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THE IMPACT OF TRADE LIBERALIZATION ON INDIA'S MANGO PRODUCTION AND EXPORTS

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ABSTRACT
This study examines how trade liberalization has affected India's mango exports and production, with a particular emphasis on the years 1991–2022. Mangoes are an essential part of the horticultural industry and account for around 40% of global production, making them a major contributor to India's agricultural economy. India's mango exports have experienced instability because of shifting demand, competition, and climate-related issues, notwithstanding the benefits of trade reforms that were started in the 1990s and opened up new markets and enhanced export infrastructure. The study uses the Revealed Comparative Advantage (RCA) model and the Cuddy-Della Valle Instability Index to evaluate production and export potential variations using secondary data from the Food and Agricultural Organization (FAO). The findings indicate that while productivity has improved, instability in exports persists, necessitating strategic interventions to stabilize the sector and enhance India's competitive edge in the global mango market.
KEYWORDS: *Mango exports, trade liberalization, horticulture, comparative advantage, Cuddy-Della Valle Instability Index, Revealed Comparative Advantage (RCA).*

I. INTRODUCTION

India's agricultural economy depends mainly on the horticulture industry, which also makes significant contributions to economic expansion and food security. Fruit cultivation plays a significant part because of its great demand both in India and internationally, but it also comprises a wide variety of crops, including fruits, vegetables, flowers, spices, and medicinal plants. Even though horticulture has been around for generations, it started to change after independence with different agricultural initiatives, and it picked up even more steam following the Green Revolution in the 1960s. However, the 1990s saw a rapid increase in horticulture, particularly fruit output, as a result of trade reforms and economic liberalization. India is now a major player in the global horticulture market and is more competitive in fruit exports because to these reforms, which also created new opportunities for investment and export.

Fruits, especially mangoes, are among the most important components of India's horticulture exports. Mango, often referred to as the "king of fruits," holds cultural and economic significance in India. The country is the largest producer of mangoes globally, accounting for nearly 40% of the world's total production. This fruit alone contributes substantially to India's fruit export portfolio. During the 1990s and early 2000s, mangoes became a flagship export product, with increasing demand from regions like the Middle East, Europe, and Southeast Asia.

The 1991 start of trade liberalization was a turning point for India's horticultural industry. Indian fruits, such as mangoes, were able to more successfully enter other markets

after trade barriers were loosened and export prohibitions were lifted. Better logistics and cold storage facilities were established as a result of liberalization, which decreased post-harvest losses and boosted export productivity. Initiatives like the National Horticulture Mission (NHM) in 2005 also helped to boost the industry by encouraging improved agricultural methods and research, which improved the quantity and quality of fruit produced.

Despite these developments, the horticultural industry has encountered difficulties, especially in preserving export stability. The beneficial global mango market is extremely competitive and susceptible to shifts in demand, trade policies, and climate-related effects. Over the last thirty years, India's mango exports have been volatile, with production and export instability continuing despite increased productivity. This study attempts to evaluate the effects of trade liberalization on India's mango production and exports, looking at the variability in important indicators such as area, production, and productivity. It also assesses India's comparative advantage in mango exports, offering insights into the factors affecting its performance in international markets.

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II. THEORETICAL BACKGROUND

According to David Ricardo's theory of comparative advantage (1817), a nation gains from manufacturing and exporting items for which its opportunity cost is lower than that of other countries. This implies that compared to producing other things, the nation can create these goods more effectively and with fewer resources. When it comes to exporting mangoes, India has a competitive advantage because of its ideal environment and knowledge of mango growing. India can effectively use its resources and export mangoes, which it produces at a lower cost than many other nations, by concentrating on mango production. This will help India's standing in the international market.

III. OBJECTIVES OF THE STUDY

1. To assess the impact of trade liberalisation on production and trade of major horticulture crops in India
2. To estimate the export potential of major horticulture crops in India

IV. METHODOLOGY

The present study is mainly focuses on the secondary data. The secondary data will be collected from Food & Agricultural Organisation (FAO) data source. For analysing the area, production, productivity and export of India's mango, the time series data of post-liberalisation period (1991-2022) is taken into consideration. To study the variability in the India's mango Cuddy-Della Valle instability index and to estimate the export potential Revealed Comparative Advantage (RCA) tools were used.

Instability Index

The coefficient of variation (CV) was used as a key measure to analyse the variability in the area, production, productivity, and export of mangoes from India. The coefficient of variation, or instability index, is calculated using the formula:

$$CV=SD/mean\times100$$

The Cuddy-Della Valle Instability Index (CDVI) is also employed to assess the degree of instability in the relationships between variables over time, offering insights into fluctuations. To calculate CDVI, a regression is conducted to obtain the R^2 value, which reflects how well the model explains the data's variation. The CDVI is then computed using the formula:

$$CDVI=\sqrt{1-R^2}\times100$$

Lower CDVI values indicate greater stability, whereas higher values signal increased instability.

Revealed Comparative Advantage

The RCA index was developed by Balasa (1967) used widely in indicating competitiveness in the international trade. It is the ratio of two shapes how competitive a product is in an export country compared to that product share in the global trade. The RCA index ranges from 0 to infinity a country said to have a reveal comparative advantage if the value exceeds unity.

The index for country i and commodity j is calculated as follows:

$RCAij= (Xij/Xit)/(Xnj/Xnt)$

Here, Xij = Exports of country 'I' of commodity 'j '

Xit = Exports of country 'I' of a total agricultural commodity 't '

Xnj = Exports of a world 'n' of commodity 'j ', and

Xnt = Exports of a world 'n' of a total agricultural commodity 't '

V. RESULT AND ANALYSIS

The table number 1, shows the instability index in terms of area of production, production, productivity and export of Mango across the three decades, shows both continuous challenges and advancements. The area under mango cultivation witnessed variations, with instability decreasing slightly from the 1990s to the 2000s but rising significantly in the recent decade of 5.04 percent. This recent growth raises questions about variables such as shifting land-use patterns, variations in the climate, or farmers' priorities shifting from one crop to another. Over the years, there was a minor reduction in production instability, suggesting that improved farming practices could stabilize mango production. However, current patterns suggest that external variables like weather and market conditions are likely responsible for the continuing variations.

Table: 1 Instability in Area, Production, Productivity and Export of Indian Mango

Period	Area	Production	Productivity	Export
1991- 2000	3.98	6.90	7.94	15.11
2001-2010	3.28	6.30	8.71	12.19
2011- 2022	5.04	5.97	5.88	13.12

Source: FAO

With a significant reduction in instability from 2011 to 2022, productivity (yield per hectare) has grown the most steadily, indicating that advances in technology and better crop management techniques are having a beneficial impact. All the decades together, exports have remained highly volatile, and the instability index shows the continuous difficulties faced by global

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markets, including fluctuating demand, changing trade regulations, and logistical problems. The long-term growth and stability of India's mango sector will depend on how well its economy handles the volatility in the area under cultivation and exports, even with advances in productivity and production. As observed from the above table, there have been little variability over the last decade in terms of Mango area, production, productivity, and export, with respective CDVI of 5.04, 5.97, 5.88 and 13.12 percent.

Table: 02 Revealed Comparative Advantage of Indian Mango

Year	India
1991	9.13
1992	10.35
1993	5.76
1994	7.03
1995	3.52
1996	3.08
1997	4.78
1998	4.52
1999	4.43
2000	3.79
2001	3.81
2002	4.17
2003	12.89
2004	14.62
2005	15.34
2006	14.23
2007	9.85
2008	14.88
2009	13.78
2010	11.69
2011	6.94
2012	4.28
2013	4.40
2014	3.83
2015	4.08
2016	4.52
2017	3.00
2018	2.63
2019	2.30
2020	2.01
2021	2.15
2022	3.10

Source: FAO

Due to National horticulture Mission (NHM) in 2005 it increased the production in the mango because of this, in the globe, India became the most competitive exporter of mangoes in the early 2000s, with the highest-ever RCA value, 15.34, in 2005. From 2003 to 2009, India was the world's largest exporter of mangoes due to advantageous production restrictions and a strong export infrastructure. But by 2020, RCA values had only dropped to 2.01, despite a gradual fall in 2010. This decline could be caused by several factors, including heightened competition between countries, market diversification by importing countries, and potential internal issues affecting India's ability to cultivate and export mangoes.

India's competitiveness in the global mango market is maintained by the recent increase, as the country's RCA values are projected to reach 3.10 by 2022. Nonetheless, compared to its high in the early 2000s, the overall trend indicates a long-term

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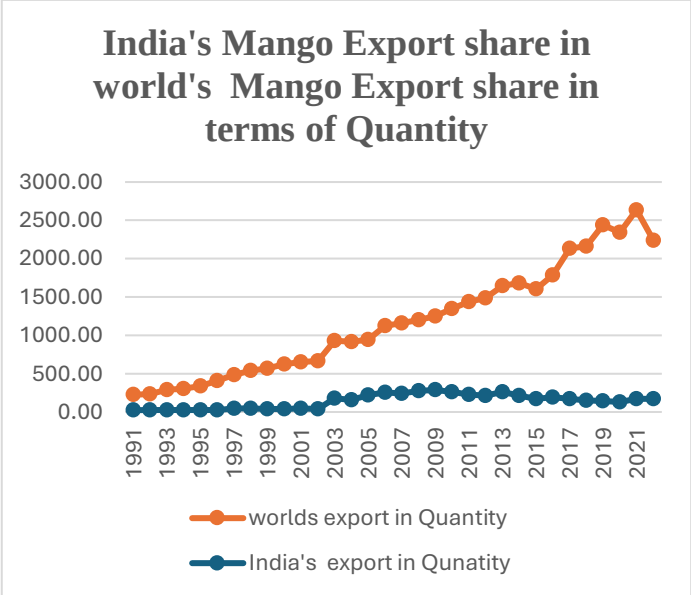
fall in India's comparative advantage. In order to mitigate this drop and broaden its global reach, India may need to concentrate on improving production efficiency, addressing issues pertaining to exports, and investigating new international markets.

Table No:3 Percentage of India Mango Export Share in World's Mango Export Share

Year	% share of India mango export in world mango export (in value)	% share of India mango export in world mango export (in Quantity)
1991	7.58	10.31
1992	8.29	11.17
1993	5.57	8.01
1994	5.66	9.09
1995	4.24	6.93
1996	3.80	6.58
1997	5.74	9.27
1998	5.25	8.74
1999	4.76	6.67
2000	4.28	6.32
2001	4.58	7.07
2002	4.95	6.26
2003	15.12	19.31
2004	16.11	17.12
2005	19.73	23.63
2006	20.82	22.77
2007	17.91	20.72
2008	22.58	22.91
2009	21.16	22.98
2010	19.78	19.30
2011	14.68	15.93
2012	11.40	14.47
2013	12.09	16.01
2014	9.75	12.53
2015	9.18	10.81
2016	9.28	10.83
2017	6.47	8.07
2018	5.54	7.08
2019	4.66	6.03
2020	4.32	5.46
2021	5.13	6.45
2022	7.36	7.67

Graph:01 India's Mango Export share in world's Mango Export Share



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Graph:02 India's Mango Export share in world's Mango Export Share

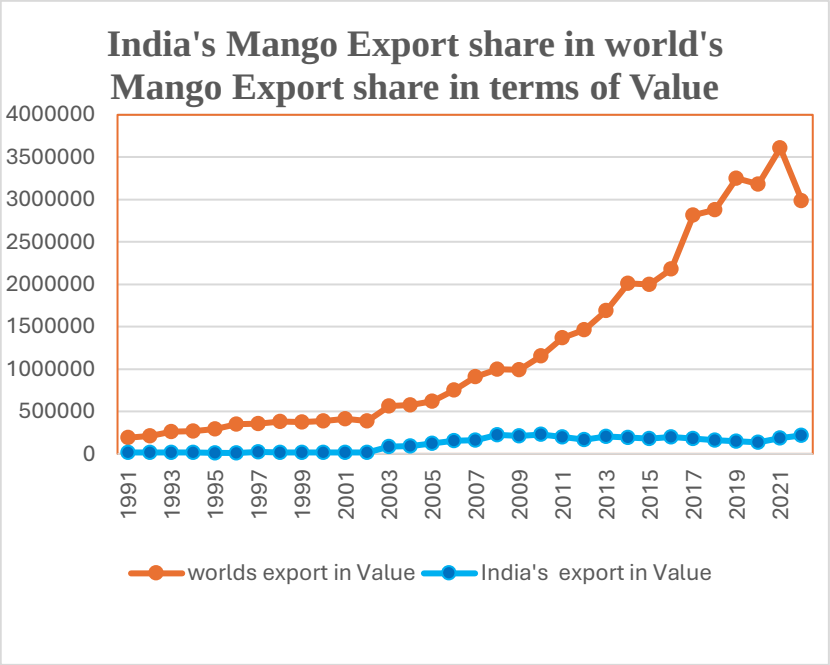

Table 3 indicates that, India's share of world mango exports, both in terms of quantity and value, varied significantly between 1991 and 2022. The share peaked in the middle of the 2000s, with the highest value share appearing in 2008 at 22.58% and the largest quantity share occurring in 2005 at 23.63%. It demonstrates India's dominant position at this time in the global mango export industry. However, after 2010, the share of India decreased, reaches a low in 2020 before slightly increasing in 2021 and 2022. This points to increased rivalry and potential barriers to preserving its export monopoly in the global mango market.

VI. POLICY SUGGESTION

To boost India's mango sector, policies should focus on improving supply chains, like better cold storage and transport, to reduce post-harvest losses and stabilize exports, which have seen instability (13.12% in the last decade). Exploring new markets in Southeast Asia, Africa, and Latin America through trade deals can help counter the decline in India's export share. Farmers need training on good agricultural practices and support for obtaining certifications to meet international standards, especially in premium markets like the US and Europe. With climate variability affecting production (instability in area at 5.04%), research into climate-resilient varieties and improved irrigation is crucial. Financial incentives or tax breaks should encourage farmers to produce export-quality mangoes. The creation of a National Mango Export Promotion Board could enhance coordination, promote new technologies like precision farming (leading to stable productivity at 5.88%), and improve global competitiveness. India's Revealed Comparative Advantage (RCA) fell from a peak of 15.34 in 2005 to 3.10 in 2022, highlighting the need for urgent measures to regain competitiveness.

VII. CONCLUSION

A review of India's mango trade during the period after liberalization shows both progress and difficulties. This sector continues to face severe export volatility and shifts in cultivation patterns, despite productivity gains illustrating the benefits of improved crop management and technology. Growing competition, changing market dynamics, and internal issues have all contributed to the slow decline of India's once-dominant position in the global mango industry.

The results highlight the necessity of strategic interventions to improve supply chains, stabilize exports, and investigate new global markets. Maintaining growth requires addressing the underlying sources of instability, such as market volatility and climate variability, through research and policy support. Additionally, India will be able to reclaim its competitive edge by encouraging export-oriented farming and bringing output into line with international quality standards. The nation can guarantee that its mango industry stays robust and competitive in a changing global market by concentrating on these areas.

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