

**Study No. 142**

**Baseline Data on Area, Production and  
Productivity of Horticulture Crops in  
North -East and Himalayan States  
- A Study in Assam**

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## PREFACE

The study on “Baseline Data on Area, Production and Yield of Horticulture Crops in North East and Himalayan States- A Study in Assam” was undertaken by the Centre at the instance of the Ministry of Agriculture, Government of India. The Agricultural Development and Rural Transformation (ADRT) Centre attached to the Institute for Social and Economic Change (ISEC), Bangalore was designated as the coordinating centre for the study.

Horticulture is an important segment of Agriculture, contributing about one-fifth share of the Agriculture and allied sectors. Rapidly growing demand for horticultural commodities and products especially for processed fruits and vegetables as well as booming floriculture market is an evidence of the phenomenon that is expected to accelerate horticultural growth in the State. Consequently, horticulture is set to assume a greater role and importance within the agriculture sector and eventually in the State economy.

However, there is a serious problem concerning reliability of data on horticulture sector which is one of the most critical requirements to facilitate systematic policy analysis and planning exercise. Lack of reliable and authentic base-line data or inadequate and incomplete data is one of the serious constraints of horticultural development. Lack of authentic data restricts the scope of identifying the opportunities for undertaking much needed crop diversification programmes. It is not just the basic data like area, production or productivity, but the whole gamut of related data set including storage data, market data, market arrivals, prices, exports and so on, are extremely important to develop and integrated data base.

The discussion and analysis of data clearly indicate that multiple agencies are involved in horticulture base line data collection/ generation process in Assam. But no systematic and accurate estimate of area and production of different horticultural crops are available. The estimates made by various agencies also vary considerably. Each agency has its own methodology, often resulting in variations in the data besides the problems of revision and time lag. Further, only a few crops could be compared in this study due to non availability of data from the agencies' end.

From the ongoing analysis it has emerged that there should be close cooperation among the data collecting agencies involved in the field of horticultural crops, with involvement of local bodies like Gaon Panchayat *etc.* The agencies are to follow standardized / uniform methodologies for data collection so that marked variation and duplication can be avoided to a great extent . All the Departments concerned should maintain a fully functional statistical & monitoring cell to keep track of the data collection process with appropriate statistical tools. Also, there is an urgent need for continuous updating of ‘Chitha’ book to document accurate data from the actual field.

Action taken in the line above can go a long way in formulating workable plans & implementing horticultural development schemes for the improvement of the State economy.

Like all other studies, this is also a joint output of the Centre. The names of the research staff associated with the study have been mentioned elsewhere in the report.

I sincerely acknowledge with thanks for the help & cooperation rendered by the officials of the Department of Agriculture & Horticulture, the Directorate of Economics & Statistics and Revenue Department of all the sample districts of Kamrup, Nagaon, Sonitpur and Barpeta. I am also thankful to all the sample respondents for their spontaneous help and co-operation during the field surveys.

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# Chapter -I

## 1. 1. Introduction

Horticulture, which has gained commercial tone in the recent years, is an important component of agriculture, having significant role in the economy of the country. India's varied agro-climatic conditions allow it to produce a wide variety of horticultural crops such as fruits & vegetables, tuber crops, plantation crops, flowers, spices & condiments etc. Commercial importance of fruits has been increasing all over the world as they contribute significantly to the country's economy besides their nutritional and social importance. India has started putting greater thrust for the development of horticultural sector after sixties in order to exploit the country's vast potential and to generate the much needed value addition. The horticultural crops put together cover approximately 11.35% of the total cropped area (192.20 million hectares) with an annual production of about 114 million tons making an overall contribution of more than 18% in terms of the gross agricultural output of the country in 2010-11. Following successful launching & implementation of various development programmes, there has been tremendous progress in the production of fruits and vegetables in terms of both quality and quantity.

India is the second largest producer of fruits as well as vegetables after China. The country ranks first in the production of mango, banana, sapota and acid lime and in recent years, it has recorded the highest productivity in grapes as well. However, there is no room for complacency in the sense that there still exist huge untapped potential to improve the productivity and production of fruits, vegetables and flowers with the help of recent technological advancement in the field of agriculture. Its importance has been increased substantially owing to its vast export potential in the WTO regime. This is well reflected in the policy documents prepared by the Planning Commission of India.

Growing horticultural crops can provide gainful employment to a larger majority of the farmers and agricultural labour throughout the year. One hectare of fruit production generates 860 man-days per annum as against 143 man-days for cereal crops. Some industrial attribute crops and cultural intensive crops like grape, banana and pineapple, generate much larger employment ranging from 1,000 to 2,500 man-days per hectare per annum.

## **Horticulture in North-Eastern Region**

The North-Eastern region is characterised by hills and mountains with folded topography, plateaus and hills with near tropical to alpine climatic condition. Under these conditions, the mixed farming system with horticultural crop cultivation in particular occupied prime position because of its economic viability as compared to other field crops. The North-Eastern region of India in particular has been found to be one of the richest reservoirs of genetic variability of large number of fruit crops .

The unique diversity in agro-climatic conditions coupled with fertile and well-drained soil makes this region suitable for growing a large number of horticultural crops like wide range of fruits, vegetables and plantation crops. Some of the selected and promising crops of temperate and tropical fruits are grown commercially by some of the farmers in some potential area. Considering the site, situation and specific problems gentle hill slope even with shallow soil depths with sufficient soil moisture regime is considered suitable for horticultural crop cultivation. So, the hill areas in the North-East have enough potential for horticultural development.

Shadeque<sup>1</sup> (1989) viewed that the North – Eastern Region of India with a mixed terrain of hills and plains, intercepted by large number of small and big rivers, streams is nature's unique gift for production of number of horticultural crops, particularly fruits. The diverse agro-climatic conditions, varied soil type and abundance of rainfall offer immense scope for cultivation of different types and varieties of horticultural crops, including fruits, vegetables, flowers, plantation crops, tuber and rhizomatous crops and medicinal and aromatic plants and other miscellaneous crops having economic values.

The tropical fruit crops of N.E. Region are citrus, pineapple, banana, mango, guava, papaya, jackfruit, litchi, coconut, arecanut and many other minor fruits grown in the hills and plains almost in an unplanned and unsystematic manner. The N.E. region is the highest producer of pineapple in the country. Besides pineapple, some temperate fruits like apple, plum, peach, pears and guava are also grown by and large on commercial basis by the farmers of the region. But, no worth mentioning development in the field of horticulture has been achieved in the region due to a

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<sup>1</sup>Shadeque.A: " Impact of Fruit Plantation on Economy and Eco-System of N.E. India." P.C. Goswami(Ed.), " Agriculture in Assam". Assam Institute of Development Studies, 1989, p.89

number of constraints like non-availability of quality planting materials of improved varieties, poor extension support and transport and marketing problems.

The region has also rich diversity of different vegetable crops; both indigenous tropical vegetables. Among the flowering plants, special mention may be made of orchids with more than 600 species in the region. The commercial flowers of the region are marigold, tuberose, gladiolus and chrysanthemum. Tuber and rhizomatous crops grown in the region are tapioca (Cassava), sweet potato, dioscorea, colocasia, ginger and turmeric *etc.* while plantation crops like tea have considerable impact on the economy of Assam in particular. Besides, other plantation crops like rubber and coffee, medicinal and aromatic plants have been considered suitable for certain areas of the region.

There lies immense potential for vertical and horizontal growth of horticulture sector in the region. At present, horticultural crops account for only 18.91% of the cultivated area in N.E. Region in the year 2012. This share is highest in Mizoram followed by Sikkim, Manipur, Arunachal Pradesh, Meghalaya, Tripura, Assam and Nagaland. There is a need to expand the area under horticultural crops particularly Nagaland, Assam & Mizoram. Table- 1.1 presents the percentage of total cropped area occupied by horticultural crops in the NE states.

**Table 1.1**  
**Percentage of Area under Horticulture in N.E. States**

States	P.C. area under Horticulture
Arunachal Pradesh	31.70
Assam	14.04
Manipur	43.48
Meghalaya	30.09
Mizoram	60.57
Nagaland	7.70
Sikkim	45.76
Tripura	30.03
Total	18.91

Source: Agricultural Statistics at a glance, Government of India, 2012

According to the Table, highest percentage of area under horticultural crops was exist in Mizoram (60.57 Per cent) followed by Sikkim (45.76 Per cent), Manipur (43.48 Per cent), Arunachal Pradesh (31.70 Per cent), Tripura (30.03), Assam (14.04) and Nagaland (7.70 Per cent). In aggregate, 18.91 per cent of total cropped area was lying under horticultural crops in North East Region. In terms of its contribution to the national production, the region accounts for about 5.10 % fruits and 4.50 % vegetables.

**Table-1.2**  
**State-wise Area under Fruits in NE States during 1998-99 to 2009-10**

(Area in ' 000 Hectare)

States	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	CGR (%)
Arunachal Pradesh	29.70	44.10	51.10	41.60	40.81	51.42	50.70	51.70	54.60	57.60	57.60	57.60	5.66
Assam	104.80	106.10	107.00	110.80	91.79	94.30	110	113	114	116	122	127	1.61
Manipur	23.80	24.60	24.70	26.10	26.68	53.07	51.20	31.20	33.90	39.10	42.40	42.40	4.93
Meghalaya	23.20	26.90	24.10	24.00	15.27	23.81	23.80	28.30	28.50	28.50	33.00	32.95	2.97
Mizoram	16.40	13.00	18.00	19.00	17.21	21.15	21.20	18.60	20.50	22.30	27.00	34.50	6.39
Nagaland	11.30	19.40	24.70	25.00	8.50	13.31	13.30	9.60	255.70	265.20	285.80	18.16	4.02
Sikkim	9.50	5.90	9.40	12.30	9.95	0.01	8.20	8.90	9.00	9.30	10.50	12.19	2.10
Tripura	30.40	30.40	28.90	28.30	28.39	30.46	32.40	33.00	33.20	33.90	36.50	31.31	0.25

*Source : National Horticulture Board. & Lok Sabha Unstarred Question No. 6238, dated 04.05.2010.*

Table-1.2 depicts the area under fruits in NE states during 1998-99 to 2009-10. From the Table, it was found that the area under fruit crops were increased in all the NE states during the period of last 12 years. It is because of the fact that there has been a perceptible change in the consumption pattern characterized by declining share of food grains and the increasing share of non-food grain items in the consumption baskets particularly fruits and vegetables. The highest area increased during the period was found in Mizoram while the least area increased was Tripura during the same period. The compound growth rate of area under fruit crops was estimated at 5.66 per cent for Arunachal Pradesh, 1.61 per cent for Assam, 4.93 per cent for Manipur, 2.97 per cent for Meghalaya, 6.39 per cent for Mizoram, 4.02 per cent for Nagaland, 2.10 per cent in Sikkim and 0.25 per cent for Tripura.

The production of fruits in NE States for the period of 1998-99 to 2009-10 are furnished in Table-1.3

In case of production also, an increasing trend was noticed during the period of 1998-99 to 2009-10. The compound growth rate was found 1.38 per cent in Arunachal Pradesh, 1.89 per cent in Assam, 9.47 per cent in Manipur, 3.90 per cent in Meghalaya, 7.62 per cent in Mizoram, (-) 0.04 per cent in Nagaland, 13.33 per cent in Sikkim and 2.09 per cent in Tripura.

**Table-1.3**  
**Production of Fruits in North-East India (1998-1999 to 2009-2010)**

States	(Production in ' 000 MT)												CGR (%)
	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	
Arunachal Pradesh	91.60	93.10	123.10	124.90	82.06	101.26	103.2	105.10	107.80	107.90	108.00	108.00	1.38
Assam	1249.50	1247.10	1293.80	1335.10	1126.46	1181.10	1325	1352	1372	1408	1495	1565	1.89
Manipur	115.30	118.10	118.70	134.00	137.80	353.25	320.9	189.10	229.10	273.70	341.91	341.91	9.47
Meghalaya	186.40	223.30	186.90	186.90	153.30	199.61	199.6	231.70	234.30	235.20	294.81	294.81	3.90
Mizoram	76.80	40.70	66.70	63.40	55.00	42.40	42.50	66.00	179.70	219.60	123.07	185.49	7.62
Nagaland	152.00	232.30	290.40	302.00	65.89	48.82	48.90	19.60	130.00	183.82	151.27	151.27	-0.04
Sikkim	8.30	8.60	9.90	9.05	10.65	11.52	12.21	13.10	-	-	15.67	18.49	13.33
Tripura	372.10	372.10	363.85	435.26	439.10	463.98	478.38	525.00	-	-	477.18	477.18	2.09

Source : National Horticulture Board. & Lok Sabha Unstarred Question No. 6238, dated 04.05.2010.

### **Horticulture in Assam**

Assam is endowed with diverse agro-climatic conditions, which permit growing of wide range of horticultural crops. It accommodates various fruits, vegetables, flowers, spices, medicinal and aromatic plants, nut crops, tuber crops and also plantation crops. Assam represents a mixed terrain of hills and plains intercepted by a large number of rivers and streams. Horticulture crops cover an area of 5.75 lakh hectares which account for 14.04 per cent of the total cultivable area of 40.99 lakh hectares in the state in the year 2011-12. The important fruit crops in the state are banana, pineapple, citrus, jackfruit, guava and litchi. coconut, arecanut and betel vine are predominant plantation crops. Potato, sweet potato, tapioca, colocasia and yams cucurbits, peas, beans and okra are cultivated in commercial scale. Ginger and turmeric occupy prime position among the spices.

Assam has a rich diversity in fruit crops. In citrus, there are as many as 17 species, 53 varieties and 7 hybrids. Wild and semi wild species of mango and temperate fruits particularly of the Rosaceae family occur in the state. In addition, quite a good number of traditional fruit crops like *leteku* (*Baccaurea sapida*), *poniol* (*Flacourtia gangomos*), *nagatenga* (*Rhus semialata*), *thereju* (*Prunus jenkinsii*), *kordoi* (*Averrhoa carambola*), *mirika tenga* (*Parameria polyneura*), *amora* (*Spondias mangifera*), *outenga* (*Dillenia indica*), *silikha* (*Terminalia chebula*), *bhomora* (*Terminalia belerica*) etc. are found in the state. Table-1.4 presents the horticultural crops grown in the state.

**Table: 1.4**  
**Horticultural Crops of Assam**

Fruits	Banana, Jackfruit, Pine apple, Papaya, Assam Lemon, Orange, Litchi, Guava, Mango, Sapota
Traditional Fruits	Carambola, Leteku, Paniyal, Thekera, Rabab Tenga, Au Tenga,
Vegetables	Ash Gourd, Bitter gourd, Bottle gourd, Brinjal, Broccoli, Cabbage, Capsicum, Carrot, Cauliflower, Chilli, Chow-chow, Cow pea, Cucumber, cucurbits, French Bean, Garlic, Knolkhol, Ladies Finger/ Okra, Lettuce, Musk melon, Pea, Pointed gourd, Pumpkin, Radish, Ridge gourd, Snake gourd, Spinach, Beet, Spine gourd, Sponge gourd, Tomato, Water melon
Tuber Crops	Potato, Sweet Potato, Tapioca, Colacasia, Yam, Kath alu
Spices	Coriander, Ginger, Chilli, Turmeric, Onion, Garlic, Black Papper, Cumin & Black Cumin, Mint, Fennel, Fenugreek, Bay leaf, Curry Leaf, Vanilla
Flowers	Marigold, Tuberosa, Gladioli, Gerbera, Bougainvillea, Mussaenda, Chrysanthemum, Dahlia, Orchids, Antirrhinum, Aster, Balsam, Calendula, Carnation, Petunia, Portulaca, Salvia, Zinnia
Medicinal Plants	Amlakhi, Silikha, Bhumura, Bael, Nefafu, Brahmi sak, Maha Brhringaraj, Madhusoleng, Sarpagandha, Kalmegh, Neem, Safed Musli, Tulsi
Aromatic Plants	Citronella, Lemongrass, Vetiver, Patchouli
Nut Crops	Areca nut, Coconut, Cashew nut
Plantation Crops	Betel vine, Tea, Rubber, Coffee, Agar

Source: <http://assamagribusiness.nic.in>

There has been a significant increase in area and production of horticultural crops in Assam during the last two decades. It is observed that although the area and production of fruit crops increased during the period of 2004-05 to 2011-12 by 19.12 per cent and 22.70 per cent respectively, the increase in productivity was almost negligible (4.40%). This might be attributed to existence of *bari* system, use of traditional low yielding varieties and lack of adoption of improved technology. In case of vegetables, the area increased only 16.17 per cent, production increased 20.76 per cent and productivity 5.54 per cent only during the period. In case of tuber crops, the increase in area, production and productivity was 6.67 per cent, 13.10 per cent and

**Table: 1.5**  
**Trend of Area, Production & Productivity of Horticultural Crops in Assam from 2004-05 to 2010-11**

(Area in lakh hectare, Production in lakh MT & Productivity in Kg. per hectare)

Sl. No.	Crop	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	CGR (%)	
1	Fruits	Area	1.10	1.13	1.14	1.16	1.22	1.27	1.32	1.37	19.12
		Production	13.25	13.52	13.72	14.08	14.95	15.65	16.47	17.63	22.70
		Productivity	12,045	12,005	12,139	12,142	12,256	12,370	12,480	12,600	4.40
2	Tubers	Area	0.84	0.80	0.88	0.85	0.87	0.93	0.95	0.90	6.67
		Production	6.30	3.93	5.46	5.57	5.82	6.39	6.99	7.25	13.10
		Productivity	7,500	4,930	6,166	6,553	6,690	6,871	7,327	8,015	6.43
3	Vegetables	Area	2.23	2.32	2.36	2.38	2.42	2.51	2.60	2.66	16.17
		Production	36.61	38.18	38.87	39.18	40.52	42.55	44.70	46.20	20.76
		Productivity	16,417	16,485	16,469	16,462	16,744	16,952	17,192	17,380	5.54
4	Spices	Area	0.83	0.86	0.86	0.88	0.90	0.94	0.97	0.98	15.31
		Production	2.06	2.12	2.14	2.18	2.24	2.35	2.45	2.48	16.94
		Productivity	2,482	2,475	2,476	2,478	2,490	2,505	2,530	2,535	2.09

Source: Department of Agriculture, Govt. of Assam

6.43 per cent respectively while, for spices, the increase was 15.31 per cent, 16.94 per cent and 2.09 per cent against area, production and productivity. The trend of area, production and productivity of some of the major horticultural crops of Assam are given in Table - 1.5. From the Table, it was seen that the compound growth rate (CGR) of area and production was highest against fruits followed by vegetables, spices and tuber crops. In case of productivity, calculated CGR was highest against tuber crops( 6.43 per cent) followed by vegetables (5.54 per cent), fruits( 4.40 per cent) and spices crops (2.09 per cent).

During the 11<sup>th</sup> five year plan period, maximum focus was laid on raising the productivity of various commercially important horticultural crops through extensive use of improved technology, management inputs and planting materials also together with the handling post harvest, setting up of collection centres with grading and transport facilities, marketing and processing, involvement of private sectors more particularly for contractual farming and buy back arrangement are also being considered as prime area of intervention. The Government of Assam has targeted to increase the area, production and productivity of different horticultural crops during the 12<sup>th</sup> plan period and is shown in Table-1.6

**Table-1.6**  
**Target of Area, Production & Productivity of Horticultural Crops**  
**during 12<sup>th</sup> Plan Period**

(Area in lakh hectare, Production in lakh MT & Productivity in Kg. per hectare)

Crop		2012-13	2013-14	2014-15	2015-16	2016-17
Fruits	Area	1.40	1.45	1.50	1.55	1.60
	Production	17.70	18.45	19.30	20.15	21.10
	Productivity	12,625	12,730	12,850	13,000	13,200
Spices	Area	1.05	1.10	1.15	1.20	1.25
	Production	2.70	2.85	3.00	3.20	3.40
	Productivity	2,570	2,600	2,630	2,665	2,700
Potato	Area	1.10	1.20	1.30	1.40	1.50
	Production	9.35	10.45	11.70	12.90	14.25
	Productivity	8,500	8,700	9,000	9,200	9,500
Vegetables	Area	2.85	2.90	3.00	3.05	3.10
	Production	50.05	51.30	53.45	54.70	56.00
	Productivity	17,560	17,690	17,810	17,940	18,060

Source: Department of Agriculture, Govt. of Assam

## 1.2. Importance of Horticultural crops

Diversification of agriculture is considered as an important strategy for agricultural development in India and importance of horticultural crops as a means of diversification and creation of additional employment opportunities in rural areas is well accepted. Besides, it also promotes development of agro-industries' with value addition. Although, the state of Assam has the potential for development of horticulture with its wide range of topographical and agro-climatic variations, the state



is yet to harness the potentiality. In a flood prone state like Assam where productivity of major crops like rice is not stable, increase in production of horticultural crops can minimize the impact of crop failure and provide monetary security to the farmers.

The horticultural crops have the potential to generate gainful employment, promote trade and commerce and earn foreign exchange besides fighting against malnutrition a common menace. Commercially grown crops usually are high value crops and certain special varieties of horticultural crops can be grown in marginal and degraded soils as well by identifying the suitable species/root stocks. Horticultural research and development in India was at very low ebb till the third five- year plan and received meager attention even thereafter. However, the plan investment in horticultural research and development increased significantly since the seventh five year plan.

It is needless to mention that fruits and vegetables are highly perishable and requires appropriate transport and storage facilities which is lacking in the north-eastern region. The farmers usually harvest these crops in regular intervals and sale the produce immediately after harvest. In the absence of adequate facilities for processing for value addition, the farmers compelled to sale their produce at lower price. Moreover, marketing has remained as a major problem of horticultural development in the State.

Saha <sup>2</sup> (1973) opined that horticulture has a bright prospect in the hill areas of the North-Eastern region. The soil and climate of this region provided an excellent scope for growing varieties of fruits such as orange, lemon, pineapple and banana on commercial basis.

The vast potential of horticultural crops needs to be exploited and emphasis should be laid on cultivation of high value and low volume crops. For this purpose, location specific agricultural technology, package of input mix, improvement of road communication, marketing, processing and cold storage facilities *etc.* are the basic requirements. In the present context of changing socio economic environment, the importance of horticultural crops has increased substantially as a result of reduced availability of per capita land for cultivation and farm labour, increased per capita income and consumption of processed fruits and vegetables.

Further, the average labour required for growing horticultural crops is about 450-2,500 mandays as compared to only 150 – 200 mandays for field crops in a year <sup>3</sup>.

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<sup>2</sup> Saha,N.(1973): “ The Economics of Shifting Cultivation in North- East India”p.49

<sup>3</sup> Government of India: “**Food Processing Industries in India**”, Ministry of Food Processing Industries, Govt. of India, New Delhi, 1993, p.1.

In the hill areas, horticultural crop is considered to be a viable alternative to *jhuming* practices. The research studies conducted in the region proved that returns from the horticultural crops are found to be quite encouraging as compared to *jhuming*. So, the horticultural sector has to be supported by sound marketing net work and needed infrastructure in the interest of the economy & ecology of the region.

At present, horticultural sector has established its credibility in improving land use, promoting crop diversification, generating employment and above all providing nutritional security to the people besides supplementing to their income. Apart from these, it also helps in maintaining the ecological balance and produces increased biomass per unit of area as well as increases the aesthetic value.

### **1. 3. Scope of the Study**

Horticulture is considered as the main axis of economic development in the hills. Horticultural sector can play a pivotal role in diversifying agriculture in terms of increasing production, productivity; providing food assortments, nutrition, income and employment. Despite impressive development in horticultural sector in recent years, there is a general feeling that data-base of horticultural crops is not comprehensive and reliable in the country. The situation is still worse in the case of NE region and Himalayan states (11 states). This poses a serious problem in understanding the real development of horticultural sector in these states. Besides, there is no systematic data on some of the major and minor horticultural crops in these states. To fill this gap, it is necessary to identify the methodology followed in collection of horticultural statistics, identify problems faced in data collection of horticultural crops by various agencies and take some remedial measures in order to make data on horticultural sector more scientific and factual. The present study makes an attempt in this very direction with a focus on NE and Himalayan states. The study intends to collect baseline data on area, production and yield for some selected villages from the state agencies responsible for collection of such data and then do the verification from the concerned households through primary survey to identify the discrepancies, if any. This will help to highlight the changes required at the policy level in the process of data collection of horticultural commodities and to improve the data collection process at various levels. This will help the policy makers in the Centre and States to chalk out effective programmes for further development of the sector.

#### 1. 4. Review of Literature

Baruah<sup>4</sup> (1986) in his research paper on horticultural crop cultivation in Assam pointed out that in the North-Eastern Region, there is vast scope for development of horticulture because of congenial climate, rainfall, soil variability, topography and altitude. Proper and scientific development of horticultural crops will greatly help in increasing the growth of the rural economy and in maintaining the nutritional security.

There are some very good varieties of fruit crops, which have got export potential to the neighbouring countries. For this, it is needed to stress more on research and development to get quality product. In order to harness commercial potential of horticultural crops, he emphasised that a strong growers' co-operative is needed for getting inputs and planting materials as supported by proper markets, proper storage and transport facilities and credit. Growers should be assisted right from planting to marketing and a co-ordinated effort of all concerned departments of the State government is essential for solving some of the vexed problems.

Bora<sup>5</sup> (1989) in his article on the East Himalayan region observed that there is sufficient development potential of horticulture in the hill regions of North-East India, particularly for fruit production and processing enterprises as the conditions are ideally suited for cultivation of pineapple, mandarin orange and other sub-tropical and temperate fruits. The region already produced some of the finest varieties of orange in the country. There are 24,000 hectares of land in the region under pineapple producing about 2.82 lakh tones and 30,000 hectares under citrus fruits with an average annual production of 1.38 lakh tonnes. Considering its potential, the development of fruit processing and preservation industry leaves much to be desired.

Sarkar<sup>6</sup> (1991) in his paper on the "Development in the North-East and Priority Area" examined the potentials and prospects of the development of agriculture, horticulture and allied activities in the North-Eastern Region. He observed that horticultural crop cultivation can be taken up at different elevations in the hilly region. The ICAR evolved and standardised certain agro techniques on scientific cultivation of agro-horticultural crops either as a single crop or in combination with other crops to derive maximum yield and economic benefits in place of *jhuming*.

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<sup>4</sup>Baruah, S.: "Horticultural Development in Assam", News Star, July 7, 1986.

<sup>5</sup> Bora, P.C.: "Focus of E. Himalayan Region", The Hindu Survey of Indian Agriculture, 1989, p.43

<sup>6</sup> Sarkar, A.N.: "Development in the North-East : Priority Area", Yojana, No.20, 1990

Goswami, Sarma and Choudhury<sup>7</sup> (1993) in their research paper opined that the potentialities for development of horticulture is very great in most of the hilly areas and this is more so in the North-Eastern hills where all kinds of horticultural crops can be grown as the region has been recognised as valuable gene pool for horticultural crop improvement. They however emphasised for the qualitative improvement of variety of horticultural crops followed by adoption of post harvest technology, storage, transportation and marketing.

Government of Karnataka<sup>8</sup>(1993) in the status paper on Agricultural Development Project analysed that one hectare area of horticultural crops can generate income to the tune of Rs. 20,000.00 annually while the corresponding figure for rice is less than Rs. 10,000.00 and a crop like ragi can hardly fetch Rs. 4,000.00 per hectare. So, due emphasis has been given on the development of horticultural crops in Karnataka.

G.L.Kaul<sup>9</sup> (1997) analysed the role of horticultural crops in crop diversification, human nutrition and industrial growth and in generating income and employment under Indian situation. His analysis is more valid today when Indian agriculture is getting more and more commercialized and competitive. These crops have been identified as most remunerative crops for replacing subsistence farming in the rainfed dry land, hills, arid and coastal agro- ecosystems. These crops are characterized by high productivity per unit area, much higher than the field crops. Their role in improving environment is an added advantage. The biomass available particularly from the tree crops is phenomenal which either gets recycled into the soil to add to its fertility, or is amenable to industrial use for value addition, thus further enhancing their economic viability

Manual of horticulture statistics<sup>10</sup>(2011) pointed out that in view of the commercial importance, it has become imperative to have proper planning for enhancing the productivity of horticultural crops. One of the basic requirements for proper planning for increasing the production of these crops in the country is the

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<sup>7</sup>Goswami, B.K. S.N. Sarma, and A.N Choudhuri.: "Agriculture in North-Eastern Region Potentialities, Problems and Strategies for Development", K. Alam (Ed.), "Agricultural Development in North-East India – Constraints and Prospects",

<sup>8</sup> Government of Karnataka : "Agricultural Development Project", Status Paper, 1993,p.9.

<sup>9</sup> Kaul,G.L.: "Horticulture in India–Production, Marketing and Processing", Indian Journal of Agricultural Economics,1997. p.562.

<sup>10</sup> Govt. of India, "Manual of horticulture statistics" Ministry of Statistics and Programme Implementation, Central Statistics Office, New Delhi, 2011, p.3

availability of reliable statistics about their area and production at various levels (Tehsil, District and State). No realistic targets for production of these crops can be fixed in the absence of reliable statistics about the area and yield rates. Even a proper evaluation of the various developmental programmes taken in this direction is not possible in the absence of reliable statistics. Though India has emerged as a major producer of horticultural crops and the share of horticulture in Gross Domestic Product (GDP) of Agriculture Sector has increased, yet the database in this regard is weak and lacks of authentic information. It is therefore, does not provide suitable support for strategies to its development.

P.K. Basu<sup>11</sup>(2012) opined that availability of relevant and reliable database on horticulture is important for analyzing the problems and prospects together with policy implications. As public investment in horticulture has increased manifold, it is necessary to ensure proper planning to facilitate systematic development of the horticulture sector in the country along with monitoring of the development policies. On the other hand, in view of globalization and integration of markets, it is important for producers and trading community to respond quickly to the changes in the demand - supply chain of horticulture commodities and make positioning of the products in the market at competitive prices. From this point of view timely availability of accurate and reliable database is of immense use of business operations.

A.K. Bhatia<sup>12</sup> (2010) opined that data is one of the most critical requirements in the modern information age to allow integrated planning and efficient management of resources. In fact, no meaningful analysis or intellectual exercise is possible without availability of proper data. Availability of reliable data is crucial for determining the status of horticultural development and suggesting ways to ensure availability of sufficient quantities of horticultural commodities and products in the market at affordable prices. Proper horticulture data is essential for estimating the growth, for carrying out analysis to assess the demand and supply trend, to identify problems and constraints, for evolving adaptive policies and exploring growth prospects. Similarly, detailed data is required in district/cluster/component wise, to monitor and evaluate the impact of various horticultural development schemes such as NHM and other Government sponsored schemes.

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<sup>11</sup> Basu, P.K.: "National Horticulture Database" Ministry of Agriculture, Govt. of India, 2012

<sup>12</sup> Bhatia A.K. : “ Horticulture Data - Current scenario and future thrust”2010, p.1

In fact, availability of reliable data can also prevent misdirection or misplacement of policy objectives and priorities. In other words, establishment of comprehensive horticulture database is a crucial requirement that would go a long way in ensuring effective planning and monitoring of the development policies to justify huge investment being made to promote horticultural production besides undertaking perspective planning to facilitate systematic development of horticulture sector in the country. Availability of proper data will also enable devising appropriate strategies to exploit huge export potential available in the horticulture sector.

### **1. 5 .Objectives of the Study**

The broad objectives of the study are

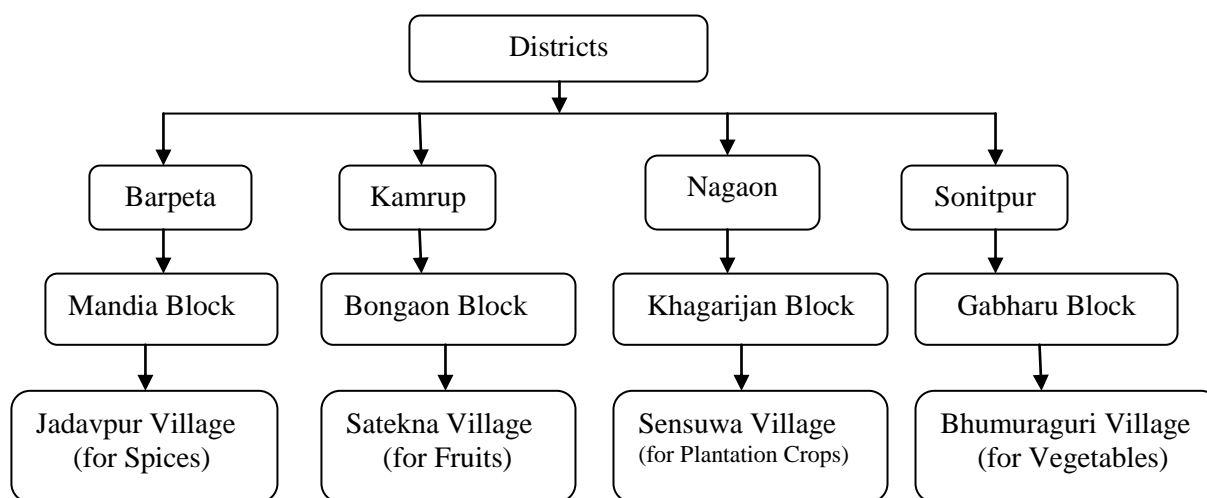
- To collect data on area, production and yield of horticultural crops and compare with the baseline data collected by the Department of Horticulture, Revenue Department and Directorate of Economics and Statistics.
- To identify the horticultural crops on which proper statistics is not being compiled at present among the selected states.
- To study the problems encountered by the grass-root officials while collecting the horticultural data.
- To identify the problems in estimation of horticultural crops and to suggest policy measures.

### **1. 6. Methodology and Data Source of the Study**

The study was confined to the state of Assam. Both secondary and primary data were collected to achieve the objectives specified above. A set of structured questionnaire was prepared to collect information related to area, production and yield of horticultural crops from the officials at district/block/ village level. The state agencies involved in collection of data on horticultural crops include Department of Horticulture/Agriculture and Directorate of Economics and Statistics, Government of Assam. Additional information was collected from the departmental officials on methodology adopted, verification process carried out in collection of horticultural data and problems encountered by them in compilation of horticultural statistics. Information on area, production and yield of horticultural crops/crop groups were collected from the concerned state agencies for the selected village(s) and household(s).

The following methodology was followed for the selection of village for complete enumeration. Based on the highest area under different crop groups (viz. fruits, vegetables, plantation crops, spices crops etc.), one district was related for fruits and another for vegetables. Based on the sample criteria, two more districts

**Chart-I : Flow Chart of Sample Design**



were selected considering the highest area under the next two crop groups, namely, spices and plantation crops. We had selected one district allocating highest area under fruits and one district allocating highest area under vegetables. Followed by this, two more districts were selected growing highest area under other horticultural categories e.g., spices and plantation crops. Thus, altogether four districts were selected for this study. From each selected district, one block was selected based on the highest area under the respective crop group categories. From each selected block, one village having highest area under that category was selected for complete enumeration. Thus, four villages from four blocks in four districts were selected for the primary survey.

Accordingly, Jadavpur village under Mandia block in Barpeta district was selected for spices, Satekona village under Bongaon block in Kamrup district for fruits, Sensowa village under Khagarijan block in Nagaon district for plantation crops and Bhumuraguri village under Gabharu block in Sonitpur district was selected for vegetable crops for complete enumeration. For this purpose, a household level schedule was prepared for the sample farmers.

During the primary survey, all the households of the sample villages were covered. The field survey provided the household area, production and yield of

horticultural crops grown in the village during the reference year together with village wise aggregate data. Thereafter, a verification exercise was carried out to match the household as well as village level data with the data provided by the state agencies.

The secondary data for the village/household level were collected from the state agencies. The reference year for the primary survey was 2010-11.

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## **Chapter-II**



## **Growth and Development of Horticultural Crops in the State**

Horticulture is considered as an important sector for agricultural development in India. It promotes agro-industries development and value addition as well. The government has already identified horticulture crops as a means of diversification for making agriculture more profitable through optimum utilization of natural resources (soil, water and environment) and creating employment for rural masses especially for women folk (GOI, 2002-03). The relative importance of horticultural crop is well established in human nutrition as source of foods. They are highly remunerative and are generally considered as high value crops with ample export potential.

### **2.1 Area, production and yield**

The horticulture sector includes a wide range of crops such as fruits, vegetables, roots and tuber crops, flowers, aromatic and medicinal plants, spices and plantation crops which facilitate diversification in agriculture. It has been recognized that growing horticultural crops is now an ideal option to improve livelihood security, attain food and nutritional security and to increase income through value addition. Over the years, there has been significant improvement in the production and productivity of various horticulture crops. In the recent years, there has been a significant change in the scenario of the state in terms of increasing in area, production and productivity in horticultural crops. This is due to the farmers in the state being more realised about the profitability of the oriented commercial horticulture and the appreciable efforts being made by the government in recent years.

Table- 2.1(a), 2.1(b), 2.1(c) and 2.1(d) shows the trend of area, production and productivity of different fruits, vegetables, spices and plantation crops during the periods from 2001-02 to 2010-11.

Table -2.1(a) highlighted that area and production of all the major fruit crops available in the state were increased during the period of 2001-02 to 2010-11. The productivity of most of the fruit crops was also increased during the period except slight decrease in case of banana, orange and jack fruit. The highest percentage of area increased during the period was orange (60.34 %), followed by jack fruit (22.73%), mango (20%), litchi (20%), guava (20%), banana (8.46%), papaya (2.58%) and pineapple (2.14%). In case of production also highest percentage increase was found in orange cultivation (56.33 %), followed by litchi (53.66 %), guava (39.18%),

mango (38.30 %), papaya (23.82 %), jackfruit (20.90 %), and pineapple (2.16%). Regarding yield rate, highest percentage increase was noticed in litchi (42.07 %) and in orange cultivation, negative growth (-10.11%) was noticed which may be due to unfavourable weather condition.

**Table- 2.1(a)**  
**Area, Production and Productivity of Fruits in Assam**  
**during 2001-02 to 2010-11**

(Area in '000 ha., Production in '000 tonne, Productivity in kg/ha)

Crops		Years										% Change
		2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	
Banana	A	43.60	42.63	43.00	42.00	42.00	43.00	43.10	45.58	44.98	47.63	8.46
	P	606.19	589.60	595.00	581.00	578.00	599.00	606.75	629.05	621.75	653.50	7.24
	Y	13,903	13,831	13,837	13,833	13,762	13,930	14,078	13,801	13,823	13,720	-1.33
Papaya	A	7.18	6.94	7.00	7.00	6.00	7.00	6.14	6.03	7.10	7.37	2.58
	P	105.50	101.53	104.00	99.00	90.00	105.00	93.36	91.53	122.44	138.48	23.82
	Y	14,694	14,630	14,857	14,143	15,000	15,000	15,205	15,179	17,245	18,790	21.80
Pineapple	A	13.71	13.89	14.00	13.00	11.00	12.00	12.83	12.66	13.59	14.01	2.14
	P	210.25	212.56	221.00	199.00	161.00	192.00	199.14	194.57	210.24	214.90	2.16
	Y	15,336	15,303	15,786	15,308	14,636	16,000	15,521	15,369	15,470	15,339	0.02
Orange	A	5.87	5.96	8.00	7.00	7.00	8.00	7.17	9.73	12.84	14.80	60.34
	P	67.98	66.87	83.00	82.00	74.00	88.00	79.50	107.71	135.87	155.66	56.33
	Y	11,581	11,220	10,375	11,714	10,571	11,000	11,088	11,070	10,582	10,518	-10.11
Guava	A	4.00	4.00	4.00	4.05	4.26	4.31	4.35	4.42	5.00	5.00	20.00
	P	59.00	50.00	63.00	67.93	78.65	77.67	78.86	80.86	88.00	97.00	39.18
	Y	14,750	12,500	15,750	16,773	18,462	18,021	18,129	18,294	17,600	19,400	23.97
Litchi	A	4.00	4.00	4.20	4.28	4.39	4.74	4.80	4.88	5.20	5.00	20.20
	P	19.00	19.00	20.00	20.78	34.89	33.34	34.64	36.33	39.20	41.00	53.66
	Y	4,750	4,750	4,762	4,855	7,948	7,034	7,217	7,445	7,538	8,200	42.07
Jack Fruit	A	17.00	17.00	18.00	18.02	21.34	21.40	21.62	21.75	22.00	22.00	22.73
	P	159.00	156.00	170.00	174.57	199.70	157.22	159.57	167.80	178.00	201.00	20.90
	Y	9,353	9,176	9,444	9,688	9,358	7,347	7,381	7,715	8,091	9,136	-2.38
Mango	A	4.00	4.00	4.00	3.84	4.40	4.45	4.50	4.60	4.60	5.00	20.00
	P	29.00	29.00	30.00	31.26	48.15	38.85	42.12	43.52	46.50	47.00	38.30
	Y	7,250	7,250	7,500	8,141	10,943	8,730	9,360	9,461	10,109	9,400	22.87

Source: Directorate of Economics & Statistics, Govt. of India

Table- 2.1(b) presents the area, production and productivity of major vegetable crops grown in the state. Table shows that area and production of potato, tapioca, *kharif* and *rabi* vegetables were increased during the last 10 years while it was decreased in case of sweet potato and onion.

From the Table, it was found that the growth of area, production and yield was highest in *rabi* and *kharif* vegetables and highest while negative growth was seen in sweet potato cultivation. The area and production of vegetables are increasing in recent years due to the initiatives taken by the Government and State Agriculture Department by providing various financial and technical support to the farmers. But the area under sweet potato decreased may be due to lack of commercial importance and market value.

**Table- 2.1(b)**  
**Area, Production and Productivity of Vegetables in Assam**

### During 2001-02 to 2010-11

(Area in '000 ha., Production in '000 tonne, Productivity in kg/ha)

Crops		Years									
		2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Potato	A	80.06	80.00	78.00	73.00	70.00	78.00	75.20	78.32	82.63	85.02
	P	620.57	621	543	589.00	354.00	505.00	520.83	515.74	600.15	657.63
	Y	7,751	7,763	6,962	8,068	5,057	6,474	6,926	6,585	7,263	7,735
S. Potato	A	8.34	8.00	8.00	8.00	7.00	8.00	6.92	6.34	6.81	6.19
	P	28.86	29.00	28.00	28.00	26.00	28.00	24.30	22.34	23.97	21.38
	Y	3,460	3,625	3,500	3,500	3,714	3,500	3,512	3,524	3,520	3,454
Tapioca	A	2.90	3.00	3.00	2.72	2.78	2.67	2.61	3.05	3.00	4.18
	P	13.71	14.00	14.00	13.06	13.26	12.60	12.21	14.40	14.00	19.92
	Y	4,728	4,667	4,667	4,801	4,770	4,719	4,678	4,721	4,667	4,766
Onion	A	7.48	8.00	7.00	7.00	8.00	7.00	6.70	6.96	6.79	6.91
	P	17.45	17.00	17.00	17.00	18.00	17.00	16.32	16.82	15.81	15.41
	Y	2,333	2,125	2,429	2,429	2,250	2,429	2,436	2,417	2,328	2,230
K. Vegetables	A	67.25	67.00	67.14	68.55	72.20	76.31	78.33	79.13	77.00	79.00
	P	699.00	703.00	922.00	1062.53	1119.29	1182.96	1287.2	1320.02	1225	1287.00
	Y	10,394	10,493	13,732	15,500	15,503	15,502	16,433	16,682	15,909	16,291
R. Vegetables	A	143.00	142.69	143.02	153.69	159.42	159.72	159.92	160.72	174.00	181.00
	P	2138.00	2142.00	2360.00	2598.10	2698.96	2704.13	2707.8	2799.85	3030.00	3183.00
	Y	14,951	15,012	16,501	16,905	16,930	16,930	16,932	17,421	17,414	17,586

Source: Directorate of Economics & Statistics, Govt. of India

The area, production and yield of different spice crops are presented in Table- 2.1(c). Here also, the area and production of spices has shown an increasing trend except in the case of ginger.

**Table- 2.1(c)**  
**Area, Production and Productivity of Spice Crops in Assam**  
**During 2001-02 to 2010-11**

(Area in 000'ha., Production in 000' tonne, Productivity in kg/ha)

Crops		Years									
		2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Turmeric	A	11.81	12.00	12.00	12.00	12.00	12.00	12.53	14.46	13.88	14.97
	P	8.16	8.00	8.00	8.00	9.00	9.00	8.63	10.50	9.72	10.62
	Y	691	667	667	667	750	750	689	726	700	709
Ginger	A	17.87	17.97	17.98	18.18	18.56	18.86	15.62	15.21	15.69	16.39
	P	114.41	115.23	115.55	123.99	126.80	128.82	107.08	103.92	107.89	112.55
	Y	6,402	6,412	6,427	6,820	6,832	6,830	6,855	6,832	6,876	6,867
Black pepper	A	3.00	3.10	3.12	2.95	3.15	3.21	2.82	3.39	2.97	3.04
	P	4.00	4.50	4.30	4.42	4.77	4.87	4.21	5.15	4.40	4.59
	Y	1,333	1,452	1,378	1,498	1,514	1,517	1,493	1,519	1,481	1,510
Chilly	A	14.73	15.00	15.00	14.00	15.00	15.00	16.10	17.01	17.11	18.81
	P	9.65	10.00	10.00	9.00	9.00	10.00	10.13	10.86	11.73	12.24
	Y	655	667	667	643	600	667	629	638	686	651
Garlic	A	6.60	6.69	6.70	6.71	7.03	7.10	8.10	8.23	8.23	9.00
	P	20.98	21.97	22.00	22.18	23.30	23.51	42.85	47.08	42.25	33.00
	Y	3,179	3,284	3,284	3,306	3,314	3,311	5,290	5,721	5,134	3,667

Source: Directorate of economics & Statistics, Govt. of India

Table 2.1(d) shows the area, production and productivity of plantation crops during the period of 2001-02 to 2010-11. From the Table it was found that area under both the crops were declined during the period, but production and yield rates showed an increasing trend. The estimated growth of production under coconut and arecanut was 27.40 percent and 0.44 per cent respectively while in case of yield rate, the growth was 29.23 percent and 6.24 percent during the above mentioned period. The area under coconut declining due to low production and old age and arecanut area was declined due to establishment of small tea gardens.

**Table 2.1(d)**  
**Area, Production and Productivity of Plantation Crops in Assam**

**during 2001-02 to 2010-11**

(Area in '000ha., Production in '000 tonne, Productivity in kg/ha)

Crops	Years											
	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	% Change	
Areca nut	A	73.24	73.67	74.00	71.00	71.00	69.00	69.10	66.24	66.07	68.95	-6.22
	P	68.26	51.63	52.00	67.00	65.00	55.00	55.04	56.66	63.9	68.56	0.44
	Y	932	701	703	944	915	797	797	855	967	994	6.24
Coconut	A	20.91	20.92	21.31	19.00	19.00	19.00	18.60	18.02	19.14	20.37	-2.46
	P	135.10	160.28	154.28	205.00	153.00	136.00	135.70	147.08	147.08	185.96	27.40
	Y	6,461	7,662	7,240	10,789	8,053	7,158	7,296	8,162	7,684	9,129	29.23

Source: Directorate of Economics & Statistics, Govt. of India

## 2.2 Infrastructural facilities available for horticulture crops

Sound infrastructure with easy access to key utilities like road connectivity, quality power supply, land availability, sound marketing system, cold storage facilities etc. are very much necessary for the development of horticulture sector in Assam. Efficient marketing of agriculture and horticulture crops continues to be a major hurdle for farmers and, given the inaccessibility and logistical problems of many of the States, is an impediment to the farmer getting an attractive price. Setting-up of cold storage, rural godown/ collection centres near the production yard or at central locations is very much essential to overcome these obstacles and enhance production as well as transform farmers into price makers rather than price takers.

The infrastructure facilities available for horticultural crops in the State are presents in Table - 2.2 and Table - 2.3

**Table – 2.2  
Cold Storage Facilities in Assam**

District	Number	Capacity (MT)	Sector	Commodity
Barpeta	1	3,000	Co-operative	Multiple
N.Cachar	2	10,000	Private	Potato, Apple, Grapes, Mousumi
Dhubri	3	2,120	Public (2), Private (1)	Multiple
Golaghat	1	3,600	Private	Potato, Cabbage & Carrot
Kamrup	12	21,956	Private	Potato ,Chilly
Nalbari	1	4,000	Co-operative	Multiple
Tinsukia	2	9,200	Private	Potato & Apple
Hailakandi	2	10,000	Private	Potato
Sonitpur	1	4,000	Private	Potato, Chilli & Apple
Karimganj	2	7,400	Co-operative(1),Private (1)	Potato, Apple & Pear
Nagaon	3	11,500	Private (2) Co-operative(1)	Multiple
Assam	30	86,776	Co-operative (4)Private (24) Public (2)	

Source: Assam Small Farmers' Agri business Consortium, 2009

**Table – 2.3  
Godowns constructed for agricultural and horticultural crops under Rural**

## Godown Scheme of Govt. of India

Name of the RMC	Location	Capacity (MT)
Dhubri	Dharamsala	500
	Bogoribari	500
	Kathalipara	500
	Hatsingimari	1000
	Kaldoba	500
Goalpara	Krishnai	500
	Jaleswar	500
Boharihat	Mandia	500
Nalbari	Rampur (Kaplabari)	500
Guwahati Sub-Div.	Maloibari	1000
	Singimari (Pacharia)	1000
	Nagarbera	1000
Jorhat	Madhopur	1000
	Dohotia	1000
	Jengrai (Majuli)	500
	Chenijan	1000
Golaghat	Naojan	500
	Gomariguri	500
Lanka	Kharikhana	500
Tinsukia	Tingrai	500
Darrang	Kharupetia	500
Rangia Sub-Div.	Athgaon	500

Source: Assam Small Farmers' Agri business Consortium, 2009

Beside the above mentioned infrastructural amenities, the State government established 6 nos. of fruit processing units of Pineapple and Orange with support from the Ministry of Food Processing Industry (MFPI) and one more unit is in the pipeline.

Moreover, to fulfill the need for creation of integrated and holistic infrastructure for food processing sector, Ministry of Food Processing Industries (MOFPI) had launched some new schemes in 11th Five Year Plan with strong focus on creation of modern infrastructure to facilitate growth of food processing and creation of an integrated cold chain mechanism for handling perishable horticultural produce. Under the initiatives of MOFPI for strengthening infrastructure in agro and food processing sector, it had launched the Mega Food Parks Scheme, Scheme for Cold Chain, Value Addition and Preservation Infrastructure in the 11th Five Year Plan. The Government of India has sanctioned a food processing park with a total project cost of Rs. 5.95 crores. The park is being set up near Chaygaon in the district of Kamrup (rural) and the implementing agency for the food processing is Assam Small Industries Development Corporation Ltd.

### **2. 3 Schemes for the development of Horticulture**

Investment in horticulture sector in different plan periods have resulted in increase of horticultural produce in the rural and urban areas. India continues to maintain a prime position in the production of various horticultural crops like mango, banana, acid lime coconut, areca nut, cashew, ginger, turmeric and black pepper. In recent years, India has put enough thrust for development of horticultural sector as a whole in order to exploit the country's vast potential and to generate the much needed value addition and accordingly, the Central as well as State Governments are making sincere efforts to boost the horticultural crop production by increasing allocation of funds since sixth five year plan.

The Assam State Agriculture Department has prioritized optimum and efficient use of available resources to enhanced the production and productivity of crops including horticultural crops by harnessing the best in frontier technologies. The Department has formulated a large number of District/State specific plan depending on the agro-climatic condition, growth potential and specific requirement of the districts through improved farm mechanization, assured irrigation, use of quality seeds of HYV, integrated nutrient and pest management, use of bio-fertiliser and bio-pesticides and organic farming etc.

Some of the important horticultural developmental schemes under State plan, Centrally sponsored and North-Eastern Council programme are furnished here in under.

### **2.3.1 State Plan**

#### **1. Up gradation and Development of Infrastructure of Horticulture Administration**

For strengthening the horticulture administration and development, Up gradation and Development of Infrastructure of Horticulture Administration programme was introduced and Rs.700.00 lakh was approved in eleventh five year plan.

#### **2. Strengthening of Horticulture Information Services**

The main objective of the scheme is effective refinement & transmission of adopted horticulture technologies in the state. During 11<sup>th</sup> five year plan, a sum of Rs. 2.00 lakhs was approved.

#### **3. Multiplication of Foundation Seed at Regional Potato Farm, Mao**

This is a continuing scheme for multiplication of Foundation Potato Seed (F-I, F-II, F-III) and Breeder Seeds from Index tuber as specified by the C.P.R.I.,

Shimla and production of Certified Potato Seed. During 11<sup>th</sup> five year plan, a sum of Rs. 500.00 lakhs was earmarked.

#### **4. Cashew nut Development**

This is a continuing scheme for multiplication of Cashew nut plant scions brought from the National Research Centre for Cashew nut. During 11<sup>th</sup> plan Rs. 100 lakh was approved for the development of Cashew nut development.

#### **5. Development of Progeny Orchards**

It is a state sector scheme for production of various identified elite planting materials. The government approved financial outlay of Rs. 400 lakh during 11<sup>th</sup> five year plan for the development of Progeny Orchards.

#### **6. Development of Fruit Preservation Factory**

This is a revenue earning scheme under Manufacturing License No. FPO – 1443 for production of orange, lemon, pineapple squash/juice and other finished products like pineapple cubes and ginger lime etc. Under this programme, Rs. 100 lakh was approved in eleventh plan as against Rs. 300 lakh fixed during the tenth plan.

#### **7. Development of Floriculture**

It is a state sector scheme for the development of horticulture to meet the need based floral items of the State Govt. functions and beautification programmes as and when required. During the 11<sup>th</sup> plan, a sum of Rs.100.00 lakhs was earmarked for the enhancement of floriculture sector.

#### **8. Mushroom Development**

The main objective of the scheme was proper management of skilled manpower and natural waste resources for maximum production of Mushroom by enhancement of small scale intensive units. During the 11<sup>th</sup> plan, a sum of Rs. 50.00 lakhs was earmarked.

#### **9. Coconut Development Scheme**

The objective of the Coconut Development Scheme is to enhance the production and supply of good quality planting materials through (i) **Establishment of 7 Demonstration cum Seed Production (DSP) Farms** in different parts of the state in a total area of 240 ha with the aim to produce quality seed nuts. These farms are the demonstration centres for scientific coconut cultivation and processing, (ii) **Setting up of coconut nurseries attached to the DSP farms** to produce quality seedlings of desired cultivars/varieties suitable for each locality. Raised seedlings are distributed to farmers at reasonable price, (iii) **Aids to registered/ private/**

**approved coconut nurseries.** The financial assistance is limited to 25% of the cost of production or Rs.2 lakhs whichever is less. The minimum financial assistance of Rs.50,000 is granted for producing 6,250 seedlings annually and maximum financial assistance of Rs.2 lakhs for producing 25,000 seedlings from one acre (iv) **Establishment of Regional coconut nursery** for supplementing the nursery programmes of the State Government. The maximum financial assistance for setting up of regional coconut nursery in non traditional areas is 50% of the cost of production, (v) **Aid to establish nuclear seed garden** to private sector / registered / cooperative societies/ farmers' associations. Maximum financial assistance is limited to Rs.6 lakhs to establish seed garden phased over a period of 3 years @ Rs.3 lakhs during the 1st year and Rs.1.50 lakhs each in second and third year. The quantum of financial assistance is based on the total area of seed garden (maximum 4 ha) or limited to 25% of the cost of establishment of the nuclear seed garden.

### **2.3.2 Centrally Sponsored Scheme:**

#### **2.3.2.1 Technology Mission for Integrated Development of Horticulture**

##### **(TM-IDH) in N.E./States**

Considering the potential of horticulture the Government of India introduced TM-IDH in North Eastern Region including Sikkim in the year 2001-02 with an outlay of Rs. 229.38 crore (Ninth Five Year Plan). The following are the objectives of the Mission:

- (i) To establish convergence and synergy among numerous ongoing Governmental programmes in the field of horticulture development to achieve horizontal and vertical integration of these programmes.
- (ii) To ensure adequate, appropriate, timely and concurrent attention to all the links in the production, post harvest and consumption chain.
- (iii) To maximize economic, ecological and social benefits from the existing investment and infrastructure created for horticulture.
- (iv) To promote ecologically sustainable intensification, economically desirable diversification and skilled employment.
- (v) To generate value addition, promote the development and dissemination of eco technologies based on the blending of the traditional wisdom and technology with frontiers knowledge such as bio-technology, information technology and space technology; and to provide the mission links in ongoing horticulture development projects.



TM-IDH is being implemented through four Mini Missions. These four components are:

1. **Mini Mission Model –I:** Research is coordinated and implemented by the Indian Council of Agricultural Research (ICAR), N.E. Region /Assam Agricultural University.
2. **Mini Mission Mode-II:** Production and productivity improvement activities are coordinated by the Department of Agriculture & Co-operation, GOI and implemented by the Agriculture/Horticulture Department of the States.
3. **Mini Mission Mode-III:** Post harvest management, marketing and export are coordinated by National Horticulture Board.
4. **Mini Mission Mode -IV:** Processing is coordinated and implemented by the Ministry of Food Processing Industries.

Some other Centrally Sponsored Schemes of horticulture development are:

#### **2.3.2.2 National Mission on Medicinal Plants**

To create appropriate financial incentives, infrastructural and marketing support in a synergic manner, the government of India has initiated this centrally sponsored scheme from the year 2009-10 .The Scheme has been approved with a total outlay of Rs. 630 crores for implementation during the 11th Plan. During the 12th Plan, the State Government's contribution is proposed to be suitably enhanced, based on the mid-term review of the scheme. Support cultivation of medicinal plants which is the key to integrity, quality, efficacy and safety of the AYUSH systems of medicines by integrating medicinal plants in the farming systems, offer an option of crop diversification and enhance incomes of farmers.

The objectives of the scheme are :

1. Cultivation following the Good Agricultural and Collection Practices (GACPs) to promote standardization and quality assurance and thereby enhance acceptability of the AYUSH systems globally and increase exports of value added items like herbal extracts, phyto-chemicals, dietary supplements, cosmeceuticals and AYUSH products.
2. Support setting up processing zones/clusters through convergence of cultivation, warehousing, value addition and marketing and development of infrastructure for entrepreneurs to set up units in such zones/clusters.

3. Implement and support certification mechanism for quality standards, Good Agriculture Practices (GAP), Good Collection Practices (GCP), and Good Storage Practices (GSP).
4. Adopt a Mission mode approach and promote partnership, convergence and synergy among stake holders involved in R&D, processing and marketing in the public as well as private sector at national, regional, state and sub state level.

### **2.3.2.3 Human Resource Development in Horticulture**

It is a centrally sponsored scheme started in the year 1999-2000. The main objectives of the scheme are to promote rapid growth of horticulture by bridging the gap of knowledge and skill both managerial and technical by training people to become entrepreneurs, or self-employed in the horticulture sector and to create skills for employability in the horticulture units/farms and upgrade the knowledge of departmental staff in the field of horticulture. Under this scheme the training institutes offering training courses for supervisors are given assistance @ Rs.18.00 lakhs for renovation of class rooms and hostel rooms, operational cost besides stipend @ Rs.1000/- per month for the trainees. For training institutes offering training programme to gardeners, the assistance is limited to Rs.14.00 lakhs. Assistance is provided to the State Governments for meeting the TA/DA and training fee for specialised training of departmental staff on horticulture related subjects.

### **2.3.2.4 The National Horticulture Mission (NHM)**

The NHM scheme was launched during the Tenth plan for holistic development of the horticulture sector, duly ensuring forward and backward linkages by adopting a cluster approach with the active participation of all the stake holders. At present, 372 districts in 18 states and 3 UTs have been covered under the NHM. The supply of quality planting materials through establishment of nurseries and tissue culture units, production and productivity improvement programmes through area expansion and rejuvenation, technology promotion ,technical dissemination , human resource development, creation of infrastructure for post harvest management and marketing in consonance with the comparative advantages of each state/ region and their diverse agro-climatic conditions are the major programmes of the mission. A major initiative has been taken during 2011-12 for enhancing the supply of good quality vegetables to metro cities under the vegetable initiative in urban clusters.

### **2.3.2.5 Integrated Programmes For Development of Horticulture In Tribal/ Hilly Areas**

The main objectives of the scheme are ,(i) Production of quality planting material of improved cultivars, (ii) new planting with seed /planting material of improved high yielding varieties,(iii) improving productivity through adoption of improved cultivation technology, plant protection chemicals, nutrient and water management, (iv) transfer of technology through farmers participatory demonstrations, training/ visits of farmers, publicity through media support, extension literatures etc., (v) creation of on-farm and post harvest infrastructure such as, collection centre, packaging, transport, storage and marketing. The project components include techno-economic feasibility study on production programmes, technology dissemination, irrigation, horticulture mechanisation, and farm handling.

### **2.3.2.6 National Horticulture Board Schemes**

The main objectives of the schemes under National Horticulture Board (NHB) are to develop high quality horticulture farms in identified belts and make such areas vibrant with horticultural activity which in turn will act as hubs for developing commercial horticulture, develop post-harvest management infrastructure, strengthen market information system and horticulture database, assist R & D programmes to develop products suited for specific varieties with improved methods and horticulture technology, provide training and education to farmers and processing industry personnel on agronomic practices and new technologies, promote consumption of fruits / vegetables in fresh and processed form.

The schemes implemented through NHB include: development of commercial horticulture through production and post-harvest management, capital investment subsidy scheme for construction/expansion/modernization of cold storages for horticulture produce , technology development and transfer, establishment of nutritional gardens in rural areas, market information service for horticulture crops , horticulture promotion service.

### **2.3.2.7 Development of Commercial Horticulture through Production and Post-Harvest Management**

It is a production and processing related programme. The major components of the programme are high quality commercial horticultural crops, indigenous crops/produce, herbs, aromatic & medicinal plants ,seed & nursery, biotechnology, tissue culture, bio-pesticides, primary processing of products , pre-

cooling unit/cool stores, processing unit/ radiation unit/VHT unit etc. The pattern of assistance under the scheme is back-ended capital subsidy not exceeding 20% of the project cost with a maximum limit of Rs 25 lakh per project. For the North-Eastern/ Tribal/Hilly Areas, maximum limit of subsidy would be Rs 30.00 lakh per project. The subsidy to be released to the leading participating financial institution on completion of project as in the case of cold storage projects approved by the Government. For projects in the cooperative sector funded by National Cooperative Development Cooperation (NCDC), the subsidy is granted through NCDC.

### **2.3.3 North Eastern Council Programme**

#### **2.3.3.1 Establishment of Breeder Seed Potato Farm at Regional Potato Farm, Mao (Senapati District)**

Out of 22,367 sq km area of the State 9/10th of the area comprises hilly terrain where there is great potentiality for Potato cultivation. It is estimated that total Potato cultivation area is about 5,000 ha. and there is still scope to increase in potato cultivation but our limitation is inability to supply certified seed to farmers.

The present production level of Potato Breeder Seed in the country in hills during Kharif is very low. The scheme aims at production of breeder seed potato not only on to meet the demand of the States of the N.E.Region but also for the states like West Bengal and Bihar.

The project is located in the Southern side of Regional Potato Farm (Senapati Dist. about 7 km. away from National Highway No. 29 along with the Mao Willong Road at a distance about 117 Km. from Imphal.

#### **2.3.3.2 Marketing Support to Agri- Horticultural produces in the North Eastern Region**

The objective of the scheme is to develop a suitable marketing mechanism and development of infrastructure so that farmers of the region may become equal partners in the process of development. The system so developed should ensure that the producers get remunerative prices for their produces and that would act as an incentive for higher production.

In brief, under the scheme, financial support is being provided for the following activities :

- (i) To create storage / cold storage facilities for Agri horticultural produce.

- (ii) To provide air conditioned transport equipment (small tonnage vehicles) for carrying of agricultural produce for long distances and also for collection from villages to first terminal markets.
- (iii) To provide support to conduct of specific project related studies.
- (iv) To provide financial assistance for establishing of processing facilities of Agri horticulture produce.
- (v) To provide assistance for purchase of packaging material/ installation of packaging equipments.
- (vi) To provide assistance for adoption of improved seed/ plants variety.
- (vii) To provide assistance in construction of market sheds in the villages or appropriate places for marketing of produces near the production points.

The scheme helps to exploit the high potential of high value low volume production of a variety of crops which have a national and international market demand such as strawberry, turmeric, flowers, ginger, cardamom, passion fruits, walnut etc. These crops were taken up during the Tenth Five Year Plan in compact areas with a view to replicate them to other part of the region during the Eleventh Five Year Plan.

#### **2.4 The impressive achievements in floriculture sector through HMNEH in**

##### **Assam**

Floriculture in Assam till the other day was considered as a traditional activity. The ongoing programmes on horticulture successfully infused the commercial concept amongst the enthusiastic farmers' groups, SHGs, more particularly women SHGs. Earlier it was confined to marigold, gladioli, tuberose and gerbera only. During last two years, two more new crops were introduced under greenhouse condition. These crops were dendrobium and anthurium. The commercial cultivation of dendrobium and anthurium has been taken up mainly in Jorhat, Nagaon, Morigaon, Kokrajhar, Kamrup districts of Assam. The flowers are grown by the farmers under buyback arrangement. The 'Mainow Orchid Growers Society' in Kokrajhar district is the first orchid project in the State. The project site has become a centre of attraction of all sections of the society and is being praised by one and all. The society could earn Rs. 1.20 lakh in just 10 months by selling cut flowers only. This project is being expanded further with involvement of more and more groups. Another SHG in Kamrup district earned Rs. 0.24 lakh during June, 2008 from

anthurium alone. So far, 31 orchid projects covering approximately an area of 20,000 sqm and as anthurium projects covering approximately an area of 24,000 sqm. are there under greenhouse condition since 2005-06. Moreover, commercial hybrid variety of gerbera, tuberose and bird of paradise were also taken up in Kamrup district covering an area of around 200 ha. during 2008-09 and 2009-10.

## 2.5 Plan Investment in Horticulture

Considerable thrust has been given to horticulture sector during the planning periods in the state. As growing of horticultural crop is economically rewarding, this sector is expected to grow and contribute to food and nutrition to the society. In view of increasing potential for rapid growth and economic return, various development programmes have been undertaken for the development of horticulture sector in commercial line and plan investment for horticulture development increased significantly from the Fifth Five Year Plan onwards and resulted in considerable strengthening of the horticultural development programmes in the state. Table - 2.4 presents the investment in different plan periods for the development of horticulture sector in Assam.

**Table – 2.4**  
**Plan Investment on Horticulture in Assam during Fifth five year plan to Eleventh five year plan**

(Rs. In lakh)

Plan	Year	Approved outlay	P.C. to total Crop Husbandry
Fifth Plan	1974-79	150	4.63
Sixth Plan	1980-85	250	1.50
Seventh Plan	1985-90	472	2.62
Eight Plan	1992-97	560	2.48
Ninth Plan	1997-02	800	1.65
Tenth Plan	2002-07	193.49	0.53
Eleventh Plan	2007-12	2,101	1.70

Sources: Planning and Development Department, Govt. of Assam

Table shows that approved outlay of expenditure on horticulture increased in each five year plan. Starting with a meager financial allocation of Rs. 150 lakh for horticulture development in fifth plan, the plan allocation rose to Rs. 2,101 lakh in eleventh plan which was nearly fourteen times more than the allocation of the fifth Plan. The allocation for horticulture increased many folds during the period with the launching of various horticultural development schemes such as Technology Mission for Integrated Development of Horticulture, National Horticulture Mission, Micro irrigation Programme, National Bamboo Mission etc.

## **2.6 Problems and Prospects of Horticultural Crops**

Although, the state of Assam has the potential for development of horticulture with its wide range of topographical and agro-climatic variations, the state is yet to harness the potentiality. In a flood prone state like Assam where productivity of major crops like rice is not stable, increase in production of horticultural crops can minimize the impact of crop failure and provide monetary security to the farmers.

### **2.6.1 Major Problems of Horticultural Crops**

Though the state of Assam has high potential for the development of horticultural crops, it is yet to become a commercial venture. Factors hindering the horticultural development in the state are as follows:

#### **2.6.1.1 Poor cultivation practices and low yield**

General neglect and non-adoption of scientific cultivation practices are the major constraints for poor return from most of the horticultural crops in the state. Despite conducive environment, the productivity and growth of all horticultural crops are lower than the all India average.

#### **2.6.1.2 Lack of desirable planting material**

The disease free, true to type genuine planting material is absolutely lacking in case of a number of horticultural crops. It is imperative to generate disease free & healthy planting materials & screening of planting materials before its distribution is of utmost importance.

#### **2.6.1.3 Lack of marketing facilities**

Due to lack of organized marketing structure the farmers are getting low return as compared to their counterparts in other states of India, whereas the middlemen amass a large chunk of profit at their expenses. For almost all the commodities including specialized products like citronella oil, the producers face considerable marketing problems. Due to perishable nature of the products and absence of adequate market support, the farmers sell their produce at a throw away prices to the middleman without even getting the opportunity to display them. Transportation and storage is perhaps the most serious constraints in the horticultural development of this region.

#### **2.6.1.4 Scarcity of trained manpower and extension support**

Dearth of trained manpower and inadequate extension support can be considered another set of pressing problem in the way of horticultural development in

this part of the country. In the states like Punjab, Himachal Pradesh, Haryana, *etc.*, where the extension services are reported to be very efficient, their pace of progress is also seen to be quite impressive.

#### **2.6.1.5 Long Gestation Period**

Since horticultural crops more specially, plantation crops have long gestation period and initial cost of establishment of orchard or plantation is high, it becomes almost impossible for the marginal farmers to go for such ventures without long-term credits from financial institutions. Nationalized banks, do not find it a favourable investment and are not sure about the recovery of loans because the existing land tenure system particularly in the tribal belts, does not permit land mortgages in favour of lending banks. Apart from these, the farmers are not tuned to the idea of considering agriculture as a business proposition and are not accustomed kitty- gritty of the bank loans. Thus, until and unless the system is changed, the much-needed financial investment will not be forthcoming.

#### **2.6.1.6 Problems of processing**

For a state like Assam, the success of fruits and vegetable growing is closely linked with the availability of processing facilities. The processing industry can help to a certain extent in sorting out the problem of proper disposal of perishable commodities. Till today, there are a few number of cold storage facilities available; few processing units exist but are not functioning up to the desired capacity. Use of appropriate pre and post harvest practices for horticultural crops is vital for the success of the crops and also to garner good returns. Unfortunately, this is one of the weakest areas in the entire region.

#### **2.6.1.7 Inadequate Investment on Research**

Investments on research in horticulture have always remained low when compared to the large number of crops it covers. As a result, many more financial issues remain unexplained for years together. There is an urgent need to increase the level of investment on research front.

#### **2.6.1.8 Absence of adequate insurance coverage**

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



Few major bottlenecks of horticultural development are as follows: -

- i. Inadequate thrust on conservation and exploitation of horticultural germplasm.
- ii. Lack of funds and financial support from Government for purchase of quality seeds/planting materials & other inputs.
- iii. High rainfall, soil erosion and high rate of leaching of nutrients.
- iv. Heavy infestation of weeds, insect-pests and diseases.
- v. Lack of awareness /needed information.
- vi. Research gap.

### **2.6.2 Future Prospect**

Assam has emerged among the top states, particularly in expansion of area under plantation crops, in the horticultural sector. The Impact Evaluation Report of Horticulture Mission for North East and Himalayan States (HMNEH) during Centre's XI Plan (2007-08 to 2011-12), places Assam in the top in area expansion under Plantation Crops, like coconut by 43 per cent share among the 11 states of North East and Himalayan States. Similarly, in expansion of area under replacement/rejuvenation of senile plantation, like orange, citrus etc., Assam is at the top with a share of 25 per cent. The state also topped the list in total additional area under horticulture crops since 2009-10, with a 13 per cent share among 11 North Eastern and Himalayan States. Assam secured second position in expansion of aromatic plants, viz.-13 per cent and spices-16 per cent. In expansion of area under floriculture, fruits crops and medicinal plants, Assam got third position registering 12 per cent, 12 per cent and 10 per cent of share respectively.

Assam is traditionally horticultural state due to its unique agro-climatic conditions which permit growing of a wide range of horticultural crops occupying 5.75 lakh hectares out of a gross cropped area of 40.99 lakh hectares. It is only 14.04 per cent of the total gross cropped area of the state but has now become a hub of horticultural activities with the sole objective of commercialization. Although, the state of Assam has enormous potential for development of horticulture the state is yet to harness the potentiality. In a flood prone state like Assam where productivity of major crops like rice is not stable, increase in production of horticultural crops can minimize the shock of crop failure and provide monetary security to the farmers. It is possible to exploit the untapped potential of the region through adoption of scientific technologies. There is ample scope of increasing the area under sweet potato, Assam lemon, guava, jackfruit and banana. Most of the existing orange orchards in the state

are of either seedling origin or of inferior variety except for some orchards. These are to be replaced with suitable high yielding varieties. Though pineapple performs fairly well, growers are still unable to get good returns due to non-adoption of improved package of practices. Hence, there is need to adopt high density orcharding and method of induction of flowering in pineapple. Jackfruit can be used as fruit, vegetable and animal feed. The existing trees are of seedling origin and have wide variability. Thus there is need for selection of superior clone and its multiplication through the vegetative method of propagation. Papaya is also having good potential in the state, which is mostly grown in backyard garden, and no compact orchard exists. Since the same set of papaya is being grown for several years, it has resulted in to large mixed population which needs purification. The scheme of Technology Mission for Integrated Development of Horticulture in Assam is in operation since 2001-02 with overwhelming response from the farmers. In spite of infrastructural problems, the state has started achieving the desired targets in case of fruits, flowers and other commercial crops. Strengthening production base, quality improvement, better price to growers, market access, value addition have become imperative for the farmers of the state and the Department of Agriculture is trying to touch upon all these issues under the Mission. The North Eastern India particularly Assam has special significance so far as its horticultural crops are concerned. It is contemplated to double the horticultural production in next 15 years through horizontal and parallel strategies but that is not enough. Assam, is expected to become a major player in emerging South East Asian markets in view of its close proximity to those global markets as projected in the latest round of ASEAN & SAARC deliberations. The state has to utilize its competitive and comparative advantages through commercialization and make horticulture highly rewarding. Employment generation and nutritional security through horticulture are some other areas of interest. It is expected that the comprehensive approach through Horticulture Technology Mission will help to transform the entire gamut of horticulture in Assam in the next few years.

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## **Chapter-III**

### **Socio-Economic Conditions of the Horticultural Crop Growers**

In this chapter an attempt has been made to analyse the socio economic condition of the sample horticultural crop growers such as, their economic conditions, educational levels, land holding and land utilization pattern *etc.* as these factors are intimately related with their socio-cultural life. The demographic features, occupational distribution, sources of income, asset position *etc.* also determine the economic status of the farm families and provide information on the aptitude of the farmers towards adoption of new farm technology based on skill profile & knowledge levels. So, there lies a great significance in studying the socio economic profile of the population under study.

#### **3.1 Background of the Respondents and the Households**

##### **3.1.1 Demographic Profile**

Demographic pattern is one of the most important factors of a farming community as it is the primary source of labour for crop cultivation. Hence, a proper appraisal of its size, growth composition and quality is considered as a pre requisite for an effective planning for balanced and sustainable socio economic development.

Classification of population by age group gives an idea of the composition of the family by size and availability of labour force as well as dependency ratio. Table-3.1 shows the distribution of respondents by age groups in four sample villages. In the sample village of Jadavpur in Barpeta district, there were 467 respondents of which 48 numbers were in the age group of 15-25 years, 317 were 26-50 years age group, 91 were 51-60 years age group and remaining 11 numbers were above 60 years age group. In Satekona village of Kamrup district, among the 73 numbers of sample respondents, 3 numbers were in the age group of 15-25 years, 27 were 26-50 years age group, 38 were 51-60 years age group and only 5 numbers were above 60 years age group. In Sensowa village of Nagaon district, total number of respondents was 172 of which 131 were between the age group of 26-50 years, 35 were between the age group of 51-60 years and rest 6 were above 60 years. There was no respondent found between the age group of 15-25 years in Sensowa village. In Bhumuraguri village under Sonitpur district, of the total 407 number of respondents, 37 number,

298 number and 72 number were lying between the age group of 15-25 years, 26-50 years and 51-60 years, respectively. Thus, altogether 1119 number of respondents

**Table 3.1**  
**Distribution of Respondents by Age Group**

Name of the District/Block/Village	Below 15	15-25	26-50	51-60	Above 60	Total
Barpeta/Mandia/Jadav pur	0	48	317	91	11	467
Kamrup/Bongaon/Satekona	0	3	27	38	5	73
Nagaon/Khagarijan/ Sensowa	0	0	131	35	6	172
Sonitpur/Gabharu/Bhumuraguri	0	37	298	72	0	407
<b>Total</b>	<b>0</b>	<b>88</b>	<b>773</b>	<b>236</b>	<b>22</b>	<b>1119</b>

Source : Field survey data

were interacted during the field survey of which 7.86 percent were in the age group of 15-25 years, 69.08 percent were in the age group of 26-50 years, 21.09 percent were in the age group of 51-60 years and 1.97 percent were in the age group of above 60 years. It is to be pointed out that no respondent was taken below 15 years of age as they were considered to be children and ignorant about the economic activities of the households.

### 3.1.2 Educational Status

Education is considered as one of the basic elements which determines the quality of manpower. The standard of education plays an important role on quality of human resources engaged in productive activities including agriculture. It has great influence on adoption of modern technology in agriculture in the sense that the level of awareness or the acceptability of a new proposition, by and large depends on the educational level of the people. Table-3.2 provides the details of educational status of the sample respondents.

According to the Table, in Jadavpur village, 87 persons were illiterate, 134 were educated up to primary standard, 78 were ME standard, 79 were high school standard, 76 were higher secondary standard, 9 numbers had education up to degree level, 2 numbers were diploma holders and 2 numbers were educated up to the post graduate level.

In Satekona village only 5 persons were illiterate, 16 numbers had education up to primary standard, 19 numbers were ME standard, 25 numbers were high school standard, 6 numbers were higher secondary standard and 2 numbers have educated up to degree level.

In Sensowa village of Nagaon district, only 2 persons were illiterate, 19 numbers had education up to primary standard, 24 numbers were ME standard, 68 numbers were high school standard, 30 numbers were higher secondary standard, 23 numbers had education up to degree level, 4 numbers were diploma holders and 2 numbers were educated up to the post graduate level.

**Table 3.2**  
**Distribution of Respondents by Education Levels**

Name of the District/Block/Village	Primary Up to 4 Std	Secondary 5-7 std	High School 8-10 std	PUC 11-12 std	Degree (3 years)	Diploma	Post Graduation	Degree-Engineering/Medical	Illiterate	Total
Barpeta/Mandia/Jadav pur	134	78	79	76	9	2	2	0	87	467
Kamrup/Bongaon/Satekona	16	19	25	6	2	0	0	0	5	73
Nagaon/Khagarijan/Sensowa	19	24	68	30	23	4	2	0	2	172
Sonitpur/Gabharu/Bhumuraguri	170	92	29	16	3	2	0	0	95	407
<b>Total</b>	<b>339</b>	<b>213</b>	<b>201</b>	<b>128</b>	<b>37</b>	<b>8</b>	<b>4</b>	<b>0</b>	<b>189</b>	<b>1119</b>
P.C. to total	30.29	19.03	17.96	11.44	3.31	0.71	0.36	0.00	16.89	100.00

Source : Field survey data

In Bhumuraguri village of Nagaon district, 95 persons were illiterate, 170 numbers had education up to primary standard, 92 numbers were ME standard, 29 numbers were high school standard, 16 numbers were higher secondary standard, 3 numbers had education up to degree level and 2 were diploma holders. Thus, of the total 1,119 numbers of respondents, 189 numbers were illiterate, 339 numbers had education up to primary standard, 213 numbers were ME standard, 201 numbers were high school standard, 128 numbers were higher secondary standard, 37 numbers had education up to degree level, 8 were diploma holders and 4 numbers were educated up to the post-graduate level. There was no engineering or medical degree holders found in any of the sample villages. The percentage of literate persons in the sample was 83.11 per cent which was much higher than the literacy rate of Assam (73.18 Percent in 2011 Census). However, among the sample villages, highest literacy rate was found in Sensowa village in Nagaon district (98.84 per cent) and lowest was found in Bhumuraguri village in Sonitpur district (76.66 per cent).

Table-3.3 shows the distribution of highest educated persons in the sample households.

In Jadavpur village, highest number of persons i.e. 227 numbers have education up to the secondary level followed by middle class (92 numbers), higher

secondary (81 numbers), primary level (38 numbers), graduate and above level (19 numbers) and technical education (5 numbers).

In Satekona village, 24 persons have highest education up to secondary level, 17 persons have education up to middle class, 16 persons have higher secondary level, 8 persons have primary standard and 2 persons have technically educated.

**Table 3.3**  
**Distribution of Highest Educated Person in the Sample Households**

Name of the District/Block/Village	Below Primary	Primary	Middle	Secondary	Higher Secondary	Graduate & Above	Technical	Illiterate	Total
Barpeta/Mandia/Jadav pur	5	38	92	227	81	19	5	0	467
Kamrup/Bongaon/Satekona	0	8	17	24	16	6	2	0	73
Nagaon/Khagarijan/ Senchowwa	0	15	37	48	36	31	5	0	172
Sonitpur/Gabharu/Bhumuraguri	7	47	148	113	77	12	3	0	407
Total	12	108	294	412	210	68	15	0	1119
P.C. to total	1.07	9.65	26.27	36.82	18.77	6.08	1.34	0.00	100.00

Source : Field survey data

In Bhumuraguri village of Sonitpur district, 148 persons had education up to middle class, 113 had secondary level, 77 had higher secondary level, 47 had primary, 12 had graduate and above level and 7 had below primary standard.

Combining all the sample villages, maximum number of persons *i.e.* 412 (36.82 per cent) were educated up to the secondary level followed by middle level (26.27 per cent), higher secondary level (18.77 per cent), primary level (9.65 per cent), graduate and above level (6.08 per cent), technical education (1.34 per cent) and below primary level (1.07 per cent).

From the above analysis, it was found that the literacy rate of the sample population is by and large satisfactory & better as compared to the state literacy rate. However, there was a wide variation in the level of education among the respondent farmers. So far as attaining the professional qualification is concerned, poor financial condition of the farmers was the main constraint followed by inadequate educational infrastructure facilities for higher education in the locality. School dropouts were found to be quite substantial who engaged themselves mainly in agriculture and allied activities.

### 3.1.3 Religion and Caste

The caste and religion of the sample respondents are presented in Table-3.4 and Table-3.5. According to the Table-3.4, all the sample respondents in Jadavpur village of Barpeta district and Bhumuraguri village of Sonitpur district belonged to general (minority) category. In Satekona village of Kamrup district all the 73 sample respondents were schedule tribe by community. In Sensowa village of Nagaon

district, majority of the sample respondents were belonged to schedule caste (50.00 per cent) followed by OBC (29.65 per cent), general (15.12 per cent) and ST (5.23 per cent) by caste.

**Table 3.4**  
**Distribution of Respondents by Caste**

Name of the District/Block/Village	SC	ST	OBC	Gen	Others	Total
Barpeta/Mandia/Jadav pur	0	0	0	467 (100.00)	0	467 (100.00)
Kamrup/Bongaon/Satekona	0	73 (100.00)	0	0	0	73 (100.00)
Nagaon/Khagarijan/ Sensowa	86 (50.00)	9 5.23	51 (29.65)	26 (15.12)	0	172 (100.00)
Sonitpur/Gabharu/Bhumuraguri	0	0	0	407 (100.00)	0	407 (100.00)
Total	86 (7.69)	82 (7.33)	51 (4.56)	900 (80.43)	0 (0.00)	1119 (100.00)

**Source:** Field survey data

**Note:** Figures in Parentheses indicate P.C. to total

**Table 3.5**  
**Distribution of Respondents by Religion**

Name of the District/ Block/Village	Hindu	Muslim	Christ	Buddhist	Jain	Total
Barpeta/Mandia/Jadav pur	0	467 (100.00)	0	0	0	467 (100.00)
Kamrup/Bongaon/Satekona	0	0	73 (100.00)	0	0	73 (100.00)
Nagaon/Khagarijan/ Sensowa	172 (100.00)	0	0	0	0	172 (100.00)
Sonitpur/Gabharu/Bhumuraguri	0	407 (100.00)	0	0	0	407 (100.00)
Total	172 (15.37)	874 (78.11)	73 (6.52)	0 (0.00)	0 (0.00)	1119 (100.00)

**Source :** Field survey data

**Note:** Figures in Parentheses indicate P.C. to total

In case of religious classification, all the sample respondents in Jadavpur village of Barpeta district and Bhumuraguri village of Sonitpur district belonged to muslim community. In Satekona village of Kamrup district all the sample respondents were Chistian by religion. In Sensowa village of Nagaon district, all the sample respondents were Hindu. Among the total sample respondents, 15.37 percent were Hindus, 78.11 per cent were Muslims and only 6.52 percent were Chistian by religion.

### 3.2 Land Ownership Details

Land is the basic input which provides food, employment and income to the farming community. Land resource plays a strategic role in determination of economic, social and cultural progress of the people at large. Economic upliftment in

the rural areas to a great extent depends on availability of suitable land resource and its judicious utilization.

Cropping pattern reflects the relative dominance of the individual crops to total cropped area. It is an important indicator to show the proportion of area under different crops at a definite point of time.

Table-3.6 shows the distribution of respondent farmers by land size classification. Out of the total 1,119 households, 52.99 per cent farmers were recorded to be marginal, 26.27 per cent small, 12.42 per cent medium and 8.31 per cent large farmers. District wise analysis reveals that Jadavpur village witnessed highest percentage of marginal farmers *i.e.* 50.54 followed by medium ( 18.63 per cent), small (18.42 per cent) and large (12.42 per cent) farmers. In Satekona village, highest percentage of farmers (38.36 per cent) belonged to large category followed by medium (31.51 per cent), marginal (16.44 per cent) and small farmers (13.70 per cent). In Sensowa village of Nagaon district, 77.91 per cent were marginal farmers, 20.35 per cent were small farmers

**Table: 3.6**  
**Distribution of Respondents by Land Size Classification**

Name of the District /Block/Village	Marginal	Small	Medium	Large	Total
Barpeta/Mandia/Jadav pur	236 (50.54)	86 (18.42)	87 (18.63)	58 (12.42)	467 (100.00)
Kamrup/Bongaon/Satekona	12 (16.44)	10 (13.70)	23 (31.51)	28 (38.36)	73 (100.00)
Nagaon/Khagarijan/ Senchowa	134 (77.91)	35 (20.35)	3 (1.74)	0 (0.00 )	172 (100.00)
Sonitpur/Gabharu/Bhumuraguri	211 (51.84)	163 (40.05)	26 (6.39)	7 (1.72)	407 (100.00)
Total	593 (52.99)	294 (26.27)	139 (12.42)	93 (8.31)	1119 (100.00)

**Source:** Field survey data

**Note:** Figures in Parentheses indicate P.C. to total

and 1.74 per cent were medium farmers. There was no large farmer in Sensowa village. In Bhumuraguri village, 51.84 per cent were marginal farmers, 40.05 percent were small, 6.39 per cent were medium and rest 1.72 per cent were large farmers.

Table-3.7 presents the distribution of family members of the sample respondents by age group. The agricultural workers were concentrated mainly in the age group of 15-60 years and non workers were usually in the age group of below 15 years and above 65 years of age. However, members below 15 years and above 65 years of age also at timed participate in different productive activities when there is a shortage of labour.. It was also noticed that there were a good number of school



dropouts below 15 years of age and they actively participated in different household activities as helper. According to the table, in Jadavpur village, 44.93 per

**Table 3.7**  
**Distribution of Family Members by Age Group**

Name of the District/ Block/Village	Male		Female		Children below 15 Years	Total
	Below 15 Yrs	Above 15 Yrs	Below 15 Yrs	Above 15 Yrs		
Barpeta/Mandia/Jadav pur	462 (22.61)	604 (29.56)	456 (22.32)	521 (25.50)	918 (44.93)	2043 (100.00)
Kamrup/Bongaon/Satekona	72 (22.09)	102 (31.29)	69 (21.17)	83 (25.46)	141 (43.25)	326 (100.00)
Nagaon/Khagarijan/ Sensowa	175 (22.46)	243 (31.19)	140 (17.97)	221 (28.37)	315 (40.44)	779 (100.00)
Sonitpur/Gabharu/Bhumuraguri	512 (24.44)	583 (27.83)	469 (22.39)	531 (25.35)	981 (46.83)	2095 (100.00)
Total	1221 (23.29)	1532 (29.22)	1134 (21.63)	1356 (25.86)	2355 (44.92)	5243 (100.00)

Source : Field survey data

Figures in Parentheses indicate P.C. to total

cent population were below 15 years of age, while in Satekona, Sensowa & Bhumuraguri villages the figures stood at 43.25 per cent, 40.44 per cent and 46.83 per cent, respectively. On an average 44.92 per cent of the family members were below 15 years of age. Again, sex-wise analysis of the population indicated that 52.18 per cent of the members were male and 47.82 per cent were female in Jadavpur village. The corresponding figures in Satekona village were 53.37 per cent male and 46.63 per cent female, 53.66 percent male and 46.34 female in Sensowa village and 52.27 percent male and 47.73 female in Bhumuraguri village. For the entire sample, 52.51 per cent were recorded to be male and 47.49 per cent female. The estimated sex ratio were 917 in Jadavpur village, 874 in Satekona village, 864 in Sensowa village and 913 in Bhumuraguri village. The overall sex ratio was worked out at 904 which was considerably lower than the state average of 954 in 2011.

Table-3.8 shows that, in Jadavpur village sample, of the total owned land of 183.33 hectares, 73.04 per cent were un-irrigated and remaining 26.96 per cent were irrigated. They possessed 45.64 hectares of uncultivated land which were mainly homestead, fallow or grazing land. These areas were usually un-irrigated. They also had 6.51 hectares land (leased in as well as leased out) for cultivating field crops.

In Satekona village, the sample farmers owned 77.27 hectares of cultivated land of which 84.55 per cent were dry land and only 15.45 per cent were irrigated. They had 5.57 hectares of uncultivated dry land and 1.61 hectares leased in as well as leased out land.



**Table 3.8**  
**Land Owned by the Households**

(Area in ha)

Name of the District/ Block/Village	Unirrigated or Dry Land	Irrigated	Total Land	Leased in	Lease out	Uncultivated Land	Total (Own and Leased in Land)	Net operated Area [7- (5+6)]
Sl. No	1	2	3	4	5	6	7	8
Barpeta/Mandia/Jadav pur	133.9	49.43	183.33	6.50	6.5	45.64	189.83	137.69
Kamrup/Bongaon/Satekona	65.33	11.94	77.27	1.61	1.61	5.57	78.88	71.7
Nagaon/Khagarijan/ Sensowa	58.9	6.29	65.19	2.81	2.81	11.95	68.00	53.24
Sonitpur/Gabharu/Bhumuraguri	59.05	123.53	182.58	5.62	5.62	35.73	188.20	146.85
Total	317.18	191.19	508.37	16.54	16.54	98.89	524.91	409.48

Source : Field survey data

**Table 3.9**  
**Distribution of Leased in and Leased out land by Terms and Conditions**

Name of the District/ Block/Village	Leased in Land					Leased in Out				
	Crop Sharing (1)	Crop and Cost Sharing (2)	Both 1 & 2	Fixed Rent/ha (in Rs)	Total	Crop Sharing (1)	Crop and Cost Sharing (2)	Both 1 & 2	Fixed Rent/ha (in Rs)	Total
Barpeta/Mandia/Jadav pur	3.45	3.06	0.00	0.00	6.50	3.45	3.06	0.00	0.00	6.50
Kamrup/Bongaon/Satekona	1.61	0.00	0.00	0.00	1.61	1.61	0.00	0.00	0.00	1.61
Nagaon/Khagarijan/ Sensowa	1.88	0.93	0.00	0.00	2.81	1.88	0.93	0.00	0.00	2.81
Sonitpur/Gabharu/Bhumuraguri	3.43	2.19	0.00	0.00	5.62	3.43	2.19	0.00	0.00	5.62
Total	10.37	6.17	0.00	0.00	16.54	10.37	6.17	0.00	0.00	16.54

Source : Field survey data

In Sensowa village, the farmers possessed 68.00 hectares of cultivated land including owned and leased in as well as leased out and 11.95 hectares of uncultivated land.

In Bhumuraguri village, of the total owned land of 182.58 hectares, 43.30 per cent were un-irrigated and 56.70 per cent irrigated land. The leased in as well as lease out land in the village were to the tune of 5.62 hectares for field crops and vegetable crops.

Combining the entire sample together, the respondent farmers had 508.37 hectares of owned land, 16.54 hectares of leased in as well as leased out land, 98.89 hectares of uncultivated land. Thus the net cropped area of the farmers stood at 409.48 hectares for cultivating various field and horticulture crops. It is to be noted here that the area under leased in and leased out land were found to be equal in size in all the sample villages. It is due to the fact that the leased in and leased out operations were usually taken place among the farmers within the same revenue village.

So far as land holdings are concerned, operational holding (net operated area) is more important from the farming point of view. The concept of operational holdings used in the study is given by owned land under personal cultivation plus land taken on lease minus leased out land. The average net operated areas of the sample villages of Jadavpur, Satekona, Sensowa and Bhumuraguri were found to be 0.29 ha., 0.98 ha., 0.31 ha. and 0.36 ha., respectively with an overall area of 0.37 ha.

In Assam, the farmers used to take leased in land on crop sharing basis. The total production from the leased in land under this arrangement is distributed equally between the tenants & land owners. Sometimes, crop and cost sharing system was also followed in some areas. Under this system, production cost such as seed, fertilizer, manure, pesticides, irrigation cost etc. are to be borne by both the land owner and the tenant.

Table-3.9 shows the details of leased in and leased out land held by the sample farmers. In leased in and leased out land, both crop sharing and cost sharing system were adopted. Crop sharing system was followed in 3.45 hectares, 1.61 hectares, 1.88 hectares and 3.43 hectares of land in Jadavpur, Satekona, Sensowa and Bhumuraguri villages, respectively while crop & cost sharing system was followed in 3.06 hectares, 0.93 hectares and 2.19 hectares of land in Jadavpur, Sensowa and Bhumuraguri villages, respectively.

To sum up, of the total 16.54 hectares of leased in as well as leased out land, 62.70 per cent were under crop sharing basis and 37.30 per cent were under crop & cost sharing system. It is interesting to note that in case of leased out land also, same kind of arrangement was found.

### **3.2.1 Irrigation Status**

Irrigation is one of the most vital input in modern agriculture. For sustainable development of agricultural sector, availability of assured irrigation facility is undoubtedly the most important prerequisite. Thus, the importance of irrigation development bears special significance in the context of increasing the agricultural production to meet the burgeoning requirements.

The three major systems of irrigation *viz.*- canal irrigation, well irrigation, and tank irrigation are adopted in Assam. As the Brahmaputra and most of its tributaries are perennial, canal irrigation is possible by damming the rivers in their upper courses. Again, as the underground water table is high, especially in the plains of the state, both wells and tanks can be dug and used as source of irrigation for well irrigation, (shallow and deep tube wells). Electrically operated lift irrigation is also feasible in the state. As per Agriculture Census 2010-11 there is about 1.62 lakh hectare net irrigated area in the state of which 1.27 lakh hectare are irrigated from 'canal', 0.016 lakh hectare from 'tanks', 0.003 lakh hectare from 'wells', 0.068 lakh hectare from tube wells and 0.26 lakh hectare receives irrigation from 'other sources'.

But in the study area, no other source of irrigation was feasible except canals and diesel operated tube wells (Table-3.10). For example, in Jadavpur (49.43 hectares), Sensowa (6.29 hectares), and Bhumuraguri (103.53 hectares) villages, whole irrigated areas were covered by diesel operated tube wells while in Satekona village (11.94 hectares) of Kamrup district, canal was the only source of irrigation. To sum up, out of the total 171.19 hectares of irrigated area, 6.97 per cent area was irrigated through canal and rest 93.03 per cent was irrigated by shallow tube wells. The sample villagers from Satekona reported that they arranged to bring water from the nearby hill slopes through a narrow drain to the cropped area. In the other three sample villages, farmers irrigated their fields through diesel operated pump sets which were purchased on their own cost. However, some farmers received Govt. subsidy under different schemes for purchasing shallow tube wells. In fact, shallow tube well schemes introduced by the Government has provided a great opportunity to intensify crop cultivation in *rabi* season.

**Table- 3.10**  
**Distribution of Irrigated Area by Source**

(area in ha)

Name of the District/ Block/Village	Canal	Tube well Diesel	Tube Well electric	Tank	Open well	Total
Barpeta/Mandia/Jadavpur	0.00	49.43	0.00	0.00	0.00	<b>49.43</b>
Kamrup/Bongaon/Satekona	11.94	0.00	0.00	0.00	0.00	<b>11.94</b>
Nagaon/Khagarijan/ Sensowa	0.00	6.29	0.00	0.00	0.00	<b>6.29</b>
Sonitpur/Gabharu/Bhumuraguri	0.00	103.53	0.00	0.00	0.00	<b>103.53</b>
<b>Total</b>	<b>11.94</b>	<b>159.25</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>171.19</b>

Source : Field survey data

It was mentioned elsewhere that the state of Assam is endowed with unique agro climatic conditions which permit to grow variety of crops including a wide range of horticultural crops namely,- fruits, vegetables, flowers, spices, medicinal and aromatic plants, nut crops, tuber crops and plantation crops. The horticulture crops are favoured more in the rural economy as they generate more employment and income to the rural masses. Although commercial cultivation of horticultural crops is not a very old practice, Assamese farmers are well acquainted with horticultural crops since long.

The no. of households growing horticultural crops across the sample villages are indicated in Table-3.11 in regard to time-span. In Jadavpur village under Barpeta district out of the total 467 sample farmers, 42.40 per cent were familiar with horticultural crop cultivation since their childhood, 33.40 per cent from more than 10 years, 16.92 per cent since 10 years and 7.28 per cent cultivated horticultural crops since last 5 years.

**Table- 3.11**  
**Year of Starting the Horticultural Crops by the Farmers**

(number of HH)

Name of the District/ Block/Village	Since Child hood	Since long (> 10 Years)	since 10 years	Since 5 years	Since 4 years	Since 3 years	Since 2 years	Since 1 years	Total
Barpeta/Mandia/Jadavpur	198 (42.40)	156 (33.40)	79 (16.92)	34 (7.28)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	467 (100.00)
Kamrup/Bongaon/Satekona	35 (47.95)	21 (28.77)	12 (16.44)	5 (6.85)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	73 (100.00)
Nagaon/Khagarijan/ Sensowa	27 (15.70)	89 (51.74)	56 (32.56)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	172 (100.00)
Sonitpur/Gabharu/Bhumuraguri	0 (0.00)	138 (33.91)	122 (29.98)	62 (15.23)	43 (10.57)	23 (0.00)	19 (0.00)	0 (0.00)	407 (100.00)
<b>Total</b>	260 (23.24)	404 (36.10)	269 (24.04)	101 (9.03)	43 (3.84)	23 (2.06)	19 (1.07)	0 (0.00)	1119 (100.00)

Source : Field survey data

In Satekona village under Kamrup district, 47.95 per cent were well acquainted with horticulture crops while 28.77 per cent cultivate horticulture crops since more than 10 years and 16.44 per cent since 5 years.

In Sensowa village under Nagaon district, out of the 172 farmers, 15.70 per cent were related with horticultural crops since their childhood, 51.74 per cent were growing the crops for more than 10 years and rest 32.56 per cent started cultivating horticultural crops since last 10 years.

Out of the 407 farmer households in Bhumuraguri village, 33.91 per cent were growing horticultural crops for more than 10 years, 29.98 per cent were since 10 years, 15.23 per cent were since 5 years, 10.57 per cent were since 4 years, 5.65 per cent were since 3 years and remaining 4.67 per cent were cultivating horticultural crops since last 2 years only.

Thus, out of the total 1,119 farmer households, 33.91 percent farmers were familiar with horticultural crops since their childhood, 36.10 per cent started cultivating horticultural crops in commercial manner for more than 10 years, 24.04 per cent were cultivated such crops since 10 years, 9.03 per cent farmers started cultivating various horticultural crops since 5 years, 3.84 per cent were since 4 years, 2.06 per cent were from 3 years and only 1.70 per cent sample farmers started horticultural crops cultivation from last 2 year.

### **3.3 Cropping Pattern of Horticultural Crops**

Cropping pattern reflects the relative dominance of individual crops to total cropped area. The cropping pattern of horticultural crops (crop wise) of the sample villages have been presented in the Table 3.12. Here it was tried to worked out the percentage of area under different horticultural crop groups to the total gross cropped area under horticultural crops. Table shows that out of the total fruits area of 107.767 hectares, Satekona village of Kamrup district covered highest area (67.330 Per cent) followed by Senshowa village of Nagaon district( 15.695 Per cent ), Jadavpur village of Barpeta district (11.237 Per cent) and Bhumuraguri village of Sonitpur district(5.738 Per cent). Table also reflects that, in Jadavpur and Bhumuraguri village, Jackfruit occupied highest percentage of area to horticultural gross cropped area while in Satekona village Orange covered largest area and in Senchowa village, Mango cultivation covered largest area as compared to other fruit crops.

Regarding vegetables cultivation, respondents of all the sample villages grew various types of crops and of different varieties. Here, Bhumuraguri village covered highest area followed by Jadavpur, Satekona and Senchowa village. Table shows that, in Jadavpur village, Pointed gourd, Ridge gourd, Brinjal and Potato cultivation occupied a considerable area while Radish, Carrot, Cauliflower, Green chillies *etc.* covered a very negligible area.

In Satekona village, the sample farmers used highest percentage of area for growing Arum while they grew Radish in least area of the total horticultural crop area.

In Senchowa village, out of the total cropped area of 9.883 hectares, highest percentage was allocated to Potato cultivation and smallest area was used for Spike gourd cultivation.

In Bhumuraguri village also, it was found that the highest percentage of area was covered for Potato cultivation followed by Cabbage and Cauliflower. The farmers grew other vegetable crops in small areas.

In case of spice crops cultivation, largest area was covered by Jadavpur village of Barpeta district afterward Senchowa, Bhumuraguri and Satekona village. In Jadavpur village, maximum percentage of area was allocated for Garlic cultivation followed by Dry chillies, Ginger and Turmeric. It was found that the farmers of Satekona village of Kamrup district was not considered spices cultivation in commercial line and they grew some spice crops like Ginger, Turmeric and some indigenous varieties of Tejpat, Mint and Black pepper in a small portion of area for domestic consumption only.

In Senchowa village, maximum area was allocated to Ginger cultivation, followed by Turmeric, Mint, *Tejpat* and Tamarind.

In Bhumuraguri village, the sample farmers allocated 5.003 hectares of land for growing various spice crops such as Coriander, Garlic, Ginger, Turmeric, Tamarind, Mint and Black pepper.

**Table -3.12**  
**Cropping Pattern of Horticultural Crops in the sample Villages**

Name of the Crop* (Sample Villages→)	Percentage to Horticultural GCA			
	Jadavpur	Satekona	Sensowa	Bhumuraguri
<b>Fruits</b>	<b>12.110</b>	<b>72.559</b>	<b>16.914</b>	<b>6.184</b>
Other citrus ( <i>Rabab Tenga</i> )	0.571	0.194	0.396	0.232
Olive ( <i>Jalpai</i> )	1.666	0.271	0.487	0.205
Orange(Mandarin)	-	52.382	0.244	0.021
Pineapple	-	13.428	0.003	-
Pomegranate	0.095	0.100	0.091	0.028
Jackfruit	3.813	2.223	3.135	2.211
Mango	2.443	1.469	6.365	1.594
Blackberry/White berry	0.728	0.174	0.122	-
Guava	1.557	0.482	1.400	0.642
Assam Lemon	0.337	0.361	1.705	0.672
Papaya	0.286	0.385	1.248	0.027
Banana	0.615	0.124	1.48	0.471
<i>Leteku</i>	-	0.793	-	-
Lemon ( <i>Gul Nemu</i> )	-	0.171	0.238	0.080

**Contd./-**



**Contd. Table- 3.12**

Name of the Crop* (Sample Villages→)	Percentage to Horticultural GCA			
	Jadavpur	Satekona	Sensowa	Bhumuraguri
<b>Vegetables</b>	<b>38.005</b>	<b>12.281</b>	<b>9.883</b>	<b>81.518</b>
Bottle Gourd / Water Pumpkin	0.900	0.278	0.670	0.791
Bitter Gourd	-	1.219	0.280	0.182
Spike Gourd	-	2.063	0.101	-
Snake Gourd	-	-	0.231	0.104
Ridge Gourd	7.181	2.564	0.620	0.964
Pointed Gourd	11.969	-	-	-
White Gourd	0.527	0.195	0.822	0.581
<i>Turoi</i>	1.172	0.095	0.423	0.043
Potato	5.984	0.056	2.192	14.206
Tomato		0.038	0.030	5.265
Brinjal	8.514	0.045	1.223	7.001
French Beans	0.152	0.053	0.144	0.012
Green Chillies	0.058	0.030	0.124	2.443
Cabbage	0.041	0.014	0.059	10.276
Knol-Khol	0.042	0.015	0.062	0.009
Cauliflower	0.032	-	0.034	7.852
Peas	0.064	-	0.058	5.436
Raddish	0.010	0.010	0.055	2.722
Carrot	0.019	0.014	0.017	2.416
Leafy vegetables (Mixed)-	0.148	0.126	0.733	2.487
Beans (Cowpea)	0.214	0.068	0.402	0.650
Lady's Finger	0.165	0.053	0.447	4.937
Red Pumpkin	0.814	1.866	0.518	2.514
Beet Root	-	0.050	-	-
Capsicum	-	0.011	0.023	0.785
Squash	-	0.199	-	-
Cucumber	-	0.408	0.524	1.294
Arum	-	2.813	0.091	-
Onion	-	-	-	7.248
Sweet Potato	-	-	-	0.906
<i>Kunduli</i>	-	-	-	0.393
<b>Spices</b>	<b>29.781</b>	<b>1.092</b>	<b>14.065</b>	<b>5.003</b>
Corriander	1.436	-	-	1.317
Garlic	12.122	-	-	0.906
Ginger	4.449	0.065	8.157	1.123
Turmeric	3.939	0.088	3.590	1.368
Tamarind	0.093	-	0.068	0.097
Dry Chillies	6.717	-	-	-
<i>Tejpat</i>	0.519	0.141	0.875	-
Mint	0.461	0.394	0.947	0.169
Black Pepper	0.045	0.404	0.428	0.023
<b>Plantation</b>	<b>10.027</b>	<b>9.529</b>	<b>30.508</b>	<b>3.724</b>
Arecanut ( Dry form)	5.477	6.134	14.387	1.844
Coconut(Nos.)	3.737	0.677	11.649	1.288
Bettelvine(Gussi)	0.814	2.718	4.472	0.593

**Contd../-**

**Contd. Table- 3.12**

Name of the Crop* (Sample Villages→)	Percentage to Horticultural GCA			
	Jadavpur	Satekona	Sensowa	Bhumuraguri
<b>Flower</b>	<b>0.425</b>	<b>0.368</b>	<b>0.693</b>	<b>0.061</b>
Rose (Nos.)	0.080	0.082	0.133	0.011
Marrigold (Nos.)	0.058	0.031	0.100	0.005
<i>Joba</i> (Nos.)	0.026	0.084	0.060	0.007
<i>Tagar</i> (Nos.)	0.039	0.070	0.089	0.006
Others (Mixed)(Nos.)	0.222	0.101	0.311	0.033
<b>Medicinal and aromatic</b>	<b>9.650</b>	<b>4.165</b>	<b>27.939</b>	<b>3.507</b>
Tulsi	0.239	0.071	0.271	0.059
Amla	2.776	1.411	7.030	0.978
<i>Silikha</i>	3.381	0.889	6.245	0.878
Sarpagandha	-	0.018	0.099	-
<i>Suklati</i>	0.036	0.009	0.079	0.006
Neem	2.426	1.449	12.702	1.318
others(Mixed)	0.791	0.316	1.512	0.269

Source : Field survey data

Regarding Plantation crops, Senchowa village of Nagaon district produced highest, occupying largest area of 30.508 hectares which was 10.027 hectares of Jadavpur village, 9.529 hectares of Satekona village and 3.724 hectares of Bhumuraguri village. Table shows that, in Jadavpur , Senchowa and Bhumuraguri village, Arecanut covered highest area followed by Coconut and Betelvine while in Satekona village largest area was covered by Arecanut after that Betelvine and Coconut.

The sample farmers allocated some amount of area for growing certain flowers and medicinal and aromatic plants in their homestead gardens for domestic use and beautification. However, cultivation of Neem occupied an important place in the cropping pattern of Senchowa village.

### **3.4 Motivating Factors for Cultivation of Horticultural Crops**

The farmers of a region are usually motivated by some specific factors for growing certain crops. They generally grow those crops which have potential market & higher return and an cost effective, easy to grow with assured availability of quality seeds and planting materials. In the study areas as well the sample farmers got motivated to grow horticultural crops by some factors (Table 3.13).

In Jadavpur village, out of the total farmers (467), 33.62 per cent were motivated by good price, 22.06 per cent went for it because it was easy to grow, 13.70 per cent due to closeness of the market, 10.49 per cent got motivated by availability of

seed, 7.07 per cent due to lower cultivation cost, 6.64 per cent for Govt. support and the remaining 6.42 per cent farmers grew horticultural crops due to suitability of land.

In Satekona village of Kamrup district, of the total farmers, 49.32 per cent grew horticultural crops because they got Govt. support, 15.07 per cent due to good price, 10.96 per cent due to suitable land, 8.22 per cent because of closeness to the market, 6.85 per cent because of lower cost of cultivation, 6.85 per cent went for it because it was easy to grow and 2.74 per cent got motivated by easy access to quality seed and planting materials.

**Table- 3.13**  
**Motivating Factors for Taking up Horticultural Crops**

(number of HH)

Name of the District/Block/Village	Total Farmers	Close to Market	Good Price	Easy to Grow	Less cultivation Cost	Govt. Support	Neighbor Grows	Easy Seed/ Nursery Availability	(Any other) Suitability of Land	Total
Barpeta/Mandia/Jadav pur	467	64 (13.70)	157 (33.62)	103 (22.06)	33 (7.07)	31 (6.64)	0 (0.00)	49 (10.49)	30 (6.42)	467 (100.00)
Kamrup/Bongaon/Satekona	73	6 (8.22)	11 (15.07)	5 (6.85)	5 (6.85)	36 (49.32)	0 (0.00)	2 (2.74)	8 (10.96)	73 (100.00)
Nagaon/Khagarijan/ Sensowa	172	47 (27.33)	28 (16.28)	45 (26.16)	15 (8.72)	0 (0.00)	2 (1.16)	12 (6.98)	23 (13.37)	172 (100.00)
Sonitpur/Gabharu/Bhumuraguri	407	137 (33.67)	115 (28.26)	47 (11.55)	7 (1.72)	6 (1.47)	0 (0.00)	2 (0.49)	93 (22.85)	407 (100.00)
Total	1119	254 (22.70)	311 (27.79)	200 (17.87)	60 (5.36)	73 (6.52)	2 (0.18)	65 (5.81)	154 (13.76)	1119 (100.00)

Source : Field survey data

In Sensowa village of Nagaon district, the motivating factors for taking up horticultural crops were 27.33 per cent due to closeness to the market, 26.16 per cent reported that it was easy to grow, 16.28 per cent went for it because of good price, 13.37 per cent due to suitability of land, 8.72 per cent because of lower cost of cultivation and only 1.16 per cent grew horticultural crops due to the fact that their neighbours grew those crops.

Of the total households in Bhumuraguri village, 33.66 per cent got motivated by closeness to the market, 28.26 per cent for good price, 22.85 per cent for suitability of the land, 11.55 per cent grew it because it was easy to grow, 1.72 per cent because of lower cultivation cost, 1.47 per cent for Govt. support and remaining 0.49 percent sample farmers grew horticultural crops due to easy access to quality seed and planting materials.

Combining all the sample farmers together, the highest percentage (27.79 per cent) of farmers took up horticultural crops because of good price followed by

closeness to the market (22.70 per cent), easy cultivation practices (17.87 per cent), suitability of land (13.76 per cent), Govt. support (6.52 per cent), easy access to quality seed (5.81 per cent), lower cultivation cost (5.36 per cent). Only 0.18 per cent farmers grew horticultural crops due to the fact that their neighbours also grew and earned good profit.

**Table 3.14**  
**Preference-wise Motivating Factors for Taking up Horticultural Crops**

Motivating Factors for Taking up Horticultural Crops	No. of Household		
	Rank-1	Rank-2	Rank-3
<b>Village-1, Barpeta/Mandia/Jadavpur, Total No of HH = 467</b>			
Close to Market	64	160	128
Good Price	157	102	68
Easy to Grow	103	119	89
Less input Cost	33	29	182
Govt Support	31	49	0
Neighbor Grows	0	0	0
Easy Availability of Seed/Nursery	49	0	0
Suitability of land	30	8	0
<b>Total</b>	<b>467</b>	<b>467</b>	<b>467</b>
<b>Village-2, Kamrup (Rural)/Bongaon/Satekona, Total No of HH = 73</b>			
Close to Market	6	34	2
Good Price	11	26	18
Easy to Grow	5	3	37
Less input Cost	5	1	0
Govt. Support	36	5	8
Neighbor Grows	0	0	2
Easy Availability of Seed/Nursery	2	3	1
Suitability of land	8	1	5
<b>Total</b>	<b>73</b>	<b>73</b>	<b>73</b>
<b>Village-3, Nagaon/Khagarijan/Senchowa, Total No of HH = 172</b>			
Close to Market	47	38	36
Good Price	28	90	40
Easy to Grow	45	32	66
Less input Cost	15	4	30
Govt. Support	0	0	0
Neighbor Grows	2	1	0
Easy Availability of Seed/Nursery	12	0	0
Suitability of land	23	7	0
<b>Total</b>	<b>172</b>	<b>172</b>	<b>172</b>
<b>Village-4, Sonitpur/Gabharu/Bhumuraguri, Total No of HH = 407</b>			
Close to Market	137	127	124
Good Price	115	253	29
Easy to Grow	47	24	75
Less input Cost	7	1	2
Govt. Support	6	2	10
Neighbor Grows	0	0	0
Easy Availability of Seed/Nursery	2	0	1
Suitability of land	93	0	166
<b>Total</b>	<b>407</b>	<b>407</b>	<b>407</b>
<b>Over all</b>			
Close to Market	254	359	290
Good Price	311	471	155
Easy to Grow	200	178	267
Less input Cost	60	35	214
Govt. Support	73	56	18
Neighbor Grows	2	1	2
Easy Availability of Seed/Nursery	65	3	2
Suitability of land	154	16	171
<b>Total</b>	<b>1119</b>	<b>1119</b>	<b>1119</b>

Table-3.14 shows the proportion of respondents as per their choices of ranks for a particular motivating factor for taking up horticultural crops. It has been found from the Table that in Jadavpur village, maximum proportion of respondents given 1<sup>st</sup> rank to “good price”, 2<sup>nd</sup> rank to “close to market” and 3<sup>rd</sup> rank to “less input cost”. The motivating factor “govt. support” got 1<sup>st</sup> rank by most of the respondents in Satekona village while, “close to market” got rank 2<sup>nd</sup> and “easy to grow” got 3<sup>rd</sup> rank. In Senchowa village most of the respondents given rank 1 to the motivating factor “close to market”, rank 2 to “good price” and rank 3 to the factor to “easy to grow”. In Bhumuraguri village, maximum number of respondents given “close to market” as most preferred motivating factor. The factor “good price” has got the 2<sup>nd</sup> rank by maximum number of respondents while, “easy accessibility of seed/ nursery” was given 3<sup>rd</sup> rank by most of the respondent farmers.

The overall picture indicates that, 1<sup>st</sup> and 2<sup>nd</sup> rank were obtained by the majority of the respondents for the same motivating factor of “good price” while motivating factor “close to market” obtained 3<sup>rd</sup> rank by maximum number of respondents.

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## **Chapter-IV**

### **Maintenance of Horticultural Crops**

#### **4.1. Destruction and Rejuvenation of Horticultural Crops**

Destruction and Rejuvenation of Horticultural crops are common operations/practices followed by the horticultural crop growers. Horticultural crops are usually grown in high lands and homestead lands. With the increase in family size, large families are broken in to smaller ones and they used to start buildings new sheds in homestead lands by destructing the existing horticultural crops. Sometimes, crops are destructed for growing a new one if the farmers consider it to be more profitable than the existing ones. Also because of the absence of potential market, high production cost, lack of higher demand, low productivity and labour crunch; the farmers some time destroy or replace the continuing crops by other crops with potential market and higher returns.

In the study areas also, the sample farmers removed some existing horticultural crops because of obvious reasons like extension of dwelling house and kitchen garden, diseases of crops and construction of new dwelling house *etc.*

Table - 4.1 shows the number of households, crops, plant area and reasons for removing horticultural crops in last 5 years by the sample farmers. According to the Table, in Jadavpur village 30 households removed 35 plants (22 jackfruit and 13 mango) due to extension of dwelling house.

In Satekona village, 0.68 hectare of crop area was removed due the old age, plant diseases and construction of cowshed in terms of 236 numbers of orange tree and 8 jackfruit trees by 25 sample households.

In Senchowa village, coconut and arecanut plants covering an area of 0.03 hectare ware removed by 7 sample households because of non productivity and old age of the trees.

In Bhumuraguri village, 10 sample households destroyed 35 numbers of banana plant, 5 numbers of mango trees and 2 numbers of jackfruit tree covering 0.09 hectare of land for construction of new dwelling houses and extension of kitchen garden area.

In totality, 72 sample farmers removed as many as 338 numbers of different horticultural crops which covered an area of 1.15 hectares of land.

**Table 4.1**  
**Horticultural Crops Removed in the last 5 Years**

District /Block/Village	Name of the Crop Removed	No. of House-hold	Number of Plants Removed	Reason for Removing	Area Covered (in ha)
Barpeta/Mandia/Jadavpur	Jackfruit	18	22	Extension of	0.23

				dwelling house	
	Mango	12	13	do	0.13
(a) Sub-total		30	35	-	0.36
Kamrup(Rural)/Bongaon/Satekona	Orange	17	236	Very old age / plant disease	0.60
	Jackfruit	8	8	Construction of cowshed	0.08
(b) Sub-total		25	244	-	0.68
Nagaon/Khagarijan/Senchowa	Coconut	3	3	Un-productive due to old age	0.02
	Arecanut	4	14	do	0.01
(c) Sub-total		7	17	-	0.03
Sonitpur/Gabharu/Bhumuraguri	Banana	6	35	Extension of kitchen garden area	0.01
	Mango	3	5	Construction of new dwelling house	0.05
	Jackfruit	1	2	do	0.02
(d) Sub-total	-	10	42	-	0.09
State Total (a to d)	-	72	338	-	1.15
<b>Per Household</b>	-	-	<b>4.69</b>	-	<b>0.02</b>

**Source:** Field Survey Data

The term rejuvenation means renewal or making new or young again. It would mean restoring the productive capacity of horticultural crops. Generally, only those plants are rejuvenated which are considered to be more profitable from the grower's point of view. It is undertaken when the old orchards are marked by unsystematic planting and inferior varieties, rampant damage due to adverse weather conditions and severe attack by rodents and other enemies *etc.* However, before an attempt is made to rejuvenate the trees, the future expected income from orchard should be taken in to consideration. It is better to remove the old plantation and replace it by new ones instead of going for rejuvenation.

Table- 4.2 depicts the number of households vis-a-vis plants rejuvenated with the reasons thereof in the sample villages during last 5 years.

Table shows that in Jadavpur and Bhumuraguri village, no individual crop was rejuvenated during the study year.

In Satekona village, 53 households rejuvenated 469 orange and 98 arecanut plants covering 1.24 hectare of area because of decline in production and old age.

**Table 4.2**  
**Horticultural Crops /Plants Rejuvenated by the Farmers in the Last 5 Years**

District/Block/Village	Name of the Individual Crop	No. of HH*	Number of Plants Rejuvenated	Reason for Rejuvenation	Area Rejuvenated (in ha)
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	Rejuvenated				
Barpeta/Mandia/Jadavpur	Nil	-	-	-	-
(a) Sub-total		-	0	-	0
Kamrup(Rural)/Bongaon/Satekona	Orange	35	460	Un-productive due to old age	1.16
	Arecanut	18	98	do	0.07
(a) Sub-total		53	558	-	1.24
Nagaon/Khagarijan/Senchowa	Arecanut	23	134	Un-productive due to old age	0.10
(a) Sub-total		23	134	-	0.10
Sonitpur/Gabharu/Bhumuraguri	Nil	-	-	-	-
(a) Sub-total		0	0	-	0
State Total (a to d)		76	692		1.34
Per Household		-	9.11	-	0.02

**Source:** Field Survey Data

**Note:** \* Household

In Senchowa village arecanut plants were invigorated by 23 sample farmers in an area of 0.10 hectares for the same reasons, viz. old age and unproductive in nature.

Altogether, 76 sample households rejuvenated 692 different horticultural crops in an area of 1.34 hectares in the last 5 years.

#### 4.2 Kitchen Garden/Bund/Rooftop Plantation

The kitchen garden which is locally known a *bari* or homestead garden is a unique feature of Assamese farmers. They have an inherent tendency to be self sufficient for meeting their daily family requirements (food) including seasonal minor fruits, vegetables, flowers, spices, condiments and medicinal crops. Largely organic in nature, these crops seldom see any chemical fertilizer or pesticides. But of late, with the spread of modern agricultural technology and coming of bigger plantations with major thrust on commercial crops, changes are taking place even in remote and backward districts of the state.

Most of the farmers of Assam traditionally cultivate different local and indigenous horticultural crops in homestead bunds mainly for their own consumption and sometimes for the market when there is surplus production. The most common and popular horticultural crops grown in bunds are coconut, areca nut, betel vine, mango, banana, Assam lemon, jackfruit, orange, arum etc.

No roof-top plantation could be traced in the sample area.

Table- 4.3(a), 4.3(b), 4.3(c) and 4.3(d) present the number of households having kitchen garden/ backyard crops. It was found that in all the sample villages, the farmers grew almost all horticultural crops in their kitchen garden or backyard



areas and earned a considerable amount of income. In Jadavpur village (Table- 4.3.(a) , the sample farmers grew 2,746 number of various fruit crops in 9.83 hectares of land and produced 685.62 quintals of fruits valued at Rs.2,65,952 in the reference year. Similarly, the sample farmers produced 202.56 quintals vegetables, 12.25 quintals spices, 38,330 number of flowers and 56.82 quintals of medicinal and aromatic crops and there values were worked out at Rs.1,13,823, Rs. 36,035, Rs.62,945 and Rs.71,107, respectively. In totality, the sample farmers of Jadavpur village produced 61,086 nos. of various crops with a valuation of Rs. 10,02,908.

In Satekona village (Table-4.3 (b) the sample farmers used 9.01 hectares of land area and grew 30,184 nos. of different plants and their value was estimated at Rs. 2,92,052.

In Senchowa village (Table-4.3(c) , the area under kitchen garden and backyard area was found at 20.21 hectares where 69,059 nos. of different horticultural crops were grown and the estimated annual value of total production was Rs. 5,77,188.

In Bhumuraguri village (Table-4.3 (d) of Sonitpur district, 26.66 hectares of land was used to cultivate various horticultural crops in their kitchen gardens and backyard areas. The farmers produced 481.238 quintals of fruits, 249.067 quintals of vegetables, 14.401 quintals of spices, 25,408 nos. of areca nut, 7,700 nos. of coconut, 15,560 *gussi* of betel vine, 10,975 nos. of flowers and 35.235 quintals of medicinal and aromatic crops and the annual value of those crops were estimated at Rs. 2,78,581.70, Rs. 1,66,243.50, Rs. 35,465, Rs.2,54,080, Rs.77,000, Rs.62,240, Rs.17,330 and Rs.46,090.50 respectively.

Combining all the sample farmers, it was found that 84.68 hectares of area was used as kitchen garden/ backyard areas and the annual estimated value of total production was Rs. 28,10,529.

Table - 4.4 shows different horticultural crops grown by the sample farmers in field bund lands in the reference year.

**Table- 4.3.a**  
**Number of Households Having Kitchen Garden/Backyard**

District/Block/Village	Name of the Crop*	No. of Household		If Yes or Having			Annual Value (Rs.)
		Having	Not Having	Area (in ha)	No. of Plants	Production (qtl)	
Barpeta/ Mandia/Jadavpur	<b>Fruits</b>						
	Other citrus ( <i>Rabab Tenga</i> )	125	342	0.48	189	37.80	7,560
	Olive ( <i>Jalphai</i> )	118	349	1.39	135	67.50	33,750
	Pomegranate	57	410	0.08	71	0.85	3,408
	Jackfruit	281	186	3.11	302	259.72	44,152

Mango	163	304	2.04	198	89.10	44,550
Blackberry/Whiteberry	45	422	0.61	59	2.07	1,652
Guava	212	255	1.30	476	71.40	14,280
Assam Lemon	186	281	0.28	311	15.55	12,440
Papaya	213	254	0.24	254	30.48	15,240
Banana	341	126	0.30	741	111.15	88,920
<b>Total</b>	-	-	<b>9.83</b>	<b>2,736</b>	<b>685.62</b>	<b>2,65,952</b>
<b>Vegetables</b>						
Bottle Gourd / Water Pumpkin	141	326	0.75	188	28.20	22,560
White Gourd	123	344	0.44	220	44.00	22,000
<i>Turoi</i>	234	233	0.98	832	20.80	6,240
Brinjal	130	337	0.11	510	15.30	7,650
Beans	124	343	0.13	1242	6.21	3,105
Green Chillies	155	312	0.05	471	2.36	1,178
Cabbage	134	333	0.03	2546	20.37	6,110
Knol-Khol	134	333	0.03	2588	2.59	776
Cauliflower	130	337	0.03	1952	3.90	1,952
Peas	58	409	0.05	1160	2.90	2,320
Raddish	29	438	0.01	1305	9.79	4,894
Carrot	69	398	0.02	2691	1.35	538
Leafy vegetables-	68	399	0.12	21080	1.75	875
Beans (Cowpea)	68	399	0.18	476	1.43	571
Lady's Finger	55	412	0.14	552	0.83	414
Red Pumpkin	68	399	0.68	272	40.80	32,640
<b>Total</b>	-	-	<b>3.75</b>	<b>38,085</b>	<b>202.56</b>	<b>1,13,823</b>
<b>Spices</b>						
Garlic	78	389	0.11	1455	0.36	291
Ginger	150	317	0.05	735	0.59	470
Turmeric	150	317	0.09	1500	1.50	750
Tamarind	13	454	0.08	14	4.20	4,200
Dry Chillies	47	420	0.01	235	0.28	2,256
Tejpat	82	385	0.43	104	0.21	208
Mint	70	397	0.39	7700	3.85	7,700
Black Pepper	168	299	0.04	504	1.26	20,160
<b>Total</b>	-	-	<b>1.19</b>	<b>12,247</b>	<b>12.25</b>	<b>36,035</b>
<b>Plantation</b>						
Arecanut (Dry form)	467	0	1.78	2335	18.68	186,800
Coconut(Nos.)	312	155	3.12	562	19,670	196,700
Betelvine( <i>Gussi</i> )	298	169	0.68	894	17,880	71,520
<b>Total</b>	-	-	<b>5.58</b>	<b>3,791</b>	-	<b>4,55,020</b>
<b>Flower (in Nos.)</b>						
Rose	189	278	0.07	201	3,800	7,600
Marrigold	122	345	0.05	242	5,500	11,000
<i>Joba</i>	42	425	0.02	65	2,500	2,500
<i>Tagar</i>	71	396	0.03	98	3,000	6,000
Others (Mixed)	320	147	0.19	741	20,500	30,750
<b>Total</b>	-	-	<b>0.36</b>	<b>1,347</b>	<b>38,330</b>	<b>57,850</b>
<b>Medicinal and aromatic Plants</b>						
Tulsi	412	55	0.20	998	0.75	1,497
Amla	199	268	2.32	225	27.00	27,000
<i>Silikha</i>	209	258	2.82	274	21.92	21,920
<i>Suklati</i>	54	413	0.03	91	0.68	1,365
Neem	195	272	2.03	223	1.12	4,460
others(Mixed)	374	93	0.66	991	4.96	14,865
<b>Total</b>	-	-	<b>8.09</b>	-	<b>56.43</b>	<b>74,227</b>
<b>Total Households - 467</b>	-	-	<b>28.77</b>	<b>61,086</b>	-	<b>10,02,908</b>

Note: Field Survey Data

**Table- 4.3.b**  
**Number of Households Having Kitchen Garden/Backyard**

Dist/Block/Village	Name of the Crop*	No. of Household		If Yes or Having			
		Having	Not Having	Area (in ha)	No. of Plants	Production (qtl)	Annual Value (Rs.)
Kamrup(Rural)/	<b>Fruits</b>						
	Other citrus ( <i>Rabab Tenga</i> )	29	44	0.10	41	8.2	1,640
	Olive ( <i>Jalphai</i> )	8	65	0.14	14	7	3,500
	Orange(Mandarin)	50	23	0.27	107	21.4	10,700
	Pomegranate	41	32	0.05	48	1,284	5,136

Dist/Block/Village	Name of the Crop*	No. of Household		If Yes or Having				
		Having	Not Having	Area (in ha)	No. of Plants	Production (qtl)	Annual Value (Rs.)	
Bongaon/Satekona	Jackfruit	73	0	1.19	115	41.28	7,018	
	Mango	59	14	0.75	73	51.75	25,875	
	Blackberry/Whiteberry	5	68	0.09	9	2.555	2,044	
	Leteku	17	56	0.42	41	1.26	756	
	Lemon ( <i>Gul Nemu</i> )	42	31	0.08	92	7.38	8,118	
	Guava	62	11	0.26	94	14.1	3,525	
	Assam Lemon	70	3	0.19	213	10.65	9,053	
	Papaya	68	5	0.21	218	26.16	13,080	
	Banana	65	8	0.06	150	22.5	20,250	
	<b>Total</b>	-	-	<b>3.82</b>	<b>1,215</b>	<b>215.52</b>	<b>110,694</b>	
	<b>Vegetables</b>							
	Water Pumpkin	13	60	0.15	37	5.55	4,440	
	Spike Gourd	26	47	0.25	125	3.75	1,875	
	Ridge Gourd	17	56	0.17	92	1.84	1,288	
	White Gourd	17	56	0.10	52	10.4	5,200	
	<i>Turoi</i>	12	61	0.05	43	1.075	323	
	Potato	32	41	0.03	1,275	5.7375	2,869	
	Tomato	25	48	0.02	80	3.2	2,560	
	Brinjal	25	48	0.02	108	3.24	1,620	
	Green Chillies	25	48	0.02	155	0.775	388	
	Cabbage	29	44	0.01	551	4.408	1,322	
	Knol-Khol	29	44	0.01	575	0.575	173	
	Raddish	20	53	0.01	800	0.6	180	
	Beet Root	12	61	0.03	261	2.61	1,305	
	Carrot	32	41	0.01	1,248	0.624	250	
Capsicum	15	58	0.01	58	12.48	6,240		
French Beans	24	49	0.03	156	0.78	468		
Squash	12	61	0.11	42	0.504	252		
Leafy vegetables (Mixed)	52	21	0.07	15,080	1.26	630		
Beans (Cowpea)	23	50	0.04	97	0.291	116		
Lady's Finger	21	52	0.03	112	0.168	84		
Red Pumpkin	21	52	0.15	58	8.7	6,960		
Cucumber	21	52	0.22	98	1.96	980		
<b>Total</b>	-	-	<b>1.50</b>	<b>21,103</b>	<b>70.53</b>	<b>39,522</b>		
<b>Spice</b>								
Ginger	31	42	0.03	535	0.428	342		
Turmeric	43	30	0.05	775	0.775	388		
Tejpat	17	56	0.08	18	0.036	36		
Mint	55	18	0.21	4,200	2.1	4,200		
Black Pepper	51	22	0.02	210	0.525	8,400		
<b>Total</b>	-	-	<b>0.38</b>	<b>5,738</b>	<b>3.86</b>	<b>13,366</b>		
<b>Plantation</b>								
Arecanut (dry form)	73	0	0.33	436	3.488	34,880		
Coconut(in Nos.)	30	43	0.36	65	2275	22,750		
Betelvine( <i>Gussi</i> )	65	8	0.20	262	5240	20,960		
<b>Total</b>	-	-	<b>0.89</b>	<b>763</b>	<b>7518.49</b>	<b>78,590</b>		
<b>Flower (in Nos.)</b>								
Rose	63	10	0.04	131	2,530	5,060		
Marrigold	26	47	0.02	83	1,960	3,920		
<i>Joba</i>	37	36	0.04	134	5,240	5,240		
<i>Tagar</i>	53	20	0.04	112	3,565	7,130		
Others (Mixed)	73	0	0.05	215	5,840	8,760		
<b>Total</b>	-	-	<b>0.20</b>	<b>675</b>	<b>19135.00</b>	<b>30,110</b>		
<b>Medicinal and aromatic Plants</b>								
Tulsi	69	4	0.04	190	0.15	300		
Amla	62	11	0.75	73	8.34	8,340		
<i>Silikha</i>	39	34	0.47	46	3.76	3,760		
Sarpagandha	12	61	0.01	28	0.13	1,040		
<i>Suklati</i>	8	65	0.01	15	0.10	200		
Neem	64	9	0.77	85	0.55	2,200		
Others (Mixed)	73	0	0.17	253	1.31	3,930		
<b>Total</b>	-	-	<b>2.22</b>	<b>690</b>	<b>14.34</b>	<b>19,770</b>		
<b>Total Households - 73</b>	-	-	<b>9.01</b>	<b>30,184</b>	-	<b>2,92,052</b>		

Note: Field Survey Data

**Table- 4.3.c**  
**Number of Households Having Kitchen Garden/Backyard**

Dist/Block/Village	Name of the Crop*	No. of Household		If Yes or Having			
		Having	Not Having	Area (in ha)	No. of Plants	Production (qtl)	Annual Value (Rs.)
Nagaon/ Khagarijan/Senchowa	<b>Fruits</b>						
	Other citrus ( <i>Rabab Tenga</i> )	42	130	0.13	53	10.6	2,120
	Olive ( <i>Jalpai</i> )	12	160	0.16	16	8	4,000
	Orange(Mandarin)	18	154	0.08	32	6.4	3,200
	Pomegranate	13	159	0.03	25	0.384	1,536
	Jackfruit	91	81	1.03	103	21.5	3,655
	Mango	157	15	2.06	195	46.35	23,175

Blackberry/Whiteberry	3	169	0.04	4	6.825	5,460
Guava	128	44	0.46	168	25.2	6,300
Lemon ( <i>Gul Nemu</i> )	56	116	0.07	77	30.24	33,264
Assam Lemon	149	23	0.56	612	30.6	26,010
Papaya	152	20	0.41	456	54.72	27,360
Banana	163	9	0.13	311	46.65	41,985
Pineapple	5	167	0.001	31	0.2015	161
<b>Total</b>	-	-	<b>5.16</b>	<b>2,083</b>	<b>287.67</b>	<b>178,226</b>
<b>Vegetables</b>						
Water Pumpkin	47	125	0.22	55	8.25	6,600
Snake Gourd	21	151	0.08	38	1.14	570
Bitter Gourd	15	157	0.13	50	0.75	375
Ridge Gourd	35	137	0.20	112	2.24	1,568
White Gourd	63	109	0.27	135	27	13,500
<i>Turoi</i>	30	142	0.14	118	2.95	885
Potato	15	157	0.05	1891	8.5095	4,255
Tomato	27	145	0.01	55	2.2	1,760
Brinjal	109	63	0.09	413	12.39	6,195
Green Chillies	142	30	0.04	398	1.99	995
Cabbage	72	100	0.02	1440	11.52	3,456
Knol-Khol	72	100	0.02	1520	1.52	456
Cauliflower	55	117	0.01	825	1.65	825
Peas	21	151	0.02	412	1.03	824
Raddish	89	83	0.02	2715	2.03625	611
Carrot	22	150	0.01	858	0.429	172
Capsicum	13	159	0.01	73	8.58	4,290
French Beans	54	118	0.05	463	2.315	1,389
Beans (Cowpea)	58	114	0.13	352	1.056	422
Lady's Finger	58	114	0.15	588	0.882	441
Red Pumpkin	28	144	0.17	68	10.2	8,160
Cucumber	12	160	0.17	43	0.86	430
Leafy vegetables	137	35	0.24	41100	3.4	1,700
<b>Total</b>	-	-	<b>2.24</b>	<b>53,722</b>	<b>112.90</b>	<b>59,879</b>
<b>Spice</b>						
Ginger	62	110	0.04	615	0.492	394
Turmeric	72	100	0.06	980	0.98	490
Tamarind	4	168	0.02	4	1.2	1,200
Tejpat	25	147	0.29	69	0.138	138
Mint	61	111	0.31	6222	3.111	6,222
Black Pepper	41	131	0.01	142	0.355	5,680
<b>Total</b>	-	-	<b>0.73</b>	<b>8,032</b>	<b>6.28</b>	<b>14,124</b>
<b>Plantation</b>						
Arecanut(dry form)	172	0	1.18	1548	12.384	123,840
Coconut(Nos.)	119	53	1.23	221	7735	77,350
Betelvine( <i>Gussi</i> )	118	54	0.27	354	7080	28,320
<b>Total</b>	-	-	<b>2.67</b>	<b>2,123</b>	-	<b>229,510</b>
<b>Flower (in Nos.)</b>						
Rose	86	86	0.04	131	2,550	5,100
Marrigold	92	80	0.03	165	3,975	7,950
<i>Joba</i>	31	141	0.02	59	1,950	1,950
<i>Tagar</i>	55	117	0.03	88	2,850	5,700
Others(Mixed)	136	36	0.10	408	8,000	12,000
<b>Total</b>	-	-	<b>0.23</b>	<b>851</b>	<b>19,325.00</b>	<b>32,700</b>
<b>Medicinal and aromatic Plants</b>						
Tulsi	169	3	0.09	445	0.40	800
Amla	132	40	2.31	224	20.50	20,500
<i>Silikha</i>	148	24	2.05	199	15.50	15,500
Sarpagandha	65	107	0.03	98	0.50	4,000
<i>Suklati</i>	41	131	0.03	78	0.55	1,100
Neem	153	19	4.17	459	2.40	9,600
others(Mixed)	149	23	0.50	745	3.75	11,250
<b>Total</b>	-	-	<b>9.18</b>	<b>2,248</b>	<b>43.60</b>	<b>62,750</b>
<b>Total Households - 172</b>	-	-	<b>20.21</b>	<b>69,059</b>	-	<b>5,77,188</b>

Note: Field Survey Data

**Table- 4.3.d**  
**Number of Households Having Kitchen Garden/Backyard**

Dist/Block/Village	Name of the Crop*	No. of Household		If Yes or Having			
		Having	Not Having	Area (in ha)	No. of Plants	Production (qtl)	Annual Value (Rs.)
Sonitpur/ Gabharu/Bhumuraguri	<b>Fruits</b>						
	Other citrus ( <i>Rabab Tenga</i> )	79	328	0.38	152	30.4	6,080.00
	Olive ( <i>Jalphi</i> )	26	381	0.34	33	16.5	8,250.00
	Orange(Mandarin)	13	394	0.04	14	2.8	1,400.00
	Pomegranate	33	374	0.05	41	0.168	672.00
	Jackfruit	238	169	3.66	355	35.26	5,994.20

Mango	188	219	2.64	256	159.75	79,875.00
Lemon ( <i>Gul Nemu</i> )	85	322	0.13	147	46.08	50,688.00
Guava	202	205	1.06	389	58.35	14,587.50
Assam Lemon	287	120	0.37	412	20.6	17,510.00
Papaya	121	286	0.05	139	16.68	8,340.00
Banana	318	89	0.25	631	94.65	85,185.00
<b>Total</b>	-	-	<b>8.97</b>	<b>2,569</b>	<b>481.24</b>	<b>278,582</b>
<b>Vegetables</b>						
Water Pumpkin	92	315	0.31	155	23.25	18,600.00
Snake Gourd	41	366	0.17	69	2.07	1,035.00
Bitter Gourd	52	355	0.30	166	2.49	1,245.00
Ridge Gourd	89	318	1.60	798	15.96	11,172.00
White Gourd	115	292	0.44	221	44.2	22,100.00
<i>Turoi</i>	32	375	0.07	60	1.5	450.00
Potato	85	322	0.02	856	3.852	1,926.00
Tomato	71	336	0.09	345	13.8	11,040.00
Brinjal	110	297	0.09	411	12.33	6,165.00
Beans	49	358	0.02	194	0.97	485.00
Green Chillies	102	305	0.05	443	2.215	1,107.50
Cabbage	77	330	0.01	928	7.424	2,227.20
Knol-Khol	77	330	0.01	1050	1.05	315.00
Raddish	58	349	0.01	1022	0.7665	229.95
Leafy vegetables( Mixed)	311	96	0.55	93300	7.1	3,550.00
Beans (Cowpea)	125	282	0.28	1244	3.732	1,492.80
Lady's Finger	111	296	0.17	698	1.047	523.50
Red Pumpkin	240	167	1.66	665	99.75	79,800.00
Cucumber	92	315	1.11	278	5.56	2,780.00
<b>Total</b>	-	-	<b>6.96</b>	<b>102,903</b>	<b>249.07</b>	<b>166,244</b>
<b>Spice</b>						
Ginger	90	317	0.06	925	0.74	592.00
Turmeric	88	319	0.05	902	0.902	451.00
Tamarind	22	385	0.16	29	8.7	8,700.00
Mint	56	351	0.28	5602	2.801	5,602.00
Black Pepper	113	294	0.04	503	1.2575	20,120.00
<b>Total</b>	-	-	<b>0.59</b>	<b>7,961</b>	<b>14.40</b>	<b>35,465</b>
<b>Plantation</b>						
Arecanut(dry form)	397	10	2.42	3176	25.408	254,080.00
Coconut(Nos.)	124	283	1.22	220	7700	77,000.00
Betelvine( <i>Gussi</i> )	240	167	0.59	778	15560	62,240.00
<b>Total</b>	-	-	<b>4.23</b>	<b>4,174</b>	-	<b>393,320</b>
<b>Flower (in Nos.)</b>						
Rose	36	371	0.02	55	1,200	2,400.00
Marrigold	21	386	0.01	39	985	1,970.00
<i>Joba</i>	19	388	0.01	33	1,050	1,050.00
<i>Tagar</i>	18	389	0.01	28	950	1,900.00
Others( Mixed)	95	312	0.06	220	6,500	9,750.00
<b>Total</b>	-	-	<b>0.10</b>	<b>375</b>	<b>10,685.00</b>	<b>17,070</b>
<b>Medicinal and aromatic Plants</b>						
Tulsi	251	156	0.10	487	0.40	800.00
Amla	122	285	1.62	157	19.20	19,200.00
<i>Silikha</i>	119	288	1.45	141	11.50	11,500.00
<i>Suklati</i>	17	390	0.01	28	0.25	500.00
Neem	147	260	2.18	240	1.30	5,200.00
others( Mixed)	224	183	0.45	668	3.50	10,500.00
<b>Total</b>	-	-	<b>5.81</b>	<b>1,721</b>	<b>36.15</b>	<b>47,700</b>
<b>Total Households - 407</b>	-	-	<b>26.66</b>	<b>237,685</b>	-	<b>9,38,381</b>

Note: Field Survey Data

The estimated annual value of these crops grown by the sample farmers was Rs. 43,302.60 in Jadavpur village, Rs. 10,788.00 in Satekona village, Rs. 10,248.75 in Senchowa village and Rs. 11,507.50 in Bhumuraguri village.

**Table 4.4**  
**Horticultural Crops Plants in the Field Bund Lands in 2010-11**

Dist/Block/Village	Name of the Crop*	No. of Household		If Yes or Having			
		Having	Not	Area	No. of	Production	Annual

			Having	(in ha)	Plants	(qtl)	Value (Rs.)
Barpeta/Mandia/ Jadavpur	<b>Fruits :</b>						
	Banana	35	432	0.03	70	10.50	9,450.00
	Assam Lemon	41	426	0.09	98	4.90	4,165.00
	Jackfruit	5	462	0.07	7	84.28	14,327.60
	<b>Plantation :</b>						
	Areca nut (dry form)	64	403	0.15	192	1.54	15,360.00
<b>Total Households</b>	<b>467</b>	<b>-</b>	<b>-</b>	<b>0.34</b>	<b>367</b>	<b>101.22</b>	<b>43,302.60</b>
Kamrup(Rural)/Bongaon/ Satekona	<b>Fruits :</b>						
	Pineapple	8	65	0.01	240	1.56	1,248.00
	Orange	7	66	0.07	29	5.80	2,900.00
	<b>Plantation :</b>						
	Areca nut (dry form)	28	45	0.06	83	0.66	6,640.00
	<b>Total Households</b>	<b>73</b>	<b>-</b>	<b>-</b>	<b>0.14</b>	<b>352</b>	<b>8.02</b>
Nagaon/Khagarijan/ Senchowa	<b>Fruits :</b>						
	Banana	7	165	0.01	15	2.25	2,025.00
	Assam Lemon	3	169	0.01	9	0.45	382.50
	Mango	2	170	0.03	3	4.05	2,025.00
	<b>Vegetables :</b>						
	Arum	3	169	0.03	87	0.65	326.25
	<b>Plantation :</b>						
	172						
	Areca nut (dry form)	12	160	0.03	38	0.30	3,040.00
	Coconut (in Nos.)	3	169	0.04	7	245	2,450.00
<b>Total Households</b>	<b>172</b>	<b>-</b>	<b>-</b>	<b>0.15</b>	<b>159</b>	<b>-</b>	<b>10,248.75</b>
Sonitpur/Gabharu/ Bhumuraguri	<b>Fruits :</b>						
	Assam Lemon	9	398	0.01	27	1.35	1,147.50
	Banana	14	393	0.04	40	6.00	5,400.00
	<b>Plantation :</b>						
	Areca nut (dry form)	21	386	0.05	62	0.50	4,960.00
<b>Total Households</b>	<b>407</b>	<b>-</b>	<b>-</b>	<b>0.10</b>	<b>129</b>	<b>7.85</b>	<b>11,507.50</b>
<b>Total</b>	<b>1119</b>	<b>-</b>	<b>-</b>	<b>0.73</b>	<b>1007</b>	<b>-</b>	<b>75,846.85</b>

Note: Field Survey Data

### 4.3 Adoption of New Technologies by the Farmers

Adoption of new farm technology is a must to make the agriculture a profit making venture. In horticultural sector, use of scientific methods of cultivation such as use of poly house, green house, adoption of INM and IPM technology, better post harvest technology, use of improved tools and implements *etc.* are important for reaping better harvest.

New farm technology can help in better production and more income in a short period of time with less labour cost. Use of poly house and green house can reduce the dependency on rainfall and makes the optimum use of land and water resources. It enables the farmers to generate income round the year by growing multiple crops.

Farming in Assam, continues to be mostly traditional. Due to a number of factors like low educational standard, ignorance and financial hardship, the farmers are yet to become aware of the benefits of new farm technology.

In the sample villages, the horticultural crop growers had not adopted full package of improved technology in crop production. Only a few farmers used poly house and INM/IPM technique in a small area of their cultivated land.

Table-4.5 reveals the extent of adoption of improved technology in crop production by the sample farmers in the year 2010-11. The new technologies adopted by the farmers included use of poly houses, adoption of Integrated Nutrient Management (INM) and Integrated Pest Management (IPM).

**Table 4.5**  
**Adoption of Improved Technology by the Sample Farmers in 2010-11**

(Area in ha.)

Name of the Village/Block	Poly House		Green House		INM/IPM		Other (Specify)		Total Farmers	Area
	No. of Farmer	Area	No. of Farmer	Area	No. of Farmer	Area	No. of Farmer	Area		
Jadavpur/ Mandia District Barpeta	20	0.4	-	-	232	13.92	-	-	232	14.32
Satekona/ Bongaon District Kamrup(Rural)	-	-	-	-	35	12.25	-	-	35	12.25
Senchowa/ Khagarijan District Nagaon	-	-	-	-	-	-	-	-	-	-
Bhumuraguri/ Gabharu District Sonitpur	16	0.3	-	-	102	39.78	-	-	118	40.08
<b>State Total</b>	36	0.7	-	-	369	65.95	-	-	369	66.65
<b>Per Household</b>	-	0.02	-	-	-	0.18	-	-	-	0.18

Source: Field Survey

In Jadavpur village, 20 sample farmers adopted poly house technology which covered 0.40 hectare of area and 232 sample farmers adopted INM/IPM technology covering 13.92 hectare of land area.

In Satekona village, 35 sample farmers adopted INM/IPM technology covering 12.25 hectares of land area.

In Bhumuraguri village, 118 sample farmers adopted new technology in the reference year in an area of 40.08 hectares.

There was no report of adoption of any improved technology in horticultural crops amongst the sample farmers of Senchowa village under Nagaon district.

#### **4.4 Benefits Received from the Government for the Development of Horticulture**

Government incentives may be in cash or kind, can motivate the resource-poor farmers of the state to a great extent. The farmers of Assam in general, are unaware of the marvels of modern technologies which can successfully be applied in their farm field. At times, they cannot afford to buy or apply the modern inputs because of financial hardship & unavailability in the nearby markets. If the government comes forward with necessary incentives, the farmers can reap higher production and improve their economic condition.

But in the study area there was no report of any benefit or support from any agency for growth and development of traditional crops in the reference year.

#### 4.5 Problems Faced by the Farmers in Application of Improved Technology

The sample farmers as reported continued to face a number of that problems in adopting improved technology like poly house, green house and application of INM and IPM practices. (Table-4.6). It was found that majority of the sample farmers could not apply improved technology due to high cost of inputs , followed by financial crunch, lack of proper knowledge, in accessibility, lack of proper guidance and ignorance of the farmers .

**Table 4.6**  
**Problem Faced by the Farmers in Application of**  
**Improved Technology in 2010-11**

(Multiple Choice)

District/Block/Village	Name of the Problem	No. of Farmers having Poly House	No. of Farmers having Green House	No. of Farmers using INM/IPM
Barpeta/Mandia /Jadavpur	High Cost	11	-	42
	Lack of proper knowledge	5	-	78
	Lack of guidance	18	-	21
	Not in easy reach	-	-	54
	Financial crunch	20	-	49
	Ignorance	3	-	18
<b>Total Farmers</b>	<b>252</b>			
Kamrup (Rural)/ Bongaon/Satekona	High Cost	-	-	25
	Lack of knowledge	-	-	10
	Lack of guidance	-	-	8
	Not in easy reach	-	-	32
	Financial crunch	-	-	12
	Ignorance	-	-	-
<b>Total Farmers</b>	<b>35</b>			
Nagaon/Khagarijan /Senchowa	High Cost	-	-	-
	Lack of knowledge	-	-	-
	Lack of guidance	-	-	-
	Not in easy reach	-	-	-
	Financial crunch	-	-	-
	Ignorance	-	-	-
<b>Total Farmers</b>	<b>0</b>			
Sonitpur/Gabharu /Bhumuraguri	High Cost	15	-	98
	Lack of knowledge	12	-	14
	Lack of guidance	12	-	26
	Not in easy reach	-	-	45
	Financial crunch	10	-	52
	Ignorance	9	-	15
<b>Total Farmers</b>	<b>118</b>			
<b>Total</b>	<b>405</b>			

Source: Field Survey

#### 4.6. Nature of Problems Faced by the Sample Farmers

The opinion of the sample farmers were collected/obtained to sort out the individual difficulties faced by them in growing horticultural crops. Table - 4.7 presents the nature of problems faced by the crop growers in the sample villages.

The Table clearly shows that road infrastructure was the major problem faced by 84.63 per cent of the sample farmers. Storage was the second large problem



felt by 42.90 per cent farmers. Shortage of quality seed was another problem for 23.50 per cent of the sample respondents. Among the other constraints of growing horticultural crops as identified by the sample farmers were shortage of labour (8.85%), packaging of products (7.69 %) and lack of potential market (7.95 %).

**Table 4.7**  
**Nature of Problems Faced by the Farmers of Horticulture in 2010-11**

Name of the Village/Block	Road Infrastructure	Seeds	Packaging Material	Labour	Storage	Market	Total Farmers
<b>Jadavpur/ Mandia</b> District Barpeta	467	0	0	0	0	89	<b>467</b>
<b>Satekona/ Bongaon</b> District Kamrup(Rural)	73	0	0	41	73	0	<b>73</b>
<b>Senchowa/ Khagarijan</b> District Nagaon	0	0	0	58	0	0	<b>172</b>
<b>Bhumuraguri/ Gabharu</b> District Sonitpur	407	263	86	0	407	0	<b>407</b>
<b>State Total</b>	<b>947</b>	<b>263</b>	<b>86</b>	<b>99</b>	<b>480</b>	<b>89</b>	<b>1119</b>
Percent	<b>84.63</b>	<b>23.50</b>	<b>7.69</b>	<b>8.85</b>	<b>42.90</b>	<b>7.95</b>	<b>-</b>

Source: Field Survey

#### **4.7 Farmers Contacted by the Agencies for Baseline Survey**

Farmers' cooperation is must to collect the useful information necessary for Baseline Survey in any locality. They must take the agencies in to confidence for divulging the actual field data. However, no sample farmers in the study area have ever been approached by any agencies for conduct of baseline survey in recent years (Table-4.8)

**Table - 4.8**  
**No. of Farmers Contacted by the Agencies for Baseline Survey in Recent Years**

Name of the Village/Block	Total Farmers	Farmer Contacted	Year of Contacting	Name of the Agency	Information Sought (Two main)	Information Missed by the agencies (as You feel)
<b>Jadavpur/ Mandia</b> District Barpeta	467	0	-	-	-	-

<b>Satekona/ Bongaon</b> District Kamrup(Rural)	73	0	-	-	-	-
<b>Senchowa/ Khagarijan</b> District Nagaon	172	0	-	-	-	-
<b>Bhumuraguri/ Gabharu</b> District Sonitpur	407	0	-	-	-	-
<b>State Total</b>	1119	0	-	-	-	-
<b>Percent</b>	100	-	-	-	-	-

Source: Field Survey

#### 4.8 Suggestions given by the sample farmers for the improvement of Horticulture

All the farmers of the sample villages were asked to provide three important suggestions on priority basis for the development of horticulture from their observations and past experiences. Table-4.9 presents the specific observations made by the sample farmers. According to the Table, all the sample farmers of the selected villages felt that soil testing is a must for balanced use of fertilizer and other farm inputs. They opined that their soil needs to be tested in order to determine proper doses of fertilizers in the crops. Presently, they are applying fertilizers & other inputs based on their traditional knowledge and experience. So before applying any inputs in the field, they suggested that soil testing should be undertaken first on priority basis.

The second important suggestion offered by the sample farmers of Jadavpur and Senchowa village was supply of the required quantity of micro-nutrients like zinc and boron.

Micro nutrients are generally used at the time of flowering/ fruiting stage of the crops with the help of sprayers. But the required micro-nutrients were not available within the easy reach of the farmers at the time of application. They have to purchased it from the fertilizer dealer(s) generally located in distant places for which they have to bear an extra overhead cost on transportation. Therefore, the sample farmers suggested that the required micro nutrients should be made available within the vicinity of the village area or nearby towns. Moreover, the State Horticulture Department should launch vigorous campaign to educate the farmers on application of micronutrients.

**Table- 4.9**  
**Three Most important Suggestions given by the Farmers**  
**for the Improvement of Horticulture**

Name of the Village/Block	Total Farmers	1	2	3
<b>Jadavpur/ Mandia</b> District Barpeta	467	Soil testing is a must for balance use of fertilizer	The micronutrient deficiency is a major constraint for horticultural crops (zinc and boron)	Marketing & road communication should be improved(specially for flood affected area)

<b>Satekona/ Bongaon</b> District Kamrup(Rural)	73	Soil testing is a must for balance use of fertilizer and other inputs	Road communication should be improved by providing pucca road with RCC bridge.	Fruit grading machine supplied under TM should be made operational
<b>Senchowa/ Khagarijan</b> District Nagaon	172	Soil testing is a must for balance use of fertilizer	The micronutrient deficiency is a major constraint for horticultural crops(zinc and boron)	Assured price for marketed quantity
<b>Bhumuraguri/ Gabharu</b> District Sonitpur	407	Soil testing is a must for balance use of fertilizer and other inputs	Marketing & road communication should be improved(specially for flood affected area)	Quality seed in adequate quantities be arranged at subsidized rate by the State Govt. in time (if possible)
<b>State Total</b>	1119			

Source: Field Survey

Note: Three most important suggestions on priority basis, as 1, 2, 3.

The sample respondents of Satekona and Bhumuraguri village suggested that road communication and marketing infrastructure should be developed so that their produce can be transported to the market easily. At the time of field investigation, it was noticed that most of the sample areas were flood affected and road condition was very bad. Most of the horticultural crops are perishable in nature and the sample farmers were deprived of getting better price for their output due to lack of adequate market support . So, the sample farmers felt that market and road communication should be improved.

The third suggestion given by the farmers of Jadavpur village was improvement of marketing and road condition. They opined that market should be established in nearby areas so that the villagers can carry their produce easily to the market place without lose of quality. Moreover, road communication should be improved by providing pucca road with RCC bridge particularly in flood affected areas.

The sample respondents of Satekona village were of the view that Fruit Grading Machine supplied under the Technology Mission in their locality should be made functional so that grading of horticultural crops can be undertaken easily and earn better prices from each unit of horticultural crops with different grades.

The third suggestion given by the farmers of Senchowa village was to ensure better price for marketed quantity.

The respondents of Bhumuraguri village were of the view that the quality seed/ planting material in adequate quantities be arranged in subsidized rate by the government on time and they considered it to be the third important suggestion for improvement of horticulture.

Horticultural development being a State subject, the Govt. and associated agencies may come forward to consider the issues raised by the sample farmers and take appropriate measures so that the farmers can improve their livelihood conditions.

The respondents of all the sample villages also foresaw the prospects of horticultural crops in their locality.

**Table 4.10**  
**Three Most Important Future Prospects of Horticulture**  
**as Expressed by Farmers**

Name of the Village/Block	Total Farmers	Future Prospects		
		1	2	3
Jadavpur/ Mandia District Barpeta	467	Export potentialities	There is a scope value added product	Employment generation
Satekona/ Bongaon District Kamrup(Rural)	73	There is a scope value added product	Employment generation	Export potentialities due to special taste and flavour
Senchowa/ Khagarijan District Nagaon	172	New variety	Better Price	There is a scope of value added product
Bhumuraguri/ Gabharu District Sonitpur	407	Cold storage	Fixation of price by the Govt. agencies	processed food
<b>State Total</b>	1119			

Source : Field Survey

Table-4.10 reflects the three most important prospects of horticultural crops as reported by the sample farmers.

According to the Table, the respondents of Jadavpur village considered export potentialities first, scope of value added product second and creation of employment generation as the third future prospect of horticultural crops in their locality. The increasing demand for horticultural crops specially, fruits and vegetables in the food basket of large number of population have opened up the prospects for export as well as processing industry in the state. Value addition including grading and standardization of horticultural products according to size, shape and degree of ripeness/maturity can fetch better prices & may create additional employment avenues in the study area.

The sample farmers of Satekona village rated value addition as first, employment generation as second and export potentialities as third important prospect of horticulture. They opined that, if the measures are taken in right perspectives, the value addition can increase employment potential and because of better taste and flavor of orange in their locality, may enhance the export potentialities as well.

In Senchowa village, the sample respondents saw bright prospects ahead with new improved variety planting materials at the first instance. It is seen that the productivity of old trees, specially the plantation crops declined sharply with age, and

as such, complete replacement of those trees by high yielding improved planting materials can bring about considerable changes. The respondents found better price for their produce as second future prospect. The farmers considered value addition as the third area of importance to look in to.

The respondents of Bhumuraguri village ranked cold storage as the first future prospect, fixation of price by the Government agencies as the second and processed food as the third important area to harness the huge potential inherent to their locality. They were of the view that the Government should come forward to create cold storage facilities/ food processing facilities. If the vicinity of the crop-growing areas and necessary measures are taken to ensure remunerative prices to the farmers, then the horticultural sector can bring about a sea-change in their economic life.

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## **Chapter V**

### **Methodologies Adopted and Training Programme Conducted for Estimating Horticultural Crops**

In this chapter, an attempt has been made to analyse the different methodologies and systems followed by different agencies in estimating horticultural base line data in India and Assam along with the training programmes conducted in the sample areas.

#### **5.1 Database & its significance**

Data is one of the most critical requirements in the modern information age to allow integrated planning and efficient management of resources. As such, availability of reliable data is crucial for determining the status of horticultural development situation and also for making the same available for the use/benefits of planners, producers & consumers. A systematic data base is essential for estimation of growth, assessment of demand and supply, identification of problems and constraints and also for evolving adaptive policies and prospects. Similarly, detailed data is required, district/cluster/component wise, to monitor and evaluate the impact of various development schemes such as NHM and other Government sponsored

schemes. Availability of reliable data can also prevent misdirection or misplacement of policy objectives and priorities.

## **5.2 Methodologies followed by Central Agencies**

The estimation of horticultural crop data mainly comprises of area and production data on Fruits, vegetables, spices, aromatic crops, nuts and flowers. There are two main agencies in the country level which generate production data on horticultural crops. The first is the Directorate of Economics and Statistics, Ministry of Agriculture (DESMOA), which operates a Centrally Sponsored Scheme “Crop Estimation Survey on Fruits and Vegetables”. This scheme is in operation in 11 States of India (i.e. Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Maharashtra, Odisha, Punjab, Rajasthan, Haryana Tamilnadu & Uttar Pradesh) covering 7 fruit and 7 vegetable and spice crops for estimating area and production. The fruit crops covered under the estimation system are mango, banana, apple, citrus, grapes, pineapple and guava. The vegetable and spice crops include potato, onion, tomato, cabbage, cauliflower, ginger and turmeric. The survey, which is still in a “pilot” stage follows a stratified three-stage random sampling design in the case of fruit crops, with village, orchard and fruit bearing tree as the sampling units at the successive stages. The sample size is usually 150 to 200 villages in each major fruit-growing district, five orchards per sample village and four fruit bearing trees per orchard. The number and weight of fruits gathered from the sampled trees is observed and recorded, which form the basis for yield estimation. The survey approach in case of vegetable crops is somewhat more complex because of their special features like short duration of the crop and the number of pickings required recording the harvested produce. The results of the DESMOA survey are published in its “Report and Database of Pilot Scheme on Major Fruits and Vegetables”.

The second source of horticultural statistics is the National Horticultural Board (NHB), which compiles and publishes estimates of area, production and prices of all important fruit and vegetable crops based on reports furnished by the State Directorates of Horticulture and Agriculture. The methodology followed by NHB for estimating area and production has not been clearly spelt out. These estimates are apparently based on the informed assessment of local officials dealing with horticulture and the reports of market arrivals in major wholesale fruit and vegetable markets.

Directorate of Economics and Statistics (DES) releases estimates of area, production and yield in respect of principal crops and selected important horticultural crops. For area estimation, a prescribed method based on categorization of States is used which includes use of land records maintained by revenue agencies and the area statistics built up on the basis of sample surveys as envisaged under the scheme called 'Establishment of an Agency for Reporting of Agricultural Statistics' (EARAS). The yield rate is another important component to arrive at production estimates. The yield estimates are obtained through analysis of Crop Cutting Experiments (CCE) conducted under scientifically designed General Crop Estimation Surveys (GCES).

It was also noticed that the Directorate of Economics and Statistics (DES) conducts crop cutting experiments on 9 crops *i.e.* summer paddy, winter paddy, autumn paddy, mustard, sugarcane, maize, jute, black gram and potato. Thus, potato is the only horticultural crop on which crop cutting method is applied for estimation of view data. In case of mixed crops, numbers of plants are estimated by the concerned officials to arrive at area data. For other horticultural crops, area and production data are calculated by eye estimation and oral enquiry.

### **5.3 Methodology adopted for estimating horticultural crops in Assam**

In Assam, multiple agencies are involved in collection/generation of horticultural data and are enumerated below:

#### **5.3.1. Department of Horticulture/Agriculture**

Horticulture set up in the state of Assam is not an old one. Horticulture department in the state have been set up by bifurcation of State Agriculture Department. Consequently the statistical activities for horticulture rest partly with agriculture and horticulture department and also with State Directorate of Economics and Statistics. These three State Departments play vital role in generating statistics on area, production and productivity of horticultural crops.

Horticultural crops in Assam are by and large, scattered in nature – each household maintaining data for few crops. Large plantations of single crops are rare in sight. Usually, the Village Level Extension Workers (VLEW) and Agricultural Development Officer collect the field level data on the basis of household in terms of number of plants of a particular crop they grow. In the next phase, the number of crops per unit area with standard spacing is calculated to arrive at the area that can be covered with the number of plants already assessed for the village. Reports received from each of the district are compiled to project the State level data. Similarly, as

regards productivity, it is calculated on average weight basis which is multiplied by the area to arrive at the figure on total production.

### **5.3.2 Directorate of Economics and Statistics (DES)**

The Directorate of Economics and Statistics under the department of Agriculture, is declared as State Agricultural Statistics Authority (SASA), by the Government of India. The department is responsible for collecting and compiling district level data on agriculture and other areas relating to agriculture. Compiled data are then transmitted to the Directorate of Economics and Statistics in Ministry of Agriculture and Co-operation Government of India, which in turn, generate all India crop estimates. All the State Governments also use the agricultural statistics estimated by the Directorate of Economics and Statistics (SASA) to take administrative policy decisions. The various schemes of data collection undertaken by the agriculture department in the state of Assam in brief are as follows.

#### **5.3.2.1 Land Utilisation Statistics (LUS)**

Data on land use and crop area in the State originate as a by-product of Land Revenue Administration. The system envisages field to field enumeration by the *Lat Mandals* (Primary Workers) in the villages under their jurisdiction in each crop season. The details of crop area and land use particulars are recorded in a register called 'CHITHA'. On the basis of this basic document, the Directorate of Economics & Statistics, Government of Assam has to prepare district and State level land use statistics *i.e.* area abstract, crop abstract and irrigation abstract. But this procedure entails and induces delays in providing statistics of area under crops for which proper utilization (for production estimates of different crops) is not done.

#### **5.3.2.2 Timely Reporting Schemes (TRS)**

In order to streamline the system of area reporting, a programme known as Timely Reporting Scheme (TRS) was introduced by the Union Ministry of Agriculture and Co-operation, Government of India way back in 1973-74. The purpose of this scheme was to make administrative policy decision *etc.* of the State Government and to prepare reliable estimates of area under different crops and its production which are required much in advance. Though the primary field work is carried out by the field worker (*Mandals*) of the Revenue Department, the Director of Economics and Statistics used to draw up the technical plan & programme, organize the training programmes and analyze the results.

#### **5.3.2.3 State Committee on Agricultural Statistics (SCAS)**



Agriculture Department of the State has constituted a Sub-divisional Committee on Agricultural Statistics (SDCAS) for preparation of forecast area under crops and review of collection, compilation and maintenance of Agricultural Statistics in the Sub-division level. There is also another committee namely, “The State Committee on Agricultural Statistics (SCAS)”, with the Secretary to the Government of Assam, Revenue Department as Chairman and Director of Economics and Statistics as Member-secretary for preparation of forecast area and production of crops and for review of collection, compilation and finalization of data on agricultural State statistics at the level.

The following is the composition of the State committee on Agricultural Statistics in Assam:

- |    |   |                   |
|----|---|-------------------|
| 1. | The Secretary to the Govt. of Assam, Revenue Deptt.     | Chairman          |
| 2. | The Secretary to the Govt. of Assam, Agriculture Deptt. | Member            |
| 3. | The Secretary to the Govt. of Assam, Supply Deptt.      | Member            |
| 4. | Director of Agriculture, Assam                          | Member            |
| 5. | Director of Land Record, Assam                          | Member            |
| 6. | Chief Engineer (Irrigation) Deptt., Assam               | Member            |
| 7. | Chief conservator of Forest, Assam                      | Member            |
| 8. | Director of Economics & Statistics, Assam               | Member- Secretary |

#### **5.3.2.4 Crop Estimation Survey (CES)**

Crop Estimation Survey (CES) is one of the vital components relating to agricultural statistics undertaken by the Directorate of Economics & Statistics, Assam. The objective of CES is to estimate district level and State level average yield (Kg/hect.) and production of principal food and non-food crops conducting scientifically planned crop cutting experiments in the field level. Nine principal food and non-food crops are covered under CES in Assam which include autumn paddy, jute, winter paddy, black gram, rape & mustard, potato, sugarcane, wheat and summer paddy. The crop estimation surveys are being done under the technical guidance of National Sample Survey Organization (NSSO), Government of India.

#### **5.3.3 Forecast Crop Calendar**

The Government of India has introduced a crop calendar showing specific dates and crops for holding forecast meetings at sub-division level for preparation of forecast area and estimation of average yield *etc.* on receipt of which, the meetings of SCAS are held for finalization and release of District and State level estimates of area,

average yield and production for onward transmission to the Government of India as per crop forecast calendar.

### 5.3.4 Survey on Areca nut, Coconut, Fruits & Vegetables (ACFV)

During the fifth plan period, the necessity of accurate statistics on area and production of arecanut, coconut, fruits and vegetables was felt for formulation of various agricultural development programmes. As such a sample survey for estimation of area and production of arecanut and coconut was started in Assam in the year 1958-59. In 1976-77, the scope of the survey was extended for estimation of yield rate and production of fruits and vegetables as well. This survey is conducted regularly by the Directorate of Economics & Statistics, Government of Assam, following some specific statistical techniques.

The Table -5.1(a), Table -5.1(b) and Table -5.1(c) depict the system of forwarding of collected horticultural data and verification by the Department of Horticulture/ Agriculture, Department of Revenue and Directorate of Economics & Statistics, Government of Assam, respectively.

**Table 5.1(a)**  
**Forwarding of Collected Data and Verification of Horticultural Crops**  
**(Department of Horticulture/ Agriculture)**

Crops	Village to Block	Block to District	District to State	Verification at village level	Verification at District level	Verification at State Level
Fruits	VLEW	ADO	DAO	ADO	SDAO/DAO	JDA (Stats.)
Vegetables	VLEW	ADO	DAO	ADO	SDAO/DAO	JDA (Stats.)
Garden/Plantation	VLEW	ADO	DAO	ADO	SDAO/DAO	JDA (Stats.)
Spices	VLEW	ADO	DAO	ADO	SDAO/DAO	JDA (Stats.)

Source: Field Survey data

- Note: 1. VLEW - Village Level Extension Worker  
2. ADO - Agriculture Development Officer  
3. DAO - District Agriculture Officer  
4. SDAO - Sub-Divisional Agriculture Officer  
5. JDA - Joint Director, Agriculture

It was observed that (Table -5.1(a), the VLEWs collect the data in village and block level and forward the same to the Agriculture Development Officer of the concerned district. The ADOs send the collected data to the District Agriculture Officer of the respected district. The ADOs verify the village level data and Sub-Divisional Agriculture Officers verify it at the district level and finally verification is done in state level by the Joint Director of Agriculture.

The Revenue Department (Table -5.1(b) collect the area data of different horticultural crops by *Lat Mandals* and forward the data to the SDO (Revenue) and finally, data are forwarded to the Secretary (Revenue), Government of Assam.

**Table- 5.1 (b)**  
**Forwarding of Collected Data and Verification of Horticultural Crops**  
**(Department of Revenue)**

Crops	Village to Circle	Circle to District	District to State	Verification at village level	Verification at District level	Verification at State Level
<b>Fruits</b>	Lat Mandal	SDO (Revenue)	DC	Kanungo	ADC(Revenue)/DC	Secretary (Revenue)
<b>Vegetables</b>	Lat Mandal	SDO (Revenue)	DC	Kanungo	ADC(Revenue)/DC	Secretary (Revenue)
<b>Garden/Plantation</b>	Lat Mandal	SDO (Revenue)	DC	Kanungo	ADC(Revenue)/DC	Secretary (Revenue)
<b>Spices</b>	Lat Mandal	SDO (Revenue)	DC	Kanungo	ADC(Revenue)/DC	Secretary (Revenue)

Source: Field Survey data

The system of data collection followed by the Directorate of Economics & Statistics is presented in Table-5.1(c). The primary data collected by the Field Assistant is forwarded to the Inspector of Statistics of respective district. The data are then sent to the Dy. Director (DES) for verification of district level data and the Director, Economics and Statistics finalizes the estimated data.

**Table 5.1( c)**  
**Forwarding Collected Data and Verification of Horticultural Crops**  
**(Directorate of Economics and Statistics)**

Crops	Village to Block	Block to District	District to State	Verification at village level	Verification at District level	Verification at State Level
Fruits	Field Assistant	Inspector of Statistics	Dy. Director (DES)	Inspector of Statistics	Dy. Director (DES)	Director (E & S)
Vegetables	Field Assistant	Inspector of Statistics	Dy. Director (DES)	Inspector of Statistics	Dy. Director (DES)	Director (E & S)
Garden/Plantation	Field Assistant	Inspector of Statistics	Dy. Director (DES)	Inspector of Statistics	Dy. Director (DES)	Director (E & S)
Spices	Field Assistant	Inspector of Statistics	Dy. Director (DES)	Inspector of Statistics	Dy. Director (DES)	Director (E & S)

Source: Field Survey data

Different methods adopted for collection of different groups of horticultural crops by the concerned departments were collected and presented in Table-5.2(a), Table-5.2(b) and Table-5.2(c).

**Table- 5.2(a)**  
**Method Adopted for Collection of Data on Mixed and Intercropping in 2010-11**  
**(Department of Horticulture/ Agriculture)**

Name of the Village/ Block	Fruits	Vegetables	Garden/ Plantation	Spices
<b>Jadavpur/ Mandia</b>	1 & 2	1 & 2	1 & 2	1 & 2

District Barpeta				
<b>Satekona/ Bongaon</b> District Kamrup(Rural)	1 & 2	1 & 2	1 & 2	1 & 2
<b>Senchowa/ Khagarijan</b> District Nagaon	1 & 2	1 & 2	1 & 2	1 & 2
<b>Bhumuraguri/ Gabharu</b> District Sonitpur	1 & 2	1 & 2	1 & 2	1 & 2

Source: Field Survey data

Note: Response code-

1. Estimate of area is based on number of Plants as reported by the farmers or by eye estimation
2. Estimate of yield is based on oral enquiry to the farmers or on average based on eye estimation

Table-5.2 (a) shows that the Department of Agriculture/ Horticulture collected area data by estimating number of plants, oral enquiry and general crop estimation survey. For yield estimate, eye estimation, oral enquiry and general crop estimation survey was adopted for all groups of crops.

The Revenue Department {Table-5.2(b)} followed field to field enumeration or Chitha Book for area estimation while the Directorate of Economics and Statistics followed general crop estimation survey, counting of number of plants and oral enquiry for area and yield estimation {Table-5.2(c)}.

**Table- 5.2(b)**  
**Method Adopted for Collection of Data on Mixed and Intercropping in 2010-11**  
**(Department of Revenue)**

Name of the Village/Block	Fruits	Vegetables	Garden/ Plantation	Spices
Jadavpur/ Mandia District Barpeta	1	1	1	1
Satekona/ Bongaon District Kamrup(Rural)	1	1	1	1
Senchowa/ Khagarijan District Nagaon	1	1	1	1
Bhumuraguri/ Gabharu District Sonitpur	NA	NA	NA	NA

Note: Response code- (Revenue Department deals with area data only)

1. Estimate of area is based on number of Plants as reported by the farmers or by eye estimation

**Table- 5.2( c)**  
**Method Adopted for Collection of Data on Mixed and Intercropping in 2010-11**  
**(Directorate of Economics and Statistics)**

Name of the Village/Block	Fruits	Vegetables	Garden/ Plantation	Spices
<b>Jadavpur/ Mandia</b> District Barpeta	1 & 2	1 & 2	1 & 2	1 & 2
<b>Satekona/ Bongaon</b> District Kamrup(Rural)	1 & 2	1 & 2	1 & 2	1 & 2
<b>Senchowa/ Khagarijan</b> District Nagaon	1 & 2	1 & 2	1 & 2	1 & 2
<b>Bhumuraguri/ Gabharu</b> District Sonitpur	1 & 2	1 & 2	1 & 2	1 & 2

Note: Response code-

1. Estimate of area is based on number of Plants as reported by the farmers or by eye estimation
2. Estimate of yield is based on oral enquiry to the farmers or on average based on eye estimation

It was observed that the mixed cropping was the common practice followed in the study area for all the crop groups. Particularly in vegetables cultivation mixed cropping system was widely practiced. Under the situation, the area was estimated based on the number of plants usually reported by the farmers or eye estimation of the officials of related Departments. On the basis of the number of plants, they estimated the required area of plantation. For yield rate estimation, oral enquiry was the normal practice followed across the districts.

### **5.3.5 Department of Forest**

Reliable forestry statistics are required for planning, policy-making, analysis and decision-making on forest management and development programmes. These statistics are collected mainly as a by-product of administrative reports of the State Forest Departments. On the recommendation of the National Commission on Agriculture (1976), the Forest Survey of India (FSI) was created in 1981 with the objective of monitoring the forest resources at macro level, storing and retrieving forestry related data, designing methodology for forest surveys, *etc.* Besides the FSI, the Indian Council of Forestry Research and Education (ICFRE) is mandated to collect, collate and compile primary and secondary data generated by the State Forest Departments and various Central Ministries. The data on the forest resource are obtained through a set of periodical reports furnished by the State Forest Departments and other agencies. In addition to details of forest area, the reports provide information on forest products (wood and non-wood), forest land under cultivation, and grazing land, *etc.*

Since 1987, the FSI started using Remote Sensing (RS) technology to collect data on forest cover under three broad classes (dense forest, open forest and mangroves) on a country-wide mode through a biennial survey. Introduction of digital interpretation has helped in reducing the time lag between the availability of the area estimates and completion of the survey.

The Directorate of Economics and Statistics, Ministry of Agriculture (DESMOA) also publishes statistics of area under forests as part of land use statistics according to the definition adopted in the nine-fold classification of land. This includes all land categorised as forests under any legal enactment dealing with the forests or administered as forests whether owned by the State or private agencies.

### 5.3.6. NSSO

National Sample Survey Organization (NSSO) under the Ministry of Statistics & Programme Implementation, Government of India has overall responsibility of providing technical guidance to all the States in developing suitable survey techniques for obtaining reliable estimates, assistance for training of staff and for ensuring supervision. For the improvement of collection of crop statistics, NSSO and Government of India jointly with State Government of Assam introduced a scheme entitled “Improvement of Crop Statistics” (ICS) in the State from 1974-75. The objective of the scheme is to locate deficiencies in the system of collection of crop statistics by exercising meaningful technical supervision over the primary field workers and to suggest remedial measures for improvement of the system.

### 5.4 Training and Extension Programmes conducted for officials for estimation of Horticultural Crops

Training and extension programme for the officials attached with the job of collecting base line data is very much necessary for conducting proper estimation survey of horticultural crops. The accuracy of crop cutting experiment data, crop forecast data *etc.* cannot be granted without proper training and extension support to the concerned officials involved in collection of base line data on area, production and productivity of crops.

**Table 5.3(a)**  
**Training Conducted for Estimation of Area, Production and Yield (2010-11)**

Name of the Village/Block	Name of Training	Duration	Place*	Yes/No		If yes, Mention advantages
				Yes (1)	No (2)	
Jadavpur/ Mandia District Barpeta	Annual Agricultural Refresher Training on Crop Estimation Survey	Two days	3	1	-	Helped the field level officials in conducting crop cutting experiments and crop forecast
Satekona/ Bongaon District Kamrup(Rural)	Crop Cutting Method	One day	3	-	2	-
Senchowa/ Khagarijan District Nagaon	-	-	-	-	2	-
Bhumuraguri/ Gabharu District Sonitpur	-	-	-	-	2	-

Note: 1. Duration in Days;

2. \* Village =1, Block =2, District HQ =3, State Capital =4, and Outside the State = 5.

In the sample districts of Barpeta and Kamrup (Metro), the district level, block level and village level officials reported that they underwent two training programmes, viz. one refresher training and another on crop cutting method in the reference year. The training was conducted by the Department of Agriculture/

Horticulture. The Department of Economics and Statistics also imparted training in all the sample districts as indicated.

**Table 5.3 (b)**  
**Training Conducted for Estimation of Area, Production and Yield (2010-11)**  
**(Directorate of Economics and Statistics)**

Name of the Village/Block	Name of Training	Duration \$	Place*	Yes/No		If yes, Mention advantages
				Yes (1)	No (2)	
Jadavpur/ Mandia District Barpeta	Annual Agricultural Refresher Training on Crop Estimation Survey	Two days	3	1	-	Increases technical efficiency
Satekona/ Bongaon District Kamrup(Rural)	Annual Agricultural Refresher Training on Crop Estimation Survey	Two days	3	1	-	Helped the field level officials regarding methodologies and their applications Helped the field level officials to conduct field surveys
Senchowa/ Khagarijan District Nagaon	Annual Agricultural Refresher Training on Crop Estimation Survey	Two days	3	1	-	
Bhumuraguri/ Gabharu District Sonitpur	Annual Agricultural Refresher Training on Crop Estimation Survey	Two days	3	1		Refreshment on methodologies and their adoption

Note: 1. Duration in Days;

2. \* Village =1, Block =2, District HQ =3, State Capital =4, and Outside the State = 5.

In Table- 5.3(a) and Table-5.3(b), it was observed that all the refresher training programmes were conducted in the district head quarter. All the respondent officials were of the view that, this kind of training programme greatly helped them in conducting crop cutting experiments and working out land utilization statistics and crop forecasting.

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## Chapter-VI

### Survey Results of Horticultural Crops

In this chapter an attempt has been made to analyse the area, production and productivity of different horticultural crops grown by the sample farmers.

#### 6.1 Area, Production and Productivity of Horticultural crops by the Sample Farmers

In the study areas, the sample farmers grew various types of fruits, vegetables, spices and plantation crops in different seasons.

Table- 6.1(a) shows the area, production and yield of fruits grown by the sample villagers. Among the fruit crops, the sample farmers grew mainly pineapple, banana, orange and Assam lemon. Moreover, papaya was also grown by some of the farmers in their homestead and backyard gardens for domestic consumption. It was found that in Jadavpur village, the farmers cultivated banana in 0.19 hectares of un-irrigated land and has vested 23.13 quintals of production with the yield rate of 12,325 kg/ha.

In Satekona village, out of the total fruit crop area of 34.82 hectares, 79.44 per cent (27.66 hectares) were devoted for cultivation of orange (Mandarin) and the remaining 20.54 per cent (7.16 hectares) were for pineapple cultivation. Here, it is to be noted that pineapple was harvested in both *kharif* and *rabi* season from the same area. But in *rabi* season, production and yield rate was too low as compared to *kharif* season. As recorded, the production and yield of orange was 4,501.31 qtl. and 16,275 kg/ha., respectively while the estimated figures for pine apple, in the same order were



1,321.95 qtl. and 18,463 kg/ha in *kharif* season and 293.77 qtl. and 4,103 kg/ha in *rabi* season.

In Sensowa village, only banana cultivation was observed in 0.35 hectares of un- irrigated land. The production and productivity were recorded at 35.41 qtl. and 10,245 kg/ha, respectively.

In Bhumuraguri village, both Assam lemon and banana were grown by the farmers in un- irrigated dry land. Of the total 1.22 hectares of land, 0.73 hectare was allocated to Assam lemon and 0.49 hectare for banana cultivation. The production and productivity of Assam lemon was 48.12 qtl. and 6,587 kg/ha, respectively, and that of banana was 46.81 qtl. and 9,538 kg/ha respectively.

**Table – 6.1(a)**  
**Area, Production and Yield of Horticultural Crops 2010-11 (Fruits)**

District/ Block/ Village	Season	Name of the Crop*	Irrigated			Unirrigated/Dry			Total		
			Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)
Barpeta/ Mandia/ Jadavpur	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Banana	-	-	-	0.19	23.13	12,325	0.19	23.13	12,325
<b>Total Farmers</b>	<b>467</b>					<b>0.19</b>	<b>23.13</b>	<b>12,325</b>	<b>0.19</b>	<b>23.13</b>	<b>12,325</b>
Kamrup(Rural)/ Bongaon/ Satekona	Kharif	Pineapple	-	-	-	7.16	1,321.95	18,463	7.16	1321.95	18,463
	Rabi	Orange(Mandarin)	-	-	-	27.66	4,501.31	16,275	27.66	4501.31	16,275
		Pineapple	-	-	-	7.16	293.77	4103	7.16	293.77	4,103
	Summer	Nil	-	-	-	-	-	-	-	-	-
Annual	Nil	-	-	-	-	-	-	-	-	-	
<b>Total Farmers</b>	<b>73</b>					<b>34.82</b>	<b>6,117.03</b>	<b>17,569</b>	<b>34.82</b>	<b>6117.03</b>	<b>17,569</b>
Nagaon/ Khagarijan/ Senchowa	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Banana	-	-	-	0.35	35.41	10,245	0.35	35.41	10,245
<b>Total Farmers</b>	<b>172</b>					<b>0.35</b>	<b>35.41</b>	<b>10,245</b>	<b>0.35</b>	<b>35.41</b>	<b>10,245</b>
Sonitpur/ Gabharu/ Bhumuraguri	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Assam Lemon	-	-	-	0.73	48.12	6,587	0.73	48.12	6,587
Banana		-	-	-	0.49	46.81	9,538	0.49	46.81	9,538	
<b>Total Farmers</b>	<b>407</b>					<b>1.22</b>	<b>94.93</b>	<b>7,773</b>	<b>1.22</b>	<b>94.93</b>	<b>7,773</b>
<b>Total</b>	<b>1119</b>					<b>36.57</b>	<b>6,270.51</b>	<b>17,145</b>	<b>36.57</b>	<b>6270.51</b>	<b>17,145</b>

Note: Pineapple was harvested in two seasons viz.- Kharif and Rabi against the same area.

Source: Field survey data

Combining all the sample villages together, one can see that 36.57 hectares of land was utilised for cultivation of fruit crops, comprising 1.03 hectares for banana, 27.66 hectares for orange, 7.16 hectares for pineapple and 0.73 hectare for Assam lemon.

Table- 6.1(b) presents the details of area, production and productivity of vegetable crops cultivated by the sample villagers. It was observed that almost all the *kharif*, *rabi* and *summer* vegetables were grown by the sample farmers. According to the Table, in Jadavpur village of Barpeta district, of the total land of 28.00 hectares used for vegetable crops, 12.00 hectares were irrigated and 16.00 hectares were dry land. In un-irrigated areas, pointed gourd and ridge gourd were grown in *kharif* season while potato and brinjal were grown in *rabi* season. In the village, there was no report of growing any summer or annual crops.

In Satekona village of Kamrup district, all the vegetables were grown in un-irrigated land viz. ridge gourd, snack gourd and bitter gourd during the *kharif* season. The villagers grew red pumpkin and arum in summer season in an area of 0.85 hectare and 1.50 hectare respectively.

In Senchowa village of Nagaon district, no vegetable area was allocated for *kharif*, *summer* and *annual* crops. Only in *rabi* season, potato and brinjal were grown in 0.67 hectare and 0.31 hectare of irrigated land, respectively.

In Bhumuraguri village of Sonitpur district, the farmers grew almost all the vegetables in all the seasons. As a matter of fact, Sonitpur is the maximum vegetables producing district of Assam. In *kharif* season, water pumpkin and white gourd, in *rabi* season potato, tomato, brinjal, onion, green chilies, sweet potato, cabbage, cauliflower, pea, radish, carrot, capsicum and other leafy vegetables and in summer season, brinjal, long beans, lady's finger, red pumpkin, cucumber, *kunduli etc.* were grown by sample growers.

Combining all the sample vegetables growers, one can see that, of the total 162.03 hectares of land, 76.52 (123.98 hectares) percent were irrigated and 23.48 per cent (38.05 hectares) were un- irrigated. The sample farmers reported that they reaped better harvest from irrigated areas as compared to rainfed areas.

Assam has been growing a variety of spices, among which ginger, turmeric, coriander and chilli have been the most common ones. In consideration of growing market demand, the State Agriculture Department has come forward to focus on four major spice crops *i.e.* black pepper, turmeric, ginger and chilli in recent years. The

**Table – 6.1(b)**  
**Area, Production and Yield of Horticultural Crops 2010-11 (Vegetables)**

District/ Block/ Village	Season	Name of the Crop*	Irrigated			Unirrigated/Dry			Total		
			Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)
Barpeta/ Mandia/ Jadavpur	Kharif	Pointed Gourd	-	-	-	10.00	945.00	9,450	10.00	945.00	9,450
		Ridge Gourd	-	-	-	6.00	616.50	10,275	6.00	616.50	10,275
	Rabi	Potato	5.00	380.75	7,615	-	-	-	5.00	380.75	7,615
		Brinjal	7.00	1704.50	24,350	-	-	-	7.00	1704.50	24,350
	Summer	Nil	-	-	-	-	-	-	-	-	-
Annual	Nil	-	-	-	-	-	-	-	-	-	
<b>Total Farmers</b>	<b>467</b>		<b>12.00</b>	<b>2085.25</b>	<b>17,377</b>	<b>16.00</b>	<b>1561.50</b>	<b>9,759</b>	<b>28.00</b>	<b>3646.75</b>	<b>13,024</b>
Kamrup(Rural)/ Bongaon/ Satekona	Kharif	Ridge Gourd	-	-	-	1.20	102.00	8,500	1.20	102.00	8500
		Snack Gourd	-	-	-	0.85	61.84	7,275	0.85	61.84	7275
		Bitter Gourd	-	-	-	0.65	41.34	6360	0.65	41.34	6360
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Red Pumpkin	-	-	-	0.85	131.75	15,500	0.85	131.75	15,500
		Arum	-	-	-	1.50	67.88	4,525	1.50	67.88	4,525
Annual	Nil	-	-	-	-	-	-	-	-	-	
<b>Total Farmers</b>	<b>73</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>5.05</b>	<b>404.80</b>	<b>8,016</b>	<b>5.05</b>	<b>404.80</b>	<b>8,016</b>
Nagaon/ Khagarijan/ Senchowa	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Potato	0.67	45.73	6,825	-	-	-	0.67	45.73	6,825
		Brinjal	0.31	72.29	23,320	-	-	-	0.31	72.29	23,320
	Summer	Nil	-	-	-	-	-	-	-	-	-
Annual	Nil	-	-	-	-	-	-	-	-	-	
<b>Total Farmers</b>	<b>172</b>		<b>0.98</b>	<b>45.73</b>	<b>6,825</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.98</b>	<b>45.73</b>	<b>6,825</b>

Contd./-

**Table – 6.1(b) contd.**

District/ Block/ Village	Season	Name of the Crop*	Irrigated			Unirrigated/Dry			Total		
			Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)
Sonitpur/ Gabharu/ Bhumuraguri	Kharif	Water Pumpkin	-	-	-	1.00	87.50	8,750	1.00	87.50	8,750
		White Gourd	-	-	-	0.52	48.98	9,420	0.52	48.98	9,420
	Rabi	Potato	23.50	2056.25	8,750	-	-	-	23.50	2056.25	8,750
		Tomato	8.63	2804.75	32,500	-	-	-	8.63	2804.75	32,500
		Brinjal	10.50	2751.00	26,200	-	-	-	10.50	2751.00	26,200
		Onion	12.00	1050.00	8,750	-	-	-	12.00	1050.00	8,750
		Green Chillies	4.00	300.00	7,500	-	-	-	4.00	300.00	7,500
		Sweet Potato	-	-	-	1.50	194.10	12,940	1.50	194.10	12,940
		Cabbage	17.00	5996.75	35,275	-	-	-	17.00	5996.75	35,275
		Cauliflower	13.00	1664.00	12,800	-	-	-	13.00	1664.00	12,800
		Peas	9.00	108.00	1,200	-	-	-	9.00	108.00	1,200
		Raddish	4.50	711.00	15,800	-	-	-	4.50	711.00	15,800
		Carrot	4.00	830.00	20,750	-	-	-	4.00	830.00	20,750
		Capsicum	1.30	58.50	4,500	-	-	-	1.30	58.50	4,500
		Leafy vegetables- Menthi	0.06	1.23	2,045	-	-	-	0.06	1.23	2,045
		Palak	0.26	5.85	2,250	-	-	-	0.26	5.85	2,250
		Lai	0.39	11.65	2,988	-	-	-	0.39	11.65	2,988
	Marisa	0.18	5.18	2,875	-	-	-	0.18	5.18	2,875	
	Corriander <i>Dhania</i>	2.50	45.38	1,815	-	-	-	2.50	45.38	1,815	
	Others	0.18	3.69	2,050	-	-	-	0.18	3.69	2,050	
	Summer	Brinjal				1.00	24.90	2,490	1.00	24.90	2,490
		Long Beans (Cowpea)				0.80	101.96	12,745	0.80	101.96	12,745
		Lady's Finger (Okra)				8.00	1144.00	14,300	8.00	1144.00	14,300
		Red Pumpkin				2.50	441.25	17,650	2.50	441.25	17,650
		Cucumber				1.03	84.72	8,225	1.03	84.72	8,225
		<i>Kunduli</i>				0.65	39.31	6,048	0.65	39.31	6,048
Annual	Nil										
<b>Total Farmers</b>	<b>407</b>		<b>111.00</b>	<b>18403.22</b>	<b>16,579</b>	<b>17.00</b>	<b>2166.72</b>	<b>12,745</b>	<b>128.00</b>	<b>20569.94</b>	<b>16,070</b>
<b>Total</b>	<b>1119</b>		<b>123.98</b>	<b>20488.47</b>	<b>16,526</b>	<b>38.05</b>	<b>4133.03</b>	<b>10,862</b>	<b>162.03</b>	<b>24621.50</b>	<b>15,196</b>

Source: Field survey data

State of Assam may not be best known as a major spice growing state, but the productivity of spices here is much above the national average. While the present all-India average spice productivity stands at 1,617 kg per hectare, the corresponding figure for Assam is recorded to be 2,490 kg/ha. In case of ginger, Assam's productivity was 6.80 tonnes per hectare which was almost double than that of the national average of 3.50 tonnes per hectare.

Table- 6.1(c) represents the area, production and productivity of spice cultivation in sample villages. According to the Table, in Jadavpur village, the sample farmers grew coriander, garlic, ginger, turmeric and dry chilies; in Satekona village, only black pepper was grown. In Sensowa village, ginger, turmeric and black pepper while in Bhumuraguri village, coriander, garlic, ginger and turmeric were grown in un-irrigated areas. In case of coriander, Jadavpur village showed higher productivity (1,267 kg/ha) than Bhumuraguri village (980 kg/ha) sample. In garlic production, Jadavpur village (4,500 kg/ha) again registered higher productivity than Bhumuraguri village (3,520 kg/ha.). In ginger production, highest yield was found in Jadavpur (7,133 kg/ha) followed by Bhumuraguri (5,623 kg/ha.) and Sensowa village (5,167 kg/ha). In turmeric production, highest yield rate was recorded in Jadavpur village (1,067 kg/ha) followed by Sensowa (750 kg/ha) and Bhumuraguri village (683 kg/ha). In black pepper cultivation, the sample farmers from Satekona village (1,538 kg/ha) received higher yield as compared to their counterparts in Sensowa village (1,418 kg/ha).

It can be concluded that Jadavpur village in Barpeta district was in a better position in spice cultivation, which was well reflected in higher productivity as compared to other sample villages under the study.

Table- 6.1(d) shows the area, production and productivity of garden and plantation crops grown by the sample villagers. It was mentioned elsewhere that Nagaon is the highest plantation crops growing district of Assam. Among the plantation crops, arecanut and coconut are extensively being grown in the district. However, almost all the sample farmers of other districts also grow these two crops in their homestead land. These two fruit crops are usually used in all social functions of each and every assamese family. Moreover, betelvine was also grown by many of the sample farmers.

**Table – 6.1(c)**  
**Area, Production and Yield of Horticultural Crops 2010-11 (Spices)**

District/ Block/ Village	Season	Name of the Crop*	Irrigated			Unirrigated/Dry			Total		
			Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)
Barpeta/ Mandia/ Jadavpur	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Corriander	-	-	-	1.20	15.20	1,267	1.20	15.20	1,267
		Garlic	-	-	-	10.02	450.90	4,500	10.02	450.90	4,500
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Ginger	-	-	-	3.67	261.78	7,133	3.67	261.78	7,133
		Turmeric	-	-	-	3.20	34.14	1,067	3.20	34.14	1,067
		Dry Chillies	-	-	-	5.60	40.26	719	5.60	40.26	719
<b>Total Farmers</b>	<b>467</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>23.69</b>	<b>802.29</b>	<b>3,387</b>	<b>23.69</b>	<b>802.29</b>	<b>3,387</b>
Kamrup(Rural)/ Bongaon/ Satekona	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Black Pepper	-	-	-	0.20	3.08	1,538	0.20	3.08	1,538
<b>Total Farmers</b>	<b>73</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>0.20</b>	<b>3.08</b>	<b>1,538</b>	<b>0.20</b>	<b>3.08</b>	<b>1,538</b>
Nagaon/ Khagarijan/ Senchowa	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Ginger	-	-	-	2.64	136.41	5,167	2.64	136.41	5,167
		Turmeric	-	-	-	1.12	8.40	750	1.12	8.40	750
		Black Pepper	-	-	-	0.13	1.84	1418	0.13	1.84	1418
<b>Total Farmers</b>	<b>172</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>3.89</b>	<b>146.65</b>	<b>3,770</b>	<b>3.89</b>	<b>146.65</b>	<b>3,770</b>
Sonitpur/ Gabharu/ Bhumuraguri	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Corriander	-	-	-	2.18	21.36	980	2.18	21.36	980
		Garlic	-	-	-	1.50	52.80	3,520	1.50	52.80	3,520
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Ginger	-	-	-	1.80	101.21	5,623	1.80	101.21	5,623
Turmeric		-	-	-	2.21	15.09	683	2.21	15.09	683	
Total Farmers	<b>407</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>7.69</b>	<b>190.47</b>	<b>2,477</b>	<b>7.69</b>	<b>190.47</b>	<b>2,477</b>
<b>Total</b>	<b>1119</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>35.47</b>	<b>992.77</b>	<b>2,799</b>	<b>35.47</b>	<b>992.77</b>	<b>2,799</b>

Source: Field survey data

**Table – 6.1(d)**  
**Area, Production and Yield of Horticultural Crops 2010-11 (Garden/Plantation)**

District/ Block/ Village	Season	Name of the Crop*	Irrigated			Unirrigated/Dry			Total		
			Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)	Area (ha)	Production (qtl)	Yield (kg/ha)
Barpeta/ Mandia/ Jadavpur	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Arecanut (Dry form)				2.80	4.59	164	2.80	4.59	164
<b>Total Farmers</b>	<b>467</b>				<b>2.80</b>	<b>4.59</b>	<b>164</b>	<b>2.80</b>	<b>4.59</b>	<b>164</b>	
Kamrup(Rural)/ Bongaon/ Satekona	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Arecanut (Dry form)				2.91	5.51	189	2.91	5.51	189
		Betelvine (in <i>Gussi</i> )				1.25	68,250	54,600	1.25	68,250	54,600
<b>Total Farmers</b>	<b>73</b>				<b>4.16</b>	<b>-</b>	<b>-</b>	<b>4.16</b>	<b>-</b>	<b>-</b>	
Nagaon/ Khagarijan/ Senchowa	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Arecanut (Dry form)	-	-	-	3.52	5.73	163	3.52	5.73	2,800
		Coconut (in Nos.)	-	-	-	2.56	43,601	17,032	2.56	43,601	17,032
		Betelvine (in <i>Gussi</i> )	-	-	-	1.20	59,915	49,929	1.20	59,915	49,929
<b>Total Farmers</b>	<b>172</b>				<b>7.28</b>	<b>-</b>	<b>-</b>	<b>7.28</b>	<b>-</b>	<b>-</b>	
Sonitpur/ Gabharu/ Bhumuraguri	Kharif	Nil	-	-	-	-	-	-	-	-	-
	Rabi	Nil	-	-	-	-	-	-	-	-	-
	Summer	Nil	-	-	-	-	-	-	-	-	-
	Annual	Arecanut (Dry form)	-	-	-	0.59	0.72	122	0.59	0.72	122
		Coconut (in Nos.)	-	-	-	0.91	13,867	15,239	0.91	13,867	15,239
		Betelvine (in <i>Gussi</i> )	-	-	-	0.39	17,131	43,925	0.39	17,131	43,925
<b>Total Farmers</b>	<b>407</b>				<b>1.89</b>	<b>-</b>	<b>-</b>	<b>1.89</b>	<b>-</b>	<b>-</b>	
<b>Total</b>	<b>1,119</b>				<b>16.13</b>	<b>-</b>	<b>-</b>	<b>16.13</b>	<b>-</b>	<b>-</b>	

Source: Field survey data



The Table shows that the entire area under plantation crops was rainfed. Of the total land under garden and plantation crops, 17.36 per cent was under Jadavpur village in Barpeta district, 25.79 per cent in Satekona village of Kamrup district, 45.13 per cent in Sensowa village of Nagaon district and 11.72 per cent in Bhumuraguri village of Sonitpur district. Of the four sample villages, coconut area was found only in Sensowa and Bhumuraguri village while betelvine area was found in Satekona, Sensowa and Bhumuraguri villages. It was found that yield rate of areca nut was highest in Satekona village (189 kg/ha), followed by Jadavpur (164 kg/ha), Sensowa (163kg/ha.) and Bhumuraguri village (122 kg/ha). In case of coconut, Sensowa village recorded highest productivity (17,032 no./ha.) followed by Bhumuraguri village (15,239 no/ha.). In case of betelvine, Satekona village registered highest productivity (54,600 gussi/ha) followed by Sensowa (49,929 gussi/ha) and Bhumuraguri village (43,925 gussi/ha).

## **6.2 Irrigation Status (Season wise)**

Irrigation is one of the important component of crop production with the help of which, the level of production can be increased under rainfed situation. In the sample villages, a section of the farmers utilised irrigation water especially in *rabi* season due to scanty rainfall during the season. Table-6.2 shows the season wise and source wise irrigation status of the sample villages.

In Jadavpur village, the farmers irrigated 12 hectares of land for growing vegetable crops with the aid of diesel operated tubewells. There was no record of using irrigation in other crop seasons.

Similarly, in Senchowa and Bhumuraguri villages, 0.98 hectare and 111.00 hectare of horticultural land respectively were irrigated through diesel operated shallow tubewells.

In Satekona village, the farmers grew the crops under rainfed condition. Thus altogether, 123.98 hectares of land area were irrigated to grow various horticultural crops during the *rabi* season and the only source of irrigation was diesel operated shallow tube well.

**Table – 6.2**  
**Season-wise Distribution of Irrigated Land Area by Source**  
(in ha)

District/ Block/Village	Seasons	Major Crop Category	Canal	Tube well Diesel	Tube Well Electric	Tank	Open well	Any other	Total
Barpeta/ Mandia/Jadavpur	Kharif	Fruits	-	-	-	-	-	-	-
		Vegetables	-	-	-	-	-	-	-
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Rabi	Fruits	-	-	-	-	-	-	-
		Vegetables	-	12.00	-	-	-	-	12.00
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Summer	Fruits	-	-	-	-	-	-	-
		Vegetables	-	-	-	-	-	-	-
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Annual	Fruits	-	-	-	-	-	-	-
Vegetables		-	-	-	-	-	-	-	
Spices		-	-	-	-	-	-	-	
Garden/plantation		-	-	-	-	-	-	-	
<b>Total Farmers</b>	<b>467</b>		-	<b>12.00</b>	-	-	-	<b>12.00</b>	
Kamrup(Rural)/ Bongaon/Satekona	Kharif	Fruits	-	-	-	-	-	-	-
		Vegetables	-	-	-	-	-	-	-
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Rabi	Fruits	-	-	-	-	-	-	-
		Vegetables	-	-	-	-	-	-	-
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Summer	Fruits	-	-	-	-	-	-	-
		Vegetables	-	-	-	-	-	-	-
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Annual	Fruits	-	-	-	-	-	-	-
Vegetables		-	-	-	-	-	-	-	
Spices		-	-	-	-	-	-	-	
Garden/plantation		-	-	-	-	-	-	-	
<b>Total Farmers</b>	<b>73</b>		-	-	-	-	-	-	
Nagaon/ Khagarjan/Senchowa	Kharif	Fruits	-	-	-	-	-	-	-
		Vegetables	-	-	-	-	-	-	-
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Rabi	Fruits	-	-	-	-	-	-	-
		Vegetables	-	0.98	-	-	-	-	0.98
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Summer	Fruits	-	-	-	-	-	-	-
		Vegetables	-	-	-	-	-	-	-
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Annual	Fruits	-	-	-	-	-	-	-
Vegetables		-	-	-	-	-	-	-	
Spices		-	-	-	-	-	-	-	
Garden/plantation		-	-	-	-	-	-	-	
<b>Total Farmers</b>	<b>172</b>		-	<b>0.98</b>	-	-	-	<b>0.98</b>	
Sonitpur/ Gabharu/Bhumuraguri	Kharif	Fruits	-	-	-	-	-	-	-
		Vegetables	-	-	-	-	-	-	-
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Rabi	Fruits	-	-	-	-	-	-	-
		Vegetables	-	111.00	-	-	-	-	111.00
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Summer	Fruits	-	-	-	-	-	-	-
		Vegetables	-	-	-	-	-	-	-
		Spices	-	-	-	-	-	-	-
		Garden/plantation	-	-	-	-	-	-	-
	Annual	Fruits	-	-	-	-	-	-	-
Vegetables		-	-	-	-	-	-	-	
Spices		-	-	-	-	-	-	-	
Garden/plantation		-	-	-	-	-	-	-	
<b>Total Farmers</b>	<b>407</b>		-	<b>111.00</b>	-	-	-	<b>111.00</b>	
<b>Total</b>	<b>1,119</b>		-	<b>123.98</b>	-	-	-	<b>123.98</b>	

Source: Field survey data

**Table – 6.3**  
**Number of Plants and Area Covered in Different Seasons, 2010-11**

(Area in Ha.)

Dist/Block/Village	Major Crop	Kharif		Rabi		Summer		Annual		Total
	Category	Area	plant	Area	plant	Area	plant	Area	plant	Area
<b>Barpeta/Mandia/Jadavpur</b>	<b>Fruits</b>							0.19	665	<b>0.19</b>
	<b>Vegetables</b>	16.00	28,300	12.00	244,750					<b>28.00</b>
	<b>Spices</b>			11.22	176,049			12.47	128,445	<b>23.69</b>
	<b>Garden/plantation</b>							2.80	3,682	<b>2.80</b>
<b>Total Farmers</b>		<b>16.00</b>	<b>28,300</b>	<b>23.22</b>	<b>420,799</b>			<b>15.46</b>	<b>132,792</b>	<b>54.68</b>
<b>Kamrup(Rural)/Bongaon/Satekona</b>	<b>Fruits</b>	7.16	313,422	27.66	10,951					<b>34.82</b>
	<b>Vegetables</b>	2.70	1,354			2.35	10,740			<b>5.05</b>
	<b>Spices</b>							0.20	263	<b>0.20</b>
	<b>Garden/plantation</b>							4.16	5,470	<b>4.16</b>
<b>Total Farmers</b>		<b>9.86</b>	<b>314,776</b>	<b>27.66</b>	<b>10,951</b>	<b>2.35</b>	<b>10,740</b>	<b>4.36</b>	<b>5,733</b>	<b>44.23</b>
<b>Nagaon/Khagarijan/Senchowa</b>	<b>Fruits</b>							0.35	1,225	<b>0.35</b>
	<b>Vegetables</b>	0.98	29,971							<b>0.98</b>
	<b>Spices</b>							3.89	59,571	<b>3.89</b>
	<b>Garden/plantation</b>							7.28	6,668	<b>7.28</b>
<b>Total Farmers</b>		<b>0.98</b>	<b>29,971</b>					<b>11.52</b>	<b>67,464</b>	<b>12.50</b>
<b>Sonitpur/Gabharu/Bhumuraguri</b>	<b>Fruits</b>							1.22	4,270	<b>1.22</b>
	<b>Vegetables</b>	1.52	510	112.50	5,918,590	13.98	48,650			<b>128.00</b>
	<b>Spices</b>			3.68	95,167			4.01	64,365	<b>7.69</b>
	<b>Garden/plantation</b>							1.89	1,453	<b>1.89</b>
<b>Total Farmers</b>		<b>1.52</b>	<b>510</b>	<b>116.18</b>	<b>6,013,757</b>	<b>13.98</b>	<b>48,650</b>	<b>7.12</b>	<b>70,088</b>	<b>138.80</b>
<b>Total</b>		<b>28.36</b>	<b>373,557</b>	<b>167.06</b>	<b>6,445,507</b>	<b>16.33</b>	<b>59,390</b>	<b>38.46</b>	<b>276,077</b>	<b>250.21</b>

Source: Field survey data

### **6.3 Number of plants and area covered across the seasons**

The density of crops is considered to be one of the important components to study the production potentiality of crops. Table-6.3 revealed that in *kharif* season the density of various plants was 13,172 nos./ha. comprising 2,837 nos./ha in vegetables and 43,774 nos./ha in fruits cultivation.

In *rabi* season, the number of various crops covered per hectare was 38,582 consisting 49,505 nos. vegetables and 396 nos. fruits.

In summer season, only vegetables crops were grown by the sample farmers whose density was 4,570 nos. /ha in Satekona village and 3,480 nos./ha in Bhumuraguri village.

In case of annual crops, fruit crops were found 3,500 nos. per hectare and garden/plantation crops 1,071 nos. per hectare.

Table- 6.4 exhibits the area under mono cropping and mixed cropping in different seasons. It is found that, of the total 250.21 hectares of land under different horticultural crops 83.67 (209.35 hectares) per cent were under mono crops and the remaining 16.33 (40.86 hectares) per cent were mixed cropped area. The Table also reveals that the area under fruits in all the sample villages and the vegetables area in Jadavpur and Senchowa villages were mostly mono-cropped. The spice crops in all the four villages, as annual were grown under mixed cropping system. In Jadavpur and Bhumuraguri villages, spice crops were cultivated as mono crop during Rabi season. The garden/plantation crops in all the sample villages were cultivated as a crop mixture.

The above analysis indicates that mono-cropping system was predominant in the study area. The farmers of the study area might not be aware of increasing the cropping intensity by resorting to mixed cropping system.

### **6.4 Area, production, marketed quantity and farm gate price across the seasons**

The estimates of area, production, marketable surplus and net return of the farmer are important to know the economic condition of the farming community. It was tried to study the area, production, marketed quantity and farm gate price across the season and is presented in Table- 6.5.

It was observed that in Jadavpur village, highest area was covered by garlic cultivation followed by pointed gourd, brinjal, ridge gourd, dry chillies, potato, ginger, turmeric, arecanut, coriander and banana. In case of farm gate price, highest amount was realised from arecanut production and least income was generated from pointed gourd cultivation. The total income earned by the sample farmers of Jadavpur

**Table - 6.4**  
**Distribution of Area under Mono Cropping and Mixed Cropping by Seasons**

(Area in Ha.)

District/ Block/Village	Major Crop Category	Kharif			Rabi			Summer			Annual			Total		
		Mono	Mixed	Total	Mono	Mixed	Total	Mono	Mixed	Total	Mono	Mixed	Total	Mono	Mixed	Total
Barpeta/ Mandia/Jadavpur	Fruits										0.19	0.00	0.19	0.19	0.00	0.19
	Vegetables	16.00	0.00	16.00	12.00	0.00	12.00							28.00	0.00	28.00
	Spices				11.22	0.00	11.22				8.17	4.30	12.47	19.39	4.30	23.69
	Garden/plantation						0.00				0.00	2.80	2.80	0.00	2.80	2.80
<b>Total Farmers</b>		<b>16.00</b>	<b>0.00</b>	<b>16.00</b>	<b>23.22</b>	<b>0.00</b>	<b>23.22</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>8.36</b>	<b>7.10</b>	<b>15.46</b>	<b>47.58</b>	<b>7.10</b>	<b>54.68</b>
Kamrup(Rural)/ Bongaon/Satekona	Fruits	7.16	0.00	7.16	27.66	0.00	27.66							34.82	0.00	34.82
	Vegetables	1.20	1.50	2.70				2.35	0.00	2.35				3.55	1.50	5.05
	Spices										0.00	0.20	0.20	0.00	0.20	0.20
	Garden/plantation										2.71	1.45	4.16	2.71	1.45	4.16
<b>Total Farmers</b>		<b>8.36</b>	<b>1.50</b>	<b>9.86</b>	<b>27.66</b>	<b>0.00</b>	<b>27.66</b>	<b>2.35</b>	<b>0.00</b>	<b>2.35</b>	<b>2.71</b>	<b>1.65</b>	<b>4.36</b>	<b>41.08</b>	<b>3.15</b>	<b>44.23</b>
Nagaon/ Khagarijan/Senchowa	Fruits										0.35	0.00	0.35	0.35	0.00	0.35
	Vegetables				0.98	0.00	0.98							0.98	0.00	0.98
	Spices										0.00	3.89	3.89	0.00	3.89	3.89
	Garden/plantation										1.33	5.95	7.28	1.33	5.95	7.28
<b>Total Farmers</b>		<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.98</b>	<b>0.00</b>	<b>0.98</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>1.68</b>	<b>9.84</b>	<b>11.52</b>	<b>2.66</b>	<b>9.84</b>	<b>12.50</b>
Sonitpur/ Gabharu/Bhumuraguri	Fruits										1.22	0.00	1.22	1.22	0.00	1.22
	Vegetables	1.52	0.00	1.52	96.13	16.37	112.50	13.98	0.00	13.98				111.63	16.37	128.00
	Spices				3.68	0.00	3.68				0.00	4.01	4.01	3.68	4.01	7.69
	Garden/plantation										1.50	0.39	1.89	1.50	0.39	1.89
<b>Total Farmers</b>		<b>1.52</b>	<b>0.00</b>	<b>1.52</b>	<b>99.81</b>	<b>16.37</b>	<b>116.18</b>	<b>13.98</b>	<b>0.00</b>	<b>13.98</b>	<b>2.72</b>	<b>4.40</b>	<b>7.12</b>	<b>118.03</b>	<b>20.77</b>	<b>138.80</b>
<b>State Total</b>		<b>25.88</b>	<b>1.50</b>	<b>27.38</b>	<b>151.67</b>	<b>16.37</b>	<b>168.04</b>	<b>16.33</b>	<b>0.00</b>	<b>16.33</b>	<b>15.47</b>	<b>22.99</b>	<b>38.46</b>	<b>209.35</b>	<b>40.86</b>	<b>250.21</b>

Source: Field Survey data

**Table - 6.5**  
**Area, Production, Marketed Qty and Farm Gate Prices of different Horticultural Crops by season in 2010-11**  
(Area in Ha; Quantity in qtl, Price in Rs/qlt)

District/ Block/ Village	Major Crop Category	Name of the Crop*	Kharif				Rabi				Summer				Annual				Total			
			Area	Pro#	MQ	FGP*	Area	Pro#	MQ	FGP*	Area	Pro#	MQ	FGP*	Area	Pro#	MQ	FGP*	Area	Pro#	MQ	FGP*
Barpeta/ Mandia/ Jadavpur	Fruit	Banana												0.19	23.13	22.90	1,500.00	0.19	23.13	22.90	1,500.00	
	Vegetables	Pointed Gourd	10.00	945.00	850.50	500.00													10.00	945.00	850.50	500.00
		Ridge Gourd	6.00	616.50	567.18	800.00													6.00	616.50	567.18	800.00
		Potato					5.00	380.75	354.10	600.00									5.00	380.75	354.10	600.00
		Brinjal					7.00	1,704.50	1,678.93	750.00									7.00	1,704.50	1,678.93	750.00
	Spices	Corriander					1.20	15.20	14.74	8,000.00									1.20	15.20	14.74	8,000.00
		Garlic					10.02	450.90	428.36	700.00									10.02	450.90	428.36	700.00
		Ginger												3.67	261.78	256.54	1,200.00		3.67	261.78	256.54	1,200.00
		Turmeric												3.20	34.14	33.12	3,850.00		3.20	34.14	33.12	3,850.00
		Dry Chillies												5.60	40.26	40.26	8,500.00		5.60	40.26	40.26	8,500.00
Plantation Crops	Arecanut (Dry form)												2.80	4.59	4.45	20,000.00		2.80	4.59	4.45	20,000.00	
<b>Total Farmers</b>	<b>467</b>		<b>16.00</b>	<b>1,561.50</b>	<b>1,417.68</b>	<b>23.22</b>	<b>2,551.35</b>	<b>2,476.13</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>15.46</b>	<b>340.77</b>	<b>334.37</b>	<b>54.68</b>	<b>4,453.62</b>	<b>4,228.18</b>	<b>0.00</b>	<b>0.00</b>		
Kamrup(Rural)/ Bongaon/ Satekona	Fruit	Pineapple	7.16	1,321.95	1,295.51	1,500.00	7.16	293.77	292.32	1,500.00								14.32	1,615.73	1,587.83	1,500.00	
		Orange(Mandarin)					27.66	4,501.31	4,465.00	2,000.00								27.66	4,501.31	4,465.00	2,000.00	
	Vegetables	Ridge Gourd	1.20	102.00	101.08	1,000.00													1.20	102.00	101.08	1,000.00
		Snack Gourd	0.85	61.84	60.60	500.00													0.85	61.84	60.60	500.00
		Bitter Gourd	0.65	41.34	40.51	1,200.00													0.65	41.34	40.51	1,200.00
		Red Pumpkin									0.85	131.75	129.13	750.00					0.85	131.75	129.13	750.00
		Arum									1.50	67.88	66.95	500.00					1.50	67.88	66.95	500.00
	Spices	Black Pepper											0.20	3.08	2.50	20,000.00		0.20	3.08	2.50	20,000.00	
	Plantation Crops	Arecanut (Dry form)												2.91	5.51	5.23	18,000.00		2.91	5.51	5.23	18,000.00
Betelvine (in <i>Gussi</i> )													1.25	68,250	67,526	400.00		1.25	68,250	67,526	400.00	
<b>Total Farmers</b>	<b>73</b>		<b>9.86</b>	<b>1,527.13</b>	<b>1,497.71</b>	<b>34.82</b>	<b>4,795.08</b>	<b>4,757.32</b>	<b>2.35</b>	<b>199.63</b>	<b>196.08</b>	<b>4.36</b>	<b>51.39</b>	<b>0.20</b>	<b>3.08</b>	<b>2.50</b>	<b>20,000.00</b>	<b>51.39</b>	<b>68,250</b>	<b>67,526</b>	<b>400.00</b>	
Nagaon/ Khagarijan/ Senchowā	Fruit	Banana												0.35	35.41	34.98	1,750.00	0.35	35.41	34.98	1,750.00	
	Vegetables	Potato					0.67	45.73	38.60	600.00									0.67	45.73	38.60	600.00
		Brinjal					0.31	72.29	69.10	750.00									0.31	72.29	69.10	750.00
																			0.31	72.29	69.10	750.00
	Spices	Ginger												2.64	136.41	135.67	1,250.00		2.64	136.41	135.67	1,250.00
		Turmeric												1.12	8.40	7.56	4,000.00		1.12	8.40	7.56	4,000.00
		Black Pepper												0.13	1.84	1.01	20,000.00		0.13	1.84	1.01	20,000.00
														3.52	5.73	5.43	18,000.00		3.52	5.73	5.43	18,000.00
Plantation Crops	Arecanut (Dry form)												2.56	43,601	42,566	1,500.00		2.56	43,601	42,566	1,500.00	
	Coconut (in Nos.)												1.20	59,915	59,011	400.00		1.20	59,915	59,011	400.00	
	Betelvine (in <i>Gussi</i> )												1.20	59,915	59,011	400.00		1.20	59,915	59,011	400.00	
<b>Total Farmers</b>	<b>172</b>		<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.98</b>	<b>118.02</b>	<b>107.70</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>11.52</b>	<b>12.50</b>	<b>0.20</b>	<b>3.08</b>	<b>2.50</b>	<b>20,000.00</b>	<b>12.50</b>	<b>68,250</b>	<b>67,526</b>	<b>400.00</b>	

Contd...../-

**Table - 6.5, Contd.....**

District/ Block/ Village	Major Crop Category	Name of the Crop*	Kharif				Rabi				Summer				Annual				Total				
			Area	Pro#	MQ	FGP*	Area	Pro#	MQ	FGP*	Area	Pro#	MQ	FGP*	Area	Pro#	MQ	FGP*	Area	Pro#	MQ	FGP*	
Sonitpur/ Gabharu/ Bhumuraguri	Fruit	Assam Lemon												0.73	48.12	47.02	1,500.00	0.73	48.12	47.02	1,500.00		
		Banana													0.49	46.81	45.98	1,700.00	0.49	46.81	45.98	1,700.00	
	Vegetables	Water Pumpkin	1.00	87.50	86.45	1,000.00													1.00	87.50	86.45	1,000.00	
		White Gourd	0.52	48.98	48.01	1,200.00													0.52	48.98	48.01	1,200.00	
		Potato					23.50	2,056.25	2,027.19	650.00										23.50	2,056.25	2,027.19	650.00
		Tomato					8.63	2,804.75	2,784.75	450.00										8.63	2,804.75	2,784.75	450.00
		Brinjal					10.50	2,751.00	2,723.11	600.00	1.00	24.90	22.11	800.00						11.50	2,775.90	2,745.22	602.00
		Onion					12.00	1,050.00	946.20	1,200.00										12.00	1,050.00	946.20	1,200.00
		Green Chillies					4.00	300.00	299.21	1,500.00										4.00	300.00	299.21	1,500.00
		Sweet Potato					1.50	194.10	193.56	700.00										1.50	194.10	193.56	700.00
		Cabbage					17.00	5,996.75	5,972.44	400.00										17.00	5,996.75	5,972.44	400.00
		Cauliflower					13.00	1,664.00	1,632.90	650.00										13.00	1,664.00	1,632.90	650.00
		Peas					9.00	108.00	106.20	1,500.00										9.00	108.00	106.20	1,500.00
		Raddish					4.50	711.00	706.40	300.00										4.50	711.00	706.40	300.00
		Carrot					4.00	830.00	816.16	850.00										4.00	830.00	816.16	850.00
		Capsicum					1.30	58.50	58.09	2,000.00										1.30	58.50	58.09	2,000.00
		Long Beans (Cowpea)									0.80	101.96	100	1,450.00						0.80	101.96	100.01	1,450.00
		Lady's Finger (Okra)									8.00	1,144.00	1,142.50	550.00						8.00	1,144.00	1,142.50	550.00
		Red Pumpkin									2.50	441.25	439.00	850.00						2.50	441.25	439.00	850.00
		Cucumber									1.03	84.72	82.50	750.00						1.03	84.72	82.50	750.00
		Kunduli									0.65	39.31	38.31	300.00						0.65	39.31	38.31	300.00
		Leafy vegetables-																					
				Menthi				0.06	1.23	1.00	1,000.00									0.06	1.23	1.00	1,000.00
				Palak				0.26	5.85	5.50	1,200.00									0.26	5.85	5.50	1,200.00
				Lai				0.39	11.65	11.50	800.00									0.39	11.65	11.50	800.00
				Marisa				0.18	5.18	5.00	800.00									0.18	5.18	5.00	800.00
				Corriander Dhania				2.50	45.38	45.00	7,500.00									2.50	45.38	45.00	7,500.00
				Others				0.18	3.69	3.20	800.00									0.18	3.69	3.20	800.00
		Spices		Corriander				2.18	21.36	20.85	5,000.00									2.18	21.36	20.85	5,000.00
			Garlic				1.50	52.80	52.00	850.00									1.50	52.80	52.00	850.00	
			Ginger												1.80	101.21	100.50	1,000.00	1.80	101.21	100.50	1,000.00	
			Turmeric												2.21	15.09	14.21	2,000.00	2.21	15.09	14.21	2,000.00	
Plantation Crops		Arecanut (Dry form)												0.59	0.72	0.51	18,000.00	0.59	0.72	0.51	18,000.00		
		Coconut (in Nos.)												0.91	13,867	12,250	1,200.00	0.91	13,867	12,250	1,200.00		
		Betelvine (in Gussi)												0.39	17,131	14,131	450.00	0.39	17,131	14,131	450.00		
<b>Total Farmers</b>	<b>407</b>		<b>1.52</b>	<b>136.48</b>	<b>134.46</b>	<b>116.18</b>	<b>18,671.49</b>	<b>18,410.26</b>	<b>13.98</b>	<b>1,836.14</b>	<b>1,824.43</b>	<b>7.12</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>138.80</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>			
<b>Total</b>	<b>1119</b>		<b>27.38</b>	<b>3,225.11</b>	<b>3,049.85</b>	<b>175.20</b>	<b>26,135.94</b>	<b>25,751.41</b>	<b>16.33</b>	<b>2,035.77</b>	<b>2,020.51</b>	<b>38.46</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>257.37</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>			

Source: Field survey data

Note: Pro# - Production, MQ - Marketed Quantity, FGP\* - Farm Gate Price

village was estimated at Rs.46,400.00 against 54.68 hectares of land with a marketed quantity of 4,251.08 qtls.

In Satekona village, maximum area was covered by orange (Mandarin) followed by pineapple. The other crops of different groups occupied negligible area in the cropping pattern. But from farm gate price point of view, black pepper provided maximum income of Rs. 20,000.00 followed by arecanut (Rs.18,000.00) and orange (Rs. 2,000.00). Combining all the crops in the village, the estimated area was 44.23 hectares, with a production of 74,780.43qtl. and farm income at Rs. 45,850.00.

In Senchowa village, it was found that maximum area was covered by arecanut and the least area was occupied by black pepper cultivation. Regarding the farm gate price, black pepper gave highest income (Rs.20,000.00) followed by arecanut (Rs.18,000.00) and banana (Rs.1,750.00).

In Bhumuraguri village of Sonitpur district, different varieties of vegetables were grown along with other group of crops. The area covered under different crops was 141.01 hectares and the total farm income was estimated at Rs. 3,200.00 for fruits, Rs.37,302.00 for vegetables, Rs. 8,850.00 for spices and Rs.19,650.00 for plantation crops.

From the above analysis, it was found that black pepper gave the maximum profit followed by arecanut and banana although the area under these crops were negligible. The Government of Assam through the Department of Agriculture should arrange to provide quality seeds and other input services to the farmers so that they got motivated to grow those crops on commercial basis.

### **6.5 Types of Land used for different horticultural crops**

The production and productivity of different crops are highly influenced by the types of land. The sample farmers of the selected villages used different types of land i.e. plain land, hill area land and char area land for growing horticultural crops and are presented in Table-6.6.

It was evident from the Table that, out of the total land area of 257.37 hectares, 72.25 hectares were plain land, 47.24 hectares were hill area land and rest 137.88 hectares were char area land. In Satekona village, all the fruit crops were grown in hill areas, but in other villages, it was grown in plain land. In Jadavpur and Bhumuraguri villages, all *rabi* vegetables were grown in char area and better harvest was recorded due to enhanced fertility of the land after flood in summer season. The



**Table – 6.6**  
**Distribution of Type of Land Used for Different Horticultural Crops by Seasons** (Area in Ha)

District/ Block/Village	Seasons	Major Category Crops	Grass Land	Waste Land	Plain Land	Hill Area Land	Others Char area	Total Area
Barpeta/ Mandia/Jadavpur	Kharif	Fruits						0.00
		Vegetables			16.00			16.00
		Spices						0.00
		Garden/plantation						0.00
	Rabi	Fruits						0.00
		Vegetables					12.00	12.00
		Spices					11.22	11.22
		Garden/plantation						0.00
	Summer	Fruits						0.00
		Vegetables						0.00
		Spices						0.00
		Garden/plantation						0.00
	Annual	Fruits			0.19			0.19
		Vegetables						0.00
		Spices			12.47			12.47
		Garden/plantation			2.80			2.80
<b>Total Farmers</b>	<b>467</b>		<b>0.00</b>	<b>0.00</b>	<b>31.46</b>	<b>0.00</b>	<b>23.22</b>	<b>54.68</b>
Kamrup(Rural)/ Bongaon/Satekona	Kharif	Fruits				7.16		7.16
		Vegetables			2.70			2.70
		Spices						0.00
		Garden/plantation						0.00
	Rabi	Fruits				34.82		34.82
		Vegetables						0.00
		Spices						0.00
		Garden/plantation						0.00
	Summer	Fruits						0.00
		Vegetables				2.35		2.35
		Spices						0.00
		Garden/plantation						0.00
	Annual	Fruits						0.00
		Vegetables						0.00
		Spices			0.20			0.20
		Garden/plantation			1.25	2.91		4.16
<b>Total Farmers</b>	<b>73</b>		<b>0.00</b>	<b>0.00</b>	<b>4.15</b>	<b>47.24</b>	<b>0.00</b>	<b>51.39</b>
Nagaon/ Khagarijan/Senchowa	Kharif	Fruits						0.00
		Vegetables						0.00
		Spices						0.00
		Garden/plantation						0.00
	Rabi	Fruits						0.00
		Vegetables			0.98			0.98
		Spices						0.00
		Garden/plantation						0.00
	Summer	Fruits						0.00
		Vegetables						0.00
		Spices						0.00
		Garden/plantation						0.00
	Annual	Fruits			0.35			0.35
		Vegetables						0.00
		Spices			3.89			3.89
		Garden/plantation			7.28			7.28
<b>Total Farmers</b>	<b>172</b>		<b>0.00</b>	<b>0.00</b>	<b>12.50</b>	<b>0.00</b>	<b>0.00</b>	<b>12.50</b>
Sonitpur/ Gabharu/Bhumuraguri	Kharif	Fruits						0.00
		Vegetables			1.52			1.52
		Spices						0.00
		Garden/plantation						0.00
	Rabi	Fruits						0.00
		Vegetables			1.52		110.98	112.50
		Spices					3.68	3.68
		Garden/plantation						0.00
	Summer	Fruits						0.00
		Vegetables			13.98			13.98
		Spices						0.00
		Garden/plantation						0.00
	Annual	Fruits			1.22			1.22
		Vegetables						0.00
		Spices			4.01			4.01

		Garden/plantation			1.89			1.89
Total Farmers	407		0.00	0.00	24.14	0.00	114.66	138.80
<b>Total</b>	<b>1119</b>		<b>0.00</b>	<b>0.00</b>	<b>72.25</b>	<b>47.24</b>	<b>137.88</b>	<b>257.37</b>

Source: Field survey data

*kharif* and annual vegetables were raised in plain land by using irrigation water through shallow tube well. Spices were grown largely in plain land in all the sample villages except 11.22 hectares grown in char area by the sample farmers of Jadavpur village. For growing garden/plantation crops, only 2.91 hectares of hill area land was used by the sample villagers of Satekona village and another 13.22 hectares plain land was used for cultivating the plantation crops.

From the analysis, it was observed that the farmers mostly used char area land specially for vegetables crops followed by plain land and hill area land.

Table-6.7 presents the types of land used for different horticultural crops in all seasons. It was found that in Senchowa village, all the crops were grown in plain land. In Jadavpur village, out of the total cultivated area, 57.53 per cent were plain land and 42.47 per cent were char area land. In Satekona village, maximum crops were grown in (91.92 per cent) hill area and the remaining (8.08 per cent ) area was under plain land. In Bhumuraguri village, the sample farmers grew crops in 24.14 hectares of plain land and 114.66 hectares of char area land.

**Table – 6.7**  
**Distribution of Type of Land Used for Different Horticultural Crops(All Seasons)**

(Area in Ha)

District/ Block/Village	Major Crop Category	Grass Land	Waste Land	Plain Land	Hill Area Land	Others Char area	Total Area
Barpeta/ Mandia/Jadavpur	Fruits			0.19			0.19
	Vegetables			16		12	28
	Spices			12.47		11.22	23.69
	Garden/plantation			2.8			2.8
<b>Total Farmers – 467</b>				<b>31.46</b>		<b>23.22</b>	<b>54.68</b>
Kamrup(Rural)/ Bongaon/Satekona	Fruits				41.98		41.98
	Vegetables			2.7	2.35		5.05
	Spices			0.2			0.2
	Garden/plantation			1.25	2.91		4.16
<b>Total Farmers – 73</b>				<b>4.15</b>	<b>47.24</b>		<b>51.39</b>
Nagaon/ Khagarijan/Senchowa	Fruits			0.35			0.35
	Vegetables			0.98			0.98
	Spices			3.89			3.89
	Garden/plantation			7.28			7.28
<b>Total Farmers – 172</b>				<b>12.5</b>			<b>12.5</b>
Sonitpur/ Gabharu/Bhumuraguri	Fruits			1.22			1.22
	Vegetables			17.02		110.98	128
	Spices			4.01		3.68	7.69
	Garden/plantation			1.89			1.89
<b>Total Farmers – 407</b>				<b>24.14</b>		<b>114.66</b>	<b>138.8</b>
<b>State Total – 1119</b>				<b>72.25</b>	<b>47.24</b>	<b>137.88</b>	<b>257.37</b>

Source: Field Survey data

## 6.6 Area, Production and Yield estimated by the various agencies

It was already mentioned that, in Assam the details of crop area and land use particulars are recorded by the lat Mandals of the Revenue Department .On the basis of this document, the Directorate of Economics & Statistics prepare the District and State level Land Use Statistics viz. an Area Abstract, Crop Abstract and Irrigation Abstract. Also, the Village Level Extension Workers (VLEW) under the State Agriculture Department separately collects the APY data. However, in Barpeta and Kamrup district, the VLEWs could not provide the required statistics on area, production and yield of horticultural crops because no updated crop registers was available with them. The Revenue Department provided only area data against the horticultural crops grown in those villages. In Sonitpur district also, no separate horticultural crops data could be found for Bhumuraguri village in the Revenue Department and area and production data were made available by the District Agriculture Office.

The Table – 6.8(a) ,Table – 6.8 (b), Table – 6.8 (c) and Table – 6.8.(d) depict the data collecting agencies vis-à-vis the crop covered with area, production and yield during 2010-11 for fruits, vegetables, spices & plantation crops, respectively.

**Table- 6.8(a)**  
**Data Collecting Agency and the Crops Covered with**  
**Area, Production and Yield in 2010-11 (Fruits)**

District/ Block/Village	Name of the Crop*	Area		Estimated Production (qtl)		Yield (kg/ha)	
		Department		Department		Department	
		Revenue	Agri./Horti.	DES	Agri./Horti.	DES	Agri./Horti.
Barpeta/Mandia/Jadavpur	Mango	1.07	-	-	-	-	-
	Jackfruit	0.67	-	-	-	-	-
	Banana	3.08	-	462.28	-	15,009	-
<b>Sub-Total</b>		<b>4.82</b>	-	-	-	-	-
Kamrup(Rural)/Bongaon/Satekona	Orange	7.90	-	813.86	-	10,302	-
	Banana	2.68	-	353.30	-	13,183	-
	Pineapple	5.35	-	949.84	-	17,754	-
	Jackfruit	0.67	-	-	-	-	-
	Mango	0.40	-	-	-	-	-
	Assam Lemon	1.34	-	-	-	-	-
	Robab Tenga	0.27	-	-	-	-	-
	Litchi	0.27	-	-	-	-	-
	Papaya	0.40	-	68.11	-	17,027	-
	Guava	0.27	-	-	-	-	-
<b>Sub-Total</b>		<b>19.55</b>	-	-	-	-	-
Nagaon/Khagarijan/Senchowa	Jackfruit	2.05	1.03	-	41.5	-	4,029.13
	Mango	3.41	2.06	-	15.2	-	737.86
	Pineapple	1.38	0.001	-	0.15	-	15,000.00
	Banana	-	0.32	46.49	50.78	14,527	15,868.75
	Lemon	-	0.57	-	7.71	-	1,352.63
	Other Citrus	-	0.28	-	3.31	-	1,182.14
	Guava	-	0.46	-	14.62	-	3,178.26
	Pomegranate	-	0.03	-	0.098	-	326.67
	Papaya	-	0.41	50.48	4.15	12,312	402.91
	Mango	-	2.06	-	20.4	-	4,975.61
<b>Sub-Total</b>		<b>6.84</b>	<b>7.22</b>	-	-	-	-
Sonitpur/Gabharu/Bhumuraguri	Jackfruit	-	2.16	-	180.5	-	8,356.48
	Assam Lemon	-	0.25	-	15.8	-	6,320.00
	Banana	-	0.47	49.24	105	10,476	22,340.43

	Guava	-	0.52	-	152	-	29,230.77
	Mango	-	1.16	-	73.45	-	6,331.90
<b>Sub-Total</b>		-	<b>4.56</b>	-	-	-	-
<b>Total</b>		<b>31.21</b>	<b>11.78</b>	-	-	-	-

\* Individual Crops

It was noted that the Revenue Department collected the area data on different horticultural crops and on the basis of that, DES and Agriculture Department estimated the production and yield data. Literally speaking, all the three Departments viz. Revenue, DES and Agriculture Department took part in estimating the area, production and yield data of most of the horticultural crops by applying specific methodologies. It was also noticed that the vegetable crops were not recorded by name, but recorded as *kharif* and *rabi* vegetables only.

**Table 6.8(b)**  
**Data Collecting Agency and the Crops Covered with**  
**Area, Production and Yield in 2010-11 (Vegetables)**

District/Block/Village	Name of the Crop*	Area		Estimated Production (qtl)		Yield (kg/ha)	
		Agency		Agency		Agency	
		Revenue	Agri./Horti.	DES	Agri./Horti.	DES	Agri./Horti.
Barpeta/Mandia/Jadavpur	Lady Finger	0.94	-	-	-	-	-
	Ridge Gourd/ bhul	0.94	-	-	-	-	-
	White Gourd	1.07	-	-	-	-	-
	Potato	1.34	-	115.63	-	8,629	-
	Onion	1.07	-	16.05	-	1,500	-
	K. Vegetables	6.02	-	-	-	-	-
	R. Vegetables	0.54	-	-	-	-	-
	Brinjal	0.67	-	-	-	-	-
Sub-Total	0.40	-	-	-	-	-	
<b>Sub-Total</b>		<b>12.99</b>	-	-	-	-	-
Kamrup(Rural)/Bongaon/Satekona	Arum	0.27	-	-	-	-	-
	Bottle Gourd	0.27	-	-	-	-	-
	White Gourd	0.03	-	-	-	-	-
<b>Sub-Total</b>		<b>0.57</b>	-	-	-	-	-
Nagaon/Khagarijan/Senchowa	K. Vegetables	8.74	1.30	-	13.50	-	1,038
	R. vegetables	18.14	2.28	-	44.70	-	1,961
<b>Sub-Total</b>		<b>26.88</b>	<b>3.58</b>	-	-	-	-
Sonitpur/Gabharu/Bhumuraguri	Potato	-	26.00	1,915.68	2,340.00	7,368	9,000
	Tomato	-	9.00	-	2,970.00	-	33,000
	Brinjal	-	13.00	-	3,380.00	-	26,000
	Cabbage	-	17.00	-	5,780.00	-	34,000
	Cauliflower	-	13.00	-	1,755.00	-	13,500
	Cucumber	-	9.00	-	720.00	-	8,000
	Pea	-	9.00	-	108.00	-	1,200
	Okra	-	8.00	-	1,120.00	-	14,000
	Raddish	-	5.00	-	800.00	-	16,000
	Carrot	-	4.00	-	840.00	-	21,000
	Coriender	-	7.00	-	245.00	-	3,500
	Pumpkin	-	3.00	-	540.00	-	18,000
	Onion	-	12.00	387.00	1,872.00	3,225	15,600
Green Chillies	-	4.00	-	300.00	-	7,500	
<b>Sub-Total</b>		-	<b>139.00</b>	-	-	-	-
<b>Total</b>		<b>40.44</b>	<b>142.58</b>	-	-	-	-

\* Individual Crops

**Table 6.8(c)**  
**Data Collecting Agency and the Crops Covered with**  
**Area, Production and Yield in 2010-11 (Spices)**

District/Block/Village	Name of the Crop*	Area		Estimated Production (qtl)		Yield (kg/ha)	
		Agency		Agency		Agency	
		Revenue	Agri./Horti.	DES	Agri./Horti.	DES	Agri./Horti.
Barpeta/Mandia/Jadavpur	Chilly	6.29	-	50.32	-	800	-
	Turmeric	0.54	-	4.32	-	800	-
<b>Sub-Total</b>		<b>6.83</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Kamrup(Rural)/Bongaon/Satekona	Black Pepper	0.54	-	8.17	-	1,513	-
<b>Sub-Total</b>		<b>0.54</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Nagaon/Khagarijan/Senchowa	Turmeric	9.42	-	59.35	-	630	-
	Ginger	5.3	-	510.92	-	9,640	-
<b>Sub-Total</b>		<b>14.72</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Sonitpur/Gabharu/Bhumuraguri	Garlic	-	8.00	-	400.00	-	5,000
	Ginger	-	2.50	-	350.00	-	14,000
<b>Sub-Total</b>		<b>-</b>	<b>10.50</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Total</b>		<b>22.09</b>	<b>10.50</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

\* Individual Crops

**Table 6.8(d)**  
**Data Collecting Agency and the Crops Covered with**  
**Area, Production and Yield in 2010-11 (Garden/Plantation)**

District/Block/Village	Name of the Crop*	Area		Estimated Production (qtl)		Yield (kg/ha)	
		Agency		Agency		Agency	
		Revenue	Agri./Horti.	DES	Agri./Horti.	DES	Agri./Horti.
Barpeta/Mandia/Jadavpur	Coconut	0.67	-	0.46	-	69	-
	Areca nut	1.34	-	2.26	-	169	-
<b>Sub-Total</b>		<b>2.01</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Kamrup(Rural)/Bongaon/Satekona	Areca nut	8.70	-	3.65	-	42	-
	Coconut	0.40	-	0.78	-	195	-
	Bettel vine (Production in Gussi)	1.34	-	-	-	-	-
<b>Sub-Total</b>		<b>10.44</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Nagaon/Khagarijan/Senchowa	Coconut	-	4.08	3.30	6,920.00	81	16,961
	Areca nut	-	2.88	4.67	115.62	162	4,015
	Bettel vine (Production in Gussi)	-	0.25	-	1,604.00	-	6,416
<b>Sub-Total</b>		<b>-</b>	<b>7.21</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Sonitpur/Gabharu/Bhumuraguri	Coconut (Production in nos.)	-	2.12	2.31	28,500 (nos.)	109	13,443 (nos.)
	Arecanut	-	0.91	1.39	12.80	153	1,407
<b>Sub-Total</b>		<b>-</b>	<b>3.03</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Total</b>		<b>12.45</b>	<b>10.24</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

Note: \* Individual Crops

1 gussi= 20 leaves

## 6.7 Difference Between the two Estimates (Survey and Agency)

It was observed that multiple agencies are involved in base line data collection/generation process in Assam incurring huge amount of cost and time, but no systematic and accurate estimate of area and production of different horticultural crops are available. The estimates made by various agencies also vary considerably. Each agency has its own methodology, often resulting in variations in the data, besides problem of revisions and time-lag. Such data are usually incomparable due to incomplete or different coverage. Further, no validation mechanism exists to establish reliability factor of individual data sets. Consequently, ad-hoc methods are used to arrive at area and production estimates which may cause improper reflection of horticultural growth and its contribution in the national accounts. In spite of all those limitations, it was tried to study the difference between the two estimates on (i.e estimate based on the survey & the data estimated/released by the Government Agencies) area, production and productivity of different horticultural crops across the sample villages and presented in Table- 6.9 (a), 6.9 (b), 6.9( c) and 6.9(d) It is to be mentioned here that only a few crops could be compared due to non availability of data from the agencies concerned.

**Table- 6.9(a)**  
**Difference between Survey and Agency data of Horticultural Crops**  
**in Jadavpur Village**

Name of the Crop	Agency Data			Survey Data			Difference between two estimates		
	Area	Prodn.	Yield	Area	Prodn.	Yield	Area	Prodn.	Yield
<b>Fruits:</b>									
Banana	3.08	462.28	15,009	0.51	144.78	28186	-2.57	-317.50	13,177
<b>Vegetables :</b>									
Potato	1.34	115.63	8,629	5	380.75	7615	3.66	265.12	-1014
<b>Spices :</b>									
Chilly	6.29	50.32	800	5.61	40.48	721	-0.68	-9.84	-79
Turmeric	0.54	4.32	800	3.29	35.64	1083	2.75	31.32	283
<b>Plantation Crops :</b>									
Coconut	0.67	4,600	6,866	3.12	18,500	5,925	2.45	13,900.00	-941
Areca nut	1.34	2.26	169	4.58	23.27	509	3.24	21.01	340

Note: Area data were provided by the Revenue and Agri/Horti Department, Production data were provided by DES and Agri/ Horti Department and yield data were provided by DES ,Govt. of Assam

**Table- 6.9(b)**  
**Difference between Survey and Agency data of Horticultural Crops**  
**in Satekona Village**

Name of the Crop	Agency Data			Survey Data			Difference between two estimates		
	Area	Prodn.	Yield	Area	Prodn.	Yield	Area	Prodn.	Yield
<b>Fruits:</b>									
Orange	7.90	813.86	10302	27.92	4522.71	16193	20.02	3,708.85	5891
Banana	2.68	353.3	13183	0.07	24.75	37320			

Pineapple	5.35	949.84	17754	7.16	1615.72	22566	1.81	665.88	4812
Papaya	0.40	68.11	17027	0.21	26.16	12756			
<b>Spices :</b>									
Black Pepper	0.54	8.17	1513	0.22	3.61	1672	-0.32	-4.56	159
<b>Plantation Crops :</b>									
Areca nut	8.70	3.65	42	3.27	9.66	295	-5.43	6.01	253
Coconut	0.40	5800	14500	0.36	2275	6300	-0.04	-3,525.00	-8200

Note: Area data were provided by Revenue Department and Production and Yield data were provided by DES, Govt. of Assam

**Table: 6.9 ( c )**  
**Difference between Survey and Agency data of Horticultural Crops**  
**in Senchowa Village**

Name of the Crops	Agency Data			Survey Data			Difference between two estimates		
	Area	Prodn.	Yield	Area	Prodn.	Yield	Area	Prodn.	Yield
<b>Fruits :</b>									
Jackfruit	2.05	41.5	4029	1.03	21.5	2087	-1.02	-20.00	-1942.00
Mango	3.41	15.2	737.86	2.09	50.4	2410			
Pineapple	1.38	0.15	15000	0.001	0.2	20150	-1.38	0.05	5150.00
Banana	0.32	50.78	15868.75	0.49	84.31	17347			
Lemon	0.57	7.71	1352.63	0.56	30.6	5464	-0.01	22.89	4111.37
Guava	0.46	14.62	3178.26	0.46	25.2	5478	0.00	10.58	2299.74
Pomegranate	0.03	0.098	326.67	0.03	0.38	1280			
Papaya	0.41	4.15	402.91	0.41	54.72	13346	0.00	50.57	12943.09
Mango	2.06	20.4	4975.61	2.09	50.4	2410	0.03	30.00	-2565.61
<b>Spices:</b>									
Turmeric	9.42	59.35	630	1.18	9.38	795	-8.24	-49.97	165.00
Ginger	5.3	510.95	9640	2.68	136.9	5109	-2.62	-374.05	-4531.00
<b>Plantation Crops:</b>									
Coconut	4.08	6920	16961	3.83	52680	13767	-0.25	45760.00	-3194.00
Areca nut	2.88	115.62	4015	4.73	18.42	390	1.85	-97.20	-3625.00
Betel vine (Production in Gussi)	0.25	1604	6416	1.47	60000	40839	1.22	58396.00	34423.00

Note: Area data were provided by the Revenue and Agri/Horti Department, Production and yield data were provided by DES and Agri/ Horti Department ,Govt. of Assam

**Table: 6.9( d )**  
**Difference between Survey and Agency data of Horticultural Crops**  
**in Bhumuraguri Village**

Name of the Crops	Agency Data			Survey Data			Difference between two estimates		
	Area	Prodn.	Yield	Area	Prodn.	Yield	Area	Prodn.	Yield
<b>Fruits :</b>									
Jackfruit	2.16	180.5	8,356	3.66	35.26	963	1.50	-145.24	-7,393
Assam Lemon	0.25	15.8	6,320	1.11	70.07	6,294			
Banana	0.47	105	22,340	0.78	147.46	18,910	0.31	42.46	-3,430
Guava	0.52	152	29,231	1.06	58.35	5,490			
Mango	1.16	73.45	6,332	2.64	159.75	6,053	1.48	86.30	-279
<b>Vegetables :</b>									
Potato	26.00	2,340.00	9,000	23.52	2060.1	8,759	-2.48	-279.90	-241
Tomato	9.00	2,970.00	33,000	8.72	2818.55	32,337	-0.28	-151.45	-663
Brinjal	13.00	3,380.00	26,000	11.59	2788.23	24,054	-1.41	-591.77	-1,946
Cabbage	17.00	5,780.00	34,000	17.01	6004.17	35,293	0.01	224.17	1,293

Cauliflower	13.00	1,755.00	13,500	13	1664	12,800	0.00	-91.00	-700
Cucumber	9.00	720.00	8,000	2.14	90.28	4,215	-6.86	-629.72	-3,785
Pea	9.00	108.00	1,200	9	108	1,200	0.00	0.00	0
Radish	5.00	800.00	16,000	4.51	711.77	15,793	-0.49	-88.23	-207
Carrot	4.00	840.00	21,000	4	830	20,750	0.00	-10.00	-250
Pumpkin	3.00	540.00	18,000	4.16	541	12,997	1.16	1.00	-5,003
Onion	12.00	1,872.00	15,600	12	1050	8,750	0.00	-822.00	-6,850
Green Chilies	4.00	300.00	7,500	4.05	302.22	7,471	0.05	2.22	-29
<b>Spices :</b>									
Garlic	8.00	400.00	5,000	1.5	52.8	3520	-6.50	-347.20	-1,480
Ginger	2.50	350.00	14,000	1.86	101.95	5482	-0.64	-248.05	-8,518
<b>Plantation Crops :</b>									
Coconut	2.12	28,500	13,443	2.13	21488	10078	0.01	-7012.00	-3,365
Arecanut	0.91	12.80	1,407	3.05	26.62	872	2.14	13.82	-535

Note: Area data were provided by the Agri/Horti Department, Production and yield data were provided by DES and Agri/ Horti Department, Govt. of Assam

From the above Tables, it was observed that there was a considerable gap in area, production and productivity between the agency data and survey data for almost all the crops. But there was no difference in area under guava and papaya in Senchowa village and cauliflower, pea, carrot and onion in Bhumuraguri village. In case of production, the data were almost same in chilly in Jadavpur village, black pepper in Satekona village, pineapple in Senchowa village and pumpkin and green chilies in Bhumuraguri village. On yield rate, minor gap was recorded in respect of chilly and turmeric in Jadavpur and Senchowa village; black pepper and areca nut in Satekona village and green chilies, mango, radish and carrot in Bhumuraguri village. But there was a vast gap between survey and agency data in respect of the area of orange in Satekona village, production of coconut in all the sample villages and betel vine in Senchowa village. Large variation in productivity was noticed in Banana in Jadavpur village; coconut and orange in Satekona village; papaya, betel vine and pineapple in Senchowa village and ginger, jackfruit and onion in Bhumuraguri village. For other crops, slight difference was observed on area, production and yield rate between the agency data and survey data. The main reason of the gap between the two estimates might be due to the survey undertaken in different season by the concerned agencies. In case of fruits and plantation crops, bearing stage vary with types and varieties and most of the times, eye estimation and farmers' experience were taken in to account. Further, the areas under vegetables and fruit crops grown in backyard/ kitchen garden of the houses were not collected by the Govt. agencies. Moreover, a number of new short duration crop varieties were grown by the sample farmers during the survey period. Although the Government officials are supposed to undertake intermediate crop inspection between the *kharif* and *rabi* seasons, this does not appear to be done regularly. Even if short



duration crops like vegetables, flowers, mushroom, *etc.* are covered during the crop inspection, they are not listed separately in the final crop abstract but clubbed together under “other crops”. Thus, there is an urgent need to review the entire process of data collection and work out standardized methodologies to cover all the crops grown in all the seasons.

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## Chapter-VII

### Local crops that have not been included while estimating of Horticultural Crops

The crops, which are neither grown commercially on large scale nor traded widely, may be termed as local or indigenous horticultural crops. These crops are cultivated, traded and consumed locally. The popularity of these horticultural crops varies from crop to crop and locality to locality. The indigenous horticultural crops have many merits. These are easier to grow and hardy in nature, producing a crop even under adverse soil and climatic conditions. Most of the indigenous crops are very rich sources of vitamins, minerals, and other nutrients such as carbohydrates, proteins and fats. Apart from nutritive value, these crops are particularly more important for medicinal properties and famous for the retentive value in ayurvedic medicine.

In Assam, the farmers grow a large number of indigenous crops in their backyard and kitchen garden. Some of such crops are *Leteku, Poniol, Kordoi, olive, Ou tenga, Mirika Tenga, Naga Tenga, Silikha, Amlakhi, Mint, Tejpat, Madhusuleng, Sarpagandha, Sukloti* etc.

#### 7.1 Area, production, yield and economics of local crops

It is to be mentioned here that, no systematic cultivation is taken up for local and indigenous horticultural crops in the State and in the sample area as well. Also, no systematic data on area, production and productivity of these crops are recorded by the State Government Agencies (Directorate of Economics & Statistics, Govt. of Assam keeps record on 36 crops). However, it was tried to estimate the area, production and productivity of some of the local crops grown by the sample farmers in kitchen gardens/ backyard of the selected villages and are incorporated in Table-7.1.(a), Table-7.1.(b) Table-7.1.(c) and Table-7.1.(d), together with estimated annual income.

In Jadavpur village, the sample farmers grew different indigenous horticultural crops in their kitchen garden/ backyard areas. Although most of the produces were consumed and used by the farmers themselves, but they also earned some amount of income by selling the produce in the nearby markets. It was found that (Table-7.1.(a) the sample farmers grew fruit crops in 2.48 hectares of land, which fetched them an amount of Rs. 42,962.00. Similarly they grew vegetables in 1.73 hectares, spices in 0.90 hectares, flowers in 0.05 hectares and medicinal and

aromatic plants in 7.40 hectares of land and an annual value estimated at of Rs. 28,800.00, Rs.12,108.00, Rs. 8500.00 and Rs.56,242.00, respectively.

**Table-7.1(a)**  
**Area, Production, Productivity and Annual income of local/indigenous**  
**crops grown by the Sample farmers of Jadavpur Village**  
 (Area in ha., Prod. in Qtl. Yield in Kg/ha)

Name of the Crops		A	P	Y	Annual Value(Rs.)
Fruits	<i>Olive</i>	1.39	67.5	4856	33750
	<i>Rabab Tenga</i>	0.48	37.8	7875	7560
	<i>Blackberry/ white berry</i>	0.61	2.07	339	1652
<b>Total</b>		<b>2.48</b>	<b>-</b>	<b>-</b>	<b>42962</b>
Vegetables	<i>Turoi</i>	0.98	20.8	2122	6240
	<i>White gourd</i>	0.75	28.2	3760	22560
<b>Total</b>		<b>1.73</b>	<b>-</b>	<b>-</b>	<b>28800</b>
Spices	<i>Tamarind</i>	0.08	4.20	5250	4200
	<i>Tejpat</i>	0.43	0.21	49	208
	<i>Mint</i>	0.39	3.85	987	7700
<b>Total</b>		<b>0.90</b>	<b>-</b>	<b>-</b>	<b>12108</b>
Flower	<i>Joba (nos.)</i>	0.02	2500	12500000	2500
	<i>Tagar(nos.)</i>	0.03	3000	10000000	6000
<b>Total</b>		<b>0.05</b>	<b>-</b>	<b>-</b>	<b>8500</b>
Medicinal & Aromatic	<i>Tulsi</i>	0.20	0.75	375	1497
	<i>Amla</i>	2.32	27.00	1164	27000
	<i>Silikha</i>	2.82	21.92	777	21920
	<i>Sukloti</i>	0.03	0.68	2267	1365
	<i>Neem</i>	2.03	1.12	55	4460
<b>Total</b>		<b>7.40</b>	<b>-</b>	<b>-</b>	<b>56242</b>

Source: Field Survey

**Table-7.1(b)**  
**Area, Production, Productivity and Annual income of local/indigenous**  
**crops grown by the Sample farmers of Satekona Village**  
 (Area in ha., Prod. in Qtl. Yield in Kg/ha)

Name of the Crops		A	P	Y	Annual Value(Rs.)
Fruits	<i>Olive</i>	0.14	7.00	5,000	3,500.00
	<i>Rabab Tenga</i>	0.10	8.20	8,200	1,640.00
	<i>Blackberry/ white berry</i>	0.09	2.56	2,844	2,044.00
	<i>Leteku</i>	0.42	1.26	300	756.00
<b>Total</b>		<b>0.75</b>	<b>-</b>	<b>-</b>	<b>7,940.00</b>
Vegetables	<i>Turoi</i>	0.05	1.08	2,160	323.00
	<i>White gourd</i>	0.10	10.40	5200	5,200.00
<b>Total</b>		<b>0.15</b>	<b>-</b>	<b>-</b>	<b>5,523.00</b>
Spices	<i>Tejpat</i>	0.08	0.04	45	36.00
	<i>Mint</i>	0.21	2.10	1,000	4,200.00
<b>Total</b>		<b>0.29</b>	<b>-</b>	<b>-</b>	<b>4,236.00</b>
Flower	<i>Joba</i>	0.04	5240.00	1,31,00,000	5,260.00
	<i>Tagar</i>	0.04	3536.00	4456250	7,130.00
<b>Total</b>		<b>0.08</b>	<b>-</b>	<b>-</b>	<b>12370.00</b>
Medicinal & Aromatic Plants	<i>Tulsi</i>	0.04	0.15	356	300.00
	<i>Amla</i>	0.75	8.76	1,168	8,340.00
	<i>Silikha</i>	0.47	3.76	783	3,760.00
	<i>Sarpagandha</i>	0.01	0.13	1,400	1,040.00
	<i>Sukloti</i>	0.01	0.10	1,125	200.00
	<i>Neem</i>	0.77	0.55	71.43	2200.00

<b>Total</b>		<b>2.05</b>	-	-	<b>15,840.00</b>
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It is seen from the Table 7.1(b) that in Satekona village, the sample farmers grew all the crop groups, viz. fruits, vegetables, spices, flower and medicinal and aromatic plants and earned considerable amount of income. The estimated annual value of fruits was Rs. 7,940.00, and that of vegetables was Rs.5,523.00. Similarly, the value estimated against spices, flowers & medicinal and aromatic plants were in the order of Rs. 4,236.00, Rs.12370.00 and Rs. 15,840.00 respectively.

**Table-7.1(c)**  
**Area, Production, Productivity and Annual income of local/indigenous**  
**crops grown by the Sample farmers of Sensowa Village**

(Area in ha., Prodn. in Qtl. Yield in Kg/ha)

<b>Name of the Crops</b>		<b>A</b>	<b>P</b>	<b>Y</b>	<b>Annual Value(Rs.)</b>
Fruits	<i>Olive</i>	0.16	8.00	5000.00	4,000.00
	<i>Rabab Tenga</i>	0.13	10.60	8153.85	2,120.00
	<i>Blackberry/ white berry</i>	0.04	6.83	17062.50	5,460.00
	<i>Lemom/gul nemu</i>	0.07	30.24	43200.00	33,264.00
<b>Total</b>		<b>0.40</b>	-	-	<b>44,844.00</b>
Vegetables	<i>Turoi</i>	0.14	2.95	2107.14	885.00
	<i>White gourd</i>	0.27	8.25	3056.00	13,500.00
<b>Total</b>		<b>0.36</b>	-	-	<b>14,385.00</b>
Spices	<i>Tamarind</i>	0.02	1.20	6000.00	1,200.00
	<i>Tejpat</i>	0.29	0.14	47.59	138.00
	<i>Mint</i>	0.31	3.11	1003.55	6,222.00
<b>Total</b>		<b>0.62</b>	-	-	<b>7,560.00</b>
Flowers	<i>Joba</i>	0.02	1950.00	9750000	1950.00
	<i>Tagar</i>	0.03	2850.00	5700000	5700.00
<b>Total</b>		<b>0.05</b>	-	-	<b>7650.00</b>
Medicinal & Aromatic	<i>Tulsi</i>	0.09	0.40	444.44	800.00
	<i>Amla</i>	2.31	20.50	887.44	20500.00
	<i>Silikha</i>	2.05	15.50	756.10	15,500.00
	<i>Sarpagandha</i>	0.03	0.49	1633.33	4000.00
	<i>Sukloti</i>	0.03	0.55	1833.00	1,100.00
	<i>Neem</i>	4.17	2.40	55.04	11250.00
<b>Total</b>		<b>8.68</b>	-	-	<b>52050.00</b>

Source: Field Survey

Table-7.1(c) provides the status of local/ indigenous crops grown by the sample farmers of Senchowa village. It was found that the farmers got highest returns by growing medicinal and aromatic plants (Rs.52,050.00) followed by fruits (Rs.44,844.00), vegetables (Rs.14,385.00) flower (Rs.7650.00) and spices (Rs. 7,560.00).

In Table- 7.1(d) it was found that in Bhumuraguri village, the sample farmers used 7.05 hectares of land for cultivating various groups of local crops and earned highest income from fruit crops. The sample farmers produced 46.08 qtls. of lemon/*gol nemu* which is more popular for its flavor and earned highest amount of income (Rs. 50,688.00). The Table shows that the annual value of fruits was Rs. 65,018.00, vegetables Rs.22,550.00, spices Rs. 14,302.00, flower

Rs.2950.00 and medicinal and aromatic plants was valued at Rs. 37200.00 which was received from cultivation of 0.85 hectares ,0.51 hectares,0.44 hectares,0.02 hectares and 5.36 hectares of land.

**Table-7.1(d)**  
**Area, Production, Productivity and Annual income of local/indigenous crops grown by the Sample farmers of Bhumuraguri Village**

Name of the Crops		(Area in ha., Prodn. in Qtl. Yield in Kg/ha)			Annual Value(Rs.)
		A	P	Y	
Fruits	<i>Olive</i>	0.34	16.5	4,853	8,250.00
	<i>Rabab Tenga</i>	0.38	30.4	8,000	6,080.00
	<i>Lemom/gul nemu</i>	0.13	46.08	35,446	50,688.00
<b>Total</b>		<b>0.85</b>			<b>65,018.00</b>
Vegetables	<i>Turoi</i>	0.07	1.5	2,143	450
	<i>White gourd</i>	0.44	44.20	10045	22,100.00
<b>Total</b>		<b>0.51</b>			<b>22,550.00</b>
Spices	<i>Tamarind</i>	0.16	8.7	5,438	8,700.00
	<i>Mint</i>	0.28	2.8	1,000	5,602.00
<b>Total</b>		<b>0.44</b>			<b>14,302.00</b>
Flowers	<i>Joba</i>	0.01	1050	10500000	1,050.00
	<i>Tagar</i>	0.01	950	98,00,000	1,900.00
<b>Total</b>		<b>0.02</b>			<b>2950.00</b>
Medicinal & Aromatic	<i>Tulsi</i>	0.10	0.40	400	800.00
	<i>Amla</i>	1.62	19.20	1,185	19200.00
	<i>Silikha</i>	1.45	11.50	793	11,500.00
	<i>Sukloti</i>	0.01	0.25	2,500	500.00
	<i>Neem</i>	2.18	1.30	60	5200.00
<b>Total</b>		<b>5.36</b>			<b>37200.00</b>

Source: Field Survey

Thus, in all the four villages, 33.20 hectares of area was devoted to grow various local and indigenous crops and the total value (annual) was estimated at Rs. 4,63,110.00. (Table-7.1.e)

**Table-7.1(e)**  
**Area and estimated Annual Income of local/ indigenous crops grown by the sample farmers**

District/Block/Village	Name of the Crops	Area	Annual value (Rs.)
Barpeta/Mandia/ Jadavpur	Fruits	2.48	42,962
	Vegetables	1.73	28,880
	Spices	0.9	12,108
	Flower	0.05	8500
	Medicinal & Aromatic	7.40	56242
<b>Total</b>		<b>12.59</b>	<b>148692</b>
Kamrup/Bongaon/ Satekona	Fruits	0.75	7,940
	Vegetables	0.15	5,523
	Spices	0.29	4,236
	Flower	0.08	12370
	Medicinal & Aromatic	2.05	15,840
<b>Total</b>		<b>3.32</b>	<b>45909</b>
Nagaon/ Khagarijan/ Senchowra	Fruits	0.40	44,844
	Vegetables	0.36	14,385
	Spices	0.62	7,560
	Flower	0.05	7650
	Medicinal & Aromatic	8.68	52050
<b>Total</b>		<b>10.11</b>	<b>126489</b>
Sonitpur/ Gabharu/ Bhumuraguri	Fruits	0.85	65,018

	Vegetables	0.51	22,550
	Spices	0.44	14,302
	Flower	0.02	2950
	Medicinal & Aromatic	5.36	37200
<b>Total</b>		<b>7.18</b>	<b>142020</b>
<b>Grand Total</b>		<b>33.20</b>	<b>463110</b>

Source: Field Survey

The above analysis highlighted that almost all the sample farmers grew some local/indigenous crops which benefitted them with returns. Although, the crops were not generally marketed in true sense of the term, they gave some relief to the farmers.

## 7.2 Growth and performance of indigenous/local crops

In the course of the study, an attempt has been made to observe the growth performance of local / indigenous crops in the sample villages. But, it was not possible to collect the area, production and productivity data over the years due to non availability of proper record in the hand of the farmers. Moreover, there were no published secondary sources of data on the growth performance of indigenous/local crops in the concerned departments. In this regard, the sample farmers opined that there was no significant growth of area, production and productivity of those crops during the last few years. It may be because of the fact that the farmers do not have the proper technological guidance for better yield. In general as per view of the agricultural scientist, horticultural crop of Assam suffers from two major characteristics of the soil. Firstly, its soil is acidic in nature and secondly its deficiency in micronutrients for which some of the crops suffers from taste and flavor. Attack of pest and disease is also one of the reasons for reduction of growth of these crops.

## 7.3 Share of indigenous/ local to conventional horticultural crops

From the observation, it was found that the share of indigenous/local to conventional horticultural crops in terms production is not least. Most of the farmers meet their domestic demand from these crops. A very few farmers sell their crops in the local market. Here an attempt has been made to estimate the share of local/indigenous crops to conventional horticultural crops on the basis of the area information provided by the farmers during field survey and presented in Table-7.2

**Table – 7.2**  
**Area under conventional and local/ indigenous crops in the Sample Villages**

(area in hectare)

District/Block/Village	conventional crop	local/ indigenous crops	Total
Barpeta/Mandia/Jadavpur	36.58 (74.39)	12.59 (25.61)	49.17
Kamrup/Bongaon/Satekona	162.03 (97.98)	3.34 (2.02)	165.37

Nagaon/ Khagarijan/Senchowa	35.47 (77.82)	10.11 (22.18)	45.58
Sonitpur/ Gabharu/Bhumuraguri	16.13 (69.59)	7.05 (30.41)	23.18
<b>Total</b>	<b>250.21</b> (88.32)	<b>33.09</b> (11.68)	<b>283.3</b>

Note: Figures in parentheses indicate percentage to total area

It may be observed from the Table that the share of area under local/indigenous crops to conventional horticultural crops is comparatively less in all the sample villages. The farmers reported during the field visit that they grew local/indigenous horticultural crops for home consumption purposes only.

#### **7.4 Prospects of local crops in Assam**

The state of Assam is bestowed with the most congenial climatic conditions for the production of under-exploited indigenous horticultural crops. The increase in area and production of these crops will not only provide nutritional security and save money on import but also open the path of export of fresh horticultural crops to boost the regional economy. It was also realized that some of the indigenous horticultural crops like olive, Amla, silikha, lemon, *etc.* have much commercial significance. Under the situation, Government agencies may consider taking suitable measure to popularize these crops, and creating facilities to add value to it thereby creating a potential market for the processed products.

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## **Chapter- VIII**

### **Difficulties Encountered by the Agencies while Compiling Horticultural Data**

Horticulture is an important segment of Agriculture, contributing about one-fifth share of the Agriculture and allied sectors. There has been a perceptible change in the consumption pattern characterized by declining share of food grains and the increasing share of non-foodgrain items in the consumption baskets particularly, fruits and vegetables. Rapidly growing demand for horticultural commodities and products especially for processed fruits and vegetables as well as booming floriculture market is an evidence of the phenomenon that is expected to accelerate horticultural growth in the State. Consequently, horticulture is set to assume a greater role and importance within the agriculture sector and eventually in the State economy.

However, there is a serious problem concerning reliability of horticulture data which is one of the most critical requirements to facilitate systematic policy analysis and planning exercise. Lack of reliable and authentic base-line data or inadequate and incomplete data is one of the serious constraint of horticultural development. The available data suffers with serious limitations due to methodological and operational problems. Multiple agencies are involved in generating horticulture data that often varies. Moreover, there are temporal variations in the data and at times, the data from the same agencies differ. Consequently, it becomes very difficult to make correct assessment of horticultural growth and to determine the demand for horticultural commodities. Lack of authentic data restricts the scope of identifying the opportunities for undertaking much needed crop diversification programmes. It is not just the basic data like area, production or productivity, but the whole gamut of related data set including storage data, market data, market arrivals, prices, exports and so on, that required to be collected and compiled to develop an integrated data base, which has become extremely important in the present era of globalization and integration of markets.

#### **8.1 Problems faced by the Agencies**

In Assam, several agencies are involved in estimating horticulture data. These agencies often come across a number of difficulties while compiling horticulture data. During the course of the study, the research team interacted with different officials at various levels. The



constraints faced by different agencies, while compiling horticulture data in Assam are presented in tabular form below:

**Table -8.1(a)**  
**Problems (3 important) faced by Different Agencies while collecting Data**  
(Department of Horticulture/Agriculture)

Name of the Village/Block	Problem	Fruits	Vegetables	Garden/Plantation crop	Spices
Jadavpur/ Mandia District Barpeta	1 Different variety shows different production	√	√	√	√
	2 Grown for Domestic or Commercial purpose				
	3 Different Method of Cultivation (Scientific/Traditional)				
Satekona/ Bongaon District Kamrup(Rural)	1 Land occupied by other village people	√	√	√	√
	2 Hill area land cannot be measured properly by the cultivators				
	3 Occupied Govt. land for cultivation, No patta				
Senchowa/ Khagarijan District Nagaon	1 Very negligible area for some of the crops	√	√	√	√
	2 All Farmers do not keep record of production				
	3 Different Method of Cultivation (Scientific/Traditional)				
Bhumuraguri/ Gabharu District Sonitpur	1 Grown for Domestic or Commercial purpose which creates problem in data collection	√	√	√	√
	2 No proper package of practice is followed				
	3 All the Farmers do not keep records of production				

Table 8.1(a) reflects the 3 important problems faced by the Department of Horticulture/Agriculture in the selected villages. In Jadavpur village, the Departmental officials faced with the problem of for estimating production because farmers grew different varieties of crops and each variety generally gives different level of production and they have to take average of both. Secondly, the farmers of the sample village grew crops for both domestic and commercial purposes. They used more fertilizer and other inputs for the crops grown for commercial purpose and as such, the production of those crops were recorded to be higher than the crops grown for domestic consumption. The officials thus could not record the proper yield rate. Moreover, farmers followed both scientific and traditional methods of cultivation for different crops *i.e.* some farmers maintained proper spacing of crops specially for fruits and plantation crops, while some others used traditional practices. Under this situation, production and yield data could not be estimated properly.

In Satekona village, the basic problem faced by the officials was that certain crop area of the village belonged to people from other village. Therefore, they could not interact with those farmers to know exactly the area and production of crops grown by them. Secondly, most of the hill area land could not be measured properly. In case of horticulture data collection, only *patta*

lands were taken in to account. But majority of horticultural land areas of the village were occupied and planted since long without any patta.

In Senchowa village, the main problem as pointed out by the Departmental officials was the negligible area under crops for which crop area could not be assessed. Secondly, the sample farmers did not maintain proper record of production and thirdly, different methods of cultivation adopted by the villagers.

Crops grown for different purposes (domestic/commercial), non use of proper package of practices and non-maintenance of proper record of production were the three major problems as pointed out by the officials of Agriculture/ Horticulture Department in Bhumuraguri village.

Table-8.1(b) presents the major problems faced by the officials of Revenue Department while collecting horticulture data. In all the sample villages, cultivation on non-patta land was the main problem. Secondly, due to heavy work load of the Departmental officials, allotted work of data collection could not be done properly. The third problem as reported by the officials was the negligible area under certain crops in the villages, for which collecting area data was much difficult.

**Table -8.1(b)**  
**Problems (3 important) faced by Different Agencies while collecting Data**  
(Department of Revenue)

Name of the Village/Block		Problem	Fruits	Vegetables	Garden/ Plantation crop	Spices
Jadavpur/ Mandia District Barpeta	1	Cannot collect data from those cultivated land which have no patta no.				
	2	Proper survey cannot be done due to over work load	√	√	√	√
	3	Very negligible area for some of the crops				
Satekona/ Bongaon District Kamrup(Rural)	1	Cannot collect data from those cultivated land which have no patta no.				
	2	Proper survey cannot be done due to over work load	√	√	√	√
	3	Very negligible area for some of the crops				
Senchowa/ Khagarijan District Nagaon	1	Cannot collect data from those cultivated land which have no patta no.				
	2	Proper survey cannot be done due to over work load	√	√	√	√
	3	Very negligible area for some of the crops				
Bhumuraguri/ Gabharu District Sonitpur	1	Cannot collect data from those cultivated land which have no patta no.				
	2	Proper survey cannot be done due to over work load	√	√	√	√
	3	Very negligible area for some of the crops				

The major difficulties confronted by the officials of the Department of Economics & Statistics in the selected sample villages are depicted in Table-8.1(c).

**Table-8.1(c)**  
**Problems (3 important) faced by Different Agencies while collecting Data**  
(Directorate of Economics and Statistics)

Name of the Village/Block		Problem	Fruits	Vegetables	Garden/ Plantation crop	Spices
Jadavpur/ Mandia District Barpeta	1	Lack of timely updation of village level chitha book in the respective revenue circles.	√	√	√	√
	2	Lack of cooperation of farmers' family.				
	3	demand for extra benefit in terms of farm inputs against information provided				
Satekona/ Bongaon District Kamrup(Rural)	1	Lack of timely updation of village level chitha book in the respective revenue circles.	√	√	√	√
	2	Lack of cooperation of farmers' family.				
	3	demand for extra benefit in terms of farm inputs against information provided				
Senchowa/ Khagarijan District Nagaon	1	Lack of cooperation of farmers' family specially in Crop- Cutting for the selected crops (say arecanut/ coconut)	√	√	√	√
	2	demand for extra benefit in terms of farm inputs against information provided				
	3	All the Farmers donnot keep records of production				
Bhumuraguri/ Gabharu District Sonitpur	1	Lack of cooperation of farmers' family specially in Crop- Cutting for the selected crops (say arecanut/ coconut)	√	√	√	√
	2	demand for extra benefit in terms of farm inputs against information provided				
	3	All the Farmers donnot keep records of production				

Table shows that due to lack of updating of village level 'Chitha' in the revenue circle offices, the employees engaged in base line data collection were not in a position to apply proper and uniform statistical method. Another important problem was lack of cooperation from farmer's family specially, in crop cutting for some selected crops like arecanut, coconut *etc.* Under this situation, the officials used to keep record of production by eye estimation. Again, many a time, some farmers asked for returns, in terms of farm inputs for providing/ supplying the required data/ information.

### **8.2 Suggestions made by different Agencies**

During the course of the study, the research team discussed these difficulties with the officials of the concerned Departments. The suggestions emerged for improvement of the data collection process are presented in Table-8.2

**Table 8.2**  
**Suggestions made by Different Agencies for the improvement of Horticultural Crops**

Departments	1	2	3
Horticulture/ Agriculture	Joint survey may be undertaken by the Departments along with panchayat representatives or <i>gaon burha</i> etc.(with some incentive) after a short -term Training under the guidance of technical experts. A specially designed schedule/ format (unique format for all) should be introduced for collection of data.	Although, a separate Directorate of Horticulture is there in the State, it needs to be made fully functional by creating separate horticultural circle/elaka & engaging more no. of personnel for overall development of horticulture sector.	Specific crop cutting programme should be taken up for some vegetable and spice crops. Crop cutting trainings are to be imparted to the grass root level officials. Awareness programme should also be taken up among the farmers about crop cutting experiments.
DES	Joint survey (with all the concerned Govt. Departments) is required for uniformity and accuracy of data.	Horticulture Deptt. should have an well equipped Statistical Cell for collection & estimation of horticultural data.	Updating village level <i>Chitha</i> in the Revenue Circle Offices should be done properly /timely for improvement of Agriculture Statistics

From the forgoing analysis it has emerged that there should be a close cooperation among the data collecting agencies involved in the field of horticultural crops, with the involvement of local bodies like Gaon Panchayat *etc.* The agencies are to follow standardized / uniform methodologies for data collection so that marked variation and duplication can be least avoided and resources saved. All the Departments concerned should maintain a fully functional statistical & monitoring cell to keep track of the data collection process with appropriate statistical tools. Also, there is an urgent need for continuous updating of ‘Chitha’ book to document accurate data from the actual field.

Action taken in the line above can go a long way in formulating workable plans & implementing horticultural development schemes for the improvement of the State economy.

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## **Chapter-IX**

### **Conclusion and Policy Implications**

In this chapter an attempt has been made to present briefly the major findings of the study undertaken in four of the sample districts in the State of Assam.

#### **9.1 Horticulture in Assam**

Assam is endowed with unique agro-climatic condition, which permits growing of wide range of horticultural crops. Assam represents a mixed terrain of hills and plains intercepted by a large number of rivers and streams. A unique diversity in agro-climate is a characteristic feature of this region representing tropical, sub-tropical and temperate areas. Horticultural crops cover an area of 5.75 lakh hectares which accounts for 14.04 per cent of the total cultivable area of 40.99 lakh hectares in the State. The important fruit crops in the State are banana, pineapple, citrus, jackfruit, guava and litchi. Coconut, arecanut and betel vine are predominant plantation crops. Potato, sweet potato, tapioca, colocasia and yams cucurbits, peas, beans and okra are cultivated in commercial scale. Ginger and turmeric occupy prime position among the spices.

#### **9.2 Trend of Area, Production & Productivity of Horticultural Crops in Assam**

There has been a significant increase in area and production of horticultural crops during the last two decades. It is observed that although the area and production of fruit crops increased during the period of 2004-05 to 2011-12 by 19.12 per cent and 22.70 per cent respectively, the increase in productivity was negligible (4.40%). In case of vegetables, the area increased by 16.17 per cent, production by 20.76 per cent and the productivity was increased by 5.54 per cent only during the period. In case of tuber crops, the increase in area, production and productivity was 6.67 per cent, 13.10 per cent and 6.43 per cent, respectively while for spices, the increase was to the tune of 15.31 per cent, 16.94 per cent and 2.09 per cent in area, production and productivity, respectively during the same period.

#### **9.3 Demographic Profile**

In the sample village of Jadavpur in Barpeta district, there were 467 respondents of which 48 numbers were in 15-25 years age group, 317 numbers in 26-50 years age group, 91 numbers in 51-60 years age group and remaining 11 were in above 61 age group. In Satekona

village of Kamrup district, among the 73 numbers of sample respondents 3 belongs to 15-25 years age group, 27 in 26-50 years age group, 38 in 51-60 years age group and only 5 were in above 61 age group. In Sensowa village of Nagaon district, total number of respondents was 172 of which 131 were in the age group of 26-50 years, 35 were in the age group of 51-60 years and rest 6 were above 61 years. There was no respondent found in the age group of 15-25 years. In Bhumuraguri village under Sonitpur district, of the total 407 number of respondents, 37, 298 and 72 were in the age group of 15-25 years, 26-50 years and 51-60 years, respectively. Thus, all together 1119 number of respondents were interacted during the field survey of which 7.86 per cent were in the age group of 15-25 years, 69.08 per cent were in the age group of 26-50 years, 21.09 per cent were in the age group of 51-60 years and 1.97 percent were in the age group of above 61 years. It is to be pointed out that no respondent was selected below 15 years as they were considered unaware of the economic activities of their households.

#### **9.4 Educational Status**

In Jadavpur village, 87 persons were illiterate, 134 numbers read up to primary standard, 78 numbers up to ME standard, 79 numbers up to high school standard, 76 numbers up to higher secondary level, 9 numbers had education up to degree level, 2 were diploma holder and 2 were educated up to post graduate level.

In Satekona village, only 5 persons were illiterate, 16 numbers had education up to primary standard, 19 numbers up to ME standard, 25 numbers were up to high school standard, 6 were up to higher secondary standard and 2 had education up to degree level.

In Sensowa village of Nagaon district, only 2 persons were illiterate, 19 numbers read up to primary standard, 24 numbers were in ME standard, 68 numbers were in high school standard, 30 were up to higher secondary standard, 23 numbers had education up to degree level, 4 were diploma holder and 2 were educated up to the post graduate level.

In Bhumuraguri village of Nagaon district, 95 persons were illiterate, 170 numbers had education up to primary standard, 92 numbers were in ME standard, 29 numbers were in high school standard, 16 numbers were in higher secondary level, 3 had education up to degree level and 2 were diploma holders.

Thus, on combining all the sample respondents, the maximum nos. of persons were found in secondary level. (36.82 per cent) followed by middle class (26.27 per cent), higher

secondary level (18.77 per cent), primary standard (9.65 per cent) and graduate and above level (6.08 per cent).

### **9.5 Land Ownership Details /Cropping Pattern**

Out of the total 1,119 households, there were 52.99 per cent marginal, 26.27 per cent small, 12.42 per cent medium and 8.31 per cent large farmers. Jadavpur village, recorded highest percentage of marginal farmers *i.e.* 50.54 followed by medium (18.63 per cent), small (18.42 per cent) and large (12.42 per cent) farmers. In Satekona village, large farmers constituted the largest category (38.36 per cent) followed by medium (31.51 per cent), marginal (16.44 per cent) and small (13.70 per cent) farmers. In Sensowa village 77.91 per cent were marginal farmers, 20.35 per cent were small farmers and 1.74 per cent were medium farmers. There was no large farmer in the sample. In Bhumuraguri village, 51.84 per cent were marginal farmers, 40.05 per cent were small, 6.39 per cent were medium and rest 1.72 per cent were large farmers.

Combining the entire sample together, the farmers possessed 508.37 hectares of owned land, 16.54 hectares of leased-in land, 98.89 hectares of uncultivated land and 16.54 hectares of leased out land. Thus, the farmers had 409.48 hectares of net cropped area for cultivating various field and horticultural crops.

### **9.6 Motivating Factors for Cultivation of Horticultural Crops**

It was found that highest percentage (27.79 per cent) of farmers were taking up horticultural crops due to better price followed by (22.70 per cent) nearest to the market, easy to grow (17.87 per cent), suitability of land (13.76 per cent), Govt. support (6.52 per cent), seed availability (5.81 per cent) and lower cultivation cost (5.36 per cent). 0.18 per cent farmers grew horticultural crops simply because of the fact that their neighbours grew and earned good profit.

### **9.7 Destruction and Rejuvenation of Horticultural Crops**

Among the sample farmers, 72 farmers removed as many as 338 number of existing horticulture crops trees which covered 1.15 hectares of land in the reference year. Again, altogether 76 the sample households rejuvenated 692 different horticultural crops in an area of 1.34 hectares in the last 5 years.

### **9.8 Kitchen Garden/Bund/Rooftop Plantation**

For the entire samples, 84.68 hectares of area was used as kitchen garden/ backyard areas and the annual estimated value of total production was Rs. 28,10,529. No rooftop plantation was recorded in the study area.

### **9.9 Adoption of New Technologies by the Farmers**

The new technologies adopted by the farmers were, use of poly houses, adoption of Integrated Nutrient Management (INM) and Integrated Pest Management (IPM).

In Jadavpur village, 20 sample farmers adopted poly house technology which covered 0.40 hectares of area and 232 sample farmers adopted INM/IPM technology covering 14.32 hectares of land area.

In Satekona village, 35 sample farmers adopted INM/IPM technology covering 12.25 hectares of land area.

In Bhumuraguri village, 118 sample farmers adopted new technology (16 Poly houses & 102 INM/IPM) in the reference year.

### **9.10 Benefits Received from the Government for the Development of Horticulture**

Most of the farmers in Assam are poor and needy to adopt new farm technology which is considered to be capital-intensive. Moreover, they are not aware of new production technology, use of modern inputs & the returns therefore. They have to depend on extension workers of the State Agriculture Department, progressive farmers, fertilizer dealer or on Agricultural University. The Government can take initiatives to provide the required farm inputs at subsidized rate at the time of need backed by extension support on input use and plant diseases management.

In the study area, there was no report of any benefit or any extension support on horticulture crop production in the reference year.

### **9.11 Problems Faced by the Farmers in Application of High Technology**

The sample farmers in all the districts came across a number of problems in adopting improved/ modern technology like poly house and green house. It was found that majority of the sample farmers were not in a position to go for application of modern technology in their field due to high cost of inputs and materials .Other difficulties in the way of applying modern techniques were lack of proper knowledge, non-availability of inputs on time & poor extension support.

In addition to that, at macro level, road connectivity was the major problem faced by 84.63 per cent of the sample farmers. Storage was the second important problem as reported by



42.90 per cent farmers. Shortage of quality seed was yet another problem for 23.50 per cent of the sample respondents. Other constraints of growing horticultural crops as mentioned by the sample farmers were shortage of labour (8.85 per cent), packaging of products (7.69 per cent) and lack of potential market (7.95 per cent).

### **9.12 Prospects of horticultural crops as perceived by the respondent farmers**

The respondents of Jadavpur village considered export potentialities first, scope of value added product second and creation of employment generation as third future prospect of horticulture in their locality.

The sample farmers of Satekona village expressed value addition as first, employment generation as second and export potentialities as third important prospect of horticulture. They opined that, if measures are taken for value addition, it can enhance the employment avenues and because of better taste and flavor of orange grown in their locality may increase the export potentialities.

In Senchowa village, the sample respondents considered use of new improved variety as first future prospect of horticulture crops. Secondly, the respondents considered better price for the produce as second future prospects of horticulture crops. The farmers considered value addition of horticulture crops as third future prospects.

The respondents of Bhumuraguri village ranked cold storage as first, fixation of price by the government agencies as second and processed food as the third major prospect of horticulture sector in their locality. They were of the view that with the abundant production of horticultural crops in the locality, there is an ample scope of establishing cold storage/ processing facilities and the farmers will be benefitted immensely if better price can be ensured by the Government agencies.

### **9.13 Methodologies Adopted for Estimating Horticultural Crops**

In Assam, multiple agencies are involved in collection/generation of horticulture data. The Department of Agriculture /Horticulture, Department of Revenue and Directorate of Economics and Statistics, Government of Assam actively participates in horticulture data collection process.

### **9.14 Area, Production and Productivity of Horticultural crops grown by the Sample Farmers**

It was observed that, in Jadavpur village, fruit crops covered 0.19 hectares of area and only banana was grown. They produced 23.13 qtl. banana with the yield rate of 12,325kg/ha.

In Satekona village, out of the total fruit crop area of 34.82 hectares, 79.44 per cent (27.66 hectares) were allocated for cultivation of orange (Mandarin) and the rest 20.54 per cent (7.16 hectares) were allocated for cultivation of pineapple. The estimated production and yield of pineapple was 1,321.95 qtl. and 18,463 kg/ha in *kharif* season and 293.77 qtl. and 4,103 kg/ha in *rabi* season. Production and yield of orange was found at 4,501.31 qtl. and 16,275 kg/ha., respectively.

In Sensowa village, only banana cultivation was found in 0.35 hectare of un irrigated land. The production and productivity was found 35.41 qtl. and 10,245 kg/ha respectively.

In Bhumuraguri village, both Assam lemon and banana were grown by the farmers in un irrigated dry land. Of the total 1.22 hectares of land, 0.73 hectare was allocated to Assam lemon and 0.49 hectare for banana cultivation. The production and productivity of Assam lemon was 48.12 qtl. and 6,587 kg/ha and that of banana was 46.81 qtl. and 9,538 kg/ha respectively.

Combining all the sample villages together, a total of 36.57 hectares of area was devoted for cultivation of fruit crops comprising 1.03 hectares of banana, 27.66 hectares of orange, 7.16 hectares of pineapple and 0.73 hectares of Assam lemon.

It was observed that almost all the *kharif*, *rabi* and *summer* vegetables were grown by the sample farmers. In Jadavpur village of Barpeta district, of the total land of 28.00 hectares used for vegetable crops, 12.00 hectares were irrigated and 16.00 hectares were dry land. In un-irrigated areas, pointed gourd and ridge gourd were grown in *kharif* season while potato and brinjal were grown in *rabi* season. In the village, there was no report of growing summer and annual crops in any season. The production and productivity in irrigated area was found at 2,085.25 qtl. and 17,377 kg/ha. while, in rainfed area it was found 1,561.50 qtl. and 9,759 kg/ha respectively.

In Satekona village of Kamrup district, the unirrigated areas were utilized for cultivating ridge gourd, snack gourd and bitter gourd during the *kharif* season. In summer season, the farmers grew red pumpkin and arum in 0.85 hectare and 1.50 hectare respectively. The overall production and productivity was estimated at 404.80 qtl. and 8016 kg/ha., respectively. The production and productivity of potato was found at 45.73 qtl. and 6825 kg/ha and in case of brinjal, the respective figures were 72.29 qtl. and 23,320 kg/ha.

In Senchowa village of Nagaon district, no vegetable area was allocated for *kharif*, *summer* and *annual* crops. In *rabi* season potato and brinjal were grown in 0.67 hectare and 0.31 hectare of irrigated area, respectively.

In Bhumuraguri village of Sonitpur district, the farmers grew almost all the vegetables in all the seasons. In fact, it is the most vegetables producing district of Assam. In *kharif* season, water pumpkin and white gourd were grown. Potato, tomato, brinjal, onion, green chillies, sweet potato, cabbage, cauliflower, pea, radish, carrot, capsicum and other leafy vegetables were grown in *rabi* season, and in summer season, brinjal, long beans, lady's finger, red pumpkin, cucumber, *kunduli* etc. were grown by major sample growers. Combining all the vegetable crops, the production and productivity was worked out at 20,569.94 qtl. and 16,070 kg/ha., respectively.

In case of spices cultivation, all the crops were grown in un-irrigated land in all the sample villages. In Jadavpur village, the farmers produced 802.29 qtl. of spices with the yield rate of 3,387 kg/ha.

In Satekona village, the farmers grew only black pepper in 0.20 hectares of area and produced 3.08 qtl. with 1,538 kg/ha. of yield rate.

In Senchowa village, ginger, turmeric and black pepper was grown as annual crop which vested 146.65 qtl. of production. The yield rate was estimated at 3,770 kg/ha.

In Bhumuraguri village, 7.69 hectares of land was allocated to grow coriander, garlic, ginger and turmeric. Combining all the crops, the production and productivity was found at 190.47 qtl. and 2,477 kg/ha., respectively.

In case of garden/ plantation crops, Senchowa village occupied maximum area followed by Satekona village, Jadavpur village and Bhumuraguri village.

### **9.15 Area, production, marketed quantity and farm gate price across the season**

It was observed that in Jadavpur village, highest area was covered under garlic cultivation followed by pointed gourd, brinjal, ridge gourd, dry chillies, potato, ginger, turmeric, arecanut, coriander and banana. In case of farm gate price, highest amount was received from arecanut production and least income came from pointed gourd cultivation. The total income earned by the sample farmers was estimated at Rs.46,400.00 accrued from 4,251.08 qtls. of marketed quantity from an area of 54.68 hectares.

In Satekona village, maximum area was covered by orange (Mandarin) followed by pineapple. The other crops of different groups occupied negligible area in the cropping pattern.

But so far as farm gate price was concerned, black pepper provided maximum income of Rs. 20,000.00 followed by arecanut (Rs.18,000.00) and orange (Rs. 2,000.00). Combining all the crops in the village, the estimated area was 44.23 hectares, production 74,780.43qtl. and farm income was estimated at Rs. 45,850.00.

In Senchowa village, it was found that maximum area was covered under arecanut and least area was occupied by black pepper cultivation. Considering the price factor (farm gate) black pepper fetched highest income (Rs.20,000.00) followed by arecanut (Rs.18,000.00) and banana (Rs.1,750.00).

In Bhumuraguri village of Sonitpur district, varieties of vegetables were extensively grown along with other group of crops. The area covered under different crops was 141.01 hectares and farm income was estimated at Rs. 3,200.00 for fruits, Rs.37,302.00 for vegetables, Rs. 8,850.00 for spices and Rs.19,650.00 for plantation crops.

#### **9.16 Difference Between the two Estimates (Survey data vis-à-vis Agency data )**

It was observed that multiple agencies are involved in horticulture base line data collection/generation process in horticulture in Assam. But no systematic and accurate estimate of area and production of different horticultural crops are available. The estimates made by various agencies also vary considerably. Each agency has its own methodology, often resulting in variations in the data besides problem of revisions and time-lag. Further, only a few crops could be compared in this study due to non availability of data from the agencies' end.

It was observed that there was a considerable gap in area production and productivity of almost all the crops. But no difference was found in area under guava and papaya in Senchowa village and cauliflower, pea, carrot and onion in Bhumuraguri village. In case of production, the data were almost same in chilly in Jadavpur village, black pepper in Satekona village, pineapple in Senchowa village and pumpkin and green chilies in Bhumuraguri village. On yield rate, small gap was noticed in chilly and turmeric in Jadavpur and Senchowa village, black pepper and areca nut in Satekona village and green chilies, mango, radish and carrot in Bhumuraguri village. But there was a vast gap between survey and agency data in area of orange in Satekona village, production of coconut in all the sample villages and betel vine in Senchowa village. On productivity, large gap was noticed in Banana in Jadavpur village, coconut and orange in Satekona village, papaya, betel vine and pineapple in Senchowa village and ginger, jackfruit and onion in Bhumuraguri village. For other crops, slight difference was observed on area,

production and yield rate between agency and survey data. The main reason for the gap between the two estimates may be due to survey done in different seasons by the concerned agencies. Further, in case of fruits and plantation crops, bearing stages vary with different types and different varieties and most of the times, eye estimation and farmers' responses were taken in to account. Also, the areas under vegetables and fruit crops grown in backyard/ kitchen garden of the houses were not considered by the Govt. Departments. Moreover, a number of new short duration crops were grown by the sample farmers during the interviewing period.. Although the Government officials are required to undertake interim crop inspection between the two major *kharif* and *rabi* seasons, this does not appear to be done regularly. Even if short duration crops like vegetables, flowers, mushroom, *etc.* are covered during the crop inspection, they are not listed separately in the final crop abstract but clubbed together under "other crops". Thus; there is an urgent need to take necessary action to cover all the crops grown in all the seasons for all types of land with standardized methodologies.

#### **9.17 Difficulties Encountered by the Agencies while Compiling Horticulture Data**

As reported, the main difficulty faced by the agencies involved in collection of data was lack of updated 'Chitha' book in the villages, which was supposed to be maintained by the Revenue Department. Consequently, the persons engaged in base line data collection process faces lot of problems in applying uniform statistical methodologies. Another problem was lack of cooperation from farmer's family specially in crop cutting for some selected crops, like arecanut, coconut *etc.* Under this situation, the officials had to keep the record of production by eye estimation only. Moreover, some of the sample farmers very often demanded free inputs in order to supply the required information, which usually put the data collecting officials in great difficulty.

#### **9.18 Policy Implication**

Based on the findings of the study and the problems identified at the grass root level, the followings are suggested for improvement of base line data in horticulture in Assam:

1. There is need to establish a full fledged Horticulture Department in Assam. Presently it is working with under the Department of Agriculture, Govt. of Assam. Only then the officials of the Department can devote full time in collecting reliable base line data for horticulture which is needed for formulating and implementing horticulture development programmes.

Moreover, the Horticulture Department should have a well supported statistical cell for collection, monitoring and estimation of horticultural data.

2. There should be a set of prescribed format for individual farmers covering all aspects of horticulture to facilitate the process of data collection by different agencies.
3. A strong mechanism should be in place to have better coordination among the agencies like a NSSO, and other Govt. Departments.
4. For collection of base line data, the concerned agencies may involve the local farmer(s) or Panchayat representative(s) for better result.
5. More funds are to be sanctioned/release to the departments to meet the increasing expenses to cover village survey and collection of data.
6. There is need to train the officials on scientific data collection/management.
7. Awareness programme may also be conducted to educate the farmers on importance of book-keeping.

### **9.19. Conclusion**

Availability of reliable data is crucial for determining the status of ongoing horticultural development programmes & for taking up new programmes & policies for improvement of the sector. It is essential for estimating the growth, for carrying out analysis to assess the demand and supply trend, to identify problems and constraints, for evolving adaptive policies and exploring growth prospects. Similarly, detailed data are required, district/cluster/component wise, to monitor and evaluate the impact of various horticultural development schemes such as NHM and other Government sponsored schemes. In fact, availability of reliable data can also prevent misdirection of policy objectives and misplacement of priorities. In other words, creation of a comprehensive horticulture database is a must for effective planning and monitoring & new policy preparation to promote horticultural production in the state. Availability of proper data will also enable devising appropriate strategies to exploit huge export potential available in the field of horticulture.

Therefore, there is an urgent need for generating of reliable base-line horticulture data, particularly at district level, classified by different components. The agencies involved in generating the data should work in close coordination so that complete and accurate data can be obtained avoiding all sorts of duplication. And in the process, it will be useful to involve the farmers or Panchayat members to get better & accurate results.

State-wise, there should be a nodal agency to handle all kinds of data generated by different agencies/Departments, which can be held responsible for systematically & regularly maintaining those valuable data. There can be a Data Consortium as well with representation from all concerned formed by a group of technical experts.

For the instant study, there were data gaps & other limitations as well. And it is difficult for an outside agency (like AERC) to undertake complete enumeration of the population at village/ tehsil/ subdivision level in order to collect the household data. For a base -line study of such magnitude, the Government may consider for initiating Horticulture Centres in different States to meet the very purposes of generating a reliable and authentic data base.

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