**Tracing Trade Strengths: An Analysis of Indian Oilseeds in the Global Market**

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**ABSTRACT**

**Aims**: To analyze India’s competitiveness in global oilseed market and to find out its comparative advantage in major oilseeds.

**Study design:** This paper investigates India’s oilseed sector competitiveness by utilizing Revealed Comparative Advantage and Revealed Symmetric Comparative Advantage indices.

**Place and Duration of Study:** The study drew data from the International Trade Centre (ITC) for 2014 - 2023

**Methodology:** Data were retrieved from the International Trade Centre (ITC) for seven major oilseeds narrowed down to groundnuts, soybeans, sesamum seeds, mustard seeds, sunflower seeds, copra, castor oilseeds. Revealed Comparative Advantage (RCA) index, along with Revealed Symmetric Comparative Advantage (RSCA) index, were utilized in assessing the trade performance and determining India's relative position among the global oilseeds exporters. The RCA assists in understanding if a country possesses a comparative edge in exports of a given product and, in contrast, the RSCA captures asymmetry in trade data and provides balanced interpretation.

**Results:** The analysis thus conducted demonstrates that India continues to have a strong relative comparative advantage in the exports of groundnuts (0.83), castor oilseeds (0.89), copra (0.89) and sesame seeds (0.75), while moderate advantage for export of mustard seeds (0.54). Nonetheless, the country is facing challenges with competitiveness for soybeans (-0.98) and sunflower seeds (-0.95) because of the country's self-sufficiency and high import dependency.

**Conclusion:** Although India is one of the leading global producers of oilseeds, increasing domestic consumption, inefficiencies in oil extraction, and growing oil imports have made the country increasingly reliant on imports. As far as enhancing the global competitiveness of sunflower and soybean exports, This study recommends India should work on growth in productivity, work to lower supply chain dependency on imports, and open up more markets through trade reforms. Also, improving processing infrastructure will align with international quality standards, resulting in value exports. This will enhance India’s standing in the international oilseed market.

*Keywords: Revealed Symmetric Comparative Advantage, groundnuts, soybeans, sesamum seeds, mustard seeds, sunflower seeds, copra, castor oilseeds.*

**1. INTRODUCTION**

Oilseeds are a fundamental component in India's agricultural economy as they contribute substantially to the edible oil industry as well as livestock feed and some other forms of industrial uses. India is one of the top producers of oilseeds in the world having a total cultivated area of about 30.1 million hectares and estimated production of 39.67 million tonnes for the year 2023-24 covering the total production of nine major oilseeds in India (E&S Division, DA & FW). Regardless of this large production, India is still one of the foremost importers of edible oils which presents a problem in the agricultural trade balance. The other important oilseeds grown in India are groundnut, soybean, rapeseed-mustard, sunflower, sesame, safflower, linseed, castor and Niger seed. The different agro-climatic regions of the country can support cultivation of these oilseeds under both rainfed and irrigated farming systems. The production and productivity of oilseeds differ very significantly among the states with some states leading in the cultivation area and others significantly in terms of production due to higher yield levels. Among Indian states, Madhya Pradesh has, by far, the largest area under oilseed cultivation which is closely trailed by Rajasthan and Maharashtra. In overall output, though, Rajasthan stands as the most productive state, followed by Madhya Pradesh and Gujarat (E&S Division, DA & FW). These regions are important for India’s edible oil output and exports, and thus for the national economy and international commerce too. (Kumari 2016)

One of the most worrying aspects of the Indian economy is the high level of dependence on edible oil imports notwithstanding the fact that the country is one of the largest producers of oilseeds (Borisagar et al., 2023). This phenomenon stems from poor extraction rates, missing links in the supply chain, and growing domestic consumption. To reduce import dependency, increase oilseed exports, and boost overall productivity, it is essential to analyze the geographic distribution, performance indices, and trade potential of the sector. This paper focuses on a matter of particular importance for India’s trade—the global competitiveness of its oilseed sector. The analysis is conducted using cross-sectional estimations, along with a comprehensive assessment of the sector’s competitive advantages and constraints. Moreover, the study employs the Revealed Comparative Advantage (RCA) measurement by Balassa (1965) and Revealed Symmetric Comparative Advantage (RSCA) measurement by Dalum et al., (1998) indices so that it can determine the competitive edge India possesses in oilseed exports as well as understand the most critical enabling and constraining factors. The trade policies of the nation have influenced its comparative advantage (Mirzaei et al., 2012).

**2. MATERIALS AND METHODS**

This research assesses the global competitiveness of Indian oilseed exports using the Revealed Comparative Advantage (RCA) and Revealed Symmetric Comparative Advantage (RSCA) indices. Data for the analysis was collected from the International Trade Centre (ITC) and covers the period from 2014 to 2023. The analysis includes the top five exporters of major oilseeds and India, where applicable, to determine its comparative advantage.

**2.1 Data Collection**

The research assesses India's trade and export prospects in the international oilseed market using secondary data from the International Trade Centre (ITC) Trade Map for the years 2014 - 2023. The dataset consists of export values and market shares of leading oilseed exporting countries and provides a basis for measuring India’s international trade performance. To illustrate India’s competitive position in the world market, the analysis divides oilseeds according to India’s export ranking.

***2.1.1 High Competitiveness Category***

Oilseeds in which India is a leading exporting country of Groundnuts and castor oilseeds and is the second largest exporter. Of Copra and sesamum seeds. (ITC 2023)

***2.1.2 Emerging and Competitive Category***

Oilseeds include the following part of the multifaceted industry which India competes against but does not feature in the top five global exporting nations of Mustard seed, Sunflower seed, Soybean seed. (ITC 2023)**.** To evaluate the sustained competitive advantage for oilseeds in high competitiveness category India has computed its RCA and RSCA values with those of the other four top exporters. In the emerging and competitive category oil seeds, the emerging superpower was benchmarked with the performance of top five world exporters to examine and proffer gaps for concentrating on trade development.

In order to measure competition in the oil seeds industry, the study capitalizes on Balassa (1965) Revealed Comparative Advantage (RCA) index which is defined as

-Revealed comparative advantage of country i in product j

-Export value of product j from country i

-Export value of all products from country i

-Export value of product j from the world

-Export value of all products from the world

In simple terms – Countries with an RCA value greater than 1 export oilseeds and is presumed to have a higher economic comparative advantage to relative to the other countries The revealed symmetric comparative advantage (RSCA) suggested by Dalum et al., 1998, also used to supplement RCA and to reduce the negative impact of asymmetrical trade information, is

The RSCA index ranges from -1 to +1 whereby the positive value closer to +1 indicates greater the comparative advantage and closer to -1 indicates greater the comparative disadvantage

**3.RESULTS AND DISCUSSION:**

**3.1 Competitive Assessment of Major Groundnut Exporting Nations**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | India | Argentina | USA | Brazil | Sudan |
| 2014 | 0.891 | 0.916 | 0.388 | 0.522 | -0.058 |
| 2015 | 0.890 | 0.945 | 0.327 | 0.622 | 0.003 |
| 2016 | 0.881 | 0.940 | 0.394 | 0.576 | 0.897 |
| 2017 | 0.870 | 0.925 | 0.292 | 0.699 | 0.983 |
| 2018 | 0.834 | 0.901 | 0.362 | 0.766 | 0.984 |
| 2019 | 0.838 | 0.950 | 0.264 | 0.717 | 0.989 |
| 2020 | 0.840 | 0.970 | 0.263 | 0.731 | 0.994 |
| 2021 | 0.800 | 0.964 | 0.189 | 0.718 | 0.996 |
| 2022 | 0.814 | 0.963 | 0.218 | 0.722 | 0.995 |
| 2023 | 0.830 | 0.968 | 0.263 | 0.748 | 0.997 |

**Table 1. Revealed Symmetric Comparative Advantage of Groundnuts**

As shown in (Figure1) Among the non-GMO groundnut exporters, India holds the highest rank with fluctuations of RSCA above 0.81 and extending to 0.89(Singh et al., 2020). Argentina enjoys processing with good quality, and the strong trade relationship with China reflects on the RSCA trend being sustainable 0.95 to 0.97(Bojnec and Fertő, 2017). Brazil has an emerging exporter with aggressive expansion strategies with increased RSCA of about 0.74. With much domestic demand and little export, the USA illustrates lower RSCA trend, decreasing from approximately 0.39 to 0.26 (Jambor and Gibba, 2017). Sudan continues to experience unstable production and political risks, making it an RSCA trend with one of the widest swings at about -0.05 to 0.99.

**Fig.1. RSCA trend in leading Groundnut exporting countries**

**3.1.1 India’s Reports on the Changes in Groundnuts Competitive Export Ability (2014 – 2023) based on RSCA**

Between 2014 and 2017, India had strong RSCA (Revealed Symmetric Comparative Advantage) values ranging from 0.87 to 0.89 (Table 1). (Suman and Shekhawat, 2023) this was because of increase in production volumes due to good monsoons (Sharma et al., 2016), high demand from countries like Vietnam, Indonesia and China, less competitive pricing from major exporters like Argentina and USA and depreciation of Indian Rupee (INR) making Indian groundnut exports more attractive. But from 2018 to 2021, RSCA values declined to 0.81 to 0.83 though India still had a comparative advantage (Table 1). This was because of increase in internal consumption of groundnut oil reducing the exportable surplus, implementation of Minimum Export Price (MEP) policies constraining price flexibility, market capture by competitors like Brazil especially in China and concerns from European Union and Japan on pesticide residue in Indian groundnuts. In 2022 and 2023, RSCA values recovered to 0.83 reaffirming India’s comparative advantage (Table 1). This was because of improved trade relations with Southeast Asian countries and European Union after resolution of pesticide residue concerns, increase in international demand for edible oil and favorable government policies under National Mission on Oilseeds and Oil Palm (NMOOP) to promote a freer market for groundnut exports.

**3.2 Competitive Assessment with Major Sesamum Seed Exporting Nations**

**Table 2. Revealed symmetric comparative advantage of sesamum seeds**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | Sudan | India | Nigeria | Pakistan | Ethiopia |
| 2014 | 0.994 | 0.846 | 0.924 | 0.850 | 0.998 |
| 2015 | 0.997 | 0.800 | 0.946 | 0.802 | 0.997 |
| 2016 | 0.997 | 0.836 | 0.910 | 0.836 | 0.998 |
| 2017 | 0.997 | 0.843 | 0.921 | 0.881 | 0.998 |
| 2018 | 0.998 | 0.837 | 0.940 | 0.911 | 0.998 |
| 2019 | 0.998 | 0.814 | 0.940 | 0.820 | 0.997 |
| 2020 | 0.998 | 0.792 | 0.957 | 0.809 | 0.997 |
| 2021 | 0.996 | 0.761 | 0.953 | 0.962 | 0.997 |
| 2022 | 0.998 | 0.768 | 0.954 | 0.950 | 0.996 |
| 2023 | 0.998 | 0.754 | 0.956 | 0.978 | 0.996 |

**Fig.2. RSCA trend in comparison with leading Sesamum seeds exporting countries**

India is recognized as a traditional exporter with full market access, as illustrated in

Figure 2. The revealed comparative advantage (RSCA) trends for India show fluctuations between 0.75 and 0.84. In contrast, Sudan's RSCA trend is quite volatile, currently standing at 0.99. This volatility indicates mixed results, as the country has a revealed comparative advantage in certain trade items due to its high production levels. The instability in Sudan's RSCA trend reflects the political balance within the country in relation to the traded items. Nigeria has a RSCA values increasing from 0.92 to 0.96. Pakistan exhibits RSCA levels ranging from 0.85 to 0.97, particularly in relation to high-quality products. This trend shows Pakistan's potential in the Middle Eastern market, which is seeing an increasing variety of exports. Overall, Pakistan's economy has remained stable with RSCA values between 0.96 and 0.98, due to export-oriented government policies and its close trade relations with China.

**3.2.1 India’s Reports on the Changes in sesamum seeds Competitive Export Ability (2014 – 2023) based on RSCA**

Between 2014 and 2017, India had RSCA values of around 0.83 to 0.84 as shown in Table 2. During this period competitiveness increased due to good weather, higher domestic production and global demand from China, South Korea and Middle East (Reddy, 2022). Seeds and oil were readily available in India and with market price drop after currency rate drop, exports increased. Indian oil also had pricing advantage as competitors like Nigeria and Sudan were facing pricing issues. But from 2018 to 2021 RSCA values declined to 0.76 to 0.81 although India still had comparative advantage as shown in Table 2. This moderate decline in international competitiveness was due to rising domestic demand driven by competitive pricing of edible oil and snacks and drop in supply of sesamum seeds which reduced export capacity.

Erratic monsoons and pest infestations added to the production volatility. European Union and Japan imposed restrictions due to quality issues of salable goods particularly pesticide residues and temporary sanctions were imposed. Nigeria and Ethiopia started exporting oil seeds to China and Middle East and competition increased for India. In 2022 and 2023 RSCA values started to recover and reached 0.75 and India still had comparative advantage as shown in Table 2. This was due to improved quality standards and adoption of service oriented post-harvest activities, shift in trade pattern with improved exports to Southeast Asia and Gulf countries, government support through grants under National Food Security Mission for oilseeds to boost production and growing international demand for organic sesame seeds which favored Indian exports.

**3.3 Competitive Assessment with Major Copra Exporting Nations**

**Table 3.** **Revealed symmetric comparative advantage of copra**

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Indonesia | India | Sri Lanka |
| 2014 | 0.941 | 0.737 | 0.977 |
| 2015 | 0.939 | 0.045 | 0.823 |
| 2016 | 0.785 | 0.760 | 0.898 |
| 2017 | 0.901 | 0.515 | 0.825 |
| 2018 | 0.923 | 0.263 | 0.839 |
| 2019 | 0.932 | 0.435 | 0.877 |
| 2020 | 0.958 | 0.540 | 0.939 |
| 2021 | 0.952 | 0.758 | 0.920 |
| 2022 | 0.925 | 0.836 | 0.956 |
| 2023 | **0.948** | **0.890** | 0.937 |

**Fig. 3. RSCA trend in comparison with leading Copra exporting countries**

As shown in (Figure 3) Indonesia became the largest exporter of copra (Rahmawati et al., 2023), and even has a strong RSCA indicators with a consistently strong trend between 0.785 and 0.958. By contrast, India faces occasional competition with other nations in the export market while sustaining high levels domestically, resulting in moderate RSCA (Narmadha & Karunakaran, 2022) indicators along with a varied trend approximating to 0.045 to 0.890. Sri Lanka, despite being a small exporter of organic copra, persists a steady RSCA, which ranges around a value of 0.823 to 0.977.

**3.3.1 India’s Reports on the Changes In Coconut/ Merchant Copra Competitive Export Ability (2014 – 2023) based on RSCA**

As presented in Table 3, India’s competitiveness in copra and its exports has witnessed a considerable change over the years, with respect to the Revealed Symmetric Comparative Advantage (RSCA). India had moderate RSCA values between 2014 and 2017, ranging between 0.45 and 0.76 (approximately), denoting a comparative advantage (Fasil et al., 2020). Such a period seemed to be great and made Export performance to a higher level. States producing coconuts, such as Tamil Nadu, Kerala, and Karnataka, always stayed at high production levels. (via: Increasing attractions into the market in the EU, ASEAN markets, Middle East) An increase in processing facilities linked with the demand for copra oil also drove exports and contributed to this boom in coconut oil trade. The depreciation of Indian Rupee also effectively reduced Indian copra prices in the world market, making it aggressively competitive against those offered by other countries. But growth period is also facing challenges.

For the years 2015 and 2016, the performance was particularly poor as an El Niño-related drought occurred which strongly impacted production and resulted in a low RSCA around 0.45. Additionally, the demand for copra-based coconut oil pipelines produced locally decreased due to rising palm oil imports from Malaysia and Indonesia. The range of RSCA values from 2018 to 2021 were between 0.26 to 0.54 during this time but still showed that India had a comparative advantage (Table 3). This was a modest fall, partly due to the expanding Indian edible oil sector, which has started putting upward pressure on domestic demand for copra and has lessened the export surplus. Copra and its by-products were affected by trade policies and restrictions, and international competition was exacerbated as major exporters Indonesia and the Philippines refocused to the China and EU markets. Natural calamities like Cyclone Gaja in 2018, and heavy floods in Kerala in 2019, have also caused a decline in crop production and yield of coconut. New EU and Japan aflatoxin limits also weighed on the quality and on the salability of copra-based products. However, the demand for organic coconut products was less affected by the pandemic disruptions, allowing India to partially stabilize its RSCA. Also, government export incentives under the National Mission on Oilseeds and Oil Palm (NMOOP), ensured stability and checked the subsequent decline. From 2022 to 2023, RSCA values demonstrated a strong recovery, increasing to approximately 0.83 to 0.89 and reflecting a stronger comparative advantage, as illustrated in Table 3.

The greater availability of copra-based coconut oil was met with higher global demand, significantly increasing exports to Southeast Asia. Sri Lanka’s economic collapse rendered them less competitive on pricing, giving India a competitive advantage in the market. Meanwhile, the persistent depreciating trend of the Indian Rupee paid off by improving export margins, thus boosting India’s global copra market competitiveness.

**3.4 Competitive Assessment with Major Mustard Seed Exporting Nations**

**Table 4. Revealed symmetric comparative advantage of mustard seeds**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Years | Canada | Germany | Russia | Belgium | India |
| 2014 | 0.982 | 0.201 | 0.162 | 0.017 | 0.633 |
| 2015 | 0.888 | 0.131 | 0.570 | 0.212 | 0.457 |
| 2016 | 0.896 | 0.238 | 0.573 | 0.210 | 0.313 |
| 2017 | 0.889 | 0.171 | 0.658 | 0.232 | 0.523 |
| 2018 | 0.875 | 0.164 | 0.715 | 0.266 | 0.536 |
| 2019 | 0.872 | 0.212 | 0.601 | 0.290 | 0.622 |
| 2020 | 0.863 | 0.163 | 0.775 | 0.295 | 0.742 |
| 2021 | 0.850 | 0.127 | 0.812 | 0.316 | 0.668 |
| 2022 | 0.860 | 0.192 | 0.718 | 0.289 | 0.709 |
| 2023 | 0.883 | 0.266 | 0.698 | 0.568 | 0.543 |

**Fig. 4. RSCA trend in comparison with leading mustard seeds exporting countries**

As shown in (Figure 4) India, as a major mustard-producing region with strong domestic consumption, shows a fluctuating RSCA trend between 0.31 and 0.74 from 2014 to 2023. Canada, a global leader in mustard with advanced export and processing industries, maintains a consistently high RSCA trend ranging from 0.86 to 0.98. Germany, being an EU member state involved in significant intra-European trade, records a moderate RSCA trend between 0.13 and 0.26. Russia, with increasing mustard seed production and growing export activities (Ishchukova & Smutka, 2013)., shows a rising RSCA trend ranging from 0.57 to 0.81.

**3.4.1 India’s Reports on the Changes in mustard seeds Competitive Export Ability (2014 – 2023) based on RSCA**

Table 4 outlines the characterization of competitiveness in mustard seed exports in India from 2014 to 2023; RSCA trends appear to show significant differences in competitiveness phase for mustard seed exports from India. Throughout the entire period from 2014 to 2017, the RSCA values in India were rather strongly competitive, spanning the range of 0.31–0.63, indicating the advantage in comparison. The upward phase was primarily supported by increased mustard production under the National Mission on Oilseeds and Oil Palm (NMOOP), increased demand from countries like Bangladesh and the UAE, lower prices relative to exporters like Canada and Germany, and strong government support through robust Minimum Support Price (MSP) policies.

Yet, between 2018 and 2021, India’s competitiveness stood consistent yet variable, having RSCA values between 0.53 and ~0.74, which however continued to indicate a comparative advantage. The volatility was mainly ascribed to higher domestic consumption of mustard oil, which lessened the exportable surplus, and tariff and non-tariff barriers imposed by the major importers particularly the European Union. The comparatively larger rate of increase in input prices compared to product prices is the reason for the index fall (Kumar et al., 2021).From 2022 to 2023, RSCA was starting to stabilize, rising from 0.54 to 0.70, still indicating an advantage. Higher MSP and new subsidy schemes announced by the government during this time to promote production also helped this improvement (Barik, 2023). The improved performance also reflected quality upgrades for European Union and Japanese standards, more robust trade relations with Southeast Asian and Middle Eastern markets. The world's edible oil consumption increased globally, which indirectly led to higher mustard seed exports too, thereby improving India’s overall export competitive stance (Jat et al., 2019).

**3.5 Competitive Assessment with Major Sunflower Seed Exporting Nations**

**Table 5. Revealed symmetric comparative advantage of sunflower seeds**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | Romania | China | Bulgaria | France | Ukraine | India |
| 2014 | 0.958 | -0.183 | 0.979 | 0.593 | 0.633 | -0.803 |
| 2015 | 0.956 | -0.026 | 0.976 | 0.560 | 0.491 | -0.849 |
| 2016 | 0.951 | -0.021 | 0.973 | 0.541 | 0.814 | -0.935 |
| 2017 | 0.952 | -0.003 | 0.971 | 0.541 | 0.537 | -0.896 |
| 2018 | 0.956 | 0.036 | 0.969 | 0.573 | 0.474 | -0.951 |
| 2019 | 0.958 | 0.026 | 0.964 | 0.509 | 0.490 | -0.972 |
| 2020 | 0.947 | -0.035 | 0.968 | 0.553 | 0.663 | -0.970 |
| 2021 | 0.963 | -0.099 | 0.976 | 0.612 | 0.461 | -0.961 |
| 2022 | 0.955 | -0.187 | 0.962 | 0.603 | 0.981 | -0.977 |
| 2023 | 0.950 | 0.045 | **0.972** | 0.600 | 0.943 | **-0.951** |

**Fig. 5. RSCA trend in comparison with leading Sunflower seeds exporting countries**

As shown in (Figure 5) For India, having a high level of domestic consumption and low prominence on exports, RSCA has been consistently negative, fluctuating between -0.80 and -0.97 from 2014 onwards till 2023. At high production volumes, Romania as a major exporter presents with a stable trend of RSCA around 0.94 - 0.96. In the case of China, it has a relatively small export status with high domestic demand and an RSCA trend that oscillates between -0.18 and 0.04. Bulgaria had an excellent access to the EU market with a continuous increase of the exports with a high RSCA trend between 0.96 and 0.98. In broadline production and also dominate Intra EU trade, France has a moderate RSCA around 0.50 to 0.60. Ukraine as the world leader in sunflower seed exports indicated a good RSCA of 0.47 to 0.98, which, however, experienced disruption due to the war between 2022 and 2023.

**3.5.1 India’s Reports on the Changes in Sunflower seeds Competitive Export Ability (2014 – 2023) based on RSCA**

In fact, the RSCA values of India in sunflower seed export have remained negative between -0.80 to -093 range during the period 2014 to 2017 indicating a clear comparative disadvantage (Table 5). Our competitiveness was also hampered by a few challenges like weak domestic production that made India a net gainer in trade, rather than being a rich exporter. A brisk domestic demand for sunflower oil also meant that fewer seeds were left to export. Romania, Bulgaria, and Ukraine remained highly competitive in the global market, while the relatively low level of sunflower seed processing plants and the absence of supporting policies for sunflower seed exports in India limited the country's position even further.

By 2021 RSCA values had dropped to a range of −0.95 to −0.97 for 2018 and 2020 showing a relative disadvantage. This fall came as India increasingly turned to imported sunflower oil, resulting in very little balance available for export, even as Ukraine and Russia greatly increased their own supply to take advantage of the expanding Indian marketplace. In addition, high-quality and stringent phytosanitary norms set by the European and Middle Eastern countries affected India's home-grown sunflower output in 2022, following adverse weather variations. India also showed stagnation at extremely low levels of competitiveness in 2022 to 2023 with RSCA values above (and equal to) between -0.95 and -0.97 showing a clear comparative disadvantage (Borisagar et al., 2023). The failure of effective mitigation strategies, prioritizing crude oilseed needs over supply enhancing exports, and limited response to the Ukraine-Russia conflict disruption led to this stagnation. Simultaneously, Romania, Bulgaria and France improved their export volumes and posted higher growth rates, consequently restricting India’s access to the international sunflower seed trade

**3.6 Competitive Assessment with Major Soyabeans Exporting Nations**

**Table 6. Revealed symmetric comparative advantage of soyabeans**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year | Brazil | USA | Paraguay | Canada | Ukraine | India |
| 2014 | 0.942 | 0.650 | 0.974 | 0.090 | 0.613 | -0.742 |
| 2015 | 0.945 | 0.603 | 0.968 | 0.178 | 0.743 | -0.703 |
| 2016 | 0.939 | 0.654 | 0.970 | 0.191 | 0.783 | -0.799 |
| 2017 | 0.946 | 0.616 | 0.973 | 0.160 | 0.762 | -0.712 |
| 2018 | 0.957 | 0.541 | 0.975 | 0.233 | 0.703 | -0.790 |
| 2019 | 0.951 | 0.590 | 0.972 | 0.079 | 0.776 | -0.893 |
| 2020 | 0.948 | 0.663 | 0.971 | 0.154 | 0.588 | -0.925 |
| 2021 | 0.950 | 0.632 | 0.975 | 0.163 | 0.432 | -0.975 |
| 2022 | 0.947 | 0.630 | 0.940 | 0.088 | 0.674 | -0.947 |
| 2023 | 0.950 | 0.551 | **0.973** | 0.074 | 0.796 | **-0.980** |

**Fig.6 RSCA trend in comparison with leading Soyabeans exporting countries**

As shown in (Figure 6) Brazil which is in high trade rate with China, keeping high levels of RSCA around 0.94 to 0.95, making him the largest export in the world (de Paula et al., 2018). USA achieves moderate RSCA from 0.54 to 0.65 due to its high-tech sector and a stable production base with a healthy domestic market. Paraguay shows a high RSCA trend (relative reveal comparative advantage between 0.94 and 0.98) given competitive export capabilities and high demand from Asian markets. Instead, Canada is being limited to focused on non-GMO niche market segment and shows negligible RSCA, which trend hovering at 0.07–0.23 level. The RSCA trend for Ukraine ranged between roughly 0.58 and 0.79, reflecting the impact of political disputes that have caused frequent export interruptions. While India's high domestic consumption constrains the nation's export capability, shown by the consistently negative RSCA trend from -0.71 to -0.98.

**3.6.1 India’s Reports on the Changes in Soyabeans Competitive Export Ability (2014 – 2023) based on RSCA**

Between 2014 and 2017, India showed an overall negative RSCA pattern from -0.70 to -0.79 reflecting a comparative disadvantage in soybean exports (as demonstrated in Table 6). This is due to several key factors, including lack of local processing facilities which lead to surplus of raw soybeans being exported. Widespread domestic use of soymeal and soybean oil drained even more soybeans from the export supply. Moreover, the competitive pressure from leading global players such as Brazil, the USA and Argentina, is so strong that Indian exporters had very few opportunities. They also lost out to Brazilian and USA high-yielding GM varieties in the context of restricted cultivation of genetically modified (GM) soybeans in India.

From 2018–21, the RSCA worsened further to -0.79 in 2018–19, -0.88 in 2019–20 and -0.93 in 2020–21, thus reinforcing India's comparative disadvantage (Borisagar et al., 2023). This further decline was due to a dramatic fall in soybean and soy product exports as domestic soybean oil crushing for export increased. Non-tariff barriers were raised due to quality issues from major importers particularly in the EU and China. In addition to this, rising Minimum Support Prices (MSP) made Indian soybeans less competitive in the international market as well as for domestic needs. The US-China trade war (2018–2019) further undermined India when China raised its soybean purchases from Brazil and Argentina. In 2022–2023, India had the RSCA level at a record low between -0.94 and -0.98 and consistently remained at a stage with no signs of recovery with continued comparative disadvantage. Stagnation at the bottom was induced by the disruption of global edible oil supply chains as a result of the Russia-Ukraine war, forcing India to ramp up its imports of soybean oil dramatically.

On the other hand, the expansion of soybean cultivation in South America cemented the dominance of Brazil and Argentina. Export bans and increasing import duties, inconsistencies in Indian trade policy and uncertain trajectory of import and export policies discouraged foreign investors and trade partners as well, further denting competitiveness of the Indian exports.

**3.7 Competitive Assessment with Major Castor Oilseeds Exporting Nations**

**Table 7. Revealed symmetric comparative advantage of castor oilseeds**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | India | Ethiopia | Brazil | Myanmar | Pakistan |
| 2014 | -0.290 | N/A | -0.953 | 0.997 | 0.963 |
| 2015 | -0.747 | N/A | N/A | 0.997 | 0.823 |
| 2016 | 0.244 | N/A | 0.241 | 0.996 | 0.767 |
| 2017 | -0.181 | N/A | -0.829 | 0.995 | 0.991 |
| 2018 | 0.365 | 0.999 | N/A | 0.981 | 0.988 |
| 2019 | 0.929 | 0.998 | N/A | 0.977 | 0.976 |
| 2020 | 0.916 | 0.999 | -0.984 | 0.948 | 0.981 |
| 2021 | 0.660 | 0.999 | -0.781 | 0.996 | 0.986 |
| 2022 | 0.597 | 0.999 | 0.700 | 0.995 | 0.980 |
| 2023 | **0.896** | **0.999** | 0.868 | 0.988 | 0.968 |

**Fig. 7. RSCA trend in comparison with leading castor oilseeds exporting countries**

As shown in (Figure 7) India dominates as a global supplier of castor oil, with significant processing capacity, and has consistently shown high RSCA of approximately 0.90. Hence, this study shows that Ethiopia is an emerging competitor in the castor oil market, with very high RSCA levels with the RSCA practically 0.99 for the recent years, explicating the recent comparative advantage of the nation resulting from increase in castor oil production. Brazil has also been known for its competitive pricing and efforts to expand market reach, with RSCA from 0.70 in 2018 to 0.86 in 2022. International, Myanmar keeps stable production and solid regional market focus which stands out in its solid RSCA ~ 0.98. Pakistan has moderate RSCA levels of 0.76 to 0.97 based on its proclivity for export and vulnerability to policy instability, which limits sustained competitiveness.

**3.7.1 India’s Reports on the Changes in Castor oilseeds Competitive Export Ability (2014 – 2023) based on RSCA**

Table 7 shows that between 2014 and 2017, the RSCA values corresponding to castor oil exports fluctuated between a comparative disadvantage of -0.29 and a low comparative advantage of 0.24.In this phase, the market saw moderate competitiveness issues when it came to erratic castor seed monsoon patterns and production patterns, volatile profit margins primarily dependent on international market pricing for castor seeds, and tougher competition from nations like Brazil and Myanmar with higher RSCA levels. Moreover, worldwide market for castor oil by-products for industrial application was not great, and government interests shifted towards other crops including soybeans and groundnuts. Nonetheless, between 2018–2021, the RSCA metrics demonstrated the largest proportional growth (0.36–0.92), indicating a greater relative benefit.

Such expansions have been aided by growing global demand from the pharmaceutical and cosmetics sectors, new customers in European, China and USA markets, rising yields in India due to improved farming methods and hybrid seed breeding, better trade policies with less export restrictions as well as a weakening Indian Rupee that makes for more competitive exports. This strong performance in exports can be attributed to India’s strong hold as the single largest global supplier of castor oil, consistent demand with support from key global markets - China and EU for industrial and pharmaceutical use, limited international competition and government promotion through National Mission on Oilseeds and Oil Palm (NMOOP), which encouraged castor cultivation.

**CONCLUSION**

India leads in the global export of **copra** and **castor oilseeds** with RSCA 0.89 due to its intensive production systems, robust domestic processing infrastructure and increasing global demand for castor oil in industrial sectors. Also, India has a strong position in groundnuts with RSCA 0.83 sesamum **seed** with RSCA 0.75 exports mainly because of large cultivation in **Gujarat** and **Rajasthan** where favorable agro-climatic conditions and traditional farming practices ensure consistent output and quality. India does export **mustard seeds** with **moderate Comparative advantage of RSCA 0.54** but is challenged by **Canada** which has a large share in the global market. Canada has an extensive export network, high quality production and strong trade relations making it a tough competitor for India in this segment. India faces challenges in the export of **sunflower seeds** and **soybeans** and has a comparative disadvantage with RSCA -0.98 and -0.95 India has **low productivity** and is **highly dependent on imports** for processing needs. Also, **strong global competitors** like **Bulgaria** in sunflower seeds and **Paraguay** in soybeans dominate the global market making it difficult for India to establish a presence. To actively compete in the global export market for sunflowers and soybeans, this study recommends India needs to make specific changes in the sector, including addressing structural inefficiencies using productivity-enhancing investments alongside market-oriented reforms. It is also vital to increase the domestic supply oilseeds exports by creating surplus capacity to increase supply through output per hectare innovation in seed technology and proficient input use. Policies that encourage greater private sector involvement in the oilseed value chain will improve access to credit, reduce input costs, and raise profitability, incentivizing more production. To reduce import dependency, the domestic supply needs to improve by strengthening farm level productivity and enhancing the available marketable surplus. Investment in rural infrastructure such as storage, logistic, and processing facilities would improve oilseed marketing and reduce post-harvest losses. Changes must also be made to ensure that domestic production remains competitively on a global scale alongside increasing alignment of local pricing with international figures using rational subsidy and procurement policies. India needs to diversify its international export markets while also improving overall product quality standards and ensuring they meet global compliance to increase their presence in the global export market. Simplifying export processes, minimizing trade policy risks, and entering into preferential trade agreements with significant importers will enhance access to new markets. Enhancing value addition through modern processing facilities and aiding branding for specialized markets (like non-GMO or organic oilseeds) will enable India to differentiate its products and target higher value portions in the international marketplace. Collectively, these actions can shift India’s position as a competitive and dependable participant in the global oilseed trade.

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Authors’ Contributions

Author Poornasree conceptualized the research, designed the methodology, performed statistical analyses, developed the protocol, and drafted the initial manuscript. And remaining authors provided critical analysis and interpretation of the selected studies, contributed to the revision of the manuscript for important intellectual content, and ensured the final version was ready for publication. All authors read and approved the final manuscript.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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