*Full Length Research Paper*

# Trading prices for India's major cereals during WTO regime: Growth rates, TOT, elasticities and foreign trade policies

## Madiga Bala Dastagiri[1], Cherukumalli Srinivasa Rao[2] and AnjaniSneha Vajrala[3]

[1]Principal Scientist, ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad-500030. India. [2]Director, ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad-500030. India. [3]Junior Research Fellows, ICAR-NAARM, Rajendranagar, Hyderabad-500030.

## Abstract

World price influence on international trade and hence economic precision is required. This is basically foreign trade research study. The exports and imports of major cereals viz., rice, wheat, maize and total cereals from 1990-91 to 2015-16 were selected. Estimated CAGR, Instability Index, Terms of Trade, Export import price elasticities of commodities and their top destinations. The results found that wheat export prices more than import prices indicating India has comparative advantage in wheat. The terms of trade for wheat and total cereals were found to be more than rice and maize crops. The exports price growth rate of wheat was more than imports, while remaining crops witnessed reverse trend. The rice witnessed high export elasticities. Export import prices of all cereals were unstable. The study found that the highest exports and imports growth rate for cereals was observed in Bangladesh and Australia respectively, while same countries also emerged as top export import destinations in cereals. The study suggests that India should make multilateral agreements in these countries. Multilateral trade relationship with high CAGR countries would help in smooth trade of agricultural crops.

## INTRODUCTION

In the market economy, the allocation of resources is greatly influenced by the world price signals. International prices require economic determinacy. Sufficient and reliable information is prerequisite for proper decision making be it the domestic market or international marketing. World price means a price for a good or services in all countries other than one's own (Financial dictionary, 2012).

As quoted by David Hallam, 2003, the effectiveness of price signals to bring about adjustments in supply and demand and the impact of world price variability on the producers and consumers is directly proportional to the extent to which world market prices are transmitted to domestic markets.

World price influence international trade. Under modern capitalism, major commercial export and import transactions, regular in nature and payable in freely convertible currency, are conducted at world price (Encyclopedia, 2010). A country exports goods and services with local price lower than the world price. On the other hand, it imports goods and services with higher local prices than the world price (Financial dictionary, 2012). Based on the above explanations, the exports and imports prices are considered as world trading price.

Alktheeb and Sultan (2015), reported that in the year 2013, India became the world's seventh-largest exporter of agricultural products surpassing Australia. Also, in the global market scenario, India is a very important global player for most of the agricultural commodities, wherein it

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Corresponding author. E-mail: E-mail: dgiri_mb@yahoo.co.in.

is the world's second largest producer of rice, wheat and other cereals. In the year 2014-15, the production of major cereals like rice, maize and bajra stood at 105.48 million tonnes, 24.17 million tonnes and 9.18 million tonnes respectively (GOI, APEDA, 2015). For the year 2016-17, estimated total food grains production in India is at 252.22 million tonnes which is marginally higher by 0.20 million tonnes than the previous year's food grains production of 252.02 million tonnes (GOI, 2016-17).

India being the largest producer and exporter of cereals in the world, during the year 2015-16 export of cereals stood at Rs. 40,433.24 crore. In India's total cereals export, Rice (including Basmati and Non-Basmati) occupies the major share with 93.60% whereas, other cereals including wheat represent only 6.40 % share in total cereals exported from India during this period (GOI, APEDA, 2015).

The empirical findings related to exports imports growth, price trading, instability, foreign earnings, elasticities, trade destinations and economic growth of agricultural commodities are furnished. A study by Glezakos (1973) found that export instability in LDCs is generally higher than DCs. And Nurkse (1958) and Caine (1958) reported that export instability has a negative impact on economic growth. Chaudhary and Qaisrani (2002), further added that export instability could affect foreign exchange earnings and economic growth. Contrastingly, Mahadevaiah (2001) showed that the stability in export earnings from total cotton export. Whereas, Pal (1992) added that rise in unit value of agricultural product would increase export earnings. Chand and Tewari (1991) reported that exports and imports growth of agriculture was much lower than total merchandise. The Alberto and Stefano (2010) reported that in Italy relatively low elasticity of substitution main specialization sector (machinery and equipment) compare to higher substitution elasticity for traditional goods like textiles, jewelry and leather products. UNCTAD (2009) found that India's exports to world are very responsive to income changes and conclude that 1% decline in GDP growth of world will lead to 1.88% decline in India's growth of exports to world. Upender (2007) found that long run as well as short run relationship between export and imports price exist in India. Singh and Sangla (2012) conclude that India has been unable to diversify its exports and destinations.

World economic precision is required on international prices, imports and exports. There are no or limited empirical studies on world trading price signals research of India's cereals. This study analyses trade signals of imports, exports and prices of major India's major cereals and identification of their destinations. Finally, the study will suggest multispeed strategies for promotion of trade. The specific objectives of the study are;

1.    To analyze world trading prices of India's major cereals.

2.    To estimate export and import price growth rates, trends and instability for India's cereals trade.
3.    To analyze export and import price elasticities for cereals.
4.    To suggest strategies and foreign trade policies for boosting cereals trade.

## METHODOLOGY

This is basically a foreign trade research study. The export and import of major cereals with other countries from India were selected viz rice, wheat, maize and total cereals. The study period is 1990-91 to 2015-16. India is exporting these commodities to more than 130 countries. For the total cereals, the countries will be classified into the top 10 countries which accounted major share of exports and rest as other countries. Finally, top 3 countries which accounted major share of India's exports for each commodity will be identified. Data on quantity, values, and prices of exports, imports and destinations of agricultural commodities were collected. Data sources are APEDA, DGCIS, NHB, FAO STAT, CMIE, Foreign Trade Year Book, Planning commission reports, National Bank for Agricultural and Rural Development (NABARD), EXIM Bank and export companies.

This research will analyze exports and import price growth rates, trends and TOT of major Agricultural commodities and their destinations. The research also estimates import export and price elasticity, exports market and prices signals of India's cereals, identify major Market destinations. The compound annual growth rates (CAGR), price elasticity, instability and trends of exports and import prices analysis were estimated using the following formulae.

### Growth rate formulae: (Damodar N. Gujarati and Sangeetha, 2007)

The compound growth rate (r) will be calculated by fitting Exponential function to the variables of interest viz., exports, prices for the period 1990-91to 2014-15.
$$Y_t - Y_0 (1+r)^t \text{---------1}$$
Assuming multiplicative error term in the equation1, model may be linearized by logarithmic transformation
$$\ln Y_t = A + Bt + \text{€ ----------2}$$
Where, A (=lnAo) and B (=ln (1+r)) are the parameters to be estimated by ordinary least square regression, t= time trend in year, r = exp (B) -1

### Price elasticity of exports formulae:

$\sum P_e$= % change in quantity exports/ % change in price
The percentage change in quantity exports is % $\Delta Q$, and the percentage change in price is % $\Delta P$. We calculate % $\Delta Q$ as $\Delta Q/Q_{ave}$ and We Calculate % $\Delta P$ as $\Delta P/P_{ave}$
*So we calculate the price elasticity of exports as ($\Delta Q/Q_{ave}$)/ ($\Delta P/P_{ave}$)*

**Instability Index Formulae**

Coefficient of variation = (Standard Deviation / Mean) *100

**Terms of Trade (TOT)**

Terms of trade were estimated by using the followings:

$$TOT = \frac{Average\ Price\ of\ Exports}{Average\ Price\ of\ Imports} = Px/Pm$$

$\uparrow Price\ M\ or\ \downarrow Price\ X \rightarrow Deterioration\ ToT$

$\downarrow Price\ M\ or\ \uparrow Price\ X \rightarrow Improvement\ ToT$

**RESULTS AND DISCUSSIONS**

**World Average Exports-Imports Prices and Terms of Trade of India's Major Cereals**

The average export import prices of India's cereals are presented in Table 1. During the period 1990-91 to 2015-16, both the export and import prices of wheat were found to be highest, followed by rice. The import prices of rice and maize were more than export prices, where as in wheat, reverse trend was observed. It indicates that India has comparative advantage in wheat. During the same period, the terms of trade of total cereals and wheat were found to be improved by about 1.28 % and 1.02 % respectively, while terms of trade has declined in rice and maize crops.

The study found that among the cereals, exports and imports price of wheat were found to be more than compared to other cereals. The terms of trade for wheat and total cereals were found to be increased.

**Export Import Prices and Quantity Growth rates & Instability of India's Major Cereals**

The coefficient of variation is a measure of the amount of variability relative to the mean. The instability index (degree of volatility) of cereals and the annual compound growth rates of export import quantity & prices of India's major cereals are presented in Table 2. Over the course of 26 years period (1990-91 to 2015-16), exports price growth rates of cereals viz., rice, wheat, maize, total cereals grew at the rate of -0.80 %, 4.11 %, 0.32 % and 0.34 % and imports price growth rates of these cereals grew at the rate of 3.85 %, 0.28 %, 2.21 % and -0.10 % per annum respectively. It shows that wheat export price and rice import price growth rate were found to be more than other cereals export import price growth rates. During the period of 1990-91 to 2015-16, the exports quantity growth rate of rice and total cereals, was more than the imports quantity growth, while remaining crops has showed a reversed trend in quantity growth.

The results of Coefficient of variation of export import prices and quantity of India's major cereals showed that during the period 1990-91 to 2015-16, the variation in exports price of cereals (Table 2) viz., rice, wheat, maize and total cereals were found to be more than imports price, while similar pattern was observed in export quantity of cereals. It is observed from the study that the exports import price of all cereals were unstable except maize import price where it witnessed stability. The export import quantity of all cereals were found to be stable except export quantity of rice.

The study found that the exports price growth rate of wheat were found to be more than imports indicating India has comparative advantage in wheat, whereas imports price growth rate of crops viz., rice, maize, total cereals were found to be more than exports price growth. The result showed that the variation in export prices of cereals were found to be more than imports prices. The export import quantity of all cereals were found to be stable except export quantity of rice.

**Export Import Prices Elasticities of India's Cereals**

How responsive are export & import quantities to a change in international prices is of direct relevance in international trade. Trade price elasticities are signals for exporters or importers to increase or decrease their trade as it indicates exports or imports responsiveness to changes in price.

Export import price elasticities of India's major cereals are presented in Table 3. During the period 1990-91 to 2015-16, the export import price elasticity's of all cereals are found to be positive except export price elasticity of wheat (-0.30 %) crop. The export price elasticities of rice are found to be more than imports followed by maize and total cereals. The study found that among cereals, rice (1.24%) has high export elasticity.

**Export Import Prices Trends Cereals**

Observing the export import price trends are necessary to understand the effects of international trade on the domestic economy. Three Year Moving Average (3MA) Method was employed to find out the trends of the exports imports price of cereals. The exports imports price trends of cereals were presented in Figures 1 and 2. The export price trends of rice, wheat and total cereals up to 2005-06 were more or less stable. But 2006 onwards these crops exports price trend were found to be steadily increasing with fluctuations. The export price trends of maize were fluctuating until 2001-02 followed by a stable price trend.

**Growth Rate and Price Elasticity of Top 10 Destinations of Cereals**

Export imports growth rate and price elasticity of Top 10 India's Destinations of cereals are presented in Table

**Table 1.** World average exports-imports price and terms of trade Indian cereals.

| Crops | Variables | Average Export Import Price US$ /Kg | | | Terms of Trade | | |
|-------|-----------|------------------------|---------------------|---------------------|------------------|---------------------|---------------------|
| | | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 |
| Rice | Export | 0.40 | 0.57 | 0.50 | 2.00 | 0.70 | 0.89 |
| | Import | 0.20 | 0.82 | 0.56 | | | |
| Wheat | Export | 1.28 | 2.29 | 1.90 | 0.74 | 1.17 | 1.02 |
| | Import | 1.72 | 1.96 | 1.86 | | | |
| Maize | Export | 0.25 | 0.21 | 0.23 | 4.17 | 0.41 | 0.45 |
| | Import | 0.06 | 0.51 | 0.51 | | | |
| Total Cereals | Export | 0.33 | 0.40 | 0.37 | 1.50 | 1.21 | 1.28 |
| | Import | 0.22 | 0.33 | 0.29 | | | |

Source: CMIE Commodities, Accessed on 3rd June 2017.

**Table 2.** Growth rate & Instability of Export-Import quantity and Price of cereals (1990-2016).

| Crops | Variables | Quantity Growth rate (%) | | | Price Growth rate (%) | | |
|-------|-----------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 |
| Rice | Export | 18.49 (116.55) | 10.96 (171.00) | 15.69 (123.14) | -4.35 (355.57) | 4.16 (198.37) | -0.80 (204.11) |
| | Import | -13.62 (80.21) | 20.47 (94.69) | -14.82 (47.71) | -1.00 (139.93) | 0.00 (158.27) | 3.85 (110.71) |
| Wheat | Export | 14.69 (77.55) | -16.13 (87.08) | -3.05 (69.15) | 2.35 (178.46) | 5.61 (182.54) | 4.11 (162.08) |
| | Import | -22.11 (95.29) | 63.48 (48.95) | 18.00 (53.69) | -3.27 (197.60) | 2.52 (129.76) | 0.28 (146.29) |
| Maize | Export | 74.85 (77.22) | 16.93 (139.62) | 36.14 (80.27) | -3.30 (114.81) | 2.54 (473.05) | 0.32 (160.77) |
| | Import | 106.38 (52.83) | 28.45 (39.05) | 45.82 (43.28) | -2.04 (86.48) | 2.70 (184.93) | 2.21 (103.07) |
| Total Cereals | Export | 9.43 (172.36) | 3.81 (139.62) | 8.22 (95.70) | -3.73 (530.86) | 6.74 (265.62) | 0.34 (299.96) |
| | Import | -8.70 (91.33) | 37.40 (38.89) | 6.83 (50.45) | -4.21 (266.78) | 3.88 (249.01) | -0.10 (228.96) |

Parenthesis in the bracket indicates CV (%). Source: CMIE Commodities, Accessed on 3rd June 2017.

4, 5, 6 and 7. India exports and imports these commodities to destinations ranging from 40 to 130 countries of the world. For each commodity, the countries classified into the top 10 export countries which accounted for major share of exports and rest as other countries.

India is anticipated to be the top rice exporter for the eighth consecutive year and the largest supplier to the European Union as per the USDA FAS report 2017-18. During 1990-91 to 2015-16 among the India's top export destinations (Table 4), highest export growth rate was witnessed in UAE (15.52%) followed by Kuwait (11.88%) and Saudi Arabia (8.71%) for rice; Nepal (8.35 %) for wheat; Bangladesh (46.33%) followed by Vietnam (31.76%) and Indonesia (13.89%) for maize; Bangladesh (25.08%), Iran (18.88%) and Malaysia (12.37%) for total cereals. During the same period, highest import growth rate was witnessed in Australia for rice (8.48%) and wheat (15.37%). Also, during the same period, UAE (1.03%), Nepal (6.78%), Indonesia (1.02%) and Bangladesh (1.37%) has the highest export price elasticity for rice, wheat, maize and total cereals respectively. This indicates that India should export these crops to these overseas markets compare to other countries. Whereas the

**Table 3.** Export Import Price elasticity of cereals (1990-2016).

| Crops | Variables | Export Import Price elasticity (%) | | |
|---|---|---|---|---|
| | | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 |
| Rice | Export | 1.84 | 0.48 | 1.24 |
| | Import | 0.97 | 1.92 | 1.03 |
| Wheat | Export | 1.48 | -0.58 | -0.30 |
| | Import | 0.98 | 0.67 | 0.93 |
| Maize | Export | 1.40 | 0.68 | 0.93 |
| | Import | 1.26 | 0.67 | 0.57 |
| Total Cereals | Export | 1.69 | 0.26 | 0.91 |
| | Import | 0.82 | 0.56 | 1.03 |

**Source:** CMIE Commodities, Accessed on 3rd June 2017.
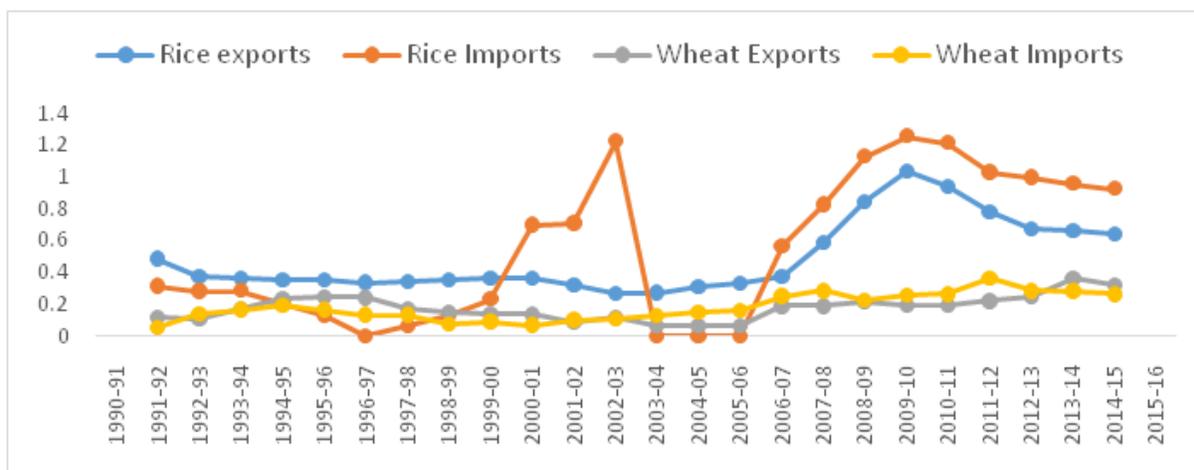


**Fig 1.** Export-Import price (US$/Kg) trends of Rice and Wheat.
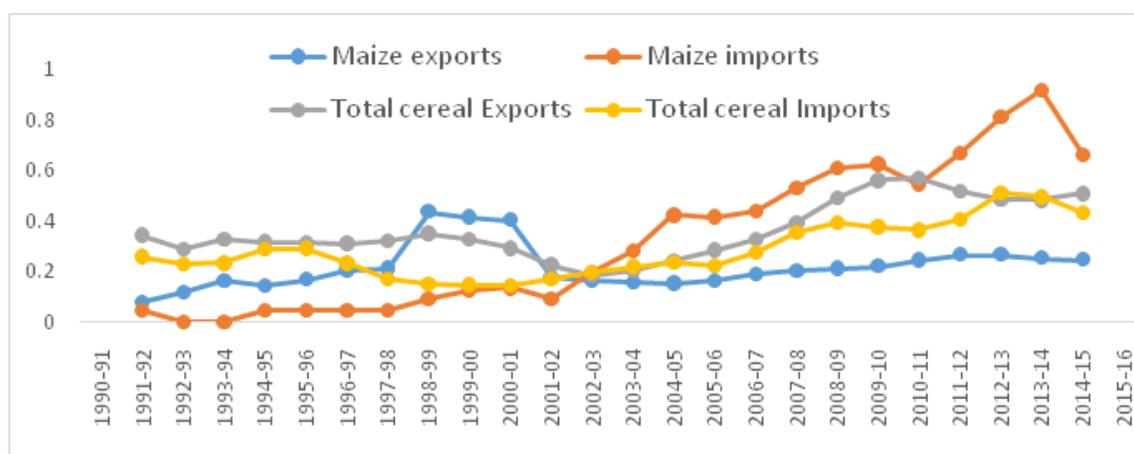


**Fig 2.** Export-Import price (US$/Kg) trends of Maize and Total cereals.

highest import price elasticity was observed in Turkey (1.06 %) followed by China (0.99 %) and Canada (0.80 %) for total cereals. This indicates that India should

imports cereals from these overseas markets compare to other countries.
The results of the Top 10 India's exports destinations and

**Table 4.** Growth rate and price elasticity of Top 10 India's Export Imports Destinations of Cereals (1990-2016).

| Country | Quantity growth rate (%) | | | Price elasticity (%) | | | Total Quantity (Tonnes) | % of Qty to World Total* | Average price (US$/Kg) | % share of Average Priceto Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 | | | | |
| **Top 10 India's Export Destinations of Cereals** | | | | | | | | | | |
| Bangladesh | 57.08 | 0.92 | 25.05 | 2.45 | -0.10 | 1.30 | 30137075 | 16.85 | 0.23 | 6.48 |
| Saudi Arabia | 7.78 | 4.74 | 5.43 | 1.53 | 0.36 | 0.74 | 16426190 | 9.19 | 0.65 | 18.67 |
| UAE | 6.02 | 12.55 | 8.94 | 4.17 | 0.14 | 1.09 | 11946122 | 6.68 | 0.48 | 13.75 |
| Indonesia | 15.20 | -2.07 | 11.38 | 0.00 | 1.51 | 0.00 | 10294439 | 5.76 | 0.25 | 7.20 |
| Malaysia | 17.37 | -0.03 | 12.37 | 0.78 | -0.59 | 0.72 | 9188136 | 5.14 | 0.25 | 7.23 |
| Iran | 5.22 | 49.34 | 18.88 | 0.00 | 0.33 | 0.00 | 7127952 | 3.99 | 0.54 | 15.62 |
| Vietnam | 0.00 | 5.96 | 0.00 | 0.00 | 1.39 | 0.00 | 6040167 | 3.38 | 0.26 | 7.37 |
| South Africa | 0.00 | -4.27 | 0.00 | 0.00 | -0.17 | 0.00 | 6009833 | 3.36 | 0.32 | 9.25 |
| Nigeria | 0.00 | 7.25 | 0.00 | 0.00 | 1.24 | 0.00 | 5060448 | 2.83 | 0.28 | 8.04 |
| Nepal | -5.40 | 18.08 | 11.03 | 0.00 | 0.71 | 0.00 | 4775783 | 2.67 | 0.22 | 6.39 |
| Other countries | - | - | - | - | - | - | 71799180 | 40.15 | - | - |
| **Top 10 India's Import Destinations of Cereals** | | | | | | | | | | |
| Australia | -15.06 | 51.41 | 8.48 | 0.00 | 0.78 | 0.00 | 6210790 | 37.04 | 0.23 | 18.72 |
| Russia | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2882728 | 17.19 | 0.05 | 4.29 |
| Canada | -100.00 | 0.00 | -15.47 | 1.00 | 0.80 | 0.80 | 2395442 | 14.29 | 0.09 | 7.07 |
| Ukraine | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 895825 | 5.34 | 0.07 | 5.69 |
| Argentina | 0.00 | 24.75 | 0.00 | 0.00 | 0.00 | 0.00 | 806614 | 4.81 | 0.31 | 25.50 |
| Turkey | 0.00 | 0.00 | 0.00 | 0.85 | 0.00 | 1.06 | 621156 | 3.7 | 0.02 | 1.63 |
| France | 0.00 | 81.95 | 0.00 | 0.00 | 1.00 | 0.00 | 607329 | 3.62 | 0.06 | 5.05 |
| USA | -8.56 | 20.87 | -10.34 | 0.00 | 0.00 | 0.00 | 540746 | 3.22 | 0.34 | 27.55 |
| China | 0.00 | -48.19 | 0.00 | 1.00 | 0.00 | 0.99 | 163647 | 0.98 | 0.03 | 2.44 |
| Pakistan | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 84309 | 0.5 | 0.03 | 2.08 |
| Other countries | - | - | - | - | - | - | 1559579 | 9.30 | 0.00 | 0.00 |

Source: CMIE Commodities, Accessed on 3rd June 2017, *world total is total of all countries.

**Table 5.** Growth rate and price elasticity of Top 10 India's Export Imports Destinations of Rice (1990-2016).

| Country | Total Quantity (Tonnes) | % of Qty to World Total* | Average price (US$/Kg) | % share of Average Price to Total | Quantity growth rate (%) | | | Price elasticity (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 |
| **Top 10 India's Exports Destinations of Rice** | | | | | | | | | | |
| Saudi Arabia | 15624607.70 | 14.22 | 0.68 | 13.42 | 15.82 | 4.33 | 8.71 | 1.56 | 0.35 | 0.74 |
| Bangladesh | 14311136.56 | 13.02 | 0.28 | 5.49 | 0.00 | 7.98 | 0.00 | 0.00 | 0.32 | 0.00 |
| UAE | 7187367.31 | 6.54 | 0.62 | 12.35 | 10.01 | 21.06 | 15.52 | 2.14 | 0.51 | 1.03 |
| Iran | 6397614.99 | 5.82 | 0.57 | 11.37 | 0.00 | 26.35 | 0.00 | 0.00 | 0.30 | 0.00 |
| South Africa | 5880933.01 | 5.35 | 0.35 | 6.98 | 0.00 | -1.06 | 0.00 | 0.00 | -0.16 | 0.00 |
| Nigeria | 5059420.38 | 4.60 | 0.28 | 5.55 | 0.00 | -10.88 | 0.00 | 0.00 | 1.24 | 0.00 |
| Nepal | 3040272.78 | 2.77 | 0.26 | 5.19 | 0.00 | 32.31 | 0.00 | 0.00 | 0.58 | 0.00 |
| Kuwait | 2722644.92 | 2.48 | 0.84 | 16.59 | 20.58 | 7.11 | 11.88 | 1.11 | 0.43 | 0.58 |
| Indonesia | 2426936.54 | 2.21 | 0.38 | 7.60 | 0.00 | -9.99 | 0.00 | 0.00 | 1.67 | 0.00 |
| UK | 2242906.39 | 2.04 | 0.78 | 15.45 | 13.44 | 7.90 | 7.87 | 1.41 | 0.78 | 1.00 |
| Other Countries | 43512396.82 | 39.59 | | 0.00 | | | | | | |
| Total | 109902333.58 | 100.00 | 5.04 | 100.00 | | | | | | |
| **Top 10 India's Import Destinations of Rice** | | | | | | | | | | |
| Vietnam | 178195.50 | 54.64 | 0.03 | 2.38 | -100.00 | 0.00 | -100.00 | 1.00 | 0.00 | 1.00 |
| USA | 76327.11 | 23.41 | 0.19 | 16.20 | -6.22 | 6.53 | -16.62 | 0.75 | 0.00 | 1.00 |
| Pakistan | 33212.11 | 10.18 | 0.02 | 1.39 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Australia | 22689.85 | 6.96 | 0.05 | 4.68 | -8.49 | 0.00 | -100.00 | 1.02 | 0.00 | 1.00 |
| Nepal | 7519.78 | 2.31 | 0.02 | 1.47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Spain | 2421.35 | 0.74 | 0.17 | 14.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Italy | 2016.82 | 0.62 | 0.39 | 33.77 | 0.00 | 31.90 | 0.00 | 0.00 | 0.00 | 0.00 |
| Thailand | 1885.57 | 0.58 | 0.20 | 17.38 | 0.00 | 99.72 | 0.00 | 0.00 | 0.00 | 0.00 |
| Saudi Arabia | 592.47 | 0.18 | 0.07 | 6.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Germany | 222.00 | 0.07 | 0.02 | 1.65 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other Country | 1014.17 | 0.31 | | 0.00 | | | | | | |
| World | 326096.71 | 100.00 | 1.17 | 100.00 | | | | | | |

Source: CMIE Commodities, Accessed on 3rd June 2017, *world total is total of all countries.

**Table 6.** Growth rate and price elasticity of Top 10 India's Exports Imports Destinations of Wheat (1990-2016).

| Country | Total Quantity (Tonnes) | % of Qty to World Total* | Average price (US$/Kg) | % share of Average Price Total | Quantity growth rate (%) | | | Price elasticity (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 |
| **Top 10 India's Exports Destinations of Wheat** | | | | | | | | | | |
| Bangladesh | 11184.63 | 33.95 | 1.32 | 11.96 | 0.00 | -19.69 | 0.00 | 0.00 | -0.64 | 0.00 |
| UAE | 3180.24 | 9.65 | 1.22 | 11.06 | 26.37 | -10.60 | -0.39 | 7.88 | -0.57 | -0.03 |
| South Korea | 2684.82 | 8.15 | 0.62 | 5.61 | 1.70 | -100.00 | -100.00 | 3.53 | 1.00 | 1.00 |
| Indonesia | 2382.75 | 7.23 | 0.70 | 6.37 | 0.00 | -45.28 | 0.00 | 0.00 | 1.00 | 0.00 |
| Philippines | 2050.18 | 6.22 | 0.88 | 8.02 | 23.17 | -100.00 | -100.00 | 2.50 | 1.00 | 1.00 |
| Yemen | 1991.90 | 6.05 | 0.80 | 7.25 | 0.00 | -100.00 | 0.00 | 0.00 | 1.00 | 0.00 |
| Malaysia | 943.63 | 2.86 | 1.09 | 9.92 | 18.98 | -31.10 | -9.60 | 0.99 | -0.54 | -0.53 |
| Oman | 825.52 | 2.51 | 1.01 | 9.16 | 24.59 | 0.70 | -12.35 | 81.87 | 0.00 | -0.23 |
| Vietnam | 822.33 | 2.50 | 0.90 | 8.19 | 0.00 | -100.00 | 0.00 | 0.00 | 1.00 | 0.00 |
| Sri lanka | 730.16 | 2.22 | 1.04 | 9.44 | 0.00 | -25.50 | 0.00 | 0.00 | -0.52 | 0.00 |
| Other country | 5756.66 | 17.48 | | 0.00 | | | | | | |
| World | 32941.39 | 100.00 | 11.04 | 100.00 | | | | | | |
| **Top 10 India's Import Destinations of Wheat** | | | | | | | | | | |
| Australia | 8227.32 | 38.41 | 1.60 | 32.23 | -19.58 | 60.91 | 15.37 | 0.98 | 0.62 | 0.79 |
| Ukraine | 3636.92 | 16.98 | 0.68 | 13.62 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Russia | 3035.83 | 14.17 | 0.59 | 11.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Canada | 2383.68 | 11.13 | 0.67 | 13.44 | -100.00 | 0.00 | -100.00 | 1.00 | 0.00 | 1.00 |
| France | 710.37 | 3.32 | 0.28 | 5.69 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Argentina | 661.22 | 3.09 | 0.36 | 7.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Turkey | 620.11 | 2.89 | 0.19 | 3.88 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| USA | 398.93 | 1.86 | 0.36 | 7.20 | -100.00 | 0.00 | -100.00 | 1.00 | 0.00 | 1.00 |
| Brazil | 95.25 | 0.44 | 0.15 | 3.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pakistan | 51.09 | 0.24 | 0.09 | 1.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other Country | 1601.11 | 7.47 | - | - | - | - | - | - | - | - |
| World Total | 21421.83 | 100.00 | 4.96 | 100.00 | - | - | - | - | - | - |

Source: CMIE Commodities, Accessed on 3rd June 2017, *world total is total of all countries.

**Table 7.** Growth rate and price elasticity of Top 10 India's Exports Imports Destinations of Maize (1990-2016).

| Country | Total Quantity (Tonnes) | % of Qty to World Total* | Average price (US$/Kg) | % share of Average Price Total | Quantity growth rate (%) | | | Price elasticity (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 | 1990-91 to 2000-01 | 2001-02 to 2015-16 | 1990-91 to 2015-16 |
| **Top 10 India's Exports Destinations of Maize** | | | | | | | | | | |
| Malaysia | 7446129.69 | 23.98 | 0.15 | 8.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Indonesia | 5450400.49 | 17.55 | 0.30 | 16.61 | 13.89 | 6.29 | 14.26 | 0.21 | 9.45 | 1.02 |
| Vietnam | 5134055.28 | 16.53 | 0.38 | 21.09 | -100.00 | 12.41 | 31.76 | 0.00 | 0.52 | 0.00 |
| Bangladesh | 4617577.09 | 14.87 | 0.18 | 10.12 | 133.33 | 7.79 | 46.33 | 0.00 | 0.34 | 0.00 |
| Taiwan | 1813955.78 | 5.84 | 0.13 | 7.39 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Nepal | 1236001.73 | 3.98 | 0.10 | 5.73 | 0.00 | 45.48 | 0.00 | 0.00 | 0.55 | 0.00 |
| UAE | 860712.55 | 2.77 | 0.17 | 9.59 | 0.00 | 24.39 | 0.00 | 0.00 | 0.88 | 0.00 |
| South Korea | 583844.55 | 1.88 | 0.16 | 8.91 | 0.00 | 30.53 | 0.00 | 0.00 | 4.52 | 0.00 |
| Yemen | 465307.91 | 1.50 | 0.10 | 5.85 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Jordan | 314723.12 | 1.01 | 0.12 | 6.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other country | 3132574.30 | 10.09 | - | - | | | | | | |
| Total | 31055282.49 | 100.00 | 1.79 | 100.00 | | | | | | |
| **Top 10 India's Import Destinations of Maize** | | | | | | | | | | |
| China | 162620.66 | 32.35 | 0.01 | 0.44 | 0.00 | -100.00 | 0.00 | 0.00 | 1.00 | 0.00 |
| Ukraine | 155665.67 | 30.97 | 0.01 | 0.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Argentina | 112012.85 | 22.28 | 0.54 | 34.33 | 0.00 | 24.62 | 0.00 | 0.00 | 0.78 | 0.00 |
| USA | 59464.08 | 11.83 | 0.54 | 34.44 | 0.00 | 31.84 | 0.00 | 0.00 | 0.00 | 0.00 |
| Brazil | 7874.07 | 1.57 | 0.19 | 12.29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| South Africa | 1718.75 | 0.34 | 0.13 | 8.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Myanmar | 1440.00 | 0.29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bangladesh | 648.00 | 0.13 | 0.01 | 0.65 | 0.00 | -100.00 | 0.00 | 0.00 | 1.00 | 0.00 |
| Australia | 621.00 | 0.12 | 0.08 | 4.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| UAE | 100.00 | 0.02 | 0.07 | 4.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other country | 545.62 | 0.11 | | 0.00 | | | | | | |
| Total | 502710.70 | 100.00 | 1.58 | 100.00 | | | | | | |

Source: CMIE Commodities, Accessed on 3rd June 2017, *world total is total of all countries.

their share in the world exports during the period 1990-91 to 2015-16 showed that, the major India's exports destinations for total cereals are Bangladesh (16.85%), Saudi Arab (9.16%), UAE (6.68%), for rice, Saudi Arabia (14.22 %), Bangladesh (13.02 %) and UAE (6.54 %); for wheat, Bangladesh (33.95 %) and UAE (9.65 %) and South Korea (8.15 %); for maize, Malaysia (23.98 %), Indonesia (17.55 %) and Vietnam (16.53%). A study by Goyal et.al., (2017) concluded that the largest component of India's export basket for fresh and processed food products is cereals and cereal preparations, which is mostly exported to Saudi Arabia (12 per cent of India's total export of cereal and cereal preparation in 2016), followed by the UAE (11.6 per cent), Iran (8.2 per cent) and Iraq (6.7 per cent). Whereas major India's import destinations for cereals are Australia (37.04%), Russia (17.19%) and Canada (14.29%); for rice, Vietnam (54.64 %), USA (23.41%) and Pakistan (10.18 %); for wheat, Australia (38.41 %), Ukraine (16.98 %) and Russia (14.17 %); and for maize, China (32.35 %), Ukraine (30.97 %) and Argentina (22.28 %) during the period 1990 to 2016. The study found that during 1990-91 to 2015-16, highest export growth rate observed in UAE (for rice), Nepal (for wheat) and Bangladesh (for maize and total cereals). The study suggest that India should make multilateral agreements in this countries. The study found that during the period 1990-91 to 2015-2016, major India's exports and import destinations were Bangladesh and Vietnam for rice; Malaysia and China for maize; Bangladesh and Australia for cereals & wheat respectively.

## CONCLUSION

World price influences on international trade. India has become a very important player on the global market for most of the agricultural commodities including cereals. The results show that among the cereals, exports and imports price of wheat were found to be more than compared to other cereals. The terms of trade for wheat and total cereals are found to be increased in comparison to rice and maize crops. The exports price growth rate of wheat are found to be more than imports, whereas imports price growth rate of crops viz., rice, maize, total cereals are found to be more than exports price growth. The terms of trade for wheat and total cereals are found to be increased. The study found that the export price trends of rice, wheat, total cereals, are found to be more or less stable up to 2005-06, but 2006-07 onwards increasing with fluctuations.
The study found that during 1990-91 to 2015-16, the highest export and imports growth rate for cereals were observed in Bangladesh and Australia respectively, while same countries emerged as top export import destinations for cereals. The study suggest that India should make multilateral agreements in these countries.

The results showed that UAE (1.03%), Nepal (6.78%), Indonesia (1.02%) and Bangladesh (1.37%) has the highest export price elasticity for rice, wheat, maize and total cereals respectively. This indicates that India should export these crops to these overseas markets compare to other countries. Whereas the highest import price elasticity was observed in Turkey (1.06 %) followed by China (0.99 %) and Canada (0.80 %) for total cereals.
The study suggest that import from inelastic countries should be exempted from any ban (without any quantity restriction) which would help in good relationships. These crops should be included and trade exemptions should be reconsider towards those countries which have shown elastic in both export and import. Multilateral trade relationship with high CAGR countries would help in smooth trade of agricultural crops.
The study findings have important implications to be considered in designing foreign trade agricultural policies and programs to boost trade and foreign earnings from export and import countries. The study guides exporters and importers of countries for market and price signals of commodities.

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## DECLARATIONS

Please contact author for data requests. The authors declare that they have no competing interests. SERB, Ministry. Department of Science Technology for funding the project.

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