**3,604.73 (51.30)**

Note: Figures in parentheses indicate share in consumer's VND

In this channel III, producers share higher of the consumer's price was high than in all the other channels discussed earlier, about 48.70 per cent of consumer's price. Because, producers sell produce direct to the millers/polishers. The millers/ polishers (Table 1) received 32.03 per cent of the consumer's price. The market costs and profit margin incurred by millers/ polishers was 8.70 and 23.32 per cent of the consumer's price. They get a profit margin on an average of VND 1.64 million/ ton. Profit margin as per cent of cost is 40.63 per cent each ton of production. In this channel, wholesalers and retailers incurred gross market margin same as channel II. Total price spread in this channel was VND 3.60 million and it accounted for 51.30 per cent of the consumer's price.

3.2 Forecast prices for HQR at CanTho market

To study the model prices in CanTho market ARIMA model was use to filter the series as mentioned earlier. The general form of the ARIMA model is as follows.

ARIMA (p d q) (P D Q)$_{12}$

Where: p = order of AR process, d = degree of differencing, q = order of the MA process, P = order of Seasonal AR process, D = degree of differencing seasonal, Q = order of the seasonal MA process

We have considered 156 observations on price of HQR in CanTho market from January 1996 to December 2008. Identification was concerned with deciding the appropriate values for p, d, q and P, D, Q. The model identified for HQR white rice price at Can Tho market was: ARIMA (1, 1, 1) (1, 1, 1)$_{12}$. With the help of the computer, we get p, d, q and P, D, Q coefficients for forecast price function below:

$$Y_t = 0.063\ Y_{t-1} - 0.937\ Y_{t-2} + 1.116\ Y_{t-12} - 0.177\ Y_{t-13} + 0.829\ Y_{t-14} + 0.116\ Y_{t-24} - 0.224\ Y_{t-25} + 0.108\ Y_{t-26} - 0.972\ e_{t-1} - 0.595\ e_{t-12} - 0.578\ e_{t-13} + e_t$$

This is done through examining the ACF and PACF of the residuals of various orders. For this purpose, various correlations up to 16 lags were compute and the same along with their significance. As the results indicate, none of these correlations is significantly different from zero at a reasonable level. This rule out any systematic pattern in the residuals is proving that the selected ARIMA model is appropriate model. A portmanteau test can also apply to the residuals as an additional test for fit. In this case, Box-Ljung for (h = 16) is $Q^* = 17.56 < \chi^2$ table = 23.68 at $\alpha = 0.05$ with 16 – 2 = 14 degree of freedom. The value of Q^* is not significant, showed the residuals can be considered as white noise series and we can be use model for forecasting price at Can Tho market.

Table 2. Forecasting price of HQR in Can Tho market from September, 2010 to August, 2011

(Unit: VND/ kg)

Sl.No.	Months	Forecast	Sl. No.	Month	Forecast
1	September – 10	13,718.48	7	March – 11	16,466.67
2	October – 10	13,068.61	8	April – 11	15,868.79
3	November – 10	14,069.49	9	May – 11	16,168.31
4	December – 10	15,488.38	10	June – 11	16,186.71
5	January – 11	15,502.45	11	July – 11	16,072.74
6	February – 11	15,682.20	12	August – 11	16,350.67

Source: Calculated by Author using SPSS software.

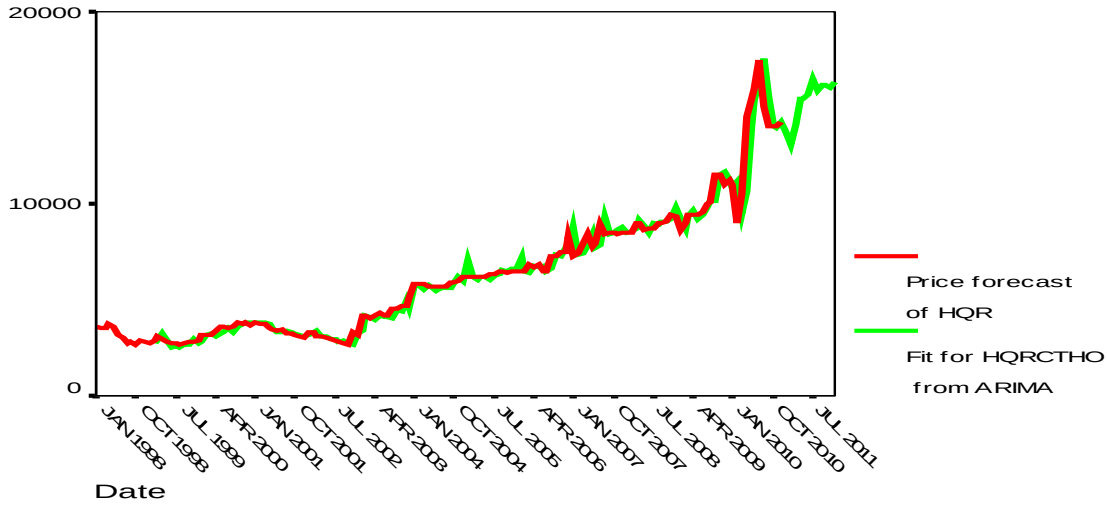

Figure 1: Forecasted price of HQR plot in CanTho market of Vietnam
Source: Calculated by Author using SPSS software.

The forecasts for the HQR price during September, 2010 to August, 2011 are present at Table 2 and figure 1. The results reveal that the HQR price is forecasted to be VND 13,718 per kg HQR in September, 2010, which increases to VND 15,488 per kg in December, 2010. The model was also given HQR price in January, 2011 (VND 15,502 per kg HQR) which will be increasing to VND 16,350 per kg in August, 2011 when the harvest season completed. It can clearly observe that the price shown trend and fluctuations are cause by different seasons in the year. From the results of the figure 1, it is observing that; price of HQR is likely to reduce during the harvest season.

4 Conclusions and policy implications

The analysis of marketing channel I for NR showed that producers received 43.26 per cent of the consumers' price. Assemblers, millers, polishing, wholesalers and retailers received 10.19 per cent, 17.68 per cent, 10.60 per cent, 10.72 per cent and 7.55 per cent of the consumer's price, respectively. In channel II producers received 43.26 per cent of the consumer's price. Assemblers, wholesalers and retailers received 35.38 per cent, 13.81 per cent and 7.55 per cent of the consumer's price, respectively. The analysis of marketing channel III for NR showed that producers received the highest consumer' price compare with producers in channel I and channel II, at 48.70 per cent. Millers/polishers, wholesalers and retailers received 32.03 per cent, 11.52 per cent and 7.75 per cent of the consumer's price in that order.

The results reveal that the HQR price is forecasted to be VND 13,718 per kg HQR in September, 2010 which increases to VND 15,502 per kg in January,2011. The model was also given HQR price in August, 2011 (VND 16,350 per kg HQR). HQR price will be increasing August, 2011 when the harvest season completed. The results of the ARIMA model clearly indicated higher price fluctuations of HQR. However, the price was forecasted to increase order time.

The government should establish wholesale markets together with build storage, warehouse with biggest reserve capacity in each province along with procurement center to make HQR cultivation more remunerative through increased share of consumer recipes to the produces.

There is a need to reduce the taxes and fees for the traders and their business activities, which may lead to reduction in the price spread and thus benefit the rice producer.

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Phân tích thị trường tiêu thụ và dự báo giá cả lúa gạo ở ĐBSCL Việt Nam

Sản xuất lúa gạo được coi là mùa vụ rất quan trọng ở Việt Nam. Trong năm 2009, Việt nam đã xuất khẩu ước đạt 5.6-6.0 triệu tấn gạo. Hầu hết lúa gạo được tiêu thụ qua các kênh chính như sau: (i) Người sản xuất-Người thu mua-Người xay chà-Nhà máy đánh bóng-Người bán buôn- Người bán lẻ-Người tiêu dùng. (ii) Người sản xuất-Người thu mua/ xay chà/ đánh bóng-Người bán buôn-Người bán lẻ-Người tiêu dùng. (iii) Người sản xuất-Người xay chà/ đánh bóng-Người bán buôn-Người bán lẻ-Người tiêu dùng. Phân tích thị trường và chuỗi giá cả của lúa gạo phẩm chất trung bình trong kênh tiêu thụ 1 và 2 chỉ ra rằng, người sản xuất chỉ nhận được 43,26 % giá của người tiêu dùng. Phần còn lại 56.74 % được chia sẻ cho các tác nhân khác cùng tham gia thị trường. Kênh tiêu thụ 3 người sản xuất nhận được tỷ lệ cao hơn so với kênh tiêu thụ 1 và 2, khoảng 48.70 % giá của người tiêu dùng. Tổng cộng chuỗi giá cả chia sẻ cho các tác nhân tham gia thị trường được tính toán khoảng 51.30 % giá của người tiêu dùng. Mô hình dự báo giá cả cho gạo có phẩm chất cao ở thị trường TP.Cần Thơ từ tháng 9 năm 2010 đến tháng 8 năm 2011 chỉ ra rằng tháng 9/2010 giá gạo có phẩm chất cao sẽ là 13,718 đồng/kg, nó sẽ tăng lên 15,488 đồng/kg vào tháng 12/2010. Mô hình dự báo cũng chỉ ra rằng tháng 01/2011 (15,502 đồng/kg) sẽ tăng lên 16,350 đồng/kg vào tháng 08/2011. Qua nghiên cứu trên có một số đề xuất như về thị trường tiêu thụ chính phủ nên thiết lập hệ thống thu mua cùng với xây dựng kho chứa, nhà lạnh có sức chứa lớn tại mỗi tỉnh cùng với nó là việc xây dựng các trung tâm thu mua tạo cho người trồng lúa được hưởng nhiều lợi hơn thông qua việc làm tăng tỷ lệ nhận được từ giá cả của người tiêu dùng phải trả. Cần thiết phải giảm thuế và các loại phí cho các thương lái và những người hoạt động kinh doanh, nó có thể trực tiếp làm giảm tỷ lệ trong chuỗi giá cả và làm người sản xuất lúa được hưởng lợi nhiều hơn