The horticulture which includes a wide variety of crops such as fruits, vegetables, spices, plantation crops, floriculture, medicinal and aromatic plants, cashew etc. is now a day recognized as an important product for potential diversification and value addition in agriculture. Presently, horticultural crops occupy around 13 per cent of India’s gross cropped area. The total production of fruits has been estimated at 63.50 million tonnes from an area of 5.34 million hectares and vegetables has been estimated at 125.9 million tonnes from an area of 7.05 million hectares during 2007-2008. Horticultural crops, particularly fruits are now receiving increasing attention in view of its increasing commercial importance accentuated by quick transportation to vast internal market. India accounts for 10 per cent of world production of fruits i.e., mango, banana, citrus, apple, papaya, pineapple and grapes account for the buck of fruit production.

The North Eastern region of India comprising eight states namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim lies between 21°.51’ and 29°.5’ latitude and 85°.5’ and 97°.5’ E longitude. It has vast physiographical variations, which have been represented in 6 agro climatic zones. The region has its own unique combination of living species, habitats and eco-systems, which together make up its diversity rich resource. While speaking strictly about plant diversity, two regions of the country are termed as hot spots. These are – Western Ghats and the North Eastern hill regions. The region is one of the richest reservoir of genetic variability and diversity of different crops i.e. various kinds of fruits, different vegetables, spices, ornamental plants and also medicinal and aromatic plants. The diversity for horticultural crops of this region has mainly been managed by local farmers, often women. Considerable diversity exists among the regional horticultural crops used for medicinal purposes and income generating source in the rural areas. The region offers scope for cultivation of a wide variety of horticultural crops such as fruits, vegetables, flowers, tuber and rhizomatus 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 types of vegetables including indigenous ones are cultivated in the region. Despite of these favourable factors and the scope for cultivation of horticultural crops, the development of horticulture has not picked up momentum as desired. The proposed paper is targeted to examine the existing position of horticulture in NER with a view to ascertain its growth potential by evaluating problems and prospects with a primary objective of suggesting lines of development in future.

Key words: Horticulture, Vegetables, Fruits, North-East India, Aromatic plants, Constraints, Prospects, Strategies

How to cite this article: Sarmah, Dinesh and Deka, Parag Kr (2012). Horticulture in north-east India: Strengths and prospects, Asian J. Hort., 7(1) : 221-228.
horticultural species including variation in plant type, morphological and physiological characteristics, reactions to diseases and pests, adaptability and distribution. Apart from the nutritional value, many regional horticultural crops are used for medicinal purposes and income generating source in the rural areas. 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 types of vegetables including indigenous ones are cultivated in the region. Despite of these favorable factors and the scope for cultivation of horticultural crops, the development of horticulture has not picked up momentum as desired. The proposed paper is targeted to examine the existing position of horticulture in NER with a view to ascertain its growth potential by evaluating problems and prospects with a primary objective of suggesting lines of development in future.

RESEARCH METHODS

The study is based on empirical approach. It is based on both primary as well as secondary data. The secondary data were collected from various periodicals and Official Gazettes published by ICAR, NEDFI, DONER, Economic Survey of India, Agricultural Departments of NER states, Statistical Hand Books of NER states during last 10 years. The publication of Indian Society of Agricultural Economics and International Journal of Commerce and Business Management were also considered. The study is based on the questionnaires and personnel interviews containing questions regarding the existing status, shortcomings, growth potential, prospects and challenges of horticulture in the nation in general and NER in particular. The information in respect to the status of horticulture was collected from 100 farmers, 50 agriculture Extension Officers, 5 Expert Scientists and Economists locally assessable and Common Peoples. Data so collected were analyzed and interpreted theoretically to draw the inferences.

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation are summarized in the following sub heads :

Existing scenario :

The diverse agro-climatic conditions, varied soil types and abundant rainfall prevailing in North East India enables the cultivation of several plantation and horticultural crops covering fruits, vegetables, spices, flowers, mushrooms and medicinal and aromatic plants where geographical conditions offer tremendous scope for horticulture. The region covers total geographical area of 2,63,179 sq.km, (which is nearly 8.0 per cent of the total geographical area of the country) and about 35 per cent area is plain and the remaining 65 per cent area is under hills with more than 45.5 million populations (census 2011). In Assam, plains account 84.44 per cent of its total geographical area and the remaining 15.56 per cent area is under hills. Net sown area is highest in Assam (34.12%) followed by Tripura (23.48%); Arunachal Pradesh has lowest net sown area in the region. Cropping intensity is highest in Tripura (156.5%) followed by Manipur (152.1%), Mizoram (136.36%) and Assam (123.59%). About 0.5 million hectare areas is under shifting cultivation in the region and out of 4.4 million hectare net sown area, 1.4 million hectare lies in hilly sub region and at least 1.3 million hectare suffer from serious soil erosion problem. The total area under horticultural crops is around 822.5 thousand hectare which is around 3.14 per cent of the total geographical area of the region and it gives total production of 6818.4 thousand tonnes. The region is characterized by difficult terrain, wide variability in slope and altitude, land tenure system and cultivation practices. Majority of the population is dependent on agriculture, horticulture and allied land based activities. The agriculture production system in the region is mostly rain fed, mono-cropped and at subsistence level. Slash and burn agriculture is still predominantly practiced in almost all the states, except Sikkim, on steep slopes with reduced fallow cycle of 2 to 3 years as against 10-15 years in the past. The climatic condition in the region is diverse which varies from temperate to sub-tropical and tropical. The diverse agro-climatic conditions, varied soil type and abundance of rainfall offer immense scope for cultivation of different types of horticultural crops, including fruits, vegetables, flowers, plantation crops, tuber and rhizomatous crops and crops of medicinal and other economic values. The fruits grown in this region range from tropical and sub-tropical fruits like banana, papaya, pineapple and citrus to temperate fruits like apple, pear, peach, plum and even certain nut fruits. The region has been described as one of the major centre of diversity for citrus, banana and mango, etc. Cultivation of mandarin is distributed in all across the North-East with Meghalaya leading the area. Assam lemon, a seedless lemon, is under cultivation to a considerable extent in the foot-hills. Systematic exploratory survey of mandarin orange showed that it is one of the most primitive species of citrus available in the region.

Among other fruits, mango is found growing wild in many parts of the region. The main problem of mango cultivation in the region is the attack of mango root weevil. One dwarf type mango called March mango found in Tripura can be used for evolving dwarf and resistant varieties to stone weevil. Pineapple cultivation in all the states of the region is done on slopes under rain fed conditions with two cultivars namely Giant Kew and Queen dominating the production. Tripura leads the area under Queen. Banana another important fruit of the region is found growing wild at varying altitudes.
The Table 1 gives a crystal clear picture about fruits production of the region during last 10 years.

Besides these three important fruits as discussed above a number of other tropical and sub-tropical fruits belonging to different genus. The state wise productivity of fruits highly fluctuates due to different climatic and natural factors. The total productivity of fruits increased from 2078.9 thousand MT in 2000-2001 to 3431.2 thousand MT in 2009-10 this is due to increase in awareness among common people and marketability of the product. The corresponding area (state wise) under fruit production also shows an increasing trend from 288.8 thousand hectare in 2000-01 to 368.0 thousand hectare in 2009-10. It is worth mentioning that the states like Assam, Manipur and Meghalaya are more consistent in production of fruits in comparison to other states of the region.

**Vegetable and tuber crops:**

The region has rich diversity of different vegetable crops and both indigenous tropical vegetables and temperate vegetables are grown to a considerable extent. The major vegetables grown in the regions are brinjal, cabbage, cauliflower, onion, pea, potato, tomato, knol-khol, radish, carrot, French bean and different cucurbitaceous crops. Among the flowering plants special mention may be made for the orchids, about 600 species are reported in the region. The other commercial flowers of the region are marigold, tuberose, the orchids, etc. The state wise productivity of fruits highly fluctuates due to different climatic and natural factors. The total productivity of fruits increased from 2933.3 thousand MT in 1991-92 to 4202.2 thousand MT in 2008-09. The areas under vegetables also show an increasing trend from 329.3 thousand hectare in 1991-92 to 396.6 thousand hectares in 2008-09. The productivity per hectare of vegetables in 2008-09, Assam is highest among the north eastern states (i.e., 12.2 MT/hectare) followed by tea have considerable impact on the economy of Assam in particular.

It should be noted that the NER is well known for its rich genetic resources and variability for edible and non-edible types of cucurbit. The region abounds in cucurbitaceous vegetables like pumpkin, bottle gourd, ridge gourd, bitter gourd and cucumber, etc. The introduced cucurbit chow-chow (Schium edule) locally known as squash needs a special mention that after having introduced into this region the crop has acclimatized so well that every house in the city of Shillong besides Nagaland, Sikkim, etc., has at least a single plant of chow-chow. The trends of production of vegetables of the region during last few years are given in Table 2.

Among the leguminous vegetables, rich diversity is available in the entire hill region of the north eastern India. Winged bean has been observed to be growing all along Indo-Burma region of Mizoram and Manipur. The vegetable offers great promise as ‘soybean’ rival to combat the nutritional deficiencies in Indian sub-continent. Besides these brinjal, tomato, chillies and capsicum also hold great promise for cultivation and improvement. The total production of the vegetables increased significantly in recent years in comparison to the productivity of 1991-92. Total production of vegetables increased from 2933.3 thousand MT in 1991-92 to 4202.2 thousand MT in 2008-09. The areas under vegetables also show an increasing trend from 329.3 thousand hectare in 1991-92 to 396.6 thousand hectares in 2008-09. The productivity per hectare of vegetables in 2008-09, Assam is highest among the north eastern states (i.e., 12.2 MT/hectare) followed by

**Table 1 : State-wise production of fruits (, 000MT) and area ('000 hectare)**

<table>
<thead>
<tr>
<th>State</th>
<th>2000-01 (000)MT</th>
<th>2001-02 (000)MT</th>
<th>2002-03 (000)MT</th>
<th>2003-04 (000)MT</th>
<th>2004-05 (000)MT</th>
<th>2005-06 (000)MT</th>
<th>2006-07 (000)MT</th>
<th>2007-08 (000)MT</th>
<th>2008-09 (000)MT</th>
<th>2009-10 (000)MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assam</td>
<td>1293.1</td>
<td>1335.1</td>
<td>1126.5</td>
<td>1181.1</td>
<td>1151.0</td>
<td>1352.1</td>
<td>1392.2</td>
<td>1410.2</td>
<td>1574.8</td>
<td>1854.0</td>
</tr>
<tr>
<td>Meghalaya</td>
<td>186.9</td>
<td>186.9</td>
<td>153.3</td>
<td>199.6</td>
<td>199.6</td>
<td>231.7</td>
<td>234.7</td>
<td>235.2</td>
<td>294.8</td>
<td>294.8</td>
</tr>
<tr>
<td>Mizoram</td>
<td>66.7</td>
<td>63.4</td>
<td>55.0</td>
<td>42.4</td>
<td>42.5</td>
<td>66.0</td>
<td>179.7</td>
<td>219.6</td>
<td>225.1</td>
<td>225.1</td>
</tr>
<tr>
<td>Nagaland</td>
<td>290.4</td>
<td>304.0</td>
<td>65.9</td>
<td>48.8</td>
<td>48.9</td>
<td>19.6</td>
<td>NA</td>
<td>NA</td>
<td>151.3</td>
<td>151.3</td>
</tr>
<tr>
<td>Tripura</td>
<td>9.4</td>
<td>12.3</td>
<td>(9.9)</td>
<td>(8.2)</td>
<td>(8.9)</td>
<td>(9.0)</td>
<td>(9.3)</td>
<td>(10.5)</td>
<td>(12.2)</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>(15.7)</td>
<td>18.5</td>
<td>18.5</td>
<td>18.5</td>
<td>18.5</td>
<td>18.5</td>
</tr>
</tbody>
</table>
| Source: National Horticulture Board (NEDFI Databank). Ministry of Agriculture, Govt. of India (N.B: Figure within bracket show the area in ‘000hectare.)
Tripura (11.5 MT/hectare), Manipur (10.5 MT/hectare), Meghalaya (9.4MT/hectare), Mizoram (7.9Mt/hectare), Nagaland (7.5MT/hectare), and Arunachal Pradesh and Sikkim (4.6 MT/hectare in each).

Spices and ornamental:

Among the different spice crops that are grown in the region are ginger, turmeric, chillies and bay leaf. Though recently introduced, the region has a potential for commercial cultivation of black pepper, cumin, large cardamom, and saffron. Three commercial crops need mention in this respect viz., ginger, turmeric and large cardamom. A number of local cultivars exist in north eastern region. In case of turmeric the local variety ‘Lakadong’ grown mainly in Jowai area of Meghalaya. The large cardamom is an important spice crop growing abundantly in Sikkim and in some parts of Arunachal Pradesh. The Table 3 gives clear picture about area, production and productivity of major spices in the region.

Among spices maximum area is covered by ginger (more than 50.0 thousand hectare in 2009-2010) followed by chilli (more than 30.0 thousand hectare) and turmeric (more than 22.0 thousand hectare). Ginger is the main cash crop for the tribals of Meghalaya, Mizoram and Arunachal Pradesh. In addition Assam also contributes substantial amount of ginger. The production and productivity of spices in north eastern states are not so significant in comparison to the national level. But productivity of ginger, turmeric and chillies in some of the north eastern state mainly hilly states like Arunachal Pradesh, Nagaland, Meghalaya, Mizoram and hill districts of Assam are comparatively high. Productivity of spices is maximum in Arunachal Pradesh i.e. 5.68MT/hectare in 2009-10 among the north eastern states followed by Nagaland (5.35 MT/hectare), Meghalaya (4.14 MT/hectare) and Mizoram (3.56 MT/hectare). The productivity of spices in the region is not consistent during the last few years. There is wide variation in state wise and item wise production of spices in the states. A vast treasure of ornamental plants and orchids exists in North East India. The important ornamental species that have now been adopted for cultivation include Bauhenia, Cassia, Calestemon, Erythrina, Jacatrenda, Magnolia, Rhodedendron, Myria, etc. Some of the shrubs and climbers like Azalia, Achenia, Baugainvillea, Camilio, Gardenia,
Hibiscus, Jatropha, Narium, Thunbergia are colourful ornamentals. However, among the flowering plants, special mention may be made about the orchids, which have both ornamental and medicinal value. Out of 1300 orchid species reported, about 600 species occur in north eastern region alone. Wide range of variability has been found in Sikkim, Arunachal Pradesh, Meghalaya and Manipur. Plants of the epiphytes origin have great opportunities for development and growth of industries.

**Plantation crops**

Among the plantation crops, coffee, rubber and tea, medicinal and aromatic oil yielding plants are the main in the region. Coffee was reported to have been introduced in Cachar district of Assam during 1853. Coffee gardens were successfully established by Soil Conservation Departments of Meghalaya at Uming (Ri-Bhoi District), Lumshnong (Jaintia Hills District) and Tura (West Garo Hills District) and in Assam at Haflong (N.C.Hills District) as early pockets of Nagaland as early as 1954 on pilot cum trial basis as a measure to prevent ‘jhuming’ and consequent soil erosion. These trial plantations in this region were laid out in different elevations from 100 meters to 1000 meters, temperature variations from 12° C in winter to 33° C in summer, soil from deep red forest to sandy clayey loam and rainfall from 1900 mm to 4000 mm with dry period between November to March. All the agro-climatic conditions prevailing in the North East are suitable for commercial cultivation of coffee. In 2007-08 total area under coffee was 5761 hectare in the entire north east among which Nagaland has maximum proportion (i.e. 2271 hectare) followed by Mizoram (1019 hectare) and Meghalaya (899 hectare).

Although the North Eastern Region lies far outside the traditional rubber growing zone, the agro-climatic conditions obtained here are unique in as much as near tropical features are experienced in most parts owing to low elevations, exposure to monsoons and other moderating influences. The positive results obtained from trial plantations undertaken in early 1960s in the then undivided Assam and Tripura, commercial scale plantations were raised by Government Forest and Soil Conservation Departments. Public Sector Corporations set up later joined rubber planting endeavors on extensive scales. Thus while in Assam and Tripura, Public Sector Corporations are leading in the rubber plantation sector, in Meghalaya, Manipur, Mizoram and Arunachal Pradesh the role has played by the State Forest and Soil Conservation Departments. Individual growers are also contributing to fast growth of rubber cultivation in this region. Rubber has been identified as one of the thrust areas in Tripura, in view of its suitability to the terrain and the acceptability amongst the people. Studies have shown that about 1, 00,000 hectares of area in the state can be brought under rubber plantation. The area under rubber cultivation at present is estimated to be about 26,500 hectares, which is the second largest, after Kerala.

The yield per hectare and the quality of rubber are also comparable to Kerala’s plantations. In fact, Tripura is now considered the “second rubber capital of India” by the Rubber Board. The state government has taken up an ambitious programme to significantly increase the area under rubber plantations during Tenth Plan period. The rubber production at present is about 10,000 MT, which is fast increasing, with more and more plantations reaching the tapping stage. Presently, only about 10 per cent of rubber produced in the State locally by industrial units and remaining quantity is sold outside the State. Recently, export of rubber to Bangladesh has also started.

In the region, tea is mostly grown in Assam and Tripura. In the recent years Arunachal Pradesh, Nagaland and Manipur has also started producing tea. Assam’s economy is predominantly a tea economy. The state alone produces more than half of the all India production of tea. Tea in Assam is mostly grown in Assam valley and Cachar area. In 2008 the production of tea in Assam was 487497 thousand kg (Economic Survey, Assam, 2010-11). Today, tea is grown in almost all parts of Assam. In the upper districts of the Brahmaputra Valley, one comes across miles and miles of planted tea without any break. The pretty sight looks as if covered with a green velvet carpet. The Barak Valley also has its own significant share in this sector. The most important feature in the growing commercial importance of the State has been the remarkable expansion of the tea industry since the early part of the 20th century. Assam tea has been contributing to India’s Foreign Exchange earnings. Total productivity of tea in India was 980818 thousand kg in 2008 out of which Assam shared more than 50 per cent i.e. 487497 thousand kg of total productivity.

Forest of the region is an important repository for a large number of naturally occurring medicinal and aromatic plants with distinct photochemical, pharmaceutical, therapeutic and industrial properties. Six important genera viz., Coetus, Coptis, Dioscorea, Epekal, Rauroltia and Solanum have been identified for this purpose. Two important aromatic plants namely, agar wood and Java citronella have been exploited for commercial cultivation for extraction of essential oils by RRL, Jorhat. Similarly, 3 endemic medicinal plant species namely, Dioscorea floribunda, D. prazeri and Solanum khasianum have been recommended for cultivation for extraction of steroids. The four important orchid species namely Dendrobium paciflorum, D. nobile, Diplomeris hirsute and Paphiopedilum with potential for use in traditional medicines are now facing extinction in this region. The promising oil-yielding aromatic plants of North East India are Citronella, Lemongrass, Agar wood, Turpentine, Cinnamon, Mentha and Eucalyptus. There is a great scope for commercial cultivation of these aromatic plantation crops to derive a sizeable production of precious essential oils for industrial use. Some of the plant species that grow usually wild in the region may be used as a potent of agarbati and other related...
Land tenure issues:  
Land tenure systems vary widely among different North-Eastern states, which are quite different from the rest of India. The complexity in land ownership and tenurial rights make it difficult for survey, demarcation and consolidation of land. Therefore, cadastral survey and land demarcation are completely absent in the hill areas of northeast.

Shifting cultivation:  
Shifting cultivation also known as jhuming is widely prevalent in the North Eastern part of India. This jhuming cycle which extended to 15-20 years earlier has now been shortened to 2-3 years because of increased population pressure on land, decrease in productivity leading to utilization of more area under jhuming. At present about 0.5 million hectare area is under shifting cultivation in whole NE region. This system has caused large-scale deforestation, soil degradation/erosion (removes nutrient rich top soil) and depletion of resource base.

Poor cultivation practices and low yield:  
General neglect and non-adoption of scientific cultivation practices are the major constraints for poor return from most of the horticultural crops in this region. Despite of the conducive environment, the rate of production and growth of all horticultural crops are far below the all India average.

Gender and equity issues in natural resources and diversity management:  
Unequal distribution of land resources is responsible for increasing dependence on forests by certain sections of the society leading to diversity degradation. Resolving the gender and equity is concerning natural resource management is equally important in North-East as in the other parts of the country.

Lack of marketing facilities:  
Due to lack of organized marketing structure in this region, farmers are getting low return compared to the other parts of India, whereas the middle man gets the profit at their expenses. Except the organized tea industry, almost all the commodities including specialized products like citronella oil, the producers face considerable marketing problems. Due to thin primary markets and perishable nature of the products the farmers sell their produce at a throw away prices to the intermediary without even getting the opportunity to display them. Transportation of perishable produces is perhaps the most serious constraints in the horticultural development of this region.

Scarcity of trained manpower and extension support:  
Dearth of trained manpower and low priority to horticulture in the development plans of states despite high potential are some of the factors responsible for ineffective extension programme. Unlike other states of India like Punjab, Himachal Pradesh, Haryana, etc., where the extension services are very efficient, the NE region on the other hand is lagging far behind in this aspect. To strengthen this wing not only trained manpower but determined extension activities with full government support are most urgently required.

Smuggling of timber across the International border:  
The illicit felling of trees and timber smuggling across the international borders has been the most important cause of horticulture areas/forest degradation in border.

Inter-state border dispute:  
There exist a lot of inter-state border disputes among the north-eastern states. Most of these border areas are forest lands and because of boundary disputes, such lands are often declared as ‘no man’s land’ and hence, do not come under any form of management. This leads to the degradation of diversity in such areas.

Insurgency:  
The long insurgency problem in the states such as Nagaland, Assam and Tripura has considerable impact on the development of horticulture and other sectors.

Problems of processing:  
For a region like this the success of fruits and vegetable growing is closely linked with the success of fruit processing units, because of poor marketing and transport facilities. The processing industry can help in sorting out the problem of proper disposal of perishable commodities. Until today, there is hardly any cold storage facility available; few processing units are exist but not functioning up to the desired capacity. Use of appropriate pre and post harvesting practices for horticultural crops is vital for the success of the crops and to provide good return to the growers. Unfortunately, this is the weakest spot in the entire region. Value addition should be given top priority for the crops like ginger and turmeric. Production of oleoresin from ginger, turmeric and chilli using improved techniques as developed by CFTRI, Mysore needs to be tested in the region.

Financial constraints:  
The high capital cost involved in establishing orchard/
plantation and setting up of required infrastructure is a serious
constraint in the expansion of area under horticultural crops.
The situation becomes all the more difficult in view of the
large number of smallholdings.

**Less expenditure on research work:**
Investments for research on horticulture have always
remained low when compared to the large number of crops it
covers. This results in poor technological support. The
extension system is also weak. The department of horticulture
has been created in many states but do not have adequate
work force and infrastructure to address the entire problem of
horticulture.

**Absence of insurance facility:**
Risk management in horticultural crops is non-existent
although crops like onion and potato are covered under the
National Agriculture Insurance Scheme. There is a need to
cover the risk in case of other horticultural crops in a different
manner, perhaps on the basis of potential production coverage
instead of average yield. This would encourage higher
investment to achieve high productivity.

**Prospects of horticulture in the region:**
The agriculture in the north eastern 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
jhumming” by tribal of hill areas. 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 reservoirs of genetic
variability with 136 horticultural species growing in region.
This region is endowed with enormous genetic diversity in a
number of crops like citrus, banana, mango, rice and maize.
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 agro climatically there are wide range of
variation. As grain, farming is proving un-remunerative 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 orange, acid lime, guava, jackfruit,
plum, peach and walnut etc.

Among the fruits mandarins, lemon, banana and
pineapple alone constitute more than $\frac{2}{3}$rd share for both in
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. Papaya is also
having good potential in the region, which is mostly grown in
backyard garden, and no compact orchard exists. Pomegranate
production has to be given a boost by introduction of improved
varieties.

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 in commercial sectors. The country is
now in the third phase of agricultural development where it is
paying more attention to agricultural diversification and
productivity enhancement. So that horticulture has emerged
as prominent sector offering wide scope of diversification and
earning of foreign exchange and generating employment.
The ministry of agriculture has been implementing the
centrally sponsored National Horticulture Mission (NHM) for
the holistic development of the horticulture sector since 2005-
2006, duly ensuring forward and backward linkages, and with
the active participation of all the stakeholders. All the States
and three Union Territories of Andaman and Nicobar Island,
Lakshadweep and Puducherry are covered under the mission
except the eight North Eastern states including Sikkim and
states of J&K, Himachal Pradesh and Uttarakhand. The latter
are covered under the Horticulture Mission for the North East
and Himalayan states (HMNEH). The scheme is being
implemented in 372 districts in the country. During 2005-2006
to 2009-2010 an additional 16.57 lakh hectare of identified
horticultural crops has been covered. Apart from
establishment of 2192 nurseries for the production of quality
planting materials, 2078 lakh hectare has been covered under
rejuvenation of old and senile orchards. Organic cultivation
of horticultural crops has been adopted in an area of 1.37lakh
hectare.

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
places for apple cultivation. The location specific technologies
generated so far had only a limited applicability. To promote
horticulture in the state and the region, there is need to refine
location specific technologies through large number of on
farm trials and frontline demonstration.
Strategies and measures for development of horticulture in the region:

- 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 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 and good number of vegetable crops are well adopted in larger parts of the region. These crops need priority research attention for increasing the productivity and quality of the produce.

- Orange is a unique horticultural crop of NE region that 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 modern technology.

- Production of vegetable nursery under protected condition is becoming popular throughout the country especially in hilly regions. As a result cultivation of vegetables like cabbages, cauliflower, 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 microorganisms and success has been achieved to a considerable extent. This technology should be adapted in the region to control the diseases and pest in vegetables crops.

Conclusion:

Till recently, for most farmers horticulture has been mainly a backyard activity as they are generally busy throughout the year in cultivation of food crops and have little time for development of horticultural crops on a commercial basis. Besides, due to the long gestation period involved in plantation and horticulture crops, the cultivation of these crops has been generally confined to small backyard gardens developed by almost every household. It is only in the past decade that there has been a more focused attention to the development of horticulture in the region. There is need to create awareness and make the farmers receptive to the new technology through farmers participating demonstration and training. Training facilities with respect to growing of horticultural crops and raising nursery has to be made available as per requirements. Considerable diversity exists among the regional horticultural species including variation in plant type, morphological and physiological characteristics, reactions to diseases and pests, adaptability and distribution in the region. Apart from the nutritional value, many regional horticultural crops are used for medicinal purposes, income generating and poverty alleviation programmes in the rural areas. Therefore, there is a need for establishing a sound system with forward and backward linkage so that vast potential of horticulture crops can be exploited through adoption of improved production technology.

REFERENCES