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MORALITY BEFORE KNOWLEDGE

Floriculture: A comparative insight of environmental business opportunities in Indonesia and India

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ABSTRACT

Background: Floriculture, a specialized field within horticulture, focuses on the cultivation of ornamental plants such as cut flowers, potted plants, and garden plants. This study examines and compares the floriculture industries of India and Indonesia by analyzing production practices, export patterns, economic contributions, and the role of government policies. **Methods:** This article employs a Systematic Literature Review (SLR) approach, focusing on recent publications (2021-2024) from Google Scholar to explore floriculture trends in India and Indonesia. The literature selection follows the PRISMA guidelines, combining studies on production, exports, economic impact, and government policies to provide a comprehensive view of the floriculture sectors in both countries. **Findings:** India has made substantial progress in floriculture, particularly in cut flower exports, driven by supportive national programs such as the National Horticulture Mission (NHM) and the Agricultural and Processed Food Products Export Development Authority (APEDA). These initiatives have supported infrastructure development, market access, and technology upgradation, enabling India to strengthen its position in the global floriculture market. Indonesia, despite its enormous potential due to its biodiversity and tropical climate, faces challenges such as limited infrastructure and insufficient production to meet global demand. **Conclusion:** The findings highlight that increasing technological innovation, improving supply chain infrastructure, and implementing supportive policies are critical to unlocking the full potential of floriculture in both countries. For Indonesia, prioritizing infrastructure and market development is essential, while India can benefit from further innovation and expanded market access. **Novelty/Originality of this article:** The study underscores the importance of a strategic approach to capitalizing on global demand for ornamental plants, ensuring long-term growth and sustainability.

KEYWORDS: ornamental plant; floriculture; India; Indonesia.

1. Introduction

Floriculture is a branch of horticulture that specializes in growing ornamental plants, such as cut flowers, potted plants, and garden plants. The main characteristic of floriculture products is their ability to produce aesthetically items (Wani et al., 2018; Ferrante & Ferrini, 2023) The ornamental plant industry is a growing sector that offers significant advantages to the agricultural sector in various countries. In 2021, the flower market at Royal Flora Holland in the Netherlands was valued at 5.6 billion euros, marking an increase from 4.8 billion euros in 2019 (Salachna, 2022). In 2019, the ornamental plant industry in the United States managed to create 2.32 million jobs including farmers, traders, and exporters. The ornamental plant business sector contributed $17 billion, which is equivalent to 10% of the total horticultural crop production in the country (Wei et al., 2023). Global floriculture

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exports have experienced consistent growth over the past five years, with a Compound Annual Growth Rate (CAGR) of 3.9%. All categories, including cut flowers, potted plants, ground cover and balcony plants, bulbs, perennials, shrubs, and trees, have all seen an upward trend (Horen, 2022).

India has high biodiversity, diverse agro-climate, and skilled workforce making it an ideal location for floriculture activities (Bobde et al., 2023).The commercial production of floricultural crops in India has rapidly increased since the 1990s. According to Misra and Ghosh (2016), flower production in India steadily increased from 1993–1994 to 2013–2014, with particularly sharp growth observed in the years 1995–1996, 2003–2004, and 2011–2012. During this period, loose flower production maintained a consistent upward trend, while the cut flower segment experienced an exceptional surge from 2006 to 2007, with a Compound Annual Growth Rate (CAGR) of 40.5%. By 2019, the value of India's floriculture market reached INR 188.7 billion. In 2018, India's share in global floriculture exports was just 0.4 % (Anumala & Kumar, 2021). That percentage is considerably lower when compared to the Netherlands (59%), Italy (6%), and Colombia (10%) (Borbaruah, 2023).

The commercial floriculture industry in India has only emerged in recent years although flowers have long been an essential part of Indian society (Haokip et al., 2023). People in India cultivate ornamental plants for a variety of purposes, ranging from aesthetics to social and religious uses (Sowmya & Harisha, 2024). Floriculture has now become an expanding sector in India, leading the government to focus on making 100% of its floriculture products export oriented. The floriculture industry in India is expanding quickly, driven by strong demand both within the country and abroad. In the coming years, India's flower export sector is anticipated to reach its maximum potential, contributing significantly to global growth turn (Sowmya & Harisha, 2024). India is on the 18th rank with contributing 0.6% share in global floriculture trade (Kumarasamy & Harshavardhini, 2021).

The global trade in cut flowers is led by top varieties such as roses, tulips, chrysanthemums, gerberas, lilies, alstroemerias, freesias, carnations, irises, and gypsophilas. Europe remains the largest market for these flowers, with the Netherlands at the forefront. This market is highly competitive, and India has recently made its entry, but faces challenges due to the established presence of flower producers from Africa and Latin America (Burud et al., 2023). The Government of India has launched several successful floriculture development programmes that have led to significant progress in flower production, especially cut flowers with their huge export potential. State governments have also initiated their own programmes that provide technical and financial support to millions of small and large producers (Kumarasamy & Harshavardhini, 2021).

The global floriculture trade is still dominated by the Netherlands, Colombia, Ecuador, Ethiopia, Kenya and India. While Indonesia has not yet taken a leading position in the global floriculture market, its tropical climate and fertile soil offer significant potential for expanding the floriculture industry. According to the statement of the Coordinating Minister for Economic Affairs of the Republic of Indonesia in 2021, the global market value of ornamental plants reached USD 22.329 billion, which is higher than coffee and tea. However, Indonesia's contribution to the global ornamental plant market is still very small, only 0.1% (Limanseto, 2021). In Indonesia, ornamental plants are part of the horticulture sector and play a role in the country's economy. In 2023, businesses related to ornamental plants accounted for 1.15% of all businesses in the horticulture industry. Despite its relatively small share in the overall horticulture industry, the ornamental plant business plays a key role in driving economic growth in domestic and international market demand (Badan Pusat Statistik, 2024b).

Indonesia and India play an important role in the global floriculture industry. Both countries have high biodiversity and a climate that supports the development and management of the floriculture industry. This comparative assessment explores the floriculture industries of Indonesia and India, focusing on their production practices, export trends, the economic impact, and government policy of the sector in both countries. By analyzing these aspects, researcher’s aim to identify the key opportunities and challenges

faced by each country in the global floriculture market, and assess the factors that influence their growth potential and competitiveness in the global market.

2. Methods

This article used a Systematic Literature Review (SLR) approach to explore various relevant scientific publications, utilizing the leading online article database, Google Scholar. This research limited the scientific publications from 2021 to 2024. The first specific keyword used to determine floriculture trends in India is "India Floriculture", while the second keyword is "Indian Floriculture Export". The specific keywords to find out the floriculture trends in Indonesia are "Indonesia Ornamental Plant" and "Indonesian Government Policies on Farming" (Figure 1.

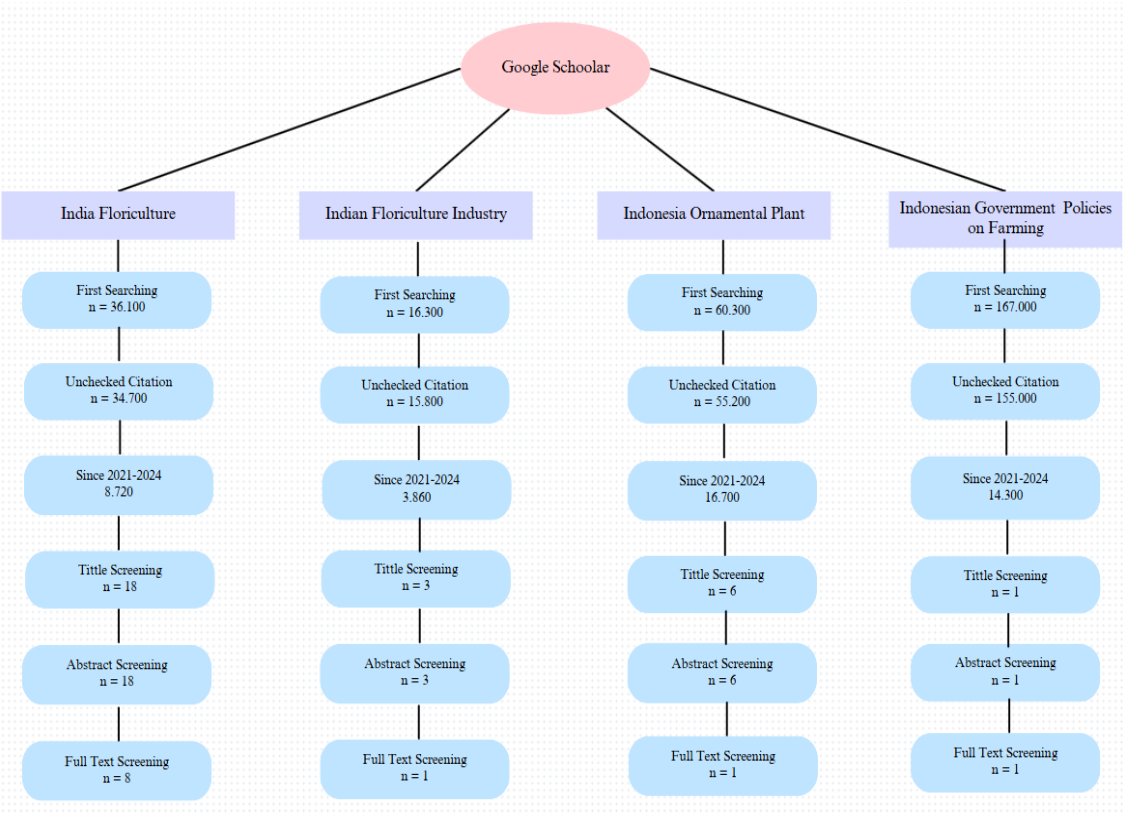


Fig. 1. Flow diagram to study selection process from google scholar

The literature selection was conducted by referring to the protocol set out in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (https://prisma-statement.org/), which provides clear guidelines and standards in the literature selection process, with the aim of ensuring a systematic, transparent and structured process. One of the main priorities in the literature selection is to ensure that the publications selected are recent studies, so that the data and information obtained reflect the current state of floriculture in India and Indonesia.

At the beginning of the literature screening, the researcher reviewed the titles and abstracts of the articles found to identify studies that specifically addressed the floriculture sector in both countries. In addition, to enrich the existing sources of information, the researcher also expanded the scope of references to include books, statistical data published by government statistical agencies, government regulations, literature published in horticultural journals, and articles published in relevant mass media. Thus, this study not only relies on scientific literature, but also integrates various sources that can provide a more complete view of the challenges, developments and opportunities in the floriculture sector in both countries. After the initial screening stage, a thorough review of the selected

articles was conducted to assess their relevance and quality. Studies that offered an in-depth analysis of the state of the floriculture industry in India and Indonesia, and discussed aspects such as production, exports, economic impact and government policies, were prioritized for inclusion (Table 1).

Table 1. Criteria used to conduct the study

PRISMA checklist	
Eligibility criteria	Got 14 journal written in English Language
Information sources	Google Scholar Specific Journal in India and Indonesia
Search strategy	Keywords: India Floriculture Indian Floriculture Exsport Indonesia Ornamental Plant
Selection process	After applying the eligibility criteria and filtering based on relevant titles, the results were further expanded to include sources from book, report, statistical data, and mass media. These sources were selected in both *Bahasa Indonesia* and English.
Data collection process	Once the selection process is complete, the gathered data is initially reviewed by the researchers to assess its relevance and determine if it should be included as a valid reference source.
Data items	All the selected literature were downloaded in full-text PDF format. These documents organized and stored in the Mendeley Reference Manager for efficient management and citation tracking. This process allowed the researchers to easily access and review the full content of each source, ensuring that the information was thoroughly evaluated.
Synthesis	This stage focuses on synthesizing the relevant evidence and information from each piece of literature that contributes to answering the research questions. The findings from this synthesis will be organized and presented in a narrative form, providing a coherent summary of the key insights derived from the literature.

3. Results and Discussion

3.1 Current state of floriculture in India

3.1.1 Production

According to the Indian government's agricultural statistics in 2020, the total area of flower crops in India reached 303 thousand hectares for the period 2018 to 2019. India has around 300 types of export-oriented floriculture products. In general, in India, flowers are divided into 2 categories, namely loose flowers and cut flowers. Types of loose flowers include marigolds, jasmine, asters, roses, chrysanthemums, tuberoses. While cut flowers include carnations, roses, gerberas, gladioli, anthuriums, and others (Sowmya & Harisha, 2024). In India, loose flowers are grown in large areas for the domestic market, while cut flowers are cultivated in limited areas for export. Loose flowers are those flowers that are picked under the petals and used in everyday activities such as worship, weddings, and garden decoration. Cut flowers are those flowers that are cut with a little stem to be arranged in arrangements, bouquets, or decorations. Cut flowers have a long shelf life and constitute a large part of the world's floriculture output (Malviya et al., 2022; Mayak et al, 1973).

In 2014-2015, the area used for flower cultivation was 246.13 thousand hectares. This area increased significantly by 12.78% to 277.57 thousand hectares in 2015-2016. In 2016-

2017, the area of flower cultivation increased by 10.60% to 306.95 thousand hectares. However, there were fluctuations in the following years. In 2023-2024, the area of flower planting recorded an increase of 4.26% compared to the previous year to 296.74 thousand hectares (Kumar et al., 2024).

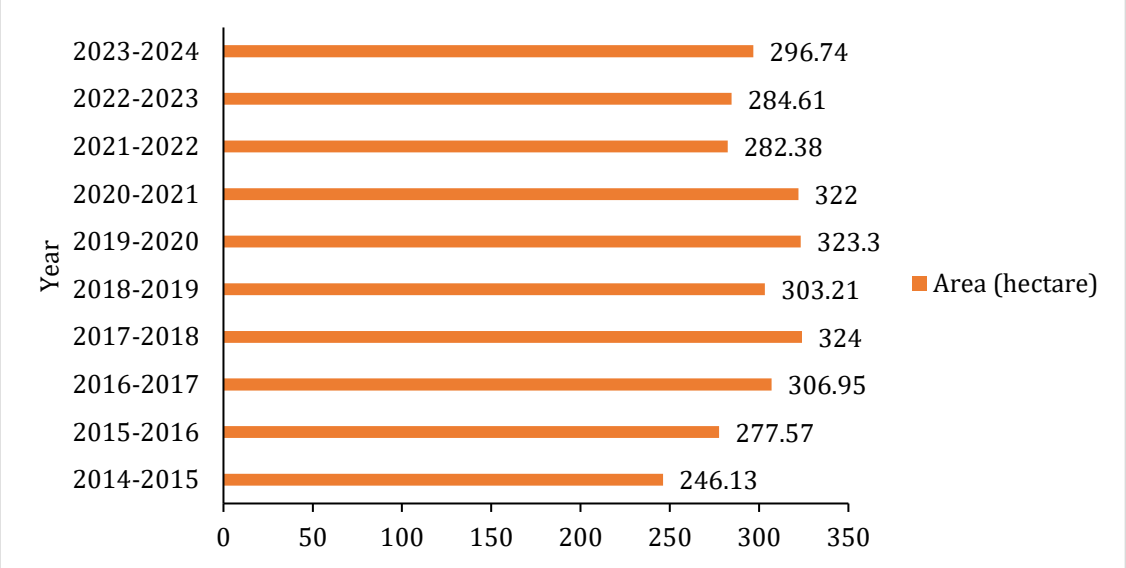


Fig. 2. Area of flower cultivation in India
(Kuma et al., 2024)

In 2014-2015, the production of loose flowers reached 1,639.02 MT. The production increased by 1.05% in 2015-2016, bringing the production to 1,656.24 MT. In 2016-2017, the production of loose flowers increased again by 2.63% so that the production was 1,699.57 MT. In 2019-2020, the production increased by 2.66% compared to the previous year period to 2,232.44 MT. However, in 2020-2021, there was a drastic decrease of 7.39%, bringing the production to 2,151.96 MT. In 2023-2024, the production of loose flowers recorded an increase of 1.88%, bringing the production to 2,284.46 MT. Meanwhile, in 2014-2015, the production of cut flowers was only 105.35 MT. In 2015-2016, there was a surge of 401.14%, bringing the production to 527.67 MT in 2015-16. In the following years, cut flower production fluctuated, with the peak reaching 946.54 MT in 2023-2024 where there was an increase of 10.78% compared to the previous year (Kumar et al., 2024).

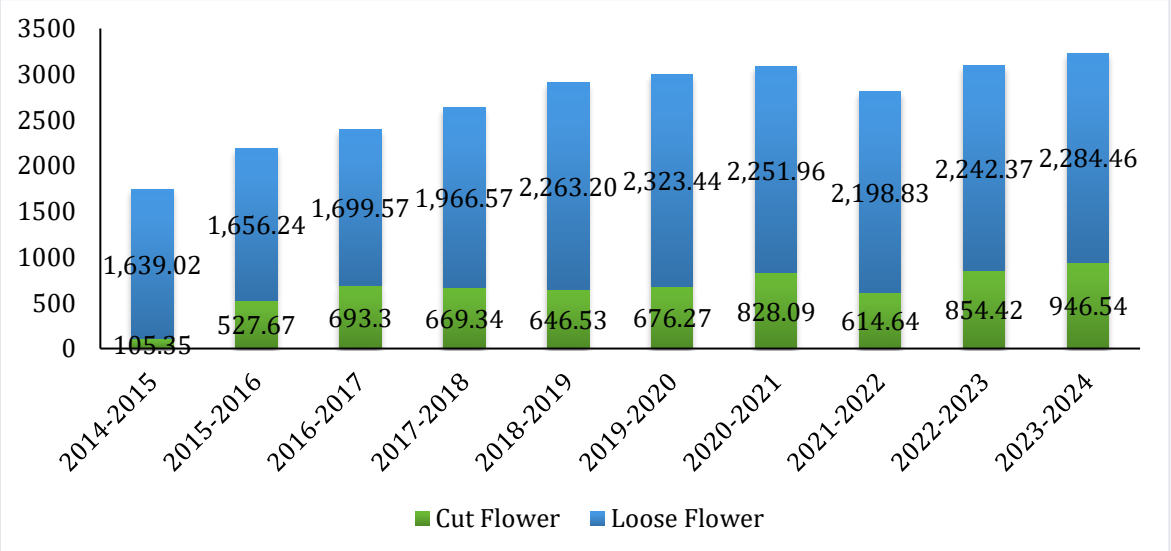


Fig. 3. Loose and cut flower production in India (MT)
(Kumat et al., 2024)

More than half of the floriculture products are produced in the states of Karnataka, Andhra Pradesh, Tamil Nadu and Madhya Pradesh. Karnataka is the main center of flower crop production in India with a total production of 253.24 thousand tons. Other major flower-producing states are West Bengal in the east; Kerala and Maharashtra in the west; Rajasthan, Delhi, and Haryana in the north; and Tamil Nadu and Andhra Pradesh in the south. The Government of India has set up an expert committee tasked with planning measures to advance the development of the floriculture sector, The committee has identified zones that have great potential for floriculture activities, particularly cut flower production, namely Bangalore, Hyderabad, Pune and New Delhi (Sowmya & Harisha, 2024).

In India, the cut flower marketing industry is still poorly organized. In most cities, flowers are brought to wholesale markets that usually operate outdoors. After that, the flowers are distributed to retail shops located on the roadside. Flowers are simply placed in large buckets. However, in big cities, flowers tend to be treated better. They are kept indoors with controlled temperatures. The process of packaging and transporting flowers from farmers to retail markets is not optimal. Flowers are packed in simple containers such as gunny sacks, bamboo baskets, cardboard boxes, or even wrapped in old newspapers. Flower deliveries are made by road, such as trains, as well as by air. Some of the major flower markets in southern India are located in Coimbatore, Madras, and Madurai in Tamil Nadu; Trivandrum and Cochin in Kerala; Bombay and Pune in Maharashtra; Mysore, Bangalore, and Dharwad in Karnataka; and Hyderabad and Vijayawada in Andhra Pradesh. Mumbai has three major markets. In eastern India, the main flower market is in Kolkata, while in the north, the major flower markets are in Lucknow/Kannauj and Delhi (Borbarush, 2023).

3.1.2 Exports and market destinations

India ranks 25th as an exporting country and 53rd as an importing country of floriculture (Borbarush, 2023). The top five floriculture products from India are dried flowers, live plants, roses, cut flowers and others. India accounts for 0.20% of the global cut rose market share (Anumala & Kumar, 2021). The Indian Society of Floriculture estimates that flower exports from India to the rest of the world are worth about 30 crore rupees (1 crore is equivalent to USD 120,382). In 1999-2000, total floriculture production in India reached 84,342.90 million tons with export earnings of 105.16 crore rupees. By 2023, total production reached 21,024.41 million tons and export earnings jumped to 707.81 crore rupees (Sowmya & Harisha, 2024).

Table 2. India's total floriculture exports

Year	Quantity (MT)	Value (Crore Rupee)
1999 – 2000	84,342.90	105.16
2004 – 2005	27,769.06	221.11
2009 – 2010	26,814.52	294.46
2014 – 2015	22,947.27	460.77
2019 – 2020	16,949.39	541.61
2022 – 2023	21,024.41	707.81
2023 – 2024 (April – September)	9,524.28	352.91

(Sowmya and Harisha, 2024 based on data from Directorate General of Commercial Intelligence and Statistics, Government of India)

The major destinations of Indian flower exports are USA (14,692.43 lacs), Netherlands (7,789.14 lacs), UK (4,470.63 lacs), Germany (3,938.55 lacs), United Arab Emirates (3,434.08 lacs), Canada (2,341.81 lacs), Australia (1,607.44 lacs), Italy (1,578.90 lacs), Japan (1,574.58 lacs), and Malaysia (1,539.92 lacs). This shows the high demand for the Indian floriculture industry in the global market (Sowmya & Harisha, 2024). Exports of cut roses from India have shown an increase in recent times, even though the selling price of Indian cut roses is lower than the world average. India exports cut roses to countries with low

purchasing power such as Singapore and Malaysia. In contrast, countries with high purchasing power, such as the United States, Jordan and Saudi Arabia, have not been major export destinations for India. This situation shows the challenges faced by the Indian cut rose export sector in improving its price position and market share in the global market. India needs to improve product quality and expand its export market reach to countries with higher purchasing power to compete with other rose producing countries (Anumala & Kumar, 2021).

Another challenge in developing floriculture exports in India is the limited number of flights which hampers the sale of floriculture products to export destination countries. Space for floriculture products is limited on major airlines as airline operators prefer large shipments. Other problems include inadequate infrastructure such as poor roads, very minimal refrigerated transportation, inadequate storage facilities and unavailability of efficient technology. In addition, flower marketing in India is not well organized. Flowers are sold in the open market without adequate packaging and transportation (Sowmya & Harisha, 2024).

3.1.3 India government policy in support of floriculture

The demand for floriculture products in India has seen a significant surge. Some of the factors driving this increase in demand include changing lifestyles, rising incomes, and rapid urbanization. In addition, the floriculture industry is export-oriented with major markets being developed countries such as Netherlands, UAE, UK, and US. Floriculture is considered an industry with great growth potential. Indian government policies support the development of export-focused cut flower production. Government agencies such as the Agricultural and Processed Food Products Export Development Authority (APEDA), which is tasked with developing and expanding floriculture exports in India, provide subsidies for the construction of facilities such as cold storage, refrigerated transportation equipment, greenhouses, and subsidies on air freight for exports. (Chittibomma et al., 2023). The India Government is taking steps to overcome obstacles that hinder export activities such as reducing import costs and air freight rates, providing better storage facilities, and establishing training centers to improve the skills of the workforce in floriculture (Sowmya & Harisha, 2024).

The Indian government is deeply dedicated to advancing floriculture by supporting it through initiatives like the National Horticultural Mission (NHM), National Horticulture Board (NHB), National Bank for Agriculture and Rural Development (NABARD), the Ministry of Agriculture, Agricultural Produce Export Development Authority (APEDA), the Ministry of Commerce, and state-level horticulture or agriculture departments. Private sector investments are also crucial. Commercial banks offer financial support through loans, manage floriculture-related operations, and assess the economic feasibility of these activities. Collaboration among research institutions, government bodies, and industry stakeholders is vital for fostering research, development, and the implementation of modern technologies in floriculture (Chittibomma et al., 2023).

Implementation of the NHM program has had a major impact on increasing the area of land used for cultivation, the production of cut and loose flowers and the export value of floriculture products (Sinha & Sharma, 2022). The NHM program provides financial support for farmers to establish high-tech farms, nurseries and greenhouses. In addition, training programs and site visits are conducted to expand farmers' technical knowledge and skills (Bobde et al., 2023; Ho et al., 2020).

The implementation of NHM has a positive impact on floriculture exports. The value of floriculture exports increased from USD 66,836 to USD 140,539 in 2007-2008. However, in 2008-2009, there was a sharp decline due to the global economic recession in 2008. During the economic recession period between 2008 and 2010, the export value dropped drastically from USD 140,539 to USD 67,612. Since 2010, there has been a gradual recovery

in foreign exchange earnings from floriculture product exports. The export value increased from USD 67,612 in 2010 to USD 73,232 in 2020 (Sinha & Sharma, 2022).

The Government of India, both at the central and state levels, provides various financial support, policies and incentives to develop the floriculture industry, both for domestic and export markets. The government established APEDA as an agency to support the export of agricultural products, including flowers. APEDA offers various schemes to help cut flower exports such as quality certification, infrastructure development, logistics support, and database updates. There is also NABARD which provides financing for high-tech floriculture units at reasonable interest rates to attract entrepreneurs in floriculture (Borbaruah, 2023).

Another major programme is the Rashtriya Krishi Vikas Yojana (RKVY) which provides financial support to the floriculture sector. The programme focuses on building agricultural infrastructure, increasing agricultural output and developing value addition. The programme also encourages the formation of Farmer Producer Organizations (FPOs) which strengthen collective marketing and competitiveness of farmers. Another important programme is the National Mission for Sustainable Agriculture (NMSA) which has floriculture as a major part. The goal of NMSA is to promote sustainable agriculture, conservation of natural resources, and climate change adaptive agriculture. The program provides financial support for the implementation of the latest technologies, water-efficient irrigation systems, and organic farming practices. By implementing sustainable practices, NMSA helps farmers increase agricultural yields, reduce production costs, and mitigate the negative impacts of climate change (Bobde et al., 2023).

There is serious threat to the floriculture industry in India from climate change as it affects production, quality and market dynamics. Adaptive strategies are needed such as breeding plants that are more resilient to climate change, implementing precision agriculture, and government policies that support the floriculture sector (De et al., 2024). Moreover, the floriculture sector in India is dominated by small farmers where a decrease in production can affect their welfare (Malviya et al., 2022). Besides national programs, there are also programs tailored to the needs of the states, such as the Mission for Integrated Development of Horticulture (MIDH). This program aims to promote horticulture by providing financial assistance. States can design sub-programs according to their needs, such as supporting floriculture clusters or developing organic horticulture (Bobde et al., 2023).

3.2 Current state of Indonesia floriculture

3.2.1 Production

Indonesia is one of the top ornamental plant producing countries in the global market. In 2018, ferns, philodendrons, and dracaena were the three pot plants with the largest harvest areas. Meanwhile, leaf anthurium ranked eighth. In 2018, the harvest area of deciduous anthurium was 106,088 m^2 with a production volume of 959,447 plants (Badan Pusat Statistik, 2018). The ornamental plants in Indonesia are divided into three groups: ornamental plants from which the stems and flowers are taken (cut flowers, such as chrysanthemums, gerberas, and roses), ornamental plants from which only the flowers are taken (such as jasmine), and ornamental plants that can be appreciated in the form of whole plants (such as philodendron, anthurium, aglaonema, and sansevieria) (Direktorat Jenderal Hortikultura, 2024).

The production of ornamental plants in unit of stems reached 811.72 million stems in 2023. Chrysanthemums dominated with the largest contribution, reaching 464.60 million stems (57.24%), followed by roses with 204.63 million stems (25.21%), tuberose 103.15 million stems (12.71%), gerbera 36.81 million stems (4.54%), and cut orchids with 2.52 million stems (0.31%). Chrysanthemum planting centers are in West Java, Central Java, and East Java. Roses are mostly planted in North Sumatra, West Java, Central Java, and East Java. While sedap malam is planted mostly in North Sumatra, West Java, Central Java, and East

Java. Meanwhile, jasmine is the only ornamental plant whose flowers are taken alone and has a production of 25 million in 2022 and drops to 21 million in 2023 (Direktorat Jenderal Hortikultura, 2024).

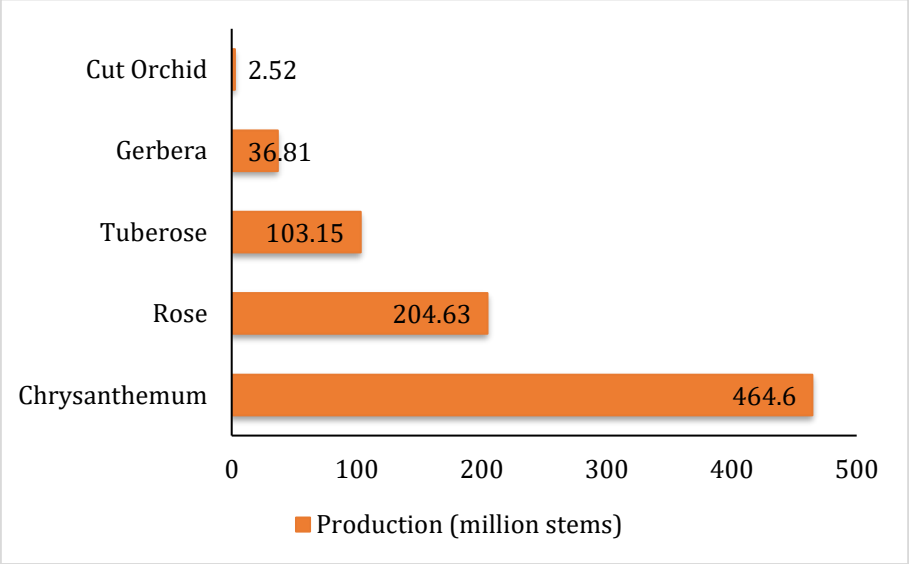


Fig. 4. Cut flower production in Indonesia
(Directorate General of Horticulture, Ministry of Agriculture, 2024)

At the same time, the production of ornamental plants in tree units in 2023 was recorded at 40.66 million trees. The six commodities with the largest production are ferns (32.86%), dracaena (27.61%), philodendron (10.08%), potted orchids (9.31%), anthurium flowers (7.54%), and aglaonema (3.33%). Other commodities have production below 1 million trees or contribution below 1% (Direktorat Jenderal Hortikultura, 2024).

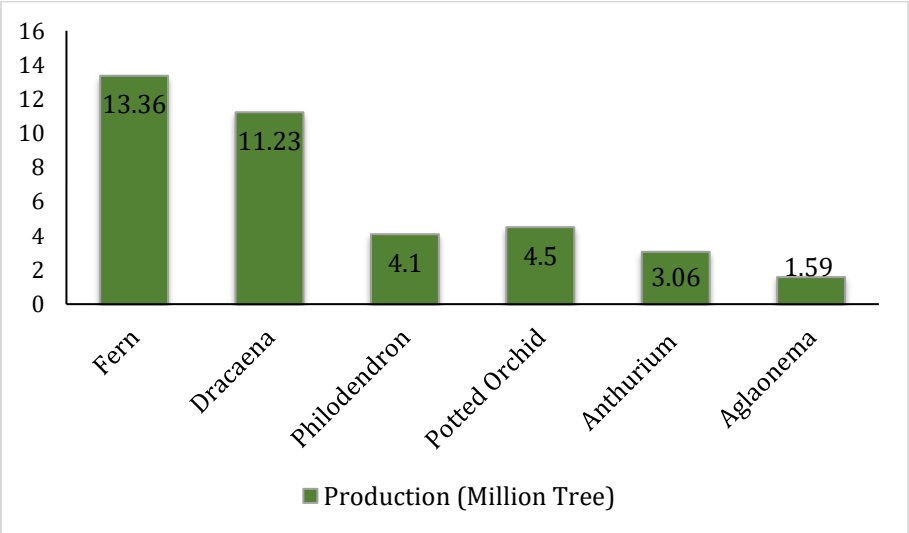
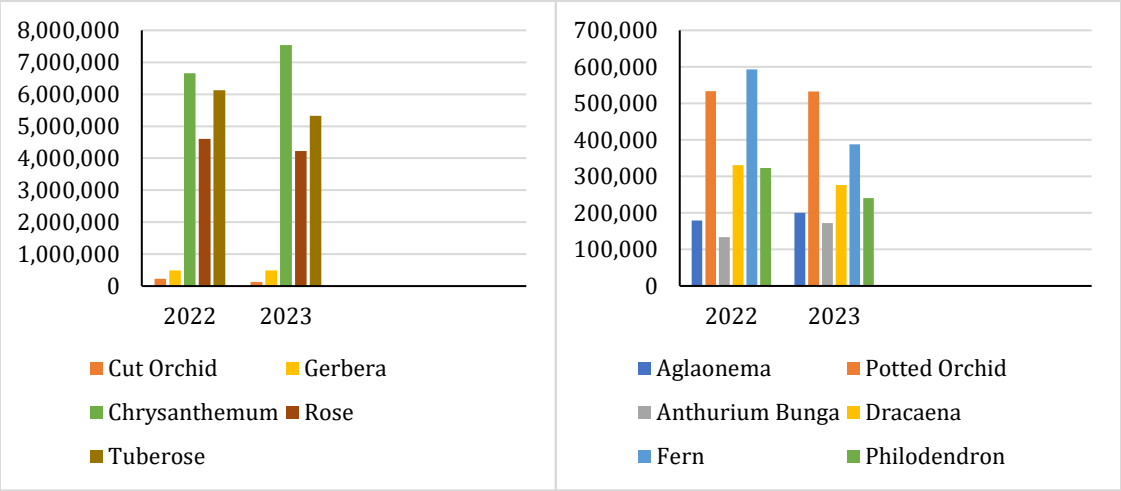


Fig. 5. Indonesia's production of tree ornamental plants in 2023
(Directorate General of Horticulture, Ministry of Agriculture, 2024)

In 2023, the harvested area of ornamental plants showed a decrease compared to 2022. For ornamental plants in stems units, the decline reached 406,093 m^2 (-2.24%), while for ornamental plants in tree units, the harvested area fell by 476,443 m^2 (-16.62%). Similarly, jasmine, which was the only ornamental crop recorded in kilograms, had a decrease in harvested area of 559,148 m^2 (-6.18%) (Direktorat Jenderal Hortikultura, 2024).



(a) (b)

Fig. 6. Ornamental plants in Indoenesia 2022-2023: a) Planting area by stems unit in b) Indonesia's ornamental by tree unit.
(Directorate General of Horticulture, Ministry of Agriculture, 2024)

Ornamental plants contribute to GDP (Gross Domestic Product) in Indonesia. In general, ornamental plants are included in the horticulture sub-sector where the GDP growth rate of the ornamental plant business is ranked second after livestock for the agriculture, forestry and fisheries sector in 2019-2022. The GDP growth rate of the horticultural plant business in that period was 4.22%, while livestock was 6.24% (Pusat Data dan Sistem Informasi Pertanian, 2023).

Table 3. Indonesia's GDP growth rate 2019 to 2022

Agriculture, forestry and fisheries sector businesses				
Year	2019 (%)	2020 (%)	2021 (%)	2022 (%)
Food Crops	-1.73	3.61	-1.40	0.08
Horticultural Crops	5.53	4.17	0.53	4.22
Plantation Crops	4.56	1.34	3.52	1.64
Livestock	7.78	-0.31	0.32	6.24
Agricultural and Hunting Services	3.17	1.65	1.43	2.65
Forestry and Logging	0.37	-0.03	0.07	-1.26
Fisheries	5.73	0.73	5.45	2.79

(Agriculture Sector GDP Analysis, 2023)

The global demand for ornamental plants continues to increase, especially from the Middle East, Europe, East Asia and the United States. Indonesia has the opportunity to become a major player. However, the growth of the ornamental plant business has not been matched by an adequate supply of plants. High consumer demand for certain types of plants has forced nurseries to increase their production capacity (Wiguna, 2020).

3.2.2 Exports and market destinations

The ornamental plant business has the potential to make a significant contribution to the economy in Indonesia. In January to August 2023, the export volume of ornamental plants reached 1,499 thousand tonnes with an FOB (Free on Board) value of USD 1,223.6. The export volume and value increased to 1,736.2 thousand tonnes with an FOB (Free on Board) value of USD 1,325 million in the period January to August 2024. The export destination countries were Japan, Taiwan, Singapore, Malaysia, Saudi Arabia, Qatar, Australia, Timor Leste, and Uruguay. Malaysia was the country that imported the most ornamental plants from Indonesia with 1,083.2 tonnes, but the FOB value was low at USD

127,073. Japan is the importing country with the highest FOB value at USD 1,177 million with 628 tonnes of plants imported. (Badan Pusat Statistik, 2024a).

The ornamental plant business has become an economic support, even in difficult times during the COVID-19 pandemic. Based on data from IQFAST (Indonesian Quarantine Full Automation System) at the Tanjung Priok Agricultural Quarantine, North Jakarta, between January and May 2020 there were 1,092 quarantine export certificates for 24,396 potted ornamental plants with a total value of IDR 6.8 billion. The main export destination country was the United States, followed by Germany, South Korea, the United Kingdom, Canada, Singapore, and the Netherlands. Most of the exported ornamental plants came from farmers in Jakarta, Bogor, and Sukabumi (Badan Karantina Indonesia, 2020).

Since the COVID-19 pandemic, the sales volume of ornamental plant traders has seen a notable rise of 40% compared to pre-pandemic levels. strPlant prices have also increased by around 100-300% when compared to the period before the pandemic. This increase is influenced by changes in people's lifestyles who spend more time at home. Many people are trying new activities or hobbies, one of which is growing ornamental plants at home. Besides the increase in demand in the domestic market, the COVID-19 pandemic has also caused a surge in demand for ornamental plant exports, especially seedlings. Some of the ornamental plants whose demand increased during the pandemic were monstera, aglaonema, syngonium, caladium, sansevieria, and anthurium, which also pushed up prices, especially for foliage ornamental plants. Post-pandemic, the value of Indonesia's ornamental plant exports has increased significantly, reaching 69.7% in the January-September 2021 period, compared to the same period the previous year, with total exports reaching USD 10.77 million. Cut flowers dominated Indonesia's ornamental plant exports with a percentage of 26.92%, followed by moss and moss scales at 22.54%, and other types of ornamental plants at 50.53% (Mubarok et al., 2023).

3.2.3 Indonesia government policy in support of floriculture

Government policies are essential to support farmers, especially in the cultivation of white jasmine, in order to maintain the stability of crop selling prices and reduce input costs. Protection from the government provides opportunities for farmers to earn higher incomes. This protection can take the form of subsidies for farm equipment and inputs, as well as price protection for crops (Simamora et al., 2023). The government's support for the ornamental plant business is stated in the Decree of the Minister of Agriculture Number 104/KPTS/HK.140/M/2/2020 concerning Assisted Commodities of the Ministry of Agriculture. The Indonesian Ministry of Agriculture fosters 361 types of ornamental plants to fulfil the demand of the worldwide ornamental plant market and also maintain its sustainability. The ornamental plants listed in the regulation include potted ornamental plants such as *Anthurium* spp., monstera (*Monstera* spp.), sri rejeki (*Aglaonema* spp.), and *Philodendron* spp.

The Indonesian Ministry of Agriculture has also issued guidelines for the cultivation of horticultural crops. The guidelines are listed in the Regulation of the Minister of Agriculture of the Republic of Indonesia Number 22 of 2021 concerning Good Horticultural Practices. Horticulture businesses, including floriculture, must ensure the preservation, soil fertility, and use of resources and production systems that are sustainable and environmentally friendly. Floriculture cultivation must be carried out based on Good Agricultural Practice (GAP) to maintain soil fertility, sustainable resource utilisation and environmentally friendly production systems. In the global market, Indonesia has a high bargaining position as a member of the G-20. Indonesia's membership in the G-20 presents challenges and opportunities for its agricultural sector. For this reason, Indonesia needs to optimally utilise this opportunity to increase the volume of international trade, especially in terms of exports (Astuti et al., 2022).

3.3 Discussion of India

3.3.1 The size and growth of the floriculture industry in India

The floriculture industry in India shows significant growth potential, both in terms of area under cultivation and production of flowers, especially export-oriented cut flowers. Despite fluctuations in production and challenges in marketing, distribution and packaging, the floriculture sector has good prospects with support from the government and a focus on areas of high potential. India needs efficient infrastructure, marketing systems, packaging and transport to achieve steady growth in floriculture.

According to the data, there is a significant upward trend in the area under flower cultivation in India from 246.13 lakh hectares in 2014-2015 to 296.74 lakh hectares in 2023-2024. The increase reflects consistent growth in the floriculture industry, despite some fluctuations. The increased 4.26% in 2023-2024 indicates the potential for a growing market, despite challenges in the stability of annual growth. India has two main flower categories, namely loose flowers (for domestic market) and cut flowers (for export). This reflects the division of domestic and international markets, with cut flowers being a more export-orientated commodity. The wide variety of flowers cultivated shows the diversity that allows India to serve to various markets and preferences.

Loose flower production experienced fluctuations with a sharp decline in 2020-2021 (2,151.96 MT). A rebound of 1.88% in 2023-2024 (2,284.46 MT) shows that despite the temporary decline, the sector still shows growth potential. Cut flower production showed a large increase in 2015-2016, with an increase of 401.14%, reflecting the high demand for cut flowers. In 2023-2024, cut flower production was recorded at 946.54 MT, with a 10.78% increase over the previous year. This indicates a steady and increasing growth in the floriculture export sector.

3.3.2 Production and distribution centre

States like Karnataka, Andhra Pradesh, Tamil Nadu, and Madhya Pradesh play a major role in flower production in India. Karnataka, in particular, is a major centre of flower production, contributing significantly to the total national production (253.24 thousand tonnes). This shows that these regions have a favourable climate and infrastructure for floriculture production. The Government of India has also identified great potential in zones like Bangalore, Hyderabad, Pune and New Delhi to further develop the sector.

While the floriculture industry in India has great potential, the marketing system is still poorly organised. In most markets, flowers are treated in a simple manner, such as packaging in sacks or cardboard boxes and shipping by road or air. This creates challenges in ensuring that the flowers reach the market in good condition and with maintained quality. Most flower markets in India operate outdoors with flowers stored in inadequate containers. Large markets such as in Coimbatore, Madras and Bangalore show that there are major distribution centres, but non-standardised systems can affect the competitiveness and efficiency of flower distribution, especially for exports.

3.3.3 Challenge

Flowers are packed in very simple ways, such as using gunny sacks, bamboo baskets, or cardboard boxes. Improper packaging can cause damage or degradation to the quality of the flowers, which impacts the selling value and consumer satisfaction, especially in international markets. Flower delivery by road or air still faces challenges in efficiency and speed. Ground shipments, such as trains, may take longer than air shipments, which may affect the freshness of the flowers, especially for export.

3.3.4 Governement policies

The government of India has constituted an expert committee to plan measures to enhance the development of the floriculture sector. The measure is the identification of potential regions for cut flower production. This shows that there is a strong effort to improve the infrastructure and organisation of the sector. It is could open up opportunities for more stable and more structured growth. Programmes such as the National Horticultural Mission (NHM), APEDA, and NABARD focus on infrastructure development, production capacity building, and financial support for floriculture farmers and entrepreneurs. Government support in reducing export barriers, such as shipping costs and infrastructure development, has fuelled the growth of India's floriculture exports. However, challenges such as climate change and reliance on smallholder farmers remain a concern.

3.4 Discussion of Indonesia

3.4.1 The size and growth of the floriculture industry in Indonesia

The ornamental plant industry in Indonesia has great potential in both domestic and international markets. This is evidenced by its significant contribution to the GDP of the horticulture sector. However, challenges such as declining harvest areas, imbalance between demand and supply, and limited infrastructure, hamper the progress of the floriculture industry in Indonesia. To capitalise on existing export opportunities, Indonesia needs to increase production capacity, improve distribution systems, and pay attention to the quality and diversity of ornamental plant products offered. Support from the government sector and technological innovation will also be instrumental in boosting the sector to a wider global market.

According to data, Indonesia's ornamental plants have major commodities that dominate the domestic and international markets, such as chrysanthemums, roses, tuberose, gerberas, and anthuriums. Chrysanthemum, with the largest contribution of 57.24% in the production of ornamental stem plants in 2023, shows the popularity of this plant, both for local and export markets. Meanwhile, plants such as philodendron, anthurium, aglaonema, and sansevieria, which are appreciated in whole plant form, have become an important sector in Indonesia's ornamental plant commodities. This indicates the variety and diversity in Indonesia's ornamental plant industry, which can appeal to various market segments.

The decrease in harvested area in 2023 for ornamental plants in stem and tree units reflects the challenge of maintaining sufficient production of ornamental plants to meet market demand. This decline could be due to several factors, such as climate change, lack of adequate agricultural technology, or constraints in infrastructure that hamper the horticulture sector.

3.4.2 Production and distribution centre

Indonesia has several regions with large ornamental plant production centres, such as West Java, Central Java, and East Java for chrysanthemums, roses, and sedges, and North Sumatra for roses and sedges. This shows that Indonesia's horticulture sector has a relatively even distribution across regions, with strong production centres in certain areas. Indonesian ornamental plants also have great export opportunities, with growing global demand, especially from countries in the Middle East, Europe, East Asia, and the United States. However, decreasing harvested area and fluctuating production can be an obstacle to meeting this demand.

Indonesia's ornamental plant industry shows a significant contribution to GDP, particularly in the horticulture sector. In the 2019-2022 period, this sector recorded a growth of 4.22%, although it still lags behind the livestock sector which grew by 6.24%. This growth shows that the ornamental plant industry has the potential to continue to grow, but

still requires improvements in production capacity and infrastructure to enlarge its contribution. The increasing demand for ornamental plants in the international market shows that Indonesia has a great opportunity to become a major player in the global ornamental plant industry. However, this must be balanced with an increase in production capacity, both in terms of quality and quantity, as well as support from the infrastructure sector, technology, and more organised marketing.

3.4.3 Challenge and government policies

Although the demand for ornamental plants continues to rise, the industry faces challenges in meeting the growing market demand, especially from high-need countries. High demand for certain types of plants means that farmers have to increase their production capacity. This indicates that there is market potential that has not been fully utilised. Therefore, Indonesia needs to increase production capacity and improve distribution processes to compete in the global market. In addition, increasing global demand requires improvements in production management, agricultural technology, and the development of supporting infrastructure, such as irrigation and transport systems. If Indonesia wants to compete with other countries in the ornamental plant industry, these problems must be addressed immediately.

Indonesia has shown great interest in the floriculture industry with various policies that support sustainability and export market development. Programmes such as the Minister of Agriculture Decree No. 104/KPTS/HK and the Minister of Agriculture Regulation No. 22 of 2021 on Good Horticultural Practices prioritise environmentally friendly and sustainable production. The floriculture sector has a great opportunity to increase exports and competitiveness in the global market after Indonesia joined the G-20.

4. Conclusions

India ranks 25th as an exporting country and 53rd as an importing country of floriculture in the world, with the top five exported floriculture products being dried flowers, live plants, roses, cut flowers and others. By 2023, India's total floriculture production was 21,024.41 million tons, with export earnings of 707.81 crore rupees (1 crore is equivalent to USD 120,382). The main destination countries for Indian flower exports are the United States, the Netherlands, the United Kingdom and Germany. Challenges in India's floriculture export sector include the limited number of flights, inadequate infrastructure and poorly organized marketing. All these challenges hamper the delivery and sale of floriculture products to the global market. To improve competitiveness, India needs to improve product quality, expand export markets, and improve infrastructure that supports the floriculture industry.

The Government of India supports the development of the sector through various policies and programs, including the National Horticultural Mission (NHM), which provides financial support for farmers to build gardens and high-tech gardening facilities. In addition, agencies such as APEDA and NABARD also play a role in supporting floriculture exports by offering subsidies and financing, as well as training programs to improve farmers' skills. Other export-oriented programs for floriculture products include the Rashtriya Krishi Vikas Yojana (RKVY) and the National Mission for Sustainable Agriculture (NMSA). Both programs focus on building sustainable agricultural infrastructure and developing agricultural technology. In addition to national programs, there are also initiatives tailored to state needs, such as the Mission for Integrated Development of Horticulture (MIDH), which supports the development of floriculture according to local needs.

Indonesia is one of the major producers of ornamental plants in the global market, with its leading products including potted plants such as ferns, philodendrons and dracaena. By 2023, Indonesia's ornamental plant production reached 811.72 million stems and 40.66 million trees. The main commodities of Indonesian ornamental plants are chrysanthemums,

roses, and tuberose. Indonesia's ornamental plant export market is growing rapidly, with major destination countries such as Japan, Taiwan, and Malaysia. Although exports are increasing, challenges facing the sector include limited supply and infrastructure. The Indonesian government supports the industry through policies and programs such as the Minister of Agriculture Decree and sustainable horticulture guidelines, as well as providing protection for farmers through subsidies and price regulation. As a member of the G-20, Indonesia has the opportunity to expand its international trade, especially in the floriculture sector. However, Indonesia does not yet have a series of special programs in floriculture like India does. Therefore, the Indonesian government should promote special programs in the floriculture sector to improve the quality and quantity of floriculture products, especially export products.

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References
Anumala, N. V., & Kumar, R. (2021). Floriculture sector in India: current status and export potential. *Journal of Horticultural Science and Biotechnology*, *96*(5), 673–680. https://doi.org/10.1080/14620316.2021.1902863.

Astuti, E. P., Nurmalina, R., & Rifin, A. (2022). The Competitiveness of Indonesian Agricultural Products in G-20 Market. *Agro Ekonomi*, *33*(1). https://doi.org/10.22146/ae.72321.

Badan Karantina Indonesia. (2020, June 12). *Makin Laris, Ekspor Tanaman Hias ke Mancanegara*. Badan Karantina Indonesia.

Badan Pusat Statistik. (2018). *Statistik Tanaman Hias Indonesia 2018*. Badan Pusat Statistik.

Badan Pusat Statistik. (2024a). *Buletin Statistik Perdagangan Luar Negeri: Ekspor*. Badan Pusat Statistik.

Badan Pusat Statistik. (2024b). *Statistik Perusahaan Hortikultura dan Usaha Hortikultura Lainnya*. Badan Pusat Statistik.

Bobde, A., Bhinde, H. N., Burande, A., & Agarwal, P. (2023). An Analysis of Government Schemes Promoting Floriculture And Horticulture: Case Study Of India. *Madhya Pradesh Journal of Social Sciences*, *28*. https://doi.org/10.13140/RG.2.2.25657.13926

Borbaruah, R. (2023). Sustainable Practices in Floriculture . In A. Burud, S. M. Kolur, K. DR, D. L. Kumar, D. Yadav, & N. Kaushal (Eds.), *Floriculture and Landscaping Chronicles: A Collaborative Insights* (1st ed., pp. 145–163). Stella International Publication.

Burud, A., Kolur, S. M., Karthik, D. R., Kumar, D. L., Yadav, D., Kaushal, N. (2023). *Floriculture and Landscaping Chronicles: ACollaborative Insight* (pp. 126–144). Stella International Publication.

Chittibomma, K., Naorem, C., Singh, H. B., G, J. T., Patil, A. A., G, H., Vaishnavi, C. S., & Kumari, T. (2023). Opportunities and challenges in the floriculture industry for entrepreneurship development in the North East Region of India. *International Journal of Statistics and Applied Mathematics*, *8*(6S), 1340–1346. https://doi.org/10.22271/maths.2023.v8.i6sr.1568.

De, L. C., Anumala, N. V., Kumar, A., Biswas, S. S., Ns, K., Natta, S., Gowda, C., & Das, S. P. (2024). Impact of Climate Change on Floriculture Industry of India. *Medicon Agriculture & Environmental Sciences*, *7*(4), 26–33. https://themedicon.com/journals/agricultureenvironmental/MCAES-07-207

Direktorat Jenderal Hortikultura (2024). *Angka Tetap Hortikultura 2023*. Kementerian Pertanian Republik Indonesia. hortikultura.pertanian.go.id/wp-content/uploads/2024/04/buku_atap_2023.pdf

Ferrante, A., & Ferrini, F. (2023). Floriculture and landscapes: Perspectives and challenges. *Frontiers in Horticulture, 2*. https://doi.org/10.3389/fhort.2023.1123298

Haokip, S. W., Chamuah, S., Lalrinngheta, J., & Devi, O. B. (Eds.). (2023). *Frontiers in horticulture sustainability* (Vol. 1). International Book Publisher. https://doi.org/10.22271/int.book.325

Ho, T., Kumar, A., & Shiwakoti, N. (2020). Supply chain collaboration and performance: An empirical study of maturity model. *SN Applied Sciences, 2*, 726. https://doi.org/10.1007/s42452-020-2468-y

Horen, L. Van. (2022, January 13). *A Mixed Bouquet of Developments in Floriculture: World Floriculture Map 2021*. Rabobank. https://www.rabobank.com/knowledge/q011329298-a-mixed-bouquet-of-developments-in-floriculture-world-floriculture-map-2021.

Kumar, A., Pathania, S., Kashyap, B., Dhiman, R., & Gupta, Y. C. (2024). A decade analysis of flower area, production and instability index-A review. *Journal of Ornamental Horticulture*, *27*(1), 1–10. https://doi.org/10.5958/2249-880X.2024.00002.1.

Kumarasamy, N., & Harshavardhini, G. (2021). *Production and Export Performance of Indian Floricultural Sector*. *2*(2). http://apeda.gov.in/.

Limanseto, H. (2021, May 7). *Airlangga Hartarto: Tingkatkan Ekspor Florikultura, Penuhi Ceruk Pasar Dunia*. Kementerian Koordinator Bidang Perekonomian. https://ekon.go.id/publikasi/detail/2978/airlangga-hartarto-tingkatkan-ekspor-florikultura-penuhi-ceruk-pasar-dunia.

Malviya, A. J., Vala, M., & Mankad, A. (2022). Recent Floriculture in India. *International Association of Biologicals and Computation Digest*, *1*(1). https://doi.org/10.56588/iabcd.v1i1.8

Mayak, S., Bravdo, B., Gvilli, A., Halevy, A.H. (1973). Improvement of opening of cut gladioli flowers by pretreatment with high sugar concentrations. *Scientia Horticulturae, 1*(4), 357-365. https://doi.org/10.1016/0304-4238(73)90020-4

Mubarok, S., Suminar, E., Karyani, T., Rufaidah, F., Sari, D. N., & Rahmat, B. P. N. (2023). An Overview of the Increasing Ornamental Plant Business in Indonesia Post-COVID-19 Pandemic as a Result of Social Media and Its Future Perspective. *Sustainability (Switzerland)*, *15*(19). https://doi.org/10.3390/su151914211.

Pusat Data dan Sistem Informasi Pertanian. (2023). *Analisis PDB Sektor Pertanian Tahun 2023*. Kementerian Pertanian. https://satudata.pertanian.go.id/details/publikasi/489

Salachna, P. (2022). Trends in Ornamental Plant Production. In *Horticulturae* (Vol. 8, Issue 5). MDPI. https://doi.org/10.3390/horticulturae8050413.

Simamora, L., Zebua, D. D. N., & Handoko, Y. A. (2023). Analysis of Competitiveness and Government Policies on Indonesian White Jasmine (Jasminum sambac) Farming. *Jurnal Sosial Ekonomi Dan Kebijakan Pertanian*, *7*(1), 212–222. http://ejournal2.undip.ac.id/index.php/.

Sinha, D., & Sharma, R. (2022). Impact of the National Horticulture Mission on the Growth of the Indian Floriculture Industry. *International Journal of Accounting, Business and Finance, 1*(2), 1–10. https://doi.org/10.55429/ijabf.v1i2.52

Sowmya, & Harisha, N. (2024). Growth and export of floriculture in India: A review. EPRA International Journal of Agriculture and Rural Economic Research, 12(2). https://eprajournals.com/IJIR/article/12285

Wani, M. A., Nazki, I. T., Din, A., Iqbal, S., Wani, S. A., Khan, F. U., & Neelofar. (2018). Floriculture Sustainability Initiative: The dawn of a new era. In E. Lichtfouse (Ed.), *Sustainable Agriculture Reviews* (Vol. 27, pp. 91–127). Springer, Cham. https://doi.org/10.1007/978-3-319-75190-0_4

Wei, X., Khachatryan, H., Hodges, A., Hall, C., Palma, M., Torres, A., & Brumfield, R. (2023). Exploring market choices in the US ornamental horticulture industry. *Agribusiness*, *39*(1), 65–109. https://doi.org/10.1002/agr.21769

Wiguna, I. (2020, February). *Membidik Pasar Aroid*. Majalah Trubus, 50–53. https://trubus.id/membidik-pasar-aroid/

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