STRATEGY AND ACTION PLAN FOR DEVELOPMENT OF ORCHID INDUSTRY IN NORTH EASTERN STATES OF INDIA

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MAJOR ACTION POINTS

Augmenting production area

- Demarcating suitable production zones
- Mobilization of youth in orchid cultivation
- Human resource development
- Developing production clusters
- Promotion of export oriented units
- Developing supply chain linkages
- Database development

Economising production cost

- Improved commercial varieties
- Greenhouse technology
- Production and post harvest technology

Ensuring availability of quality planting material

- Import of commercial varieties
- Licensing and multiplication
- Setting up tissue culture laboratories

Controlling the product quality

- Certified quality planting material
- Sanitary and phytosanitary measures
- Adoption of good agricultural practices (GAP)
- Development of post harvest management infrastructure
- Transportation infrastructure

Skilling Human Resource Marketing

- Strengthening supply chain linkages
- Encouraging direct sale
- Brand promotion
- Boosting domestic consumption

1.0 INTRODUCTION

The State of Manipur is gifted with serene beauty and abundant natural resource. It is encircled by nine hill ranges on all sides with a small and beautiful oval-shaped valley at the centre. The State has 0.7 per cent of the total land surface of India and supports 0.24 % population of the country. Ninety per cent of the State's geographical area is hills, and the remaining 10 per cent area is a small valley. The valley is the rice bowl of the State. The altitude at the lowest level of the valley is barely 20 m (Jiribam), and the highest at 2994 m at Mount Isii (Tenipu) above the mean sea level (Anonymous, 2021). The topography of this hilly region largely influences the climate of Manipur. The valleys experience tropical and subtropical climate, whereas the hilly region experiences temperate type of climate. The variations in climate are well reflected in its floral and faunal diversity. The State is home to 4000 species of angiosperms, including 1200 species of medicinal plants, 34 species of edible fungi, 500 species of orchids, 55 species of bamboo.

Manipur is an agricultural state, and 70 per cent of its population depends on agriculture and allied activities. Agriculture contributes a significant share to State Domestic Product and employment. Recently, horticultural and plantation crops have been introduced for commercial cultivation in the State. However, selecting low-volume, high-value crops with high export potential is desirable considering the State's geographic location and inherent constraints. Orchids are high-value crops and are in great demand in national and international markets.
Considering the climatic diversity ranging from tropical humid to temperate, abundant water,

human resources, proximity with Myanmar, orchids hold good prospects for commercial cultivation. The State is home of 389 native species of orchids belong 97 genera distributing from hills to valleys (Rao and Kumar, 2018). Commercialising orchid cultivation in the State would create employment opportunities for rural educated unemployed youth but also helpful in curtailing the import bills on the import of orchid flowers and planting materials.

2.0 STATUS OF ORCHID CULTIVATION

The commercial cultivation of orchids in the state is negligible. However, there are many enthusiasts growing orchids as their hobby. The State's Wildlife Forest Department has conserved 310 species at Orchidaceous Plant Preservation Centre, Khonghampat, Manipur (Sadananda,2019). The Orchid Research and Development Centre (ORDC), Hengbung, Senapati Dist. has a collection of 16,500 accessions of the 285 native orchid species belonging to 65 genera.

3.0 OPPORTUNITIES FOR MANIPUR

The commercial cultivation of orchids includes plant breeders who breed the varieties, multipliers or tissue culturists multiply the selected variety and supply the planting materials to orchid growers, and cultivators produce cut-flower and pot plants for domestic or export markets. The post-harvest handling, transportation, and marketing of cut flowers and pot plants are either carried out by producers or through agencies or intermediaries. Additionally, orchids can also be cultivated to supply raw material to herbal industries. The ancillary industries supply the inputs like plant nutrition, plant protection chemicals, construct polyhouses etc. Thus, orchid cultivation, apart from being labour intensive, also generates ample job opportunities for young educated rural and urban youth under different activities. The State also have prospects for exporting orchids to Myanmar and other neighbouring countries apart from meeting the domestic demand.

4.0 ORCHID PRODUCTION POTENTIAL

4.1 Congenial climatic

The State has two physiographic regions- Hills and Valleys. The Hills occupy about 90 per cent of the total area under

State, and the Valleys occupy 10 per cent of the State's total area. The average elevations in hills vary between 1,500 and 1,800 metres is ideal for the cultivation of Cymbidium orchids. The climate is warm in the valley and cold in the mountains. In summer, the average maximum temperature is about 32–34 ° C, while in the winter, temperatures can drop to about 1–2 °C. Rainfall is abundant, with approximately 1,650 mm of precipitation occurring annually. The State receives well-distributed sufficient rainfall except for November through February. The favourable climate offers an excellent opportunity to grow many horticultural crops, including orchids. However, low volume high-value crops are preferred where the production centres are located far off the centres of consumption. Orchids are the perennial crop with a long juvenile phase ranging from 2-4 years. Therefore, one should exercise the utmost care in selecting the production location, type of orchid, and varieties for the market. As a thumb rule, large-flowered Cymbidium suit to hills 1400-1800 m altitude, miniature cymbidium suit to hills with 1000-1400 m altitude. The valleys below 1000 m altitude are ideal for growing Dendrobium, Vanda, Aranda, Mokara, Phaleanopsis etc.

4.2 Orchid genetic wealth

Manipur is one of the richest states in the orchid genetic diversity of the country. It is home to 389 taxa of orchids belonging to 90 genera (Rao and Kumar, 2018). The diversity of orchids in the state is attributed to topography and climatic diversity, large forest cover, high rainfall and humidity, etc. Species under genus Paphiopedilum (Lady's Slipper Orchids), *Vanda coerulea* (Blue vanda) and *Renanthera imschootiana* (Red vanda highly threatened in their natural habitats and has been included in Schedule -VI of the Wildlife (Protection) Act, 1972,) Orchid Research and Development Centre (ORDC), Hengbung, Senapati District of Manipur, is engaged in conservation

and masspropagation orchid genetic resources of Manipur. It has a collection of 16,500 accessions belonging to about 285 native orchid species distributed 65 genera. In addition, the Orchidaceous Plant Preservation Center, Khonghampat of Wildlife Forest Division, Manipur, has conserved 310 species (Sadananda, 2019).

4.3 Organizational strength

The State has the Department of Horticulture & Soil Conservation headed by the Director. It is spread up to Sub Divisional level where Hort. Development Officer, Assistant Hort. Development Officer and Assistant Hort. Inspector is the major functionaries. The organizations like Central Agriculture University (CAU), Manipur University, Institute of Bioresources and Sustainable Development (IBSD), Orchid Research and Development Centre, Hengbung and Department of Forest (Wildlife) can play a role in the commercialization of orchids in the State. The State can also utilize other organizations located in northeastern states to develop the orchid industry in the State. In addition, the State may encourage the formation of a non-profit apex organization of flower growers, exporters which can guide and advise the government about the requirements of the flower industry in the State.

4.4 Demand in domestic and international markets

Orchids have taken a significant position in the cut flower industry due to their attractiveness, long shelf-life, high productivity, the correct season of bloom, ease of packing and transportation. The fresh Orchid cut-flower trade accounts for nearly 10 % total cut flower trade in the world. In addition to cult flowers and pot plants, orchids are also cultivated for medicinal uses. Fifty-one countries in the world export orchid cut flowers and pot plants to about 103 countries.

The top ten orchids cut flower exporters of 2019 are Netherlands, Thailand, Singapore, New Zealand, Viet Nam, China, Malaysia, Republic of Korea, Belarus and Costa Rica (Fig 1). Netherlands and Thailand exported orchid cut flowers worth 77.65 and 70.07 million US dollars in 2019. Japan, the USA, China, Italy, Viet Nam, Germany, United Kingdom, France, Australia and Singapore were the top ten importers of orchid cut flowers (Fig 2). Japan imported cut flowers worth 62.43 million US dollars and USA 22.86 million US dollars. Among the imported cut flowers, Dendrobium constituted 90 % and Phalaenopsis 8 %. In addition, to cut flowers and pot plants, there is a vast market for planting materials for cut flowers and pot plants. India imports orchid cut flowers, pot plants and planting materials of orchids from Thailand, Malaysia, Indonesia, New Zealand, Australia and the Netherlands. India imported cut flowers worth INR 3425.7 lakhs in 2015-16, which reduced to INR 1584.4 lakhs in 2019-20 (Fig 3). The export of orchid cut flowers from India are negligible (Fig 4) There are ample opportunities to substitute import and export of cut flowers, planting materials from northeastern and hilly states of India. Several orchids have therapeutic value and Indian herbal companies use them as a constituent in the formulations of herbal products.

For example, the dried tubers of an orchid *Dactylorhiza hatageria* (Salam Panja) are being sold on online platforms at INR 20,000 per kg. The scientific cultivation of medicinal orchids can benefit both herbal industries and farmers of the country's northeastern states.

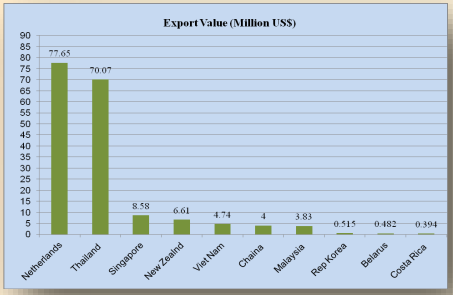

Fig. 1. Top ten orchid cut flower importing

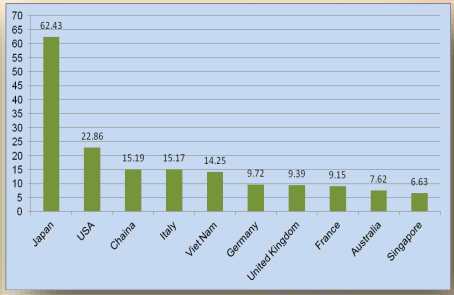

Fig. 2. Top ten orchid cut flower exporting

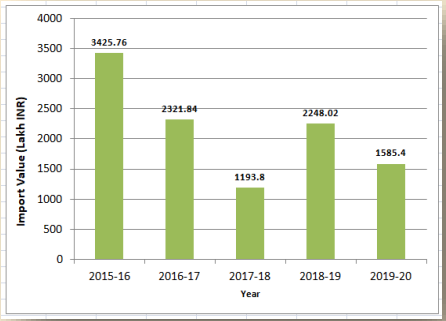

Fig3. Import of orchid cut flowers during last five years (2015-2020)

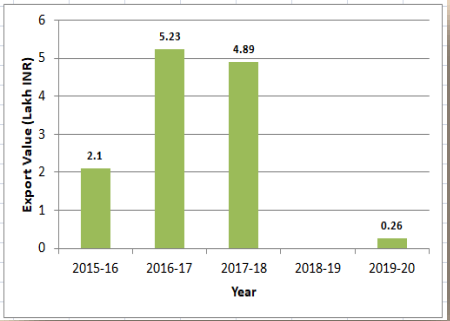

Fig4. Export of orchid cut flowers during last five years (2015-2020)

4.5 Air, rail and road connectivity

The nearest railway station is Dimapur town of Nagaland state which is 215 km away from Imphal, the state capital of Manipur. The State has air links with many major cities of India viz., Delhi, Kolkata, Guwahati, Silchar, Aizwal, Dimapur, Jaipur, Bagdogra, Chennai, Ahmedabad, Goa, Pune, Bengaluru and Mumbai. The Imphal Airport has been declared an International Airport; once the services resume, it will have international connectivity. Manipur National Highway No 2 connects Imphal with Dimapur, the state capital of Nagaland.

From Imphal, it also connects to the International border town Moreh on the Indo-Myanmar border. National High way 37 connects Imphal with Silchar in Assam

5.0 CHALLENGES IN ORCHID CULTIVATION

Unavailability of quality planting material of commercial varieties, postharvest infrastructure, high initial investment on construction of polyhouses, technical knowledge for growing orchids, and shortage of skilled human resources for cultivation, postharvest handling, and marketing orchids are the major constraints expanding orchid cultivation in the state. The majority of commercial orchid growing units import the planting material from other countries. India was a late beginner in the breeding of new varieties. There are 200 Indian bred varieties that need to be multiplied and tested for yield and quality parameters. The quality planting material of high yielding varieties either not available or very costly. Nearly 30-40 per cent of the total project cost is involved in the purchase of planting materials. Construction of polyhouses and other infrastructure takes about 40-50 per cent of the total project cost. Thus, a high investment cost is needed to be incurred on these two requirements. In addition, orchid growers and market agents lack knowledge of modern methods of cultivation and handling and marketing cut flowers and pot plants. They need to be equipped with the latest technical know-how.

6.0 STRATEGIES AND ACTION PLAN

The commercial orchid cultivation in the State is negligible. However, many hobby orchid growers are prospective commercial orchid growers of the State. The primary issue that needs immediate attention is productivity, quality, new varieties, postharvest management, and logistics. Therefore, the State should promote orchid cultivation in a mission mode approach with a targeted production volume of selected orchids.

The strategy for commercialization of orchids in the State includes (i) augmenting production area, (ii) economizing inputs and production cost, (iii) ensuring availability of quality planting material, (iv) controlling the quality of products, and (v) planning and creating infrastructure for postharvest handling and marketing.

6.1 Augmenting production area

The commercial cultivation of orchids in the State is a new beginning. Therefore, the selection of production area will have a long bearing on the production and quality of orchid cut-flowers and pot. The efforts should be made to select the areas with a congenial climate, proper transport connectivity, and sufficient water and sunshine availability. The State may consider the following points for augmenting the area under orchid cultivation.

6.1.1 Awareness about orchid cultivation

People of State are unaware of the prospects of orchid cultivation. Therefore, in collaboration with local orchid societies, flower growers association, amateur orchid growers, ORDC and ICAR-NRC for Orchids, Sikkim, the Govt. of State should create awareness about the benefits of orchid cultivation. Furthermore, the hobby orchid growers can share their experience of growing orchids during the awareness campaigns.

6.1.2 Mobilization of youths in orchid cultivation

The private investment in floriculture, including orchids, is not flowing in the State. Therefore, State has to devise its strategy to promote orchid cultivation. First, it can target hobby orchid growers who have experience in orchid cultivation to convert them to full-time commercial orchid growers. Further, unem-

cultivation as a commercial venture.

6.1.3 Human resource development

In the floriculture business, quality, quantity, and supply of products are essential for fetching higher prices from markets. The contract farming of orchids could be remunerative for small and marginal farmers in places where the availability of inputs and marketing of the produce is still a constraint. The clusters of orchid growing farmers should be backed with backward and forward linkage. The formation of FPOs of orchid cultivators in suitable orchid growing locations needs to be encouraged.

6.1.4 Developing production clusters

Quality, quantity, and continuity in the supply of the orchid cut flowers or pot plants to the market are the significant issues the small farmers face in the cultivation of orchids. The small marginal farmers also face constraints in arranging the inputs like quality planting material, plant protection chemicals etc. The area under cultivation should increase through the cluster production, leading to organised production necessary for domestic and export-oriented output of quality produce. The orchid growers should be encouraged to develop linkages among the clusters for the exchange of information. The private agencies should be encouraged to involve in the cultivation, aggregation and post-harvest management of orchids.

6.1.5 Promotion of export oriented units

The State should encourage private players to set up export-oriented units. The units would infuse new varieties for cultivation and the technology of orchid growing from other countries. In many cases, it has been observed that in the public-private partnership (PPP) mode, private companies limit themselves

only to the supply of planting material.

6.1.6 Developing supply chain linkages

In Manipur, the supply chain linkages for inputs for flower cultivation, including orchids, are very weak and need to be strengthened. A close association between the research, education and extension would benefit the commercial cultivation of orchids.

6.1.7 Database development

The State should prepare a database of orchid growers, infrastructural facilities and disseminate marketing information to the orchid growers of the State. The data would be helpful in future planning and managing investments. In addition, the data would help in assessing the performance and taking mid-term corrective measures, if needed.

6.2 Economising production cost

The input costs are increasing while market prices of the flowers are stagnant. Therefore, input use efficiency needs to be improved through technological interventions.

6.2.1 Demarcating suitable production zones

Orchids are perennial plants having a long juvenile phase ranging from 2-4 years. Therefore, one should exercise the utmost care in selecting the production location, type of orchid, and varieties for the market. As a thumb rule, large-flowered Cymbidium suit to hills 1400-1800 m altitude, miniature cymbidium suit to hills with 1000-1400 m altitude. The valleys below 1000 m altitude are ideal for growing Dendrobium, Vanda, Aranda, Mokara, Phaleanopsis etc. The GIS mapping tools help to demarcate production zones for different kinds of orchids. Suitable locations with optimum temperature, light

humidity would reduce the construction cost of polyhouses. In addition, the production zones should have better road connectivity, postharvest handling infrastructure, telecommunication facility for easy movement of products and inputs.

6.2.2 Developing indigenous commercial varieties

New and improved varieties of cut flowers or pot plants form the backbone of the flower industry. Breeders, therefore, play an important role by developing the varieties and hybrids and help in the production of planting materials for the commercial growers. However, the consumers' preference keeps changing, and the breeders are under continuous pressure to replace the varieties as the requirements of the markets. A new cultivar of orchids takes at least 7-14 years, depending upon the orchids and breeding method used. The State has two orchid conservatories, ORDC, Hengbung and Orchidaceous Plant Preservation Center, Khonghampat. The germplasm conserved in these centres can be used for the breeding of new varieties. Dr K. Rajkumar Kishore, Manipur University, has registered five orchid hybrids, namely Kangla, N. Biren, Siv Shidu, Okram Ibobi, and Momon Shija, using indigenous species. The same can be tested and used for commercial cultivation.

6.2.3 Greenhouse technology

The permanent shelters/polyhouses involve high initial investment cost (Rs 700-1000/ m2) and beyond the financial capacity of small and marginal farmers. The Govt. of the State may create the basic infrastructure for the farmers at the initial stage. The low-cost polyhouses made from bamboo would reduce initial investment. The technology for enhancing the lifespan of bamboos has been developed and popularized to treat bamboos to construct low-cost polyhouses.

6.2.4 Production and post harvest technology

Technological interventions related to production practices such as production system, planting containers, integrated nutrient management, integrated pest and disease management, controlling production season etc. control should be directed to maximize the profit of orchid grower. Furthermore, the optimized postharvest management practices like grading and sorting, treatments for enhancing vase-life, packaging, fumigation, protocols for long-distance shipment, and value addition would help realize the market's best prices. ICAR-NRC for Orchids, Sikkim is engaged in developing production and postharvest technologies for orchid cultivation.

6.3 Ensuring availability of quality planting materials

Availability of quality planting material of commercial varieties is one of the major issues in expanding orchid cultivation in the State. The old varieties are inferior in quality and have low productivity. Therefore, high-yielding varieties should be introduced for commercial cultivation. Moreover, the native species of State with ornamental/medicinal value should be multiplied for commercial cultivation.

6.3.1 Setting up tissue culture laboratories

Propagation of orchids through conventional methods is very slow, and the planting material produced through these methods is not uniform. In contrast, tissue culture techniques help to produce a large quantity of uniform, disease-free planting material in a short duration. Therefore, the State should emphasise setting up a tissue culture laboratory to produce planting material. The educated unemployed youths should be trained in tissue culture techniques and encouraged for setting up tissue culture laboratories.

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6.3.2 Introduction of orchid varieties

There are a few commercial orchid varieties are available for cultivation in the State. Therefore, the State Department of Horticulture should introduce the commercial varieties of Cymbidium, Dendrobium, Phalaenopsis, Vanda, Aranda, Mokara, Cattleya etc., for multiplication and cultivation.

6.4 Controlling the product quality

The majority of orchid cultivators are not cautious about the quality of their produce. Among other factors, quality is essential to realise the price from the market. The farmers/ postharvest managers need to be trained in modern harvesting methods, postharvest handling, and approved methods for enhancing vase life, packaging, etc. The State should also train the line department staff in implementing phytosanitary measures, plant variety protection, and planting material certification. The non-tariff barriers associated with the export of orchids need to be recorded. Information about them should be disseminated to the orchid cultivators so that growers should undertake them at the farm level.

6.4.1 Certified quality planting material

Orchid is a perennial crop and infected by various diseases and pests during cultivation. The viral diseases viz. Cymbidium Mosaic Virus (CyMV), Odontoglossum and Ring Spot Virus (ORSV) are more prevalent cause severe damage to orchids. These diseases are transmitted during the propagation of orchids. Department of Biotechnology, Govt. of India, implements the National Certification System for Tissue Culture Raised Plants (NCS-TCP) to produce certified quality planting material. The DBT recognises tissue culture laboratories based on compliance with technical capabilities, infrastructure, package of practices and documentation/ record keeping. The recognised tissue culture laboratories eligible to get certified tissue culture raised planting material certified from accredited testing laboratories. The State should encourage the tissue culture laboratories to get recognised under NCS-TCP.

6.4.2 Sanitary and phytosanitary measures

The importing countries strictly impose sanitary and phytosanitary regulations, provisions under the plant variety protection and seed act, foreign exchange and foreign trade act, labelling regulations, etc., on importing cult flowers and pot plants. The consignments should be accompanied by Phytosanitary Certificate issued by the competent government agency in the exporting country. If any violations occur, the importer is ordered to fumigate, discard, or reship the consignment. Phytosanitary measures are likely to play an important role in exporting orchid cut flowers and pot plants. The Govt of State can constitute a team of inspectors to inspect and rank the orchid production units based on the adoption of sanitary and phytosanitary measures.

6.4.3 Adoption of good agricultural practices (GAP)

The GAP in orchids includes farm conditions, greenhouse, pest control, preharvest production, harvesting and post harvest practices, personal health and training workers and record keeping. ICAR-NRC for Orchids, Sikkim is developing good agricultural practices on orchids and same will be available soon.

6.4.5 Development of post harvest management infrastructure

Post-harvest management helps maintain the quality of the produce by minimising the losses caused by physical, biological and environmental factors. The post-harvest losses occur at the farm, whole seller and retailer's level in a value chain. The unit operations involved in post-harvest handling of orchids include harvesting, grading, pretreatment/ pulsing, tubing, sleeving or prepackaging, packaging, storage and transportation. The lack of post-harvest infrastructure deteriorates the quality of perishables, including orchids. The appropriate post harvest infrastructure should be developed in the State.

6.5 Skilling human resource

Orchid growing is labour intensive, and induction of professionalism in orchid cultivation requires skill development from farmers to managers for proper development of the orchid industry. The State should encourage the orchid farmers, farmers producer organizations, extension functionaries, master trainers to undertake training on the quality aspects of production, postharvest handling, packaging and transportation of cut flowers and pot plants. The vocational courses on various aspects viz. micropropagation, postharvest handling, packaging and transportation cultivation etc., need to be developed. The officers from the line Departments viz. Horticulture Officers,

Horticulture Supervisors should be trained to address the field level problem in the production and management of orchids. ICAR-NRC for Orchids, Sikkim, in collaboration with other institutes and universities, can start online and offline vocational courses related to the cultivation and management of orchids.

6.6 Marketing

Currently, State produces a minimal quantity of flowers that are sold in the capital market. However, for export markets, the varieties of orchids need to be targeted as per their requirements. The awareness about social and environmental standards is increasing in flower importing countries. These days the international flower market is characterized by many certification schemes, codes of practice and consumer labels. North Eastern Region Agriculture Marketing Corporation, Guwahati, can play a significant role in establishing the linkages with input suppliers and exporters for the marketing of orchids. There is a need to develop joint grading, packaging and branding of the product involving small growers. The state government may promote an apex organization of growers and exporters which strive to build a coordinated approach that creates national product recognition in foreign markets.

6.6.1 Strengthening supply chain linkages

Manipur is situated far off from the mainland supply chain for flowers including orchids does not exists in the region. Orchids flowers or pot plants are perishable in nature therefore supply chain has special significance in enhancing shelf life and delivery of quality product in the hands of consumer. The supply chain for orchids includes on farm handling, sorting and grading, packaging, transport and storage solutions maintain required cold chain from production to consumption. The linkages with research institutions, plant propagators, orchid

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6.6.1 Encouraging direct sale

Direct marketing bypasses the auction market system and links producers directly with the consumers. The remote buying system is becoming more popular. The web-based shops have a tracking facility and have the facility for online payment and feedback. In these cases, the packaging and value addition is to be done at the producers level. The Orchid Growers Associations, Self Help Groups should be encouraged for direct marketing using an online trading system.

6.6.2 Brand promotion

The State should promote the branding of the produce as branding enhances the market of the produce. It also gives a feedback on consumers' satisfaction. The orchid growers should be encouraged to take part in national and international flower exhibitions.

6.6.3 Boosting domestic consumption

The domestic consumption of fresh flowers, pot plants and value-added products like garlands, coarse, value-added products needs to be encouraged. Manipur receives a large number of tourists, and these value-added products can be sold to the tourist as a souvenir. In addition to increasing domestic consumption, the orchid growers, orchid societies should be encouraged to hold orchid flower shows, competitions for flower arrangements etc.

ACTION POINTS WITH INTRA AND INTER STATE RESOURCE CENTERS

Action Points	Resource Centre
Awareness program for orchid cultivation	State Department of Horticulture & Soil Conservation; ICAR-NRC for orchids, Sikkim, ORDC, Hengbung, Orchid/ Flowers Societies, Growers Associations
Mobilization of youths in orchid cultivation	State Department of Horticulture & Soil Conservation
Trainings in scientific cultivation of orchids	ICAR-NRC for Orchids, Sikkim
Setting up of model units for orchid production	State Department of Horticulture & Soil Conservation, ICAR-NRC for Orchids, Sikkim; ORDC, Hengbung
Promotion of Contract / Cooperative farming	Govt. of Manipur
Setting up of Ventures under Public Private Partnership (PPP)	Govt. of Manipur
Promotion of Export Oriented Units	Govt. of Manipur, APEDA, Orchid Growers Associations, FPO
Setting up of orchid production Clusters/FPOs	Department of Horticulture & Soil Conservation; Department of Rural Development, NABARD, NHB
Demarcation of ideal orchid production zones	ICAR-NRC for orchids, Sikkim
Technologies' for Production and postharvest handling of orchids.	ICAR-NRC for Orchids, Sikkim College of Agriculture Engineering & Post Harvest Technology, Sikkim Central Agricultural University

Promotion bamboos for construction of polyhouses	North East Council Cane and Bamboo Technology Canter Department of Horticulture & Soil Conservation
Reducing cost of planting materials	North eastern Hill University, Shillong, Meghalaya Nagaland University, Nagaland ICAR-NRC for Orchids, Sikkim Institute of Bioresource and Sustainable Development, Rajiv Gandhi University, Arunachal Pradesh
Disease diagnostic lab	ICAR-NRC for Orchids, Sikkim Assam Agriculture University
Orchid ecotourism	State Department of Tourism State Department of Horticulture & Soil Conservation
Import of commercial exportable varieties	State Department of Horticulture & Soil Conservation
Evolving new cultivars	Manipur University, ORDC, Hengbung, ICAR-NRC for Orchids, Sikkim; SFRI, Arunachal Pradesh Institute of Bioresource and Sustainable Development, Imphal; CAU, Imphal; North Eastern Regional Institute of Science and Technology (NERIST); NEHU, Shillong, Meghalaya
Setting up joint venture	Govt. of Manipur
Identification of suitable indigenous orchid species for medicine, cut flowers, pot plants	ICAR-NRC for Orchids, Sikkim; SFRI, Arunachal Pradesh; North Eastern Hill University, Meghalaya Institute of Bioresource and Sustainable Development, Meghalaya; Manipur University

Development/revival of tissue culture laboratory	Govt. of Manipur
Introduction of vocational courses on various aspects of orchid cultivation	ICAR-NRC for Orchids, Sikkim
Training of rural youth, field functionaries, extension workers	ICAR-NRC for Orchids, Sikkim
Online courses for orchid cultivation and management	ICAR-NRC for Orchids, Sikkim
Development of post harvest Infrastructure	Govt. of Manipur
Implementation of good agricultural practices	ICAR-NRC for Orchids, Sikkim
Sanitary and phytosanitary measures	Govt. of Manipur
Marketing linkages	North Eastern Region Agriculture Marketing Corporation in Guwahati; Department of Horticulture & Soil Conservation
Supply chain linkages	North Eastern Region Agriculture Marketing Corporation in Guwahati; Department of Horticulture & Soil Conservation / Marketing Agencies in States
Brand promotion	Govt. of Manipur
Increasing domestic consumption	State Department of Horticulture, NHB, FPOs, Orchid Growers Associations
Supply of farm inputs	Govt. of Manipur, North Eastern Region Agriculture Marketing Corporation, Guwahati

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