

STATUS AND PROSPECTS OF HORTICULTURE IN NEH REGION

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The northeastern region of India comprises eight states namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. The region lies between 21°57' and 29°28' north latitude and 89°40' to 97°50' east longitude. The total geographical area of the region is 2.55 lakh km², which is about 8% of the country's total area. The physiography of the region is divided into three divisions namely Meghalaya plateau, the northeastern hills and the Brahmaputra valley. The NE hills alone accounts for 65% of the total land area while the Brahmaputra valley and the Meghalaya Plateau cover 22% and 13% of the area respectively. The region offers scope for cultivation of a wide variety of horticultural crops such as fruits, vegetables, flowers, tuber and rhizomatous crops and spices because of its diversities in topography, altitude and climatic conditions. A range of fruit crops varying from highly temperate types like walnut, apple, etc., to subtropical as well as tropical fruits are coming up well in this region. Similarly wide and diverse type of vegetables including indigenous ones are cultivated in the region. Despite the favourable factors and the scope for cultivation of horticultural crops, the development of horticulture has not picked up momentum as desired. The productivity of the horticultural crops is very low in the region. This paper describes the present status of horticultural crops, major constraints and future strategies for development of horticulture to insure sustainable horticultural production.

Weather, Soil and Crops in NE Region

The northeastern region faces vagaries of the high rainfall and consequently the nutrient depletion and the erosion, therefore enormous loss year after year. Agroclimatically the region is known for its wide diversities, representing temperate, subtropical and tropical areas. The diversity within a single region provides ample scope for growing a large variety of fruits, vegetables and plantation crops. Northeastern region with diverse soil and weather conditions comprises several typical agroecological situations, which in turn permit cultivation of large variety of crops. This diversity is manifested through erratic rainfall and similar fluctuations are witnessed in temperature, sunshine and relative humidity, etc.

The soil of NE region has not been surveyed thoroughly due to hilly terrain, poor communication, accessibility and dense forest. The soil of the region can be broadly classified into four groups namely, Red loamy soils, Red and Yellow soils, Laterite soils and Brown hill soils.

Table 1. Distribution of area according to elevation (Prasad, 1998)

Elevation	Area in million ha	Share percentage
Below 150m	9.23	34.88
150-300m	2.61	9.86
300-600m	2.89	10.92
600-1200m	4.76	17.99
More than 1200m	6.97	26.34

Present Status of Horticulture Crops in NE Region

About 362841.7 hectares area was brought under cultivation of fruit crops during 1995-1996 which indicates 49.42% increase in area coverage over 1993-1994. However in vegetables, 354690 hectares area was put under cultivation, which was 15.55 per cent higher than that of 1993-1994. The production of fruits and vegetables increased by 28.18 and 20.84 per cent respectively in 1995-1996 over 1993-1994. The highest increase in area (115.60%) and production (63.28%) of fruit crops were noticed in Assam and Mizoram, respectively over 1993-1994. However production of fruit crops decreased in Nagaland (8.42%) and Sikkim (44.33%) over 1993-1994. In vegetables, maximum increase in area and production was noticed from Mizoram (120.83 and 75.72%), whereas area and production decreased in Nagaland (6.46 and 19.04%, respectively) and Meghalaya (12.36 and 11.18%, respectively).

Table 2. Agroclimatic zones of NE region and the horticulture crops grown in these zones.

Agroclimatic zone	Area	Crops

Temperate zone	<p>Arunachal: Tawang, Dirang, Bomdila, Shergaon, Diban valley, Upper subansiri, Anini, North eastern part of Lohit and Northern part of east Siang</p> <p>Meghalaya: Upper Shillong, Mawphlong and Mairang</p> <p>Mizoram: Blue mountain, Halkhan, Turpang, Nauzuarzo, and Tiang</p> <p>Nagaland: Tuensong and Zunebota, Vangkung and higher areas of Mokachung</p> <p>Sikkim: gnathing, Chhangu, Serrathong, Lima, Zema, Karponag, Bordong, Resi, Kangdem, Melli param, Lachem Hilley and Yaksum</p>	<p>Fruits: Apple, pear peaches, plums, cherries, pistachio, almond, apricot, walnut, chestnut and kiwifruit.</p> <p>Vegetables: Cabbage, cauliflower, knoll-khol, broccoli, radish, turnip, beetroot, carrot, garlic, onion, spinach, cucumber, tomato, brinjal, okra, French bean, aspergus, bean, capsicum and peas</p>
Subtropical zone	<p>Arunachal Pradesh: Changyak, Naga, Khonsa, areas of trip district, Basar area of Siang district</p> <p>Manipur: Imphal valley</p> <p>Meghalaya: Jawai, Nongstonin, Nokrek, Kailash area of west garo hills, western part of east garo hills and Umkeang area</p> <p>Mizoram: As whole except lower valleys, adjoining area of Cachar and lower parts of Chhimituipuii</p> <p>Nagaland: Mokachung district, lower parts of Kohima, Wokha and Monbhagti and Longhak valley.</p> <p>Sikkim: Namchi, Gayzing, Rongli, Rehnok, Mangan, Changthong, Utre and Gangtok</p>	<p>Fruits: Mango, guava, citrus, litchi, low chilling peaches, pears, plums, almond, aonla etc.</p> <p>Vegetables: Brinjal, tomato, okra, beans, peas, all cucurbits, carrot, radish, turnip, cole crops, leafy vegetables, onion, garlic, chillies and capsicum etc.</p> <p>Tuber crops: Potato, sweet potato, colocasia, yams, alocasia</p> <p>Ornamentals: Rose, gladiolus, orchids, carnation, chrysanthemum, marigold, petunia, large number of other ornamental and foliage plants.</p>
Tropical zone	<p>Arunachal Pradesh: Southern part of lower Subansiri, Pasighat, Singthow and lower part of Lohit</p> <p>Assam: Whole Assam except Karbi Anglong and North Cachar hills</p> <p>Meghalaya: Southern part of Jawai, adjoining part of Karimganj, Cachar, North Cachar Hills of Assam, southern part of Nongpol, eastern part of east Garo hills and west Khasi hills, lower part of west Garo hills</p> <p>Manipur: Manipur west district including Juibair area, Chrachanpur and Thallour of south district, Marera area</p> <p>Mizoram: Northern and western part, Chhimheipuii district</p> <p>Nagaland: Medzephena area of Dimapur sub division, southern part of Dimapur and Jampuii area</p> <p>Tripura: major part of Tripura</p> <p>Sikkim: Rongpoh area of east district</p>	<p>Fruits: Mango, citrus, banana, pineapple, papaya, grape, sapota</p> <p>Vegetables: Brinjal, tomato, okra, beans, gourds, amaranthus etc.</p> <p>Tuber crops: Cassava, sweet potato, amorphophallus, dioscorea, yams, coleus, colocasia etc.</p> <p>Plantation crops: Coconut, arecanut, cashew, oilpalm, rubber, coco</p> <p>Spices: Turmeric, ginger large cardamom, pepper etc.</p> <p>Ornamentals: Rose, chrysanthemum, jasmine, marigold, zenna, balsum, orchids etc.</p>

Prospects for Horticulture in NE region

The northeastern region covers a total geographical area of 25.50 million hectares (Table 1). The agriculture in the region is broadly of two types, one practiced in the plains, valleys, foothills and terraced slope called "settled agriculture" and other on slopes of all possible gradients called "shifting cultivation or jhuming" by tribals of hill areas. The Himalayan ranges in Arunachal Pradesh extending to 5000m near the Selapass and 3000m near Tawang represent a typical Temperate Zone. At lower elevations are Naga Hills, the Miker hills and the Shillong plateau with an altitude of 1300 to 2500m above MSL having mild temperate to subtropical climate, while the Imphal valley of Manipur at 750m, represents a typical subtropical zone. The plains of Assam, Tripura and southern Mizoram are mainly tropical. The diversities within the single region provide ample evidence for the bright scope to grow a large variety of fruits, vegetables, flowers and plantation crops.

The region is one of the richest reservoir of genetic variability with 136 horticultural species growing in region (Table 2). This region is endowed with enormous genetic diversity in a number of crops like citrus, banana, mango, rice and maize. The region is the natural home of many citrus species like *Citrus indica*, *C.*

assamensis, *C. latipes*, *C. ichagensis*, *C. macroptera*, *C. aurantium* and *Citrus reticulata* (Sheo Govind and Ghosh, 1997). Rich genetic diversity has also been reported in crops like yams, ginger and medicinal and aromatic plants. Large number of ornamental and flower species are grown wild and semi wild conditions and about 693 species of orchids are flourishing in the region. The region is reported to have immense potential for horticultural development since topographically and agroclimatically there are wide range of variation. As grain farming is proving unremunerative in the undulating topography of hilly tracts which is deprived of irrigation facilities despite the concerted efforts put forth by Government of India for the upliftment of this region. It becomes possible to exploit the untapped potential of the region through location specific horticulture and subsequently expanding the area under horticultural crops. Production of fruit crops can also be increased through adoption of scientific technologies. There is ample scope to increase the area under Sweet Orange, Acid Lime, Aonla, Guava, Jackfruit, Plum, Peach, Walnut and Kiwifruit. The trials conducted by ICAR Research Complex for NEH Region, Umiam and its regional centres have indicated that aonla, guava and peach can be successfully cultivated with improved production technologies (Anonymous, 1999).

Most of the existing orange orchards are of either seedling origin or inferior variety except for some orchards. These have to be replaced with suitable high yielding varieties. Though pineapple performs fairly well, growers are still unable to get good returns due to non-adoption of improved package of practices. Hence, there is need to adopt high density orcharding and method of induction of flowering in pineapple. In other fruit crops grafted/budded orchards of improved variety can be planted and maintained under improved production technologies for realizing better profit. Banana crop is well adopted in the region. This crop need priority research attention for increasing productivity and quality of produce. Jackfruit can be used as fruit, vegetable and animal feed. The existing trees are of seedling origin and have wide variability. Thus there is need for selection of superior clone and its multiplication through the vegetative method of propagation. Papaya is also having good potential in the region, which is mostly grown in backyard garden, and no compact orchard exists. Since it has been grown for the last several years, large mixed population has resulted which needs purification. Extraction of papain can be taken up on commercial scale to obtain better income. Pomegranate production has to be given a boost by introduction of improved varieties.

Apple industry in Arunachal Pradesh has failed to develop to a desired extent simply due to lack of follow up action for improved varieties along with adoption of scientific technologies to desired extent from the growers, developmental agencies and R & D institutions. Peaches and plums, which are well adopted, can be grown profitably by induction of early, mid and late maturing cultivars. Pears have good potential but existing trees are of inferior varieties. Productivity of pears can be increased by introduction of superior varieties. Preliminary results indicate that like walnut, apricot, chestnut, almond, cherry and kiwi fruit will be of immense value having bright scope for commercial cultivation at higher altitude of northeastern states. Jamun, jalpai and indigenous wild fruits can also be planted for obtaining fruits as well as fuel and timber.

Among the fruits mandarins, lemon, banana and pineapple alone constitute more than 2/3rd share for both area and production. Temperate fruits can be successfully grown in higher altitude of Arunachal Pradesh, Nagaland and Manipur, while Shillong plateau is ideal for potato cultivation. Coconut and arecanut which are presently confined to Assam, Tripura and some parts of Meghalaya having sizable area under mango, jackfruit and litchi have to be extended to other nontraditional areas of north eastern region. Bay islands are well suited for the cultivation of coconut, pineapple and jackfruit whereas ginger and turmeric can be grown successfully in Meghalaya and Mizoram.

The horticultural development is moving at a faster pace throughout the country and in near future there will be a greater technology adoption both in the traditional horticultural enterprises as well as commercial sectors. The horticultural developments in NE region has to be brought to keep in pace with that of mainland. To bring the horticultural industry back from brink, some bold initiative like introduction of apple in Meghalaya, Nagaland and Arunachal Pradesh which has taken place in early seventies has to be repeated. The Arunachal Pradesh is one of the ideal place for apple cultivation. The Arunachal apples are known for its quality, which has won "All India Apple Prize" for the quality of the apples which is excellent. Arunachal Pradesh, if introduced with high yielding varieties of apple, sure it can make a big headway by exporting the produce to Bangladesh which presently depends on Bhutan besides meeting the internal demand of the northeastern markets.

The location specific technologies generated so far had only a limited applicability. Orange is the unique horticultural crop of the state but average productivity of orange is very poor in Arunachal Pradesh (2.62 Mt/hectare). When two villages of Mizoram and three villages in Tripura could sell oranges worth Rs. 35 lakhs and Rs. 54 Lakhs respectively (Bortakur, 1992), Why not it is possible in other parts of the region having good potential for orange cultivation. Therefore, there is need to refine location specific technologies through large number of on farm trials and frontline demonstration.

Strategies

- Indiscriminate introduction of planting materials from other region has to be avoided and indexing and certification programme should be implemented properly to ensure availability of quality planting material.

Production technologies in fruit crops like pineapple, banana, orange and rejuvenation technologies for declined mandarin orange orchard, etc., are some useful technologies for dissemination among farmers so as to increase the productivity and quality of produce. Area should be increased under aonla, papaya, pomegranate, and jackfruit at low to mid altitude and walnut, chestnut, cherry, almond and kiwifruit at higher altitude of the region.

- Few crops like banana, citrus, pineapple, jackfruit, potato, cassava, sweet potato, ginger, turmeric, large cardamom, coconut, arecanut and good number of vegetable crops are well adopted in larger parts of the region. For ornamental orchids Sikkim, Arunachal Pradesh and Meghalaya have unique position for commercial cultivation. These crops need priority research attention for increasing the productivity and quality of the produce. Certain other fruit crops like litchi in Tripura, kiwi and avocado in Sikkim and Arunachal Pradesh, gauva and low chilling peaches in Meghalaya and Arunachal Pradesh have shown good potential and needs research support for their commercial scale cultivation. Among the spices, black pepper and cinnamon have good potential. Potato is the most important crop and its yield is quite high in Tripura (17.10t/ha). The yield of potato in Meghalaya is about 6.78t/ha against 24.4t/ha in West Bengal. The advantages of off-season cultivation have to be exploited to the maximum and potato cultivation should be increased in mid hills of the region. Orchids are the specialty of the region. Among the large number of native orchid species *Cymbidium* needs maximum research focus. Iris, *Lilium*, *Anthurium* etc., are some other crops to flourish the floriculture industry of the region.
- Orange is a unique horticultural crop of NE region and need priority research attention for increasing its productivity and quality of the fruits. Organic cultivation of oranges can pave the way for successful venture.
- Since the productivity of vegetables per unit area is much low in this region, there is ample scope for adopting plasticulture applications like polyhouse cultivation, drip irrigation and mulching. Low cost plastic house technologies have potential and opportunities in various agroclimatic zones of India for commercial vegetable production. These polyhouses with environment control facilities can be used for successful cultivation of high value crops like tomato, capsicum, broccoli, Brussels sprout, lettuce, celery and cucumber, etc.
- Production of vegetable nursery under protected condition is becoming popular through out the country especially in hilly regions. Management of vegetable nursery in protected structure is easier and early nursery can be raised. Needless to emphasize that this practice eliminates dangers of destruction of nurseries by hailstorm, rain, etc., and protects from biotic and abiotic stresses. As a result cultivation of vegetables like cabbages, cauliflower, knol khol, tomato and onion has become commercial in cold desert region of the country such as Laddakh. This technology for raising nursery in poly houses should be tried in hilly areas of region.
- In recent past, throughout the world efforts have been made to control the vegetable pest by use of natural enemies, parasite, predators besides host specific insect viruses and other entomo-pathogenic micro-organisms and success has been achieved to a considerable extent. The IPM strategy combines biological, cultural, genetical and chemical methods in a compatible manner. This technology should be adapted in the region to control the diseases and pest in vegetables crops.
- IPM strategies like seed treatment with carbofuran, nursery management by sterilization of soil, use of fungicides in soil, use of bio pesticides in seed dressing, destruction of diseased plants in case of bacterial and viral incidence, avoidance of mono cropping in succession, wide spacing of plants so as to allow free air passage to keep plants dry and to take care of leaf moulds, early and late blight, encouraging the use of predators, and microbial pathogens for effective suppression of pests/diseases will fit well for revolutionizing the horticulture industry.

Conclusion

There is a need to create awareness and make the farmers receptive to the new technology through farmers participating demonstrations and training. Training facilities with respect to growing of horticultural crops and raising nursery has to be made available as per requirements. Therefore, there is a need for establishing a sound marketing system with forward and backward linkage so that vast potential of horticulture crops can be exploited through adoption of improved production technology.

Bibliography

- Anonymous, 1999. Annual Report, ICAR Research Complex FOR NEH Region, Barapani
 Bortakur, D.N. 1992. Agriculture of the North Eastern Region, Bee See Prakasan Guwahati
 Prasad, R.N. 1998. Soil and Water conservation in NEH Region lecture delivered in National Seminar on Management Strategies for North Eastern Hill Ecosystem

Sheo Govind and Ghosh S.P. 1997. Citrus genetic resources of North Eastern Himalayan Region and their Utilization. Indian J. Hill Farming 10(1&2): 78-91

Summary of completed/ongoing projects, funded by IERP, GBPIHED