

## **Export Competitiveness of Important Cereals in India**

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### **ABSTRACT**

India occupied second place in production of rice, wheat and other cereals in the world. Export of cereals stood at 10064 USD Millions. Rice (including Basmati and non Basmati) occupied the major share in India's total cereals export with 77.6 per cent in terms of quantity and 87.6 per cent in terms of value of exports during the year 2020-21. It is important to know the export competitiveness of Indian cereals as it leads to countries economic growth. The present study was taken-up to study the export competitiveness of important cereals from India. Secondary data on area, production and productivity, export quantity, domestic prices and border prices or (reference price) of cereals from India were collected from [FAO](#), agricultural prices in India year books and AGMARK for the period of 21 years i.e., from 2000-01 to 2020-21. Compound Growth Rates, Cuddy Della Valle Index and Nominal Protection Coefficient were used for the study. The results revealed that among the selected crops maize showed better performance in area, production and Productivity during the study period. Except wheat all the other cereals under study showed positive growth rate in quantity exported in the first period and also during overall period. The instability was less in the area, production and productivity and high in the quantity of the commodity exported. All the selected cereals had moderate export competitiveness during the first period and except rice other cereals became noncompetitive during second period.

Key words: Important cereals, Compound Growth rates, Export Competitiveness, Nominal Protection Coefficient

### **INTRODUCTION**

India is one of the major exporters of agricultural commodities in the world. During 2020-21 India had US\$ 41.87 billion and crossed US\$ 50 billion in agriculture exports (19.92% increase) during 2021-22. India's share in total agricultural export value raised from 14.5 per cent during 2015-16 to close to 19 per cent during 2019-20, India occupies second place in production of rice, wheat and other cereals in the world. Cereals contributed 71.14 per cent to the total agricultural exports with 48.68 per cent to the total value agricultural export. Export of cereals stood at 10064.04 USD Millions. Rice (including Basmati and non Basmati) occupied the major share in India's total cereals export with 87.6 per cent (APEDA 2020-21). It is attributed to synergy and collaboration between various stakeholders viz., farmers, millers, exporters and Government agencies in boosting exports (Ministry of Commerce and Industry). Indian basmati rice is well recognized in international market due to its quality and there is a continuous increase in demand with the new emerging markets. India would have to take effective steps to enhance domestic production in area as well as productivity (Udhayakumar and Karunakaran (2020)). Export value of rice is significant source of foreign exchange with consider to agriculture, which fortifies the Balance of Payment of the country (Satishkumar et al., 2016). The major export destinations of Indian cereals are Saudi Arabia, Bangladesh, Iraq, Nepal and Iran (APEDA, 2020-21). The global markets for Indian rice are highly dynamic and the barriers to trade are being lowered gradually all around the world (Singh, 2001).

Paddy, wheat, sorghum, barley and maize are the important cereals produced and exported from India which occupied a total area of 92.34 million ha, with a production of 322.55 million tonnes and the total export quantity of 3.15 million tonnes during 2020-21. The huge demand for cereals in the global market is generating an outstanding situation for Indian cereal products export. In 2008, to meet domestic needs, India had levied ban on the export of agricultural commodities i.e., rice and wheat. Now, on observing surplus production of the country, the enormous demand in the world market, the Nation has raised the ban, but limited quantity of export.

It is important to know the export competitiveness of Indian cereals in the world market as export and trade leads to economic growth of the country. The export competitiveness varies with the changes in domestic and international prices. The present study was undertaken with an objective to assess the export competitiveness of important cereals from India over a period of time.

### **Materials and Methods**

Growth and instability in area, production and productivity and competitiveness of Indian cereals were estimated for the selected crops viz., rice, wheat, sorghum, maize and barley in India for the period 2000-01 to 2020-21. The analysis was carried out by using the following tools of analysis.

Compound Growth Rate (CGR) analysis:

Past performance is indicated by growth variable. The trend of a particular variable over a period of time was estimated by the analysis of growth. Hence, the growth rate was assessed by using the exponential growth function:  $Y_t = ab^t u_t$

where,

Y = dependent variable

a = Intercept

b = Regression co-efficient

t = Number of years i.e., 1, 2, ..., n

$U_t$  = Disturbance term for the t year.

The equation was converted into log linear form for assessment purpose and was estimated by using Ordinary least square (OLS) technique. The compound growth rate  $g = (\text{antilog of } \ln b^{-1}) * 100$  (Oladele and KenAmara, 2015). The compound growth rates were estimated for the period from 2000-01 to 2020-21. The entire period was divided into two sub periods i.e., 2000-01 to 2010-11 (first period), 2011-12 to 2020-21 (second period).

Instability Analyses Cuddy Della Vella Index:

Instability in area, production, productivity and quantity of commodity exported of selected crops was estimated by using Cuddy Della Vella Index. The formula suggested by Cuddy and Della Valle (1978) was used to compute the degree of variation around the trend.

Coefficient of Variation: Although Coefficient of Variation (C.V) is the simplest measure of instability, it over-estimates the level of instability in time series data which are characterized by long-term trends. Coefficient of Variation (CV) can be calculated as follows:

$(C.V) = (\text{Standard Deviation} / \text{Mean}) * 100$

Instability Index: Cuddy- Della Valle Index

Cuddy Della Valle Index corrects the coefficient of variation in long term trend. The Cuddy Della Valle Index de-trends shows the exact direction of the instability. Therefore, it is a better measure to capture the instability. Cuddy- Della Valle Index corrects the CV as:

Cuddy- Della Valle Instability Index (%):  $CV \sqrt{1-R^2}$

Where,

R<sup>2</sup> was the coefficient of determination from a time trend regression adjusted by its degrees of freedom. The present study divided the CDI value into three categories, which present the different range of instability (Sihmar,2014)

**The ranges of Cuddy Della Valle Index are given as follows**

Low instability=0 to 15

Medium instability= 15 to 30

High instability=30 and above

**Nominal Protection Coefficient:**

The Nominal Protection Coefficient (NPC) under exportable hypothesis (Gulati and Sharma 1994) was used to estimate the export competitiveness of important cereals from India. NPC was the modest indicator of export competitiveness. The coefficients were computed to determine to what extent competitive advantage was enjoyed by the commodity in the context of free trade. The coefficients explain whether a country has enough comparative advantage in the export /import of that commodity in a free trade scenario (or) not. NPC is the ratio of domestic price to the border price (or) reference price. In this study, the export competitiveness was measured by exportable hypothesis. The data sources for this study were [www.fao.org](http://www.fao.org), agricultural prices in India year books and [agmarknet.gov.in](http://agmarknet.gov.in) from 2000-01 to 2020-21. The commodities selected for study included rice, wheat, sorghum, maize and barley.

The NPC was calculated with the help of following equation

$$NPC = Pd/Pb$$

Where,

NPC=Nominal protection coefficient of the commodity.

Pd=Domestic price of the commodity

Pb=Border price (or) reference price of the commodity after taking care of transportation and marketing expenses.

If NPC value is less than 0.5 the commodity is highly export competitive, and if it is between 0.5 to 1.0 moderately export competitive, and greater than 1.0, the commodity is non-export competitive (i.e., import competitive).

## **Results and Discussion**

The growth in area, production and productivity for the selected crops were estimated using compound growth rates and the results were presented in the Table 1. The results showed that among the selected cereals, maize showed better growth rates in area, production and yield during first period with 2.84, 5.75 and for 2.83 per cent respectively. Rice and sorghum showed significant growth in the yield with 1.61 per cent and 2.57 per cent respectively. During the second period, rice showed positive and significant growth in the production and yield with 1.86 per cent and 3.86 per cent respectively. Wheat showed positive growth in production with 1.84 per cent. Sorghum showed negative growth rates in area, production and productivity. Maize showed positive and significant growth rates in production and yield by 3.49 and 2.54 per cent. Sorghum and barley showed negative growth in area throughout the study period.

The instability in the area, production and productivity of selected crops was estimated by using Cuddy Della Valle Index and the results were presented in the Table 2. The results indicated that except yield of rice during second period, all the selected crops during

the study period showed less instability as the index values are less than 15. The yield of rice in the second period showed medium instability with Cuddy Della Valle index 15.36.

The Growth rates of export quantity of important cereals from India (2000-01 to 2020-21) were estimated and the results were presented in Table 3. The results indicated that in the first period except wheat all the other crops under study recorded positive growth rates. Among the selected crops barley recorded highest growth rate with 221.7 per cent followed by sorghum (89.9 per cent) and Maize (54.7 per cent). During second period from 2011-12 to 2020-21, except rice all the other crops under study recorded negative growth rates in the quantity exported, where rice recorded 5.2 per cent growth. For the entire period except wheat, all the cereals under study recorded positive growth rates among which, rice recorded high growth with 9.89 per cent.

The instability in the quantity of commodity exported for all the selected crops was estimated by using Cuddy Della Valle index and the results were presented in the Table4. The results indicated that except rice during second period, all the selected crops during the study period showed high instability in the quantity of the commodity exported as the index values are higher than 30. Rice exhibited medium instability during the second period with the index value of 19.1.

The Nominal Protection Coefficients of Important cereals from India from 2000-01 to 2020-21 i.e., for 21 years was calculated and the results were presented in Table 5. The results revealed that rice had high export competitiveness from 2005-06 to 2011-12 though there was a ban on rice exports from 2008-10. Medium competitiveness was observed in the remaining years except 2017-18, 2019-20 and 2020-21 where it became noncompetitive because of the ban on the exports and limits on the quantity exported. Sorghum showed medium Government support price (MSP) for the last several years and also the Government has withdrawn the tax incentive. Sorghum showed medium competitiveness up to 2013-14 and it became noncompetitive from 2014-15 to 2020-21. Maize and Barley showed moderate competitiveness up to 2014-15 and both the crops became noncompetitive from 2015-16 to 2020-21. On an average rice, wheat, sorghum, maize and barley showed moderate competitiveness during the first period with NPC of 0.53, 0.94, 0.66, 0.69 and 0.63 respectively. Except rice all the other cereals became noncompetitive during the second period. Rice had moderate competitiveness with NPC 0.82 whereas, wheat, sorghum, maize and barley had NPC of 1.32, 1.28, 1.05 and 1.03 respectively, during second period. For the overall period wheat (NPC of 1.12) and sorghum (NPC of 1.01) became noncompetitive and other cereals i.e., rice, maize and barley showed moderate competitiveness with an NPC of 0.67, 0.88 and 0.88 respectively. For maize the results are in line with the results of (Srikala and Devi 2020) who stated that Indian maize has a moderate degree of competitiveness as Nominal Protection Coefficients during all the years studied ranged between 0.50 and 1.0. For rice the results are supported by Chandrashekhar, 2013 who stated that there was a strong demand for Indian rice in the international markets. The increasing consumer demand for rice and India's strength for production of basmati as well as non-basmati rice, coupled with liberal export policy, and larger public stock have created ample scope for rice export. In recent years, the African countries have also shifted to Indian non-basmati rice because of price competitiveness.

**Fig.1. International prices (USD per tonne) for the selected cereals during the study period in India.**

The international prices for the selected cereals (USD per tonne) were presented in Fig. 1. Fig. 1 indicated that the prices for all the commodities considered under the study were highly fluctuating. Rice showed high level trend in prices (but subjected to fluctuations) compared to all other cereal crops due to its market demand.

**Fig.2. The quantity (tonnes) for the cereals exported from India during the study period**

The quantity of the cereals exported from India (in tonnes) were presented in Fig. 2. Indicated that the quantity of rice exported was high but subjected to high fluctuations. Wheat and maize also showed better performance up to 2013 and declined later.

**Fig.3. The value (000'USD) of the cereals exported from India during the study period.**

The value of the cereals exported from India (in 000'USD) were presented in Fig. 3 which indicated that the rice had added more foreign income compared to all other crops under the study. Wheat and maize also showed good performance up to 2013.

Wheat and maize showed significant and positive growth in area and except sorghum, all the cereals showed positive growth in production and yield for the total period. Though

there was less instability in area, production and productivity of the selected crops, there was high instability (except rice which had medium instability) in the quantity of commodity exported which may be due to the fluctuating and low international prices. Rice had good market price compared to other cereals and it showed medium competitiveness during the second period. The sharp spike in rice exports was due to disruption of supply chains of many commodities by the COVID19 pandemic. The Government has taken prompt measures to ensure export of rice and other cereals. APEDA has been promoting rice exports through collaborations with various stakeholders in the value chains. The Government had setup the Rice Export Promotion Forum under the aegis of APEDA. Only rice export was promoted on large scale for the last 10 years which may lead to intensive cultivation. According to Kumar et al., 2021, intensive rice cultivation with traditional methods for long term has been associated with severe deterioration of natural resources, declining factor productivity, multiple nutrient deficiencies, depleting ground water, labour scarcity and high cost of cultivation putting the agricultural sustainability in question. Besides rice, India ranks second place in wheat production with 107.6 million metric tonnes and 4<sup>th</sup> in production of sorghum with 8.13 per cent (4770 thousand mt) in the world (APEDA 2020). In case of wheat, major portion will be consumed domestically leaving little for export (less than one per cent). India is giving preference to export wheat to neighbouring countries and most vulnerable countries to support their needs. India is the 7<sup>th</sup> largest exporter of sorghum in the world. Sorghum is a rainfed crop and also India has rainfed agriculture occupying about 51 per cent of countries net sown area. Promoting production and export of sorghum benefits the rainfed farmer.

## **Conclusions**

In this study compound growth rates, Cuddy Della Valle Index and Nominal Protection coefficient were employed to estimate the growth in area, production and productivity and export quantity, instability in area, production, productivity and quantity exported and also the export competitiveness of important cereals from India. The results showed that among the selected cereals maize had better growth in area, production and growth during the first period and rice showed positive and significant growth in the production and yield during the second period. Sorghum and barley showed negative growth in area throughout the study period. The results of growth rate of export quantity indicated that except wheat, all the other cereals under study showed positive growth rate in the quantity of the commodity exported during the first period and except rice all the other cereals showed negative growth in the quantity exported during second period. Except yield of rice in the second period, all the other cereals showed less instability in the area, production and productivity in both the periods and for the entire study period. Except rice in the second period, all the selected crops recorded high instability in the quantity of the commodity exported during the study period.

The results of the nominal protection coefficient indicated that there was moderate export competitiveness for all the selected important cereals in the first period and except rice all the crops became noncompetitive during the second period. The Government should increase the MSP for cereals to increase the area under these crops. The department of agriculture and the extension scientists should encourage the farmers to adopt latest technologies to increase the production and productivity of cereals to meet the global standards. The Government should take measures to increase the competitiveness of Indian cereals by collaborating with various stakeholders of value chain. Special attention should be given to improve the production and export of sorghum to enable the rainfed farmers to get benefits of foreign trade.

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FAO

www.fao.org

**Table 1 Growth rate of area, production and yield of important cereals from India (2000-01 to 2020-21)**

S N o	Name of the crop	2000-01 to 2010-11			2011-12 to 2020-21			2000-01 to 2020-21		
		CGR			CGR			CGR		
		Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
1	Rice	-0.07	1.54	1.61**	0.30	1.86**	3.86*	0.13	1.96**	2.37**
2	Wheat	0.79*	1.23*	0.43	0.33	1.84**	1.5	0.97**	2.28**	1.30**
3	Maize	2.84**	5.75**	2.83**	0.93	3.49**	2.54**	1.99**	4.81**	2.76**
4	Barley	-1.45*	-0.32	1.15	-1.49*	0.12	1.63*	-0.53*	1.48**	2.02**
5	Sorghum	-2.72**	-0.22	2.57**	-4.02**	-5.05**	-1.08	-3.78**	-3.14**	0.66

\*\* Significance at 1 per cent level and \* significance at 5 per cent level

**Table 2 Cuddy Della Valle Index values for area, production and yield of selected cereals from India (2000-01 to 2020-21)**

S N o	Name of the crop	2000-01 to 2010-11			2011-12 to 2020-21			2000-01 to 2020-21		
		CDI			CDI			CDI		
		Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
1	Rice	3.37	7.43	4.89	1.55	2.79	15.36	2.58	5.26	12.98
2	Wheat	3.04	5.88	3.46	2.71	4.47	5.83	3.12	5.79	5.23
3	Maize	2.08	10.18	9.10	4.30	4.44	4.04	4.09	6.52	6.25
4	Barley	6.65	10.91	6.52	5.80	7.03	5.58	6.90	10.15	6.26
5	Sorghum	2.68	5.59	7.93	9.06	11.37	9.41	5.43	10.49	10.11

**Table 3 Growth rate of export quantity of selected cereals from India (2000-01 to 2020-21)**

S No	Name of the crop	2000-01 to 2010-11	2011-12 to 2020-21	2000-01 to 2020-21
		CGR	CGR	CGR
1	Rice	1.32	5.2**	9.89**
2	Wheat	-69.9**	-23.9**	-1.1**
3	Maize	54.7**	-20.6**	11.0**
4	Barley	221.7**	-46.4**	34.9**
5	Sorghum	89.9**	-9.3**	23.8**

**Table 4 Cuddy Della Valle Index values for quantity of commodity exported of selected cereals from India (2000-01 to 2020-21)**

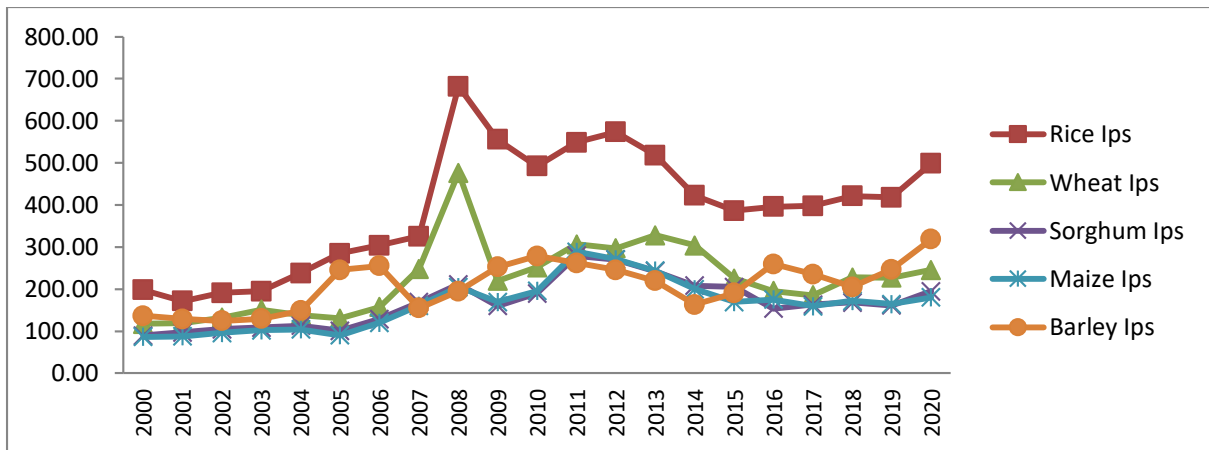
S No	Name of the crop	2000-01 to 2010-11	2011-12 to 2020-21	2000-01 to 2020-21
		CDI	CDI	CDI
1	Rice	45.62	19.10	32.83
2	Wheat	93.99	115.29	128.60



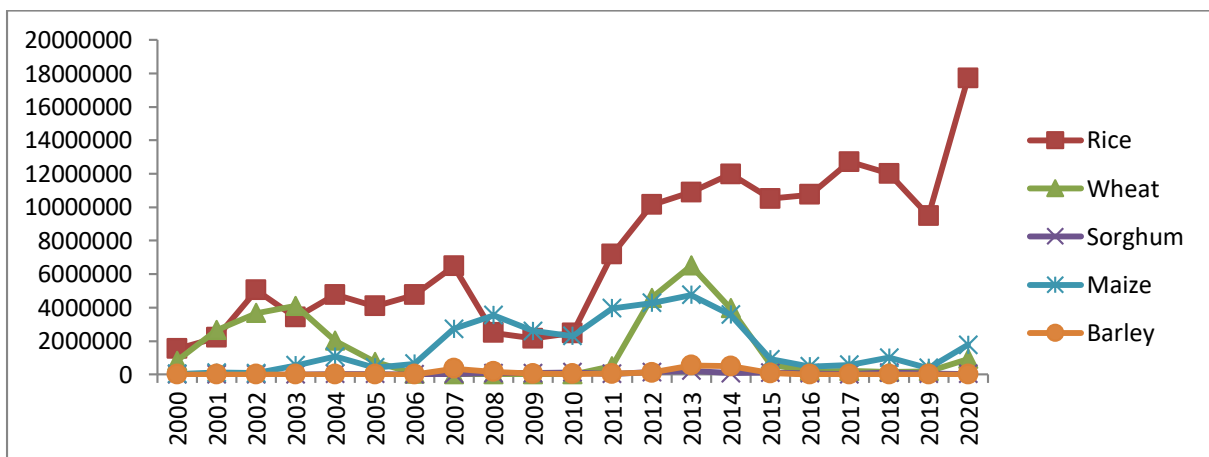
3	Maize	55.77	53.75	90.70
4	Barley	188.77	151.15	185.38
5	Sorghum	56.01	66.40	83.81

Table 5 Nominal protection coefficients (NPC) of important cereals exported from India from 2000-01 to 2020-21

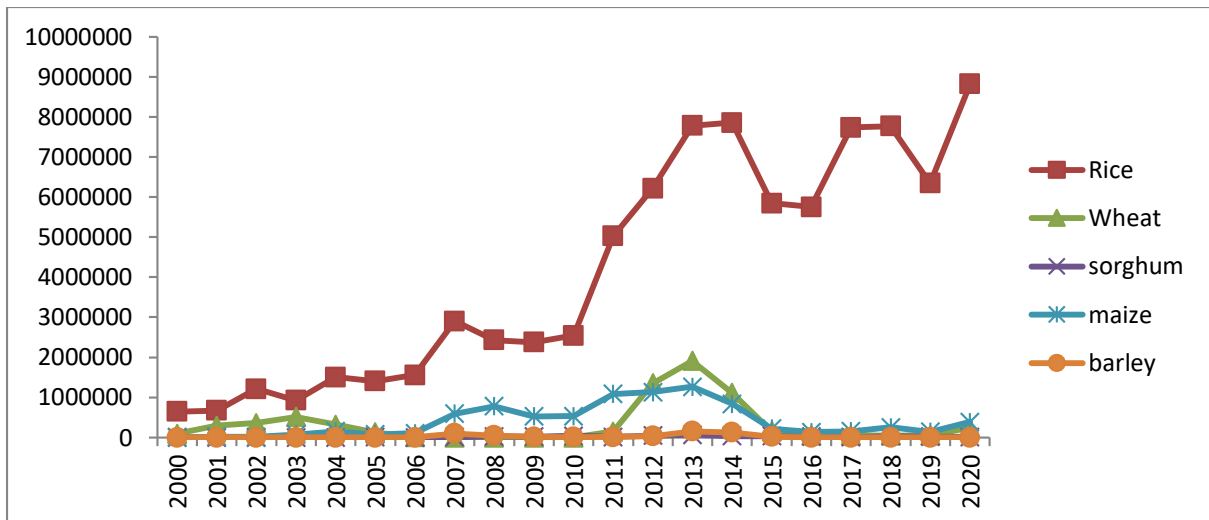
Year	Rice	Wheat	Maize	Barley	Sorghum
2000-01	0.65	1.00			
2001-02	0.72	0.97			
2002-03	0.65	0.96	0.74		
2003-04	0.70	0.85	0.66		0.54
2004-05	0.57	0.97	0.60		0.50
2005-06	0.46	0.99	0.91	0.67	0.79
2006-07	0.48	1.04	0.78	0.58	0.90
2007-08	0.45	0.79	0.61	0.41	0.70
2008-09	0.28	0.71	0.57	0.53	0.57
2009-10	0.41	1.04	0.69	0.87	0.68
2010-11	0.48	1.06	0.68	0.74	0.63
<b>Average</b>	<b>0.53</b>	<b>0.94</b>	<b>0.69</b>	<b>0.63</b>	<b>0.66</b>
2011-12	0.45	0.86	0.54	0.57	0.67
2012-13	0.52	0.97	0.64	0.66	0.70
2013-14	0.64	0.95	0.75	0.79	0.81
2014-15	0.76	0.98	0.85	0.84	1.13
2015-16	0.83	1.32	1.09	1.05	1.08
2016-17	0.76	1.61	1.19	1.75	1.47
2017-18	1.03	1.69	1.24	1.29	1.97
2018-19	0.93	1.52	1.09	0.85	1.39
2019-20	1.05	1.61	1.72	1.07	1.81
2020-21	1.24	1.70	1.36	1.40	1.75
<b>Average</b>	<b>0.82</b>	<b>1.32</b>	<b>1.05</b>	<b>1.03</b>	<b>1.28</b>



**Fig1. The international prices of the cereals exported from India during the study period**



**Fig.2 The quantity (Tonnes) of the cereals exported from India during the study period**



**Fig.3 The value (000' USD) of the cereals exported from India during the study period**