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JS Atla

Assistant Professor, Department of Agricultural Economics, College of Agriculture Konghar, Dr. PDKV, Akola, Maharashtra, India

NV Rathod

Assistant Professor, Department of Agricultural Economics, College of Agriculture, Buldhana Dr. PDKV, Akola, Maharashtra, India

J Rahane

Ph.D. Scholar, Department of Agricultural Economics, MPKV, Rahuri, Maharashtra, India

Corresponding Author:

JS Atla

Assistant Professor, Department of Agricultural Economics, College of Agriculture Konghar, Dr. PDKV, Akola, Maharashtra, India

The trends in domestic and international prices of paddy

JS Atla, NV Rathod and J Rahane

Abstract

The present study was conducted to estimate the trends in domestic and international prices of paddy studying by the polynomial function and exponential function for calculating trends and CGR of domestic and international prices of paddy respectively during 1970-71 to 2017-18. Tendency in international prices of paddy was more fluctuated than domestic prices of paddy during the entire study period. Fluctuations in domestic and international prices of paddy due to time factor to extents of 97 and 70 per cent respectively, as indicated by R^2 . Growth rate estimated for domestic prices i.e. 8.21 per cent per annum is higher than international prices i.e. 7.02 per cent per annum at overall period (1970-71 to 2017-18). Instability index of domestic prices of paddy shows that more consistent than international prices of paddy i.e. 37.99 and 53.23 per cent respectively, at overall period.

Keywords: Domestic & international prices, exponential function, fluctuation, polynomial function and trend

Introduction

Paddy (*Oryza sativa* L.) was originated either in southern parts of India or in the parts of India and Burma. Paddy is the most widely grown cereal in the World and is staple food for more than 60 per cent of World's population. At all India level compound annual growth rates of area, production and yield of paddy were positive and there is increase in instability at all India level in area, production and yield of paddy. The possible reasons for increase in instability were low percentage of irrigated area to total cropped area, decline in use of seeds and manure and other inputs necessary for agriculture Jain (2018).

Samal *et al.* (2018) concluded the decadal growth in an area, production and yield of paddy in India and for different states were computed and compared for the period 1970-71 to 2015-16. It was found that area growth in most of the states has either exhausted or declined. The production growth was mainly from the growth in productivity. Therefore, future growth in paddy production has to come from yield growth through technological improvement. This requires more investment in paddy research to increase the yield. Trends and volatility in domestic and international prices of paddy found that although both the international and domestic prices are volatile, the degree of volatility is higher in the international prices. The volatility in domestic prices is mainly due to internal production shocks and is not influenced much by the international prices. Mittal *et al.* (2018).

The future performance of any product in international markets can be judged in the light of its past performance. Therefore, evaluation of past performance of paddy is necessary to work out its export potential, challenges and opportunities. The present study has analysed major markets for Indian paddy, in terms of its future share. The present study *viz.*, The changing tendency of domestic and international prices of paddy has examined the growth performance, instability and tendency of domestic and international prices of paddy.

Material and Methods

The experiment was conducted from 2015-16 to 2021-22 at research in Mahatma phule Krishi Vidyapith Rahuri, district Ahmednagar (MS). The study is completely based on secondary data, Therefore required data for the present study was collected from various reports *viz.*, APEDA, Agricultural statistics at a glance 2015, Maharashtra at A Glance, Economic Survey (GOI), Food Corporation of India (FCI), Commission for Agricultural Costs and Prices (CACP), Food and Agricultural Organization (FAO), World Trade Organization (WTO), International Rice Research Institute (IRRI), Rice Board of India, and studies on different government sector reports etc. was used for the study.

The data collected from secondary sources was subjected to appropriate analytical technique in order to arrive at a meaningful conclusion. The data on area, production, and productivity of paddy, domestic and international prices and export etc. was collected for the period 1970-71 to 2017-18. The study period was divided into two periods based on the policy of the government on WTO of trade at different periods.

Period-I: Pre-WTO Period (1970-71 to 1994-95)
 Period-II: Post-WTO Period (1995-96 to 2017-18)

Analytical Techniques

1. Tendency/Trend Analysis

To estimate the trend in domestic prices and international prices for paddy the linear trend were computed for the time series data. The study for estimating the trend of domestic and international prices was 1970-71 to 2017-18.

The linear trend equation of the form.

$$Y_t = a + bT + cT^2 + dT^3 + e_t$$

Where,

- Y_t = Price (Domestic/International)
- a = Intercept
- T = Time period
- b, c, d = Partial regression coefficient
- e_t = Error term

2. Compound growth rate analysis

$$Y = ab^t$$

Where,

- Y = Prices
- t = Time period
- b = Regression coefficient
- a = Intercept
- CGR (%) = (Antilog b - 1) × 100

3. Instability analysis

a. Coefficient of variation

$$C.V. = [S.D./(\bar{X})] * 100$$

Where,

- C.V.= Coefficient of variation
- S.D.= Standard deviation
- X = prices (Domestic/International)

b. Cuddy and Della instability index (CV_t)

$$CV_t = CV \sqrt{1 - R^2}$$

Where,

- CV= Coefficient of variation
- R² = Coefficient of multiple determination

Results and Discussion

The results obtained from the present study to analyse the tendency in domestic and international prices of Indian paddy. The discussion regarding tendency in domestic and international prices of paddy, growth rates and instability index of domestic and international prices of paddy are briefly discussed in this chapter. The finding of the present investigation are discussed under following headings.

1. Tendency in Domestic Prices of Paddy
2. Tendency in International Prices of Paddy
3. Growth rates of domestic and international prices of paddy.
4. Instability of domestic and international prices of paddy

1. Tendency in domestic prices of paddy

The tendency in domestic prices of paddy are presented in Table1. It is observed from the Table that, the domestic prices were decline in first stage at the rate of 6.60 ₹/qtl. In second stage it increased at the rate of 0.42 ₹/qtl and in terminal stage domestic prices of paddy significantly increased at the rate of 0.02 ₹/qtl. The overall trend equation was statistically significant, as revealed by F value (483.58) and fluctuation in domestic prices of paddy due to time factor to extent of 97 per cent as indicated by R². The polynomial curve of domestic prices of paddy (Fig. 1) behaved almost constant in the initial study years. But after 1990-91 it started increasing at increasing rate till the end of the year 2017-18. The volatility of domestic prices of paddy is mainly due to the internal production stocks and is not influenced much by the international prices (Mittal *et al.*, 2018).

Table 1: Polynomial trend analysis of domestic price of paddy in India

Sr. No.	Variables	Coefficients	S.E.
1	Intercept	125.77*	83.56
2	T	-6.60	13.70
3	T ²	0.42	0.64
4	T ³	0.02**	0.009
5	R ²	0.97	
6	F	483.58	

$$Y_t = 125.77 - 6.60T + 0.42T^2 + 0.02T^3 + e_t$$

Where, Y= Domestic prices of paddy; T= Time period

2. Tendency in international prices of paddy

The tendency in international prices of paddy is presented in Table 2. It is observed from the Table 2. that, the growth tendency in international price increases for first stage at the rate of 31.40 ₹/qtl. Then in second stage decline at the rate of 0.82 ₹/qtl and in terminal stage increase at the rate of 0.04₹/qtl. The overall tendency equation was statistically significant, as revealed by F value (34.66) and fluctuation in international prices of paddy due to time factor to extent of 70 per cent as indicated by R². The analysis of tendency in international prices of paddy movement indicated more fluctuation (Fig. 2) during the entire period (1970-71 to 2017-18).

Table 2: Polynomial trend analysis of international price of paddy

Sr. No.	Variables	Coefficients	S.E.
1	Intercept	222.94	482.84
2	T	31.40	79.14
3	T ²	-0.82	3.68
4	T ³	0.04	0.049
5	R ²	0.70	
6	F	34.66	

$$Y_t = 222.94 + 31.40T - 0.82T^2 + 0.04T^3 + e_t$$

Where, Y= International price of paddy (₹/qtl)

T= Time period

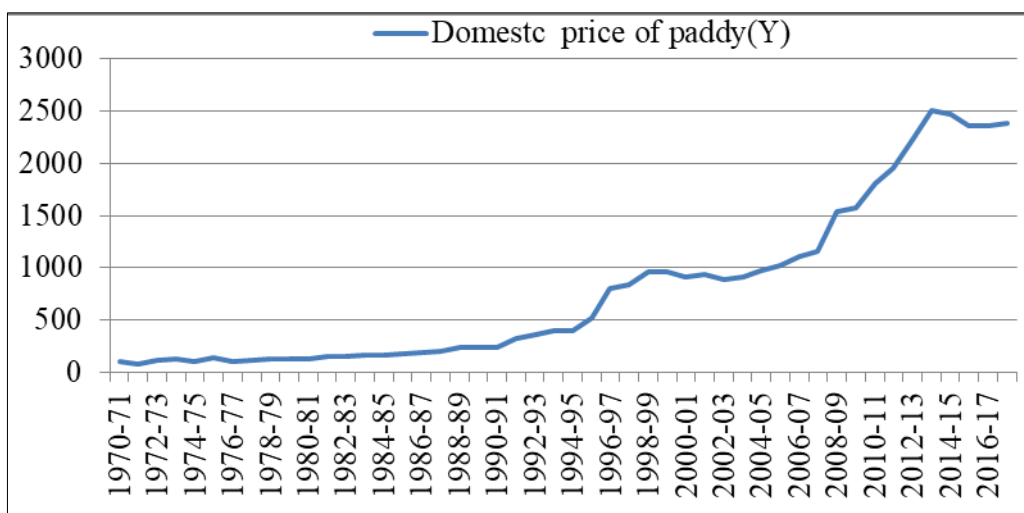


Fig 1: Tendency in domestic prices of paddy during 1970-71 to 2017-18

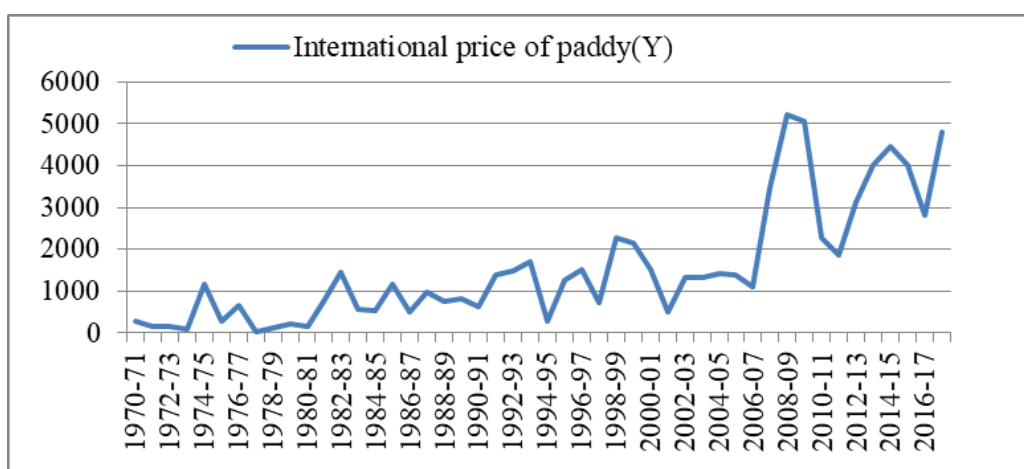


Fig 2: Tendency in international prices of paddy during 1970-71 to 2017-18

3. Compound growth rates of domestic and international prices of paddy

The exponential growth function was used for estimation of growth in domestic and international prices of paddy. The data related to domestic and international prices of paddy were collected for 48 years from 1970-71 to 2017-18 and results are presented during Pre-WTO (1970-71 to 1994-95), Post-WTO (1995-96 to 2017-18) and over all period (1970-71 to 2017-18) in Table 3.

The growth rates of domestic and international prices of paddy have been presented in Table 3. The results revealed

that during the pre-WTO period the domestic market prices of paddy was analysed significant growth at 5.92 per cent per annum whereas the international prices had a growth rate of 8.71 per cent per annum. However, during post-WTO period, the growth rate in paddy prices was calculated to be 6.71 per cent per annum for domestic prices and 6.84 per cent per annum for international prices. As such growth rate for domestic price is higher than international price *i.e.* for domestic price growth rate was calculated 8.21 per cent per annum and 7.02 per cent per annum for international price during overall period (1970-71 to 2017-18).

Table 3: Compound growth rates of domestic and international prices of paddy

Price	Periods		
	Pre-WTO (1970-71 to 1994-95)	Post-WTO (1995-96 to 2017-18)	Overall (1970-71 to 2017-18)
Domestic price	5.92***	6.71***	8.21***
International price	8.71***	6.84***	7.02***

Note: *** indicates 1% level of significance

4. Instability indices of domestic and international prices of paddy

The coefficient of variation and Cuddy and Della index of domestic and international prices of paddy have been presented in Table 4. the instability index of domestic (45.95) and international (61.77) prices of paddy was higher in pre-WTO period and in both post-WTO (33.77 and 42.03%) and overall (37.99 and 53.23%) period, respectively. This indicate

that the growth of domestic and international prices of paddy in post-WTO period did not fluctuates more due to less restrictions and growing demand of Indian paddy. In general, domestic prices of paddy were more consistent than international prices of paddy in both pre and post- WTO period.

From the forgoing discussion it is noted that, the international prices of paddy were more fluctuating than that of domestic

prices of paddy. The international paddy market is characterised by high volatility with inelastic supply and demand. The global trade of rice is very low in comparison to its production. Similar observations were reported by Adhikar

et al. (2016) and Mittal (2018). The hypothesis *viz*; the domestic and international prices of paddy are fluctuating has been proved.

Table 4: Instability indices of domestic and international prices of paddy

Indices	Domestic price of paddy			International price of paddy		
	Pre-WTO (1970-71 to 1994-95)	Post-WTO (1995-96 to 2017-18)	Overall (1970-71 to 2017-18)	Pre-WTO (1970-71 to 1994-95)	Post-WTO (1995-96 to 2017-18)	Overall (1970-71 to 2017-18)
C.V.	49.92	45.8	98.98	77.26	58.72	92.33
Cuddy and Della Index	45.95	33.77	37.99	61.77	42.03	53.23

Conclusions

1. The tendency in domestic prices of paddy were fluctuated due to time factor. The polynomial curve of domestic prices of paddy behaved almost constant in the initial study years. But, after 1990-91 it started increasing at increasing rate till the end of the year 2017-18.
2. The tendency in international prices of paddy were fluctuated due to time factor. The analysis of trend in international prices of paddy movement indicated more fluctuation during the entire period (1970-71 to 2017-18).
3. The growth rate calculated for domestic prices *i.e.* 8.21 per cent per annum is higher than international prices *i.e.* 7.02 per cent per annum at overall period.
4. The growth of domestic and international prices of paddy in post-WTO period did not fluctuates more due to less restrictions and growing demand of Indian paddy. In general, domestic prices of paddy were more consistent than international prices of paddy in both pre and post-WTO period.

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