Indian Floriculture Industry : A Country-Wise Export Analysis

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Abstract

Purpose : This paper aimed to improve understanding of India's floricultural exports. It attempted to examine India's floricultural export performance in relation to the major importers of floriculture.

Methodology : The data were analyzed using statistical approaches such as average, standard deviation (*SD*), coefficient of variation (CV), and CAGR. Six other indices were also considered. The analysis was entirely dependent on secondary data.

Findings : India's floriculture production met domestic and international demand. In 2001–2002, India exported 18803.67 metric tons of floricultural goods for a total of ₹ 115.30 crores. In 2021–2022, the export was 23597.17 metric tons worth ₹ 771.41 crores. From 2009–2010 to 2021–2022, the CAGR was 2.779% of total floriculture exports. Malaysia, Hungary, Singapore, and the United Arab Emirates are the top four leading importers of Indian floriculture goods, with CAGRs of 25.31%, 22.92%, 17.85%, and 12.69%, respectively.

Practical Implications : The research paper advised that more incentives be given to stimulate floriculture exports. Some countries' growth rates for India's floriculture exports were low. As a result, increased demand for Indian floriculture from importing countries was critical. Based on the results of the country-by-country analysis, the export concentration was in a small number of countries, which caused worries for the Indian floriculture business.

Originality : The current paper revealed an overall picture of Indian floriculture exports to facilitate the exporters.

Keywords : **exports, growth rate, concentration, floriculture industry**

JEL Classification Codes : F1, F14, F17

Paper Submission Date : January 17, 2023 ; Paper sent back for Revision : April 28, 2023 ; Paper Acceptance Date : May 15, 2023

The cultivation of flowering and attractive plants for gardens and floristry, which makes up the floral business, is known as floriculture, often known as flower farming. India is fortunate to have various agroclimatic conditions that predominate in different parts of the nation, making it suited to grow practically all decorative crops yearly. The floriculture sector is rapidly growing and highly competitive. It is considered India's "sunshine industry" since it provides small and marginal farmers with exceptional self-employment opportunities and competitive pay. India has significantly increased the production of cut flowers, particularly. Cut flowers have a strong export potential; from an economic standpoint, floriculture is also significant. Commercial floriculture has continuously grown with more sheltered farming techniques like greenhouses, shade nets, and polyhouses. Commercial flower production in India provides an opportunity for rural development due to higher returns per unit area and new job opportunities. India can close the supply-demand gap due to the faster-growing global demand for floricultural items. India is one of the top exporters of floriculture. However, the neighboring nations present the country with fierce competition in the export of this product. The paper's topic is essential as it focuses on country-wise total exports. It talks about the change in the growth of exports to every selected county and the rest of the country. The paper analyzes India's

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DOI : https://doi.org/10.17010/aijer/2023/v12i2/173179

floricultural export performance with its trade partners. The research problem is that the demand for India's floriculture exports is low, and the floricultural exports experience with major countries is unsatisfactory.

Review of Literature

In their research work, Kumarasamy and Harshavardhini (2021) analyzed how the floriculture market and production were expanding because of the rise in demand in the domestic and global markets. The Indian government should try to enhance the export of cut flowers. Numerous chances are hidden in this developing industry; raising awareness would boost the Indian economy's status in the world market. Waghmare and Shendage (2019) examined that India's floriculture business has been booming recently. Wintertime saw the highest prices for seasonal products, while exports commanded higher prices. To benefit from the highest pricing, the farmer should implement production technology to ensure the maximum output may be used for marketing. Vahoniya et al. (2018) explained that floriculture is a traditional form of agriculture in India with enormous potential for creating profitable self-employment among small and marginal farmers. It has become an international profitable agribusiness in India in recent years.

In addition to the data on pricing and market arrivals, Harisha (2017) analyzed the entire data on floriculture as a subset of horticulture, focused on an area, production, and yield. It tried to highlight the size and dynamics of global trade in the floriculture industry. Misra and Ghosh (2016) explored that the floriculture industry has recently developed in India, notably in terms of the production of cut flowers and the expansion of the sector and its international trade. During this time, the production of both loose and cut flowers increased at a compound annual growth rate (CAGR) of 9.92% and 26.66%, respectively. Approximately 0.6% of the world's floriculture trade belongs to India. According to Shelke (2014), the cut flower market expanded quickly globally. Although considerable work was needed, the Indian floriculture business had significant growth potential. Consumption in India was increasing due to the changing socioeconomic structure and the effects of globalization. Simultaneously, India prepared to play a larger role in the minor global floriculture trade. The floriculture industry has matured into a commercial enterprise with significant market value and potential opportunities. They investigated floriculture acreage, production, and trade patterns in India and worldwide. It also attempted to comprehend export performance dynamics and the floriculture sector's key flaws.

Objectives of the Study

The main objectives of the research analysis are :

- To examine India's floricultural export experience with major countries.
- To give the policy implications for improving floricultural exports.

Data Source and Analysis Framework

The current empirical research looks into the expansion of floricultural exports to carry out this research analysis. The analysis is entirely based on secondary data from 2009–2010 to 2021–2022. The data on the nations/markets of exports are collected from the Agricultural and Processed Food Products Export Development Authority (APEDA). The data has been evaluated using various statistical methods, including average, standard deviation (*SD*), coefficient of variation (CV), and CAGR. Six indices are also used to identify the concentration of the major countries buying India's floricultural products. The indexes are the following: (I) Index of Maximum Proportion (*D1*), (II) Hirschman–Herfindhal Index (HHI) (*D2*), (III) Entropy Index (*D3*), (IV) Concentration Ratio of CR4 (*D4*), Concentration Ratio of CR8 (*D5*), and Concentration Ratio of CR16 (*D6*). These indices are based on the percentage share of the various importing countries in the research.

Appendix A depicts India's floriculture exports by country from 2009–2010 to 2021–2022. APEDA, Ministry of Commerce and Industry, Government of India, New Delhi, provides floriculture export data.

Let m stand for the importing nations, and q_{it} denotes the imports of i^{th} partner nation at time t. Then, the sum of q_{it} from 1 to m will be q_t, and the share of each nation in the import of floriculture products for year t would thus be shown as follows:

$$S_{it} = \frac{q_{it}}{q_t} \text{ and}$$

$$q_t = \sum_{i=1}^{n} q_{it}$$

where,

S_{it} : Share of each importing nation at time t,

q_{it} : Imports of each importing nation at time t,

q_t : Sum of the total of each importing nation.

$i = 1, m$ and $t = 1, \ldots\ldots, T$

Appendix B shows the export shares of key Indian floriculture countries from 2009–2010 to 2021–2022. The proportion of total exports sold in each foreign country to total exports in the home country. It is the sum of total export shares squared.

All six concentration measures are calculated based on S_{it}.

(i) Index of Maximum Proportion:

$$D_1 = max\, S_{it}$$

(ii) Hirschman–Herfindhal Index:

$$D_2 = \sum_{i=1}^{n} S_{it}^2$$

Appendix C shows the HHI of total floriculture exports by country for the research period. The HHI is calculated by squaring each country's market portion and then adding the resulting values. The HHI is a broad measure of an industry's market concentration.

(iii) Entropy Index:

$$D_3 = \sum_{i=1}^{n} S_{it} \log 1/S_{it}$$

Appendix D displays the Entropy Index of total floriculture exports by country from 2009–2010 to 2021–2022. The Entropy Index is a concentration metric. In the current paper, it is used to calculate the county concentration of floriculture exports. This appendix is based on the research's percentage share of the various importing countries.

(iv) Concentration Ratio *(CR_n)*:

$$CR_n = \sum_{i=1}^{n} S_{it}, n < m$$

In most cases, CR_4 (D_4), CR_8(D_5), and CR_{16} (D_6) have been used in the research analysis.

Analysis and Results

Table 1 depicts total Indian floricultural exports in terms of quantity and value between 2001–2002 and 2021–2022, as well as growth indices. According to Table 1, India exported 18803.67 metric tons of floricultural products in 2001–2002, totaling ₹ 115.30 crores. During 2002–2003, total exports were 26682.10 metric tons, valued ₹ 165.74 crores. Except for the years 2009–2010 and 2010–2011, floral exports increased from 2001–2002 to 2021–2022. In 2021–2022, the export was 23597.17 metric tons worth ₹ 771.41 crores. Furthermore, the Table shows that the appropriate growth indices in 2021–2022 are 669.0459 in value and 125.49 in quantity. These improvements result from the continually growing quality of Indian floricultural products, which is good news for the country's floricultural exports and the agricultural sector.

Table 2 shows the primary country-by-country growth rates for floriculture exports to the major importing countries from 2009–2010 to 2021–2022. This demonstrates that Malaysia, Hungary, Singapore, and the United Arab Emirates have had the highest compound annual growth rate, indicating high potential. Furthermore, the United States, Saudi Arabia, Canada, and New Zealand have shown positive growth rates with greater than a low potentiality. For example, Austria, Poland, Spain, the Netherlands, France, and Italy show poor potential. This type of study may be useful in identifying high and low-potential nations when analyzing floriculture export success.

Table 1. ***Floricultural Exports of India in Terms of Value and Quantity During the Period from 2001–2002 to 2021–2022***

Year	Value (in ₹ Crore)	Growth Index of Value	Quantity (in MT)	Growth Index of Quantity
2001–2002	115.3	100	18803.67	100.00
2002–2003	165.74	143.7467	26682.10	141.90
2003–2004	249.51	216.4006	30659.53	163.05
2004–2005	221.06	191.7259	27769.08	147.68
2005–2006	301.43	261.4310	35457.44	188.57
2006–2007	652.67	566.0624	42545.28	226.26
2007–2008	340.15	295.0130	36240.75	192.73
2008–2009	368.8	319.8612	30798.34	163.79
2009–2010	294.5	255.4206	26814.51	142.60
2010–2011	296.05	256.7649	28906.83	153.73
2011–2012	365.29	316.8169	30926.01	164.47
2012–2013	423.46	367.2679	27121.88	144.24
2013–2014	455.9	395.4032	22485.21	119.58
2014–2015	460.75	399.6097	22947.23	122.04
2015–2016	483.42	419.2714	22691.66	120.68
2016–2017	546.72	474.1717	22020.35	117.11
2017–2018	507.35	440.0260	20703.47	110.10
2018–2019	571.38	495.5594	19726.57	104.91
2019–2020	541.61	469.7398	16949.37	90.14
2020–2021	575.97	499.5403	15695.32	83.47
2021–2022	771.41	669.0459	23597.17	125.49

Source : Agricultural and Processed Food Products Export Development Authority (APEDA). Ministry of Commerce and Industry, Government of India, New Delhi.

Table 2. ***Growth Rates of India's Floricultural Exports to Major Countries During the Period from 2009–2010 to 2021–2022***

Ranks	Country	CAGR	*t*-value	*F*-value	R^2
High Potential Category	Malaysia	25.3163	8.6014*	73.9856	0.8705
	Hungary	22.9216	7.6352*	58.2969	0.8412
	Singapore	17.8534	5.3926*	29.0806	0.7255
	UAE	12.6999	9.9801*	99.6033	0.9005
Middle Potential Category	USA	10.6604	13.2249*	174.8993	0.9408
	Saudi Arabia	10.6234	2.9989**	8.9937	0.4498
	Canada	10.5497	9.0440*	81.7953	0.8814
	New Zealand	10.1084	2.5666*	6.5879	0.3745
Low Potential Category	Austria	9.0449	4.5335*	20.5528	0.6513
	Poland	8.8451	6.7894*	46.0961	0.8073
	Spain	8.8143	4.6228*	21.3706	0.6601
	Netherlands	8.1722	6.0922*	37.1153	0.7713
	France	7.4037	3.3184*	11.0121	0.5002
	Italy	6.9369	7.6699*	58.8278	0.8424
	Other Countries	5.7482	6.2404*	38.9432	0.7797
	Australia	4.1759	2.6947**	7.2615	0.3976
	China P RP	2.1285	0.3178	0.1010	0.0090
	Japan	0.6299	0.4170	0.1739	0.0155
	UK	0.1083	0.0624	0.0038	0.0003
	Belgium	–0.3409	–0.2336	0.0545	0.0049
	Germany	–1.8858	–1.2077	1.4587	0.1170

Source : Agricultural and Processed Food Products Export Development Authority (APEDA), Ministry of Commerce and Industry, Government of India, New Delhi.

Note. * The coefficients are significant at $\alpha = 0.01$.

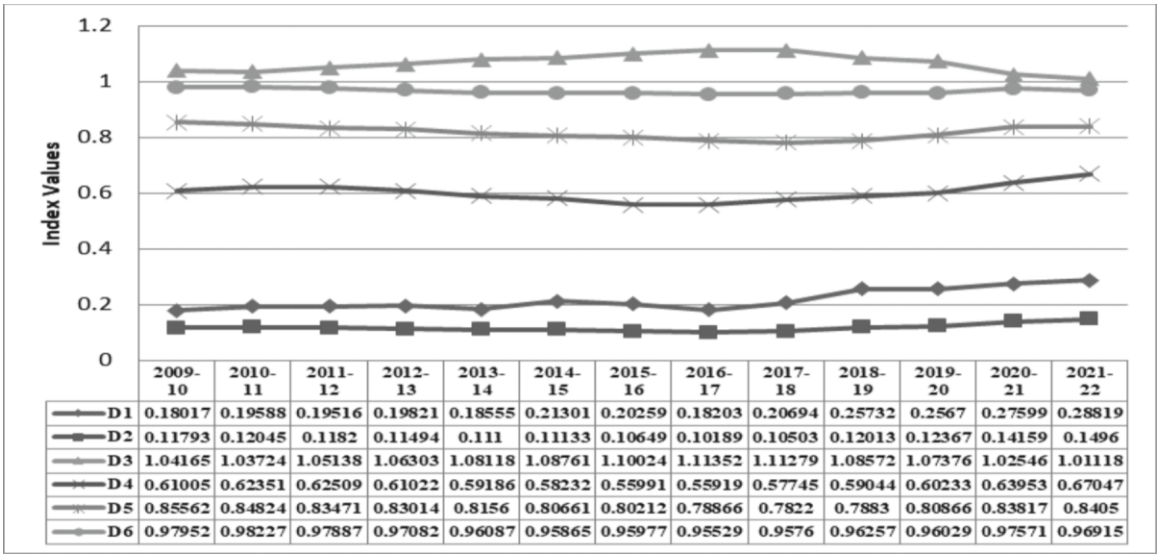
** The coefficients are significant at $\alpha = 0.10$.

Based on the rankings for growth rates, Malaysia, Hungary, Singapore, and the United Arab Emirates are classified as having high potential. This demonstrates India's great success in exporting floriculture to various countries. Furthermore, the remaining countries are regarded as having minimal promise. The *t*-values of the growth rates show that certain countries have positive values while others have negative values. However, Belgium and Germany's growth rates have all been below average and statistically insignificant; the *t*-value, coefficient of determination R^2, and ANOVA all confirm these conclusions (*F*-value).

From 2009–2010 to 2021–2022, Figure 1 depicts the value of six unique concentration metrics for the top 20 floriculture-importing nations. The Index of Maximum Proportion (*D*1), Herfindhal Index (*D*2), and Entropy Index (*D*3) concentration values range from 0.1801 to 0.2881, 0.1064 to 0.1496, and 1.0111 to 1.1135, respectively. Furthermore, the concentration ratios of the four leading importing nations *CR4* (*D*4), the eight significant importing countries *CR8* (*D*5), and the 16 major imparting countries *CR16* (*D*6), respectively, vary from 0.5591 to 0.6704, 0.7822 to 0.8556, and 0.9552 to 0.9822.

Table 3 displays the COV for floricultural exports to important importing countries from 2009–2010 to 2021–2022. Column III of the table shows the mean values of total exports for the study period. Column IV, like

Figure 1. ***Country Concentration Indices of Floricultural Exports During the Period from 2009–2010 to 2021–2022***



	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
D1	0.18017	0.19588	0.19516	0.19821	0.18555	0.21301	0.20259	0.18203	0.20694	0.25732	0.2567	0.27599	0.28819
D2	0.11793	0.12045	0.1182	0.11494	0.111	0.11133	0.10649	0.10189	0.10503	0.12013	0.12367	0.14159	0.1496
D3	1.04165	1.03724	1.05138	1.06303	1.08118	1.08761	1.10024	1.11352	1.11279	1.08572	1.07376	1.02546	1.01118
D4	0.61005	0.62351	0.62509	0.61022	0.59186	0.58232	0.55991	0.55919	0.57745	0.59044	0.60233	0.63953	0.67047
D5	0.85562	0.84824	0.83471	0.83014	0.8156	0.80661	0.80212	0.78866	0.7822	0.7883	0.80866	0.83817	0.8405
D6	0.97952	0.98227	0.97887	0.97082	0.96087	0.95865	0.95977	0.95529	0.9576	0.96257	0.96029	0.97571	0.96915

Source : Agricultural and Processed Food Products Export Development Authority (APEDA), Ministry of Commerce and Industry, Government of India, New Delhi.

Table 3. ***Descriptive Statistics of Floricultural Exports During the Period from 2009–2010 to 2021–2022***

(Values in ₹ Crores)

Sr. No.	Year	Mean	*SD*	CV
1	2009–2010	14.0238	17.4619	124.5164
2	2010–2011	14.0976	17.8655	126.7271
3	2011–2012	17.3947	21.70006	124.7505
4	2012–2013	20.1347	24.5316	121.8371
5	2013–2014	21.7095	25.6648	118.2191
6	2014–2015	21.9395	26.0039	118.5257
7	2015–2016	22.7509	259,211	113.9343
8	2016–2017	25.9433	28.3808	109.3956
9	2017–2018	24.1571	27.1806	112.5158
10	2018–2019	27.1885	34.378	126.4431
11	2019–2020	25.8195	33.3741	129.2592
12	2020–2021	27.4271	39.4804	143.9467
13	2021–2022	36.7338	55.0847	149.9564

Source : Agricultural and Processed Food Products Export Development Authority (APEDA), Ministry of Commerce and Industry, Government of India, New Delhi.

Column III, displays the *SD* of year-to-year exports to various nations, demonstrating the discrepancy between importing nations. COV, considered a relative marker of inequality in India's floriculture exports, is provided in the final column.

The average value of floriculture exports increased from 14.0238 to 36.7338 yearly, more than tripling

between 2009–2010 and 2021–2022. Furthermore, over the last 13 years, the absolute dispersion as measured by *SD* has increased from 17.4619 to 55.0847. The COV has also changed throughout the research. However, the result was 124.5164 in 2009–2010 and climbed to 149.9564 in 2021–2022, demonstrating that the stability of floriculture exports has improved over the study period.

Recommendations

Based on the study and secondary data findings on Indian floricultural exports, many recommendations to improve the performance of Indian floricultural exports may be made. India's floriculture exports have increased at a value-based CAGR of 2.779%. Because the growth rate looks low, the research article recommends that more stimulus be applied to stimulate floriculture exports. Some countries' growth rates for India's floriculture exports are not encouraging. As a result, increasing demand for Indian floriculture among importing countries is critical. Many activities can be performed to achieve this goal, including price control, quality enhancement, easy availability, low cost, and flexible terms of trade.

Conclusion

Based on a country-by-country review of floriculture exports, it is possible to infer that Indian floriculture exports have a bright future in foreign markets. Total floriculture exports increased at a CAGR of 2.779% over 21 years (2009–2010 to 2021–2022). It is a good indicator for both the floriculture industry and the Indian agriculture sector. The nation concentration indicators reflect the presence of diversification in India's overall floriculture exports from 2009–2010 to 2021–2022. Malaysia (25.31%) and Hungary (22.92%) have the greatest CAGR and remained in the first and second place throughout the study period. Over the last 13 years, the absolute dispersion, as measured by SD, has increased from 17.4619 to 55.0847. Throughout the inquiry, the coefficients of variation have also changed. However, the result was 124.5164 in 2009–2010 and grew to 149.9564 in 2021–2022, demonstrating that the stability of floriculture exports has improved over the study period. Finally, India has a significant domestic and international floriculture market.

Future Research Potential and Limitations

The state-by-state trade analysis may be investigated in future studies. A comparison of floriculture imports and exports is another intriguing topic of inquiry. A comparison of various floriculture products could be done as a prospective new study topic. Consumption, area, and yield analyses of floriculture may be included as part of a research project. It is feasible to evaluate the floriculture plantations and labor conditions in Indian floriculture farming.

Furthermore, the same approaches and tools can be used to compare floriculture's trade position before and after independence. The biggest disadvantage of this study is that it only looked at data from 2009 to 2010. The study spans the years 2009–2010 through 2021–2022. The study is based primarily on country-by-country export analyses.

Author's Contribution

Dr. Naresh Kumar thought about the idea and created quantitative and qualitative strategies for the empirical investigation. He gathered codes and concepts relevant to the research design from credible publications and research papers. The analytical techniques were confirmed by Dr. Naresh Kumar. MS Excel was used to compute the data numerically.

Conflict of Interest

The author certifies that he has no affiliation with or involvement in any organization or entity with any financial interest or no financial interest in the subject matter or materials discussed in this research paper.

Funding Acknowledgment

The author received no financial support for this paper's research, authorship and/or publication.

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Appendix A. *Country-Wise India's Exports of Floriculture During the Period 2009–2010 to 2021–2022*

(Value in ₹ Crores)

Sr. No.	Country	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021	2021–2022
1	USA	53.06	57.99	71.29	83.81	84.59	98.14	96.79	99.17	104.98	146.92	139.03	158.96	222.31
2	Netherlands	42.18	45.27	54.13	59.7	66.15	51.25	55.67	58.03	65.63	77.89	78.52	109.3	147.11
3	Germany	40.65	43.32	57.52	56.75	59.29	55.47	56.93	62.5	36.68	39.39	40.93	32.13	50.71
4	UK	37.88	35.3	38.56	45.68	55.13	59.48	55.95	68.77	53.2	44.7	40.92	33.12	39.62
5	UAE	10.71	9.96	11.26	15.45	17.01	22.04	26.72	32.96	29.3	34.16	33.11	34.43	36.6
6	Canada	7.69	8.11	12.03	16.19	13.65	15.38	17.36	17.93	21.28	23.35	20.12	23.01	33.57
7	Italy	8.14	8.93	11.19	13.5	13.33	12.08	11.35	16.1	16.61	15.79	16.14	17.67	21.37
8	Malaysia	1.3	1.53	1.9	3.07	5.4	7.37	7.83	11.63	13.26	15.4	17.6	9.64	18.32
9	France	4.15	4.98	4.06	4.57	4.39	4.96	3.78	5.59	3.75	5.88	7.13	7.69	15.78
10	Singapore	1.8	2.25	3.78	6.13	9.11	10.68	12.85	15.15	15.46	14.78	12.79	11.2	15.58
11	Australia	7.57	6.79	9.91	10.74	9.96	14.59	13.07	13.34	13.13	16.07	10.18	10.44	13.6
12	Japan	15.59	12.34	14.72	15.67	16.21	14.67	15.97	14.82	13.61	15.74	13.12	26.15	11.5
13	Poland	4.21	3.33	4.35	5.15	5.82	6.06	8.08	9.03	7.82	10.66	7.68	8.01	10.69
14	Spain	3.92	4.37	5.02	3.36	4.56	5.22	3.95	6.61	10.33	11.26	7.83	9.25	8.09
15	Belgium	4.84	8.05	7.78	5.43	7.51	5.52	4.9	6.56	5.73	7.94	7.25	5.32	5.68
16	Hungary	0.48	0.36	0.75	0.49	1.73	1.81	1.92	2.86	2.7	2.86	4	2.42	5.56
17	China PRP	1.26	1.01	6.57	10.6	9.52	8.52	10.83	12.67	6.82	3.2	2.28	2.09	5.02
18	Austria	1.42	1.8	1.97	3.19	4.24	2.98	4.79	4.06	3.43	5.29	4.55	3.69	4.89
19	Saudi Arabia	1.57	1.15	1.43	3.24	2.92	4.08	6.41	7.53	5.9	4.14	4.68	3.04	4.28
20	New Zealand	2.31	1.2	1.67	2.35	5.58	5.23	4.78	5.29	8.55	7.93	6.6	2.75	4.05
21	Other Countries	43.77	38.01	45.4	57.76	59.8	55.2	57.84	74.21	69.13	67.61	67.75	65.66	97.08
	Total	**294.5**	**296.05**	**365.29**	**422.83**	**455.9**	**460.73**	**477.77**	**544.81**	**507.3**	**570.96**	**541.61**	**575.97**	**771.41**

Sources : Agricultural and Processed Food Products Export Development Authority (APEDA), Ministry of Commerce and Industry Government of India, New Delhi.

Appendix B. ***Export Shares of Major Countries of Indian Floriculture During the Period 2009–2010 to 2021–2022***

Sr. No.	Country	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021	2021–2022
1	USA	0.18017	0.195879	0.19516	0.198212	0.185545	0.21301	0.202587	0.182027	0.206939	0.257321	0.256698	0.275987	0.288187
2	Netherlands	0.143226	0.152913	0.148184	0.141191	0.145098	0.111237	0.116521	0.106514	0.129371	0.136419	0.144975	0.189767	0.190703
3	Germany	0.138031	0.146327	0.157464	0.134215	0.13005	0.120396	0.119158	0.114719	0.072304	0.068989	0.075571	0.055784	0.065737
4	UK	0.128625	0.119237	0.10556	0.108034	0.120926	0.129099	0.117107	0.126227	0.104869	0.078289	0.075553	0.057503	0.05136
5	UAE	0.036367	0.033643	0.030825	0.03654	0.037311	0.047837	0.055926	0.060498	0.057757	0.059829	0.061133	0.059777	0.047446
6	Canada	0.026112	0.027394	0.032933	0.03829	0.029941	0.033382	0.036335	0.032911	0.041948	0.040896	0.037149	0.03995	0.043518
7	Italy	0.02764	0.030164	0.030633	0.031928	0.029239	0.026219	0.023756	0.029552	0.032742	0.027655	0.0298	0.030679	0.027703
8	Malaysia	0.004414	0.005168	0.005201	0.007261	0.011845	0.015996	0.016389	0.021347	0.026138	0.026972	0.032496	0.016737	0.023749
9	France	0.014092	0.016821	0.011114	0.010808	0.009629	0.010766	0.007912	0.01026	0.007392	0.010298	0.013164	0.013351	0.020456
10	Singapore	0.006112	0.0076	0.010348	0.014498	0.019982	0.023181	0.026896	0.027808	0.030475	0.025886	0.023615	0.019445	0.020197
11	Australia	0.025705	0.022935	0.027129	0.0254	0.021847	0.031667	0.027356	0.024486	0.025882	0.028146	0.018796	0.018126	0.01763
12	Japan	0.052937	0.041682	0.040297	0.03706	0.035556	0.031841	0.033426	0.027202	0.026828	0.027568	0.024224	0.045402	0.014908
13	Poland	0.014295	0.011248	0.011908	0.01218	0.012766	0.013153	0.016912	0.016575	0.015415	0.01867	0.01418	0.013907	0.013858
14	Spain	0.013311	0.014761	0.013743	0.007946	0.010002	0.01133	0.008268	0.012133	0.020363	0.019721	0.014457	0.01606	0.010487
15	Belgium	0.016435	0.027191	0.021298	0.012842	0.016473	0.011981	0.010256	0.012041	0.011295	0.013906	0.013386	0.009237	0.007363
16	Hungary	0.00163	0.001216	0.002053	0.001159	0.003795	0.003929	0.004019	0.00525	0.005322	0.005009	0.007385	0.004202	0.007208
17	China PRP	0.004278	0.003412	0.017986	0.025069	0.020882	0.018492	0.022668	0.023256	0.013444	0.005605	0.00421	0.003629	0.006508
18	Austria	0.004822	0.00608	0.005393	0.007544	0.0093	0.006468	0.010026	0.007452	0.006761	0.009265	0.008401	0.006407	0.006339
19	Saudi Arabia	0.005331	0.003884	0.003915	0.007663	0.006405	0.008856	0.013416	0.013821	0.01163	0.007251	0.008641	0.005278	0.005548
20	New Zealand	0.007844	0.004053	0.004572	0.005558	0.01224	0.011352	0.010005	0.00971	0.016854	0.013889	0.012186	0.004775	0.00525
21	Other Countries	0.148625	0.12839	0.124285	0.136603	0.131169	0.11981	0.121062	0.136213	0.13627	0.118415	0.12509	0.113999	0.125847
	Max	**0.18017**	**0.195879**	**0.19516**	**0.198212**	**0.185545**	**0.21301**	**0.202587**	**0.182027**	**0.206939**	**0.257321**	**0.256698**	**0.275987**	**0.288187**

Sources : Calculated based on data given in Appendix A.

Appendix C. *Hirschman–Herfindhal Index (HHI)*

Sr. No.	Country	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021	2021–2022
1	USA	0.0324611	0.0383686	0.0380874	0.039288	0.034427	0.0453732	0.0410415	0.0331337	0.0428236	0.0662141	0.0658937	0.0761686	0.0830515
2	Netherlands	0.0205136	0.0233825	0.0219584	0.019935	0.0210533	0.0123736	0.013577	0.0113453	0.0167369	0.0186102	0.0210178	0.0360114	0.0363675
3	Germany	0.0190524	0.0214115	0.0247949	0.0180136	0.0169131	0.0144952	0.0141986	0.0131604	0.0052279	0.0047595	0.005711	0.0031119	0.0043213
4	UK	0.0165443	0.0142174	0.0111429	0.0116713	0.014623	0.0166667	0.0137139	0.0159334	0.0109975	0.0061292	0.0057082	0.0033066	0.0026379
5	UAE	0.0013225	0.0011318	0.0009502	0.0013351	0.0013921	0.0022884	0.0031278	0.00366	0.0033358	0.0035795	0.0037372	0.0035733	0.0022511
6	Canada	0.0006818	0.0007504	0.0010846	0.0014661	0.0008965	0.0011143	0.0013203	0.0010831	0.0017596	0.0016725	0.00138	0.001596	0.0018938
7	Italy	0.000764	0.0009099	0.0009384	0.0010194	0.0008549	0.0006874	0.0005644	0.0008733	0.001072	0.0007648	0.000888	0.0009412	0.0007674
8	Malaysia	1.949E–05	2.671E–05	2.705E–05	5.272E–05	0.0001403	0.0002559	0.0002686	0.0004557	0.0006832	0.0007275	0.001056	0.0002801	0.000564
9	France	0.0001986	0.000283	0.0001235	0.0001168	9.272E–05	0.0001159	6.26E–05	0.0001053	5.464E–05	0.0001061	0.0001733	0.0001783	0.0004184
10	Singapore	3.736E–05	5.776E–05	0.0001071	0.0002102	0.0003993	0.0005373	0.0007234	0.0007733	0.0009287	0.0006701	0.0005577	0.0003781	0.0004079
11	Australia	0.0006607	0.000526	0.000736	0.0006452	0.0004773	0.0010028	0.0007484	0.0005995	0.0006699	0.0007922	0.0003533	0.0003285	0.0003108
12	Japan	0.0028023	0.0017374	0.0016238	0.0013734	0.0012642	0.0010138	0.0011173	0.00074	0.0007198	0.00076	0.0005868	0.0020613	0.0002222
13	Poland	0.0002044	0.0001265	0.0001418	0.0001483	0.000163	0.000173	0.000286	0.0002747	0.0002376	0.0003486	0.0002011	0.0001934	0.000192
14	Spain	0.0001772	0.0002179	0.0001889	6.315E–05	0.0001	0.0001284	6.835E–05	0.0001472	0.0004146	0.0003889	0.000209	0.0002579	0.00011
15	Belgium	0.0002701	0.0007394	0.0004536	0.0001649	0.0002714	0.0001435	0.0001052	0.000145	0.0001276	0.0001934	0.0001792	8.531E–05	5.422E–05
16	Hungary	2.657E–06	1.479E–06	4.215E–06	1.343E–06	1.44E–05	1.543E–05	1.615E–05	2.756E–05	2.833E–05	2.509E–05	5.454E–05	1.765E–05	5.195E–05
17	China PRP	1.831E–05	1.164E–05	0.0003235	0.0006285	0.000436	0.000342	0.0005138	0.0005408	0.0001807	3.141E–05	1.772E–05	1.317E–05	4.235E–05
18	Austria	2.325E–05	3.697E–05	2.908E–05	5.692E–05	8.65E–05	4.183E–05	0.0001005	5.553E–05	4.571E–05	8.584E–05	7.057E–05	4.104E–05	4.018E–05
19	Saudi Arabia	2.842E–05	1.509E–05	1.532E–05	5.872E–05	4.102E–05	7.842E–05	0.00018	0.000191	0.0001353	5.258E–05	7.467E–05	2.786E–05	3.078E–05
20	New Zealand	6.153E–05	1.643E–05	2.09E–05	3.089E–05	0.0001498	0.0001289	0.0001001	9.428E–05	0.0002841	0.0001929	0.0001485	2.28E–05	2.756E–05
21	Other Countries	0.0220893	0.0164841	0.0154467	0.0186605	0.0172053	0.0143544	0.0146561	0.0185539	0.0185696	0.014022	0.0156475	0.0129958	0.0158376
	HHI	**0.1179335**	**0.1204525**	**0.1181982**	**0.1149401**	**0.1110012**	**0.1113304**	**0.1064899**	**0.101893**	**0.1050332**	**0.1201264**	**0.1236657**	**0.1415903**	**0.1496006**

Sources : Calculated based on data given in Appendix B.

Appendix D. *Entropy Index*

Sr. No.	Country	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021	2021–2022
1	USA	0.1341036	0.1386847	0.1384873	0.1393173	0.1357356	0.1430575	0.1404715	0.1346752	0.1415788	0.1516971	0.1516	0.1543074	0.1557148
2	Netherlands	0.1208795	0.1247092	0.1228738	0.1200398	0.1216411	0.1060921	0.1087833	0.1035949	0.1149026	0.1180197	0.1215916	0.1369698	0.1372379
3	Germany	0.1187097	0.1221354	0.126415	0.117062	0.1152102	0.1106906	0.1100872	0.1078776	0.0824874	0.0801115	0.0847638	0.0699248	0.0777135
4	UK	0.1145629	0.1101258	0.1030794	0.1044083	0.1109471	0.1147792	0.1090752	0.1134591	0.1027037	0.0866112	0.0847511	0.0713215	0.0662227
5	UAE	0.0523425	0.0495596	0.0465794	0.0525159	0.053286	0.0631562	0.0700414	0.0737024	0.0715258	0.0731762	0.0741983	0.0731355	0.0628087
6	Canada	0.0413395	0.0427989	0.0488186	0.0542533	0.0456219	0.0492879	0.0523111	0.0487953	0.0577741	0.0567767	0.0531245	0.0558694	0.0592421
7	Italy	0.043076	0.0458645	0.0463728	0.0477585	0.0448536	0.0414626	0.0385854	0.0451968	0.0486184	0.0430929	0.0454684	0.0464219	0.0431461
8	Malaysia	0.0103962	0.0118176	0.0118793	0.0155306	0.0228185	0.0287291	0.0292612	0.0356635	0.0413698	0.0423215	0.0483593	0.0297303	0.0385765
9	France	0.0260842	0.0298436	0.0217189	0.0212515	0.0194166	0.0211862	0.0166284	0.0204063	0.0157542	0.0204654	0.024757	0.0250268	0.0345539
10	Singapore	0.0135309	0.0161059	0.0205422	0.0266567	0.0339572	0.0378974	0.0422349	0.0432644	0.0462019	0.0410797	0.0384169	0.0332747	0.0342278
11	Australia	0.04087	0.0376023	0.0424995	0.0405175	0.0362792	0.0474814	0.0427563	0.0394485	0.0410749	0.0436422	0.0324404	0.0315699	0.0309186
12	Japan	0.0675605	0.0575234	0.0562031	0.0530362	0.0515238	0.0476662	0.0493341	0.0425822	0.0421582	0.0429945	0.0391401	0.0609712	0.0272303
13	Poland	0.0263722	0.0219217	0.0229134	0.0233166	0.024178	0.0247405	0.0299646	0.029512	0.0279328	0.0322781	0.0262092	0.025822	0.0257519
14	Spain	0.0249682	0.0270257	0.0255876	0.0166862	0.0200034	0.0220453	0.0172182	0.0232467	0.0344367	0.0336259	0.0265996	0.0288155	0.0207579
15	Belgium	0.0293233	0.0425699	0.0356032	0.024289	0.029375	0.0230216	0.0203994	0.0231106	0.0219928	0.0258212	0.0250767	0.0187917	0.0157051
16	Hungary	0.0045439	0.0035447	0.005518	0.0034024	0.0091863	0.0094512	0.0096284	0.0119683	0.0121024	0.0115221	0.0157429	0.0099855	0.0154402
17	China PRP	0.0101344	0.0084165	0.0313864	0.0401322	0.0350862	0.0320474	0.0372793	0.0379876	0.0251597	0.0126185	0.0100011	0.0088549	0.0142293
18	Austria	0.011171	0.013474	0.0122322	0.0160121	0.0188936	0.0141599	0.0200403	0.0158561	0.0146718	0.0188373	0.0174375	0.014052	0.0139331
19	Saudi Arabia	0.0121185	0.0093642	0.0094239	0.0162113	0.0140491	0.0181785	0.0251205	0.0257001	0.0224976	0.0155142	0.01783	0.0120209	0.012516
20	New Zealand	0.0165149	0.0096964	0.0106974	0.0125334	0.0234049	0.0220781	0.0200075	0.0195438	0.0298871	0.0257963	0.0233255	0.0110821	0.0119694
21	Other Countries	0.1230478	0.1144559	0.1125501	0.1180989	0.1157133	0.1104057	0.1110131	0.1179305	0.1179555	0.1097223	0.1129284	0.1075123	0.1132823
	Entropy	**1.0416498**	**1.0372401**	**1.0513815**	**1.0630297**	**1.0811804**	**1.0876146**	**1.1002412**	**1.1135218**	**1.112786**	**1.0857246**	**1.0737624**	**1.0254602**	**1.0111782**

Sources : Calculated based on data given in Appendix B.

About the Author

Dr. Naresh Kumar is an Associate Professor in the Department of Economics at Government P.G. College, Ambala Cantt. He has a teaching experience of 15 years. He has presented more than 20 papers at various national and international conferences. He has published more than 10 research papers in various reputed journals.