

Research Article

ANALYSIS OF SEASONAL PRICE FLUCTUATIONS OF PADDY (Boro) IN BANGLADESH

S. Islam^{*}, S. Afrin, T. Afrin and M.M. khatun

Department of Agribusiness and Marketing
Sher-e-Bangla Agricultural University Bangladesh, Dhaka

ABSTRACT

This paper has focused on seasonal variations of price and trend of the price escalation of paddy in Bangladesh using monthly average wholesale price of Boro paddy over a period from 2001 to 2019. Secondary data were used in this study and collected from different secondary sources. The multiplicative model was exercised in this study; the least square method was applied to find out the long-term changes occurring in the price of paddy and the ratio to moving average method was used to measure seasonal fluctuations in price of paddy. It was evidently observed from the study that seasonal fluctuations in price of paddy prevail in Bangladesh as seasonal indices were deviated from hundred in different months. April to August, the price of paddy was lower compare to other months' price because April and May are the harvesting period of Boro paddy and resulted in more supply to the market. From August, it was increasing gradually and reached to the highest position on March with 112.15. Long-term trend analysis showed that prices of paddy will increase Tk. 72.80 per quintal higher annually compare to the country's average price.

Keywords: Paddy, Price fluctuation, Seasonal variation

INTRODUCTION

Bangladesh is predominantly an agrarian country (Rasha et al., 2018). According to Bangladesh Economic Review (2019), agriculture sector contributed to Gross Domestic Product (GDP) with 13.6 % of the total GDP in FY 2018-19. The most important issue in Bangladesh agriculture is to enhance and sustain growth in crops' production. Bangladesh has made some progress in agriculture during the post-independence period. In an agro-based country like Bangladesh, crop sub-sector is one of the most important and promising sub-sectors having vital contribution towards her economic development. This sector plays a significant role in meeting

*Corresponding author: safiul.islam@sau.edu.bd

the carbohydrate demand and socio-economic development of the rural poor by reducing poverty through employment generation (Rasha et al., 2018).

Rice is one of the major food crops in the world. It is consumed by more than half of the world population (Makama et al., 2016). Rice is Bangladesh's largest crop and the main staple food for the 157 million people of the country (Sayeed and Yunus, 2018). Bangladesh has got the 4th position among paddy producing countries in the world after China, India and Indonesia (FAO, 2018). In Bangladesh, there are three paddy cultivation seasons identified as Aus, Aman and Boro. According to BBS and DAE, the volume of rice production in FY2018-19 stood at 415.74 lakh metric tons (MT), Aus 27.02 lakh MT, Aman 141.34 lakh MT, Boro 196.23 lakh MT (BER, 2019). Boro is the most important and single crop in Bangladesh in respect of volume of production. In FY 2018-19, Boro occupies about 41.58 % of total rice area and contributes 53.75 % of total rice production in Bangladesh (BBS, 2019).

The price of rice remains a sensitive factor for producers, consumers and policy makers. At the village level, it affects poor consumers who derive the major proportion of calorie intake from rice (70 % in 2009). It also matters to producers, for whom rice cultivation is increasingly a commercial activity and often accounts for a large share of total annual household income (Sayeed and Yunus 2018).

The price of paddy has been rising gradually since liberty in 1971. Most of the farmers in Bangladesh are small and marginal, and they have no enough cash money to cultivate paddy, so they often purchase means of production (seed, fertilizer, pesticides, irrigation etc.) in credit. Therefore, at harvesting period, farmers have to sell the paddy with comparatively lower price due to the payments in time. Besides, natural disaster and rise of cost of means of production are also significant causes in price increase. In rural area, main source of income is agriculture produce especially paddy, and their livelihood mostly depends on paddy's price. But, the price of paddy varies significantly in different months in Bangladesh. Even sometimes, farmers have to pay higher price for paddy in the off seasons compared to their selling price in the harvest period. The current paper is discussed about the trend of price escalation of paddy and also discussed about the seasonal variation of price of paddy. If the impact of seasonal variation of the price of paddy can be reduced then it will be easy to ensure appropriate margin for the farmers as well as reasonable price for the consumers.

Although, the government has been attempting for a long time to control the seasonal variations in price of paddy through open market sales to limit price increases, targeting food distribution to poor households, providing emergency relief after natural disasters and procuring paddy to support producers' prices and incomes, but these are not so effective to stabilize the market price of paddy due to various kind of unwanted reasons. If the year-to-year prices changes and the impact seasonal variation are reduced, then the government can ensure food for every household at reasonable price and the stability of price of paddy will be ensured. So,

it's required to formulate the effective policies to keep prices stable and protect the interest of the farmers and consumers also. Therefore, the current study would be helpful in policy making to stabilize the fluctuations of price of paddy as well as beneficial to the paddy cultivator in making a decision about the most advantageous time for marketing the paddy. This research was conducted to study the extent of seasonal fluctuations in prices of paddy and to determine the long-term changes in the market prices of paddy in Bangladesh.

MATERIALS AND METHODS

This study is fully dependent on secondary data. Bangladesh Bureau of Statistics (BBS), Yearbook of Agricultural Statistics (2001-2019) is the main sources of data. From the three paddy cultivation seasons (Aus, Aman and Boro), only Boro paddy (coarse) has been selected for the study as it is the major source of supply of rice in terms of production. According to the BBS, Boro production was 53.82 % of total rice production in 2001-19 (BER, 2019).

Analytical framework

The analysis was carried out based on the average wholesale price (monthly) of Boro paddy (coarse) over a period of nineteen years from 2001 to 2019. The multiplicative model was applied to examine the trend and seasonal fluctuations in price of paddy. In the multiplicative model, with the removal of the trend, the values fluctuate around 1. If equal to 1, the seasonal, cyclical, and irregular factors do not affect the trend. If they are different from 1, but with error from 1 to 5 percent, the trend will not be affected by seasonal, cyclical, or irregular factors either, and if the error around 1 is greater than 5 percent, the trend will be affected by these factors (Yohana and Yunxian, 2019).

The multiplicative model is; $Y = T \times C \times S \times I$

Where; Y = Original data on monthly average wholesale price of Boro paddy; T = Trend component; S = Seasonal variations; C = Cyclical component; I = Random/Irregular variations (Govardhana et al., 2014).

Trend determination

The least square method was applied to determine the long-term movements in the price of paddy. The constants (a, b) of the mathematical model are estimated from the given series by the method of least squares so that the sum of squares of the deviations of actual values from the corresponding estimated values is minimum (Renu and Sanjoy, 2007). The following equation was used to determine the trend line:

$$Y = a + bt$$

Where; Y=Trend values for annual average price of paddy; a = Intercept; b=Slope of/Regression coefficient; t= Time from 2001-2019

Seasonal Variations

The ratio to moving average method was used to assess the seasonal variations in price of paddy. This method is based on calculating moving averages by considering $n = 12$ for monthly data. At first calculated the successive averages for groups of size 12 and then take a 2-point moving average of these averages. The resultant moving averages will give the estimates of the combined effects of the trend and cyclical variations. Leaving the first 6 months and the last 6 months ($n = 12$), convert the given data series as percentages of the 2-point moving average values i.e. [(given data)/ (2-point moving average) *100]. These percentages would now represent seasonal variations along with random/irregular components. Further, the random component is eliminated by averaging these monthly percentages. Since the sum total of these seasonal indices is not equal to 1200 (for monthly data) so, finally adjusted seasonal indices are computed to make the sum of the indices 1200 by multiplying them throughout by a correction factor k defined as follows (Renu and Sanjoy, 2007).

Correction factor (k) = $1200 / \text{Sum of average indices for 12 months.}$

RESULTS AND DISCUSSION

Seasonal variations

The seasonal component is defined as the intra-year pattern of variation that is repeated from year to year. Seasonal price variations resemble a cycle covering a period of 12 months or less (Dorosh and Shahabuddin, 2002). The pattern of variation in price within a year is revealed by seasonal indices (Govardhana et al., 2014), and calculated for each month (January to December) over the period from 2001 to 2019.

Table1 represents the seasonal indices of monthly wholesale prices of Boro paddy and Figure 1 depicts the changes of seasonal indices from January to December. Evidently, it indicated that seasonality was existed in wholesale price of paddy in Bangladesh as seasonal indices were deviated from hundred in different months. Some major changes can be observed in the overall (2001-2019) seasonality index. From October to March, seasonal indices were more than 100, but April to September the indices were below the 100, in which, March contained the highest with 112.15 and May showed the lowest value with 86.19. Coefficient of variation (CV) of seasonal indices for this period was 7.87. The seasonal indices of wholesale price of paddy reflected that in the months of April to August the price of paddy was lower than the price of other months, because April to August is the peak period of Boro paddy with more production and supply to the market. From August, it increased gradually and reached to the highest position in March, just before the harvest period of Boro paddy.

Table 1. Seasonal variation of wholesale price of Boro paddy in Bangladesh during 2001-2019 (BBS, 2019)

| Month | Seasonal indices (2001-2010) | Seasonal indices (2011-2019) | Seasonal indices Overall |
|--------|---------------------------------|---------------------------------|-----------------------------|
| Jan | 108.46 | 105.83 | 107.15 |
| Feb | 116.01 | 107.24 | 111.63 |
| Mar | 117.21 | 107.09 | 112.15 |
| Apr | 97.23 | 97.63 | 97.43 |
| May | 85.16 | 87.22 | 86.19 |
| Jun | 88.55 | 93.04 | 90.80 |
| Jul | 91.60 | 95.69 | 93.65 |
| Aug | 95.04 | 98.00 | 96.52 |
| Sep | 97.34 | 101.52 | 99.43 |
| Oct | 100.19 | 102.88 | 101.54 |
| Nov | 98.00 | 102.32 | 100.16 |
| Dec | 105.21 | 101.54 | 103.38 |
| Peak | 117.21 | 107.24 | 112.15 |
| Trough | 85.16 | 87.22 | 86.19 |
| CV | 10.07 | 5.99 | 7.87 |

During the period of 2001-2010, the lowest seasonal index was 85.16 in May and highest seasonal index was 117.21 in March with 10.07 coefficient of variation (CV). In the next decade (2011-2019), the lowest seasonal index was 87.22 in May and gradually increased to 107.24 in March with 5.99 coefficient of variation. It was evident that coefficient of variation of seasonal indices was decreased significantly from 10.07 to 5.99 and it indicated to less seasonal variations of price of paddy in the year 2011- 2019 compare to the year 2001-2010.

Table 2 shows the seasonality index of Boro paddy price for the late 1980s, the 1990s and the early 2000s. Two major patterns in the seasonality index were recorded. First, the month of peak price of Boro paddy during the study period was March, just before the harvest period. In the late 1980s, prices continued to rise from June to next March with a small drop in November and January. In the 1990s, there was a rise in prices from June to next March and some stable prices from September to November (Salam et al., 2012).

Table 2. Seasonal price indices of Boro (HYV) paddy (Salam et al., 2012)

| Month | Seasonal indices (1986-87 to 1989-90) | Seasonal indices (1990-91 to 1999-2000) |
|--------|--|--|
| Jan | 108.89 | 111.14 |
| Feb | 115.92 | 119.01 |
| Mar | 118.73 | 120.25 |
| Apr | 105.30 | 93.31 |
| May | 82.60 | 85.20 |
| Jun | 82.68 | 87.98 |
| Jul | 87.46 | 92.20 |
| Aug | 92.66 | 94.76 |
| Sep | 98.57 | 98.09 |
| Oct | 98.70 | 98.90 |
| Nov | 94.06 | 96.75 |
| Dec | 114.41 | 102.41 |
| Peak | 118.73 | 120.25 |
| Trough | 82.60 | 85.20 |
| CV | 12.69 | 11.34 |

The changes of coefficient of variations (CV) of seasonal indices over the last four decades from 1987 to 2019 showed in fig 2. CV declined appreciably with 12.69, 11.34, 10.07 and 5.99 in the year 1987-90, 1991-2000, 2001-2010 and 2011-2019 respectively. From the graph it could be said that seasonal fluctuations of price of paddy reduced significantly over the last thirty-three years, though seasonal variations of price of paddy was exist.

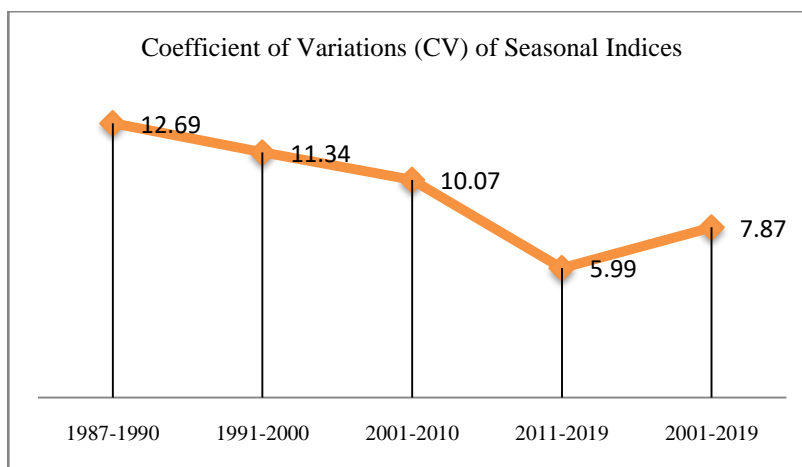


Figure 2. Coefficient of variations (CV) of seasonal indices (1987-2019)

Long term trends

The analysis of trend component in the annual average wholesale price of the paddy was carried out by ascertaining the direction of the movement of prices over a period (Govardhana et al., 2014). The results showed from long-term trend analysis in Table 3 and Figure 3 that prices of paddy will increase Tk. 72.80 per quintal higher annually compared to the country's average price; and the impact of time in changing the paddy price was to the extent of 74.5 % as the value of R^2 was 0.745 (Table 3). There were three major changes observed from the trend line (Figure 3) that price of Boro paddy was gradually increasing over the years; and inter-year price movements were minimum from 2001 to 2007, but after the year 2007 fluctuated notably with increasing rate.

Table 3. Long term trend equation for annual average wholesale prices of Boro paddy in BD

| Intercept (a) | Regression coefficient (b) | Significance F | R^2 |
|---------------|----------------------------|----------------|-------|
| -144947 | 72.80 | 1.901 | 0.745 |

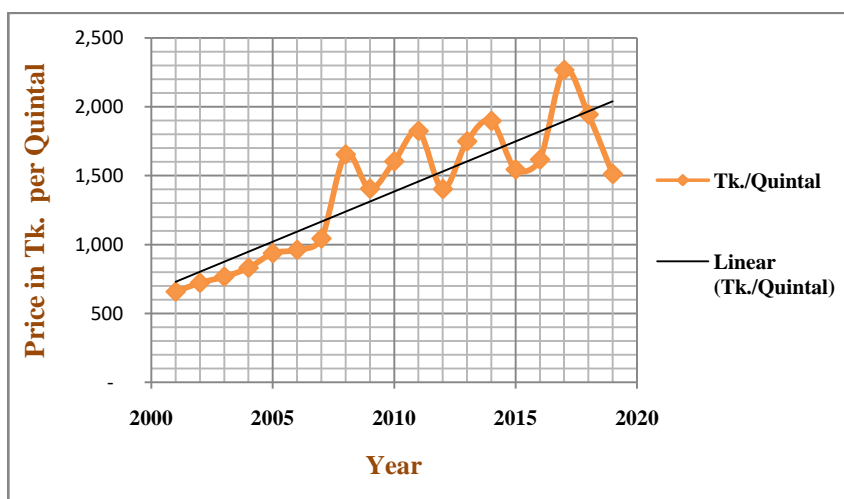


Figure 3. Trend line for annual average wholesale price of Boro paddy in BD (2001-2019)

CONCLUSION

Based on results and discussion, it has been understood that seasonal effect is one of the foremost reasons of variation in prices of paddy. In Bangladesh, staple food's price is very sensitive and political concern for the government; high price of the paddy is considered and indicated to vulnerable situation of the country in terms of food security, and government is not capable to ensure the basic food for all the

population of the country. Therefore, the Government should undertake effective policy measures to stabilize the price of paddy. Besides, government can avail advanced information dissemination system so that both farmers and consumers will get information in due time, and thereby seasonal price fluctuations will be reduced significantly.

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