



# An Analysis Of The Scope Of Establishing Post Harvest Infrastructures In The North East Region

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## Abstract:

The augmentation of the rural economy is largely dependent upon agricultural development. North East India has recorded poor economic growth since independence despite the existing vast scope for development of the agriculture sector especially horticulture through an integrated approach accommodating cultivation, marketing and processing together which can also play an important role in the production scenario. Development of horticulture calls for the establishment of appropriate post-harvest infrastructure like PPC etc. The relative position of horticulture compared to other agricultural activities is very poor. Although in hill states it is comparatively better, it is still far below the expected level. Specialised production of horticultural crops is lacking. A wide range of products with small inventories makes it difficult for planning appropriate post-harvest infrastructure. A definite reorientation in the primary Agri-horticultural production is strongly recommended. The agricultural marketing system is very unorganised and its infrastructure underdeveloped. The marketing system is fully dominated by private traders and a large chain of middlemen. Crop specific establishment of PPC is an utmost necessity in the production centres.

**Keywords:** Horticulture, Marketing, PPC, FPO, North East States.

## 1. Introduction:

The augmentation of the rural economy is largely dependent upon agricultural development. In India, the rural population comprises more than 80% of the total population, economic upliftment of the rural mass is the main means of the economic development of the country. Marketing plays an important role in the augmentation of the agricultural production scenario, the efficiency of which depends upon the availability of infrastructure and systems.

North-East India, consisting of seven states (excluding Sikkim) has recorded poor economic growth since independence. Several geographical and other constraints have restricted industrial development in the region. Being predominately a hilly region, the availability of cultivable land suitable for food grain production is very meagre. It has been strongly advocated by several expert groups of the country and abroad to put a thrust upon horticulture for the sustainable economic development of the region. However, the horticultural development approach calls for an integrated approach accommodating cultivation, processing and marketing together.

The majority of the horticultural produces being perishable in nature, requires appropriate facilities for post-harvest handling and storage which in turn determines the efficiency of the marketing system. Processing activities utilising surplus farm produce help in maintaining demand-supply balance to a great extent and thereby add up dynamism in the marketing system. It has already been established in some parts of the country, that a smooth and efficient marketing system supported by appropriate infrastructure remarkably uplift the production scenario through the improvement of quality as well as vertical and horizontal growth of production.

## 2. Rationale of the study:

- i) Realistic information on resources and potentiality is not available. Secondary information available from various sources is not always precise enough to facilitate conceptualization of commercial projects.
- ii) Production and marketing statistics, as well as data on the movement of high-value commercial crops within/ outside the region, are not available.
- iii) Logistic facilities, infrastructure facilities and utility services available need to be assessed to determine the techno-economic feasibility of the establishment of the post-harvest infrastructure at a given location.

## 3. Objective of the study:

- i) To assess the existing level of production of horticultural crops in North East states and identify the infrastructure required for the perishable horticultural crops.
- ii) To assess the salient feature of the Agri-horticulture marketing scenario of horticultural crops.
- iii) To assess the volume of post-harvest losses with respect to perishable commodities given the inefficient marketing system.

#### 4. Coverage of the study:

- i) Detailed analysis of the horticultural scenario of North East states.
- ii) Detailed analysis of the market.
- iii) Critical examination of feasibility of establishment of post-harvest Infrastructures.

#### 5. Methodology:

The primary objective of the study is to provide basic techno-economical information regarding the establishment of commercially viable horticultural infrastructure facilities.

- i) State-wise area, production and productivity of major crops for the last ten years were collected. Relative rates of area expansion, production augmentation and productivity improvement were worked out and tabulated. State-wise important horticultural crops were selected. Important horticultural crops of the state that need infrastructure facilities for efficient marketing were identified.
- ii) Special emphasis has been given to reveal the information relating to the marketing of Agri-horticultural products. The market intelligence system being non-functional in most of the states, both direct and indirect information were gathered.
- iii) A primary survey was conducted with special emphasis on revealing the scenario for production and marketing of perishable produces.
- iv) A well-designed methodology is to be prepared to facilitate a concentrated effort for the development of effective Horticultural infrastructural facilities.

#### 6. Study Area:

The study area covers the entire North Eastern Region (except Sikkim) comprising of seven states namely Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland and Tripura. The entire project area belongs to Agro-climatic Zone-II.

The abundance of land resource is a characteristic of the study area. The following table 1.01 presents the land utilisation pattern of various states.

**Table-1.01 Land utilisation pattern of different states of North East Region**

\*Area in thousand hectares

Description	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Tripura
Geographical area	8374	7844	2233	2242	2108	1657.90	1049.71
Reporting area	5498	7844	1902	2240	2108	156.16	1
Forest	5154	1853	1099	946	1598	862.53	629.426
Area put to non-agricultural use	26	29	27		4.50	65.23	132.70
Barren & uncultivable land	48	1217	0.95	131.74	8.50	123.53	27.00
Permanent pasture	4	169	1	-	13	-	-
Cultivable wasteland	37	161	0.85	-	85.35	64.57	0.60
Fallow including current	47	179	6	155	226	169.86	2.41
Net sown area	234	2699	469	285	95	262.01	255
Other	45	12	5	-	12	-	-
Total Cultivable land	293	3077	481	440	421	496.53	283.29

Source: Directorate of Horticulture of North East States.

Data in Table 1.01 Reveals that out of 2.55 lakh sq.Km geographical area, 2.05 lakh sq. km area is reported as utilized land out of which 54.91 lakh ha is available for cultivation of which 73.25 % comprise of the net sown area.

#### 7. Agri-Horticultural Scenario:

Agriculture is the largest economic activity and mainstay of the population in the project area. The present study is largely related to the feasibility of the establishment of post-harvest infrastructure for horticultural produces. The Agri-horticultural scenario in the project area varies from state to state. Yet there are certain common characteristics features. An overview of the state-wise Agri-horticultural scenario is presented in the following Table1.02

**Table-1.02 State-wise analysis of Agri-horticultural scenario**

\*Area in thousand hectares

Description	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Tripura
Net sown area	234	2699	469	285	95	262.01	280.12
Land sown more than once	86.10	1276	253.26	46.12	2.12	26.12	168
Gross cropped area	320.60	3975	722.26	331.12	97.12	288.2	448
Cropping Intensity (%)	137	146	154	120	104	110	160
Land occupancy by major crops							
Paddy	178.56	2401	224.38	121.52	55.74	151	254.7
Other cereals	7.12	53.15	58.75	20.42	11.74	67	4.3
Pulses	32.52	143.962	30.22	12.38	6.56	51	8.5
Oilseeds	4.56	310.822	36.69	15.62	4.12	40	4.12
Fibre crop	-	64.247	-	-	-	2.50	5.6
Fruit	55.48	126.12	55.63	26.25	17.66	16.53	33.16
Vegetables	16.93	562.12	27.77	26.23	14.12	28.69	31.52
Spices & Condiments	13.95	88.12	15.78	12.75	4.72	7.12	4.58

Source: Directorate of Horticulture of North East States

Data presented in Table 1.02 highlights the characteristics features of Agri-horticultural scenario in the study area are—

- Low cropping intensity except in Tripura which is in average order and there exists scope for further improvement.
- Rice dominated agriculture despite low productivity.
- Very marginal cultivation of horticultural crops which are more revenue spinning crop
- Vast scope for expansion of horticultural crops up to 1.10 lakh ha in Arunachal Pradesh.

The study also attempted to reveal the relative position of horticulture in the overall Agri-horticultural scenario. Data in this regard is presented in the Table 1.03

**Table-1.03 Relative position of Horticulture in overall Agri-horticultural Situation**

\*Area in thousand hectares

Description	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Tripura
Net sown area	234	2699	469	285	95	262.01	280.12
Area covered by permanent horticultural crops	55.48	126.12	55.63	26.25	17.66	16.53	33.16
Net area available for seasonal crops	178.52	572.88	413.37	258.75	78.47	245.48	246.96
Land sown more than once	86.10	1276	253.26	46.12	2.12	26.12	168
Total land available for seasonal crops	264.62	1248.88	666.63	304.87	80.59	271.60	414.96
Land utilized for vegetables	16.93	562.12	27.77	26.23	14.12	28.69	31.52
Spices & Condiments	13.95	88.12	15.78	12.75	4.72	7.12	4.58
Land utilized for other annual horticultural crops	0.00	11.84	0.00	3.96	0.02	4.39	0.00
Total land utilized for seasonal horticultural crops	30.88	662.08	43.55	42.94	18.86	40.2	36.10
Total land under horticulture crops	86.36	788.20	99.18	69.19	36.52	56.55	69.26
Gross cropped area	320.60	3975	722.26	331.12	97.12	288.2	448
Cropping Intensity (%)	137	146	154	120	104	110	160
Percentage of GCA under horticulture	26.93	18.52	13.73	20.89	37.60	19.62	15.45

Source: Directorate of Horticulture of North East States

It is evident from Table 1.03 that the relative position of horticulture in terms of land occupancy is relatively less especially in state like Assam, Manipur, Meghalaya, Nagaland and Tripura. This indicates inadequate attention towards this high revenue generation sector. Attempts have also been made to reveal the production profile of horticultural crops of the state. Ten major

horticultural crops showing the highest area coverage during the 2018-19 crop season were identified and listed since these are evident priority crops. (Table 1.04)

**Table 1.04: State wise list of prioritised Horticultural crops**

\*Area in,000ha and Production in,000MT

Name of the crop	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Tripura
Orange A	23.60	156.41	1.74	4.12	7.80	2.84	2.81
	P	27.80	210.141	11.67	21.76	34.37	18.15
Pineapple A	7.91	16.195	13.12	9.5	0.63	1.62	5.18
	P	37.04	85.165	106.52	92.04	2.31	106.46
Banana A	4.160	51.103	2.11	6.27	5.62	1.52	5.71
	P	15.452	881.706	17.76	67.84	119.67	79.29
Apple A	76.86	-					
	P	10.687	-				
Jackfruit A		21.997					8.64
	P		197.203				256.26
Potato A	6.20	103.812	14.80	18.57	062	4.40	1.00
	P	44.95	694.002	125.42	145.21	3.52	462.12.
Vegetable A	26.65	277.50	27.77	11.94	3.52	2.12	
	P	138.450	1902.201	297.73	87.56	47.55	23.560
Ginger A	7.9	16.306	9.22	9.22	3.43	1.00	
	P	55.474	141.441	611.68	111.68	55.43	13.03
Papaya A	-	7.219	1080	0.58			
	P	-	145.476	10.28	4.48		
Assam Lemon A	22.920	13.175	8.54	12.25			
	P	28.361	108.492	76.12	16.74		

It is evident from Table 1.04 that despite having leading area coverage, of the prioritized crops, no horticultural crops could sustainably occupy the rank of a special commodity. Practically too many crops in the production profile of each state are not only indicative of a poor level of commercialisation in the horticulture sector but also the need for reorientation in the production sector. The creation of specialized infrastructure for perishable items is neither practicable nor advisable. However, the analysis presented in Table 1.05 helps in the identification of priority commodities for examination of the feasibility of the establishment of post-harvest infrastructure.

**Table 1.05 List of cluster pockets identified for Horticultural crops**

Sl. no	Crops identified	Name of the state	Selected clusters
1	Pineapple	Arunachal Pradesh	Along, Pasighat, Daparijo
		Assam	Karbi Anlong, N.C. Hills, Cachar, West K. Along
		Manipur	Sadar Hills, Imphal East, Imphal West
		Meghalaya	Ri-Bhoi, East Khasi Hills, West Khasi Hills, East Garo Hills, West Garo Hills, South Garo Hills
		Nagaland	Dimapur, Mokokchung, & Wokha
		Tripura	North Tripura, Dhalai, South Tripura, South Tripura
2	Apple	Arunachal Pradesh	Bomdila, Tawang
3	Kiwi	Arunachal Pradesh	Bomdila, Ziro
4	Orange	Arunachal Pradesh	Along, Pasighat, Daparijo, Lohit
		Assam	Karbi Anlong, N.C. Hills, Cachar, West K. Along, Tinsukia, Kamrup, Nagaon
		Manipur	Ukhrul, Tamenglong
		Meghalaya	Esat & West Khasi Hills, Jaintia hills
		Nagaland	Kohima, M, Wokha, Mokokchong
		Tripura	Dhalai, North Tripura
5	Large cardamom	Arunachal Pradesh	Along, Pasighat, Daparijo, Bomdila, Roing, Lohit
		Nagaland	No
6	Assam lemon	Assam	Nagaon, N.C. Hills, Karbi Anglong, Dibrugarh, Tinsukia, Golaghat
7	Ginger	Arunachal Pradesh	Lower Dibang Valley, East Siang, Lohit, Along
		Assam	Karbi Anglong, West Karbi Anglong, N.C. Hills, Golaghat
		Manipur	Churchandpur, Senapati, Chandal
		Meghalaya	East Garo Hills, West Garo Hills
		Mizoram	All over the state
		Nagaland	Kohima, Wokha, Mokokchong, Zuneheoto, Mon, Phek
		Tripura	North Tripura, West Tripura, South Tripura, Dhalai
8	Vegetables	Assam	Darrang, Sonitpur, Nagaon, Golaghat, Barpeta, Dhubri
		Meghalaya	East Khasi Hills, East Garo Hills, West Garo Hills
		Tripura	North Tripura, South Tripura, West Tripura

9	Banana	Assam	Barpeta, Goalpara, , Dhubri, Nagaon, Jorhat, Golaghat.Kamrup
		Meghalaya	East Garo Hills, West Garo Hills, East Khasi Hills,
		Tripura	North Tripura, West Tripura, South Tripura
10	Cashew Nut	Assam	Dhubri
		Meghalaya	West Garo Hills, East Garo Hills, South Garo hills
11	Passion fruit	Manipur	Senapati, Churhandpur
		Mizoram	Champai, Longlei, Kolasib
		Nagaland	Kohima, Mokokchong, Wokha
12	Turmeric	Assam	Kamrup, Nagaon, Sonitpur
		Meghalaya	West Garo Hills, Jaintia Hills
		Nagaland	Kohima, Wokha
		Tripura	South Tripura

The status of surplus Horticultural commodities of the North East region is presented in Table 1.06

**Table 1.06: Status of state-wise Marketable surplus Horticultural Crops**

SI No	State	Name of the surplus Fruit/vegetables	Percentage of Marketable surplus of total	Realistic surplus available for post-harvest management as per assessment(MT)
1	Arunachal Pradesh	Ginger	70	5000
		Pineapple	80	5500
		Orange	72	4000
		Apple	74	500
		Kiwi	74	20
2	Assam	Banana	70	45000
		Pineapple	80	15000
		Orange	70	7300
		Assam lemon	70	10000
		Ginger	70	22000
		Total Vegetables	70	75000
3	Manipur	Pineapple	70	20000
		Orange	70	2400
		Passion fruit	80	6500
		Ginger	70	1500
4	Meghalaya	Pineapple	75	7500
		Banana	50	12000
		Orange	70	4800
		Vegetables	70	15000
		Ginger	75	10500
		Potato	20	12000
		Cashew Nut	80	3200
5	Mizoram	Ginger	80	10200
		Grapes	60	1100
		Passion fruit	90	1050
		Vegetables	50	6320
6	Nagaland	Pineapple	60	1450
		Passion fruit	90	500
		Ginger	70	10150
		Turmeric	60	280
7	Tripura	Pineapple	75	7500
		Jackfruit	40	15500
		Banana	45	14450
		Orange	40	5550
		Winter Vegetables	48	18000

Based on the realistic data it is neither practicable nor advisable to establish a processing unit of each surplus perishable horticultural commodity in each state.

The status of commodity wise supply of horticultural commodities from the producing states to different locations are presented in Table 1.07



**Table 1.07: Commodity wise supply of Horticultural Commodities from the producing states to different states**

Sl No	State	Crops	Destination State / Country
1	Arunachal Pradesh	Pineapple	Assam
		Apple	Assam
		Kiwi	Delhi
		Orange	Assam, Bangla Desh via Assam
		Ginger	Assam, Delhi, Maharastra, West Bengal, Uttar Pradesh
		Large Cardamom	Assam, Delhi
2	Assam	Banana	Nepal, Bangla Desh, Bihar, West Bengal, Uttar Pradesh
		Jackfruit	Bangladesh
		Ginger	Delhi, BaglaDesh, West Bengal, U.P.
		Vegetables	Nagaland, Arunachal Pradesh, Meghalaya, Mizoram, Delhi
3	Manipur	Pineapple	Assam <sup>4</sup>
4	Meghalaya	Off-season potato	Assam
		Off-season vegetables	Assam
		Pineapple	Assam, Bangla Desh
		Banana	Apple, West Bengal
		Straw berry	Assam
5	Mizoram	Ginger	Assam, Bihar, West Bengal, U.P.
		Vegetables	Assam
6	Nagaland	Pineapple	Assam, West Bengal
		Ginger	West Bengal, Delhi
7	Tripura	Pineapple	Bangla Desh, Assam, Bengal
		Jack Fruit	Assam, Bangla Desh
		Banana	Bangla Desh
		Vegetables	Bangla Desh, Assam

### 8. Agri-horticulture marketing scenario:

The scenario of Agri-horticultural marketing in the North East states is unorganised and underdeveloped. The salient features of the Agri-horticultural marketing scenario in the North East states are as follows:

- Poorly developed market infrastructure. Most of the markets do not have adequate facility for display, auction and seller-buyer interactions. Storage facility for non-perishable commodities although available to some extent, the same for perishable items is almost nil.
- A major portion of the commodities do not flow through the market yards. Farmer's participation in market operation is seldom found even at the primary rural markets. Traders have their own established channel for procuring and disposal of the commodity.
- Backward and forward linkage is formed by a long chain of middlemen spread right up to the village level. Middlemen at backward link very often change their role in market management, as agricultural trading is not the primary occupation of 79% of such middlemen surveyed. Often, they disassociate themselves from the marketing chain depending upon the ups and downs of the market.
- The entire marketing system has been created and managed by private traders and middlemen. Institutional market functionaries are not seen at any stage of marketing.
- Buyer dominance at the primary stage of marketing is very evident. This has been possible for the existence of area and commodity-specific monopoly of large traders, who operate through their own established channels. Farmers receive a throw-away price which is 16-28% of a depending upon the area and commodity
- Pre-harvest sales and credit-linked marketing are witnessed with respect to cash crops like ginger, areca nut etc.
- The extent of post-harvest loss of horticultural produces is very high. It is estimated that the same ranges between 18-32% during marketing and transport depending upon the commodity and their production sites. Nevertheless, around 30-40% of the perishable produces especially vegetables and certain types of fruits perish at the field itself before they could be harvested.

Trading of perishable consumables in the surveyed states has two distinct features namely

- Trading of perishable item produces within the surveyed area are marketed within the North East states and also sent outside including export.
- Trading of perishable items brought from outside and distributed within the study area.

### 9. Wastage at the market level:

Survey data in the markets indicate the occurrence of wastage which varies from commodity to commodity. It was further revealed that the waste percentage regarding the total value of arrival is almost constant. It is implied that this wastage is due to the lapses in receiving and distributing the consignments at wholesale market centres. However, the question remains whether the percentage of wastage quantified from the wholesale market survey is the total volume of wastage or are there points where

further wastage is encountered? Since, there exists a constant gap between arrival and disposal of commodities in wholesale markets, a definite percentage of wastage is evident, which has been quantified commodity wise in Table 1.08

**Table 1.08: Percentage of wastage in the wholesale markets during last three years**

Sl. no	Commodity	Percentage of wastage w.r.t arrivals		
		2018	2019	2020
1	Apple	2.90	2.92	2.94
2	Banana	18.00	18.76	18.77
3	Pineapple	7.98	8.09	8.35
4	Orange	14.58	14.62	14.66
5	Potato (Kharif)	5.09	5.16	5.08
6	Summer vegetables	4.57	4.56	4.69
7	Cole crop (main season)	17.45	17.24	17.51
8	Tomato	5.16	5.2	5.65
9	Ginger	18.73	29.30	24.26

## 10. Field collection centres & Primary Processing Centres

There exists feasibility to establish field collection centres linked with primary processing centres at relatively remote places. The potential locations for establishing such units are not too many at present. But it is expected that once the Primary Processing network is established in the production centres, there would be a high demand for such field collection centres. Based on the present scenario, few potential locations have been selected for the field collection centres. Each field collection centre should have a 20 MT capacity cold chamber along with a semi-automatic facility for grading, sorting, packaging etc. Following Table 1.09 presents

Location wise proposed commodity plan and linkage for feeder units.

**Table 1.09: Location of proposed field collection centres and linkage for primary processing centres**

Sl No	Location (FCS)	State	Main commodities	Upward linkage (Location)	Distance from the collection centres (KM)
1	Along	Arunachal Pradesh	Ginger, pineapple, orange	Passighat (Arunachal Pradesh)	112
2	Ziro	-Do-	-Do-	-Do-	145
3	Rowing	-Do-	Ginger	Tinsukia (Assam)	66
4	Bomdilla	-Do-	Temperate fruits	Balipara (Assam)	80
5	Domdooma	Assam	Orange, Pineapple	Tinsukia	20
6	Kharupetia	Assam	Vegetables	Mangaldai	30
7	Barpeta	Assam	-Do-	Guwahati	80
8	Bishnupur	Manipur	Pineapple	Imphal	42
9	Nongphoo	Meghalaya	-Do-	Byrnihat	30
10	Mokokchong	Nagaland	Pineapple/ Passion fruit	Jorhat	60
11	Serchhip	Mizoram	Ginger	Aizawl	62
12	Udaipur	Tripura	Pineapple	Agartala	62
13	Dharmanagar	-Do-	-Do-	Silchar	85

The main features of the PPC s are as under

- Provide all necessary infrastructures to the growers for storing their goods, adding value to the goods and selling goods to the large consumers such as exporters and processing industry etc.
- The PPC facilities may be provided under PPP mode. The FPO may also be engaged for the purpose.
- The PPC shall act as a one-stop centre for the farmers with various facilities like storing, cooling, sorting, farm input supply, weather forecasting, e-marketing, market information etc.

## 11. Conclusion:

Now-a -days horticulture is a purely commercial venture. An important aspect to consider is to whether the north-eastern states should remain as a silent spectator when the other states flourish with horticulture's highly significant presence in their economy. We have the strongest horticultural base in this part of the country. It is the centre of origin of many horticultural crops. An innumerable number of tropical orchids took birth here with their fascinating beauty. Some latest forms of tourism like horticultural tourism, medicinal value tourism and newly initiated festivals like the orange festival, orchid festival, pineapple festival, anthurium festival etc are coming up in various parts of the north-east and boosting the horticultural production. And practices like creative horticulture can go a long way to boost the state's economy.