Floriculture Industries, Opportunities and Challenges in Indian Hills

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Abstract The hill regions of India include Himachal Pradesh, J&K, Uttarakhand and the North Eastern region (NE) comprising states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim, has been identified as a potential area for the development of floriculture owing to its diverse geo-climatic conditions and floral biodiversity. The existing flower crops in NE region include orchids, roses, lilies, bulbous ornamentals, bird of paradise, gerbera, marigold, tuberose, begonia, dahlia, etc. Out of 1331 species of orchids reported, 856 species are found in this region including rare and endangered species of other ornamentals also. State wise floricultural activities, infrastructure, marketing and transport facilities, constraints, opportunities and relevant strategies discussed in details for the region.

Keywords Flower crops, North Eastern region

Introduction Floriculture has blossomed into commercial activity with a considerable growth and a useful crop diversification option, particularly for small farmers over the past three decades. India has now emerged as second largest grower of flowers after China. About 232.74 thousand hectares area is under cultivation in floriculture in 2012-13. Production of flowers are estimated to be 1.729 million tonnes loose flowers and 76.73 million tonnes cut flowers in 2012-13. The country has exported 22,485.21 MT of floriculture products to the world for the worth of Rs. 455.90 crores in 2013-14. Leading cut flower producing states of India are West Bengal (33%), Jharkhand (12%), Himachal Pradesh (10%), Andhra Pradesh (9%), Orissa (8%) and Assam (5%). Leading loose flower producing states in India are Tamil Nadu (18%), Andhra Pradesh (13%), Maharashtra (13%), Karnataka (12%) and Chhatisgarh (11%).

Globally 171 countries practice floriculture. India occupies 51st position in terms of exports and contributes Rs. 455 crores which is 0.06% of global trade. Top ten importing countries for Indian flowers are USA, Netherlands, Germany, UK, UAE, Japan, Canada, Italy, Australia and China.

The hill regions include Himachal Pradesh, J&K, Uttarakhand and the North Eastern region (NE) comprising states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim, has been identified as a potential area for the development of floriculture owing to its diverse geo-climatic conditions and floral biodiversity (Table 1). Mizoram and Meghalaya have already started commercial cultivation and export of anthurium, lilium in Nagaland, orchids and bulbous ornamentals in Sikkim. A wide variety of flowers have been used in the social and cultural life of the region (Table 2).

The existing flower crops in NE region include orchids, roses, lilies, bulbous ornamentals, bird of paradise, gerbera, marigold, tuberose, begonia, dahlia, etc (Table 3). Out of 1331 species of orchids reported, 856 species are found in this region including rare and endangered species of other ornamentals also e.g. Siroi Lily (Lilium mackliniae), a rare and endangered species endemic to Manipur only, is found their natural habitat (Chowdhery, 2009; Nayar and Sastry, 1990). Considering the importance of floriculture in NE region, an Agri-Export Zones (AEZ) has been set up exclusively for floriculture in Sikkim. The floriculture industry includes:
1. Floristic trade of cut flowers, cut foliage and potted flowering and foliage plants
2. Production and sale of seeds, bulbs, corms, rhizomes, tubers and tuberous roots of ornamental plants
3. Plant nursery business and production of tissue culture raised plants
4. Production of flower perfumes, essential oil, attar and concrete
5. Production of dried flowers and plant parts
6. Landscaping and turf grass industry

Table 1 Statewise area covered by flower cultivation

| Sl. no | States                     | Area under production (ha) | 2009-2010 | 2010-2011 | 2011-2012 |
|--------|----------------------------|----------------------------|-----------|-----------|-----------|
| 1      | Arunachal Pradesh          | 100                        | 185       | 143       |           |
| 2      | Assam                      | 577                        | -         | 0         |           |
| 3      | Manipur                    | 694                        | 505       | 629       |           |
| 4      | Meghalaya                  | 263                        | 281       | 503       |           |
| 5      | Mizoram                    | 620                        | 275       | 202       |           |
| 6      | Nagaland                   | 730                        | 870       | 785       |           |
| 7      | Sikkim                     | 813                        | 470       | 645       |           |
| 8      | Tripura                    | 124                        | 221       | 132       |           |
| 9      | Himachal Pradesh           | 170                        | 44        | 220       |           |
| 10     | Jammu & Kashmir            | 570                        | 241       | 87        |           |
| 11     | Uttarakhand                | 877                        | 89        | 156       |           |
| 12     | Total                      | 5538                       | 3181      | 3502      |           |

Floriculture Activities in Hilly States

**Assam:** The floriculture sector in the state is in a nascent stage at present while the market holds great potential. Varied climate and soil types of Assam make congenial for commercial of different floriculture crops. During last two years, two new crops mainly dendrobium and anthurium were introduced to cultivators under greenhouse condition. The commercial cultivation of dendrobium and anthurium is now taken up in upper Assam especially in Jorhat, Navgaon, Morigaon, Kokrajhar, Kamrup, etc districts of Assam. The flowers are grown by farmers under buyback system. The Mainow Orchid Growers Society in Kokrajhar district is the first orchid project in the State. This society could earn Rs. 1.20 lakh in just 10 months by selling cut flowers. Another SHG in Kamrup district could earn Rs. 0.24 lakh during June, 2008 from anthurium. So far, 31 orchid projects covering approximately an area of 20000 sqm and 29 of anthurium projects covering approximately an area 24000 sqm under greenhouse infrastructure since 2005-06. Moreover, commercial hybrid variety of gerbera, tuberose and bird of paradise were also taken up in Kamrup district covering an area of around 200 ha during 2008-09 and 2009-10.

**Arunachal Pradesh:** Diversified climatic zones of Arunachal Pradesh are congenial for almost all the flowers grown in India, but the State Department of Horticulture is emphasizing on cultivation of top ten cut flowers like gerbera, anthurium, rose and carnations, etc (Table 4). Commercial cultivation of these flowers has been successful, opening a huge prospect for State to emerge as a major producer of fresh cut flowers. At present, area covered under floriculture is about 1220 ha, producing about 286 million stems. In addition to these, the popularity of flowering potted plants and ornamental foliage are ever increasing. Floriculture development in Arunachal Pradesh is mainly confined to orchid cultivation, which has been promoted in the state as a cash crops well as a supplement crop in Jhum and wastelands by Forest Department. About 1331 species of orchids are reportedly available in India, of which 856 species are reportedly found in North East India, and about 600 species
Table 2 Recommended varieties under different flowers for hills (De, 2011; De, 2014)

| Name of flower | Recommended varieties |
|----------------|-----------------------|
| Anthurium      | Tropical, Midori, Acropolis, Pistache, Choco, Fantasia, Cheers, Champagne, Casino, Lady Jane, Nitta, Rainbow |
| Gerbera        | Pink Elegance, Sangria, Red Monarch, Piton, Goliath, Rosalin, Tiramissu, Salvador, Tropic Blend, Savannah for polyhouse and Alesmera, Black Heart, Divas Memory, RCGH-113, RCGH-114, RCGH-76, RCGH-86 |
| Gladiolus      | Peter Pears, Pusa Jyotyena, Her Majesty, Candyman, Chantiler, Jester, Jester Gold, White Prosperity, Legend, Priscilla, Australian Fair and Novalux |
| Heliconia      | *H. psittacorum*, *H. stricta*, and *H. angusta* |
| Cymbidium      | Bob Martin Lucky, ‘Fire Storm Blaze’, ‘Fire storm Ruby’, ‘Evarett Stockstill Bullai’, ‘Valley Legend Steff’, ‘Soul Hunt Series’, ‘Angelica December Gold’, Winter Beach Sea Green’, ‘Madrid Forest King’, ‘PCMV’, ‘H.C. Aurora’, ‘Sungold’, ‘Sparkle Late Green’ |
| Dendrobium     | ‘Big White 4N’, ‘Big White Jumbo’, ‘Bangkok Blue’, ‘Sagura Pink’, ‘Miss Singapore’, ‘Madam Pink’, ‘Sonja-16’, ‘Ear Sakul’, ‘Candy Stripe Pink’, ‘Sonja-17’, ‘Sonja-28’, ‘Dr. A. Abraham’, ‘Thongchail Gold’, ‘Kating Daang’ |
| Vanda          | Roberts Delight, ‘Dr. Anek’, ‘Pakchong Blue’, ‘Miss Joaquim’, ‘Fuch’s Delight’, ‘Lumpini Red’, ‘Motes Indigo Blue’, ‘Pat Delight’, ‘Rasri Gold’, ‘Sansai Blue’ |
| Phalaenopsis   | White Dream, ‘Florida Snow’, ‘Nobby’s Pink Lady’, ‘Minho Valentine’, ‘Sogo Zebra’, ‘Chih Shang Stripes’, ‘Okay Seven’, ‘Carmela Spots’, ‘Rousserole’, ‘Sorosa Delight’, ‘Leopard Prince’, ‘Carol Campbell’, ‘Brother Lawrence’, ‘Taipei Gold’, ‘Strawberry’ |
| Cattleya       | Day Tripper, ‘Spring Break’, ‘Beau’s Apricot Gem’, ‘Dendis Angel’, ‘Dendis Bee’, ‘Sweet Peggy’, ‘Redland Icicle’, ‘Queen Sirikhit’, ‘Ahmad Seikhi’, ‘Chinese Beauty Orchid Queen’ |
| Oncidium       | ‘Wild Cat Bob Cat’, ‘Sherry Baby Sweet Fragrance’, ‘Taka Yellow’, ‘Sweet Sugar’, ‘Gower Ramsay’, ‘Popki Red’, ‘Golden Shower’ |
| Aranda         | ‘City of Singapore’, ‘Hilda Galistan’, ‘Urmila Nandey’, ‘Christine’, ‘Thailand Sunspot’, ‘Millenium Dawn’, ‘Brogia Giant’, ‘Salaya Red’, ‘Propine White’, ‘Propin Spot’, ‘Lueng Cholburi’, ‘Ishbel Manisaki’, ‘Baytown’, ‘Chao Praya Blue’ |
| Mokara         | ‘Madam Panne’, ‘Bangkok Gold’, ‘Chao Praya Gold’, ‘Chark Kuan Orange’, ‘Chark Kuan Pink’, ‘Kelvin Red’, ‘Kelvin Orange’, ‘Walter Ouam’, ‘Jotti Orange’, ‘Happy Beauty’ |
| Rose           | First Red, Noblesse, Golden Gate, Cherry Red, Corvette, Iceberg, Rakthia, Raktagandha, Arjun, G.S. Randhawa, Vivaldi, Sonia, Happiness, Super Star, Grand Gala. |
| Tuberose       | Single. Semi double, Double flowered tuberose. Important varieties are Single, Rajat Rekh (mutant), Swarna Rekh (mutant), Shringar, Semi Double, Suvasini, Prajwal and Vaibhav |
| Chrysanthemum  | Yellow Star, White Star, Tata Centenary, Poornima, Surf, Nanako, Ajay |
| Carnation      | Happy Golem, Baltic, Arka Flame, Tempo, Snow Storm, Tamarind, Lady Green, Madras, Marathon |
| Marigold       | Inca Series, Climax Series, Pusa Basanti, Super Petite, Boy-Boy, Red Brocade, Queen Sofia |

are reportedly found in Arunachal Pradesh alone (Hegde, 2000; Hegde, 2005). At present, a couple of orchid growers who have taken up Cymbidium farming for markets in Delhi and Kolkata. These farms are mainly located in the Hapoli / Ziro area in the lower Subansiri District. Orchids, particularly Cymbidium are the only commercial flower crop in the state at present. The Orchid Division of the State Forest Research Institute (SFRI), Orchid Research Centre at Tipi, Bhalukpong (West Kameng District), and also at Itanagar, has been multiplying the Cymbidium planting material through tissue culture for distribution among the growers as well as for conducting demonstration trials.

Most of the flowers produced are sent to Guwahati (Assam) by road, from where they are further transported to different parts of India for sale, a part of which is exported to several destinations. With streamlining of transport system (Rail, Road, Air) in the State, new avenue for improved marketing will emerge for such highly perishable produce. Arunachal Pradesh with its high quality produce and low cost of production would make its produce most competitive.
Table 3 Potential crops for Hills for different purposes

| Type of product          | Plant type                                                                                                                                 |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Fresh cut flowers       | Orchids, gladiolus, carnations, chrysanthemum, tuberose, gerbera, Anthurium, heliconia, bird of paradise, camellia.                               |
| Potted plants           | Foliage plants, shade loving plants, palms, cycads, cactus and succulents.                                                                     |
| Dry flowers             | Most of the flowers in the forest, stems, shoots, fruits and foliages.                                                                        |
| Bulbs, corms, rhizomes, tubers | Bulbs etc of rainy and winter season flowering ornamental plants                                                                             |
| Essential oil           | Rose, jasmine, gardenia, hachipat, katki etc.                                                                                                |

Table 4 Potential flower crops for hill region

| Sl. No. | Sates                | Crops                                                                                     |
|---------|----------------------|-------------------------------------------------------------------------------------------|
| 1.      | Assam                | Orchids (dendrobium, vanda), anthurium, marigold, tuberose, jasmine, gladiolus, gerbera, bird of paradise, chrysanthemum, lilium, rose |
|         |                      | Gerbera, rose, carnation, gladiolus, orchids (cymbidium, paphiopedilum, vanda, oncidium), lilium, anthurium, foliage, succulent plants, begonia |
| 2.      | Arunachal Pradesh    | Orchids (dendrobium), anthurium, roses, gerbera, carnation, Leather leaf ferns, marigold |
| 3.      | Manipur              | Orchids (dendrobium), calla lily, heliconia, bird of paradise, gladiolus, gerbera         |
| 4.      | Nagaland             | Dendrobium orchids, anthurium, gerbera, lilium, tuberose, marigold, gladiolus, chrysanthemum |
| 5.      | Tripura              | Anthurium, bird of paradise, rose, gladiolus                                              |
| 6.      | Mizoram              | Anthurium, rose, carnation, asiatic and oriental lilies, calla lily, bird of paradise, heliconia, gerbera, golden rod, leather leaf fern |
| 7.      | Meghalaya            | Anthurium, orchids (cymbidium, phalaenopsis, oncidium, cattleya), alstroemera, calla lily, carnation, bird of paradise, gerbera, chrysanthemum |
| 8.      | Sikkim               | Anthurium, orchids (cymbidium, phalaenopsis, oncidium, cattleya), alstroemera, calla lily, carnation, bird of paradise, gerbera, chrysanthemum |
| 9.      | H.P.                 | Marigold, Carnation, Tulip, Lilium, Gladiolus, Chrysanthemum and Rose                      |
| 10.     | J & K                | Tulip, lilium, rose, gladiolus                                                            |
| 11.     | Uttarakhand          | Carnation, lily, chrysanthemum, gladiolus, gerbera and Indian red roses                   |

**Manipur:** Manipur has good potential for commercial production of flowers. Shirui Lily, *Lilium mackliniae*, locally known as Shirui Kashung Timrawon, the state flower of Manipur is a rare and endangered species endemic to Manipur. Commercial cultivation of flowers like anthurium, gerbera, roses and dendrobium was started from 2007-08. The farmers are now earning more than three lakhs per year by selling their cut flowers of roses, anthurium and dendrobium orchids, etc. The floriculture in Manipur is characterized by cultivation of traditional flowers (loose flowers) and cut flowers under both open field conditions and protected environment conditions. The State has a great potential in dry flower sector also. It is contributing substantially to the overall trade of flowers. The other segments like fillers, potted plants, seeds and planting material, turf grass and value added products also contribute a share to the overall growth of floriculture sector in Manipur.

The cultivation of traditional loose flowers by small and marginal farmers to meet the demand for worship, garland making and decorations is recognized as the backbone of floriculture in Manipur. Of the total flower produced in the State, about 86% flowers are grown under open condition and the remaining 14% under protected conditions. The orchids, believed to have evolved in the state, is an important feature of the vegetation here. Out of 1331 species of orchids (belonging to 158 genera in India), concentrated in the Northeast region and out of which, 251 species are found in the State of Manipur alone (De and Medhi, 2014). Among the orchids found in Manipur, Dendrobium species has proved promising. Accordingly, this orchid has been prioritized by the State for large scale cultivation through four mega projects at different locations (i) Khonghampat of Imphal West District, (ii) Hengbung of Senapati District, (iii) East Garden and (iv) Megha Floritech of Imphal East District. These
centres have already started production of cut flowers which are being exported to markets outside the State by tying up with some renowned companies. The Flower Growers Association of Manipur is sending its produce of dendrobium, anthurium, carnation, gerbera, alstroemeria, leather leaf Ferns to different Metropolitan cities like Delhi, Kolkata, Bangalore, etc through the Bangalore based Florence Flora under buy-back arrangements.

Loose marigold flowers are being sent to Kolkata and Guwahati markets in bulks.

Meghalaya: Commercial floriculture is a new introduction in Meghalaya. Despite the fact that there is a deep rooted cultural love of flowers amongst the people of the state, the cultivation has been mainly confined to the growing of potted, garden and house plants for aesthetic value amongst the general populace. The launching of the Horticulture Mission changed all that with the introduction of cut flower cultivation of anthurium, roses, carnations, lilies and orchids. The invention of polyhouses further boosted the adoption of cut flower cultivation across the state. This is amply demonstrated by the fact that the area under protected floriculture (roses, anthurium, gerbera, carnations, lilies, etc) went up from almost negligible, in the pre mission days, to 35 ha during 2009-10 with an annual production of 62 lakh cut flowers. In the process new flower crops of heliconia, bird of paradise, chrysanthemum, zanthedescia, iris, gladioli and foliage plants of leather leaf fern, golden rod, limonium, have been introduced and are slowly gaining acceptance amongst the farming community. The adoption of the Hub and Spoke model of horticulture development with a distinct horti-business and marketing model as initiated by the hortihubs of Samgong in East Garo Hills and Dewlieh in Ri Bhoi District, have been hugely instrumental in the success of floriculture in the state with linkages between the producers and markets as well as the PHM infrastructure being facilitated and catered to by the horti-hubs.

A model floriculture centre has been set up at Upper Shillong and Centres of Excellence in every district have been identified and established. A Model Pilot Project on Rose is located at the Dewlieh Horticulture Farm, in Umsning, Ri Bhoi district to demonstrate viability of commercial cultivation of roses as well as one step destination for training and collection centre for existing and potential growers. An average of 2000 roses per day produced from this project, farm serving as viable revenue generator too. A Model Pilot Project on Anthurium is located at Samgong Horticulture Farm, on the outskirts of Williamnagar, East Garo Hills. It is an attraction for local farmers as well as for visitors with 3 shade net houses covering a total area of 4000m2 and 40,000 plants. The project is set up for growing of 8 varieties of anthurium from Anthura, Holland. State department of Horticulture has initiated the export of commercial varieties of roses grown under naturally ventilated polyhouse near Umsning and production of anthurium in East Garo hills.

Mizoram: The mild climate of the hills in Mizoram is favourable for growing of almost all type of flowers like anthurium, roses, bird of paradise, gladiolus, chrysanthemum etc. round the year (Table 2). Department of Horticulture started cultivation of anthurium flowers since Nov. 2002 under Technology Mission. Initially, 24 potential growers had been identified for taking up anthurium cultivation by providing quality planting materials imported from the Netherlands, shadenets, cocopeat, water tanks, sprinkler irrigation etc. At present, more than 70 different varieties of anthurium have been introduced in the State. As of now, more than 400 farmers are cultivating anthurium within the State. The Mizoram Anthurium Growers Society participated at State, National and International level exhibitions, in which the cut flowers displayed were admired by the visitors and even awarded various prizes. Cultivation of rose (Dutch Rose) on commercial Scale under Hi-Tech Green House has been introduced since 2006 covering an area of 28,500 sqm. The first cut flowers of rose were harvested in April, 2007 and continued till date. Presently, the cut flowers harvest is over 10,000/day. These cut flowers have been marketed at various cities and locations within the country. So far, 10 different world class varieties of rose are being grown in Mizoram. As of now, there are 37 Hi-Tech Green House Rose cultivators within the State. The total area under Dry flowers and Foliage cultivation is 5.6 ha. The required infrastructure includes development of land; establishment of collection centre, refrigerated vans, developing a nursery, provision for lift irrigation and water tanks, etc. Lengpui will be the main exit point of the state for the flowers to be sent outside.
Nagaland: Floriculture is one of the most important activities of the State due to the inherent love of flowers especially amongst the ladies since time immemorial. Since 2004-05, due to the tremendous push from the Department of Agriculture and Cooperation (Government of India) under Horticulture Mission, Floriculture is now one of the most flourishing industries of the State bringing a revenue of about Rs. 1.50 to Rs. 2.00 crores annually, and most importantly, offering employment opportunities to thousands of youth and SHGs. One of the important crops that are being grown under Hi-Tech Greenhouses are Calla lilies. So far, about 42 ha of area has been developed both under hi-tech and low cost greenhouses. Also, about 450 ha is being cultivated under open field conditions for heliconia, bird of paradise and dry flowers. It is estimated that about 70,000 stems of cut flowers are being produced in a week in the State. Apart from offering greenhouses and quality planting materials to the entrepreneurs, the State Department of Horticulture also provides buy-back arrangements, technical support, cold room facilities.

Nagaland is rich in flora and fauna. Commercial flower production is being given a major impetus by the government. The Department of Horticulture used to organize Flower show every year to popularize the production of commercial flowers, foliage plants and ornamentals. The main ornamental crops grown in Nagaland are: i) Ornamental plants-Orchids, amaryllis, anthurium, begonias, lilium, gerbera, chrysanthemum, dahlia, gardenia, gladiolus and marigold; ii) Foliage plants-ferns, caladium, ficus, monstera, dracaena, calathea, aralia, etc.

Women are in the forefront in floriculture activities in the state have enthusiasm in growing quality flowers like anthurium. Nagaland’s main production centers are Kohima, Dimapur, Mokokchung and Wokha. The infrastructure required such as land development, establishment of collection centre, refrigerated vans and developing a nursery.

Ramesh flowers, India’s largest exporter of dry flowers, sourcing some flowers from Nagaland. Government official is used to impart training to the people to make dry flowers. They have a tradition of making beautiful accessories from bamboo for the flower industry.

A Blossoms Florist society has been developed by Mrs. Akruzo Pusture, a house wife and amateur flower grower from Nagaland after visiting the Netherlands and Germany, auction and breeding houses in Holland. The society is now initiated to grow flowers under hi-tech polyhouse for the export market. The project is situated at Dimapur district, where the temperature ranges from 15°C in winter to 34°C in summer with an average rainfall of 1500 mm and humidity of 80%, highly suitable for anthurium. The project area is also well connected by rail head, air port and National Highway 39. The society has plans to set up 14 hi-tech polyhouses covering an area of 14,112 m² in 2005-06.

Two model greenhouses for rose and lilium have been set up in Mokokchung and Wokha districts. Kohima a hilly area with temperate climate is congenial for growing of liliums, orchids, statice, carnation, foliage plants and dry flowers.

Sikkim: The traditional floriculture of Sikkim is the cultivation of orchids and anthurium (Nayar and Sastry, 1999). However, several other flowers like rose, alstroemeria, zantedeschia, carnations, gerbera, bird of paradise, heliconia, spray chrysanthemums have also been introduced in the State (Table 2). Cymbidium is another important flower of the State. A Cymbidium Development Centre has been established to promote various activities like varietal screening, multiplication, technology up-gradation, training and skill development of farmers. Four laboratories under private sector and two under public sector have been set up for production of cymbidium clones. To further promotion production of Cymbidium, East Sikkim has been declared Agri-Export Zone. Sikkim has successfully established a number of RoseVillages, a concept which is unique to this region. As per this concept, the whole lot of farmers in a village are encouraged to adopt rose cultivation on commercial scale, using scientific inputs provided by the State Department of Horticulture under the Horticulture Mission. Another activity which is worth mentioning is establishment of a joint venture between the State Department of
Horticulture and Florance Flora of Bangalore for production and export of anthurium cut flowers. As a result of these interventions, the economy of the farmers has improved. Cymbidium farmers are now earning an average annual income of Rs. 35,000-Rs. 40,000/- from a unit of 500 plants. Likewise, each rose grower earns Rs. 80,000-Rs. 100,000/- from an area of 500 sqm. Gerbera farmer’s have recorded an earnings of Rs. 25,000-Rs. 30,000/- from an area of 134 sqm. The average income per unit area probably is the highest in floriculture, ranging from Rs. 100 to Rs. 200 per sqm.

Currently about 210 ha of land area has been brought under commercial flower production. Oriental lilium targeting Gulf, Japan and U.K, Alstroemeria for other SAARC countries, carnation for SAARC countries and Gulf, potted plants and flower bulbs are other items grown in the state. Flower bulbs are basically being multiplied for the European market. The main production centers are Assam Linzay, Pakyong, Majitar, Namchi and Sadamturukbumbuk. Jorethang, Melli, Sumbhuk and Turuk are the main production bases, which provide for exportable surpluses of floriculture produce to nearby markets such as Kalimpong and Siliguri.

Tripura: There has been significant progress in flower cultivation in the state after launching of Central Sector Technology Mission, especially amongst the unemployed youth. Many exotic flowers like anthurium, orchids (dendrobium), gerbera and lilium were introduced in sub-divisions adjoining the state capital of Agartala whose area have been increasing with time because of easy availability of market within and outside the state. Commercial cultivation of other open field flowers like, tuberose, gladiolus and marigold have also got a special emphasis.

Significant efforts of bodies like the North Eastern Development Finance Corporation with a new beginning of local production has just started with about 32 growers organizing themselves on a very small scale. Currently, supplies from Kolkata are meeting the local demand.

Till 2009-10, about 108 ha (including 4.6 ha under protected and 103.40 ha under open field cultivation) has been brought under this sector.

Himachal Pradesh: In the recent years, flower farmers in Himachal Pradesh have been shifting from traditional crops to high value crop-flowers. The diverse agro-climatic conditions in the hill state ensure availability of flowers from different climatic zones throughout the year. Mid-and high-altitude areas of Solan, Shimla, Sirmaur, Mandi, Kullu, Bilaspur and Chamba districts of the State have emerged as the most productive areas for flower cultivation in the State. The farmers in these regions are producing commercial varieties of Marigold, Carnation, Tulip, Lilium, Gladiolus, Chrysanthemum and Rose. Carnations produced in Himachal Pradesh are generally in high demand in the cut flower markets and fetch premium prices, due to their quality and shelf life. Most of the farmers in the Solan district grow exotic varieties of roses in greenhouses. At present, around 2,500 farmers are involved in flower cultivation in 584 hectares of land in the State. The total earnings from floriculture in the state are around Rs. 220 million a year.

Jammu and Kashmir: The practice of flower cultivation at commercial scale by individual growers is at its infancy stage in the State; however commercial cultivation is gradually increasing with boost from the State government. At present, around 300 hectares of land in the state is under cultivation of different varieties of flowers, particularly Marigold, Jasmine, Aster, Rose, Chrysanthemum and Tuberose. In the recent years, the state has been exporting flowers worth Rs. 2 crore annually and more than 300 people are associated with this sector. With the recent launch of the Tulip Garden, the State is set to become the Tulip hub of the country. Currently around 50 exotic varieties of Tulips imported from Holland are produced in over 90 acres of land, producing around 3 million Tulip bulbs annually. Other varieties grown in the State include Gladioli grown in Jammu, Kud, Chenani, Poonch and Rajouri Districts in Jammu, and Srinagar; Budhgam and Anantnag in Kashmir region, producing around one lakh stems annually; Lily is grown in Panchari, Sudhmahadev (during winter), Poonch and Rajouri (during summer) in Jammu region; and Srinagar, Budhgam, Pulwama in Kashmir region.

Uttarakhand: Floriculture is fast picking up in Uttarakhand as farmers adopt it a lucrative option as against the
traditional farming. A large number of farmers are substituting traditional farming with flower business. High altitude coupled with cold winds and moist soil makes Uttarakhand a congenial place for investment in floriculture. Farmers say that the weather conditions are conducive as flowers bloom well in low temperatures. “The cultivation takes place in polyhouses. Exquisite varieties of flowers like carnation, lily, chrysanthemum, gladiolus, gerbera and Indian red roses that are in high demand in domestic as well as in European markets are produced in the state.

Infrastructure, Transport and Marketing

There are only a few organized sector commercial floriculture units in the region such as ICL Flora Exitica, Guwahati, Nana-Koo Agro Pvt. Ltd., Ziri-Hapoli and Oriental Orchids Ltd. (Tissue culture unit), Imphal. The supporting infrastructure for commercial floriculture is presently lacking in the region. The region has one State Agricultural University and a Central Agricultural University (Assam) and a Central Agricultural University (Manipur) and a network of ICAR Research Centres for providing the technology support, though at present little floriculture technology is available with them. Lack of proper transport facilities in one of the major reasons for a poor level of commercial floriculture activity in the region. There are a number of National Highways in the region connecting the state capitals. The rail network in the region is mainly concentrated in the state of Assam. AAI and NEC have together been funding upgradation of these airports. Guwahati airport is the only airport in the region with night landing facilities. The market infrastructure in the region is very poor. There are no integrated post-harvest management facilities, collection centres or auction centres. In many states, there are no retail markets for flowers, even the major market related activities are confined primarily to the respective state capitals. The only active flower markets in the region are Sukreshwar Ghat (Guwahati) and Ima Market (Imphal). There are no cold storages for flowers in the region.

The cut flowers produced in different parts of Himachal Pradesh are being sold through different marketing channels viz. commission agents, wholesalers, registered companies, cooperatives or retailers to different markets. The main cut flower markets are located in Delhi, Mumbai, Pune, Bangalore, Chandigarh, Ludhiana, Amritsar, Jalandhar and Pathancot.

In Jammu & Kashmir, Department has linkage with departments and institutions engages in marketing of floriculture products at National and International level including Agriculture product Export Development Agency (APEDA), New Delhi.

J&K State Industrial Development Corporation extends the promotional support as well as commercial banks / NABARD provides financial assistance for floriculture project.

Constraints

1. Lack of reliable database on floricultural crops
2. Lack of uniform land tenure system and ownership right
3. Non-availability of quality seeds and planting materials
4. Necessary inputs like advanced technology, credit and transport facilities, fertilizers, pesticides, farm implements and tools and irrigations are not easily available to the growers at reasonable prices
5. Lack of adequate infrastructure facilities for quick disposal of the produce in the market
6. Floricultural crops have not been included with the overall land use planning
7. Inadequate support to postharvest management including grading, storage, marketing and processing
8. Poor extension and training efforts in the sector

Opportunities

1. Diversified topography, altitude and climatic conditions, rich fertile soil and well distributed rainfall, social and cultural activities like church meeting sessions, weddings, funerals and decorations in Meghalaya and Mizoram; existence of institutional buyers like hotels, airports and a few corporate houses demand for cut flowers, potted
plants and orchids in Guwahati, habitat of export quality orchid like Cymbidium originated from Sikkim Himalaya.

2. The region is rich in other ornamental plants like Bauhinia, Cassia, Callistemon, Erythrina, Jacaranda, Rhododendron, Azalea, Bougainvillea, Camelia, Gardenia, Hibiscus, Jatropha, Nerium, Thunbergia, palms, foliages, bulbous plants and wild flowers which could be utilized for landscaping, as component in FSRP, as potted plants, as raw materials for handicraft and dry flowers. The region is very much suitable for production of flowers seeds, bulbs, corms and other planting materials.

3. Stress should be given on foliage plants like ferns and bulbs. Bulbs can be grown for sale in plains for Amaryllis, Lilium, Gladiolus, Canna, Dahlia and Zantedeschia.

4. The agro-climatic conditions prevailing in the State of Himachal Pradesh offer excellent opportunities for the development of floriculture both to serve the internal off-season market and also for exports, an avenue yet to be tapped. A large variety of floriculture products, viz., cut flowers, bulbs, seeds, live plants, etc. can be produced as economic cash crops. Although flowers from different agro climatic zones of the State can be made available all through the year for domestic market, export quality flower produce can be ensured only by cultivation under controlled environment conditions of greenhouses.

5. Uttarakhand has almost all the different agro-geo climatic zones making it particularly conducive to commercial floriculture. Floriculture is being developed in a big way in order to meet the demand of both - the domestic as well as the foreign markets. The climate is ideal for growing flowers all round the year.

6. Employment generation through traditional flower cultivation, protected cultivation, nursery plant production, corporate landscaping, tissue culture techniques, essential oil extraction, dry flower production, seed production and lawns & parks

**Strategies**

1. Production of quality floriculture produce and maintenance of its standards with active participation of research institute and BIS.
2. Infrastructure development including roads for floriculture units, electric supply, water, cold storage at airport and training of custom officials for faster and careful clearance
3. Development of HYV of flowers and ornamental plants for domestic market
4. Pest management at blooming period through indigenous research and knowledge
5. Development of floriculture and establishment of at least on model village of floriculture near urban area supported with modern sale centres at nearby city and linkage with APEDA for export
6. Emphasis on commercialization of flowers like rose, carnation, chrysanthemum, orchid, gladiolus, anthurium, lily, bird of paradise, gerbera, dry flowers, live plants and micropropagated plants through protected cultivation and creation of other infrastructural facilities
7. Identification of product/region as intensive floriculture zone along with the availability of large scale planting materials and post-harvest facilities to provide technical and economical support to farmers
8. In-situ and ex-situ conservation and propagation of nearly 175 endangered species of orchids available in the region.

**References**

Chowdhery H.J., 2009, Orchid diversity in northeastern states of India, The Journal of Orchid Society of India, 23(1-2): 19-42
De L.C., 2011, ‘Value addition in flowers and orchids’, pp.294, Published by New India Publishing Agency, Pitampura, New Delhi-110088
De L.C., 2014, ‘Production Technology of Commercial Flowers’, In 2 volumes Pp. 599. Published by Pointer Publisher, Jaipur, Rajasthan
De L.C., and Medhi R.P., 2014, Diversity and conservation of rare and endemic orchids of North East India- A Review, Indian Journal of Hill Farming, 27(1): 138-153

Hegde S.N., 2000, Conservation of North East Flora, Arunachal Forest News, 18(1): 2
Hegde S.N., 2005, Orchid diversity in the Eastern Himalayas, Journal of Hill Research, 18(2): 43-54
Nayar M.P., and Sastry A.R.K., 1990, Red Data Book of Indian Plants, Volume III. Botanical Survey of India
Nayar M.P. and Sastry A.R.K., 1999, Red data Book of Indian Plants, Volume 1-3, Botanical Society of India, Calcutta