



Mapping the Growth Trajectory of Indian Dairy Exports and Imports

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ABSTRACT

Indian dairy industry is one of the largest and fast growing industries which contribute significantly to the national economy. The global dairy market has undergone significant structural changes in recent times, particularly concerning milk production. But even though India is the world's largest milk producer, it only managed to capture one per cent of global dairy trade. Under this backdrop, the study was undertaken with the objectives to determine the growth of export/import of dairy products from 2001-2022 and calculate competitiveness of India's dairy products in the world market. The study is based on secondary data. The structural change in import and export of Indian dairy products was examined by Chow test and for direction of trade Gauss Markov Chain analysis was applied. The results of study showed that there was structural change in import/export of Indian dairy products in year 2013. After that data have witnessed a remarkable growth in export of dairy products and decline in import as a consequence of Intensive Dairy Development Programme initiated by Government of India. The result of direction of trade showed Bangladesh, Egypt and other countries are the loyal importers and USA, New Zealand and other countries are the loyal exporters of Indian dairy products throughout the study period. Study recommends that to enhance the production and global trade of dairy products, additional efforts should be directed towards the implementation of dairy development programs.

KEY WORDS: Chow test, Dairy products, Export, Gauss Markov analysis, Import.

INTRODUCTION

The global dairy market has experienced substantial structural transformations, over the past two decades with milk production witnessing an annual average compound growth rate of nearly 2 per cent. The majority of global milk production, exceeding fifty per cent, is generated in developing nations. (Ohlan R, 2012). Dairy product demand has increased along with production in many developing nations and oil-exporting nations due to their rapid economic growth. Furthermore, the rise in population, growing urbanization, and the adoption of western dietary preferences has also contributed to an increased demand. In addition, as dairying provides the majority of the rural poor with their primary source of food and income, it is crucial for food security in many developing nations, including India (FAO, 2011).

Milk production is an integral component of Indian agriculture supporting the livelihood of more than two-thirds of the rural population (Ohlan R, 2012). The dairy industry in India is the largest smallholder milk production system in the world (Chandel *et al*, 2020). The level of milk production per household is notably limited, with 63 per cent of households producing 2.75 liters of milk per day or less. (Birthal, 2008). The industry has created new income avenues for rural households and serves as a crucial tool in combating poverty (Verma *et al*, 2007).

Trade of dairy products in India has experienced remarkable growth as India's Export of Dairy products was 67,572.99 MT to the world for worth Rs. 2,269.85 Crores during the year 2022-23. The Government of India's 1991 economic reforms led to a rise in the trading of

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dairy products. Following delicensing and deregulation, the Uruguay Round Agreement (URA) of the General Agreement on Tariffs and Trade (GATT) was signed by India, ushering in a new era for the dairy industry. The conventional dairy sector, once heavily regulated by government interventions, is now transitioning to a scenario characterized by widely acknowledged trade barriers, restrictions on export subsidies, and established minimum market access provisions. These developments are poised to drive the industry into new phases of growth. This is due to the gradual easing of international trade restrictions and regulations following the GATT negotiations, which led to the establishment of the World Trade Organization (WTO). India also became the net exporter of dairy products after 2000 (Kumar *et al*, 2011; Parida *et al*, 2019). The Middle East, South Asia, South East Asia, and USA are the major markets for India's dairy products (Parida *et al*, 2019). Furthermore, the environment in which the Indian dairy business operates may very well be rebuilt as a result of the combined consequences of the WTO commitments and macroeconomic reforms. The dairy industry is showing initial indications of shifts in trade patterns, marked by a redistribution of market share among key players in the global dairy market. However, the immediate effects of the Agreement on Agriculture, which advocates for liberalization in global trade, remain uncertain. In this context, the present study was conducted to examine the major markets, trade direction, and structural changes of Indian dairy products.

MATERIALS AND METHODS

The entire study and discussion has been made based on secondary data. The different journals and related websites especially APEDA website have been consulted in this regard. The information regarding the production and trade of dairy products in terms of value from 2001 to 2022 is sourced from the FAOSTAT database.

Analytical Tools

Chow test: In 1960, econometrician Gregory Chow formulated the Chow test to ascertain whether the actual coefficients in two linear regressions based on distinct datasets are equal

(Karacor *et al*, 2013). In time series analysis, one of the most widely used applications of econometrics is to examine the presence of a structural break at a moment that can be considered known a priori (for example, a significant historical event like a war). In present study this test proposed to study the structure change over the period of time with respect to dairy export and import. Here the annual values of export/import were used to check the structural transformation for period 2001 to 2022 by using Chow test. For the calculation the study period were divided into two time period i.e., 2001 to 2013 and 2014-2022.

Gauss Markov Chain Analysis: To provide a comprehensive depiction of the trade direction, specifically the import/export practices of Indian dairy products, the Gauss Markov Chain model with first order has been employed, as described by Dent (1967) and Bansal and Singh (2020). Other features of its uses include those by Zimmermann and Heckeley (2012), Gohain *et al*, (2022), Chavan *et al*, (2023). Prediction of value is made by using Transitional Probability Matrix (Siddeshwar *et al*, 2017).

RESULTS AND DISCUSSION

India's dairy exports showed a very erratic pattern, mostly because of changes in domestic demand, international market pricing, and dairy production. Historically, India used to be a net importer of dairy products until the initiation of Operation Flood. The trend of imports persisted until 1993 when exports eventually surpassed imports. However, between 1993 and 1999 imports and exports continued to gain ground, and by 2000, India was turning a profit on its dairy products exports (Joshi, 2014). Its exports continued to increase almost consistently from US\$ 39713 thousand in 2001 to US \$575360 thousand in 2022.

Figure 1 revealed that balance of trade of dairy exports have increased from US \$34852 thousand in 2001 to US \$540751 in 2013. In 2009, trade volumes experienced a deceleration to \$88,950 thousand, attributed to the global economic crisis in 2008. Subsequently, as income levels increased in metropolitan areas, there is a

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Figure 1 Trade performance of Indian dairy products (2001-2022)

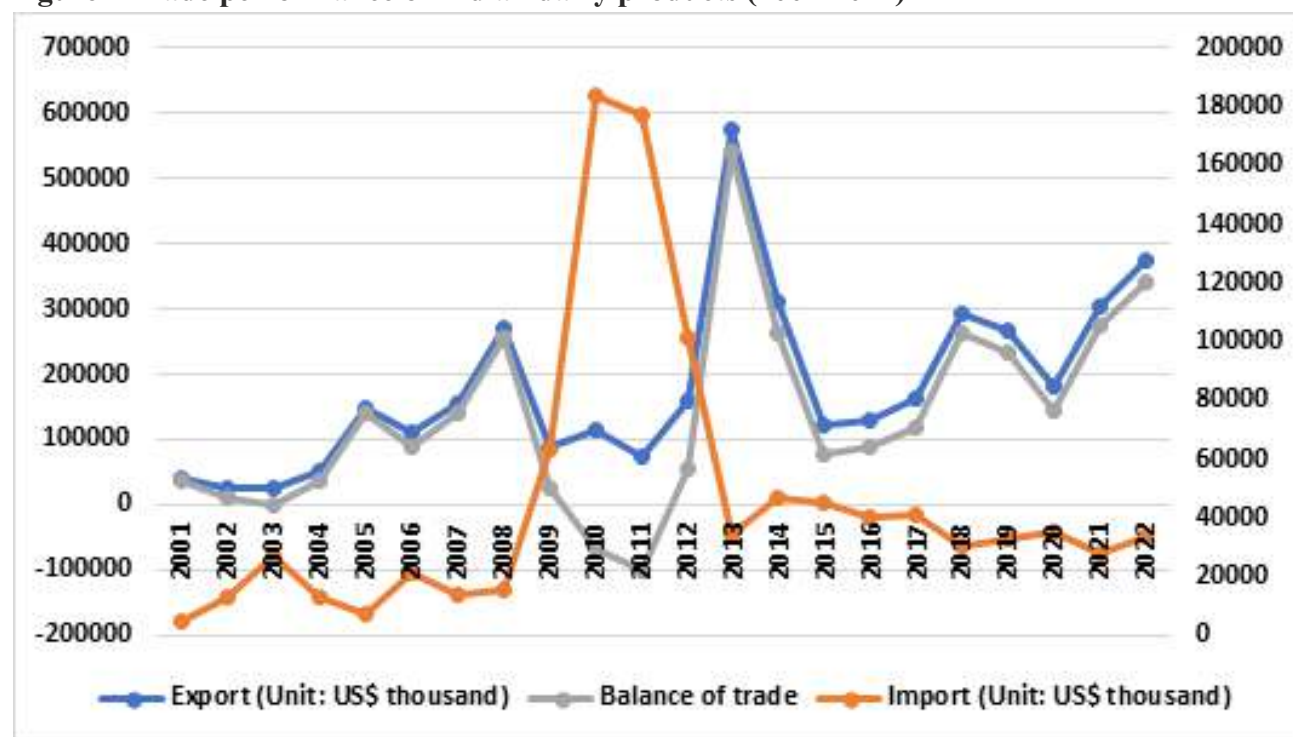


Table 1. Results of First Stage.

Particular	Export			Import		
Variables	Coefficient	t-statistics	P value	Coefficient	t-statistics	P value
Intercept	38451.88	0.795302	0.435775	35067.43	1.616819	0.121582
Time	12362.04	3.358143	0.003129	943.7888	0.571514	0.574019
R-squared	0.360555	SSR	2.4E+11	0.016069	SSR	4.83E+10

Table 2. Results of Second Stage.

Particular	Export			Import		
Variables	Coefficient	t-statistics	P value	Coefficient	t-statistics	P value
Intercept	-24710.7	-0.35102	0.732203	-18609.3	-0.61623	0.550284
Time	23700.59	2.672255	0.021706	10094.93	2.653278	0.022455
R-squared	0.393637	SSR	1.5748E+11	0.39024	SSR	2.9E+10

heightened demand for processed dairy products. Moreover, the liberalization of dairy trade policies has led to a significant upswing in export volumes (Ahmed *et al*, 2023).

Conversely, India has witnessed a rapid surge in dairy imports, escalating from US\$ 4,861 thousand in 2001 to US\$ 177,392 thousand in 2011, driven by the country's swiftly growing domestic demand. As a result, in the period of 2010–2011, India transitioned into a net importer

of milk products (Figure 1). However, while its imports decreased, India's dairy exports increased significantly over the ensuing years. India once again emerged as a net exporter of dairy goods in 2022, with its dairy exports reaching US\$374518 thousand as opposed to US\$33636 thousand in imports. This could be attributed to the implementation of India's National Dairy Plan (NDP) by the Government of India. The NDP aims to improve an extensive dairy development

Table 3: Results of Third Stage.

Particular	Export			Import		
Variables	Coefficient	t-statistics	P value	Coefficient	t-statistics	P value
Intercept	154579.7	2.5254	0.039498	47424.56	16.93874	6.12E-07
Time	16595.68	1.525717	0.170912	-2072.8	-4.16616	0.004209
R-squared	0.249556	SSR	49692556725	0.712607	SSR	1.04E+08

initiative, create infrastructure for producing high-quality and sanitary milk products, and implement a program for fostering dairy entrepreneurship (Ohlan, 2016).

Structural Change in the growth of dairy export and import products

An economic model has been developed, and its variables include:

$$Y = b_0 + b_1 X + e$$

Y: Dairy export/import (US\$ thousand) and X: Time (years)

First stage: The regression model for the export and import of Indian dairy products was formulated for the period 2001-2022.

Second stage: The development of the regression model for the export and import of Indian dairy products was undertaken for the period 2001-2013.

Third stage: The development of the regression model for the export and import of Indian dairy products was undertaken for the period 2013-2022.

Fourth stage: hypothesis

H_0 : There is structural change in dairy export/import during study period

H_1 : There is no structural change in dairy export/import during study period

Fifth stage: (a) Calculation of F test statistics of export of Indian dairy products

$$F = \frac{(2.4E+11 - (1.5748E+11 + 49692556725))/2}{(1.5748E+11 + 49692556725)22 - 2(2)} \quad F = 1.425$$

(b) Calculation of F test statistics of export of Indian dairy products

$$F = \frac{(48296356635 - (28980439209 + 103966019.8))/2}{(28980439209 + 103966019.8)22 - 2(2)} \quad F = 5.945$$

Sixth stage: (a) Decision of export of Indian dairy products

$$F_{\text{calculated}} = 1.425, F_{\text{table}} = 0.051, F_{\text{calculated}} > F_{\text{table}}$$

(b) Decision of export of Indian dairy products

$$F_{\text{calculated}} = 5.945, F_{\text{table}} = 0.051, F_{\text{calculated}} > F_{\text{table}}$$

Since the computed F-test value exceeded the critical F-test value, it indicates the rejection of the null hypothesis for both the export and import of dairy products. The outcome of the Chow test confirmed the existence of a structural change in dairy export/import patterns over time. Specifically, the structural change in 2013 exerted a positive impact on dairy export/import.

Loyalty within India's dairy export markets

The Markov chain model has been employed to quantify the structural changes in the trajectory of India's dairy exports. The figures representing retention per centages can be observed in the primary diagonal of the transitional probability matrix. How much of an import partner's market share from the previous year, it has kept this year, is known as its retention per centage. The diagonal elements in the Transitional Probability Matrix offer insights into the probability of trade ownership. On the contrary, components from the rest of the world delineate the potential risks of losses in trading due to competition from other countries. The elements presented in a column signify the likelihood of successful trade from competing nations.

As indicated (Table 4), other countries, as a collective entity, demonstrated stability as prominent importers of Indian dairy products, evidenced by a higher retention probability of

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Table 4. Transitional probability matrix of Indian Dairy Products Exports (Unit: US\$ thousand).

Country	Bangladesh	USA	Saudi Arabia	UAE	Egypt	Others
Bangladesh	0.5147	0.0000	0.0000	0.0000	0.0000	0.4853
USA	0.6294	0.1149	0.2557	0.0000	0.0000	0.0000
Saudi Arabia	0.8745	0.0000	0.1255	0.0000	0.0000	0.0000
UAE	0.0000	0.1673	0.0000	0.1168	0.1962	0.5198
Egypt	0.1357	0.0000	0.1185	0.0000	0.3128	0.4330
Others	0.0204	0.0004	0.0454	0.3003	0.0000	0.6336

Source: Author's computation based on data available from APEDA

0.6336 from the period 2009-10 to 2022-23. It indicated the probability that other countries combined retains its export share of 63.36 per cent. Similarly, it maintained its export share to Bangladesh at a rate of 51.47 per cent, while Egypt retained 31.28 per cent of its export share. USA, UAE and Saudi Arab had more or less same probability of retention i.e., 12 per cent with similarly defined. According to the ICFA (2020) report, the most important products that India exports are skim milk powder, casein, and ghee, followed by butter and whole milk powder. The majority of these exports are made to countries in the region that lack access to milk, such as Bangladesh, Pakistan, Afghanistan, Nepal, Bhutan, and the United Arab Emirates. Small amounts of casein are also exported by India to the US, Europe, and other nations.

The data clearly showed that Bangladesh, with a probability retention rate of 51.47 per cent, surpassed the United States, Saudi Arabia, Egypt, and the least amount of other nations in terms of share. Conversely, it only lost 48.53 per cent to other countries. In case of USA, with 11.49 per cent probability retention gained from UAE but lost to Bangladesh (62.94%), Saudi Arab (25.57 %). While Egypt stands as the third most loyal and stable market among the major importers of Indian dairy products, as indicated by a higher retention probability of 31.28 per cent, it experienced a loss of approximately 13.57 per cent to Egypt, 11.85 per cent to Saudi Arabia, and 43.30 per cent to other countries. But it gained only from UAE i.e. 19.62 per cent. In case of other counties, it gained share from UAE and Egypt but lost to Bangladesh, USA, Saudi Arab and UAE with small probability retention. It is astounding to see that all of the per

centages added together from row to row equal 100%. This makes sense because whatever that is lost must also be retained. Conversely, the total of the per centages along a column need not equal 100. The reason for this is that those numbers represent per centages of market shares from many countries rather than the market share of a single nation from the prior year.

Projection of Dairy Products in India to major importing countries

A Transitional Probability Matrix was employed to compute the export share of Indian dairy products to various countries. Projections for the future market shares of Indian dairy products to the major importing countries were extended up to 2027-28. A detailed examination of the actual and projected per centages of dairy products exported from India to various nations during the course of the study period shows that the projected export shares, which came from the Markov Chain method, were inconsistency with the predicted share of exports.

As evident from Annexure 1 that the actual export to Bangladesh has increased from 13685 thousand US\$ to 83209 thousand US\$ between 2009-10 to 2022-23. Nevertheless, within the same period, the anticipated export share of Bangladesh witnessed an increase from 14.81 per cent to 25 per cent. The projected share of Indian dairy products to importing countries up to 2027-28 indicated a declining trend. But in case of USA, the actual value of export of dairy product had shown increasing trend from 2.16 per cent in 2009-10 to 6.75 per cent in 2022-23. But it expected value shown fluctuation over the years. The projected share of Indian dairy product was

Table 6: Projected exports of Indian dairy products to major importing countries: 2023-24 to 2027-28.

Country	Bangladesh	USA	Saudi Arabia	UAE	Egypt	Others
2023	77769 (20.77)	11127 (2.97)	14992 (4.00)	60759 (16.22)	15152 (4.05)	194719 (51.99)
2024	66166 (17.67)	11512 (3.07)	15364 (4.10)	65564 (17.51)	16659 (4.45)	199254 (53.20)
2025	61059 (16.30)	12361 (3.30)	15894 (4.24)	67486 (18.02)	18072 (4.83)	199645 (53.31)
2026	59629 (15.92)	12781 (3.41)	16363 (4.37)	67828 (18.11)	18892 (5.04)	199026 (53.14)
2027	59665 (15.93)	12886 (3.44)	16598 (4.43)	67682 (18.07)	19215 (5.13)	198472 (52.99)

Source: Author's computation based on data available from APEDA

more or less same during the projected period. Moreover, the result of Saudi Arab had shown an increasing trend till 2022-23. After that, the predicted future market share had suggested decreasing trend up to 2027-28 shown in Table 6. The actual share of UAE and Egypt has shown a decreasing trend from 19.22 to 13.84 per cent in UAE and 7.00 to 1.55 in Egypt during the study period. While the estimated predicted future value from 2023-24 to 2027-28 suggested an increasing trend from 16.22 to 18.07 per cent in UAE and 4.05 to 5.13 per cent in Egypt. Considering the rest of other countries both the actual and expected export value declined during the study period. While the estimation of future export market value of Indian dairy product from 2023-24 to 2027-28 has suggested an increasing trend.

Thus, Bangladesh, Egypt and other countries are the loyal importers of Indian dairy products throughout the study. But the future market share of dairy products showed encouragement of export of dairy products in UAE, USA, Saudi Arab. According to the research conducted by Ahmed et al. (2023), with improved domestic production and marketing efficiency, increased competitiveness, and enhanced access to the growing global market, India has the potential to boost its export of dairy products. Nevertheless, there is still considerable room for further advancements in market conditions.

Loyalty among India's dairy import markets

Policy modeling for the progression of a nation's exports should align with the swift shifts in global commodity markets. Consequently, it is important to properly document any changes that can aid in export promotion strategies. Even though it can be exceedingly challenging to pinpoint the nature and direction of changes, Markov chain analysis has employed a novel strategy that uses probability terms to provide a thorough unwinding of the charges.

The major countries for the study were New Zealand, France, Denmark, Italy, USA and remaining exporting countries were grouped as others. An examination of Table 7 indicates that during the study period, the USA remained the most robust market among the major importers of Indian dairy products, boasting a higher probability of retention at 0.69. This signifies a 69 per cent probability that the USA maintained its import share over the study period. The higher probability retention was estimated in New Zealand (64.54%), followed by Other countries (60.53%) and France (57.37%), respectively. Although Italy and Denmark had probability retention i.e. 47 per cent. It is evident from the results that New Zealand with 64.54 per cent probability retention gained share from Italy (29.95 %) and USA (31%). In contrast, it lost to other countries (27.59 %) and least proportion to Denmark, Italy and USA. In case of France, with 57.37 per cent probability retention gained 22.69 from Italy and 35.24 from other countries but lost

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Table 7. Transitional probability matrix of Indian Dairy Products imports (Unit: US\$ thousand).

Country	New Zealand	France	Denmark	Italy	USA	Others
New Zealand	0.6454	0.0000	0.0234	0.0228	0.0325	0.2759
France	0.0000	0.5737	0.0649	0.0780	0.0000	0.2834
Denmark	0.0000	0.0000	0.4733	0.0617	0.0000	0.4650
Italy	0.2995	0.2269	0.0000	0.4736	0.0000	0.0000
USA	0.3100	0.0000	0.0000	0.0000	0.6900	0.0000
Others	0.0000	0.3524	0.0277	0.0145	0.0000	0.6053

Source: Author's computation based on data available from APEDA

Table 9. Projected exports of Indian dairy product to major exporting countries: 2023-24 to 2027-28.

Country	New Zealand	France	Denmark	Italy	USA	Others
2023	1843 (5.48)	13139 (39.06)	2310 (6.87)	2712 (8.06)	128 (0.38)	13505 (40.15)
2024	2041 (6.07)	12912 (38.39)	2364 (7.03)	2690 (8.00)	148 (0.44)	13481 (40.08)
2025	2169 (6.45)	12769 (37.96)	2379 (7.07)	2669 (7.94)	169 (0.50)	13482 (40.08)
2026	2252 (6.69)	12682 (37.70)	2380 (7.07)	2652 (7.88)	187 (0.56)	13484 (40.09)
2027	2306 (6.85)	12629 (37.55)	2376 (7.06)	2639 (7.85)	202 (0.60)	13484 (40.09)

Source: Author's computation based on data available from APEDA

to Denmark (6.49%), Italy (7.80 %) and (28.34 %) from rest of other countries. Despite being recognized as the most loyal and stable market among the major exporters of Indian dairy products, with a higher retention probability of 69 per cent, the USA holds this distinction, it lost approximately 31 per cent to New Zealand and gained just 3.25 per cent from USA. In case of other countries, it gained more share from Denmark (46.50 %) followed by France (28.34%) and New Zealand (27.59%), respectively. But lost to France, Denmark and Italy.

As evident from Annexure 2 that the actual import to New Zealand has decreased from 37231 thousand US\$ to 987 thousand US\$ between 2009-10 to 2022-23. However, during the same period, the expected import share of Bangladesh had shown an decreased from 39.46 per cent to 4.54 per cent. The projected share of Indian dairy product to exporting countries up to 2027-28 had suggested increasing trend shown in Table 9. But

in case of France, the actual value and expected of import of dairy product had shown increasing trend from 2.42 per cent to 39.80 per cent and 12.14 to 39.90 per cent, respectively from the period 2009-10 to 2022-23. The projected share of Indian dairy product has suggested declining trend. Moreover, the result of Denmark had shown an increasing trend till 2022-23 for actual and expected value. But, the predicted future market share had suggested more or less same trend upto 2027-28. In case of Italy the actual and expected share had shown tremendous growth but its predicted value for the period of 2023-24 to 2027-28 a declining trend. In case of USA, the actual and expected import share had shown fluctuation over the study period. Considering the rest of other countries both the actual and expected export value increased during the study period. While the estimation of future export market value of Indian dairy product from 2023-24 to 2027-28 has suggested more or less same trend i.e., 40 percent.

Annexure 1. Actual and Expected share of Indian dairy products exports (Unit: US\$ thousand)

Particular	Bangladesh		USA		Saudi Arabia		UAE		Egypt		Others		Total
	A	E	A	E	A	E	A	E	A	E	A	E	
2009	13685 (15.39)	13172 (14.81)	1925 (2.16)	3097 (3.48)	3574 (4.02)	3788 (4.26)	17093 (19.22)	15943 (17.92)	6224 (7.00)	5300 (5.96)	46449 (52.22)	47650 (53.37)	88950 (100.0)
2010	16884 (14.64)	15812 (13.71)	1673 (1.45)	3780 (3.28)	4376 (3.79)	4708 (4.08)	21309 (18.48)	21770 (18.88)	6877 (5.96)	6331 (5.49)	64214 (55.68)	62932 (54.57)	115333 (100.0)
2011	4533 (6.01)	8556 (11.34)	2493 (3.30)	3197 (4.24)	2717 (3.60)	3994 (5.29)	17318 (22.95)	13189 (17.48)	11198 (14.8)	6900 (9.15)	37187 (49.29)	39611 (52.50)	75446 (100.0)
2012	20712 (13.17)	26684 (16.96)	4091 (2.60)	4555 (2.90)	11208 (7.12)	7918 (5.03)	24244 (15.41)	27632 (17.56)	14469 (9.20)	9282 (5.90)	82596 (52.50)	81249 (51.65)	157320 (100.0)
2013	97589 (16.96)	104237 (18.12)	5007 (0.87)	8922 (1.55)	39009 (6.78)	29284 (5.09)	49232 (8.56)	98015 (17.04)	77247 (13.4)	33822 (5.88)	307276 (53.41)	301079 (52.33)	575360 (100.0)
2014	76576 (24.58)	48853 (15.68)	2755 (0.88)	6702 (2.15)	3514 (1.13)	10286 (3.30)	37772 (12.12)	59814 (19.20)	6430 (2.06)	9421 (3.02)	184511 (59.22)	176482 (56.64)	311558 (100.0)
2015	19205 (15.82)	16386 (13.49)	2605 (2.15)	5157 (4.25)	4004 (3.30)	4198 (3.46)	28900 (23.80)	23408 (19.28)	0 (0.0)	5669 (4.67)	66716 (54.94)	66612 (54.86)	121430 (100.0)
2016	17405 (13.34)	15872 (12.16)	2807 (2.15)	5064 (3.88)	4065 (3.11)	4772 (3.66)	28179 (21.59)	26729 (20.48)	0 (0.0)	5528 (4.24)	78058 (59.81)	72549 (55.59)	130514 (100.0)
2017	11056 (6.85)	17869 (11.07)	6268 (3.88)	6266 (3.88)	4744 (2.94)	8241 (5.11)	32962 (20.43)	30785 (19.08)	16620 (10.3)	11665 (7.23)	89705 (55.59)	86529 (53.63)	161355 (100.0)
2018	32314 (11.07)	43507 (14.91)	14386 (4.93)	8999 (3.08)	10023 (3.43)	16897 (5.79)	43604 (14.94)	49172 (16.85)	44677 (15.3)	22529 (7.72)	146800 (50.31)	150700 (51.64)	291804 (100.0)
2019	10831 (4.08)	33746 (12.72)	13557 (5.11)	7803 (2.94)	15361 (5.79)	15450 (5.83)	36976 (13.94)	54760 (20.65)	20480 (7.72)	13660 (5.15)	167990 (63.35)	139776 (52.71)	265195 (100.0)
2020	11953 (6.66)	33218 (18.50)	23715 (13.2)	8959 (4.99)	11272 (6.28)	12029 (6.70)	37079 (20.65)	32152 (17.91)	2891 (1.61)	8178 (4.55)	92658 (51.60)	85031 (47.35)	179568 (100.0)
2021	71500 (23.67)	67115 (22.22)	15072 (4.99)	11068 (3.66)	20233 (6.70)	12921 (4.28)	55522 (18.38)	47704 (15.79)	2477 (0.82)	11666 (3.86)	137277 (45.44)	151608 (50.19)	302081 (100.0)
2022	83209 (22.22)	93617 (25.00)	25266 (6.75)	11633 (3.11)	34952 (9.33)	19412 (5.18)	51818 (13.84)	58141 (15.52)	5796 (1.55)	11978 (3.20)	173477 (46.32)	179737 (47.99)	374518 (100.0)

CONCLUSION

In the study an attempt has been made to calculate the growth, structural change and direction of trade of export and import of dairy product from India. Throughout the study period, there was a notable decline in the import of dairy products, coupled with a substantial increase in exports. In 2022, India transitioned into a net exporter of dairy products, with dairy exports totaling US\$374,518 thousand, while imports stood at US\$33,636 thousand. Moreover the result of Chow test showed that there was structural change in import and export of Indian dairy products in year 2013. It might due to the introduction of India's National Dairy Plan (NDP) by Government of India. Hence, the research suggests that to boost the production and international trade of dairy products, it is advisable to focus additional efforts on the execution of dairy development programs. The result of direction of trade showed Bangladesh, Egypt and other countries are the loyal importers

and USA, New Zealand and other countries are the loyal exporters of Indian dairy products throughout the study.

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Annexure 2. Actual and Expected share of Indian dairy products imports (Unit: US\$ thousand)

Particular	New Zealand		France		Denmark		Italy		USA		Others		Total
	A	E	A	E	A	E	A	E	A	E	A	E	
2009	37231 (58.73)	25014 (39.46)	1532 (2.42)	7700 (12.14)	2598 (4.10)	2722 (4.29)	807 (1.27)	1782 (2.81)	2397 (3.78)	2865 (4.52)	18833 (29.71)	23315 (36.78)	63398 (100.0)
2010	120485 (65.56)	79009 (42.99)	3567 (1.94)	20854 (11.35)	3517 (1.91)	6158 (3.35)	1927 (1.05)	4906 (2.67)	2158 (1.17)	5408 (2.94)	52123 (28.36)	67441 (36.70)	183777 (100.0)
2011	53147 (29.96)	37338 (21.05)	18960 (10.69)	44293 (24.97)	3572 (2.01)	6708 (3.78)	4743 (2.67)	6486 (3.66)	5212 (2.94)	5325 (3.00)	91758 (51.73)	77242 (43.54)	177392 (100.0)
2012	35345 (34.91)	24410 (24.11)	31135 (30.75)	27468 (27.13)	3828 (3.78)	5372 (5.31)	2433 (2.40)	4995 (4.93)	2804 (2.77)	3085 (3.05)	25693 (25.38)	35908 (35.47)	101238 (100.0)
2013	6081 (17.57)	6235 (18.02)	6731 (19.45)	8414 (24.31)	2782 (8.04)	2214 (6.40)	2224 (6.43)	2055 (5.94)	5305 (15.3)	3859 (11.1)	11486 (33.19)	11832 (34.19)	34609 (100.0)
2014	7459 (15.83)	7280 (15.45)	10580 (22.45)	13199 (28.01)	2600 (5.52)	2603 (5.52)	2798 (5.94)	2748 (5.83)	5252 (11.1)	3867 (8.21)	18428 (39.11)	17420 (36.97)	47117 (100.0)
2015	11099 (24.63)	7831 (17.38)	13020 (28.90)	13071 (29.01)	4227 (9.38)	3507 (7.78)	2198 (4.88)	2780 (6.17)	30 (0.07)	382 (0.85)	14480 (32.14)	17483 (38.80)	45054 (100.0)
2016	7029 (17.38)	5252 (12.99)	13011 (32.18)	12905 (31.92)	4057 (10.0)	3316 (8.20)	2307 (5.71)	2720 (6.73)	78 (0.19)	282 (0.70)	13953 (34.51)	15959 (39.47)	40435 (100.0)
2017	2953 (7.15)	2741 (6.64)	8787 (21.28)	13912 (33.69)	3385 (8.20)	2890 (7.00)	2780 (6.73)	2617 (6.34)	7 (0.02)	101 (0.24)	23381 (56.62)	19032 (46.09)	41293 (100.0)
2018	121 (0.40)	1146 (3.81)	10132 (33.69)	11572 (38.48)	2107 (7.01)	2050 (6.82)	3398 (11.30)	2738 (9.10)	163 (0.54)	116 (0.39)	14156 (47.07)	12453 (41.41)	30077 (100.0)
2019	1248 (3.81)	1797 (5.48)	12617 (38.48)	12754 (38.90)	2037 (6.21)	2189 (6.68)	3223 (9.83)	2862 (8.73)	85 (0.26)	99 (0.30)	13577 (41.41)	13085 (39.91)	32787 (100.0)
2020	3402 (9.63)	2645 (7.48)	16308 (46.14)	14410 (40.77)	746 (2.11)	1863 (5.27)	1480 (4.19)	2291 (6.48)	20 (0.06)	124 (0.35)	13388 (37.88)	14011 (39.64)	35344 (100.0)
2021	807 (2.90)	898 (3.23)	11335 (40.77)	11345 (40.81)	1465 (5.27)	1807 (6.50)	1248 (4.49)	1772 (6.37)	10 (0.04)	33 (0.12)	12937 (46.53)	11947 (42.97)	27802 (100.0)
2022	987 (2.93)	1528 (4.54)	13386 (39.80)	13421 (39.90)	1838 (5.46)	2163 (6.43)	2855 (8.49)	2742 (8.15)	117 (0.35)	113 (0.34)	14453 (42.97)	13669 (40.64)	33636 (100.0)

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