Impact of the National Horticulture Mission on the growth of the Indian floriculture industry

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Abstract

This paper aims to examine the impact of the National Horticulture Mission (NHM) on the growth of the Indian Floriculture industry. The growth of the industry is assessed using trend analysis after implementation of the mission for the period 2005-2021, and a pre and post-mission analysis is done for the period 1995-2021 considering the area under cultivation of flowers, production of loose and cut flowers, and export of floriculture products from India in terms of value and volume. Findings reveal that the mission has no significant impact on the growth of exports of floriculture products in terms of volume/quantity. It is concluded that the increase in the value of exports is attributed to the increase in the rate of inflation and the price of floriculture products in the international market and is not due to a higher quantity of exports of floriculture products from India.

Keywords: *National Horticulture Mission; Growth; Floriculture; Export; Trend analysis; Pre-post analysis.*

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1. Introduction

Horticulture is a branch of agriculture dealing with garden crops, fruits, and ornamental plants. According to Horticulture Statistics 2018, the percentage share of horticulture output in Agriculture has become 33% *(DES-GOI, 2020)*. Floriculture is a horticulture division that deals with producing and marketing flowers and ornamental plants. Flowers have been an integral part of human civilization since the dawn of the era. Growing flowers has been a traditional and non-commercial activity in the past. However, after the globalization of the Indian market, the trading of floriculture products boosted leaps and bounds and has become a commercially viable industry. The products of the floriculture industry are categorized under the harmonized system code (HS code) 06, which includes live trees and other plants, bulbs, roots, cut flowers, and ornamental foliage. Further, there are four sub-categories of the product, HS0601 (bulbs, tubers, and roots), HS0602 (root cuttings, mushroom spawns), HS0603 (Cut flowers and flower buds), and HS0604 (Foliage, branches, and other parts of plants, without flowers or flower buds, and grasses, mosses, and lichens). All four categories pose their significance in terms of trade.

Considering the significance of the industry, the Government of India (GOI) has recognized floriculture as a sunrise industry and rendered it with 100% export-oriented status. Though the share of flower production in total horticulture crops was only 1.2% in 2017-18, the income per unit area of floriculture is much higher than any other branch of agriculture *(Manikas et al., 2020)*. According to a report of the Directorate General of Commercial Intelligence and Statistics (DGCIS), Government of India, the total quantity of export of floriculture products from India in the year 2019-2020 is 16,949.37 MT having a value of

Rs.54, 161.01 Lacs (75.89 US$ MIL). Therefore, the GOI has introduced several schemes and programs to promote the holistic growth of the sector, including the National Horticulture Mission *(NHB, 2018).*

National Horticulture Mission (NHM) is a sub-scheme of the Mission for Integrated Development of Horticulture (MIDH), a Centrally Sponsored Scheme for the holistic growth of the horticulture sector. The NHM was launched under the 10th five-year plan in 2005-06 covering all states and union territories except the North East and Himalayan region, with the Government of India contributing 85% and 15% share contributed by State Governments. Among other objectives of the mission, some crucial objective includes enhancing production, improving productivity, augmenting farmers' income, and supporting skill development activity to create employment opportunities for the youth. The current paper analyses the impact of the National Horticulture Mission on the growth of the Indian floriculture Industry. The broad objective of the paper is to ascertain the growth of the Indian Floriculture industry after the introduction of the National Horticulture Mission. The broader objective is further sub-divided into two: (i) to analyze the impact of the National Horticulture Mission on the area under cultivation and production of flowers in India, and (ii) to analyze the impact of the National Horticulture Mission on the exports of Indian floriculture products in terms of value and volume.

This paper is further divided into four sections. Section ***2*** focuses on the literature review, Section ***3*** describes data and methodology, Section ***4*** provides the analysis and results, and Section ***5*** presents the conclusions and suggestions.

2. Review of Literature

The Horticulture sector's contribution to India's economic growth accounts for 30% of India's agricultural GDP. Researchers have focused on the growth and productivity of agricultural areas as a hole in specific economies. *Mitra and Panda (2020)* have studied the short-run and long-run relation between economic growth and horticulture production using the Vector Error Correction model. *Gerdin (2002)* analyzed the productivity and economic growth patterns in Kenyan agriculture, concluding that labor is the least significant source of growth. In a similar attempt, *Ball et al. (2015)* bifurcate growth into the contributions of input growth and productivity growth to demonstrate productivity growth as the main contributor to the growth of U.S. agriculture. *Jaiswal and Dubey (2022)* reveal that the policy initiatives taken by the Indian government have helped in safeguarding the Indian economy to a large extent at the time of the global financial crisis.

In the horticulture sector, *Galdeano-Gómez et al. (2006)* analyzed the Spanish horticulture sector in terms of the productivity of marketing cooperatives incorporating environmental inputs/outputs. Similarly, *Oude Lansink and Bezlepkin (2006)* calculates nonparametric measures of total factor productivity growth in Dutch horticultural firms. A decomposition analysis of horticultural trade flows is carried out by *Alvarez-Coque and Bautista (1994)* to diagnose the primary sources of change in European Countries' horticultural imports from different LDC regions.

To study the effect of opening to international trade on structural transformation and output growth, *Choi et al. (2021)* analyze a simple model of a small economy with the agricultural and non-agricultural sectors. There is also a relationship between economic growth and poverty reduction, which *Suryahadi et al. (2012)* studied in Indonesia before and after the Asian financial crisis. *Honma (1993)* took Japan as an example of a rapidly growing market in developing countries to explore possibilities and opportunities to expand horticultural exports

into six commodities. Various socio-economic and demographic factors affect the demand for ornamental plants as they are predominantly price-elastic.

To analyze the impact of the economic policy reforms on the Egyptian horticultural sector, *Pautsch and Abdelrahman (1998)* have taken the data related to Egyptian fruits and vegetable crops under study. So, it is observed that most of the research has focused on the growth potential and performance of agriculture and horticulture as a whole, but a necessary and commercially viable aspect of horticulture, i.e., the floriculture sector, has been overlooked. *Bradley et al. (2016)* have outlined a need for a strategic plan related to consumer horticulture. *Los et al. (2021)* have used the Markov chain analysis and a hybrid panel data model to explain the price differences that primary producers receive by selling their output. Through the Bayesian random coefficient model, *Los et al. (2021)* confirm the difference in response of Dutch horticulture firms towards the energy prices. Talking of gender equality, women-owned farms are still less in number. To through some light on the condition of female farmers in the United States, *Schmidt et al. (2021)* examine U.S. female farmers' characteristics and factors associated with county-level female farm shares.

In horticulture, the food supply chain is the most talked about, but research on food waste reduction is minimalistic. Addressing the issue, *Richards et al. (2021)* use a paradox theory approach to resolve the food waste across the Australian horticulture supply chain. Multichain strategies have implications for governance in GVC (*Pasquali et al., 2021*). Managing the post-harvest supply chain is still challenging in horticulture and requires scientific skills to trade fresh produce globally *(East, 2022)*. Combining aggregation with market-based cold storage boost demand and improves fruit and vegetable availability significantly in smaller markets like Bihar, India *(Cooper et al., 2021*).

The basic purpose of flowers is beauty. Of all the attributes, appearance appeals the most to the consumers (*Rombach et al., 2018*). Besides prioritizing cut flower attributes, the floriculture industry has a huge potential to generate employment, but the labor task is physically demanding and low-paid *(Manolchev & Ivan, 2022)*. The job satisfaction of workers from the Ethiopian cut flower industry is majorly affected by extrinsic organizational rewards (*Staelens et al., 2018*). The labor-management system applied since 2005 on farms of Kenyan cut flower provides a foundation for an Industrial–Civic compromise *(Riisgaard & Gibbon, 2014*).

The previous studies have focused on the managerial and behavioral aspects of the industry. A recent study is needed to evaluate the industry's growth, given the efforts taken by the government to augment primary aspects. Therefore, the current paper attempts to examine the growth of the Indian floriculture sector given the objectives of the National Horticulture Mission (NHM) of holistic growth of the horticulture sector.

Accordingly, the following hypotheses are formulated:

H_1: The NHM does not impact the area under cultivation of flowers in India
H_2: The NHM does not impact the production of loose flowers in India
H_3: The NHM does not impact the production of cut flowers in India
H_4: The NHM does not impact the export of floriculture products in terms of value
H_5: The NHM does not impact the export of floriculture products in terms of volume

3. Data and Research Methodology

3.1. Data

The study is based on secondary data. For trend analysis, data is taken from 2005-06 to 2020-21, i.e., after the mission's launch. Five variables are selected to analyze the impact of

NHM on the growth of the Indian floriculture industry. The variables are area under cultivation, production of loose and cut flowers, and export of floriculture products in terms of value and volume. A trend analysis is done to determine the growth pattern of the variables after the mission. A trend line with the equation model is depicted in the figures (*Farid et al., 2011*). Several studies have used a pre-post analysis to derive the impact of a phenomenon *(Amagir et al., 2022; Beukeboom et al., 2015; Liu et al., 2017)*. For carrying out pre and post-mission analysis 25 years of data from 1995-to 2021 (3rd advance estimate) is taken into account. The secondary data on the area under cultivation and production of cut and loose flowers are taken from the comprehensive e-resource platform of India stat. The area under cultivation of flowers is measured in thousand hectares, and the production of loose flowers is measured in thousand metric tonnes. The data on the value of export of floriculture products from India is derived from the website of the International Trade Centre (ITC) Trade Map, and the data on the quantity of export is taken from the Agricultural and Processed Food Products Export Development Authority (APEDA), India.

3.2. Research methodology

Firstly, a trend analysis is done to graphically analyze the impact of the NHM by taking data from 2005-06 to 2020-2021. Then, a dummy variable technique is applied to test the impact of the NHM on the variables measuring the growth of the Indian Floriculture industry. For analysis, the data is divided into two groups, i.e., pre and post-mission data. Pre-mission data pertains to the period of 10 years from 1995-to 2004, and post-mission data relates to 16 years from 2005-to 2020. The following function is used for the test.

$$Y = f(M) \quad (1)$$

where, Y – Variables measuring the growth of the Indian Floriculture Industry, M-National Horticulture Mission, the dummy variable which takes the value of 0 for pre-mission and 1 for the post-mission period.

Table 1. Variables defined

	Variables	Measuring unit
1.	Area under cultivation	'000 hectares
2.	Production of loose flowers	'000 Metric tons
3.	Production of cut flowers	Lakh numbers
4.	Export value	US $
5.	Export volume	In Metric tons

Table 1 defines the variables taken for the study. Normality of data is tested using the Kolmogorov-Smirnov normality test. If the variables are normally distributed, then a parametric Independent Sample T-test is applied to measure the difference between the mean of the two groups. If the data is not normally distributed, then a nonparametric test of Mann-Whitney is applied. IBM SPSS software is used to conduct the analysis. The null hypothesis of the study is that there is no significant impact of NHM on the growth of the floriculture industry. In the output, if the p-value > 0.05, the null hypothesis is rejected, otherwise accepted.

4. Analysis and Results

4.1. Trend Analysis

Figure 1 shows the linear trend of the area under cultivation of flowers in India after the launch of the mission. There has been a gradual increase in the area under cultivation for most of the years after the implementation of NHM, from 126.2 thousand hectares in 2005 to 329 thousand hectares in 2020. The increase or decrease in the area is due to changes in seasonal demand and the price of products in the market. If farmers get a higher price for

producing flowers in a particular year than other commercial crops, then the area under cultivation tends to increase.

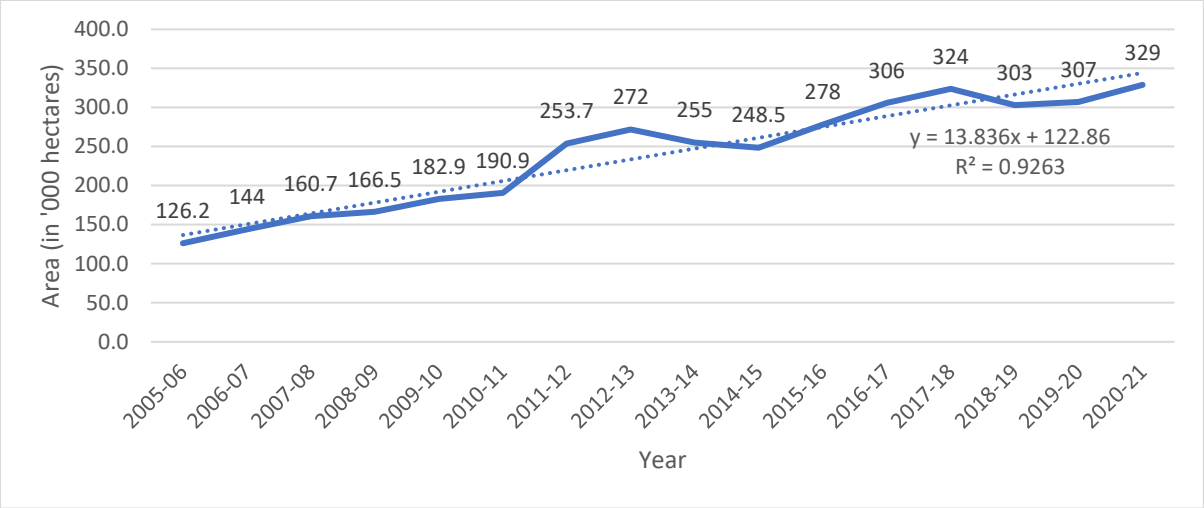

Figure 1: Area under cultivation of Flowers in India from 2005-06 to 2020-21
Source: Drawn by the author based on the data extracted from Indiastat statistic (available at https://www.indiastat.com/data/agriculture)

Figure 2 shows the linear trend of the production of loose flowers from 1995 to 2020. The variation in production over the years is due to the change in area under cultivation and productivity of crops. The production of loose flowers accelerated from 693.4 thousand million tons in 2005 to 2266 thousand million tons in 2020. A steep rise in the production of loose flowers in 2011 is explained by an increase in the area of cultivation of flowers from 190.9 thousand hectares to 253.7 thousand hectares. Productivity is also affected by seasonal changes and proper crop management. Since most of India's crops depend on seasonal rain, the production of loose flowers is also affected due to climate change, soil quality, and post-harvest management.

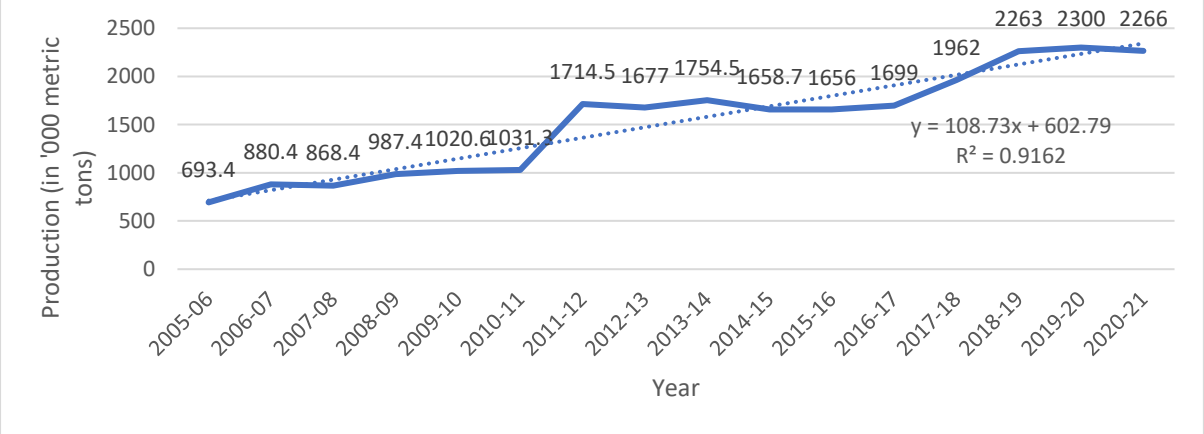

Figure 2: Production of loose flowers from 1995-2020
Source: Drawn by the author based on the data extracted from Indiastat Statistic (available at https://www.indiastat.com/data/agriculture)

Figure 3 shows the polynomial trend of export value of floriculture products from 2005-06- to 2020-21. After the implementation of the National Horticulture Mission, the export value of floriculture products increased from 66836 US$ to 140539 US$ in 2007-08. However, in 2008-09, there was a steep fall in the export value due to the Great economic recession of 2008. Throughout the economic depression from 2008-to 2010, the value of exports falls from 140539 US dollars to 67612 US dollars. From 2010 onwards, there was a slight recovery in

foreign exchange earnings from exports of floriculture products. The export value reached from 67612 US$ in the year 2010 to 73232 US$ in the year 2020.

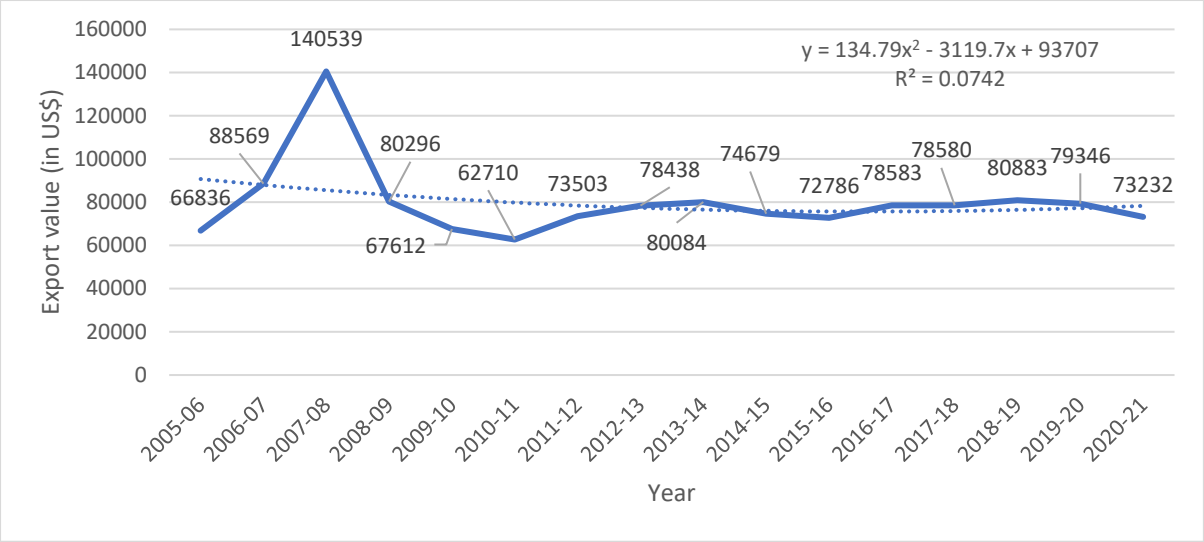

Figure 3: Export of Indian Floriculture products (HS 06) from 1995-to 2020
Source: Drawn by the author based on the data extracted from International Trade Centre (ITC) Trade Map (available at http://trademap.org)

Figure 4 is the graphical presentation of the exponential trend line of exports of Indian floriculture products from 2005-06 to 2020-21. The commercialization of floriculture products in India is a recent practice and started in the late 90s after the Indian economy was globalized. The value and volume of exports are interrelated to each other. In 2006-2007, exports decreased from 42545.28 metric tons to 26814.52 metric tons in 2009-10. Even after a slight rise in 2010-11, from 2013-14 onwards, there has been a gradual decrease in the export volume of floriculture products.

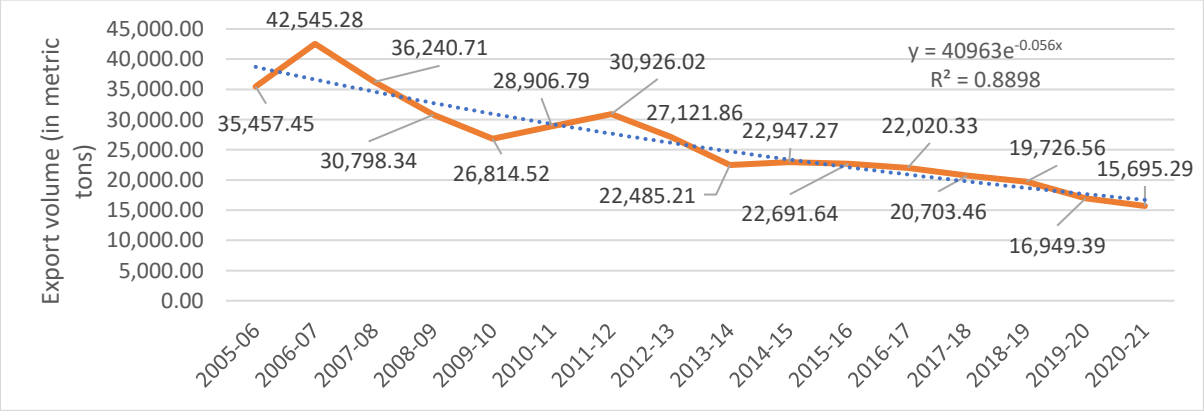

Figure 4: Exports of Indian Floriculture Products (HS 06) by Volume from 1998-2020
Source: Drawn by the author based on the data extracted from APEDA (Agriculture and Processed Food Export Development Authority) (Available at https://apeda.gov.in/apedawebsite/)

4.2. Pre and Post-Mission Analysis

To statistically analyze the impact of the National Horticulture Mission on the growth of the Indian floriculture industry, a pre and post-mission analysis is done by dividing the data into two groups (*Amagir et al., 2022*). The first group consists of data from 1995-to 2004 (pre-mission), and the second group consists of data from 2050 to 2020.

To check if the data is normally distributed or not, the normality of the data is tested first, using the Kolmogorov-Smirnov normality test. The normality is tested using SPSS software. If the p-value < 0.05, then the null hypothesis is rejected, and the data is considered

to be not normally distributed. So, to accept the null hypothesis of normal distribution, the probability value should be greater than 0.05 (p >0.05).

Table 2: Test of Normality of data from 2005-06 to 2020-21

Variables	**Kolmogorov-Smirnov[a] test**		
	Statistic	Df	Sig.
Area	0.153	16	.200*
Production loose	0.208	16	0.063
Production cut	0.141	16	.200*
Export value	0.141	16	.200*
Export volume	0.28	16	0.002

Notes: * indicates a lower bound of the true significance. [a] Lilliefors Significance Correction
Df = Degree of freedom, Sig. = Significance value
Source: Results taken from the SPSS software

Table 2 shows the test of the normal distribution of the data. The result shows that the data of four variables out of five usually are distributed, i.e., area under cultivation, production of loose flowers, production of cut flowers, and value of exports of floriculture products. Therefore, to compare the means of all the normally distributed variables, the parametric test of Student's T-test is considered suitable, and for comparing means of export volume, the nonparametric test of Mann-Whitney is applied.

Table 3: Group statistic and Significance value (at 95% confidence interval)

	Variable	Pre-Mission (1995-2004)			Post-Mission (2005-2020)			P-value for difference between groups	Accept/Reject the hypothesis
		Yr.	Mean	S.D.	Yr.	Mean	S.D.	Independent sample T-test	
1	Area under cultivation	10	89.77	15.28	16	240.46	68.44	0.00	Reject
2	Production of cut flowers	10	10937.17	7702.30	9	54455.60	17431.05	0.00	Reject
3	Production of Loose flowers	10	572.67	107.51	16	1527.01	540.83	0.00	Reject
4	Export value of floriculture products	10	33516.57	11931.49	16	79792.20	17396.44	0.00	Reject
		Yr.	Median	Range	Yr.	Median	Range	Mann-Whitney U Test	
5	Export volume of floriculture products	7	26682.10	65621.84	16	24880.8	26849.99	0.947	Accept

Notes: Yr. indicates the number of years. S.D. indicates standard deviation.
Source: Tabulated by the author as per the results of the SPSS software

Table 3 presents the group statistics and results of the independent sample T-test for normally distributed variables and the Mann-Whitney test for a not-normally distributed variable. At a 95% confidence interval, it is observed that the p-value < 0.05 (p=.000) for the

first four variables and the mean of post-mission data is also higher than pre-mission, which indicates an increase in the four variables after the NHM. Hence, the null hypothesis is rejected, and it is concluded that there is a significant difference between the mean of the pre-and post-mission data of the first four variables. Therefore, by referring to the results of group statistics and test values of the independent sample T-test, it is inferred that the National Horticulture Mission has a positive impact on the area under cultivation of flowers, production of cut and loose flowers, and export of floriculture products in terms of value.

In the case of the Mann-Whitney test, the p-value > 0.05 (p=0.947) for the export volume of floriculture products from India, hence the null hypothesis is accepted, which shows that there is no significant difference between the mean of the exported quantity of floriculture products before and after the mission. Hence, it is concluded that the NHM has no significant impact on the export volume.

The present study poses limitations in terms of the limited time taken for the analysis, the methods adopted for comparing the results, and only one sector is considered for analyzing the impact of the horticulture mission. Other than floriculture, other industries included in the broad range of the mission could be evaluated, like fresh fruits and vegetables, processed food, animal products, cereals, organic products, and other categories listed under the mission.

5. Conclusion and suggestions

After going through the test results, it is concluded that the National Horticulture Mission has a significant impact on the area under cultivation, the production of loose and cut flowers, and the value of exports of floriculture products. But, the mission has no significant impact on floriculture exports in terms of volume. It implies that the NHM has not influenced the export of floriculture products from India in terms of quantity/volume. It is observed that the volume of exports of floriculture products from India has not increased significantly while the value of exports increased after the mission. It is also observed that the quantity of exports of flowers is not accelerated with an increase in cut and loose flowers production, which proves that domestic consumption of flowers has also increased in India over the years. Hence, the increase in the value of exports is attributed to the increase in the rate of inflation and the price of floriculture products in the international market and is not due to a higher quantity of exports of floriculture products from India.

Even after sixteen years of implementation of the mission, the production of cut flowers has not amplified significantly due to a lack of proper infrastructure facilities required for growing cut flowers in a controlled environment. Most of the cultivation of cut flowers is in an open field without proper climate control techniques. The irrigation facility is also not sufficient. Further research could be done in the direction of finding more suitable causes and appropriate measures of dealing with the infrastructural and financial needs of the sector. Primary data could be collected from the farmers and exporters of floriculture products to know the opinion towards government initiatives and major problems faced by the stakeholders of the industry. Factors affecting the growth of the industry and major challenges faced by the key players could be highlighted which would help the government in framing more suitable policies associated with the industry.

Therefore, the Government of India should make an effort not only to augment the foreign exchange earnings by exporting the floriculture products but also to increase the volume/quantity of exports of floriculture products from India. So that the farmers get the motivation to enhance the production and area under cultivation of flowers and the overall growth of the floriculture industry is ensured. Further research must be undertaken to enhance productivity and smoothen post-harvest management practices. Structural commercialization

of the industry is still under process and must go a long way ahead. The study reveals that there is still considerable potential for the growth of the floriculture industry in India, which needs to be harnessed.

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