Indian Journal of Agricultural Economics 80: 3 (2025):1050-1067
DOI:10.63040/25827510.2025.03.026

Assessing India's Performance of Key Agricultural Commodities: A Comparative Analysis of Pre- and Post-WTO Era

Barnamala Kalita[1], Jitender Mohan Singh[2], and Kashish Arora[2]

ABSTRACT

The study examined India's export and import performance of key agricultural commodities, including cotton, pulses, vegetable oil, sugar and fresh fruits and vegetables, from the period 1990-2023. Utilising secondary data sourced from FAOSTAT and employing statistical tools such as compound annual growth rate (CAGR), coefficient of variation (CV) and revealed comparative advantage index (RCA), for detailed analysis. The research examined trade trends, commodity performance, and the impact of the World Trade Organisation (WTO) on the export-import scenario in India. To assess the impact of the WTO on the performance of major agricultural commodities, the data have been divided into two periods: pre-WTO (1970-1994) and post-WTO (1995-2023). The results revealed that fresh fruits and vegetables led exports, whereas vegetable oil dominated imports. Notably, almost all selected commodities exhibited upward trajectories in the post-WTO period, with coffee being a notable exception. Improved RCA indices were observed in the post-WTO period for cotton, pulses and sugar. In terms of variability, CVs for exports decreased for most commodities after the WTO, indicating relative stabilisation. Additionally, India's share in global agricultural exports has shown a gradual rise since WTO accession, reflecting improved trade integration and competitiveness. Given the dynamic nature of the global trade landscape and the accompanying competitive challenges, the study emphasises the urgency for India to recalibrate its trade policies, thereby fostering an environment conducive to expanding international trade.

Keywords: agricultural trade performance, WTO, revealed comparative advantage, trade policy reforms

JEL Codes: F14, Q17, Q18, C43, O24

I

INTRODUCTION

Agriculture plays a pivotal role in India's socio-economic fabric, contributing significantly to the country's GDP, employment, and overall well-being of its populace. With a diverse climate and rich agroecological diversity, India is blessed with abundant natural resources that support the cultivation of a wide range of agricultural commodities. Agricultural growth has increasingly been driven by high-value commodities, reflecting changing consumer preferences and greater market orientation (Birthal *et al.*, 2019). India has achieved a significant milestone in terms of food and overall livelihood security, and is now one of the leading producers of wheat, rice, milk, vegetables, fruits, and other commodities globally. Indian agriculture has advanced from relieving the country of severe food shortages to becoming food self-sufficient, and now it is one of the world's food surplus economies. In addition to meeting domestic requirements, Indian agricultural goods, encompassing horticultural products and processed foods, are shipped to over 100 nations globally.

[1]Assam Agricultural University, Jorhat, Assam-785 013 [2]Punjab Agricultural University, Ludhiana, Punjab - 141 004

The Indian economy has been experiencing globalisation in the sense that it is fast integrating with the world economy. When the World Trade Organisation (WTO) was established, it significantly influenced the global economy in terms of international trade, as the WTO defined new global trade laws in the form of tariffs and non-tariff barriers for international trade (Singh, 2014). India became a member of the World Trade Organisation (WTO) on January 1, 1995, marking its participation in the first multilateral agreement aimed at addressing inequitable agricultural trade practices and promoting agricultural reforms. The World Trade Organisation (WTO) holds significant global importance due to its membership of 164 nations. India has significantly contributed to the procedures of the World Trade Organisation (WTO) in its capacity as a developing nation, specifically by effectively expressing its concerns and representing the interests of the wider developing global community.

India is among the world's top 10 largest exporting countries of agricultural products. Sugar, beef, rice, and shrimp are among the most popular exports. To fulfil domestic demand, exports of rice, wheat, sugar, cotton, fruits, and vegetables are 'unrestricted,' but exports of pulses (excluding chickpea) and edible vegetable oil in bulk (except coconut and rice bran oils) are 'restricted.' Although agricultural exports have expanded in India, the percentage of agricultural exports to total exports has fallen (Bhatia *et al.,* 2021). India's agriculture and associated product exports were $41.87 billion in 2019-20. In FY22, India's agricultural exports surpassed $50 billion for the first time, marking the highest level ever (NABARD, 2023).

India is a significant importer of agricultural commodities due to its large and diverse population, as well as its rapidly rising food demand. Imported goods often prove to be less expensive than domestically produced alternatives, helping consumers manage their limited household budgets. In fiscal year 2020, India imported approximately 2.97 million tonnes of pulses, valued at over US$1.53 billion, making it the world's largest importer of pulses, with dependency still at around 15% of domestic availability (Shukla & Mishra, 2019). On edible oils, India imported around 13.39 million tonnes worth US$11 billion in 2020–21, with palm oil making up 56% of import value, highlighting chronic dependence on imports for over half of domestic oil demand (Sekhar & Jha, 2025). Such import-heavy reliance can strain the trade balance and exert downward pressure on the currency when imports outpace exports over time.

Over the years, India's international trade in agricultural commodities has seen both successes and challenges. On the positive side, India has emerged as a major exporter of certain products, showcasing its agricultural capabilities on the global stage. Commodities like rice, spices, cotton, and fruits and vegetables have found strong demand in various countries, and India has capitalised on its comparative advantage in these sectors. The export-oriented approach, combined with targeted policies and export promotion schemes, has enabled India to gain market access and

establish its presence in various international markets. The introduction of e-NAM (National Agricultural Market) and other digital platforms has enhanced transparency and efficiency in agricultural trade, benefiting both farmers and traders. Moreover, India's emphasis on organic farming and the growing global demand for organic products have opened new avenues for export opportunities. However, India's international trade in major agricultural commodities has also faced significant challenges. Despite being one of the largest producers of certain commodities, India's domestic demand, population growth, and consumption patterns often outpace production, leading to a reliance on imports to bridge the gap.

II

MATERIALS AND METHODS

The study utilises secondary data from the FAOSTAT database to examine the export and import performance of major agricultural commodities at the national level in India. The data were collected over the period from 1990 to 2023, with a focus on selected commodities, including cotton, pulses, vegetable oil, sugar, fresh fruits and vegetables, and tea. To examine the comparative performance of India and major trading countries, average trade data from the last five years (2019–2023) were also analysed. Furthermore, to assess the impact of World Trade Organisation (WTO) agreements on India's agricultural trade, the study period was divided into two phases: the pre-WTO period (1970–1994) and the post-WTO period (1995–2023).

Basic descriptive statistics, such as averages and percentages, were used to study the trends and performance of agricultural commodities in international trade. To analyse the trade growth, the Compound Annual Growth Rate (CAGR) was computed, and the following form of the exponential function was employed:

$$Y = a\, b^{t} e^{ut} \qquad (1)$$

Where,

Y= Export Value/ Export Quantity/ Import Value/ Import Quality

a = Intercept

b = Regression coefficient

t = Time period

U_t= Disturbance term in year 't'

The equation (1) was transformed into a log-linear form and expressed as;

$$\log Y = \log a + t \log b + U_t \qquad (2)$$

Equation (2) was calculated using the Ordinary Least Squares (OLS) method.

Subsequently, the compound growth rate (g) was calculated.

$$g = (b - 1) \text{ X } 100 \quad (3)$$

Where,

g: Compound growth rate (in % per annum)

b: Antilog of b

The variability in export and import of major agricultural commodities has been studied using the coefficient of variation. The subsequent formula was employed for the calculation of the coefficient of variation:

$$CV = \frac{\text{Standard Deviation } (\sigma)}{\text{Mean } (\bar{X})} \times 100$$

The Revealed Comparative Advantage (RCA) index was used to quantify the extent of a country's specialisation in a particular commodity, taking into account the relative share of that commodity in the country's total exports. RCA can be straightforwardly interpreted; when its value surpasses 1, it signifies that the country holds a revealed comparative advantage in the respective product. The following formula computed the estimate of RCA:

$$RCA_{ij} = (X_{ij}/X_t) / (X_{wj}/X_{wt})$$

where,

RCA_{ij} = Revealed Comparative Advantage for country *i* in product *j*

X_{ij} = value of country *i*'s export of product *j*

X_t = value of country *i*'s total agriculture export

X_{wj} = value of world export of product *j*

X_{wt} = value of world total agriculture exports

III

RESULTS AND DISCUSSION

3.1 India's agricultural export and import

Table 1 shows the trends in India's agricultural exports and imports from 1990 to 2023. Over the period, agricultural exports grew from USD 2.99 billion to USD 42.24 billion, with a CAGR of 9.89%, while total exports grew faster, resulting in a decline in agriculture's share from 16.43% in 1990 to 9.78% in 2023. This reflects the structural shift in India's export composition, with increased growth in sectors such as manufacturing and services. A notable rise in agricultural export share was seen in 2020 (11.61%), likely due to strong global demand for food during the COVID-19 pandemic. On the import side, agricultural imports increased from USD 0.99 billion to USD 32.91 billion, growing at a CAGR of 13.37%, slightly higher

than total imports (12.5%). However, agriculture's share in imports remained low (2.96%–6.67%), suggesting continued self-sufficiency in food production, with imports mainly filling gaps in items like edible oils and pulses. Overall, while the value of agricultural trade increased, its relative importance in total trade declined, indicating a need for policies that boost competitiveness, reduce import dependence, and enhance value-added in agricultural exports.

TABLE 1. CONTRIBUTION OF AGRICULTURAL EXPORTS AND IMPORTS TO THE TOTAL EXPORTS AND IMPORTS IN INDIA, 1991-2023

Year	Export Value (Billion USD)			Import Value (Billion USD)		
	Total	Agriculture	Share (%) *	Total	Agriculture	Share (%)
1990	18.22	2.99	16.43	24.19	0.99	4.08
1995	32.97	5.25	15.92	38.03	2.10	5.52
2000	45.30	4.56	10.07	51.37	2.81	5.48
2005	103.52	8.25	7.97	149.78	4.93	3.29
2010	226.35	18.03	7.97	350.23	10.36	2.96
2015	267.44	28.66	10.72	392.87	22.40	5.70
2020	276.30	32.08	11.61	372.85	21.40	5.74
2021	395.41	41.58	10.52	572.52	30.71	5.36
2022	453.40	45.29	9.98	720.44	37.43	5.19
2023	432.00	42.24	9.78	672.67	32.91	4.89
CAGR[@]	11.31 ***	9.89 ***		12.5 ***	13.37 ***	

*Contribution of agricultural export and import to total export and import for each respective year
@From 1990 to 2023
Note: *** indicates significance at the 1 per cent level

India has a persistent trade deficit, as the country imports far more goods than it exports. This is mainly attributed to a decline in merchandise exports of iron ores, cotton raw materials, including waste, plastics, petroleum products, electronics goods, drugs, gems, jewellery, and chemicals, as well as a rise in imports (Bala and Sudhakar 2016). India has experienced a persistent trade deficit in total trade throughout the period, with the deficit widening significantly after 2005, reaching its lowest point in 2022. This growing deficit is mainly due to high imports of crude oil, machinery, and electronic goods. In contrast, the agricultural trade balance has remained positive across all years, indicating that India consistently exports more agricultural products than it imports. The agricultural trade surplus was particularly noticeable from 2010 onwards, reflecting India's strong performance in exporting cereals, spices, and tea, among other products. The chart thus highlights that while India faces a growing overall trade gap, the agricultural sector continues to contribute positively to the country's trade position, acting as a buffer against the rising overall deficit.

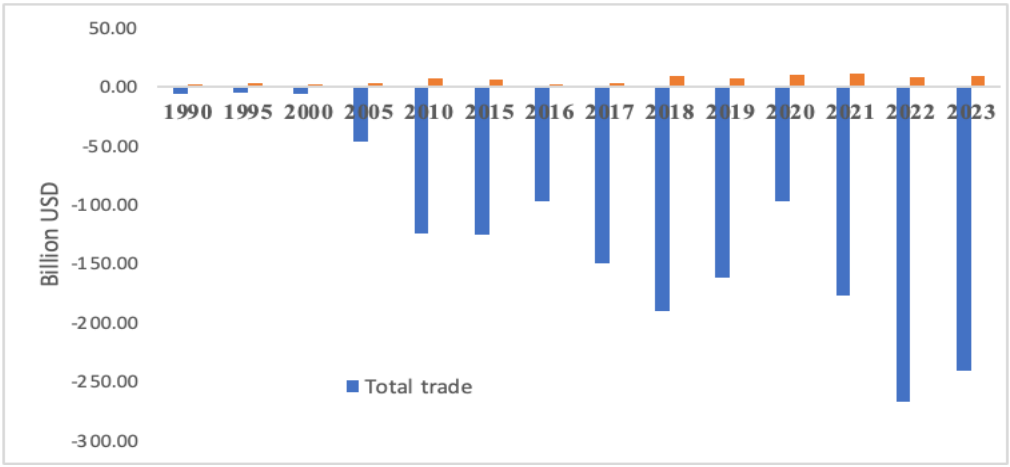

FIGURE 1. TRADE BALANCE OF TOTAL TRADE AND AGRICULTURAL TRADE OF INDIA, 1990-2023

Table 2 provides information on the major agricultural exporters and importers worldwide. Knowing the leading producers and consumers at a global level is very important. For a better comparison and to obtain an accurate picture of the country, data on the export and import of all countries is collected over the last five years and averaged for 2019-2023.

TABLE 2. MAJOR AGRICULTURAL EXPORTING AND IMPORTING COUNTRIES IN THE WORLD, AVG (2019- 2023)

Countries	Agricultural Export (Billion USD)	Share (%)	Countries	Agricultural Import (Billion USD)	Share (%)
USA	149.16	9.80	China	154.76	9.94
Netherlands	101.71	6.68	USA	139.06	8.93
Brazil	85.71	5.63	Germany	95.62	6.14
Germany	80.86	5.31	Netherlands	69.51	4.46
France	68.28	4.49	France	57.51	3.69
Spain	57.27	3.76	Japan	58.58	3.76
China	54.00	3.55	UK	59.16	3.80
Italy	50.54	3.32	Italy	44.75	2.87
Canada	49.24	3.24	Belgium	39.12	2.51
Indonesia	39.64	2.60	Canada	35.83	2.30
India	32.83	2.16	India	24.58	1.58
Others	752.77	49.46	Others	778.66	50.01
World	1522.01		World	1557.12	

Among the major exporters, the USA holds the top position and contributes approximately 9.80 per cent of the world's agricultural export. After the USA, the Netherlands and Brazil ranked in second and third position, contributed around 6.68

per cent and 5.53 per cent respectively, to the global agricultural export. The United States' notable export success can be ascribed to the improved quality and longevity of its goods, along with an expanded presence in free trade zones (Khiyavi *et al*, 2013). India holds the 14th position among all exporting countries with a contribution of merely 2.16 per cent to the total world export. On the other hand, in terms of imports, China is the leading importing country, accounting for about 9.94 per cent of the total imports worldwide. The contributions of the USA, Germany, the Netherlands, France, and Japan were 8.93%, 6.14%, 4.46%, 3.69%, and 3.76%, respectively. India's contribution to total global imports was a mere 1.58 per cent and ranked 11th in the world. Understanding India's position on the global map is crucial for assessing its competitiveness, identifying growth opportunities, and shaping future trade and agricultural policies.

3.2 Contribution of major agricultural commodities to total agricultural export and import

To see the contribution of major agricultural commodities to total agricultural trade, the commodities chosen for the present study are cotton, pulses, vegetable oil, sugar, fresh fruits & vegetables. These commodities together contributed a major share to both exports and imports at the Indian level.

TABLE 3. CONTRIBUTION (%) OF MAJOR AGRICULTURAL COMMODITIES TO THE TOTAL AGRICULTURAL EXPORTS OF INDIA

Year	Cotton	Pulses	Vegetable oil	Sugar	Fresh fruits and vegetables
1990	15.17	0.29	3.91	0.01	13.73
1995	0.97	0.29	4.08	0.08	13.63
2000	0.3	2.03	4.43	0.11	21.19
2005	7.75	2.29	2.84	0.25	19.2
2010	16.49	1.08	3.55	0.24	15.03
2015	6.49	0.77	2.96	0.28	13.35
2020	4.51	1	4.24	0.33	12.62
2021	6.45	0.99	3.77	0.38	10.8
2022	2.66	1.60	3.56	0.38	10.98
2023	1.79	2.03	3.77	0.51	13.73

Table 3 presents the percentage contribution of selected agricultural commodities to India’s total agricultural exports between 1990 and 2023. Cotton, once a major export with a 15.17% share in 1990, exhibited volatility, peaking at 16.49% in 2010 but declining to 1.79% by 2023 due to factors such as shifting global demand, pest outbreaks, and trade issues with China and Bangladesh (Chand *et al*., 2020). Pulses, by contrast, contributed minimally, rising from 0.29% to 2.03%, reflecting India’s status as a net importer, driven by low productivity and growing domestic demand (Meena and Kumar, 2021). Vegetable oil exports remained marginal, averaging around 3–4%, constrained by high import dependence and

limited export surplus. Sugar exports also stayed low, influenced by domestic policy and WTO constraints (Gulati & Banerjee, 2019). Fresh fruits and vegetables once contributed over 20% in 2000 but have settled around 11–13% recently, impacted by logistics, quality standards, and international competition (FAO, 2022). The trends highlight a gradual shift in India's agri-export structure, shaped by both internal challenges and global market forces.

The changing pattern in agricultural imports reflects India's evolving agri-food system, characterised by rising demand, production limitations, and policy adaptations. The composition of India's agricultural imports has undergone substantial changes between 1990 and 2023, reflecting shifts in domestic production, consumption preferences, and policy measures as observed from Table 4. Among the various commodities, vegetable oil has consistently held the highest share in agricultural imports. Its contribution rose from 18.79% in 1990 to over 50% from 2020 onwards, peaking at 57.45% in 2022. This sharp rise is attributed to India's structural deficit in oilseed production, coupled with increasing consumption of edible oils due to rising incomes and dietary changes. Goyal and Kumar (2018) highlight that low domestic productivity and underinvestment in processing technology have made India heavily reliant on imports to meet its demand for edible oil. Pulses, on the other hand, displayed a fluctuating trend.

TABLE 4. CONTRIBUTION (%) OF MAJOR AGRICULTURAL COMMODITIES TO THE TOTAL AGRICULTURAL IMPORTS OF INDIA

Year	Cotton	Pulse	Vegetable oil	Sugar	Fresh fruits and veg
1990	0.03	22.14	18.79	0.04	36.11
1995	7.69	6.01	34.56	0.03	22.18
2000	9.32	2.79	48.95	0.12	17.19
2005	3.16	9.26	41.47	0.10	25.95
2010	0.81	10.99	48.64	0.11	21.48
2015	1.73	16.23	46.71	0.07	30.37
2016	3.65	16.68	43.47	0.07	28.73
2017	3.49	14.42	43.23	0.07	27.41
2018	2.87	4.95	46.39	0.1	23.43
2019	6.09	7.17	44.93	0.1	22.21
2020	1.61	7.33	49.23	0.08	23.08
2021	1.69	6.85	56.46	0.09	19.29
2022	3.88	5.24	57.45	0.08	17.53
2023	1.80	9.38	50.05	0.09	22.37

The share was as high as 22.14% in 1990, declined significantly in the early 2000s, and again increased during 2010–2017, reaching above 16%. These fluctuations are primarily due to unstable domestic production caused by erratic weather patterns and a growing population that demands higher pulse intake for protein. Reddy (2016) emphasises that India's dependence on imports for pulses is a result of the yield gap and inconsistent supply across regions. The contribution of

fresh fruits and vegetables to the total agricultural import basket was substantial in the early 1990s but has gradually declined, settling between 17% and 30% over the last decade. Singh and Sharma (2020) point out that though India has become a leading producer of fruits and vegetables, imports persist for high-value and non-native varieties. Cotton, while a major export commodity, has shown irregular import trends, with a peak of 9.32% in 2000 and moderate shares in subsequent years. Imports are generally linked to specific demands from the textile industry, particularly for extra-long staple or contamination-free cotton, which is not readily available domestically. Sugar has remained a marginal component of agricultural imports throughout the period, contributing less than 0.1% annually. This indicates India's strong position as a self-sufficient and even surplus producer of sugar. Gulati and Juneja (2019) assert that India's sugar sector is largely insulated from global markets, except during exceptional circumstances, such as droughts or shifts in trade policy.

3.3 Trade Performance of Major Agricultural Commodities

The trade performance of key agricultural commodities in India serves as a vital indicator of the nation's economic growth and sustenance of its burgeoning population. Analysing the trends and patterns in the trade of commodities such as cotton, pulses, vegetable oil, fresh fruits, and vegetables offers valuable insights into India's agricultural prowess on the global stage.

TABLE 5. MAJOR AGRICULTURAL EXPORTING COUNTRIES IN THE WORLD, AVG (2019-2023)

Cotton		Pulses		Vegetable oil		Sugar		Fresh fruits and veg	
Countries	Share (%)	Countries	Share (%)	Countries	Share (%)	Countries	Share (%)	Countries	Share (%)
USA	39.47	Canada	23.65	Indonesia	23.77	Germany	10.88	USA	8.95
Brazil	15.97	Myanmar	9.06	Malaysia	14.61	China	9	China	8.95
India	11.86	Australia	10.21	Argentina	4.84	Mexico	6.34	Netherland	8.28
Australia	7.09	USA	7.75	Russia	3.73	Belgium	6.24	Spain	7.8
Greece	3.43	Turkey	4.23	Netherlands	4.22	Netherlands	6.26	Mexico	5.87
Benin	3.03	China	4.44	Canada	3.59	Spain	5.01	Thailand	3.08
Burkina Faso	2.25	Russia	3.64	Germany	2.59	Turkey	4.14	Italy	3.57
Turkey	1.33	India	2.7	Italy	2.49	USA	4.51	Belgium	3.45
Côte d'Ivoire	1.8	Argentina	4.01	Brazil	1.45	Poland	3.66	Türkiye	2.89
Egypt	1	Mexico	2.02	India	1.36	Canada	4.08	Canada	2.66

Table 5 presents the average share (%) of major agricultural exporting countries for selected commodities from 2019 to 2023. The United States remained the top cotton exporter with a 39.47% share, followed by Brazil (15.97%) and India (11.86%), indicating India's notable position in global cotton trade despite facing domestic production and trade challenges. In the case of pulses, Canada led with 23.65%, followed by Myanmar and Australia. In comparison, India contributed just 2.7%, consistent with its role as a net importer due to low productivity and high domestic demand (Meena and Kumar, 2021). Vegetable oil exports were dominated

by Indonesia and Malaysia, owing to their large palm oil industries; India's low share of 1.36% reflects its dependence on imports. For sugar, countries like Germany and China led the market, whereas India was not among the top exporters, likely due to export regulations and domestic consumption priorities (Gulati and Banerjee, 2019). In fresh fruits and vegetables, the US, China, and the Netherlands held leading positions. At the same time, India's absence among the top exporters highlights persistent challenges, including limited cold chain infrastructure, quality control issues, and strong competition from countries such as Mexico and Vietnam (FAO, 2022).

TABLE 6. MAJOR AGRICULTURAL IMPORTING COUNTRIES IN THE WORLD, AVG (2019-2023)

Cotton	Share (%)	Pulse	Share (%)	Vegetable oil	Share (%)	Sugar	Share (%)	Fresh fruits and veg	Share (%)
China	22.24	India	16.88	India	12.3	USA	8.22	USA	14.36
Bangladesh	14.85	China	7.18	China	9.83	Germany	2.67	Germany	8.4
Viet Nam	16.11	Pakistan	5.44	USA	7.23	UK	2.31	China	5.65
Turkey	11.11	Bangladesh	4.8	Netherlands	4.84	Canada	1.77	Netherlands	5.64
Pakistan	7.13	Turkey	3.94	Italy	4.26	Netherlands	1.6	France	4.98
Indonesia	7.26	USA	3.91	Spain	3.05	France	1.56	UK	4.96
India	4.79	UAE	3.15	Germany	3.14	China	1.54	Canada	3.77
Thailand	2.44	Egypt	3.14	Pakistan	2.5	Belgium	1.16	Japan	3.36
Republic of Korea	1.93	Italy	2.55	Bangladesh	1.97	Poland	0.88	Russia	2.88
Mexico	1.94	Venezuela	2.45	France	2.04	Russia	0.83	Belgium	2.84

The global agricultural import pattern from 2019 to 2023 reflects a combination of structural demand, consumption preferences, and production gaps across countries. China continues to dominate cotton imports (22.24%) due to its vast textile manufacturing base and limited arable land for cotton cultivation. Similarly, India holds the top position in pulse imports (16.88%). It is a major importer of vegetable oil (12.3%), driven by stagnating domestic yields and growing demand for protein- and fat-rich diets, issues also highlighted by Mehta and Jha (2022) in their study on India's agri-import dependency. The USA, despite being a major exporter, imports large volumes of sugar (8.22%) and fresh fruits and vegetables (14.36%), indicating a preference for off-season and diverse produce, as well as strong demand from the food industry. Several European countries, such as Germany, the UK, and the Netherlands, rank among the top importers of sugar and horticultural products, supported by high per capita income and intra-regional trade liberalisation within the European Union (FAO, 2021). These trends underline that agricultural imports are influenced not only by production constraints but also by evolving consumption

patterns and trade policy environments, as emphasised by Joshi (2020) in the context of global food trade dynamics.

TABLE 7. EXPORT PERFORMANCE OF MAJOR AGRICULTURAL COMMODITIES FROM INDIA, 1990-2023

Value: Million USD

Year	Cotton	Pulses	Vegetable oil	Sugar	Fresh fruits and vegetables
1990	454.02	8.53	116.86	0.41	410.68
1995	50.96	15.46	214.29	4.12	715.11
2000	13.73	92.53	202.27	5.01	966.80
2005	639.70	189.01	234.44	20.67	1584.36
2010	2972.20	194.12	639.59	43.57	2709.57
2015	1860.98	219.86	847.10	79.08	3825.61
2020	1448.52	320.68	1359.95	106.47	4049.70
2021	2682.05	409.77	1566.39	156.61	4492.49
2022	1203.84	723.69	1611.44	172.02	4971.32
2023	755.66	857.40	1590.70	216.34	5799.13
CAGR[@]	14.18 ***	13.8 ***	10.19 ***	20.51 ***	8.66 ***

@From 1990 to 2023
*Note: *** indicates significance at the 1 per cent level*

India's export performance of key agricultural commodities from 1990 to 2023 (Table 7) shows strong and statistically significant growth, driven by policy reforms, technological adoption, and global demand. Cotton exports surged notably after 2005, peaking in 2010 at $2,972.20 million, mainly due to the adoption of Bt cotton and increased competitiveness (Kranthi and Stone, 2020). However, recent fluctuations reflect global price volatility and shifting domestic policies. Pulses exports grew steadily, especially after 2000, reaching 857.40 million USD in 2023, supported by improved processing and regional demand (Ali and Gupta, 2019). Vegetable oil exports also increased, aided by re-exports and processing capacity, though growth has been moderate due to domestic shortages and price sensitivity (Rai et al., 2020). Sugar exports recorded the highest CAGR of 20.51%, rising from $ 0.41 million in 1990 to $ 216.34 million in 2023, supported by government incentives, surplus production, and favourable global prices (Gulati & Dhar, 2021). Fresh fruits and vegetables, the largest export group by value, increased from $ 410.68 million in 1990 to $5,799.13 million in 2023, reflecting improved cold chain logistics and compliance with global quality standards (Singh and Pal, 2020).

India's import performance indicates a steep and statistically significant rise across all categories, driven mainly by domestic production deficits, changing consumption patterns, and trade liberalisation (Table 8). Vegetable oil shows the

highest import value and a CAGR of 16.2%, growing from USD 185.23 million in 1990 to USD 16,474.26 million in 2023.

TABLE 8. IMPORT PERFORMANCE OF MAJOR AGRICULTURAL COMMODITIES FROM INDIA, 1990-2023

Value: Million USD

Year	Cotton	Pulses	Vegetable oil	Sugar	Fresh fruits and vegetables
1990	0.31	218.29	185.23	0.00	356.00
1995	161.51	126.23	725.74	0.66	465.74
2000	262.25	78.51	1377.53	3.25	483.68
2005	155.77	456.18	2042.65	4.93	1278.08
2010	84.11	1138.53	5038.80	11.30	2224.71
2015	386.49	3635.40	10462.03	14.57	6800.91
2020	344.65	1568.56	10536.98	17.75	4940.32
2021	519.61	2102.37	17340.82	28.26	5923.70
2022	1451.04	218.29	21507.89	28.12	6563.71
2023	593.39	99.72	16474.26	29.34	7364.78
CAGR	14.75 ***	9.53 ***	16.2 ***	16.55 ***	11.8 ***

@From 1990 to 2023
Note: *** indicates significance at the 1 per cent level

This reflects India's heavy reliance on palm and soybean oil imports due to stagnant oilseed productivity and rising edible oil consumption (Rai *et al*., 2020). Pulses imports, which peaked at over USD 3600 million in 2015, have fluctuated in recent years, with a declining trend post-2020 due to improved domestic production and import restrictions (Ali & Gupta, 2019). Fresh fruits and vegetable imports also show a strong growth trend, rising from USD 356 million in 1990 to over USD 7300 million in 2023. This rise is driven by increasing urban demand for exotic, off-season, and high-value produce (Singh & Sharma, 2021). Cotton imports, although relatively low, rose significantly in certain years, like 2022, indicating demand from the textile sector for high-quality or contamination-free fibre (Kranthi, 2020). Sugar imports, though small in value, show a steady upward trend, with a CAGR of 16.55%, mainly due to occasional domestic supply shortages and import of specific grades for industrial use (Gulati & Dhar, 2021).

3.4 Performance of major agricultural commodities in pre-WTO vs post-WTO

India joined the World Trade Organisation (WTO) in January 1995, marking its first multilateral agreement aimed at addressing unfair practices in agricultural trade and initiating reforms in the agricultural sector. The WTO's Agreement on Agriculture (AoA) focused on improving market access, reducing export subsidies, and disciplining domestic support. Figure 2 presents a comparative view of India's

contribution to global agricultural trade during the pre-WTO (1970–1994) and post-WTO (1995–2023) periods.

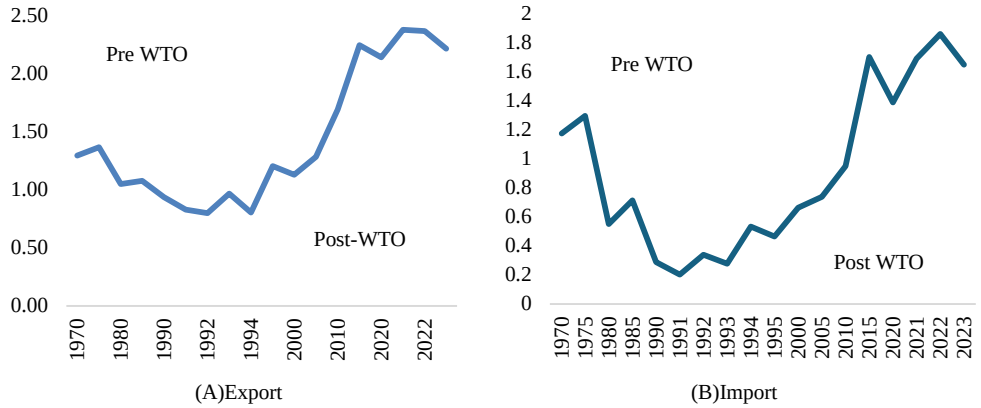

FIGURE 2. COMPARISON OF CONTRIBUTION (%) OF INDIA'S AGRICULTURAL EXPORT (A) AND IMPORT (B) TO GLOBAL AGRICULTURAL EXPORT AND IMPORT

In panel (A), India's share in world agricultural exports remained relatively stagnant at around 1.0-1.5% during the pre-WTO era. Still, it showed a notable increase after 1995, surpassing 2.5% by 2021, reflecting enhanced market access, trade facilitation, and competitiveness following liberalisation (Chand, 2002). Panel (B) shows that India's share in global agricultural imports, which was below 1% before WTO accession, rose gradually in the post-WTO period and reached nearly 2% by 2021, mainly due to increasing demand for edible oils, pulses, and fresh fruits driven by income growth and consumption diversification (Dev, 2014). This shift indicates India's deeper integration into global agri-food markets following its membership in the WTO, supported by policy reforms and structural demand-side changes (Acharya, 2012).

TABLE 9. COMPARISON OF COMPOUND ANNUAL GROWTH RATE (CAGR) AND COEFFICIENT OF VARIATION (CV) IN PRE-WTO AND POST-WTO PERIOD FOR EXPORT OF MAJOR AGRICULTURAL COMMODITIES IN INDIA

Commodities	CAGR		CV	
	Pre-WTO	Post-WTO	Pre-WTO	Post-WTO
Cotton	8.15 **	21.62 ***	113.91	95.34
Pulses	9.47 **	10.69 ***	81.73	68.64
Vegetable Oil	6.79 ***	10.25 ***	51.67	73.12
Sugar	7.02 ***	18.95 ***	56.45	93.69
Fresh Fruits and Vegetables	6.7 ***	8.71 ***	45.69	58.34

Note: ***, **, * indicate significance at 1 per cent, 5 per cent and 10 per cent level, respectively

The export performance of major agricultural commodities in India has shown a significant shift when comparing the pre-WTO (1990–1994) and post-WTO (1995–2023) periods, as observed in Table 9. The CAGR increased notably across all commodities in the post-WTO phase. Cotton exports, for instance, recorded a sharp rise in CAGR from 8.15% during the pre-WTO period to 21.62% in the post-WTO period, reflecting increased global demand and India's policy alignment with trade liberalisation (Gulati & Kelley, 1999). Similarly, the CAGR of sugar exports more than doubled from 7.02% to 18.95%, indicating better price realisation and diversification of export markets (Chand, 2002).

TABLE 10. REVEALED COMPARATIVE ADVANTAGE (RCA) INDEX OF THE MAJOR COMMODITIES DURING THE PRE-WTO PERIOD

Year	Cotton	Pulses	Vegetable oil	Sugar	Fresh fruits and vegetables
1970	0.657	1.775	0.396	0.076	1.236
1975	0.33	0.21	0.588	0.021	1.029
1980	2.341	0.031	0.77	0.069	0.858
1985	0.587	0.232	0.813	0.051	1.198
1990	5.646	0.351	1.139	0.021	0.867
1991	1.747	0.327	0.723	0.027	0.966
1992	1.11	0.455	0.558	0.037	0.983
1993	2.851	0.382	0.764	0.031	1.054
1994	0.792	0.45	0.908	0.042	1.249

While vegetable oil showed a moderate increase in CAGR, its Coefficient of Variation (CV) also rose significantly, from 51.67 to 73.12, indicating growing volatility possibly due to global price shocks and domestic supply fluctuations (Acharya, 2012). Conversely, commodities such as pulses, fresh fruits and vegetables experienced only marginal increases in CAGR. Still, their export variability (CV) declined in the post-WTO phase, suggesting greater market stability and improved logistics and storage infrastructure (Dev & Rao, 2010). Overall, the export competitiveness of these commodities improved under the liberalised trade regime, albeit with mixed trends in volatility across commodity groups. The RCA index helps assess the global competitiveness of Indian agricultural exports across time. During the pre-WTO period (1970–1994), cotton exhibited significant fluctuations in its RCA values, ranging from a low of 0.33 in 1975 to a high of 5.646 in 1990, highlighting India's inconsistent competitiveness in cotton exports, which was influenced by domestic production shocks and fluctuating global prices (Jha, 2004). Pulses, with RCA values generally below 1, lacked a significant comparative advantage, reflecting India's traditional focus on import dependence, self-sufficiency and limited global market integration. Vegetable oil also remained non-competitive during this period, with RCA values consistently below unity, a result of India's

structural dependency on edible oil imports (Rao *et al*., 2006). Sugar exports, too, were marked by low RCA values, likely due to export restrictions and high domestic consumption. However, fresh fruits and vegetables showed modest export competitiveness, with RCA values hovering near or above 1 in some years, indicating niche market opportunities supported by India's agro-climatic diversity (Singh & Pal, 2010).

TABLE 11. REVEALED COMPARATIVE ADVANTAGE (RCA) INDEX OF THE MAJOR COMMODITIES DURING THE POST-WTO PERIOD

Year	Cotton	Pulses	Vegetable oil	Sugar	Fresh fruits and vegetables
1995	0.417	0.471	0.804	0.085	0.847
2000	0.188	3.135	1.076	0.103	1.263
2005	4.948	4.326	0.549	0.267	1.099
2010	12.313	1.509	0.558	0.303	2.896
2015	7.269	0.847	0.497	0.332	2.731
2018	6.832	1.547	0.607	0.465	1.679
2019	3.507	1.333	0.730	0.481	2.706
2020	4.779	1.271	0.729	0.442	2.666
2021	6.324	1.318	0.533	0.494	1.615
2022	2.330	2.048	0.466	0.491	2.672
2023	2.062	2.300	0.592	0.570	1.783

Post-WTO developments (1995–2023) reveal considerable shifts. Cotton became a highly competitive export, reaching an RCA peak of 12.313 in 2010, largely due to policy support, expanded acreage under Bt cotton, and improved global demand (Birthal et al., 2014). Pulses saw intermittent spikes in RCA, notably in 2005, reflecting temporary export surpluses driven by domestic policy changes and favourable trade conditions. Conversely, vegetable oil continued to show RCA values well below 1, affirming India's enduring import dependency due to low oilseed productivity. Sugar recorded a gradual increase in RCA, reaching 0.570 in 2023, signalling mild improvements in competitiveness amid fluctuating policy regimes. Fresh fruits and vegetables also maintained strong competitiveness, with RCA values consistently above one since 2000, peaking at 2.896 in 2010, driven by increasing global demand and India's diversified horticultural production.

IV

POLICY IMPLICATIONS NEEDED TO PROMOTE INTERNATIONAL TRADE BY INDIA

In today's highly interconnected global economy, expanding international trade is vital for countries aiming to accelerate economic growth and diversify their markets. For India, a major emerging economy, it is crucial to implement focused and practical policy measures that can strengthen its position in global agricultural trade.

The analysis of key commodities, including cotton, sugar, fresh fruits and vegetables, vegetable oil, and pulses, reveals distinct challenges and opportunities that call for commodity-specific and cross-sectoral policy attention. With rising global competition and evolving trade rules, India must improve domestic efficiency, address supply gaps, and build resilience in its agricultural trade strategy.

Key Policy Directions:

- Cotton: Stable and predictable export policies, better fibre quality control, and branding support are essential to maintain India's competitiveness in the global cotton market amidst volatile international prices.
- Pulses: By improving productivity, storage infrastructure, and developing export-quality varieties, India can gradually build export potential while ensuring domestic food security.
- Vegetable Oil: Reducing import dependency by boosting domestic oilseed production and encouraging exports of processed oil products through modern processing facilities is a long-term priority.
- Sugar: Export policies should strike a balance between domestic demand and global opportunities, particularly during surplus years, while ensuring compliance with international trade obligations.
- Fresh Fruits and Vegetables: Investments are needed in cold storage, transport, and improved packaging to reduce spoilage and meet global quality standards, enabling India to scale up its horticultural exports.

V

CONCLUSION

India's agricultural trade has undergone a notable transformation between the pre- and post-WTO periods. The post-WTO phase has witnessed higher growth in the export of several key commodities, including cotton, sugar, and pulses, driven by policy reforms, market-oriented strategies, and enhanced production systems. The rise in revealed comparative advantage (RCA) for these commodities indicates India's increasing competitiveness in global markets. However, the country's growing dependence on imports of vegetable oil, pulses, and fruits and vegetables points to structural gaps in domestic production and rising consumer demand. While India's share in global agricultural trade has improved, challenges such as inadequate storage, quality compliance, and price fluctuations continue to affect its trade performance. To sustain and enhance its position, India must invest in better infrastructure, promote value addition, strengthen farmer-market linkages, and adopt stable, forward-looking trade policies. A balanced approach that boosts exports while reducing unnecessary imports will be crucial for securing long-term growth and resilience in the agricultural trade sector.

REFERENCES

Acharya, S. S. (2012). Food security and Indian agriculture: Policies, production performance and marketing environment. *Agricultural Economics Research Review*, *25*(2), 249–260. https://doi.org/10.22004/ag.econ.57378

Ali, J., & Gupta, K. (2019). Changing dynamics of pulse exports from India. *Indian Journal of Agricultural Marketing*, *33*(1), 57–65.

Bellundagi, V., Umesh, K. B., & Ravi, S. C. (2016). Growth dynamics and forecasting of finger millet (Ragi) production in Karnataka. *Economic Affairs*, *61*, 195.

Bhatia, J. K., Mehta, V. P., Bhardwaj, N., & Nimbrayan, P. K. (2021). Export import performance of major agricultural commodities in India. *Economic Affairs*, *66*, 117–126.

Birthal, P. S., Joshi, P. K., & Gulati, A. (2014). *Transforming Indian agriculture: From productivity to markets.* Academic Foundation.

Chand, R. (2002). *Trade liberalization, WTO and Indian agriculture: Experience and prospects.* Mittal Publications.

Chand, R. (2017). *Doubling farmers' income: Rationale, strategy, prospects and action plan* (Policy Paper No. 1/2017). NITI Aayog.

Chand, R., Saxena, R., & Rana, S. (2020). Trade policy and agricultural exports: An analysis of India's experience. *Indian Journal of Agricultural Economics*, *75*(3), 301–314.

Dev, S. M. (2014). *Small farmers in India: Challenges and opportunities* (Working Paper). Indira Gandhi Institute of Development Research (IGIDR).

Dev, S. M., & Rao, N. C. (2010). *Agricultural price policy, farm profitability and food security: An analysis of linkages.* Commission for Agricultural Costs and Prices.

Devi, A., Singh, A., Malhotra, S. K., Jha, G. K., & Panghal, P. (2024). Study on production and utilization of minor millets in Madhya Pradesh. *Indian Journal of Agricultural Sciences*, *94*(3), 303–307. https://doi.org/10.56093/ijas.v94.i3.133902

FAO. (2021). *The State of Agricultural Commodity Markets 2021.* Food and Agriculture Organization of the United Nations.

FAO. (2022). *Horticultural exports and supply chain challenges in Asia.* Food and Agriculture Organization of the United Nations.

Goyal, A., & Kumar, A. (2018). Edible oil demand and import dependency in India: A trend analysis. *Indian Journal of Agricultural Economics*, *73*(2), 245–258.

Government of India. (2022). *Agricultural Statistics at a Glance.* Ministry of Agriculture and Farmers Welfare.

Gulati, A., & Juneja, R. (2019). *Sugar sector in India: Current challenges and policy reforms* (ICRIER Policy Series No. 14). Indian Council for Research on International Economic Relations.

Gulati, A., & Kelley, T. (1999). *Trade liberalization and Indian agriculture: Cropping pattern shifts and efficiency gains in semi-arid tropics.* Oxford University Press.

Jha, R. (2004). *WTO and Indian agriculture: Implications for policy and livelihoods* (Working Paper). Australian National University.

Joshi, P. K. (2020). Global food trade: Implications for India. *Indian Journal of Agricultural Economics*, *75*(4), 487–499.

Khiyavi, P. K., Moghaddasi, R., & Yazdani, S. (2013). Investigation of factors affecting the international trade of agricultural products in developing countries. *Life Science Journal*, *10*, 409–414.

Kranthi, K. R. (2017). Cotton production and trade in India: Emerging challenges. *Cotton Research Journal*, *30*(1), 1–9.

Kumar, A., Roy, D., & Tripathi, G. (2015). *Fruit and vegetable supply chains in India: Implications for small farmers and intermediaries* (IFPRI Discussion Paper). International Food Policy Research Institute.

Meena, M. S., & Kumar, A. (2021). Pulse production in India: Trends, constraints and policy implications. *Journal of Food Legumes*, *34*(1), 12–18.

Mehta, R., & Jha, S. (2022). Structural challenges in Indian agriculture: Import dependency in pulses and edible oils. *Journal of Rural Development*, *41*(1), 55–70.

NABARD. (2023). *Export Credit Report 2023.* National Bank for Agriculture and Rural Development.

National Statistical Office. (2021). *Situation assessment of agricultural households and land holdings of households in rural India, 2019 (NSS 77th Round).* Ministry of Statistics and Programme Implementation, Government of India.

Rai, R. K., Jha, G. K., & Tripathi, A. M. (2020). Agri import dependency and trade diversification: A case study of India's edible oil sector. *Agricultural Economics Research Review*, *33*(1), 47–56.

Rao, C. H. H., Gulati, A., & Kelley, T. (2006). Policies and performance of Indian agriculture: A review. *Economic and Political Weekly*, *41*(26), 2553–2560.

Reddy, A. A. (2016). Pulse crops in India: Trends, challenges and policy options. *Indian Journal of Agricultural Economics*, *71*(3), 341–357.

Sekhar, C. S. C., & Jha, G. K. (2025). Edible oil sector in India: Price support and trade policy for self-sufficiency. *Economic & Political Weekly*, *60*(19), 45–52.

Shukla, U. N., & Mishra, M. L. (2019). Comprehensive analysis of production and import dependency of pulses in India. *Legume Research: An International Journal.*

Singh, S. (2014). Analysis of trade before and after the WTO: A case study of India. *Global Journal of Finance and Management*, *6*, 801–808.

Singh, R., & Sharma, H. (2020). Changing trends in horticultural imports of India: An overview. *Agricultural Situation in India*, *76*(10), 17–22.

Singh, S., & Pal, S. (2010). Horticultural exports: Issues and prospects. *Indian Journal of Agricultural Economics*, *65*(3), 546–558.