Annual Report

(2015-16)

CENTRAL INSTITUTE OF HORTICULTURE
DEPARTMENT OF AGRICULTURE AND COOPERATION
MINISTRY OF AGRICULTURE, GOVERNMENT OF INDIA
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Dated: 10th May, 2016

FOREWORD

North Eastern region is the vibrant source of varied horticultural crops and is abode with diverse agro-climatic condition ranging from tropical to temperate crops. During the last one decade and high value agriculture, there has been a significant sensitization towards organic cultivation in NER for environmental preservation and assuring food quality. As a part of high value agriculture, horticulture, provides a wide range of options to farmers for diversification and has potential to sustain large number of agro-industries, provides employment opportunities, nutritional security and health care.

The Central Institute of Horticulture (CIH) has been imparting various training programmes, certificate courses as a part of capacity building, promoting production of quality planting materials, protected cultivation, organic farming, nursery accreditation and certification, post harvest management activities and marketing aspects. The Institute has been actively co-ordinating with various reputed Institutes, different organization and stake holders of horticulture in the region and the state government departments of North east region in an effort to achieve its objectives.

In the present scenario of climate changes, challenges are many to produce more. The productivity of many of the horticultural crops is still below the national level. Development of human resource through trainings and transfer of technology for large scale adoption of hi-tech production system shall help in increasing the production and productivity of horticultural crops on the lands of small and marginal farmers.

I compliment Dr. Lallan Ram, Director, Central Institute of Horticulture, Medziphema and his team for putting their sincere efforts to address and challenges and augmenting the production and productivity of horticultural crops. I am happy that CIH is bringing out its annual report highlighting achievements made during the year 2015-16 and wish the institute all success in its future endeavor.

(S. K. Malhotra)

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EXECUTIVE SUMMARY

This Annual Report of Central Institute of Horticulture, Nagaland carries all the activities undertaken by the Institute in improving the horticulture sector in North East Region and has made some significant achievements so far. Inspite of manpower and other logistic constraints, the institute with regard to production of quality planting material, till date the Institute has established about 41.5 ha area under on farm and off farm. Different fruit blocks has been established as mother plants for scion collection to be used in different propagation activities and has developed about 50,000 plants of quality planting material in different fruit crops. During the year under report, gap filling has been done for five crops in the existing scion blocks of guava, litchi, peach, passionfruit and citrus. Besides this, about 1.15 lakhs of rootstocks were raised in crops like citrus, cashew nut, guava and rose by the Institute.

In terms of technology demonstrations, various on farm activities such as cultivation of organic turmeric and turmeric, demonstration of oyster mushroom cultivation, cultivation of indigenous fruits and vegetables, cultivation of onion and cole crops, intercropping of cow pea in fruit blocks, plantation of strawberry, papaya, gladiolus and cocoa etc were carried out. Under protected cultivation, activities such as cultivation of high value vegetables, plantation of Anthurium, Rose and gerbera were done. With regard to off farm demonstrations, the various activities implemented are Tissue culture pineapple demonstration plot conducted at Molvom and Pherima Village, Nagaland, guava and banana at Karbi Anglong, Assam in an area of 4 ha, guava, sweet orange and banana at Lotovi Village, Dimapur, Nagaland in an area 1 ha, Citrus rejuvenation in Wokha district of Nagaland in an area of 2 ha and in Karbi Anglong district of Assam in an area of 1 ha.

In the field of human resource development, the institute has organized 31 farmers training which were attended by 1596 farmers and six training for trainers (189 officials) were conducted in identified areas of horticulture in the region. The Institute has also organized two numbers of exposure trips cum training for the officials and farmers of North East Region besides participation in various exhibitions and trade fairs. Extension bulletins and folders with special reference to focus horticultural crops of NER was also published by the institute for technology dissemination.

CIH has been authorized as the nodal agency for providing accreditation and certification of nurseries in the region in order to facilitate accreditation of nurseries for horticulture crops. The aim is to establish a network of quality nurseries across the country for the purpose of propagation and distribution of quality planting material in the region. In this regard, six nurseries have been accredited for crops such as Cashew nut, Sweet orange, Litchi, Guava, Citrus, Mango and Assam lemon.

The three months certificate course for the less educated youth of NER has also been initiated to provide self employment and entrepreneurship in focused courses. The first course was taken on "Modern Nursery Management Practices of Horticulture crops" with 19 trainees from 5 states of North East from 15th July to 15th October, 2015. The second course was on "Post Harvest Management of horticulture crops" with 21 trainees from 26th October, 2015 to 27th January, 2016.The third course on "Protected Cultivation of Horticulture Crops" was started from 29th February 2016 with 14 trainees.

The Institute has also taken several initiatives in creating market linkage and promoting the produce of the region. The Institute by organizing trainings, exposure trips, workshops/seminars, buyers and sellers meet provides a platform to the farmers to understand the issues related to production and marketing of horticulture crops.

I take this opportunity to thank Dr. S.K. Malhotra, Agriculture and Horticulture Commissioner, Dr. Tamil Selvan, Addl. Commissioner and Dr. Naveen Patle, Dy. Commissioner, Ministry of Agriculture & Farmers Welfare, Government of India for their cooperation and constant support to carry out my duties in the best possible way. I also thank my staff for their hard work and cooperation in achieving the goals set by the Institute.

Dr. Lallan Ram
Director

1. INTRODUCTION

Central Institute of Horticulture was established in the year 2006 for the holistic development of horticulture sector in the North East Region. Located at Medziphema, Nagaland about 30 km from Dimapur city and 44 km from the capital city Kohima the Institute spreads over an area of 43.50 hectare. The main thrust areas of the Institute are refinement and demonstration of identified technologies pertaining to the region; production and supply of quality seed and planting material; training and capacity building of state govt. officials, field functionaries and farmers on different aspects of horticulture development including organic farming, monitoring of centrally sponsored programmes in the area of horticulture, post harvest management, processing, value addition, marketing and agribusiness promotion.

VISION

To emerge as the pioneering, innovative, farmer focused and self-supporting institute in the country.

MISSION

To provide excellent, innovative and relevant training to all the stakeholders so as to empower individuals and enable horticulture industry to bring about socio-economic development and sustainability in North East Region.

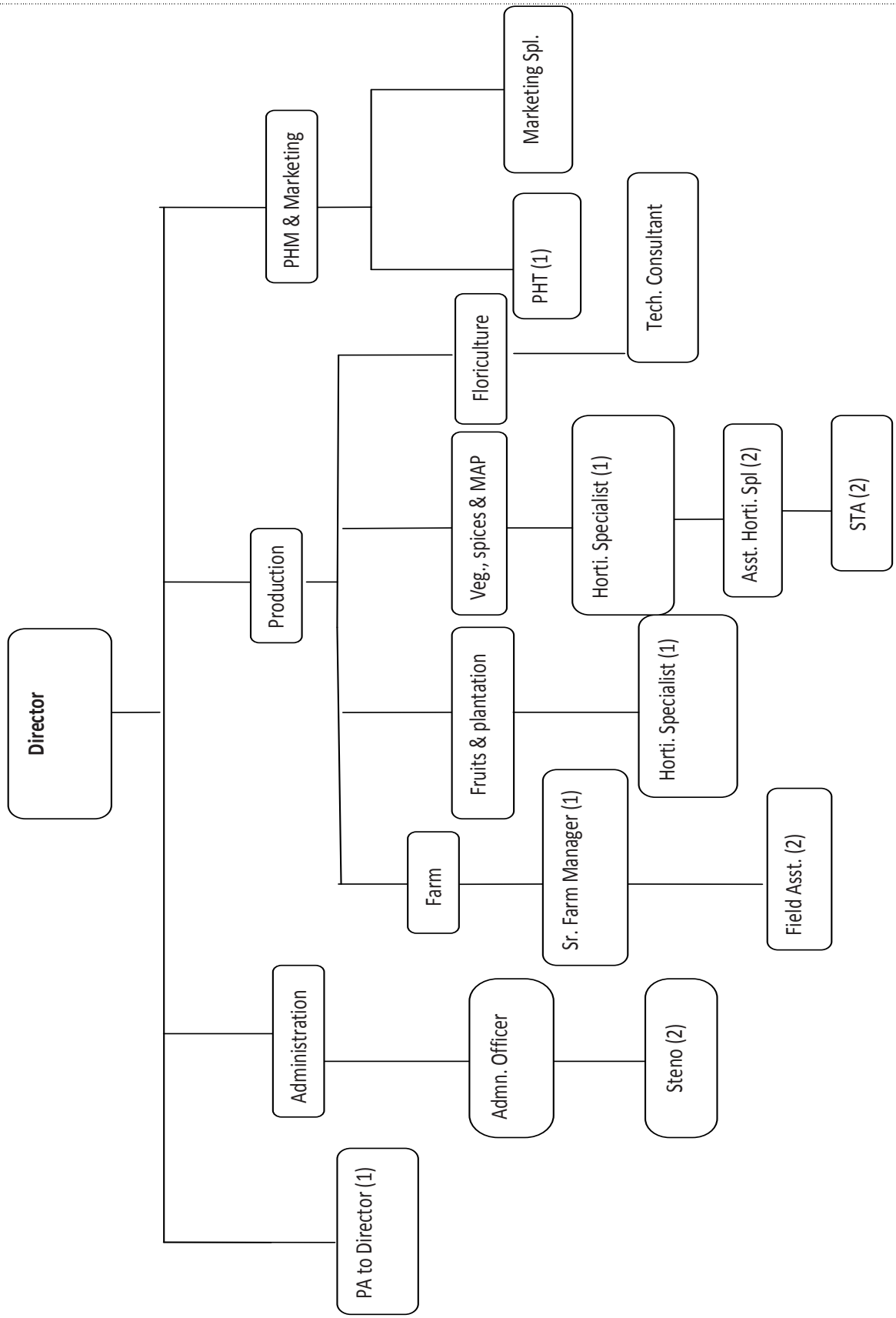
OBJECTIVES

- Capacity building by training of trainers and farmers.
- Demonstration of improved production technologies.
- Accreditation and certification of nurseries in NER
- Follow-on extension support in the field of horticulture.
- Promotion of organic cultivation of horticulture crops.
- Establishing convergence and synergy among programmes in the field of horticulture.
- Monitoring of centrally sponsored programmes in the area of horticulture.

FOCUS AREAS

- Training of State Govt. officials and farmers/beneficiaries of North Eastern Region.
- Production and supply of quality planting material.
- Accreditation and certification of nurseries in NER
- Transfer of technology through method and result demonstration and publication of folders, manuals, leaflets etc
- Promotion of organic farming.
- Post harvest, marketing and agri-business promotion through exhibition, seminars, workshop, exposure trip, buyers' seller meet.
- Coordination with state horticulture departments of NER and other National organizations.
- Monitoring of centrally sponsored programms in the area of horticulture

ORGANIZATIONAL SETUP



2. HORTICULTURE SCENARIO IN NORTH EAST REGION

The diverse agro-climatic condition has benefitted this region to grow horticulture crops ranging from tropical to temperate crops. The tropical, sub-tropical and temperate fruits include Mandarin Orange, Pineapple, Banana, Guava, Pear, Plum etc. Vegetables both indigenous and exotic are grown across a wide range of agro-climatic zones. The higher altitude provides a condusive ecosystem to grow traditional vegetables like potato and cole crops. Spices such as black pepper, turmeric, ginger and chilies are grown abundantly. Plantation crops such as tea, cashewnut and arecanut have been performing well and offer a great scope for area expansion. During the last two decades, there has also been a significant sensitization of the global community towards organic cultivation in NER for environmental preservation and assuring of food quality. After almost a century of development, organic agriculture is now being embraced by the mainstream and shows great promise commercially, socially and environmentally even in NER region. Organic spices like ginger (cv. Nadia) and turmeric (cv. Lakadong) have gained its momentum in exporting quality produce outside the region and in neighbouring countries as well. In North east region , the production of fruits accounts to 4434.01MT, Vegetables 5406.8MT, Cut Flowers 4962.98 MT, Loose flowers 205.04MT, Aromatic crops109.89MT, Spices 627.62MT, Plantation 227.45MT. Therefore, the North East Region has the great scope for the enhancement of production and productivity under horticulture industry due to conducive climatic condition. Thus improving the socio economy of the farmers of North East Region of India.

Though the NE region has high potential for the development of horticultural crops, efforts have not been made to develop it as a commercial venture due to poor cultivation practices and low yield, lack of desirable planting material, lack of marketing facilities, scarcity of trained manpower and extension support, problems of processing, financial constraints, Inadequate thrust on conservation and exploitation of horticultural germplasm, remoteness of the region, lack of awareness about the potentiality of horticultural crops as commercial crop. Keeping in view the regional demand for horticultural crops efforts must be taken to tap the potential and fully exploit the focus crops of this region. Inorder to achieve this goal, various organizations must step forward and must be sensitive to the needs of farmers and entrepreneurs and come up with endogenous and timely solutions, especially in the face of the opportunities presented by crises.

The state wise status of area, production of fruits, vegetables, flowers and spices in North east is indicated in Table1-5

Table 1. Area (A) and production (P) of various horticulture crops in NER (2014-15)

Area in ha ('000); Production in MT ('000)

State	Fruits		Vegetables		Flowers			Aromatic		Spices		Plantation	
	A	P	A	P	A	P		A	P	A	P	A	P
						loose	cut						
Arunachal Pradesh	90.0	331.40	1.70	41.0	0.02	0.01	1.86	5.15	109 .18	10.17	64.27	0.00	0.00
Assam	145.21	2030.14	289.26	4469.73	3.53	22.80	33.04	4.39	0.16	98.60	321.03	98.76	238.06
Manipur	55.62	521.57	29.33	268.01	0.81	0.30	0.00	0.00	0.00	10.47	24.14	0.90	0.15
Meghalaya	36.33	377.25	44.60	534.00	0.06	0.00	2.61	0.00	0.00	17.50	83.88	25.61	29.18
Mizoram	60.27	350.91	44.03	273.76	0.20	181.54	1.83	1.10	0.95	23.30	65.72	10.78	7.38
Nagaland	40.56	411.00	38.55	492.37	0.01	0.0	0.00	0.00	0.00	9.77	39.16	2.17	11.55
Sikkim	0.02	0.03	29.15	130.06	0.24	16.50	1.92	0.00	0.00	34.08	61.14	0.00	0.00
Tripura	71.77	819.12	48.61	811.09	-	-	-	0.00	0.00	5.69	18.04	15.88	31.97
Total	**499.78**	**4841.42**	**525.23**	**7020.02**	**4.87**	**221.15**	**41.26**	**10.64**	**110.29**	**209.58**	**677.38**	**154.10**	**318.29**

Sources: *National Horticulture Board database 2015*

Table-2. State wise area and production of fruit crops in NE Region (2014-15)

States	Area (000 ha)	Production (000 t)	Productivity (t/ha)
Arunachal Pradesh	90.0	331.40	3.68
Assam	145.21	2030.14	13.98
Manipur	55.62	521.57	9.37
Meghalaya	36.33	377.25	10.38
Mizoram	60.27	350.91	5.82
Nagaland	40.56	411.00	10.13
Sikkim	0.02	0.03	1.50
Tripura	71.77	819.12	11.41
NEH Region	499.78	4841.42	9.69
India	6109.67	86601.68	14.17

Source- Indian Horticulture database-2015, NHB

Table-3. State wise area and production of Vegetable crops in NE Region (2014-15)

States	Area (000 ha)	Production (000 t)	Productivity (t/ha)
Arunachal Pradesh	1.70	41.0	24.11
Assam	289.26	4469.73	15.45
Manipur	29.33	268.01	9.13
Meghalaya	44.60	534.00	11.97
Mizoram	44.03	273.76	6.21
Nagaland	38.55	492.37	12.77
Sikkim	29.15	130.06	4.46
Tripura	48.61	811.09	16.68
NEH Region	525.23	7020.02	13.36
India	9542.23	169478.23	17.76

Source- Indian Horticulture database-2015, NHB

Table-4. State wise area and production of flower crops in NE Region (2014-15)

States	Area (000 ha)	Production	
		Loose (000 t)	Cut (lakh nos.)
Arunachal Pradesh	0.02	0.01	1.86
Assam	3.53	22.80	33.04
Manipur	0.81	0.30	0.00
Meghalaya	0.06	0.00	2.61
Mizoram	0.20	181.54	1.83
Nagaland	0.01	0.0	0.00
Sikkim	0.24	16.50	1.92
Tripura	-	-	-
NEH Region	4.87	221.15	41.26
India	248.51	1658.72	484.17

Source- Indian Horticulture database-2015, NHB

Table-5. State wise area and production of Major spices crops in NE Region (2014-15)

States	Area (000 ha)	Production (000 t)	Productivity (t/ha)
Arunachal Pradesh	10.17	64.27	6.31
Assam	98.60	321.03	3.25
Manipur	10.47	24.14	2.30
Meghalaya	17.50	83.88	4.79
Mizoram	23.30	65.72	2.82
Nagaland	9.77	39.16	4.0
Sikkim	34.08	61.14	1.79
Tripura	5.69	18.04	3.17
NEH Region	209.58	677.38	3.23
India	3317.28	6108.28	1.84

Source- Indian Horticulture database-2015, NHB

3. ACHIEVEMENTS

3.1. PRODUCTION AND DISTRIBUTION OF QUALITY PLANTING MATERIAL

3.1.1. Establishment of scion/mother block under field condition

Availability of good planting material being very important for horticulture development and one of the key mandates of CIH is production of quality planting material and the Institute have established about 12 ha area under different fruit blocks as mother plants for scion collection to be used in different propagation activities. The following fruit crops that were established in CIH is given below.

	Crops	Varieties
1	Sweet orange	Early Gold, Rhod-e-Red, Trovita, Cara-cara Navel, Ruby Nucellar, Moro Blood, Olinda Valencia, Itaborai,
2	Tangerine/ Mandarin	Clemenule, Daisy Tangerine, W. Murcott, Sikkim Mandarin, Khasi Mandarin, STG, Nagpur Mandarin
3	Lime	Bears lime, Mexican lime, Acid lime
4	Lemon	Eureka Lemon, Lisbon lemon, Kachai lemon
5	Cashew	VRI-3, Vengurla-4, BBSR -1,H-2/16,H-1608, Bhaskara, Dhana, V-7, Ul-lal-3, Ullal-4, Priyanka, VRI-3,Sel.-2
6	Guava	Sweta, Lalit, Allahabad safeda, Lucknow-49,
7	Mango	Langra, Bombay green, Pant Sinduri, Dashehari, Mallika
8	Litchi	Shahi, Seedless, Kalkatia, Red Rose Scented, China and Tezpur
9	Bael	B-2,NB-5,NB-6
10	Aonla	Kanchan ,NA-6, NA-10, NA-7, Krishna, Laxmi -52
11	Peach	Shane-E-Punjab
12	Passion fruit	Purple local, Yellow
13	Pomegranate	Bhagwa

During 2015-16, gap filling of existing mother blocks was done in fruit crops such as Guava var Lucknow-49 (250 nos), Allahabad Safeda (100 nos), Shweta (100 nos). The total number of gap filling done for Litchi var. China were 145 nos, Peach var. Shane-e-Punjab 10 nos, Passion fruit var. Yellow and purple 200 nos and for citrus var. Khasi Mandarin 127 nos of plants were gap filled.

3.1.2. Raising of Rootstocks

3.1.2.1. Containerized primary nursery

Under containerized primary nursery, plastic crates are used for sowing the seeds filled with media in the composition of two part sand, one part sand and one part coco peats/ FYM. Seeds were sown at a distance of 4 cm at a depth of 1-2 cm.

The supply of good planting material is very vital for the development of good nursery management practices which include methods of propagation. As such, the Institute has been raising rootstock for crops such as citrus, cashewnut, guava and rose for further multiplication. The numbers of rootstock raised at the Institute during the year 2015-16 are Rangpur lime (32550), Volkamariana (26000), cashewnut (32050), guava (16650) and Rose var. Natal Bear (2750)

Fig 1. Seedlings under plastic crates

Fig 2. Buddable stage of citrus rootstock

Fig 3. Guava rootstock seedlings ready for grafting

Fig 4. Cashew rootstock ready for grafting

Fig 5. Mango rootstock ready for grafting

The rootstocks that has been raised by the Institute in the following crops till date is mentioned below:

Sl. No.	Crops Name	Variety	No. of root-stock raised	Source	Remarks
1.	Citrus	*C. volkemariana*	62,000	Government Horticulture Farm, okokchung, NRC Citrus, Nagpur, ICAR Manipur, ICAR, Basar, Arunachal Pradesh	Successful grafted/ budded plants were used for gap filling, distribution to farmers, demonstrations and trainings purpose
		Rangpur Lime	87,800		
		Cleopatra mandarin	16,300		
		Rough lemon	10,200		
2.	Guava	Local	32,150	Local	
3.	Cashew Nut	Local	93,550	Cashew Development Board, Cochin, Manjuri Dhubri, Assam, M/s Trupty Orchard, Keonjhar, Orissa	
4.	Rose	Natal Bear	2750	Shrushti Hi –tech, Pune	
5	Mango	Local	26,500	Local	

3.1.3. Propagation

The availability of quality planting material is one of the major constraints in improving the production of horticulture crops and considering the huge demand for quality planting material of improved varieties,

Fig 6. Wedge grafted guava plants

Fig 7. Soft wood grafted cashew plants

Fig 8. Wedge grafting in mango

Fig 9. T- budding in citrus

the Institute is putting its effort in carrying out propagation activities in crops like citrus, cashew, rose, mango and guava. During the period under report, the Institute has propagated 7638 nos of cashew nut in varieties V-4, VRI-3 and BBSR-1, The propagaton method followed in cashew nut is soft wood grafting. In guava var. Sweta, L-49, Lalit and Allahabad Safeda, 10651 nos of plants were propagated by wedge grafting method, 6670 nos of citrus var. Khasi Mandarin, Valencia, W. Murcot, Early Gold and Sweet orange following T-Budding and Wedge grafting method and in mango var. Amrapali and Mallika 250 nos were propagated by wedge grafting method. The successful propagated plants are used for gap filling and distribution to the farmers for demonstration programmes at farmers field.

3.2. TECHNOLOGY DEMONSTRATIONS

3.2.1. AT INSTITUTE LEVEL

Establishment of demonstration plots of focused and important horticultural crops were conducted time to time at campus for introducing the latest technology to increase horticulture production and dessiminate to the farmers in particular and uplift of the rural masses in general.

3.2.1.1. Protected cultivation

1. **Tomato**

Tomato (Lycopersicon esculentum L) is one of the most popular and widely grown vegetables. Tomato in large quantities is used to produce soup, juice ketchup, puree, paste and powder, it supplies vitamin C and adds variety of colours and flavours to the food. Green tomatoes are also used for pickles and preserves. Most of the farmers in the region grows vegetables traditionally with little technological inputs. Therefore, new technologies have to be adopted to increase the production and productivity.

During 2015-16, the Institute has undertaken cultivation of tomato variety Abhinav and Avinash under polyhouse in an area of 200 sq m with the following objectives

- Intensive crop cultivation farm by demonstrating latest technologies
- High quality vegetables production systems for domestic market
- To achieve potential productivity per unit area
- lead the farmers with technology

The seedlings were transplanted after 4 weeks of sowing at a spacing of 60 x 45 cm. Manures were incorporated at the time of transplanting and observations on plant growth and physico-chemical parameters were also recorded as given in Table 6 and 7. The result indicates that the variety Abhinav is suitable for growing under protected cultivation as it showed significant impact on growth, yield and other attributes.

Impact :

- Most successful varieties were recommended to the farmers.
- Regular trainings are conducted to the growers and extension workers
- A lot of farmers and officials from the State departments of the region has visited the Centre to see the technologies demonstrated in the Institute. After seeing the technologies, some of the farmers got confidence and started adoption of technologies at their farm.
- The Institute also takes the produce to showcase in exhibitions and trade fairs.

Table 6. Growth characteristics of tomato varieties

Cultivar	Date of planting	DAT	Plant height (cm)	No. of branches/ plant	No. of leaves/ branch	No. of flowers/ plant	No. of fruits/ plant	Yield/ 100 sq m (Kg)
Abhinav	Nov. 2015	30	59.94	8.6	119.8	0	0	1200
		45	137.0	10.4	129.8	10.8	0	
		60	151.6	12.4	155.0	25.6	15	
		75	162.26	10.6	177.6	32.2	23	
Avinash		30	52.4	8.2	98.8	0	0	600
		45	112.8	3.2	76	4	0	
		60	137.4	9.2	99.6	15.8	1	
		75	159.5	13.8	149	30.2	5.6	

DAT : Days after transplanting

Table 7. Physico-chemical parameters of tomato

Qualitative characters	Abhinav				Avinash			
	Colour breaking stage	1/4th stage	1/2nd stage	Ripen stage	Colour breaking stage	1/4th stage	1/2nd stage	Ripen stage
Fruit wt.(g)	20.00	25.00	30.00	35.00	10.00	15.00	20.00	25.00
Fruit diameter (mm)	33.35	31.21	30.59	28.52	31.35	30.12	29.60	26.34
T.S.S (Brix)	6.10	6.20	6.50	6.68	6.00	6.10	6.30	6.38
Acidity (%)	0.59	0.58	0.51	0.33	0.58	0.57	0.52	0.28
Fruit firmness (kg/ cm^2)	8.96	7.43	7.17	5.1	8.87	7.31	7.14	5.0
Lycopene (mg/ 100g)	0.23	0.37	1.01	1.64	0.21	0.35	1.00	1.63
Total sugar (%)	1.89	2.50	2.50	3.04	1.85	2.20	2.30	3.02

Economics of tomato for 100 sq m

Variety	Estimated expenditure	Total expenditure (Rs)	Production (kg)	Gross return (Rs)	Net return (Rs)	Cost benefit ratio
	Material & inputs					
Abhinav	10000	10000	1200	18000	8000	0.80
Avinash	10000	10000	600	9000	-1000	-

Fig. 10. Tomato cultivation under polyhouse

2. Gerbera

Gerbera is one of the most important commercial flowers grown world over and highly valued for their brilliant colours, appearance, and potentialities in the local as well as domestic and international market. Since, local cultivars do not perform as per consumer demand and have low production potential, it is essential to introduce exotic varieties adapted to local condition.

A field demonstration was conducted with the objective to study the performance of gerbera cultivars Imperial, Rosalin, Shimmer, Paradise, Zingaro and White house under protected condition at CIH Farm, Medziphema. Improved production technologies, uniform cultural practices and fertilizers application was followed to ensure optimum good quality flowers as well as response of vegetative growth. The performance indicated strong adoptability and good association with foot hill agro climatic condition of Nagaland. Among the characters studied, days to flowering, plant height, number of leaves/clump, number of flowers/clump, flower colour, stalk length, number of petals/flower, flower bud size, flower diameter and vase life under room condition variety Zingaro showed significant differences among the other varieties followed by Paradise (Table 8 & 9).

Thus, it may be concluded that the cultivation and performance of different cultivars of gerbera has been found more productive in variety Zingaro. The technological and extension gap can be bridged by popularizing the package of practices with emphasis of improved varieties, use of balanced nutrient management and proper use of plant protection which will subsequently increase the income as well as livelihood of the farming community.

Table 8. Plant characteristics flowering traits and yield of gerbera

Cultivars	Plant height (cm)	Number of leaves	Number of days taken for bud emergence after planting	Flower petal colour	No. of flowers/ plant
Imperial	34.80	18.36	117.50	Yellow	8-10
Rosalin	31.90	15.83	116.25	Pink	10-12
Shimmer	34.68	16.89	117.00	White	6-10
Paradise	41.44	17.53	116.50	Yellow	10-12
Zingaro	42.11	18.50	118.00	Red	12-14
White house	33.00	15.60	114.75	White	6-8

Table 9. Flower characteristics of gerbera

Cultivars	Number of flowers/ clump	Length of flower stalk (cm)	Diameter of flower bud (cm)	Diameter of flower (cm)	Disc diameter (cm)	Number of petals/ flower	Vase life of flowers in 2% sucrose solution (days)
Imperial	15.21	30.40	1.83	5.78	2.78	51.28	12.32
Rosalin	13.00	25.59	1.67	5.45	2.47	51.28	7.30
Shimmer	13.65	31.60	1.88	5.60	2.58	51.30	5.58
Paradise	15.31	32.90	2.02	6.10	2.88	56.90	8.90
Zingaro	15.35	33.00	2.04	6.21	2.98	57.00	12.57
White house	14.12	30.20	1.68	5.75	2.74	52.68	11.45

Economics of gerbera for 1000 sq m

Variety	No. of plants	Estimated expenditure		Total expenditure (Rs)	Production (nos)	Gross return (Rs)	Net return (Rs)	Cost benefit ratio
		Material	inputs					
Imperial	500	27500	2000	29500	5000	35000	5500	0.18
Rosalin	500	27500	2000	29500	6000	42000	12500	0.42
Shimmer	500	27500	2000	29500	3000	21000	-	-
Paradise	500	27500	2000	29500	5000	35000	5500	0.18
Zingaro	1000	55000	5000	60000	14000	98000	38000	0.60
White house	1000	55000	5000	60000	6000	42000	-	-

Fig.11. Different varieties of gerbera grown under polyhouse

Anthurium

Anthurium are tropical plants of great beauty and grown either for the showy cut flowers or for their unusually attractive foliage. They are very popular with flower arrangers because of the bold effect and lasting qualities of flowers when cut. These contribute to the elegance and attractiveness which are the prerequisites for a quality design. During the period under report, a field demonstration was undertaken with an objective to study the performance of anthurium cultivars Tropical, Xavia, Momento and Pistachi under protected condition at CIH Farm, Medziphema. The main purpose is to ensure uniform cultural practices to ensure optimum good quality flowers as well as response of vegetative growth.

Fig. 12. Anthurium cultivation under polyhouse

3.2.1.2. **Open field**

1. **Turmeric**

Fig. 13. Turmeric in field

Turmeric *(Curcuma longa)* the sacred spice is used as condiment, dye, drug and cosmetic in addition to its use in religious ceremonies. It is an erect, perennial herb grown as an annual crop. Turmeric prefers a warm, humid climate with a rainfall of 1500 mm and temperature of 20^0-30^0C. Turmeric being a value added crop may be cultivated by the farmers on commercial basis. During 2015-16, demonstration of organic model farm for cultivation of turmeric variety Megha Turmeric-1 was undertaken in an area of 1 ha. It was planted at a distance 30 x 25 cm during the month of April 2015. Activities such as farmers meeting

and field visit during cropping season, low yield and increased incidence of insect pest and diseases of turmeric were identified as major issues. In order to manage these problems, innovative and recommended practices were followed as new interventions during demonstrations programme. In case of recommended practices, crop rotation, field drainage, seed treatment, plant protection measures and balanced cultural practices were followed.

Before conducting the demonstration, farmers were trained with respect to identified technologies. Procedure for site and farmers selection, layout of demonstration and farmers participation etc. were followed. Visits of the farmers and extension functionaries were organized at demonstration plots to show the significance of large scale cultivation of turmeric. Yield data was collected from demonstration plots and analyzed (Table 10)

The results of demonstrations showed that the yield of turmeric could be increased with the help of innovative technological intervention coupled with the proper management of disease. The demonstration has also motivated the farmers towards adoption of turmeric cultivation. The suitable technology for enhancing the productivity of turmeric crop, and need to conduct such demonstrations may lead to the improvement and empowerment of farmers.

Table 10. Growth, yield and quality characteristics of turmeric

Cultivar	DAS	plant ht. (cm)	No. of leaves / plant	No. of clumps / plant	Total yield (tonnes)	Curcumin content (%)
Lakadong	30	15.40	4.00	2.00	5.0	4.60
	60	24.61	6.00			
	90	42.82	9.00			
	120	65.90	12.00			
	150	84.65	18.00			

DAS : Days after sowing

2. Onion

Onion *(Allium cepa)* is a cool season vegetable crop but its demand remain constant year round in the market due to its usefulness as an essential ingredient in various culinary recipes and as raw in salad. During the reported period, demonstration on of season production of Kharif onion variety N-53 was conducted in an area of 0.10 ha. The main objective of the demonstration is to evaluate the performance

Fig. 14. Onion in field

of the variety and its effect on organic manures and introduction of kharif onion for higher income. A total of four treatments were replicated three times in a randomized block design. The treatments were farmyard manure @ 6 tonnes/ha, pig manure@5 tonnes/ha, vermicompost @4 tonnes/ha and control. Manures were incorporated at the time of planting. Seeds of onion variety N-53 @ 500 gm were sown in the nursery in the month of September 2015. After 60 days, the seedlings were transplanted at a distance 15 x 10 cm in a plot size of 1 x 1 m during the month of Nov. 2015. Interculture operation were adopted at 20-25 and 40-45 days after planting. Irrigation was given according to the needs. The results and observations were recorded at regular intervals and the parameters recorded are detailed in Table 11 where the result indicated that application of FYM was found to be better than that of other treatments. Kharif onion was found feasible and compatible and the farmers have also adopted the technology.

Table 11. Effect of different treatments on growth and quality attributes of Onion var. N-53

Treatments	Plant height (cm)	No. of leaves/ plant	Neck thickness (cm)	Bulb dia. (cm)	Wt. of bulb (g)	T.S.S (^{0}Brix)	Average yield (t/ha)
Vermicompost	17.40	4.33	4.90	18.02	12.23	8.92	0.09
Pig manure	25.33	5.33	5.16	32.35	23.99	8.80	0.10
FYM	27.30	5.33	4.16	29.98	22.77	12.08	0.15
Control	8.46	3.00	2.50	15.12	9.00	8.60	0.06

Economic analysis of establishing, maintaining and returns from 0.25 ha Kharif season onion cultivation spaced at 10 x15 cm

Estimated expenditure	Total expenditure (Rs)	Production (tonnes)	Gross return (Rs)	Net return (Rs)	Cost benefit ratio
Material & inputs					
4300	4300	0.1	8000	3700	0.86

3. **Broccoli**

Broccoli *(Brassica oleracea var. italica)* is a winter season vegetable crop. It is an edible green plant in the cabbage family whose large flower head is used as vegetable. During the period under report, cultivation of broccoli variety Princess was planted as part of demonstration with an objective to assess adoption of improved technology and to popularize this high value cole crop and its varieties among the marginal and small farm ers and response of different organic manures on growth and yield of broccoli. In the demonstration, the improved variety suitable to local condition was selected and the

recommended package of practices was adopted. A total of four treatments farmyard manure @ 6 tonnes/ha, pig manure@5 tonnes/ha, vermicompost @4 tonnes/ha and control were replicated three times and was incorporated at the time of planting. Broccoli seeds were first sown in nursery beds. At four leaf stage the seedlings were transplanted in the main field at a distance 60 x 45 cm in a plot size of 2 x 2 m during the month of Oct. 2015. The crop was watered regularly. Before conducting the demonstration, farmers were trained with respect to identified technologies. Procedure for site and farmers selection, layout of demonstration and farmers participation etc. were followed. Visits of the farmers and extension functionaries were organized at demonstration plots to show the significance of large scale cultivation of turmeric. Regular observations were recorded for different manures as given in Table 12 which indicates that application of FYM showed significant impact on growth and other attributes of broccoli followed by Pig manure. The demonstration has also motivated the farmers towards adoption of broccoli cultivation. The farmers who has adopted the new technology is having a good impact on the other farmers as well as more farmers are contacting the Institute for providing them with necessary technical guidance.

Fig. 15. Broccoli in field

Table 12. Growth and yield characteristics of Broccoli var Princess

Treatments	Plant height (cm)	No. of leaves/ plant	Diameter of curd/ head (cm)	Wt. of curd (g)	Average yield (t/ha)
Vermicompost	45.93	15.67	13.38	332.67	0.18
Pig manure	45.67	17.67	15.46	341.33	0.20
FYM	48.0	19.67	16.33	357.33	0.26
Control	43.30	14.00	13.0	308.65	0.16

Economic analysis of establishing, maintaining and returns from 800 sq m broccoli cultivation spaced at 40 x 60 cm

Estimated expenditure	Total expenditure (Rs)	Production (tonnes)	Gross return (Rs)	Net return (Rs)	Cost benefit ratio
Material					
3500	3500	0.20	8000	4500	1.28

4. Cabbage

Fig. 16. Cabbage in field

Cabbage (Brassica oleraceae L. var capitata) is a cole crop and belongs to the family Cruciferae or Brassicaceae. In Nagaland, cabbage is grown as a major crop during the winter and a minor crop during the summer but the productivity is very low in spite of its great potential in the state. Therefore, a demonstration on cabbage variety Rare ball was carried out during 2015-16 at CIH during the month of October, 2015.

The objective of the demonstration is to educate the cabbage growers about its scientific cultivation right from nursery raising stage to increase productivity and response of different organic manures on growth and yield of cabbage.The improved variety suitable to local condition was selected and the recommended package of practices was adopted. A total of four treatments farmyard manure @ 6 tonnes/ha, pig manure @5 tonnes/ha, vermicompost @4 tonnes/ha and control were replicated three times and was incorporated at the time of planting. The seeds were first sown in nursery beds. At four leaf stage the seedlings were transplanted in the main field at a distance 60 x 45 cm in a plot size of 2 x 2 m. Regular observations were recorded for different manures and the result indicates that in all the parameters application of FYM was found to be significant than that of the other treatments and the demonstration has also motivated the farmers towards adoption and cultivation of cabbage (Table 13).

Table 13. Growth and yield characteristics of cabbage var Rare ball

Treatments	Plant height (cm)	Stalk length (cm)	Head diam-eter (cm)	Wt. of head (g)	Vit. C (mg/100 g)	Average yield (t/ha)
FYM	28.50	7.00	11.80	1245	141.15	0.29
Pig manure	26.45	6.58	10.75	1063	138.19	0.26
Vermicompost	24.15	4.60	10.17	1027	137.85	0.25
Control	23.47	4.19	9.15	9479	137.11	0.19

Economic analysis of establishing, maintaining and returns from 800 sq m cabbage cultivation spaced at 30 x75 cm

Estimated expenditure	Total expenditure (Rs)	Production (tonnes)	Gross return (Rs)	Net return (Rs)	Cost benefit ratio
Material					
3240	3240	0.25	7500	4260	1.31

5. **Knol khol**

Khol Rabi which is the german name for cabbage turnip resembles an above ground turnip. It is also called knol-knol. The fleshy edible proration is an enlargement of the stem, which develops entirely above ground and is used as a vegetable. It is a cool season crop and thrives in a relatively cool moist climate. During the period under report, cultivation of knoll khol variety Seoul ball was planted as part of demonstration at CIH, Nagaland. The demonstration was carried out with an objective to assess adoption of improved technology and to popularize the crop and its varieties among the marginal and small farmers. A total of four treatments farmyard manure @ 6 tonnes/ha, pig manure@5 tonnes/ha, vermicompost @4 tonnes/ha and control were replicated three times and was incorporated at the time of planting. The seeds were first sown in nursery beds and the seedlings were transplanted in the main field at a spacing of 30 x 20 cm. The observations revealed that the growth and yield attributing characters differed significantly within the treatments. On the basis of performance of treatments related to plant height, no. of leaves and weight of swollen stem, application of pigmanure was found better. Highest diameter of swollen stem was recorded in Vermicompost whereas yield was more in FYM (Table 14). Visits of the farmers and extension functionaries were organized at demonstration plots and the farmers has also adopted the new technology is having a good impact on the other farmers as well.

Table 14. Growth and yield characteristics of knol khol var. Seoul ball

Treatments	Plant height (cm)	No. of leaves/ plant	Wt. Swollen stem (g)	Diameter of Swollen stem (cm)	Average yield (t/ha)
FYM	22.90	8.60	0.04	4.23	0.27
Pig manure	27.92	9.87	0.06	4.61	0.20
Vermicompost	27.86	8.60	0.36	6.12	0.17
Control	15.90	7.13	0.01	1.94	0.16

Economic analysis of establishing, maintaining and returns from 800 sq m knol khol cultivation spaced at 30 x20 cm

Estimated expenditure	Total expenditure (Rs)	Production (tonnes)	Gross return (Rs)	Net return (Rs)	Cost benefit ratio
Material					
2480	2480	0.20	6000	3520	1.41

6. Cultivation of indigenous fruits and vegetables

The underutilized or indigenous crops are species that are used traditionally for food, fibers, fodder, oil or medicinal properties. They have an underexploited potential to contribute to food security, nutrition, health, income generation and environmental services. Considering the importance of the crops as food, medicine and for industries, these underutilized or indigenous crops can be exploited at the commercial level. Therefore, during the reported period, as recommended by the Technical Advisory Committee (TAC) of CIH, Nagaland, the Institute has established a demonstration plot in an area of 0.25 ha. A total of 5 indigenous crops was collected and planted in the field. The crops includes tree bean (30 nos), Jamun (30 nos) and Plum (30 nos), local garlic and local chive.

Fig. 17. L-R. Plantation of Tree bean, Jamun and Plum

7. Oyster mushroom cultivation

The availability of manpower, raw materials (paddy straw) and climatic conditions is suitable for mushroom cultivation throughout the year in the region. Mushroom production has not gained momentum due to

Fig. 18. (L) Mushroom production unit (R) Preparation for production by Farm workers

dearth of knowledge about the distinction between the poisonous and non-poisonous species, improved production technology, availability of quality spawn, processing and marketing. Therefore, keeping in view the above facts, the Institute has established one mushroom production unit during the period under report so that demonstrations on various aspects of distinguishing edible and poisonous mushrooms, low cost year round production technology, management of mushroom units and processing and preservation technologies can be demonstrated to the farmers. Besides this, CIH, Nagaland has organized awareness training programme on hands on demonstration on oyster mushroom cultivation with an aim to promote skills for income generation to improve livelihood.

8. **Papaya**

Papaya, papaw or papita is a popular tropical fruit native to Mexico. Papaya is cultivated for its fast growth, high yield, long fruiting period, high nutritive and medicinal values as well. Commercial cultivation of papaya is very successful and highly profitable. During the period under report and as per recommendation of Board of Management, the Institute has planted papaya gynodioecious varieties Arka Surya in an area of 0.25 ha developed by IIHR, Bangalore. The main purpose is to popularize the varieties and also to limit the import of papaya seeds from other countries.

Fig. 19. Plantation of papaya variety Arka Surya

9. **Strawberry**

Strawberry is one of the most popular soft fruit and is cultivated in plains as well as in hills upto an elevation of 3000 metres in humid or dry regions, widely grown under protected and open condition in temperate and subtropical countries with maximum temperature of 22^0 -25^0 C in the day and 7^0 -13^0 C at night. Among all the different types of berries, strawberry gives the quickest return in a shortest possible period. Its cultivation has spread to tropical and subtropical zones, where states like Meghalaya, Sikkim, Nagaland and Mizoram have taken up the cultivation of this viable fruit since North Eastern Region has

a vast potential for the development of horticulture sector. During the year 205-16, CIH, Nagaland has established a demonstration plot for strawberry varieties Sweet Charlie, Winter Dawn and Fortuna in an area of 1 acre with an objective to study the performance of different varieties under Nagaland condition. The plantation was carried out following the right package of practices and the plants were regularly observed and recorded as given in Table 16, 17, 18, and 19 where the results revealed the growth, yield and yield attributing characters significantly differed within the varieties. On the basis of performance of varieties related to growth and other yield attributing characters Winter Dawn proved to be the best suited with a yield of 7.85 t/ha followed by Fortuna and Sweet Charlie.

Table 16: Growth and yield characteristic of strawberry cultivars

DAS	Sweet Charlie					Winter Dawn					Fortuna				
	Spread of plant (cm)	No. of Crowns /plant	No. of flow-ers/ plant	Yield/ plant (g)	Yield (t/ ha)	Spread of plant (cm)	No. of Crowns/ plant	No. of flow-ers/ plant	Yield/ plant (g)	Yield (t/ ha)	Spread of plant (cm)	No. of Crowns/ plant	No. of flowers/ plant	Yield/ plant (g)	Yield (t/ ha)
30	vertical-23.02	0	0			0	0	0			0	0	0		
	horizontal-19.49														
45	verti-cal-22.14	1.9	2			1.2	1.16	1.2			1.3	1	1.3		
	horizon-tal-21.74			543.23	6.02				835.35	7.85				489.25	6.75
60	vertical-23.19	2.7	2.2			2.8	1.4	2.8			1.7	1.7	1.7		
	horizontal-21.85														
75	verti-cal-24.08	2.6	1.88			3	1.43	3			2.5	2.4	2.5		
	horizontal-22.12														

DAS: days after planting

Table 17: Physical and quality characteristic of strawberry cultivars

Physical parameters of fruit	Sweet Charlie				Winter Dawn				Fortuna			
	colour break stage	1/4th stage	1/2nd stage	Ripen stage	colour break stage	1/4th stage	1/2nd stage	Ripen stage	colour break stage	1/4th stage	1/2nd stage	Ripen stage
Berry length(mm)	35.02	32.23	34.15	33.91	37.1	37.18	35.22	37.26	10.34	37.03	31.61	40.92
Berry breadth (mm)	22.34	26.22	27.36	30.87	25.61	26.38	22.97	28.32	22.38	25.15	22.59	26.80
Fruit weight (g)	9.35	12.83	15.53	19.43	14.4	14.56	15.12	20.16	11.17	14.73	10.74	15.89
Fruit density (cm^3)	5.00	15.00	16.6	18.33	15.00	16.60	20.00	26.60	10.00	15.00	13.33	16.66
Firmness (kg/cm^2)	2.13	2.13	1.73	1.00	2.86	2.60	2.36	2.30	2.86	2.60	2.36	2.33
Acidity (%)	0.89	0.99	0.85	0.78	1.26	1.23	1.19	0.99	1.02	1.06	1.06	4.01
PH value of juice	3.40	3.40	3.50	3.60	3.30	3.30	3.20	3.20	3.60	3.60	3.50	3.40
Vit C (mg/100g of pulp/juice)	260	256.66	240	216.66	296.6	283.33	328	380	284	272.3	244.58	238.12
T.S.S (Brix)	5.20	5.80	5.80	7.33	5.46	5.53	6.06	6.06	5.60	6.00	7.40	8.20
Reducing sugar (%)	2.12	3.08	3.15	5.17	1.39	2.66	2.94	3.36	10.34	37.03	31.61	40.92
Total sugar (%)	1.86	1.76	1.61	1.28	2.00	2.60	2.74	2.76	22.38	25.15	22.59	26.8

Economics of Strawberry per ha

Cultivar	Estimated expenditure	Total expenditure (Rs)	Production (tonnes)	Gross return (Rs)	Net return (Rs)	Cost benefit ratio
	Material & inputs					
Sweet Charlie	366940	366940	6.02	903000	536060	1.46
Winter Dawn			7.85	1177500	810560	2.20
Fortuna			6.75	1012500	645560	1.75

Fig. 20. Strawberry cultivation

10 Cocoa

Cocoa is an important commercial plantation crop of the world. It is a crop of humid tropics and so it was introduced as a mixed crop in India in areas where the environments suit the crop. During the period under report it was advised by Board of Management to carry out a demonstration plot for cocoa in an area of 0.25 ha. Farmyard manure was incorporated at the time of planting and the seedlings were transplanted in the field at a distance 5 x 5 m in a pit size of 60 x 60 x 60 cm.

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Fig. 21. Cocoa plantation

11. Gladiolus

Gladiolus is one of the most important bulbous ornamental grown for its long lasting spikes with attractive color. In the North Eastern region Sikkim, Nagaland, Tripura, Manipur, Meghalaya and Assam are suitable for gladiolus cultivation. During the reported period, the Institute has planted gladiolus varieties Pink Friendship, White Prosperity, Tader Horn and Novalux in open field in an area of 500 sq m. Corms of 4.5 cm diameter were planted at a spacing of 20 x 30 cm. The observation recorded is given below where it indicates that the variety Pink Friendship is found better than the other varieties on growth characteristics (Table 18). In terms of flowering attributing characters, variety Pink Friendship was found to be more significant than other varieties (Table 19).

Table 18. Performance of Gladiolus varieties on growth characters

Varieties	Plant height (cm)	Number of leaves per plant	leaf length (cm)	leaf width (cm)
Pink Friendship	62.69	4.80	34.46	3.45
White Prosperity	61.78	4.76	34.26	3.43
Tader Horn	61.67	4.74	34.00	3.41
Novalux	61.70	4.68	34.28	3.45

Fig. 22. Gladiolus cultivation

Table 19. Performance of Gladiolus varieties on flowering characters

Varieties	Days to spike emergence	Spike length (cm)	Number of floret per spike	Flower diameter (cm)	Flower length (cm)	Diameter of corm (cm)	Number of cormels
Pink Friend-ship	82.02	58.41	8.61	6.68	5.47	3.40	10.37
White Pros-perity	82.00	58.37	8.47	6.46	5.35	3.38	10.25
Tader Horn	82.01	58.00	8.35	6.38	5.27	3.34	10.13
Novalux	82.02	58.21	8.23	6.42	5.31	3.38	10.21

12. Tissue culture pineapple

Pineapple *(Ananas comosus)* is one of the commercially important fruit crops of India. It is being cultivated in high rainfall and humid coastal regions of peninsular India and hilly areas of North-Eastern region. Of late, it has been shown that pineapple can also be grown commercially in the interior plains with medium rainfall and supplementary protective irrigation. A major problem that both large scale commercial production of pineapple and the expansion of the existing small farms face is the difficulty in obtaining uniform planting material in large quantity due to low rate of multiplication by conventional methods and lack of high quality propagules. Using tissue culture pineapple has a comparative advantage over the traditional methods as it leads to the production of large scale of disease free uniform planting materials in a short period of time. Therefore, during the reported period, the Institute has under taken cultivation of tissue culture pineapple variety MD-2 as part of demonstration with an objective to access improved quality planting materials and to study the performance of growth and yield under Nagaland condition. The demonstration plot was established in an area of 1150 sq m under plastic mulch.

Fig. 23. Tissue cultured Pineapple under plastic mulch

13. Other plantation activities

As recommended by the Technical Advisory Committee, plantation of Banana var. Bhimkal and Athia Kal (1500 nos) and Neem (780 nos.) were planted during the reported period way in and around campus and road side as wind break as they would not only act as wind breaks but also will serve many other purposes.

3.2.1.3. Maintenance of existing plantation of various horticulture crops

1. Ultra high density plantation of guava

Fig. 24. Ultra HDP of guava in field

Guava (*Psidium guajava*) is an important fruit crop in tropical and subtropical regions of the country due to the hardy nature of its tree and prolific bearing even in marginal lands. Its cultivation requires little care and inputs. Hence, a need arose to improve the existing production system, besides increasing its productivity through higher density or meadow orcharding to control tree size and maintain desired architecture for better light interception and ease in operations such as pruning, pest control and harvesting. The high density or meadow orcharding facilitates enhance production and quality of fruits. Ultra high density plantation of guava variety Lucknow 49, Shweta, Lalit and Allahabad safeda was established in an area of 1 ha at CIH farm during May 2010.

Potentiality of recommended technology through demonstration was attempted with the following objectives.

- Harvesting is easy and the cost of picking is reduced
- Easy in spraying of chemicals for pest and disease control
- The ratio of fruiting shoots to supporting ones is higher
- Possible to plant more trees per unit area leading to higher income

In case of recommended practices, field drainage, plant protection measures and balanced cultural practices were followed. Visits of the farmers and extension functionaries were organized at demonstration plots to show the significance of large scale cultivation of guava. Yield data was collected from demonstration plots and cost of cultivation, net income and Benefit: Cost ratio were calculated and analyzed.

The observations recorded for different parameters in different varieties is given in Table 22, 23 and 24. The result indicated that different varieties exhibited significant varieties in terms of growth and other qualitative parameters. Variety Lalit was found to be superior over other varieties with regard to Fruit whole weight, fruit volume, number of seeds per fruit, Peel weight/ fruit, pulp weight/ fruit and juice content. L-49 variety recorded the highest Fruit breadth compared to other varieties. The highest Fruit length was recorded in variety Allahabad Safeda and Lalit. In terms of quality performance, variety L-49 was found superior with regard to TSS, Vit. C and Pectin content. Highest reducing sugar was found in variety Lalit and Non-reducing sugar, Total sugar and acidity was superior in Allahabad Safeda and highest yield was obtained in Lalit (12.65t/ha). The results also indicate that benefit: cost ratio also advocated the economic viability of the demonstration and motivated the farmers towards adoption of technology demonstrated. This technology for enhancing the productivity of guava and conducting such demonstrations may lead to the livelihood improvement of farmers

Table 20. Growth characters of different guava varieties

Parameters	L-49	Allahabad Safeda	Lalit	Shweta
Fruit weight (kg)	0.12	0.14	0.15	0.16
Fruit length (cm)	2.28	2.30	2.30	2.28
Fruit breadth (cm)	2.27	2.22	2.31	2.26
Fruit vol (cm^3)	96.00	110.00	110.00	120.00
No. of Seeds/ fruit	467.20	454.00	472.60	501.60
Peel wt./ fruit (kg)	0.04	0.02	0.02	0.04
Pulp wt. / fruit (kg)	0.08	0.09	0.08	0.10
Juice content/ fruit (ml)	30.20	20.20	18.40	38.40
Skin colour of fruit	Yellowish	Yellowish	Yellowish	Yellowish
Flesh colour of fruit	White	whitish pink	pink	White
Yield/ plant (kg)	8.93	9.82	10.12	9.75
Yield/ ha (t/ha)	11.16	12.27	12.65	12.18

Table 21. Performance of different guava varieties on fruit quality

Parameters	L-49	Allahabad Safeda	Lalit	Shweta
TSS (^{0}Brix)	9.30	7.00	5.40	9.00
Vit. C (mg/100g pulp/juice)	108.00	98.00	52.00	96.00
Reducing sugar (%)	3.30	3.70	6.60	3.70
Non-reducing sugar (%)	0.13	0.43	0.11	0.10
Total sugar (%)	3.44	4.16	3.27	3.12
Pectin (%)	12.71	12.23	19.10	12.11
Acidity (%)	0.89	0.96	0.64	0.57

Table 22. Economic analysis of establishing, maintaining and returns from one hectare meadow orchard spaced at 2.0 x 1.0m (5000 plants ha^{-1})

Cultivar	Estimated expenditure	Total expenditure (Rs)	Production (tonnes)	Gross return (Rs)	Net return (Rs)	Cost benefit ratio
	Material & inputs					
L-49	172050	172050	11.16	334800	162750	0.94
Allahabad Safeda			12.27	368100	196050	1.13
Lalit			12.65	379500	207450	1.20
Sweta			12.18	365400	193350	1.12

2. Plantation of mango

The Institute has established mango block of varieties Langra, Bombay green, Pant Sinduri, Dashehari, Mallika in the farm to evaluate the performance of different varieties. The plantation was done during the year 2010-12 in an area of 0.5 ha. The planting materials were procured from CISH Lucknow and BAU, Sabour. The parameters recorded for different varieties are given in Table 25 and 26. The results revealed that the variety Pant Sindhuri was found significant in all growth attributes whereas, highest number of fruits, Pulp peel ratio and Non-reducing sugar was found in Mallika. Dashehari recorded the highest Juice content/ fruit, T.S.S, Acidity, Reducing sugar and Total sugar and Vit C was found superior in Pant Sindhuri. Highest yield (2.66t/ha) was observed in Mallika variety.

Fig. 25. Mango plantation in field

Table 23. Performance of different mango varieties on growth and yield attributes

Variety	Plant ht. (cm)	Trunk diameter (cm)	Canopy spread (cm)		No. of terminal Shoots/ tree	No. of Fruits/ tree
			East west	North south		
Amrapalli	150.31	27.00	162.10	162.22	25.60	25.60
Langra	198.18	21.17	156.17	132.24	69.00	0.00
Gulabkhas	204.26	30.05	192.27	192.19	70.60	0.00
Pant Sindhuri	322.83	30.19	352.63	352.28	182.25	29.00
Mallika	204.04	29.48	288.10	234.34	123.60	39.25
Dashehari	174.21	26.00	156.18	180.14	104.80	11.00
Bombay green	174.27	26.42	192.22	210.35	74.80	0.00

Table 24. Performance of different Mango varieties on quality attributes

Parameters	Amrapalli	Pant Sindhuri	Dashehari	Mallika
Fruit wt (kg)	0.17	0.20	0.18	0.17
Fruit length (cm)	8.16	8.20	8.14	8.12
Fruit breadth (cm)	5.45	5.75	5.43	5.37
Fruit Vol. (cm^3)	10.43	10.57	10.42	10.40
Skin Colour of fruit	Green	Green	Green	Green
Flesh colour of fruit	Yellow	Yellow	Yellow	Yellow
Seed / fruit	1.00	1.00	1.00	1.00
Pulp peel ratio	70.06:31.40	67.86:34.71	76.71:33.60	114.30:65.69
Juice content/ fruit (ml)	27.00	36.33	41.66	36.00
T.S.S ($Brix^0$)	16.00	15.20	17.60	12.80
Acidity (%)	0.12	0.26	0.36	0.21
Vit C (Mg/100g of pulp/juice)	53.33	356.66	280.00	200.00
Reducing sugar (%)	2.43	3.83	4.09	2.56
Total sugar (%)	4.42	5.12	6.34	5.71
Non-reducing sugar (%)	1.92	1.22	2.13	4.32
Yield/ ha (t)	1.74	2.32	1.58	2.66

Economic analysis of mango per ha

Cultivar	Estimated expenditure	Total expenditure (Rs)	Production (tonnes)	Gross return (Rs)	Net return (Rs)	Cost benefit ratio
	Material & inputs					
Amrapalli	50000	50000	1.74	87000	37000	0.74
Pant Sindhuri			2.32	116000	66000	1.32
Dashehari			1.58	79000	29000	0.58
Mallika			2.66	133000	83000	1.66

3. Peach

Peach is a cold season crop and is cultivated in all the North east states. It is consumed as fresh fruit or processed one. The Institute has established peach block in an area of 0.25 ha during the year 2009-10 to study the performance of peach variety Shane-E-Punjab. The planting materials were procured from ICAR Research Centre for NER, Barapani. The parameters recorded is given in Table 25.

Fig. 26. Peach var. Shane-E-Punjab in bearing stage

Table 25. Performance of peach variety Shane-E-Punjab on growth, yield and quality attributes

Variety	Plant height (cm)	Trunk diameters (cm)	Plant spread (cm)		No. of Terminal shots	Fruit length (cm)	Fruit wt. (g)	Fruit breadth (cm)	Yield per plant (kg)
			North west	North south					
Shane-e Punjab	234.14	38.02	414.04	282.11	104.20	44.20	54.81	328.60	12.50

Fruit vol (cm^3)	Skin colour of fruit	Flesh colour of fruit	No. of seed per fruit	Pulp peel ratio	Juice content per fruit (ml)	TSS (^{0}Brix)	Acidity (%)	Total sugar (%)	Vit. C (mg/100g of of pulp/ juice)
1.40	Slightly pink	Dark pink	1.00	36:04:766	15.20	12.00	1.11	3.60	108.00

4. **Aonla**

Aonla (*Emblica officinalis*) or Indian gooseberry is indigenous to Indian sub-continent. The fruits have the richest source of Vitamin C with high medicinal value. Plantation of Aonla variety NA-6, NA-10, NA-7, Krishna and Laxmi-52 was established in an area of 0.75 ha at CIH farm to study the performance of different varieties. The observations recorded for different varieties is given in Table 26 and 27.

Fig. 27. Fruit Bearing in Aonla var. NA-10

Table 26. Growth performance of different varieties of Aonla

Aonla varieties	Plant height (cm)	Trunk diameter (cm)	Canopy spread (cm)	
			East-west	North-south
NA-10	396.00	45.00	266.00	350.00
NA-6	324.60	51.00	347.00	374.00
NA-7	321.00	32.43	326.00	347.00
Laxmi-52	385.00	27.00	335.00	353.00
Krishna	313.00	121.00	349.00	366.10

Table 27. Parameters of different aonla varieties on quality

Parameters	NA-10	NA-6
Fruit length (cm)	27.47	22.31
Fruit breadth (cm)	25.81	22.54
Juice content/ fruit (ml)	15.80	16.20
Vit. C mg/100g/ pulp/juice	26.00	122.00
Acidity (%)	1.85	2.36
Reducing sugar (%)	1.98	3.12
Total sugar (%)	8.12	7.48
Non-reducing sugar %	1.84	1.04
T.S.S. (Brix^0)	9.44	14.20

5. Pineapple

Nagaland pineapples are best known for their unique taste and high qualitative parameters with almost fibreless pulp, high juice and high TSS content. The most commonly grown variet y in Nagaland is "Kew' and the season of fruit availability is July-August in summer and Oct-Jan in winter. It is one of the main crops supported by the government for commercialization in the state as pineapple cultivation has the potential to improve the livelihood of the rural people in the state. During the reported period, a demonstration plot for pineapple variety Kew was established in an area of 0.25 ha which was planted at double row system of 30 x 60 90 cm. The parameters recorded in different stage is given in Table 28 and 29.

Fig. 28. Pineapple var. kew plantation in field

Table 28. Physical parameters recorded in pineapple variety Kew

Parameters	Green stage	Matured stage	Slightly yellowish stage	Fully ripened stage
Fruit whole wt (kg)	1010.00	1.43	1.11	1.97
Fruit wt (kg)	0.87	1.12	0.83	1.62
Crown wt (kg)	0.22	0.30	0.27	0.34
Fruit length (cm)	12.53	11.88	12.37	16.17
fruit breadth (cm)	9.89	10.79	10.38	12.2
peel wt (g)	0.33	0.35	0.31	0.45
Pulp wt. with core (kg)	0.68	0.73	0.52	1.14
Pulp wt. without core (kg)	0.60	0.60	0.44	0.99
Core wt. (kg)	0.08	0.13	0.08	0.14
Juice content (ml)	255.00	305.00	270.00	665
wt. of extracted pulp waste (kg)	0.13	0.14	0.14	0.26

Table 29. Qualitative parameters recorded in pineapple variety Kew

Parameters	Green stage	Matured stage	Slightly yellowish stage	Fully ripened stage
TSS (^{0}Brix)	12.93	13.00	16.20	14.26
Vit. C (mg/100g pulp/ juice)	60.00	66.66	56.66	60.00
Acidity (%)	0.49	0.38	0.36	0.36
Total sugar (%)	6.63	6.45	6.07	4.13
Reducing sugar (%)	1.90	1.58	1.86	1.82
Non-reducing sugar (%)	4.49	4.62	3.99	2.19

3.2.1. Farmers field

As per the Institute's mandate and targets of Action plan of CIH, various demonstration plots of focus fruit crops were established in farmers field to demonstrate the recent improved technology and create awareness so as to acquaint them of the horticultural technologies. The Institute has supplied all inputs and technical guidance for establishing the demonstration plots. The activities carried out for off farm demonstration during the year 2015-16 are being mentioned in short below.

Sl.no	Name of farmer	Place	Crop	Area (ha)
1	Mr. Letthang	Molvom village, Nagaland	Tissue culture pineapple	0.20
2	Mr. Semato Zhimomi	Pherima village Nagaland	Tissue culture pineapple	0.20
3	Mr. Kurusung Timung	KarbiAnglong Assam	Tissue culture banana	0.06
4	Mr. Kurusung Timung	KarbiAnglong Assam	Guava	4 ha
5	Mr. Chozukhwu Nyekha	Bade Area Agri-allied Cooperation Society Ltd., Dimapur, Nagaland	Vegetables (Palak, cabbage, pea, knoll khol, capsicum, cauliflower and Radish)	3 ha
6	Smt. Kare Ronghangpi	KarbiAnglong Assam	Citrus rejuvenation	1 ha
7	Mr. Nzan Kikon	Wokha, Nagaland	Citrus rejuvenation	1 ha

1. **Tissue Culture Pineapple**

During the reported period, the Institute has established demonstration plot of tissue culture pineapple variety MD-2 in an area of 0.20 ha at Molvom and Pherima Village, Nagaland to study the performance of growth and yield under Nagaland condition.

2. **Banana**

Banana (*Musa sp.*) is the second most important fruit crop in India next to mango. Its year round availability, affordability, varietal range, taste, nutritive and medicinal value makes it the favourite fruit among all classes of people. It is also one of the focus crop s of the region and therefore, the Institute has established demonstration plot of Banana variety Grand Naine at Karbi Anglong, Assam in an area of 0.06 ha

Fig. 29. Banana demonstration plot at Karbi Anglong, Assam

3. **Guava**

Guava (*Psidium guajava* L.) is known as the apple of the tropics. It is one of the most common fruits in the region. It is grown all over the tropics and subtropics. A demonstration plot for Guava variety Allahabad Safeda, L-49 and Shweta was also established by the Institute at at Karbi Anglong, Assam in an area of 4 ha.

Fig.30. Guava demonstration plot at Karbi Anglong, Assam

4. **Vegetables**

A wide range of tropical, sub-tropical and temperate vegetable crops both indigenous and exotic, are grown in the region. In terms of its contribution to the national production, the region accounts for about 4.5% for vegetables. During the reported period, CIH has established demonstration plot of vegetables (Palak, cabbage, broccoli and french bean) in an area of 3 ha at Bade area under Dimapur district.

Brief records of progress after the technical intervention imparted by CIH, Nagaland

Sl.no	Vegetable crops	Quantity supplied	Unit (ha)	Production (tonnes)
1	Broccoli (F1 hybrid Sakura)	300 g	1	07
2	Cabbage (Golden Acre)	2 kg	5	25
3	French bean (Arka Anoop, arka Subidra)	330 Kg	8	30
4	Palak (Pusa Bharti)	50 kg	5	06

Remarks/ feedback by the farmers

Sl.no	Vegetable crops	Remarks/ feedback
1	Broccoli (F1 hybrid Sakura)	Production was good, however since its shelf life is very short, it requires proper marketing channel to supply the produce soon after harvesting
2	Cabbage (Golden Acre)	Good production but unstable market price, varies between Rs. 3 to Rs. 20 per kg. Hence, would require change in crop cycle for better market price.
3	French bean (Arka Anoop, arka Subidra)	Good production and gives multiple harvest. Tender beans are used as vegetables and when matured, the beans are used as pulses. Good market price for both beans and pulses
4	Palak (Pusa Bharti)	Good production if irrigated properly and regularly. Require abundant water for cultivation when young. It has a long shelf life and gives multiple harvest. Good and stable market price.

Fig.31. Vegetable demonstration plot at Bade, Urra village, Dimapur district

5. Citrus rejuvenation programme at Nagaland and Assam

Citrus decline is due to combined effect of biotic factors such as poor orchard management, improper pruning, lack of insect pest management and abiotic factors namely, lack of soil and water management, nutrient deficiencies etc. The region is considered as the main producers of oranges but the production is dropping down due to senile orchard, climate change, attack of insect pests and diseases, lack of nutrients, loss of top soil and more importantly mismanagement and total negligence of the orchard. Most of the fruit trees required total rejuvenation. Therefore, with an objective to rejuvenate the decline citrus orchard in the region, demonstration on citrus rejuvenation was carried out by CIH, Nagaland at Karbi Anglong, Assam (1 ha) and Wokha district, Nagaland (2 ha). Different approaches are adopted for rejuvenation, such as adoption of suitable soil and water conservation measures and proper management of the orchard by following the year round calendar of operation. With the intervention of CIH, Nagaland, the farmers were provided with every input required for rejuvenation of his orchard. The result proved fruitful as the rejuvenated trees started showing sign of improvement. The calendar of operation recommended month wise is given below.

Sl no	Month	Operations
1	**December –January** **(After fruit harvest in dry months)**	• Pruning of dried branches • Removal of parasite plants like Loranthus • Clean tree base, give shallow (5-10 cm) soil working of an area about one metre around the tree trunk • Paste tree trunk upto an height of one metre with Bordeaux paste (Cu 504-1kg; Lime – 2kg, 16-20 litres water)
2	**Late Feb to 2nd week March**	• Apply 650g of urea, 450g SSP and 500g of MOP per plant in the tree base following the ring method.
3	**Mid April to early May** **(New leaf fully ex-panded)**	Spray the tree canopy with a mixture of Zinc Sulphate - 98g Copper Sulphate - 59g Magnesium sulphate - 39g Dissolved in 20 litres of water Ferrous sulphate - 39g Managanese sulphate - 39g Lime - 180g In highly acidic soil with pH 4.5-5.0 apply 500g of Dolomite lime per plant once in 3 years

4	**Disease and pest control (April – May)**	
a	Rot or gummosis	Affected portion should be scrapped with a sharp knife taking care that no wood is damaged and paint with Bordeaux paste (1:2:3 linseed oil)
b	Phytophthora disease infested Plants	Spray infested plants 2 times 1st spray in April and 2nd spray 40 days after with 1% Bordeaux spray. Drench the soil at tree base with Ridomil MZ-72 (2.75g dissolved in one litre of water) For prophylactic control of pest and disease, spray Bavistin 0.1% and Nuvacron (0.1%)
5	**November December (trunk and stem borer control)**	Treat the soil, 6-9 cm deep around tree trunks (0.5 m) with 5% Aldrin / sevin dust in dry month A regular surveillance for trunk borer during July-August is essential. Whenever frass (excreta) are seen in tree trunk/ branches, clean the tunnel (bored hole) with an iron wire, inject 3-5 ml carbondisulphide/ petrol or insert a cotton swab soaked in Nuvan/ Nuvacron/ Petrol and plug the hole with wet mud.



Fig.32. Citrus rejuvenation programme carried out in Assam and Nagaland

6. **Supply of planting material produced by CIH and distributed for demonstration in farmers' field in NER**

Sl. no	Name of farmer/ Society	Place	Crops	No. of planting material supplied
1	Akivi Multipurpose Society	Chekiye village, Dimapur, Nagaland	Aloe Vera	4100
2	Mr. P. Chakhesang	Runguzu village, Phek, Nagaland	Mango var. Mallika	50
3	Mr. Mhathung Jami	Pangti village, Wokha, Nagaland	Sweet orange	400
4	Mr. Phyobemo Murry	Wokha, Nagaland	Khasi mandarin	400
5	Mr. Tohevi Awomi	Lotovi Village, Dimapur, Nagaland	Guava (Allahabad Safeda & Shweta)	100
			Sweet orange	100
			Banana (Grand naine)	100
6	Mr. Petevi Meyase	Zubza, Nagaland	Guava (Allahabad Safeda)	100
			Banana (Grand naine)	100
7	Chakhesang Women Welfare Society	Phek, Nagaland	Khasi Mandarin	100
8	The Rural Auxillary for People's Action	Thoubal, Manipur	Mango	5
			Khasi Mandarin	10
			Guava	10
			Banana	10

Fig.33. Planting material distribution to farmers of Assam and Nagaland

3.3. HUMAN RESOURCE DEVELOPMENT

Training is an essential component for successful dissemination and adoption process of any agricultural technologies. It provides a systemic improvement of knowledge and skills which in turn helps the trainees to function effectively and efficiently in their given task on completion of the training. The Institute imparts trainings to state govt. officials of horticulture department and farmers of all North East states as per the need of the state. The trainings are conducted in respective states by inviting renowned experts from different parts of the country along with the faculty of CIH.

The institute has so far conducted 306 trainings out of which 249 trainings for farmers and 57 trainings for state government officials and extension functionaries in different states of North East, where about 19739 farmers and state government officials and extension functionaries have been trained in identified areas of horticulture for NER from 2006-2016.

The focus area of trainings are as follows.

- Improved production technology of horticultural crops
- Nursery management and quality planting materials production
- High density planting and canopy management in fruit crops
- Organic farming and certification
- Post harvest management of horticultural crops
- Protected cultivation
- Citrus rejuvenation
- Banana fibre extraction
- Value addition in horticulture crops
- Supply chain and marketing linkages of Agri./Horti. Crops

3.3.1. IMPACT FACTOR OF TRAINING PROGRAMMES

3.3.1.1. Impact factor on knowledge and skill level (Trainers training)

Training	KL (%)	SL (%)	TUI (%)	TPI (%)	TEI (%)
Improved production technologies in temperate fruit crops, Dirang, Arunachal Pradesh	26.49	31.14	88.80	73.33	65.11
High density planting & canopy management, Sikkim	31.89	35.16	72.00	148.00	106.56
Nursery management & quality planting material production, Tripura	33.52	19.43	80.00	94.00	75.20
Post harvest management of focus horticulture crops, Itanagar, Arunachal pradesh	46.41	38.16	84.00	90.00	75.60
Improved production technologies of focus horticulture crops, Guwahati, Assam,	43.28	14.38	84.20	100.00	84.20
Supply chain management of horticulture crops , Imphal, Manipur	27.90	44.30	81.20	92.00	74.70
Nursery management & quality planting material production, Shillong, Meghalaya	22.00	41.53	82.20	102.00	83.84

Where,

KL= Knowledge level, **SL**= Skill level, **TUI**= Training Utility Index, **TPI**= Training Participation Index, **TEI**= Training Effectiveness Index.

3.3.1.2. Impact factor on knowledge and skill level (Farmers training)

Training	KL (%)	TPI (%)
Value addition in horticulture crops, Shillong, Meghalaya	39.15	97.77
Value addition in horticulture crops, SAMETI, Medziphema, Nagaland	40.81	83.00
Improved production technologies of horticulture crops, CIH, Nagaland	52.27	130.00
Improved production technologies of organic spices & vegetables	29.35	130.00

Where,

KL= Knowledge level, **SL**= Skill level, **TUI**= Training Utility Index, **TPI**= Training Participation Index, **TEI**= Training Effectiveness Index.

3.3.1.3. Feedback

The overall feedbacks from the trainees have been very positive. Some of the suggestion which has been suggested by the trainees during the various trainings are:

- Training duration to be increased especially for Trainers' Training.
- Inclusion of more practical based training and Field Visits.
- Training Manuals to be distributed.
- Conduct of more training at Village level as per the need of the locality.
- To include local as resource persons due to language barrier in farmers training

3.3.1.4. Issues and Challenges

Poor women participation in training.

Despite the fact that the participation of women has been encouraged, it has been encountered that very few women attend or participate in the training as compared to men.

Poor participation of progressive farmers.

It has been found that only few progressive farmers attend the training/s. Due to reasons unknown, the farmers, either send their sons or daughters or even the laborers to attend the training.

Inaccessible/far away demonstration plots/ fields for field visits.

Very often, during the course of the training, it has been encountered that the demonstration plot/field lies very far away from the site of the training thus wasting precious training/practical hour.

Lack of proper guest house and farmer's hostels.

As trainings are conducted year round, the absence/lack of proper/permanent guest house and farmers hostel hinder proper conduction of training. Much of the efforts of the training seem to be spent on finding proper Guest Houses for resource persons or accommodation for the trainees.

Transportation

Lack of proper transportation facilities for transportation of resource persons and trainees creates problem during trainings. The institute very often has to resort to hiring of private vehicles/buses. This problem is acutely felt especially during "on campus" training.

Irregular electricity.

Erratic and irregular supply of electricity has been affecting the smooth conduction of trainings. Due to this problem the use of audio visual aids and training equipments are hindered.

Absence of a common language/dialect and local experts for effective conduction of training.

The NER is a region of hundreds of languages and dialects. This rich lingual diversity sometimes creates problem especially during conduction of trainings as the trainer has to conduct the training with the help of a local interpreter. Very often, in a situation like this, the message gets lost in translation/interpretation.

Translation of study materials in local dialects.

For easy understanding and grasping of knowledge, the study materials need to be translated into local dialects. Although efforts have started in this area, more study materials in many dialects needs to be translated so as to reach more farmers and cover more regions.

3.3.1.5. Post training evaluation

Some method and ways of training follow up by CIH is through telephonic follow up. The telephonic follow-up is used when the participants are located in a wider geographical area. Some of the feedbacks received from various trainees are as follows.

1. Training on protected cultivation

- There was improve in production
- There was no idea for cultivation but after attending training they got better idea of cultivation.
- Could not practice due to water problem.

2. Nursery management and propagation

- Continuously practicing but diseases infection going on in citrus.
- Have about 1000 mother plant, going to practice on cashew and mango
- There was gained in knowledge but lacked in skill as well as no proper facilities.

3. Training on value addition

- Training was very good and has practiced but facing marketing problem.
- Training was good for commercial purpose but better for family use only.
- Practiced in chilli pickle and shelf life increased to 2 months.
- Practiced in chilli pickle and shelf life increased to 2 weeks.

4. Improved production technology

- Technology applied on yam cultivation and improved in production.
- Technology well applied in vegetables.
- Improvement in growth and yield in cashew after applying the technologies.
- Could not practice due to lack of facilities from government.

5. Organic farming

- Training was very good and resource full.
- Practicing how to make compost like vermicomposting.
- Learned how to use biofertilizers and applying in field.
- Maintaining buffer zones
- Learned how to prepare bio-pesticides and applying in field for controlling diseases.
- Availability of bulk quantity of FYM is limited.
- Bio agents/ organic inputs are not readily available in market.

6. Post harvest management and processing

- Improve in skill on curing and drying of turmeric.
- Application of improved harvesting techniques on pineapple.
- Improve in identifying the maturity indices

3.3.2. FARMERS TRAINING PROGRAMMES

During 2015-16, the institute has organized 31 farmers training which were attended by 1596 farmers. The trainings were conducted in different areas of horticulture in different states of the region and is mentioned in brief below.

1. Hands on demonstration oyster mushroom cultivation and value addition of horticulture crops at Aoyimkhum village, Nagaland

With a aim to promote skills for income generation as well as food security and to improve livelihood a special two days **'Hands on demonstration on oyster mushroom cultivation & value addition of horticulture crops'** was organized by Central Institute of Horticulture (CIH), DAC, GoI, Medziphema in collaboration with State Horticulture, Nursery, Dept. of Horticulture, Govt. of Nagaland on 25th & 26th April 2014 at State Horticulture Nursery (SHN), 4th Mile Dimapur. The training was imparted to the destitute and unemployed homeless youth mainly comprising of women from different orphanages and homes within Dimapur district.

Dr. Lallan Ram, Director, CIH, Medziphema who graced the programme emphasized on the importance of cultivation of mushroom and preparation of pickles, sauce, candy etc and to incorporate these enterprises not only as a daily source of nutrition but also to become self reliant and as a means of self employment avenue through participation in the programme . The programme was chaired by Dr. Moa Walling, Dy. Director, SHN, Department of Horticulture, Govt. of Nagaland.

Hands on demonstration on oyster mushroom cultivation was demonstrated by Mr. Imlitemsu, Supervisor and Mr. Bithungo Lab Attendant from Mushroom Development centre, Dept. of Horti., Govt. of Nagaland. While preparation of Chilly pickle, Jack fruit pickle, Ginger candy and tomato sauce was demonstrated by Mr. Manzar Hussain, Post Harvest Technologist, CIH and Ms.Sentiyangla, Horticulture specialist, CIH. As a part of training visit to pack house and mushroom development centre located at SHN, 4th Mile was also done, where the participants were appraised on the washing, grading, packing and storage of vegetables and on spawn production of oyster mushroom and structures for cultivation of mushroom.

During valedictory, Certificate along with reading materials & training kit consisting of mushroom spawn and gloves was distributed by Dr. Lallan Ram, Director, CIH to all the participant. He stated that the objective of the training will be fulfilled if any of the participants implement what they have learnt after the training, and also ensured that CIH will try to support such type of training programme for the improvement of livelihood. Feedback from the participants were also delivered and expressed their gratitude to the Institute and State Horticulture Department for conducting such intensive and practical oriented training programme and also requested Director CIH to conduct similar type of training.

2. **Farmers training at Tripura (06 nos)**

Central Institute of Horticulture, Nagaland in collaboration with the Directorate of Biotechnology, Govt. of Tripura has organized 06 nos of training programme in Tripura from 12-20 August 2015, 9th Sept 2015 and 15th Dec 2015 on Improved production technologies of horticulture crops (2 Nos), Nursery techniques of fruit (2 nos) & IPM & IDM (2 nos) with one day duration of each training. The training programmes have been conducted at Meghlipara GP, Agartala, Tripura, Ishanchandranagar GP, Agartala, Tripura and Aralia GP, Agartala,Tripura .The training programmes were attended by 300 farmers. The training were pertained by the resource persons from Directorate of Biotechnology, ICAR Tripura, Dept. of Agriculture, Dept. of Horticulture, CIPMC, Govt. of India, College of Agriculture, Tripura. The topic included improved vegetable and fruit production, green house technologies, Nursery techniques of fruit crops, production of quality planting material, grafting and budding techniques, Micro-propagation techniques, IPNM techniques of vegetable and fruit crops etc.

3. **Farmers training at Manipur (05 nos)**

Central Institute of Horticulture, Nagaland in collaboration with Department of Horticulture, Govt. of Manipur has organized 05 nos of training programme in Manipur from 16-19th September, 2015 and 17th October, 2015 on "Nursery management and propagation techniques in fruits and IPM in horti crops". The training programmes has been conducted at Imphal west, Imphal East, Thoubal, Bishnupur and Kangpoki district of Manipur.

4. **Farmers training at Arunachal Pradesh (03 nos)**

Central Institute of Horticulture, Nagaland in collaboration with KVK, Dirang has organized 05 nos of training programme in Arunachal Pradesh from 15-17th October, 2015 on Advance in improved production technology in Apple, Training and pruning in Kiwi and Nursery management and propagation techniques in Kiwi. The training programmes has been conducted at KVK Conference hall, Sangti, West Kameng, Arunachal Pradesh.

5. **Advances in production technology of major spice crops at CIH, Medziphema**

The Central Institute of Horticulture (CIH) organised one day farmers' training on 'Advances in production technologies of major spice crops (Ginger, Turmeric and Naga Chilli) of NER' on October 21 at CIH, Medziphema, which was funded by the Department of Biotechnology twining project for NER, Ministry of Science and Technology, Government of India, New Delhi.

The inaugural program was graced by Dr. Lallan Ram, Director of CIH, Principal Investigator of DBT Twinning Project for NER who encouraged the farmer participants to get the utmost benefit by interacting with the resource persons. He emphasised on the importance of these three spice crops in NER and deliberated on enhancing farmers' knowledge about crop techniques and thereby improve their productivity. He also stated that the objective of the training would only be fulfilled if participants implement the technologies learnt after the training programme.

The resource persons were Dr. C.S.Maiti, Assoc. Professor, Department of Horticulture, SASRD: NU, Mr. J. Akato Chishi, STA, Department of Entomology, SASRD: NU , Prof. L.Dahio, H.O.D of Department of Plant Pathology, SASRD: NU. And Md. Manzar Hossain, Post Harvest Technologist, CIH Director CIH Dr. Lallan Ram in his valedictory address exhorted the trainees and awarded certificates along with farm inputs like Trichoderma, Tricho cards and Pseudomonas to the participants. Altogether 23 participants from 6 villages under Dimapur and Peren District attended the training programme.

6. Post harvest handling of mandarin orange at Worokvu village, Nagaland

With an aim to create awareness among the orange growers about the losses incurred due to improper post harvest management, a one day farmers training on 'Post harvest handling of mandarin orange' was organized by Central Institute of Horticulture (CIH), DAC, GoI, Medziphema and, District Horticulture office, Wokha, Dept. of Horticulture, Govt. of Nagaland at Woroku village, under Wohka on 23rd November 2015. Guest of Honor Dr. Lallan Ram, Director, CIH and the main resource person in his lecture stated that the North east states offer a very favorable agro-climatic condition for cultivation of various citrus species. The most important citrus grown on commercial scale is Khasi mandarin orange which has a good market demand due to its excellent quality and occupies a rightful place in the horticultural wealth and economy of this region.

Hands on demonstration on Maturity indices, TSS: acid ratio, improved harvesting techniques, sorting, grading and packaging in special tray pack CFB boxes were demonstrated in the farmer's field by Mr.Meyasashi, DHO Wokha & staff and Mr. A K singh, Technical Consultant, CIH and Ms.Sentiyangla, HS CIH.

Certificate along with reading materials & training kits consisting of orange clipper, hand gloves tray type CFB boxes were distributed to the entire participant. The participants also expressed their gratitude to the Director CIH and state Horti. Department for conducting such intensive and practical oriented training programme in the village level and mentioned that such training was first of its kind. Altogether, about 55 participants from Woroku and Chandalashung old village attended the training programme.

7. Farmers training at Assam (06 nos)

Central Institute of Horticulture, Nagaland in collaboration with NE CARD, Assam has organized 06 nos of training programme in Assam on 10, 12, 17, 18 and 22nd December, 2015 on Technological advancement in HDP & Canopy management for enhanced production in horticulture crops, Value addition of horticulture crops for livelihood, Advances in Integrated pests & diseases management in horticulture crops, Protection cultivation technology in vegetables/ flowers, Advances in production technologies of focus horticulture crops and Nursery management & propagation techniques of focus fruit crops in different districts of Assam. Altogether, about 323 farmers from attended the training programme.

8. Bee keeping for enhancing horticulture crop production at Nagaland

Central Institute of Horticulture (CIH) and National Bee Board (NBB), DAC, Govt. of India, New Delhi jointly organized 3 nos. of two days each farmers training on 'Bee keeping for enhancing horticulture crop production' at Ruzaphema village, Dimapur from 28th-29th March 2014 and at Seithekema A and Seithekema C village, Dimapur from 21st -24th January 2016. The training was held to promote bee keeping among the farming community as bees plays a major role in enhancing horticulture crop production through pollination and also bee keeping as a profitable enterprise for farmers to earn additional income. Dr. Lallan Ram, Director, CIH, Medziphema graced all the three programmes, where he exhorted the participants to apply new technologies learned from the training to improve their production and economy through honey bees. The programe was coordinated by Ms. Sentiyangla, Horticulture specialist & Training i/c, CIH, Medziphema. The resource persons Dr. A. K. Singh, Asst. Scientist, AICRP (Honey bees & pollinators) SASRD: NU, Mr. Ngukho, Apiarist AICRP (Honey bees & pollinators) , Mr. Nzanbemo K Lotha, Team Member,NBHM, Dimapur i/c and Mr.Thungben Yanthan, Team Member,NBHM, Wokha i/c imparted training on various aspects of bee keeping like Scope & Importance of Honey bees and its colony management, Importance & impact of insect pollinators on Vegetable crops, Pest of honey bees & their management, Desertation- causes & preventive measure, Apiary site selection and hands on demonstration on handling of scientific tools & equipments transferring of bee colony from traditional to scientific hives, handling and up care of scientific hives. Certificates were distributed by Dr. Lallan Ram, Director, CIH to all the participants along with reading materials. Altogether 69 vegetable growers under Farmers producer organization, Dimapur from all the three villages attended the training programme.

9. Farmers training at Mizoram (03 nos)

Central Institute of Horticulture, Nagaland in collaboration with MIRADS, Mizoram has organized 03 nos of training programme in Mizoram from 28-30th January, 2016 on Mandarin orange - cultivation and maintenance in Mizoram at East Phaileng, Sawleng, Kepran districts of Mizoram. Altogether 150 Farmers attended the training programme.

10. **Farmers training at Manipur (03 nos)**

Central Institute of Horticulture, Nagaland in collaboration with RAPA, Manipur has organized 03 nos of training programme in Manipur from 15-17th March, 2016 on Nursery management & propagation techniques of focus fruit crops, Advances in production technologies of focus horticulture Crops and Rejuvenation of declining orchard for quality fruit production. A total of 150 farmers attended the training programme.

After the completion of each training programme, feedback was taken from the participants. The participants expressed their high level of satisfaction and continuous demand has been obtained from different organizations in NER for conduction of such intensive and practical oriented training programmes for the benefit of youth and women. The suggestions received from participants have been well taken for further improvement in the quality of training programmes.

Table 30. Farmers' training

Sl/ No.	Topic	Date	Venue	No. of participants	Organized/ sponsored	Category
1	Hands on Demosnstration Oyster Mushroom & cultivation & value addition of Horti. Crops	20th May 2015	Aoyimkhum village, Nagaland	95	Incoll. With State Horti, GON & Metemlar SHG, Aoyimkhum	Farmers training
2	IPM of horti. Crops	12th Aug. 2015	Meghlipara GP, Agartala,Tripura	50	In coll. with Dept. of Biotechnology	Farmers training
3	Nursery Management & propagation techniques of fruit crops	13th Aug. 2015	Meghlipara GP, Agartala,Tripura	50	In coll. with Dept. of Biotechnology	Farmers training
4	Improved production technologies of organic farming	19th Aug. 2015	Ishanchandranagar GP, Agartala, Tripura	50	In coll. with Dept. of Biotechnology	Farmers training

5	Nursery Management & propagation techniques of fruit crops	20th Aug. 2015	Ishanchandranagar GP, Agartala, Tripura	50	In coll. with Dept. of Biotechnology	Farmers training
6	Improved production technologies of organic farming	9th Sept. 2015	Aralia GP, Agartala,Tripura	50	In coll. with Dept. of Biotechnology	Farmers training
7	IPM of horti. Crops	15 Dec. 2015	Aralia GP, Agartala,Tripura	50	In coll. with Dept. of Biotechnology	Farmers training
8	Nursery management & propagation techniques in fruits & IPM in horti crops	16th Sept. 2015	Imphal west, Manipur	50	In coll. With Dept. of Horticulture, Manipur	Farmers training
9	Nursery management & propagation techniques in fruits & IPM in horti crops	17th Sept. 2015	Imphal east, Manipur	50	In coll. With Dept. of Horticulture, Manipur	Farmers training
10	Nursery management & propagation techniques in fruits & IPM in horti crops	18th Sept. 2015	Thoubal, Manipur	50	In coll. With Dept. of Horticulture, Manipur	Farmers training
11	Nursery management & propagation techniques in fruits & IPM in horti crops	19th Sept. 2015	Bishnupur, Manipur	50	In coll. With Dept. of Horticulture, Manipur	Farmers training
12	Nursery management & propagation techniques in fruits & IPM in horti crops	17th Oct. 2015	Kangpoki, Manipur	102	In coll. With Dept. of Horticulture, Manipur	Farmers training
13	Advance in improved production technology in Apple	15th Oct. 2015	KVK Conference hall, Sangti, West Kameng, Arunachal Pradesh	50	incoll. with KVK Dirang	Farmers training
14	Training & Pruning in Kiwi	16th Oct. 2015	KVK Conference hall, Sangti, West Kameng, Arunachal Pradesh	50	incoll. with KVK Dirang	Farmers training

15	Nursery management & propagation techniques in Kiwi	17th Oct. 2015	KVK Conference hall, Sangti, West Kameng, Arunachal Pradesh	50	incoll. with KVK Dirang	Farmers training
16	Advances in production technology of major spice crops (ginger, turmeric & nagal chilli)	21st Oct. 2015	Trg. Hall, CIH	23	Funded by Dept. of Biotechnology, Twinning project for NE India, Ministry of Sc. & Tech., GOI	Farmers training
17	Post harvest handling of mandarin orange	23rd Nov. 2015	Worokvu village, Nagaland	55	organized	Farmers training
18	Technological advancement in HDP & Canopy management for enhanced production in horti. Crops	25th Nov. 2015	Mangaldoi, Assam	56	In coo. With NE CARD, Assam	Farmers training
19	Value addition of hort. Crops for livelihood	10th Dec., 2015	Dalgaon, Assam	53	In coo. With NE CARD, Assam	Farmers training
20	Advances in Integrated pests & diseases management in horticulture crops	12th Dec. 2015	Bor Thekerabari, Assam	54	In coo. With NE CARD, Assam	Farmers training
21	Protection cultivation technology in vegetables/ flowers	17th Dec. 2015	Nagarbahi, Assam	54	In coo. With NE CARD, Assam	Farmers training
22	Advances in production technologies of focus horti. Crops	18thDec. 2015	Borbori, Assam	54	In coo. With NE CARD, Assam	Farmers training
23	Nursery management & propagation techniques of focus fruit crops	22nd Dec. 2015	Borhampur, Assam	52	In coo. With NE CARD, Assam	Farmers training

24	Bee keeping for enhancing horticulture crop production	21-22nd Jan, 2016	Seithekema C, Nagaland	27	In coll. With Bee Board	Farmers training
25	Bee keeping for enhancing horticulture crop production	23-24th Jan, 2016	Seithekema A, Nagaland	21	In coll. With Bee Board	Farmers training
26	Training on Mandarin orange - cultivation and maintenance in Mizoram	28th Jan 2016	East Phaileng, Mizoram	50	in coll. With MIRADS, Mizoram	Farmers training
27	Training on Mandarin orange - cultivation and maintenance in Mizoram	29th Jan 2016	Sawleng, Mizoram	50	in coll. With MIRADS, Mizoram	Farmers training
28	Training on Mandarin orange - cultivation and maintenance in Mizoram	30th Jan 2016	Kepran, Mizoram	50	in coll. With MIRADS, Mizoram	Farmers training
29	Nursery management & propagation techniques of focus fruit crops	15th March. 2016	Wangjing Lamding, Manipur	50	In coll. With RAPA, Manipur	Farmers training
30	Advances in production technologies of focus horti. Crops	16th March 2016	Wangjing Lamding, Manipur	50	In coll. With RAPA, Manipur	Farmers training
31	Rejuvenation of declining orchard for quality fruit production	17th March 2016	Wangjing Lamding, Manipur	50	In coll. With RAPA, Manipur	Farmers training
	Total			1596		

GLIMPSES OF FARMERS TRAINING

Fig.34. Director, CIH along with resource person and trainees on mushroom cultivation & value addition training at Aoyimkhum village, Nagaland

Fig.35. Dr. Lallan Ram, Director, CIH during training on IPM of horti. Crops at Tripura

Fig.36. Training on nursery management at Tripura

Fig.37. Training on organic farming at Tripura

Fig.38. Training on nursery management and propagation techniques at Imphal, Manipur

Fig.39. Training on nursery management and propagation techniques at Bishnupur, Manipur

Fig.40. Training on nursery management and propagation techniques at Thoubal, Manipur

Fig.41. Training on Post harvest handling of mandarin orange at Worokvu village, Nagaland

Fig.42. Training on bee keeping at Seithekema C village

Fig.43. Training on bee keeping at Seithekema A village

3.3.3. TRAINERS TRAINING PROGRAMMES

1. **Supply chain management and marketing of Horticultural Crops**

Three days trainer's training on 'Supply chain management & marketing of horticultural crops' was organized by Central Institute of Horticulture, DAC, Ministry of Agriculture, GOI, Medziphema, Nagaland in collaboration with Directorate of Horticulture, Meghalaya with CSS NIAM, Jaipur as the technical knowledge partner at the conference hall of Directorate of Agriculture, Shillong, Meghalaya from 17th -19th June 2015, for the state Govt. officials of horticulture dept. Govt. of Meghalaya. The objective of the training was to give individual attention to the trainees for imparting theoretical and practical knowledge on the subject who in turn will be the master trainers for the farmers of the state.

The chief guest was Smt. M N Manpui, Jt. Secy (Agri) Govt. of Meghalaya and inaugural programme was chaired by Mr. M Syiem, Director, Directorate of Horticulture. Dr. Lallan Ram, Director, CIH who was also the guest of honor deliberated that the supply chain starts even before the crop is harvested till it reaches the consumer and motivated the participants to work as an ambassador for transfer of technology at the farmer's field . Brief remark about the subject was delivered by Dr.Ramesh Mittal, Dy. Director, NIAM and vote of thanks was pronounced by Smt. Sentiyangla Pongener, HS & Training i/c CIH. The resource persons were Dr.Ramesh Mittal, Dy. Director, NIAM Shri. M Iboyaima Meitei, Advisor Horticulture.North East Council Govt. of India, Shillong and Mr.Pabin Das, Marketing specialist, CIH

The participants was expressed his gratitude to the institute and NIAM, Jaipur for conducting such intensive and practical oriented training programme and requested CIH to conduct similar training programme in the near future. Certificates along with reading materials were distributed to all the participants. Altogether 42 participants attended the training programme.

2. **Advances in production technology of focus fruit crops**

Three days trainer's training on 'Advances in production technologies of focus horticulture crops with special reference to sub tropical fruits' was organized by Central Institute of Horticulture, DAC, Ministry of Agriculture, GOI, Medziphema, Nagaland at Training centre, CIH, Medziphema from 21-23rd July 2015. The training was imparted to the state Govt. officials of horticulture dept. Govt. of Nagaland to provide individual attention to the trainees to upgrade the knowledge and skill on the subject who in turn will be the master trainers for the farmers of the state.

Various aspects on the advances in production technologies of fruit crops like Mango, Guava, Cashew, Pineapple, Banana, citrus and litchi were highlighted by experts from Dept. of Horticulture, SASRD:NU Dr. C S Maiti, Assoc. prof. and Dr.Animesh Sarkar, Asst. Prof., Horticulture Research station ,AAU, Kahikuchi, Assam Dr.P Borah, Sr. Scientist and Dr.K.K Deka, Sr. Scientist and CHES, Bhubaneshwar

Dr. Kundan Kishore, Sr.Scientist. Visit to bio control and bio fertilizer laboratory, Medziphema were also done to upgrade the participants on the use of various bio agents and biofertilizers for controlling pest/ diseases and enhancing productivity. Field visit to farmer's field at Molvom village, Dimapur was also done. Practical on the use of fertilizers and pesticide application, maturity indices in pineapple, banana and mango, use of plastic mulch in fruit crops, training and pruning were demonstrated at CIH farm.

During the valedictory function Certificates along with reading materials were distributed to all the participants by Dr.Lallan Ram where he exhorted the participants to work as an ambassador for transfer of technology at the farmer's field. short speech was also delivered by Mr. Pawan Kumar, Jt. Director, Dept. of Horticulture, Govt. of Nagaland, where he thanked CIH for organizing a training on the topic that is so relevant and very useful for the extension functionaries of the state department and expressed hope that the information gathered and knowledge gained during the training will go a long way in helping the farmers of the state. Feedbacks from the participants were also delivered and altogether 20 participants from 7 districts attended the training programme.

3. Production of quality planting material & accreditation of nursery of focus horticulture crops

Three days trainer's training on 'Production of quality planting material & accreditation of nursery of **focus horticulture crops** was organized by Central Institute of Horticulture, DAC, Ministry of Agriculture, GOI, Medziphema, Nagaland at Imphal, Manipur w.e.f 26-28 Aug. The training was imparted to the state Govt. officials of horticulture dept. Govt. of Arunachal Pradesh with an objective to upgrade the knowledge and skill of the officials on the concerned subject for the promotion and production of genuine quality planting material who in turn will be the master trainers for the farmers of the state.

4. Production of quality planting material & accreditation of nursery of temperate fruit crops

Three days trainer's training on 'Production of quality planting material & accreditation of nursery of temperate fruit crops' was organized by Central Institute of Horticulture, DAC, Ministry of Agriculture, GOI, Medziphema, Nagaland at Regional Apple Nursery, Dirang, Arunachal Pradesh w.e.f 12th -14th October 2015. The participants thanked CIH for organizing a training on the topic that is so relevant and very useful for the extension functionaries of the state department and expressed hope that the information gathered and knowledge gained during the training will go a long way in helping the farmers of the state. Altogether 42 participants from the horticulture department attended the training programme.

The training was imparted to the state Govt. officials of horticulture dept. Govt. of Arunachal Pradesh with an objective to upgrade the knowledge and skill of the officials on the concerned subject for the promotion and production of genuine quality planting material who in turn will be the master trainers for

the farmers of the state. Various aspects on the importance and advances in propagation techniques of fruit crops like Apple, Kiwi, walnut, persimmon, peach, plum and pear, protocols and standards, care and management of nursery plants, role of rootstocks and bud wood bank and guidelines and procedures for recognition of horticulture fruit nursery were highlighted by Dr. Jayant Kumar, Assoc. Director, RHRTS, Kullu, Himachal Pradseh, Dr. Naveen C Sharma, Asst. Prof., Dept. of fruit science, Dr. YS Parmar UHF, solan, Himachal Pradesh and Ms. Yongkongtula, Asst. Horticulture Specialist, CIH.

During the valedictory function Certificates along with reading materials were distributed to all the participants by the resource persons and horticulturist RAN, Dirang. . Feedback from the participants was delivered by Mr. Nawang Lobsang, Horticulturist, Shergaon Horticulture Farm, Shergaon, where he thanked CIH for organizing a training on the topic that is so relevant and very useful for the extension functionaries of the state department and expressed hope that the information gathered and knowledge gained during the training will go a long way in helping the farmers of the state. Altogether 40 participants from the horticulture department and KVK, Dirang attented the training programme.

5. **Technological advancement in HDP & Canopy management for enhanced production in horticulture crops**

Three days trainer's training on 'Technological advancement in HDP & canopy management for enhanced production in horticulture crops' was organized by Central Institute of Horticulture, DAC, Ministry of Agriculture, GOI, Medziphema, Nagaland at Training centre, Horticulture Research Complex (HRC), Nagicherra, Tripura from 15th -17th December 2015 , for the state Govt. officials of horticulture dept. Govt. of Tripura. The objective of the training was to give individual attention to the trainees for imparting theoretical and practical knowledge on the subject who in turn will be the master trainers for the farmers of the state. The resource persons were Dr. Biswajit Das, Pr. Scientist, ICAR Tripura centre, Dr.N A Deshmukh, Scientist, (Horti), ICAR Research complex for NEHR.

Feedback from the participants were also delivered who expressed their gratitude to the institute for conducting such intensive and practical oriented training programme and suggested CIH to conduct similar training programme on different topics in the near future. Altogether 35 nos participant attended the training programme.

6. **Short term training in horticulture**

Seven days short term training course in horticulture was organized by Central Institute of Horticulture (CIH), DAC, MOA & Farmers welfare, Govt. of India, Nagaland. The training was sponsored by the horticulture department, New Delhi Municipal Council, New Delhi for their department horticulture officers from 28th January -3rd Feb 2016 held at CIH, Nagaland. About 10 nos. officer consisting of 1 Dy. Director, 5 nos. Asst. Director and 4 nos. Supervisor attended the training programme. The aim of the training was to sensitize and provide first hand information on improved technologies of horticulture crops in different subject.

Dr. Lallan Ram, Director, CIH welcomed and graced the inaugural programme on 28th Jan 2016 at the institute's training hall. He deliberated that horticulture is the core sector of agriculture; representing a broad spectrum of crops and production of a wide range of horticultural commodities collectively these horticultural corps make a significant contribution to the Indian economy, in term of rural employment generation and farmers income. He appraised that the challenge before us is to produce more with less in the scenario of that from climate change. Director CIH also exhorted the participants to work as an ambassador for transfer of technology. The resource persons were Mr. Arvind Singh, Technical Consultant, CIH, , Dr. Moa Walling i/c. SHN, Govt. of Nagaland, Mr. A K Singh, Technical Consultant, CIH, Smt. Meribeni Shitri, Horticulture Specialist, CIH and Prof. Madhumita Choudury Talukdar, Dept. of Horticulture, AAU, Jorhat.

Table 31. Trainers' training

Sl/ No.	Topic	Date	Venue	No. of participants	Organized/ sponsored	Category
1	Supply chain management & marketing of Horti. Crops	17th - 19th June 2015	Directorate of Horti., Shillong	42	Organized in col. With Directorate of Horti, Meg & Technical knowledge partner, CSS NIAM, Jaipur	Official
2	Advances in production technology of focus fruit crops	21-23 July 2015	CIH, Nagaland	20	Organized	Official
3	Production of quality planting material & accreditation of nursery of focus horti. Crops	26-28 Aug. 2015	Imphal, Manipur	42	Organized	Official
4	"Production of quality planting material & accreditation of nursery of temperate fruit crops	12th – 14th October 2015	RAN, Dirang, Arunachal Pradesh	40	Organized	Official
5	Technological advancement in HDP & Canopy management for enhanced production in horti. Crops	15-17th Dec., 2015	HRC, Nagicherra, Tripura	35	Organized	Official
6	Short term training in horticulture	28th Jan., to 3rd Feb. '16	CIH, Nagaland	10	Organised	Official of NDMC, New Delhi
	Total			189		

GLIMPSES OF TRAINERS TRAINING PROGRAMMES

Fig.44. Trainers training on Supply chain management & marketing of horticulture crops at Meghalaya

Fig.45. Trainers training on improved production technology of horticulture crops at CIH, Nagaland

Fig.46. Trainers training on Production of quality planting material & accreditation of nursery at Manipur

Fig.47. Trainers training on Production of quality planting material & accreditation of nursery at Arunachal Pradesh

Fig.48. Trainers training on Technological advancement in HDP & Canopy management at Tripura

Fig.49. Short term training in horticulture for officials of NDMC, New Delhi at CIH, Nagaland

3.3.4. CAPACITY BUILDING

3.3.4.1. National level training on "Production technology and processing of cashew"

Mr.Anjani Kumar Singh underwent National level training on "Production technology and processing of cashew" from 7-9 January, 2016 at RFRS, Vengurala, Maharashtra. The topics covered in the training include nursery management, production technology, plant protection and processing of cashew.

3.3.4.2. Intensive training on cultivation of mushroom

Three days capacity building training on "Intensive Mushroom Cultivation" was held at SHN, Mushroom Development Centre Govt. of Nagaland, Department of Horticulture Dimapur from 2nd – 4th march 2016. Ms. Eloni Felicity and Mr. Ngupani P. S underwent the said training. The topics covered during three days training were: acquaintance with the equipments, sterilization and preparation of media, isolation, culture maintenance and storage, preparation of mushroom spawn, substrate preparation, spawning of substrate crop management and post harvest practices, straw cutting, soaking of straw and steam sterilization of straw, mushroom bags filling and spawning, crop management.

3.3.5. EXPOSURE TRIPS CUM TRAINING FOR FARMERS AND OFFICIALS OF NER

CIH conducts exposure trips cum trainings for the officials, farmers and SHGs of North East Region at regular intervals to various reputed Institutions and Research centres in the country. The main objective is to build and strengthen their capacities and help them to sharpen their skills and ability. During the year 2015-16, the Institute has conducted **2 nos** of exposure trips cum trainings for the officials and farmers of NER in different high tech horticulture programmes.

3.3.5.1. Exposure cum training on 'Production technology and processing of Aloe Vera' at Jaipur, Rajasthan

Central Institute of Horticulture under the Department of Agriculture Cooperation & FW, Ministry of Agriculture and FW, Govt. of India as a part of its vision to promote transfer of technology for better production and productivity organized a subject oriented exposure trip for 18 farmers and entrepreneur of Manipur state to enhance skills for income generation so as to as improve livelihood at Manesh Agro Engineering & Technology, Kotpuli, Jaipur, Rajasthan from 14th to 16th December 2015 on 'Production technology & processing of Aloe Vera with hands on demonstration on preparation of soap making, shampoo, juice and various value added products from aloe vera and Amla were also shown. Field visit to

cultivation of Aloe vere in the desert was also done. Exposure tour to Jaipur city was done where various historical sites like Amer fort, Hawa Mahal,Jal Mahal and Albert Hall was done.

Fig.50. A view on hands on demonstration on preparation of soap making, shampoo, juice and various value added products from Aloe vera at Jaipur, Rajasthan

3.3.5.2. Horticulture study tour to Nagaland

Two days short training course cum exposure trip in horticulture was organized by Central Institute of Horticulture (CIH), DAC, MOA & Farmers welfare, Govt. Of India, Nagaland in collaboration with Dept. of Agri. (Hort.), Govt. of Pondicherry. The training was conducted for officials from 29-30 September 2015 held at CIH, Nagaland where about 12 nos. officers attended the training programme. The aim of the training was to sensitize and provide first hand information on improved technologies of horticulture crops in different subject.

Exposure visit to Kohima was done. The participants visited the museum, run by the Dept. of Art & Culture, Govt. of Nagaland. The participants got a glimpse of the various traditional attires and customs of the different tribes of Nagaland being displayed. Secondly, they visited Naga heritage village located at Kisama village, Kohima. Here, the participants could view the various types of houses and morungs built belonging to all the Naga tribes. They also visited the horti-scape run by dept. of Hort., Govt. of Nagaland and also the various traditional games displayed. Lastly, visit to war cemetery memorial of world war II at Kohima Town was done.

3.4. AGRI-BUSINESS PROMOTION

3.4.1. Participation in Exhibitions/ Trade Fairs/Meets

1. Co-organized Meghalaya Women Farmers Tea and Horticulture Festival at Delhi Haat, New Delhi w.e.f. 7-10 May, 2015.

Central Institute of Horticulture, Nagaland has Co-organized Meghalaya Women Farmers Tea and Horticulture Festival at Delhi Haat, New Delhi w.e.f. 7-10 May, 2015. The exhibition provided a platform to the farmers to interact and learn more about horticulture industry in the region

2. 1st Manipur National Horti Expo at Manipur

The Institute participated as an exhibitor in the 1st Manipur National Horti Expo held at Imphal, Manipur w.e.f. 11-13 June, 2015 .The event was organized by Dept. of Horticulture & Soil Conservation, Govt. of Manipur in collaboration with Central Agricultural University (CAU), Imphal, ICAR-Manipur Center & National Skills foundation of India, Gurgaon.

The technical staffs manned the stall providing technical guidance to farmers/ beneficiaries. Various horticulture produce were displayed in the exhibition. Folders on package of practices of horticulture crops were distributed to the farmers. The exhibition provided a platform to the farmers to interact and learn from the staffs of CIH. The issues with regards to planting materials, production, PHM and marketing of horticulture crops were being highlighted to the farmers. A variety of products/ produce were being displayed in the exhibition by different agencies/ departments from all NE states. More than 500 people visited CIH stall and enquired on various aspects of horticulture.

Fig.51. Shi Okram Ibobi Singh, Hon,ble CM of Manipur interacting with Dr. Lallan Ram, Director CIH

Fig.52. Shri. Sanjeev Chopra, JS, DAC & Mission Director, MIDH along with Director CIH

3. Organized N E Organic Fest in Delhi

Central Institute of Horticulture, Nagaland organized a 5 days N E Organic Fest at Delhi Haat, Janakpuri, New Delhi w.e.f. 26-30 November, 2015. The fest was organized to provide a platform to the farmers to exhibit, sell & interact with potential investors to create suitable market linkage of organically grown produce of the region.

The programme was formally inaugurated by Hon'ble Chief Guest Dr. S K Malhotra, Agriculture & Horticulture Commissioner, DAC, Ministry of Agriculture, Govt. of India. In his address he mentioned that a clear roadmap for organic produce should be made as the region has huge potential for production of organic produce. He suggested to organize more awareness programmes and also to give proper knowledge on organic farming and certification. He appraised Director CIH for the initiative taken in bringing producers and procurement agencies together. Dr. Jankiram, DDG, ICAR, Govt. of India was the Guest of Honor in the inaugural programme. Director, CIH Dr. Lallan Ram chaired the inaugural function. A total of 25 farmers from 5 different states of NE (Arunachal Pradesh, Assam, Manipur, Nagaland & Sikkim) participated in the event and exhibited various fresh & processed horticultural products. Around 2 tons of horticultural produce like pineapple, passion fruit, kiwi, banana, chili, large cardamom, ginger, turmeric, pickles, candies, squash etc was taken for the exhibition which was sold off during the exhibition. As an initiative to link the farmers' produce to potential markets, a buyers & sellers meet was organized on 26th November, 2015 where several domestic & export houses interacted with farmers and discussed on procurement of organically grown produce of the region. Dr. Tamil Selvan, Addl. Commissioner, DAC chaired the BS meet and Dr. N K Patle, Dy. Commissioner, DAC co-chaired the meet. Delhi Darshan was also organized for the participants as a part of the event. The event was organized in association with National Skills Foundation of India, Gurgaon.

Fig.53. Inauguration of exhibition by Dr. S K Malhotra, Agriculture & Horticulture Commissioner, DAC, Ministry of Agriculture, Govt. of India

Fig.54. Dr. Lallan Ram, Director, CIH delivering speech during the inaugural programme

4. 3rd Assam International Agri Horti Show

The 3rd Assam International Agri Horti Show was organized by Dept. of Agriculture, Govt. of Assam in association with Assam Agriculture University and Indian Chamber of Commerce.

The event was the third international exposition in Assam for innovation and inspiration in Agriculture, horticulture, floriculture and allied sectors. The show was formally inaugurated by Shri. Tarun Gogoi, Hon'ble Chief Minister of Assam who graced the inaugural programme as Chief Guest. Central Institute of Horticulture participated in the show as an Exhibitor and highlighted the activities of the institute through print media. Horticulture crops were being displayed to the participants. Consultancy was given to the farmers on problems related to quality planting material, production, post-harvest management & marketing.

The focus horticulture crops available in the NEH region were displayed. Folders and other publications on production technologies, package of practices PHM on fruits, flowers, vegetables and spices were displayed and distributed during the programme. Quality planting material of major fruit crops propagated in the Institute was also displayed. More than 300 people from different parts of the country visited the stall and interacted with technical staffs.

Hon'ble Chief Minister of Assam, Shri. Tarun Gogoi visited CIH stall and appreciated the efforts put in by the Institute of development of horticulture in NE states.

Fig.55. Hon'ble Chief Guest, Shri. Tarun Gogoi visiting CIH, Nagaland stall

Fig.56. Visitors at CIH stall

5. Krishi Unnati Mela

Krishi Unnati Mela was organized by Dept. of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Govt. of India in association with IARI, New Delhi & Confederation of Indian Industry, New Delhi at IARI Campus, Pusa, New Delhi w.e.f. 19-21 March, 2016. The event was formally inaugurated by Shri. Narendra Modi, Hon'ble Prime Minister of India who graced the inaugural programme as Chief Guest.

The 3 days show had participation from all national level agencies & state agri. & allied departments in India, private companies. The show was organized with focus on agriculture and horticulture advancements, Hi-tech technologies, protected cultivation, farm mechanization, fertigation and farming technologies, processed foods and post harvest technologies, cold storage. More than one lakh farmers and around five hundred exhibitors from different parts of the country participated in the event. The event was the biggest mela in agricultural sector in India.

Central Institute of Horticulture participated in the show as an Exhibitor and highlighted the activities of the institute through print media. A model on Integrated Farming System was displayed in the stall. Horticulture crops like strawberry, orange, mosambi, lime, lemon, banana, king chilli, spring onion, chow chow, large cardamom, pepper, kiwi etc were being displayed to the participants and information regarding package of practice, cultivation practices, pests and disease management etc were given to the farmers. Consultancy was given to the farmers on problems related to quality planting material, production, post-harvest management & marketing. Two progressive farmers were also a part of the CIH team during the mela. Mr. Letthang Misao, Chairman, Organic Pineapple growers Society (OPGS), Molvom Village, Dimapur, Nagaland and Mr. L Subhachandra Singh, Secretary, Rural Auxiliary for People's Action (RAPA), Thoubal district, Manipur attended the mela.

Fig.57. Hon'ble Prme Minister of India, Shri. Narendra Modi in Krishi Unnati Mela 2016

Fig.58. Dr. Lallan Ram, Director, CIH interacting with the farmers

3. Exhibition at ICAR, Jharnapni, Nagaland centre

Central Institute of Horticulture, Nagaland participated as an exhibitor in one day Farmer Fair-cum-Awareness on Pradhan Mantri Fasal Bima Yojana at ICAR Research Complex, Jharnapani, Nagaland Centre on 31st March 2016. The occasion was graced by the Hon'ble Member of parliament, Lok Sabha, Shri.Neiphiu Rio. The focus horticulture crops available in the NEH region were displayed. Folders and other publications on production technologies, package of practices PHM on fruits, flowers, vegetables and spices were displayed and distributed during the programme. Quality planting material of major fruit crops propagated in the Institute was also displayed. Folders on POP of horticulture crops were distributed to the farmers. Budded plants and seedling produced by the Institute was also displayed during the exhibition. The exhibition provided a platform to the farmers to interact and learn from the staffs of CIH.

Fig. 59. Director CIH interacting with Shri. Neiphiu Rio at CIH stall

Fig. 60. CIH Stall as an exhibitor at ICAR Research Complex, Jharnapani, Nagaland Centre

3.5. POST HARVEST MANAGEMENT

The Institute has carried out a number of post harvest management activities such as harvesting, sorting, grading, and packaging of horticulture crops and has imparted and trained many extension functionaries, officials, farmers and SHGs related to post harvest management and value addition of important horticulture crops in the region inorder to provide gainful employment to unskilled and skilled people. During the reported year, the institute has produced value added products such as squash of peach, Jackfruit and plum, Jackfruit pickle, dried, roasted, fried and powdered jackfruit seeds, Mango pickle, dried naga king chilli etc

Fig. 61. Value added products prepared from CIH

3.6. ACCREDITATION AND CERTIFICATION OF NURSERIES IN NER

Availability of true to type, quality planting material is crucial and has become of utmost importance for the success of horticulture development. In order to meet the ever increasing demand of genuine quality planting material especially in North east region, Central Institute of Horticulture has been authorized for accreditation of nurseries for overall development of horticulture and establish a network of quality horticulture nurseries in the North east region of India. During the period under report, the Institute has accredited 6 nos of nurseries in NER in addition to visit and monitoring of nurseries.

Accreditation of Horticulture Nurseries in NER

Sl. No	Name & address of Nursery	Name of crop	State	Grade
1	Central Institute of Horticulture, Medziphema-797106, Dimapur	Citrus, Cashewnut, Guava, Mango	Nagaland	3 stars
2	State Horticulture Nursery, Dept. of Horticultrue, Govt. of Nagaland, 5th Mile, Dimapur-797112	Litchi, Guava, Sweet Orange	Nagaland	2 stars
3	M.Hossain Nursery, Chaper Balajan, P.O.Moterjhar, Dhubri-783334, Assam	Litchi, Lemon	Assam	1 star
4	J.N.Nursery, Uttar Chelabari, P.O.Ambari, P.S.Dhupdhara, Goalpara-783123, Assam	Litchi	Assam	1 star
5	Daffodil Nursery Old, Bherakuchi, Jagi road, Assam	Litchi, Citrus, Guava, Mango and Assam lemon	Assam	2 stars
6	Model Horticulture Nursery, Govt. of Assam, 16th Mile Byrnihat, Guwahati	Litchi, Guava, Citrus, Mango and Assam lemon	Assam	1 star

BRAIN STORMING SESSION ON NURSERY ACCREDITATION AND CERTIFICATION

Brain storming session on nursery accreditation and certification was formally inaugurated Shri. Kejong Chang, Hon'ble Parliamentary Secretary (Horticulture), Govt. of Nagaland at CIH, Medziphema on 25th July, 2015. In his address, he congratulated Central Institute of Horticulture for the initiative. He gave a brief history of the people of Nagaland and enlightened the participants on how indigenous practices of cultivation came into existence. The inaugural programme was followed by a brain storming session on nursery accreditation and certification and was chaired by Dr. S K Malhotra, Horticulture Commissioner and co-chaired by Dr. R K Pathak, Ex-Director, CISH, Lucknow. The topic on scope, importance & present scenario of horticulture nurseries in NER was presented by four states viz. Dr. Moa Walling, Dy. Director, horticulture Department, Nagaland, Mr. Pranjal Dutta, HDO, Meghalaya horticulture dept.,

Mr. Pintso Bhutia, Dy. Director, horticulture department, Sikkim and Mr. Baikul Saikia, Sr. ADO, Horti, Assam. Shri. N C Mistry, Addl. Managing Director, NHB presented on Guidelines and Procedures for Nursery Accreditation and Certification. Dr. R K Pathak, Ex Director, CISH, Lucknow spoke on Organic Nursery Practices for Enhancing Production of Fruits in NE region. The other key resource persons were Dr. V J Shivankar, Ex-Director, NRC Citrus, Lucknow, Prof. R K Arora, Former professor, HAU, Hissar. The session had participation from officials, nurserymen and farmers from five different NE states and trainees of the certificate course.

Fig. 62. Chairman, Dr. S K Malhotra & Co-Chairman, Dr. R K Pathak during the brainstorming session

Fig. 63. Mr. Pranjal Dutta, Resource person delivering lectures during the brain storming session

Fig. 64. Participants of the programme of Brain storming session of planting material production

3.7. CERTIFICATE COURSE

The three months certificate course of horticulture crops was formally inaugurated Shri. Kejong Chang, Hon'ble Parliamentary Secretary (Horticulture), Govt. of Nagaland at CIH, Medziphema on 25th July, 2015. In his address, he congratulated Central Institute of Horticulture for the initiative. He emphasized the need of such courses to empower the uneducated youth of the region and creating avenues for self employment. The inaugural programme began with lighting of lamp by Chief Guest and other dignitaries. Director, CIH, Dr. Lallan Ram welcomed all the participants in the programme and gave a brief outline on the activities carried out by the Institute. Brief remarks were given by Dr. B C Deka, Joint Director, ICAR, Nagaland Centre and Mr. Amos Ao, Dy. Director, Dept. of Horticulture, Govt. of Nagaland. Dr. S K Malhotra, Horticulture Commissioner, Dept. of Agri. & Coop. was the special invitee from Ministry of Agriculture, Govt. of India. Prof. N S Jamir, Pro-Vice Chancellor, SASRD, Nagaland University graced the occasion as Special Guest.

The three months certificate course for the less educated youth of NER has been initiated to provide self employment and entrepreneurship in focused courses. The first course was taken on "***Modern Nursery Management Practices of Horticulture crops***" with 19 trainees from 5 states of North East from 15th July to 15th October, 2015. The second course was on "***Post Harvest Management of horticulture crops"*** with 21 trainees from 26th October, 2015 to 27th January, 2016.The third course on ***"Protected Cultivation of Horticulture Crops"*** was started from 29th February 2016 with 14 trainees. A total of 180 number of lecture and practical classes were taken during each of the certificate course which were coupled with internship cum exposure trip to AAU, Jorhat, IICPT, Regional Centre, Guwahati and Daffodil Nursery,Bherakuchi, Jagiroad. Certificates were given to each trainees at CIH, Nagaland as well as internship places which would be very useful to the trainees.

Fig. 65. L-R : Prof. N S Jamir, Pro-VC, SASRD, NU, Shri. Kejong Chang, Hon'ble Parliamentary Secretary (Horticulture), Dr. S K Malhotra, Horticulture Commissioner, Dr. Lallan Ram, Director, CIH

Fig. 66. Lightening of lamp by dignitaries

Fig. 67. Shri. Kejong Chang, Parliamentary Secretary (Horticulture), Govt. of Nagaland

Fig. 68. Dr. S K Malhotra, Horticulture Commissioner, DAC, GOI delivering keynote address

Fig. 69. Prof. N S Jamir, Pro-Vice Chancellor, SASRD, NU during his adress

Fig. 70. Dr. Lallan Ram, Director, CIH delivering the welcome address

Fig. 71. Trainees of Modern Nursery Management Practices of Horticulture Crops along with faculty from CIH

Fig. 72. Trainees of Post Harvest Management of Horticulture Crops with faculty from CIH

3.8. INFRASTRUCTURE DEVELOPMENT

- The first floor of newly constructed training centre has been completed.
- Installation of model cold storage unit of 15000 liters capacity

Fig. 73 Newly constructed first floor training centre

Fig 74. Installation of model cold storage unit of 15000 liters capacity

3.9. OTHER ACTIVITIES

- Production and value addition/ sale of horticulture produce like guava, banana, pineapple, mango, sweet orange, gerbera, rose and vegetables produced from CIH farm which acts as a source for generation of remuneration.

Fig. 75. Tomato variety Abhinav for sale

Fig. 76. Peach variety Shane-E-Punjab from the field

Fig. 77. Strawberry variety Winter Dawn and Fortuna from the field

4. WOMEN EMPOWERMENT

Central Institute of horticulture, Medziphema, Nagaland since its inception has conducted training programmes, demonstration and exposure trips for women involved in horticulture and agriculture sector for empowerment as well as to respond to the needs of farm women. The broad areas of activities related to extensions were focused on developing resource management by women horticultural labourers, mobilization of rural women through women self help groups, exposure trips and training of farm women and beneficiaries to empower them and make them independent through self employment.

4.1. Training

During 2015-16, around more than 500 women are trained in various aspects through trainings and exposure trip. The Institute conducted trainings exclusively for women on various topics in the region which are given below.

- Demonstration on Oyster mushroom cultivation
- Improved production technologies of fruit crops
- Improved production technologies of vegetable and spices
- Value addition in focus horticultural crops
- Post harvest management of horticultural crops

Fig. 78. Training on organic farming at Tripura

Fig. 79. Nursery management of horticultural crops at Tripura

Fig. 80. Training on IPM in horti. crops

Fig. 81. Training on value addition at Nagaland

5. PUBLICATIONS

ARTICLE/ ABSTRACT OF PAPERS PUBLISHED IN SEMINAR/ CONFERENCE

Md Manzar Hossain, Lallan Ram. 2016. Bioactive compound present in fruits and vegetables with special reference to NER. National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, 2016

Lallan Ram, Dinesh Kumar, Sunil Kumar and Archana Khadse. 2016. Extraction of Essential Oils and Aroma from Acid Lime (Citrus aurantifolia) by Supercritical Carbon Dioxide. National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, 2016

Lallan Ram and Md Manzar Hossain. 2016. Post harvest system development for Horticultural crops in NER of India-Present status and future scope. National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, 2016

Lallan Ram, P. Sentiyangla and F. Eloni. 2016. Comparative study of various organic manures on growth, yield of French bean under the foothill condition of Nagaland, India. National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, 2016

Lallan Ram & Anjani Kumar Singh. 2016. Status and strategies for improving horticulture sector in NE India. National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, 2016

Lallan Ram and Meribeni Shitiri. 2016. Physiology of flowering in Mango. National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, 2016

Arvind Singh , Lallan Ram &,C. S. Maiti. 2016. Variability and genetic advance studies in exotic Carnation varieties under protected condition. National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, 2016

Md Manzar Hossain, Lallan Ram, Nugpani P S, Eloni Felicity. 2016. Development and storage studies of blended Jackfruit-Aloe Vera Ready to Serve (RTS) functional beverage. National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, 2016

Lallan Ram and Jamir Sentirenla. 2016. Performance of single bud rhizomes of turmeric (*cucurma longa*) cv. Lakadong on growth and yield influence by various sources of organic nutrients. National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, 2016

BULLETINS/ LEAFLETS

- Lallan Ram, A.K. Singh and Meribeni Shitiri. 2016. Nursery Management and Quality Planting Material Production of Horticultural crops. CIH/ Tech./ Pub. No. 5 / pp 1-41
- Lallan Ram and Meribeni Shitiri. 2016. Success story on various demonstration of focus horticulture crops carried out in different NE states by CIH. CIH/ Tech./ Pub. No. 6 / pp 1-50
- Md. Manzar Hossain, Meribeni Shitiri and Lallan Ram. 2016. Value addition of tomato (tomato soup & canning of tomatoes). CIH/ Tech. Folder/ pp 1-6
- Md. Manzar Hossain, Meribeni Shitiri and Lallan Ram. 2016. Value addition of tomato (tomato juice, tomato ketchup & tomato chutney). CIH/ Tech. Folder/ pp 1-6

ABSTRACT/ SOUVENIR

- Lallan Ram and Meribeni Shitiri. 2016. Souvenir. National seminar on Integrated development of horticulture in sub tropical & hill region.
- Lallan Ram and Meribeni Shitiri. 2016. Abstract. National seminar on Integrated development of horticulture in sub tropical & hill region.

6. SEMINARS, CONFERENCES, WORKSHOPS, MEETINGS

6.1. National seminar on Integrated development of horticulture in sub tropical & hill region

A 3-days National Seminar on 'Integrated Development of Horticulture in Sub-Tropical and Hill Region' was organized by Central Institute of Horticulture, Nagaland in collaboration with Assam Agricultural University, Jorhat and co-sponsored by National Horticulture Board, Gurgaon at Horticultural Research Station, Kahikuchi, Guwahati w.e.f. 17th – 19th February, 2016.

The seminar focused on streamlining and setting the agenda for horticultural development in sub-tropical and hill regions while deliberating on recent technological innovations in the horticulture sector.

The programme was formally inaugurated by Chief Guest, Dr. SK Malhotra, Agriculture & Horticulture Commissioner in the Union Ministry of Agriculture & Farmers Welfare. The Guest of Honor of the programme was Dr. AK Singh, Managing Director of National Horticulture Board. Welcome address was delivered by Dr. Lallan Ram, Director of Central Institute of Horticulture Nagaland. Special remark was given by Dr. NK Mohan, Chief Consultant, CIH & Dr. Elizabeth Saipari, Joint Director, Department of Horticulture, Mizoram and vote of thanks was pronounced by Dr. Sarat Saikia, Chief Scientist of Horticultural Research Station, Kahikuchi.

The Souvenir and other publications were released by the Chief Guest & Guest of Honor during the inaugural programme. A total of 9 technical sessions and a session on poster presentation were conducted where eminent scientists from all over the country presented 10 lead papers, 23 oral presentations and 17 poster presentations during the seminar. Over a hundred delegates from twenty states of India participated in the event.

Fig. 82. Dr. SK Malhotra, Agriculture & Horticulture Commissioner along with other dignitaries

Fig. 83. Lightening of lamp

Fig. 84. Release of souvenir and abstract of seminar and CIH publication

Fig. 85. Resource persons presenting papers during technical session

Fig. 86. Poster paper presentation

Fig. 87. Dr. Lallan Ram, Director, CIH speaking during valedictory programme of seminar

6.2. Meetings

6.2.1. Meeting for AAP 2015-16 at Delhi on 9th April, 2015

6.2.2. Meeting with Pineapple Growers of Molvom and Pherima village, Nagaland on 28.04.2015 for preparation and forwarding of 24 DPRs to National Horticulture Board.

6.2.3. Attended Scientific Advisory Committee meeting on 30th April, 2015 at ICAR Jharnapani, Nagaland

6.2.4. Meeting with citrus growers in Karbi Anglong district of Assam in 29th April, 2015

6.2.5. Meeting on State level empowered committee (MIDH) conducted on 16th March.2016 in the office of Secretary (Hort), Govt. of Nagaland Kohima.

6.2.6. Technical Advisory Meeting (TAC) held on 16th February 2016 at at conference hall, KVK, Kamrup, Kahikuchi, Guwahati, Assam.

6.2.7. Board of Management meeting (BOM) held on 18th March 2016 at at room no. 142, Krishi Bhawan, New Delhi.

Fig. 88. 8th Technical advisory committee meeting

Fig. 89. 11th Board of Management meeting held at Delhi Krishi Bhavan

6.3. Participation in conference/seminar/workshop/meetings

6.3.1. Participated and delivered lecture on ***"Primary Processing and Value Addition of Important Horticultural Crops with special reference to NER"*** during the National Horti. Expo cum Workshop on "Strengthening Horticultural Development for Enhancing Productivity, Quality and Sustainable Livelihood" from 11th – 13th June, 2015.

7. IMPORTANT EVENTS CELEBRATED

7.1. Independence Day Celebration

Central Institute of Horticulture celebrated 68th Indian Independence Day along with the whole country on 15th August, 2015. Flag hoisting was done by Director CIH, Dr. Lallan Ram. All the staffs and field workers were a part of the programme.

Fig. 90. Flag hoisting by Dr. Lallan Ram, Director, CIH

Fig. 91. Director, CIH along with staff and farm workers

7.2. Republic Day Celebration

The Institute, with the rest of the country, celebrated the 67th Republic Day on 26th January 2016. Flag hoisting was done by Director CIH, Dr. Lallan Ram. A brief programme was being organized where all the staffs and field workers participated.

Fig. 92. Flag hoisting by Dr. Lallan Ram, Director, CIH

Fig.93. CIH staff and farm workers

8. AWARDS AND RECOGNITIONS

8.1. AWARDS

8.1.1. Mr. Arvind Singh and Dr. Lallan Ram

Award for 3rd best poster paper during National seminar on Integrated development of horticulture in sub tropical & hill region organized by Central Institute of Horticulture, Nagaland and Assam Agriculture University, Jorhat during 17th – 19th February, on ***"Variability and genetic advance studies in exotic Carnation varieties under protected condition".***

8.2. RECOGNITIONS

8.2.1. Dr. Lallan Ram

- Examiner for evaluation of thesis of 2 nos. of M.sc (Ag.) students of Nagaland University, SASRD, Medziphema
- Examiner for Bachelor of Vocation in Plant Propagation & Nursery Management at NU-SASRD, Medziphema by the Agriculture Sector Skill Council of India (ASCI)
- Convener & Organizing Secretary of National Seminar on Integrated Development of Horticulture in Sub tropical & Hill region on 17th – 19th February, 2016 at HRS, Kahikuchi, Guwahati, Assam in collaboration with AAU, Jorhat, Assam

Members

- Member of NSLIC(MIDH) of Govt. of Nagaland
- Member of State Level Monitoring Commission for monitoring & Implementation of Coconut Development Board Scheme of Govt. of Nagaland
- Member of Seed Sub-Committee of Govt. of Nagaland

9. PERSONNEL

PRESENT STAFF POSITION AT CIH

Director	:	Dr. Lallan Ram
Administrative officer	:	Mr. Babu Singh
P A to Director	:	Ms. Imtinaro Jamir
Stenographer	:	Mrs. Shrada Devi
		Mrs. Achibeni Yanthan
Technical consultant	:	Mr. Arvind Singh
Horticulture Specialist	:	Mrs. Meribeni Shitiri
		Mr. Anjani Kumar Singh
Post Harvest Technologist	:	Mr. Manzar hossain
Marketing Specialist	:	Mr. Prabin Das
Assistant Horticulturist	:	Mr. Lichamo Yanthan (w.e.f. 28-04-2016)
		Ms. Shisarenla (w.e.f. 25-04-2016)
Senior Farm Manager	:	Mr. Diganta Gohain
Senior Technical Assistant	:	Mr. Ngupani P.S
		Ms. Eloni Felicity (left on 08-05-2016)
Field Assistant	:	Mr. Eliyamo Humtsoe
		Mr. Anukul Roy

All development, trainings and transfer of technology activities are being carried out at the institute under the administrative control of the Director, Central Institute of Horticulture supported by total staff strength of 17 comprising of technical, administrative staffs and 54 outsourced labours.

10. BUDGET

FINANCIAL STATEMENT OF CIH FOR THE FINANCIAL YEAR 2014-15

HEAD OF ACCOUNT	B.E.	R.E.	Expenditure
248-Crop Husbandry	2015-16	2015-16	
119-Horti & Veg. crop			
02-Estt. of CIH			
510101- Salary	25.00	27.00	26.68
510102- Wages	45.00	40.00	37.12
510106- Medical Treatment	5.00	7.00	7.00
510111- D T Expenses	20.00	10.00	8.45
510113- Office Expenses	50.00	35.00	29.98
510114- Rent rate & taxes	2.00	1.00	0.43
510116- Publication	5.00	6.00	4.38
510120- Other Admni. Expn.	70.00	70.00	40.30
510126- Advt. & publicity	3.00	3.00	1.95
510127- Minor works	60.00	60.00	26.54
510128- Prof. services	5.00	5.00	0.15
510150- Other charges	210.00	210.00	164.32
Total (2401Crop Husbandry)	500.00	474.00	347.30
4401 CO on Crop Husbandry			
119-Horti. & Veg. Crop			
14-Estt. of CIH			
510151-Motor Vehicle	15.00	-	-
510152-Machinery & Equip.	10.00	-	-
510153- Major Works	375.00	79.01	78.92
Total – Major Head 4401-	400.00	79.01	78.92
Grand total	900.00	553.01	426.22

11. IMPORTANT CONTACT DETAILS

11.1. Board of Management Members (BOM) of CIH, Medziphema

Sl.	Address	Contact No.
	Chairman	
1	Dr. S.K. Malhotra, Agriculture and Horticulture Commissioner, Department of Agriculture & cooperation, Govt. of India, Khrishi Bhawan -110001, New Delhi	011-23381012(O) -23383712
	Members	
2	Secretary (Horticulture), Govt. of Arunachal Pradesh, Itanagar: Arunachal Pradesh -791110	0360-2212595 (O) -2212446 (F)
3	Secretary (Agriculture), Govt. of Assam, Guwahati: Assam -781022	0361-2237277 (O) -2547406 (F)
4	Secretary (Horti. & Soil Cons.), Govt. of Manipur, Imphal : Manipur -795001	0385- (O) - (F)
5	Secretary (Horticulture), Govt. of Meghalaya, Shillong : Meghalaya -793003	0364-2211081(O) -2225978(F)
6	Secretary (Horticulture), Govt. of Mizoram, Aizwal : Mizoram-796001	0389-2322123 (O) - 2335916 (F)
7	Secretary (Horticulture), Govt. of Nagaland, Kohima : Nagaland -797001	0370-2243025(O) -2244042 (F)
8	Secretary (Horticulture), Govt. of Sikkim, Gangtok: Sikkim-737102	03592-231960 (Telefax)
9	Secretary (Horticulture), Govt. of Tripura, Agartala : Tripura-799001	0381-2416036 (Telefax)
10	Vice Chancellor, Assam Agriculture University, Jorhat-785013, Assam.	0376-2340013(O) -2340001 (F)

11	Vice Chancellor, Central Agriculture University, P.O.Box -23, Imphal-795004, Manipur	0385-2410450(O) -2415933(F)
12	Prof.D.P.Ray, Ex-Vice Chancellor of OUAT, HIG-105, K-5, Kalinga Vihar, PO:Bhubaneshwar-751 019	07351036054(M) 0674-2475093(R) dpray1949@gmail.com
13	Dr.Jagmohan Singh, Ex-VC, Y.S.Parmar University of Horticulture Solan, Kothon Village, P.o Shamti, Solan, Himachal Pradesh -173212	09418156047(M) jschauhan88111@gmail.com
14	Secretary, Ministry of DONER, Vigyan Bhavan Annexe, Mulana Azad Road, New Delhi-1100011	011-23022026(O) -23022307 (F)
15	Secretary, Ministry of DONER, North East Council, Nongrim Hills, Shillong, Meghalaya -793003	0364-2522645 (O) -2522643 (F) sect_nec_meg@nic.in
16	Director ICAR, Umroi Road, Umiam-793103, Meghalaya	0364-2570257(O) -2570355(F)
17	Dr.V.B.Singh, Professor &Head (Horti. Deptt.), SASARD-NU, Medziphema-Dimapur-797106, Nagaland	03862-247212 (O) -247255 (F) vbs_horti04@rediffmail.com
18	Chairman , NABARD, Plot Np-c24, G Block, Bandra Kurlar Complex, P.O.Box-8121, Bandra East, Mumbai-400051	022-26524748(O) -26530092 -265300113(F) chairman@nabard.org
19	Representative of M/S.ITC Ltd., 6th Floor, Peace Enclave, G.S.Road, Ulubari, Guwahati -781007	0361-2735370(O)
20	Mr. Ostander Lyngkhoi, General Secretary, Ri-Bhoi Strawberry Growers Association, House No-59, Lower Nongshilliang, Nongthymmai, Shillong-793014, Meghalaya (Progressive farmer of NER)	09862042137(M)
21	Mr.Th. Joykumar Singh, Thangjam Agro Industries, Chingmeirong East, Imphal, Manipur -795001 (Successful entrepreneur of NER)	08974009452(M) thangjamagro@gmail.com
	Member Secretary	
22	Dr. Lallan Ram Director, CIH, Medziphema- Dimapur-797106, Nagaland	03862-247707(O) -247088 (F)

11.2. Technical Advisory Committee (TAC) members of CIH, Nagaland

Sl.No	Name & Organization	Contact details
1	Dr.K.K.Jindal, UGC Emeritus Fellow, Retd. ADG Horti. ICAR & Ex-Director of Research,UHF Solan Himachal & CAU, Imphal, Manipur, Jindal Niwas, Surya Vihar, Rajgarh Road, Solan 173212, Himachal Pradesh	094180 29482 (M) 01792- 229842 ecofriendlyhorticulture@gmail.com
2	Dr. W.S.Dhillion, Director PHT & Ex ADG, ICAR, PAU, Ludhiana	09888070460 wasakhasingh@yahoo.com
3	Dr.N.K.Mohan, Chief Consultant of CIH & Ex Chief Scientist, HRS, Kahikuchi,, Milan Nagar (VIP), Near St.Claret School, P.O.Guwahati Airport, Guwahti, Assam -781015	09435145039(M) nalin.k.mohan@gmail.com
4	Dr.Ramesh Kumar, Ex Director, DFR, Ex Director of Research, PAU, Ludhiana	09815202495 rameshuk19@yahoo.com
5	Dr. R.A.Ram, Principal Scientist, CISH, Lucknow	09415459464(M) 09919899994 (M) raram_cish@yahoo.co.in
6	Dr. Ramesh Mittal, Dy.Director, NIAM, Bambala, Kota Road,Jaipur-302033	09829210015(M) mittalramesh@gmail.com
7	Dr. B.C.Deka, Jt. Director, ICAR- Jharnapani, Nagaland	09436349416(M) 03862-247241(O) bidyutdeka@yahoo.com
8	Dr. A.K.Srivastava, ICAR-CCRI, Amravati Road, Nagpur	09422458020 0712-2500249 -2500615 0712-2500813 aksrivas2007@gmail.com
9	Dr. L.C.Bora, Professor, AAU, Jorhat, Assam	09854022454 (M) boralohitc@gmail.com
10	Dr.V.B.Singh, Ex-Professor, Dept of Hort., SASRD-NU, Medziphema, Nagaland	09436018409(M) 03862-247212 (O) -247255 (F) vbs_horti04@rediffmail.com
11	Dr.Awani Kumar Singh, Sr. Scientist, CPCT, IARI, New Delhi	09013439110(M) singhawani5@gmail.com
12	Dr. Lallan Ram Director, CIH, Medziphema- Dimapur-797106, Nagaland	09436276767 (M) 09423404432 (M) 03862-247707(O) -247088 (F)

12. ANNUAL ACTION PLAN 2016-17

Sl	Components	Physical Targets	Approx. Cost per unit	Approx. Financial Implication
			(Rs. In lakh)	(Rs. In lakh)
A	Demonstration of production technologies at Institute level			
A.1	Management of existing demonstrations			
	a) Purchase of fertilizers, chemicals, manures etc for farm & polyhouse	13 ha		5.00
	b) Repair & maintenance of poly house	11 nos.	0.72	8.00
	c) Maintenance of Organic model farm	1 unit	0.20	0.20
	d) Repair & re-installation of drip irrigation system in fruit blocks including plastic mulching	5ha	2.00/ha	10.00
	e) Developing and maintenance of landscape of office compound & proposed training centre	18000sqft	27.78/ sqft	5.00
	Sub total			28.20
A.2	Demonstrations of improved Technology in the Institute			
	a) Plantation of orchids in poly house	500 plants	500/ plant	2.50
	b) Performance of high value vegetables under protected cultivation (tomato, sweet pepper,Cucumber & filler plants)	2500 sqm	40/sqmtr	1.00
	c) Organic cultivation of Turmeric (On farm)	0.5ha	0.05	0.05
	d) Comparative study on performance of Naga King Chilli under Protected Cultivation & open field condition	500 sq.m each	0.12	0.24
	e) Production of kharif season onion var.Agri found dark/light red	0.25 ha	0.30	0.30
	f) Performance of cole crops (cabbage, cauliflower & broccoli)	0.25 ha	0.50	0.50
	g) Intercropping of Papaya var.Arka Surya/Coorg honey dew & Pusa delicious/Pusa Majesty with fruit crops	0.25ha	0.45	0.45
	h) Plantation of windbreak/shelter belts (Naga Neem & Banana var. Bhimkal/ Athia kal)	6 ha	0.17	1.00
	i) Mushroom cultivation	1nos	0.50	0.50

	j) Intercroppingof cowpea var.Assam Valley in between fruit crops	3ha	0.10	0.30
	k) Cultivation of indegineous fruits & vegetables of Nagaland	0.25ha	2.00	0.50
	l) Plantation of Cocoa	0.25	2.00	0.50
	m) Low cost organic input production unit	1 unit	0.40	0.40
	Sub total			8.24
B.	Demonstration of improved Technologies in NE States			
	a) Demonstration on fruit crops in NER	1 ha each	3.00	3.00
	b) Demonstration on Mango & Guava at Nagaland in colloboration with CISH, Lucknow	In process		
	c) Construction of Naturaly Ventilated Poly house in Assam & Tripura & Procurement of Planting material (Gerbera and Rose)	1250 sqmt	1760/ sqmt	22.00
	e) Citrus rejuvenation in Nagaland & Assam	3ha	1.00	1.00
	Sub total			26.00
C.	Quality Planting Material & Seed Production			
	a) Establishment of mother block (gap filling of guava, citrus, cashew, pomegranate& passion fruit etc)	1000 nos.		0.50
	b) Mass multiplication of quality planting material			
	i) Asexually propagated plants (Cashew, citrus, mango, guava & rose)	50,000 nos		9.00
	Sub total			9.50
D	Accreditation of Horticulture Nurseries in NER	10 nos.	2.50	25.00
E	Human Resource Development			
	a) Farmers Training	50 nos.(50 trainees/batch		25.00
	b) Training of Trainers	08 nos. (40 trainees/batch		27.00
	c) Capacity Building of CIH Staffs & State officials	04 nos.		2.00
	d) Exposure trip cum training	03 nos.		8.00
	Sub total			62.00
F	Certificate Course	4 courses		35.42
G	Seminar/ Workshop/ Confrence/Meetings			
	a) National level (3 days event)	1 no		5.00
	b) Technical Advisory Committee (TAC) & Board of Management (BOM) meetings	2 nos	1.50	3.00
	Sub total			8.00

H	Exhibitions/ Trade Fairs/ Meets/Mela			
	a) Horticulture Fest (Exhibition cum seminar cum Buyer Seller meet) (To organize)	1 no		9.64
	b) National/ State level exhibitions (To participate)	2 nos		5.00
	c) NE Kisan Mela (To organize 2 days event)	1 no		8.00
	Sub total			22.64
I	PHM & Marketing			
	a) Promotion of SHGs (technology for processing, packaging & marketing of processed products like pineapple, aloevera, turmeric)	3 SHG groups	1.00	3.00
	b) Setting up of pilot processing plants in the Institute (Machines/ Equipments required)			
	iii. Solar tunnel dryer	1 no	2.50	
	v. Sealing machine	3 nos	0.60	
	vi. Juice pasteurizer	1 no	1.00	
	vii. Working table	2 nos	0.60	
	ix. Value added product		0.30	
				5.00
	Sub total			8.00
J	Machineries & equipment			
	a) Farm tools & implements			2.50
	b) Tractor drawn weed cutter	1 nos.	2.50	2.50
	Sub total			5.00
K	Chemical & glassware's for laboratory			2.00
L	Minor works			
	a) RCC platform for citrus primary nursery	3 Nos. (50mx1mx2ft)	1/unit	3.00
	b) Land development and construction of polyhouses for nursery unit	2 Nos. (500 sqm)	3/unit	6.00
	c) Construction of terracing for farm development	2 ha	2.50	5.00
	d) Soil sterilization unit	1nos.	5.00	5.00
	e) Construction of disinfectant chamber in poly houses (double door)	10 nos.	0.40	4.00
	f)Construction of Labour shed (For Block E)	1 Nos.	1.00	1.00
	g)Construction of openshed garage for tractors, power tillers & other farm implements.	1 No. (60 x 20ft)	6.00	6.00
	h) Maintenance of office building/Bamboo structure			2.00
	i) Geomembrane sheet (150-200 micron) lining in existing water harvesting structure to control water seepage	1 nos. (13.5x40.5x3 mtrs)	6.00	6.00

	j) Bore well construction	01unit	13.00	13.00
	k) Renovation of laboratory	1nos	7.00	7.00
	l) Miscelleanous works			2.00
	Sub total			**60.00**
M	Publication			
	a) Annual Report 2014 – 2015	1		3.00
	b) Technical bulletin			
	i.Bulletin on Nursery management and production of quality planting materials.	1		1.00
	c) Success story on various demonstration of focus horticulture crops carried out in different NE states by Central Institue of Horticulture	1		1.00
	Sub total			**5.00**
N	Motor Vehicle - Bus 32 seater	1	15.00	15.00
O	Others			
	a) Salaries			25.00
	b) Wages			45.00
	c) Medical			5.00
	d) Rate, Rent & Taxes			2.00
	e) Advertisement & publicity			3.00
	f) Domestic travelling Expenses (DTE)			20.00
	g) Professional services			5.00
	h) Contractual staff remuneration			50.00
	ii. Office Expenses			
	a) Office furniture			1.00
	b) Telephone bill			4.00
	c) Electricity bill			5.00
	d) Repair of motor vehicle			3.00
	e) Purchase of rubber stamp			0.10
	f) Stationary			1.00
	g) Office equipment			1.00
	h) Computer			1.00
	i) Contingent staffs remuneration			1.00
	j) Stores			5.00
	k) Printing & binding jobs			0.20
	l) POL			7.00
	m) AMC			6.00
	n) Postage & telegraph			2.70
	iii) Trainig hall/Guest house furnishing			12.00
	Sub total			**205.00**

	Grand total			**525.00**
Budget Projection for the year 2015-16				
Sl	Head of Account	Estimated Budget for 2015-16 (Rs. In Lakhs)		
A	Major Head -2552			
1	Salary	25.00		
2	Wages	45.00		
3	Medical Treatment	5.00		
4	Domestic Travel Expenses	20.00		
5	Office expenses	50.00		
6	Rent, Rates & Taxes	2.00		
7	Publication	5.00		
8	Other Administrative Expenses	70.00		
9	Advertisement & Publicity	3.00		
10	Minor works	60.00		
11	Professional Services	5.00		
12	Other Charges	210.00		
	Sub Total	**500.00**		
B	Major Head -4552			
1	Major works	375.00		
2	Machinery & Equipment	10.00		
3	Motor vehicle-Bus	15.00		
	Sub Total	**400.00**		
	Grand total	**900.00**		

13. RECOMMENDATION OF TAC AND BOM COMMITTEE

13.1. Recommendation of Technical Advisory Committee

Minutes of the 8th Technical Advisory Committee (TAC) meeting of CIH held on 16th February, 2016 at 2:00 PM at conference hall, KVK, Kamrup, Kahikuchi, Guwahati, Assam

Out of the 12 members only 09 TAC members and 08 invited members of CIH were present during the meeting, the details of which are given as under.

Members present:

1.	Dr.K.K.Jindal, Retd.ADG Horti., ICAR	- Chairman
2.	Dr. N.K.Mohan, Chief Consultant, CIH	- Member
3.	Dr. W.S.Dhillion, Director, PHT PAU, Ludhiana	- Member
4.	Dr.Ramesh Mittal, Dy.Director, NIAM, Jaipur	- Member
5.	Dr. R.A.Ram, Principal Scientist, CISH, Lucknow	- Member
6.	Dr. V.B.Singh, Professor, SASRD-NU, Medziphema	- Member
7.	Dr. L.C.Bora, Professor, AAU, Jorhat, Assam	- Member
8.	Dr. Awani Kumar Singh, Sr. Scientist, CPCT, IARI, New Delhi	- Member
9.	Dr. Lallan Ram, Director, CIH	-Member Secretary

Invited members present:

1. Dr.S.K.Malhotra, Agriculture & Horticulture Commissioner, Govt. of India
2. Mr. Prabin Das, Marketing Specialist, CIH
3. Mr. Anjani Kumar Singh, Technical Consultant, CIH
4. Mr. Arvind Singh, Technical Consultant, CIH
5. Mr. Manzar Hossain, Post Harvest Technologist, CIH
6. Mr. Gohain, Senior Farm Manager, CIH
7. Ms. Eloni Felicity, Sr. Technical Asst., CIH
8. Ms. Imtinaro, PA to Director, CIH

Director, CIH and member secretary of the TAC Dr.Lallan Ram warmly welcomed all the members to the meeting. The Chairman, Dr.K.K.Jindal also welcomed all the members and invited members and requested the special invitee Dr.S.K.Malhotra, Agriculture & Horticulture Commissioner, Ministry of Agriculture & Farmers Welfare, Govt. of India to preside over the meeting. The following were discussed as per the various agendas prepared for the meeting which are mentioned as under.

1. **Confirmation of 7th TAC meeting held on 20th Feb., 2015**

The minutes of the 7th TAC meeting held on 20th Feb., 2015 at CIH, Nagaland was confirmed by the members.

2. **Achievements of CIH 2015-16**

Dr. Lallan Ram, Director, CIH presented a power point on the achievements of CH for the year 2015-16.

3. **Action Plan of CIH 2016-17**

The draft Annual Action Plan 2016-17 of CIH presented by the Director, CIH was approved by the honourable members with the following suggestions:

i. Demonstration of improved Technology in the Institute

a. It was suggested to undertake intercropping of gladiolus in two fruit blocks of citrus and litchi only.

b. It was suggested to plant tomato var. GS-600, Himsona in the month of June-July under polyhouse and to plant semi-determent var.Avinash 2, Avinash 3 for small naturally ventilated polyhouse.

c. It was advised to maintain germplasm of underutilized/unexplored vegetables & fruits of NE region in CIH demonstration farm.

d. It was advised not to undertake the plantation of cassava and colocasia.

e. It was advised to plant marigold var. Pusa Basanti in a small area of 500sqmtr and to produce seeds from the same for distribution to the farmers. It was also advised to prepare cost benefit ratio for cultivation of the same.

f. Advice was given to undertake model vegetable garden in an area of 500 sqmtr with crop sequencing throughout the year as demonstration to farmers for achieving nutritional security and also increase of livelihood income of the farmers.

ii. Demonstration of improved technologies in NE States

a. It was advised by chairman to include the states of Sikkim & Arunachal Pradesh for citrus rejuvenation programme in a phase wise manner and also to increase the budget provision for the same.

b. It was advised not to further include construction of Naturally Ventilated Poly house and distribution of planting material and media for demonstration of orchids/ anthurium in Tripura as these flowers have limited scope as compare to other NE State.

c. It was also advised not to include maintenance of ongoing organic model farm, Meghalaya in the Action Plan.

iii. Quality Planting Material & Seed Production

a. Advice was given to include khasi mandarin and Assam lemon in mass multiplication of quality planting material.

iv. Human Resource Development

a. It was advised to take cashew farmers from selected areas of NE where cashew growing is initiated for exposure cum training to Karnataka and Kerala for training on new techniques of cultivation and home scale processing of cashew nut.

v. Post Harvest Management & Marketing

a. It was advised by the members not to carry out promotion of SHGs and only to focus on creating of infrastructure and machineries as a post harvest handling unit for grading, waxing, shrink wrapping, pre cooling and ripening chamber for demonstration purpose at CIH farm.

b. The members suggested that, Buyers & Sellers meet at Yangoon, Myanmar can be considered subject to the approval from the Ministry of External Affairs, Govt. Of India.

c. It was advised not to include Online Marketing: Promotion & Portal Development of Horticulture Crops of NE in the Action Plan till qualified staff is made available.

d. It was advised to confirm from the State Horticulture Departments of NE before, CIH initiates the activities for the Geographical Indication Registry of Horticulture crops as the subject comes under the domain of the respective states.

vi. Minor Works

a. It was advised to go for Supremo or Silpaulin brands of geomembrane sheet of 400-500 gauge for lining in water harvesting structure.

b. It was advised to avoid construction of packhouse for flower grading and packaging including cool chamber from the list of minor works under Action Plan. These require proper technical and financial approval under the plant for major construction.

4. Suggestions & opinions from members

a. Dr. S.K.Malhotra, Agriculture & Horticulture Commissioner, Govt. of India as a special invitee shared that the Ministry was looking into the possibility of linking CIH with the National Skill programmes for HRD programmes of the Institute. Inorder to increase the number of certified nurseries in NER, he advised CIH to prepare a list of all government run farms/nurseries in NER which required accreditation so that quality planting material can be distributed to the farmers. Director CIH should strengthen accreditation Govt. nurseries in other NE States besides on going two states. He also advised the Institute to prepare the yield data of all existing crops in the Institute and prepare cost benefit ratio and present it in future achievements of the Institute. He further requested, Dr. Awani Kumar Singh, Sr. Scientist, CPCT, IAR, New Delhi to visit CIH and give inputs for the protected cultivation technology demonstrated in the Institute and advised the Director to depute the horticulturist of the Institute to visit the Indo-Israel project on Mandarin at Sirsa, Haryana.

b. Dr.W.S.Dhillion advised that, CIH should strengthen the system for high quality planting material from accredited nurseries and to distribute certified disease free plants to the farmers for the success of horticulture crops with special reference to fruit crops. He also shared that, strong post harvest handling system should be demonstrated to the farmers to reduce the post harvest loss of horticulture crops.

c. Dr.N.K.Mohan opined that importance should be given for capacity building of the staffs of the Institute and that the institute should work in close coordination with important Institutions and organizations in NER.

d. Dr.Ramesh Mittal shared that NIAM, Jaipur was ready to collaborate with CIH for conducting trainings on market led initiatives. He also suggested that CIH can act as an agency from NE to promote the distance learning programme of NIAM.

e. Dr.L.C.Bora suggested that, CIH should work as a knowledge centre and give guidance to farmers

for organic farming and certification.

f. Dr.V.P.Singh advised the Institute to invite experienced resource person/lecturers from outside the Institute for the three months certificate courses.

g. Dr.R.A.Ram advised the institute to increase the onfarm input production of bio enhancers, bio manures, bio pesticides for organic farming.

h. Dr.Awani Kumar Singh Suggested that, CIH should have a complete package of practices on protected cultivation technology for demonstration to the farmers and advised that, CIH should promote/carry out more cultivation of vegetables under protected cultivation.

i. All the members unanimously pointed out the need to have regular employees as the Institute was already 10 years old and that, proper remuneration should be given to the contractual employees of the Institute who are working hard with dedication to achieve the mandates of the Institute and also to retain and attract experienced personnel. In this regard, Dr. S.K.Malhotra, Agriculture & Horticulture Commissioner, Govt. of India shared that all options are being looked into for change of contractual recruitment policy to direct recruitment and that the remuneration of the contractual staffs are being enhanced from time to time. He further stated that, these matters will be looked into on utmost priority.

The Chairman, Dr.K.K.Jindal gave the closing remark whereby, he thanked all the members for their in put on the various agendas discussed in the meeting. The Chairman also congratulated the Director and the staff of the institute for achieving 10 years in the development of horticulture sector in NER and suggested that, the Institute should come out with a bulletin on ten years achievements and technologies developed have a vision document for the future course of the Institute. He also advised that, the institute should work for the development of horticulture in the whole of NE region and that holistic approach towards integrated horticultural based farming system should be adopted by the Institute. He suggested that, there should be interface meetings with stakeholders especially State horticulture departments, SAU, CAU and ICAR institutions in NER before Technical Advisory Committee meetings to get their views and opinions for the development of horticulture sector in the NER through the programmes of CIH. He further suggested that, under the initiative of CIH, a national seminar or a conclave should be organised for drawing a road map to address the issues on decline of citrus industry in NER and organic farming in selected Horticultural crops.

13.2. Recommendation of Board of Management

Minutes of the 11th Board of Management meeting of CIH, Nagaland held on 18th March, 2016 at 11:00 am at room no. 142, Khrishi Bhawan, New Delhi.

The BOM meeting was held under the chairmanship of Dr. S K Malhotra, Agri. & Horti. Commissioner, DAC & FW, Govt. of India with 08 members and 02 invited members to review the progress of activities of CIH and to consider approval of the Annual Action Plan 2015-2016 of the Institute. List of participants is in Annexure -I.

The chairman welcomed the members and had a brief moment of introduction by all the members. The chairman shared on the many new initiatives that have been taken up by the institute and remarked that the institute has been growing with time. He started the meeting by discussing and deliberating the agendas bid before the members

1. **Confirmation of the minutes of 10th BOM meeting:** The minutes of the 10th BOM meeting held on 31st March 2015 at KVK Kamrup, Guwahati, Assam was confirmed by the members.

2. **Achievements of CIH 2015-16:** Dr. Lallan Ram, Director, CIH presented a power point on the achievements made by the Institute in the year 2015-16 which was approved by the Board.

3. **Action plan 2016-17**: Power point presentation of Annual Action Plan 2016-17 was presented by Director CIH and was deliberated thoroughly and the following suggestions were expressed.

   i) **Demonstration of improved technology in the Institute**

   a. It was advised by the members not to go for intercropping of Gladiolus in citrus and litchi mother block so that the probability of the spread of diseases to the mother plants can be prevented.

   b. The members suggested that the Institute should also provide training as well as produce spawn for oyster mushroom as the demand for the same was very high amount the farmers/ SHG's / entrepreneurs.

   c. It was advised to set up a low cost model water harvesting pond and demonstrate the use of micro irrigation system for display of judicious use of water.

   d. It was advised that from henceforth, clear objectives of the new demonstrations to be undertaken which should be mentioned in the Action Plan.

ii) **Quality planting material and seed production**

It was advised that CIH should generate revenue by the sale of quality planting materials produced in the Institute at nominal rates.

iii) **Human Resource Development.**

CIH was advised to conduct trainings for the farmers by linking it with the various schemes under MIDH.

iv) **Certificate course.**

a. The members shared that the various trainees of Certificate course should be linked to the various schemes of MIDH through their respective states Govt, so that they can receive the benefits under the scheme.

b. It was informed that the proposal for linking of the 3 months certificate to skill development foundation was in the pipeline, whereby the skill development foundation would need to authenticate and ascertain the qualification pack of the course curriculum.

c. The Director, CIH informed that a new course on entrepreneurship Development of Horticulture crops will be started by the Institute.

v) **PHM and Marketing.**

a. It was advised by the Chairman to take the opinion from the Ministry for G.I. Registry of Horticulture crops of NER by submitting complete proposal with the names of the crops to be registered and those that has been already registered.

vi) **Minor works.**

a. It was advised to set up a model of solar based water pump for demonstration purpose in the Institute.

b. It was advised that the Institute should demonstrate on the use of model cold storage installed in the Institute.

5. Any other with the permission of the chair:

a. It was advised by the members that CIH should encourage the farming of gynodioecious varieties of papaya like Arka Prabha and Arka Surya among the farmers of NE through the state Horticulture dept. by providing trainings on papaya cultivation.

b. It was suggested that CIH should provide training of trainers for organic certification and PGS system of organic farming under the Mission Organic by coordinating with the NE states.

c. As availability of quality planting material was a problem in NE region, it was advised that CIH should motivate the farmers to start nurseries by providing trainings and awareness programmes, and also prepare a document by getting information from the NE states of the requirement of quality planting material and link it up with the already accredited nurseries of NER. Further, CAU, Imphal shared their willingness to work together with CIH for production of quality planting material.

d. As many regions of NE were suitable for growing temperate crops, it was advised that trainings should be provided by CIH for creating awareness and educating the farmers on the PoP of various temperate crops.

e. It was advised that CIH should organise a programme and bring out a road map on how to network with the NE states for citrus rejuvenation programme as decline of citrus orchards is a common problem of all the farmers of NE region.

4. **The chairman gave time to all members to share their suggestion and inputs, which are mentioned as follows.**

i) Representative of Manipur state shared that two private nurseries will be applying for accreditation and requested for conducting of farmers training on the production technology of Kiwi cultivation in Manipur.

ii) Representative of NABARD shared that CIH should write to the head office in Mumbai for any requirement of resource persons especially for presenting lecture on DPR preparation during the certificate course and that NABARD was looking forward to work with CIH for preparation of bankable projects on opening of Nurseries for production of quality planting material.

iii) Horticulture Secretary, Govt. of Nagaland expressed that importance should be given for infrastructure development of the Institute.

iv) Dr. V B Singh opened that some new post should be created for strengthening of the Institute.

v) Dr. Jagmohan shared that importance should be given for production of quality planting material and to try chip budding for propagation of citrus.

vi) Vice Chancellor, CAU shared that their university was looking forward to work together with CIH for development of horticulture in NER. He also shared that the Institute should work for developing of PoP which are suitable for NE states as the farmers of the region are confused on which PoP to be followed. Further, he shared on the need for promoting small processing units especially for spice production among the farmers of NER.

The chairman ended the meeting by thanking all the members for their valuable inputs to move forward in addressing the issues with a new dimension. He shared that, he will be working on priority basis for strengthening of manpower in the Institute.

List of members present in the Board of Management held on 18th March, 2016 at Krishi Bhawan, New Delhi

Sl. no	Name and designation	
1	Dr. S K Malhotra Agriculture and Horticulture Commissioner, Department of Agriculture & cooperation, Govt. of India, Khrishi Bhawan, New Delhi	Chairman
2	Shri. C M Tsanglao Secretary (Horticulture), Govt. of Nagaland	Member
3	Dr.Jagmohan Singh Ex-VC, Y.S.Parmar University of Horticulture Solan, Kothon Village, P.o Shamti, Solan, Himachal Pradesh	Member
4	Dr. M Premjit Singh VC, CAU, Imphal	Member
5	Dr..V.B.Singh Rtd. Professor, SASRD, Nagaland University	Member
6	Shri. C S R Murthy DGM, NABARD, Mumbai	Representative of Managing Director, NABARD
7	Shri. K Jogeshchandra Sharma Dy. Director, Dept. of Hort. &Soil Conservation, Govt. of Manipur	Representative of Director, Dept. of Hort. & Soil Conservation, Govt. of Manipur
8	Dr. Lallan Ram Director, CIH, Medziphema- Dimapur, Naga-land	Member Secretary
Other invited members present:		
9	Dr. M Tamil Selvan Addl. Commissioner (Hort.) DAC&FW, MOA, GOI, New Delhi	
10	Dr. Naveen Patle, Dy. Commissioner (Hort.), DAC&FW, MOA, GOI, New Delhi	

Physical and Financial Progress Report for the year 2015-16

Sl. No.	Activity	Year' 2015-16			
		Target		Achievements	
		Phy	Fin.	Phy	Fin.
1	Technology demonstration	10ha area	34.24	17.75ha area established	1.67
2	Production of quality planting materials	50000 nos.	9.50	32500 nos.	7.92
3	Accreditation & certification of nurseries	10 nurseries	25.00	3 nurseries certified	4.51
4	Trainings	58 nos.	62	43nos. completed	26.25
5	Certificate course	4 nos.	35.42	2 nos. completed	17.72
6	PHM, Marketing & promotional events	8 progs.	33.64	5 progs conducted	24.73

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Dr. Lallan Ram, Director

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