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Production, export and import trends of rice and wheat: Insights from global and Indian perspectives

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Abstract

This research paper delves into the trade dynamics of rice and wheat on a global scale and within India from 2012 to 2022, focusing on export and import trends, unit values, and competitive advantages using 6-digit HS codes. The analysis reveals a significant upward trend in global rice exports, which peaked at 48.83 million tonnes (MT) in 2017 compared to 37.26 MT in 2012, indicating robust market expansion. However, rice imports exhibit substantial fluctuations, reaching a high of 44.73 MT in 2018 due to climatic disruptions such as drought and heavy rainfall during 2016-2018. Conversely, India's rice exports have shown a steady increase, culminating in 146.11 million tonnes in 2020, underscoring its leading role as an exporter, with minimal rice imports highlighting its position as a net exporter. Similarly, global wheat exports increased to 198.55 MT in 2020 from 156.20 MT in 2012, though import volumes fluctuate significantly, peaking at 149.76 MT in 2018, again influenced by climatic factors. India's wheat exports peaked at 4.585 million tonnes in 2012, while imports varied, with a notable peak of 5.347 million tonnes in 2017. The study also evaluates export unit values (EUV) and import unit values (IUV), providing insights into economic positioning. For rice, the USA holds the highest EUV, while India has the lowest for broken and husked rice. Among rice importers, Saudi Arabia shows the highest IUV, suggesting high demand for premium rice products. In wheat, the USA leads in EUV, while India's EUV is lower, with Algeria being the top importer with the highest IUV, indicating significant demand.

Keywords: Export Unit value, import unit value, trade dynamics, CAGR and competitive advantages

1. Introduction

Rice and wheat are integral to global food security, with India playing a crucial role as a leading producer and exporter of these staple cereals. India, along with China, dominates global rice production, collectively contributing over half of the world's output. By 2029, global rice production is projected to reach 582 million tonnes, with India expected to drive much of this increase due to advancements in agricultural practices, such as the adoption of improved seed varieties and enhanced irrigation infrastructure. India's rice production is bolstered by supportive policies, including minimum support prices that stabilize production and incentivize farmers, making the country a key player in meeting global rice demand. In the wheat sector, India is equally significant, contributing to the global output projected to reach 839 million tonnes by 2029. Although the growth in wheat production is expected to be more moderate compared to the previous decade, India's output remains vital, supported by favourable domestic policies that ensure stable incomes for farmers. The global trade dynamics of rice and wheat are further shaped by India's strategic export policies. Historically, India imposed export restrictions on wheat and rice to prioritize domestic food security, but recent relaxations, albeit with regulated quantities, reflect the country's strategy to balance internal needs with global market opportunities. In the fiscal year 2022-2023, India's cereal exports reached a value of Rs. 111,062.37 crore (13,857.95 USD million), with rice alone accounting for 80% of this total, emphasizing India's dominance in the global rice trade. The demand for Indian rice, particularly Basmati, continues to grow in international markets, reinforcing the country's position as a vital supplier. Additionally, India's wheat production, with an output of 107.49 million tonnes for the 2019-2020 period, highlights its substantial contribution to global grain supplies.

In the 2022-2023 period, India's total food grain production reached 329.69 million tonnes, including 135.75 million tonnes of rice and 110.55 million tonnes of wheat, underscoring the country's capacity to support global food security. Analysing these production and trade trends provides valuable insights into India's strategic role in the global food supply chain, demonstrating its importance in addressing the challenges of global food security (Anonymous, 2023).

2. Methodology

The mission of the study is to understand the Indian trade dynamics of cereals at the HS 6-digit level within the global context. The study utilizes cereal production data from 2012 to 2022, sourced from the World Bank, to assess growth trends. Trade data for imports and exports at the HS 6-digit level has been obtained from ITC Trademap to evaluate the performance of Indian cereal products on the global stage. To analyze trade performance, descriptive statistics such as mean and percentage shares are calculated to determine India's average product trade levels and their shares. These methods provide a comprehensive view of export unit value, import unit value, and revealed comparative advantage, facilitating an understanding of India's competitive positioning in the global cereal market.

2.1 Export Unit Value (EUV) refers to the average price at which a country's goods are sold in international markets, calculated by dividing the total export value by the quantity exported. It is a crucial indicator of a country's competitiveness in global trade.

$$EUV = \frac{\text{Quantity Exported}}{\text{Total Export Value}}$$

Import Unit Value (IUV) represents the average price paid for goods imported into a country, obtained by dividing the total import value by the quantity imported. It helps assess the cost of goods and the relative price levels of imports.

$$IUV = \frac{\text{Quantity Imported}}{\text{Total Import Value}}$$

2.2. Compound Annual Growth Rate (CAGR) Analysis

The growth rates can be specified as the percentage change of a particular variable within a given period. Compound annual growth rates (CAGR) of area and production of onion crop in the study area were estimated using the following growth model:

$$Y_t = \alpha \beta^t \dots (1)$$

Where,
 Y_t = Area/ production of onion for the year t = Time variable (1,2,n) for each period.
 α = Constant
 β = Growth coefficient Log transformation of (1)

$$\ln Y_t = \ln \alpha + t (\ln \beta) \dots (2)$$

$$\ln \beta = \ln (1 + t), \text{ and} \dots \dots \dots (3)$$

$$t = [\text{antilog} (\ln \beta) - 1] \dots (4)$$

$$CAGR = [\text{antilog} (\ln \beta) - 1] * 100 \dots (5)$$

2.3 Rice and Wheat Products Classification and HS Code Mapping with Product Labels

Table 1: Classification of Rice Products with Corresponding HS Codes and Product Labels (6-Digit HS Code Level)

Rice		
Sl. No	Product code	Product label
1	'100630	Semi-milled or wholly milled rice, whether or not polished or glazed
2	'100640	Broken rice
3	'100620	Husked or brown rice
4	'100610	"Rice in the husk, ""paddy"" or rough"

Table 2: Classification of Wheat Products with Corresponding HS Codes and Product Labels (6-Digit HS Code Level)

Wheat		
Sl. No	Product code	Product label
1	'100199	Wheat and meslin (Excluding seed for sowing, and durum wheat)
2	'100119	Durum wheat (Excluding seed for sowing)
3	'100191	Seed of wheat and meslin, for sowing (excluding durum)
4	'100190	Wheat and meslin (Excluding durum wheat)
5	'100110	Durum wheat
6	'100111	Durum wheat seed for sowing

3. Results and Discussion

3.1 World and Indian Scenario in Cereal Production

Over the decade, global cereal production experienced a steady increase, with a Compound Annual Growth Rate (CAGR) of 0.0039 per cent. India's cereal production also showed consistent growth, with a slightly higher CAGR of 0.0044 per cent, reflecting India's significant role in global cereal production. India's share in global cereal production

remained relatively stable, averaging 10.93 per cent across the period, with minor fluctuations. Notably, India's production share peaked at 11.60 per cent in 2022. The Coefficient of Variation (CV) for both world and India's cereal production indicates moderate variability, suggesting that despite year-to-year fluctuations, the overall trend for both global and Indian cereal production has been upward, with India maintaining a crucial position in global cereal supply.

Table 3: Cereal production in World and India

Year	World Cereal Production in million tonnes	India Cereal Production in million tonnes	India's share in world (%)
2012	2054.46	234.93	11.43
2013	2763.40	295.67	10.69
2014	2817.95	297.11	10.54
2015	2837.71	286.00	10.07
2016	2915.08	295.36	10.13
2017	2967.14	311.42	10.49
2018	2914.53	321.56	11.03
2019	2963.50	324.96	10.96
2020	3003.64	342.11	11.39
2021	3071.26	355.11	11.56
2022	3059.64	355.09	11.60
Average	2756.90	301.10	10.93
CV	15.383	15.763	-
CAGR (%)	0.039	0.044	-

Source: World Bank Data, 2023

3.2 Global Rice Trade Leaders: The Top Ten Exporting Countries

The data on the top ten rice-exporting countries highlights India's dominant position in the global rice market, with an exported quantity of 14.61 million tonnes, accounting for a substantial 31.20 per cent of global exports. Thailand and Viet Nam follow as the second and third largest exporters, contributing 12.15 per cent and 12.03 per cent to global rice exports, respectively. Pakistan, the USA, and China also play significant roles, with shares ranging from 4.92 per cent to 8.51 per cent. Other notable exporters include Myanmar, Brazil, Uruguay, and Paraguay, each contributing between 1.93 per cent and 4.17 per cent of the global total. Collectively, these top 10 countries account for the majority of global rice exports, while the remaining nations contribute 12.85 per cent to the global market, emphasizing the concentration of rice export activities among a few key players

Table 4: Top Ten Rice Exporting Countries

Sl. No	Country	Exported quantity, (MT)	Percentage share in global exports
1	India	14.61	31.20
2	Thailand	5.69	12.15
3	Viet Nam	5.63	12.03
4	Pakistan	3.99	8.51
5	USA	3.29	7.03
6	China	2.30	4.92
7	Myanmar	1.95	4.17
8	Brazil	1.40	2.99
9	Uruguay	1.04	2.21
10	Paraguay	0.90	1.93
11	Others	6.02	12.85
12	World	46.83	100.00

Source: ITC Trademap statistics, 2023

3.3 Global Wheat Trade Leaders: The Top Ten Exporting Countries

The data on the top ten wheat-exporting countries reveals that the Russian Federation leads the global market, exporting 37.27 million tonnes of wheat, which accounts for 19.22 per cent of total global wheat exports. The United States and Canada follow closely, each contributing approximately 13.50 per cent to global exports. France and Ukraine are also key exporters, with shares of 10.21 per cent and 9.31 per cent, respectively. Argentina, Australia, Germany, Kazakhstan, and Poland round out the top ten, with export shares ranging from 2.42 per cent to 5.49 per cent. Together, these ten countries dominate the wheat export market, collectively accounting for

86.51 per cent of global exports, while other nations contribute the remaining 13.49 per cent. This distribution underscores the concentration of wheat export activities among a few leading countries.

Table 5: Top Ten Wheat Exporting Countries

Sl. No	Country	Exported quantity, (MT)	Percentage share in global exports
1	Russian Federation	37.27	19.22
2	USA	26.24	13.53
3	Canada	26.11	13.46
4	France	19.79	10.21
5	Ukraine	18.06	9.31
6	Argentina	10.64	5.49
7	Australia	10.48	5.41
8	Germany	9.29	4.79
9	Kazakhstan	5.20	2.68
10	Poland	4.69	2.42
11	Others	26.17	13.49
12	World	193.94	100.00

Source: ITC Trademap statistics, 2023

3.4 India's Rice Trade Dynamics: Export and Import Trends

The data in Table 6 highlights the export and import status of rice from India between 2013 and 2022. Over the decade, India's rice exports have shown a significant upward trend, with exported quantities rising from 4.97 million tons in 2013 to 14.61 million tons in 2022. Correspondingly, the export value also increased from USD 4.07 billion in 2013 to USD 7.98 billion in 2022, reflecting the growing demand for Indian rice in global markets. On the import side, India's rice imports remained minimal throughout the period, with quantities ranging from just over 500 tons to a peak of 6,528 tons in 2020. Despite occasional fluctuations, the import value has generally stayed low, underscoring India's self-sufficiency and dominant position as a net exporter of rice. The consistent growth in export volume and value over the years illustrates India's expanding role in the global rice trade, while the negligible import figures highlight its strong domestic production capabilities.

3.5 India's Wheat Trade Dynamics: Export and Import Trends

The data from 2013 to 2022 reveals notable fluctuations in India's wheat export and import activities. India's wheat exports peaked in 2014, with 4.58 million tons exported, generating USD 1.35 billion in revenue. However, exports significantly declined in subsequent years, reaching a low of

168,315 tons in 2020. On the other hand, imports saw a substantial increase, particularly in 2019, when India imported 5.35 million tons of wheat valued at USD 1.22 billion, reflecting domestic supply challenges. The export value followed a similar trend, peaking in 2014 and then declining, while import values showed a notable spike in

years with higher import volumes. By 2022, both exports and imports had decreased, with exports slightly recovering to 928,684 tons and imports dropping to just 257 tons. This data underscores India's dual role as a wheat exporter and importer, with trade volumes influenced by domestic production and market conditions.

Table 6: Export and Import status of Rice from India

Year	Exported quantity, Tons	Exported value, USD thousand	Imported quantity, Tons	Imported value, USD thousand
2013	49,66,160	40,73,331	1,093	1,181
2014	105,69,565	61,27,952	539	576
2015	113,87,082	81,69,519	1,343	1,304
2016	111,62,015	79,05,650	1,798	1,644
2017	109,50,902	63,54,685	1,308	1,138
2018	99,07,061	53,14,875	1,000	942
2019	121,20,539	70,77,714	1,876	1,648
2020	116,65,625	73,61,500	6,528	4,444
2021	98,19,123	68,00,670	5,795	11,235
2022	146,10,589	79,80,028	4,503	3,323

Source: ITC Trademap statistics, 2023

Table 7: Export and Import status of Wheat from India

Year	Exported quantity, Tons	Exported value, USD thousand	Imported quantity, Tons	Imported value, USD thousand
2013	4,99,901	1,45,159	25	7
2014	45,84,967	13,49,820	1,569	541
2015	43,02,754	12,60,270	10,247	4,233
2016	39,50,910	11,09,934	18,817	6,574
2017	5,81,795	1,49,692	5,11,916	1,35,115
2018	1,98,965	49,906	19,10,833	4,12,552
2019	2,01,956	55,233	53,46,728	12,22,909
2020	1,68,315	46,642	85,343	18,437
2021	1,90,078	54,009	1,666	589
2022	9,28,684	2,43,067	257	67

Source: ITC Trademap statistics, 2023

3.6 Export Unit Value Analysis of Major Rice Exporting Countries

The Table 8 indicates notable differences in export unit values for rice among major exporting countries. The USA has the highest prices, with semi-milled or wholly milled rice at \$744.866 per metric ton, followed by husked or brown rice at \$721.196. Thailand also shows strong pricing, with semi-milled rice at \$660.915 and husked rice at \$706.764, although it reports a zero value for rice in the husk. India's export

values are comparatively lower, with semi-milled rice at \$576.008 and broken rice at \$296.504. Pakistan's values include \$543.478 for semi-milled rice and \$151.029 for rice in the husk, reflecting more competitive pricing. Viet Nam offers the lowest values, with semi-milled rice at \$497.392 and husked rice at \$450.817, indicating a price-driven market strategy. These variations illustrate the diverse pricing strategies and market positions of the top rice exporters similar results were reported by Kumari and Suseela (2023).

Table 8: Export Unit Value (EUV) of Major Rice Exporting Countries

Country	Semi-milled or wholly milled rice,	Broken rice	Husked or brown rice	Rice in the husk, ""paddy""
India	576.008	296.504	328.943	402.073
Thailand	660.915	528.331	706.764	0
Viet Nam	497.392	489.772	450.817	480.756
Pakistan	543.478	398.512	680.376	151.029
USA	744.866	339.819	721.196	540.399

Source: ITC Trademap statistics, 2023

3.7 Import Unit Value (IUV) Analysis of major rice importing countries

The Table 9. Presents the import unit values for various types of rice among major importing countries. Saudi Arabia has the highest prices across all categories, with semi-milled or wholly milled rice at \$903.18 per metric ton, broken rice at \$979.01, husked rice at \$939.89, and rice in the husk at \$1001.79, indicating a premium market for rice. The Philippines shows a mixed pricing strategy, with semi-milled rice at \$384.06 and broken rice at \$363.75, but exceptionally high values for husked rice at \$3722.20 and lower values for

rice in the husk at \$587.33. China's import values are moderate, with semi-milled rice at \$542.38 and rice in the husk at \$340.93, while Ethiopia has the lowest values for semi-milled rice at \$252.65 and broken rice at \$181.88, but high values for husked rice at \$1146.01. Malaysia's data reveals a high price for broken rice at \$783.71 and a zero value for rice in the husk, suggesting selective import practices or data reporting issues. These variations highlight different market dynamics and import strategies among the leading rice importing nations, similar results were quoted in their studies by Pal P and Mukherjee S (2022).

Table 9: Import Unit Value (IUV) of Major Rice Importing Countries

Country	Semi-milled or wholly milled rice,	Broken rice	Husked or brown rice	Rice in the husk, ""paddy""
China	542.38	426.48	403.57	340.93
Philippines	384.06	363.75	3722.20	587.33
Saudi Arabia	903.18	979.01	939.89	1001.79
Ethiopia	252.65	181.88	1146.01	542.65
Malaysia	472.61	783.71	90.95	0.00

Source: ITC Trademap statistics, 2023

3.8 Export Unit Value (EUV) Analysis of Major Wheat Exporting Countries

The Table 10. Outlines the export unit values for various types of wheat from major exporting countries. The USA leads with the highest prices for several wheat categories, with durum wheat (Excluding seed for sowing) at \$260.16 per metric ton and seed of wheat and meslin for sowing at \$303.27. Canada follows closely, with durum wheat at \$266.51 and seed of wheat and meslin for sowing at \$281.73. France has notable prices for durum wheat seed for sowing at

\$299.55 and wheat and meslin (Excluding durum) at \$225.13. Russia shows competitive pricing, particularly for wheat and meslin (Excluding seed for sowing) at \$212.36 and durum wheat at \$209.59. Ukraine has the lowest prices across most categories, with wheat and meslin (excluding seed for sowing) at \$182.68 and durum wheat at \$182.48. These values highlight the price differentials and competitive positioning of the leading wheat-exporting nations in the global market, similar results were reported by Bhuimali, *et al.* (2018) [2].

Table 10: Export Unit Value (EUV) of Major Wheat Exporting Countries

Country	Russian Fed.	USA	Canada	France	Ukraine
Wheat and meslin (Excluding seed for sowing, and durum wheat)	212.36	240.29	234.33	225.13	182.68
Durum wheat (Excluding seed for sowing)	209.59	260.16	266.51	290.69	182.48
Seed of wheat and meslin, for sowing (excluding durum)	241.67	303.27	281.73	246.87	276.64
Durum wheat seed for sowing	157.39	374.49	215.11	299.55	0.00
Durum wheat	0.00	0.00	0.00	0.00	0.00
Wheat and meslin (Excluding durum wheat)	0.00	0.00	0.00	0.00	0.00

Source: ITC Trademap statistics, 2023

3.9 Import Unit Value (IUV) Analysis of Major Wheat Importing Countries

From the Table 11 it can be seen that it provides the import unit values for various types of wheat among major importing countries. Turkey has the highest prices for several categories, including seed of wheat and meslin for sowing at \$759.11 and durum wheat seed for sowing at \$849.77. Algeria shows the highest values for seed of wheat and meslin for sowing at \$1000.00 and durum wheat seed for sowing at \$1500.00. China's import values include wheat and meslin (excluding seed for sowing and durum wheat) at \$291.22 and durum

wheat at \$265.10. Egypt has significant values for wheat and meslin (Excluding seed for sowing and durum wheat) at \$281.20, while Indonesia has the lowest prices, with wheat and meslin at \$253.99. Notably, values for durum wheat and wheat and meslin (Excluding durum wheat) are zero in several countries, indicating either a lack of imports in these categories or data reporting issues. These figures reflect the diverse pricing strategies and import practices of the major wheat-importing nations, similar results were quoted in their studies by Kumareswaran (2018) [3].

Table 11: Import Unit Value (IUV) of major wheat importing countries

Country	Indonesia	Turkey	Egypt	China	Algeria
Wheat and meslin (Excluding seed for sowing, and durum wheat)	253.99	234.18	281.20	291.22	211.12
Durum wheat (Excluding seed for sowing)	0.00	301.01	0.00	265.10	243.97
Seed of wheat and meslin, for sowing (Excluding durum)	0.00	759.11	0.00	0.00	1000.00
Durum wheat seed for sowing	0.00	849.77	0.00	0.00	1500.00
Durum wheat	0.00	0.00	0.00	0.00	0.00
Wheat and meslin (Excluding durum wheat)	0.00	0.00	0.00	0.00	0.00

Source: ITC Trademap statistics, 2023

4. Conclusion

The analysis of global rice and wheat trade dynamics from 2012 to 2022 reveals significant trends and economic insights into the pricing and trade strategies of major exporting and importing nations. The upward trend in rice exports, especially from India, highlights the country's dominant role as a global supplier, supported by strategic policies and agricultural advancements. The fluctuating import volumes, influenced by climatic factors, underscore the vulnerability of global food security to environmental changes. The study of export and import unit values provides a nuanced understanding of market positioning, with countries like the USA commanding higher export prices, while nations like Saudi Arabia and Algeria demonstrate a willingness to pay

premium prices for rice and wheat imports. These findings emphasize the strategic importance of both rice and wheat in global trade, with India's consistent export growth reinforcing its critical role in the global food supply chain. The diverse pricing strategies across different countries reflect varying market demands and economic priorities, offering valuable insights for policymakers and stakeholders aiming to ensure food security and stability in international markets.

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