

# Development of Mountain Horticulture in the Indian Himalaya

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India, the seventh largest country in the world, with a total geographical area of 328.73 million hectares, is ideally suited for growing large varieties of temperate, sub-tropical, and tropical fruits and vegetables, including potato, flowers, spices, and mushrooms. The country can be divided into three well-defined regions (Figure 1.1):

- the Himalaya in the north, from west to east,
- the Indo-Gangetic plains, primarily the basins of three major rivers: Indus, Ganges and Brahmaputra, and
- the Deccan Plateau,

These regions have a typical agro-ecological situation, with wide fluctuations, in temperature, sunshine, relative humidity, and rainfall. Soils of the country are grouped into 27 different types with four groups, alluvial, black, red, and laterite, being the most predominant.

Horticulture covers a wide range of crops: fruits (including nuts), vegetables (including potato), flowers and ornamental crops, medicinal and aromatic plants, plantation crops, spices, and mushroom. The statistics on area and production of horticultural crops, except in the case of banana, onion, garlic, potato, and chillies, which are forecast crops, are not available. The data on these crops are collected by the Directorate of Economics and Statistics of the Department of Agriculture and Cooperation. However, in accordance with the data compiled by the Horticulture Division of the Ministry of Agriculture the total production of fruits at the end of the Sixth Plan period was estimated to be 23.5 million tons, which rose to the level of 26.6 million tons, during the third year (1987/88) of



the Seventh Plan against the target of 28.0 million tons (Annex 1). The total production of vegetables in the terminal year of the Sixth Plan was estimated to be 34.0 million tons, which was increased to 48.5 million tons during the third year (1987/88) of the Seventh Plan, against the target of 50.0 million tons (Annex 2).

Productivity of fruits and vegetables, in general (barring grape and potato), is lower than in other developed countries. The overall productivity of fruits is around 9.77 tons/hectare (Annex 3). For example, the average yield of citrus works out to be about 8 to 10 tons as compared to 17 to 30 tons/hectare in Spain, Italy, and Japan, and the yield of pineapple to 15 to 20 tons as against 60 to 70 tons/hectare obtained in the Philippines and Hawaii. In India, the average yield of onion, tomato, and cauliflower is 9.96, 9.51, and 7.33 tons/hectare, respectively. The corresponding world averages are 14.32, 23.49, and 13.52 tons/hectare, respectively. The main reason for low productivity is unorganized orchard and vegetable growing, poor orchard efficiency, old heterogeneous population of trees, poor or low-yielding varieties, multiplication of plants grown of unknown pedigree, and poor quality seeds. The factors responsible for higher productivity, therefore, need greater attention.

The per caput availability of fruits (30 g per day) and vegetables (180 g per day) in the country is far below the minimum dietary standards prescribed by the Indian Medical Association and the National Institute of Nutrition, Hyderabad. In its report the National Commission on Agriculture recommended that the area under fruits be increased to 4 million hectares by 2000 A.D., with the possibility of doubling the average yield by various research and development measures so that the total production of fruit crops could be increased by more than four times. The target for vegetable production under the Seventh Five-Year Plan is around 50 million tons calculated on the basis of 280 g per person per day as recommended by dieticians.

Although horticultural crops occupy around 6.73 per cent of the total cropped area in the country, their contribution to the Gross National Agricultural Output was 18.84 per cent, as per the National Accounts Statistics for the year 1970/71 published in 1986 (Annex 4). In the production of vegetables the country ranks second in the world, next only to China. However, in the production of fruit it has slipped down to third position after Brazil and the United States (FAO Production Year Book, Vol. 41, 1988).

Based on soil and agroclimatic conditions, the country has been broadly divided into the following major agroclimatic zones:

- (1) Humid Western Himalayan region, comprising the states of Jammu and Kashmir, Himachal Pradesh, and the hilly areas of Uttar Pradesh;

- (2) Humid Eastern Himalayan region and Bay Islands comprising the states of Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Sikkim, Meghalaya, and Andaman and Nicobar Islands;
- (3) Humid Bengal, which includes the states of West Bengal and Assam;
- (4) Sub-humid Sutelj;
- (5) Arid western plains;
- (6) Semi-arid plateau and central highlands;
- (7) Humid semi-arid western ghats; and

Zones 4 to 7 have not been described since the paper covers only the Himalayan mountain region of the country.

The mountainous region of India consists of two regions:

- *Northwest hill region*, comprising the states of Jammu and Kashmir, Himachal Pradesh, the hilly areas of Uttar Pradesh, Kumaon and Garhwal Divisions (Districts of Dehradun, Tehri Garhwal, Pauri Garhwal, Chamoli, Uttar Kashi, Pithoragarh, Nainital and Almora).
- *Northeast region*, comprising primarily seven states: Assam, Arunachal Pradesh, Manipur, Mizoram, Meghalaya, Nagaland, and Tripura. This region also includes the states of Sikkim and the Siliguri-Darjeeling area of West Bengal.

### **Horticulture in the Northwest Hill Region**

The Himalayan hill region covers more than one-eighth of the total land area of the country, stretching from Jammu and Kashmir in the west to Arunachal Pradesh in the east. The northwest hill region is located between 20° and 36° N, having elevations ranging from 300 to 8400 m above sea level. Some of the areas at the higher altitude are sparsely populated. Basic statistics for this region are given in Table 1.1.

TABLE 1.1  
Basic statistics for northwest hill region

State	Population (million)	Total area ('000 km <sup>2</sup> )	Area of fruit trees ('000 ha)	Area of vegetables ('000 ha)
J & K	5.98	222	166	15.5
HP	4.28	55	142	40.0
UP	4.84	51	160	51.0
Total	15.10	328	468	106.5

Source: National Horticultural Board, Ministry of Agriculture, Government of India, Gurgaon, 1988.

## Fruits

Fruit trees cover about 20 per cent of the total cultivated area of the region. Apple is the major fruit, contributing around 40 per cent of the total area under fruit trees and 80 per cent of the volume of production. The area and production of fruits and nuts in this region are given in Table 1.2.

TABLE 1.2  
Area and production of fruit and nuts in northwest hill region

Commodity	Area ('000 ha)				Production ('000 tons)			
	J&K	HP	UP	NWHR	J&K	HP	UP	NWHR
Apple	67	55	51	173	427	259	153	839
Other temperate fruits	9	26	34	69	2	26	61	89
Nuts and dried fruits	55	11	60	143	30	20	128	178
Sub-tropical fruits	35	48	60	143	30	20	128	178

Source: National Horticultural Board, Ministry of Agriculture, Government of India, Gurgaon, 1988.

## Vegetables

Almost all kinds of vegetables are grown in this region. However, the important ones are potato, tomato, peas, beans, lettuce, artichoke, asparagus, and cucurbits. Perennial vegetables, because of frequent occurrence of frost, are not successfully grown. Vegetables in the hilly areas are primarily grown as off-season vegetables and are highly priced during that season because they are not available in the plains, the main consuming market. The region is also ideally suited for seed production of different vegetables. Statistics on area and production for individual vegetables grown in this region are not recorded on a regular basis. However, the estimated area and production of vegetables, including potatoes, in this region are given in Table 1.3.

## Mushroom Cultivation

Under the diversification of crops in the hills, mushroom cultivation has become popular, especially among unemployed youths. *Morchella* sp. (*gucchi*), *Pleuroties ostreatus*, and *Chanterelle* sp. are the typical mushrooms of the region. *Morchella* sp. has received major attention. It grows in the coniferous forests of high hills at elevations between 2500 and 5000 m above sea level in Himachal Pradesh, Jammu and Kashmir, and Uttar Pradesh (hills). The agroclimatic conditions are also suitable for the cultivation of *Agaricus bispores*, which has been taken up on a

TABLE 1.3  
Area and production of vegetables and potatoes in northwest hill region

State	Crop	Area (ha)	Production (tons)	Yield (tons/ha)
J& K	Vegetables	13,600	104,000	7.64
	Potato	1,900	3,300	1.73
H.P.	Vegetables	24,000	351,848	14.66
	Potato	16,750	110,000	6.9
U.P.	Vegetables	37,783	175,719	4.65
	Potato	13,038	233,249	17.89

Source: National Horticultural Board, Ministry of Agriculture, Government of India, Gurgaon, 1988.

commercial scale in all the three major hill states under various programmes. To encourage mushroom cultivation emphasis has been given to training farmers, providing technical guidance, and supplying spawn. Facilities have also been provided to advance loans on easy terms to create the necessary infrastructure. In Jammu and Kashmir, the programme has progressed very well under the cooperative sector. In Himachal Pradesh, small and marginal farmers have been provided with various incentives by way of supplying pasteurized compost and spawn. However, these farmers are facing difficulties in marketing their produce. In Uttar Pradesh (hills) unemployed youths have been encouraged to take up mushroom cultivation and the programme has been very successful.

To boost mushroom cultivation a mushroom development project with collaboration from the Netherlands government has been initiated in all the hill states. The main emphasis has been placed on training and the supply of pasteurized compost to mushroom growers. It is also proposed to introduce high-yielding strains to get better yields per unit area. The necessary infrastructure has been provided for the project in the main mushroom-growing areas.

A National Research Institute on Mushroom Research has been established at Solan in Himachal Pradesh. This centre has helped the hill states to identify technical problems in mushroom cultivation and to suggest corrective measures. It is also an important centre for the production of spawn, supplied to farmers on a no-profit no-loss basis. The Horticulture Station at Chaubattia is also helping farmers by following their technical problems and supplying them with spawn.

### *Floriculture*

The Himalaya are a rich source of flora but, unfortunately, no concentrated efforts have been made to exploit it commercially. In recent years,



some attempts have been made to grow gladioli and tuberose in Uttar Pradesh and Jammu and Kashmir. The cut flowers fetch good prices in Delhi and other big city markets, and they can be supplied in summer when there are no good flowers available in the plains. However, although the marketing of flowers is a serious problem, no systematic research has been done on any aspect of floriculture. It would, therefore, be worthwhile to initiate research on packing and storage, so that small and marginal farmers may be attracted towards this new occupation.

Floriculture has developed specially in the cities of the plains. But it is facing difficulty for want of suitable good seed and plant material. Imported seed material is very expensive and only a few people can take advantage of it. Furthermore, in the plains, it degenerates after some time and the quality of the flowers deteriorates. The climatic conditions of the hill areas are suitable for raising the seed of flowers which can find an easy market in the plains. Large varieties of bulbous plants can also be multiplied under hill conditions.

The northeastern region is a rich source of orchids which has not been commercially exploited. The production of new and attractive hybrids under controlled conditions can give a new impetus to the flower industry.

### *Spices*

The agroclimatic conditions of the Indian Himalaya are suitable for growing spices such as ginger, cardamom, turmeric, onion, garlic, chillies, and saffron. Some of these crops, depending on market requirement have been commercially cultivated. However, some of the spices are also successfully grown in the plains. To be commercially viable, therefore, mountain products have to compete with those of the plains. The cost of cultivation is lower in the plains than in the hills. This is the main reason why spice cultivation in the mountains is not gaining momentum in spite of the emphasis given to it. In one study conducted by the Horticultural University, Solan, it was revealed that ginger cultivation by the farmers in Himachal Pradesh is done at a loss, and the farmer does not count his labour in its cultivation. But an alternative system of farming has not been adopted so far in these areas due to constraints like non-availability of irrigation and climatic conditions. In the sub-arid region of Kashmir valley, saffron cultivation has become a steady source of income for the farmers.

### *Medicinal Plants*

The mountain regions of the Hindu Kush-Himalaya contain a large number of medicinal plants. Many plants are used, in both fresh and dried forms, as preventives for various diseases and ailments. Their impor-

tance has increased because of the commercialization of extraction and purification methods. However, there is no regular programme in any of the hill states for the development of medicinal plants. These plants are mostly found growing wild in the forest areas but they are exploited too drastically without concomitant measures for their regeneration. Because of the depletion of natural resources, and the present demands of the pharmaceutical industry, some efforts are being made to preserve plant material.

### *Apiculture*

The Hindu Kush-Himalayan region is a centre for the origin and evolution of honey bees and has the maximum concentration and diversity of biological forms. Apiculture is an old profession in the Indian Himalayan region. With the development of horticulture, mountain beekeeping has attained greater importance since it helps in the better setting of fruits; honey extraction has become of secondary importance.

There are four main species—*Apis cerana*, *A. mellifera*, *A. dorsata*, and *A. florea*—which are found in the Indian mountain region. In the sub-tropical region (300–1500 m), *A. mellifera*, a European species of honey bee, has become very popular and has replaced the native domesticated species, *A. cerana*. The main problem with this species is that it has a tendency to abscond and to swarm frequently. The climate of this zone varies from moderate to extremely hot. In this zone *A. mellifera* and *A. cerana* are kept for producing honey, but for pollination purposes (1350–2000 m), both *A. cerana* and *A. mellifera* are becoming popular. *Apis dorsata* migrate to this zone during the summer. All three species are a good source of pollination in this zone.

The most important area for apple production is the temperate zone. This is the area where the fruit crop is invariably affected by adverse weather conditions. Apiculture with *A. cerana* has attained importance in this zone, because it can withstand the adverse conditions. It is noted that pollination with *A. cerana* not only helps to better set the apple bloom, but also improves the quality and size of the fruit. In the last few years there has been a spread of sac brood virus disease, which has damaged important fauna, and this has ultimately affected the production of apple. In Himachal Pradesh and Uttar Pradesh, for better setting of fruit blossoms, beehives are available on hire from the Department of Horticulture. With the expansion of the horticultural industry, apiculture will play an important role in the setting of fruits and improving the vegetable and flower seed industry. Follow-up research for the proper maintenance of beehives will be essential in the larger interest of the horticultural industry. The state government frequently runs special training courses in apiculture for the benefit of the farmers.



## Horticulture in the Northeast Region

The total population of the northeastern region is 26.6 million (1981 census) and agriculture is the main occupation. The agriculture practised in the region is broadly of two distinct types: that practised in plains, valleys, foothills, and terraced lands on slopes is settled agriculture, and the other followed on slopes of all possible gradients is shifting cultivation or 'Jhuming', practised by the tribal people of the hill areas. Settled agriculture accounts for 14 per cent (37 million hectares) of the total geographical area. Banana, pineapple, and mandarin orange are predominant, followed by apple, stone fruits, coconut, mango, litchi, guava, jackfruit, and papaya. Among plantation crops, tea cultivation is an old and established industry. Introduction of coffee and rubber has been successful. Among vegetables and spices, potato and ginger are the major crops, producing a large marketable surplus, followed by chillies, tapioca, sweet potato, and green vegetables.

The region is known as a major centre for citrus, producing about 17 species with 52 varieties. It has been reported that *Citrus limon* Burn., *C. medica* Linn., *C. gambhiri* Lush., *C. ichengensis* Swingle, *C. Latipes* Tanaka, *C. macroptera* Montr., *C. arsamensis* (a new species), *C. indica* Tanaka, and *C. aurantium* Linn are indigenous to this region. The Indian wild orange *Citrus indica* is found in the Naga Hills and the Garo Hills of Meghalaya.

The total area under fruit cultivation in the region is more than 200,000 hectares (Table 1.4) with an annual production of about 700,000 tons, of which mandarin, banana, and pineapple constitute about 85 per cent in both area and production. In mandarins, the Khasi mandarin, also known as soh-nia-matara, Jatinga orange, Shella orange, Lushia orange, is the main cultivar grown as a seedling on slopes or even steep gradients. Cultivation of the mandarin is distributed among all the states of the region, with Meghalaya leading in area, followed by Manipur. Mandarin plantations were widespread in Tripura, Manipur, and Meghalaya before the partition of the country in 1947, when the trade routes were through the area now in Bangladesh. Now, due to neglect, the orchards do not produce optimum yields. With proper care the yield could reach up to 6 tons per hectare. The Indian Council of Agricultural Research, Shillong, found that the decline in citrus is not due to virus but to the attack of trunk borer (*Monohammus versteegi*) and *Phytophthora* root rot to a large extent, accentuated further by attack of powdery mildew, scales, mites, leaf miner, and above all heavy weed growth. However, the greening virus, which is a damaging disease, is also present.

Besides the mandarin, Assam lemon is the other citrus species grown on a commercial scale in the region. The fruit also holds promise for the extraction of pectin, oil, and citrates.

TABLE 1.4  
Area and production of fruit and vegetables in Northeast Region

State	Fruit		Vegetables	
	Area (ha, 1986/87)	Production (tons)	Area (ha, 1986/87)	Production (tons)
Assam	102,263	666,979	92,797	384,961
Arunachal Pradesh	10,045	23,629	18,439	64,899
Manipur	17,030	175,260	51,734	4,760
Meghalaya	20,389	172,897	4,827	45,170
Mizoram	3,827	13,944	7,227	57,588
Nagaland	3,248	5,889	2,987	32,477
Sikkim	9,380	16,820	8,950	56,200
Tripura	39,122	279,970	24,700	36,500
Total	205,304	1,363,388	211,661	772,555

Source: North Eastern Council, Shillong (1986).

Pineapple cultivation, like that of mandarin, is old and spread through the whole region, on slopes under rainfed conditions with two cultivars, Giant Kew and Queen. The highest acreage of pineapple is in Meghalaya, Manipur, and Assam. The yield is only 8 to 10 tons against the optimum yield of 40 tons per acre, this low yield being primarily due to low plant population and poor management practices.

Banana occupies the largest area among fruits, occupying 40 per cent of the total area and contributing about 50 per cent of the total production of fruit in the region. However, the yield is very low. The main cultivars are Jahaigi, Malbhog, and Chini-champa.

Under temperate fruits, the species of *Malus*, *Prunus*, and *Rubus* genera are found growing wild. The crab apple (*Malus baccata*) is found growing wild at higher elevations of Arunachal Pradesh. The Shillong plateau of the Khasi Hills, in Meghalaya, accounts for many *Prunus* species, such as *P. nepalensis* sev., *P. punctata* HK  $\times$  *P. undulata* Ham., *P. cerasoides* D. Don., *P. genkinsii* H.K.f. and Th., *P. acuminate* Wall, *P. persica* Benth and H.K.f, *P. communis* Hud., and *P. triflora* Roxb. (or *P. salicina* Lindl). *Pyrus* species like *Pyrus pashia* Ham, *P. pyrifolia* var., *Culta Nakai*, *P. communis* Linn., and *P. khosiana* Dene are also found in Khasi Hills and Northeast Manipur district.

Regular cultivation of temperate fruits is confined to higher elevations of Arunachal Pradesh, Meghalaya, Manipur, Nagaland, and Assam Hills. Apple is quite successful in Bomdila, Tawang, adjoining areas of Kameng district and zero area of Subansiri district of Arunachal Pradesh. The fruit quality of apples from Kameng district of Arunachal Pradesh is excellent, with fruit size and colour being quite attractive.

## Vegetables

The cultivation of vegetables is very old in the northeastern region. The recorded area under different vegetable crops in the region including tubers, rhizomestus, and bulb crops, but excluding greens, is more than 200,000 hectares with an annual production of about 7,70,000 tons. The other vegetable crops like cole, cucurbits, legumes, and solancens are grown on a limited scale. About 36 different types of vegetables are found growing in the region, which include six species of *dioscorea*, four species of *arum*, and many kinds of bean. In addition, several indigenous vegetables, not common to other parts of the country, are grown for local consumption. These include tree bean (*Parka roxburghii* G. Don), and a tuber crop, *Vigna vixilata*, grown by the tribals of Tripura. The plant produces edible pods like cowpea and underground tubers like sweet potato, both being edible and rich in nutrients. Nodulation is commonly observed on the root system.

Under vegetables, potato is an important crop, grown both in the plains and on the hills in the region. With the introduction of disease-resistant varieties like *Jyoti Kufri*, production is increasing. Ginger is cultivated all over the region. Improved varieties like Maran, Poona, and Nadia have been introduced as commercial plantations.

## Marketing

In spite of good potential, the horticultural industry is not doing as well as might be expected for want of proper marketing facilities. Among the horticultural crops, the problem is mainly the disposal of pineapple, orange, ginger and potato. Export outside the region is mainly directed to the Calcutta market, disposed mainly through private traders, who purchase from the farmers either through pre-harvest contract or through spot purchase from village markets.

The cooperative societies organized earlier to market horticultural crops have performed a limited role as they are not active.

The inadequacy of transport facilities in the region is a major handicap to its overall development. At present, the bulk of the foods traffic to and from the region is carried by the railways, while within the region road transport is predominant due to the extensive hilly terrain. Lack of communications and long-distance transport add to the marketing cost of horticultural produce, which ultimately finds it difficult to compete in the open market with the produce of the plains, for example, pineapples from Siliguri and oranges from Nagpur. Furthermore, the post-harvest loss is as high as 30 to 40 per cent for pineapple.

Although there are about 30 processing units in both the public and the private sector, they are small units which cannot compete against

produce from the plains. Their cost of production is very high. New units under NAFED management may find some solutions to the problem of use of horticultural produce.

### *Research Facilities*

There is no systematic coverage of research on all aspects of horticulture in the region. The research complex of the Indian Council of Agricultural Research at Gangtok has taken up work on production problems. Some useful recommendations have been released from the regional research station in Shillong on potato. Due to import of plant material from unreliable sources, virus in citrus and pests and diseases in apple have already been introduced into the region, and they are going to be serious problems in the development of these crops in the region.

### *Commercial Varieties*

Commercial varieties of fruits and vegetables grown in the northwestern and northeastern regions are given in Annex 5.

## **Central and State Sector Programmes**

Agriculture including horticulture is a state subject. Till the Fourth Five-Year Plan, the entire attention of the central sector was devoted towards food security, whereas horticulture did not receive any attention. A token provision of Rs. 0.5 million for fruits and vegetables was made during the Fourth Plan period in the central sector. Once the importance of these more remunerative and nutritious crops was realized, central sector allocations were increased subsequently as follows:

Fifth Plan: Rs. 20 million

Sixth Plan: Rs. 86.8 million

Seventh Plan: Rs. 330 million

Eighth Plan: Rs. 2,500 million (anticipated)

### *Central Sector Programmes*

With the meagre allocation in the central sector, only a few developmental programmes could be taken up. The important programmes taken up on fruits and vegetables in this region under the central sectors during the Seventh Plan period are detailed below.

## **ESTABLISHMENT OF ELITE PROGENY ORCHARDS**

A central sector scheme has been implemented through State Farm

Corporation of India from the Sixth Plan period and continued during the Seventh Plan period. It is proposed to continue this scheme during 1990-91 in the Eighth Plan period. The main objective of this scheme is to produce elite planting materials of fruit trees and to generate good quality of vegetable seed. There are 10 farms on which planting materials are being produced covering an area of 500 hectares. Out of this, 464 hectares have already been covered. The scheme has four components: collection block of mother trees, progeny tree testing block, seed garden, and nursery. The nursery has so far produced 265,587 quality plants to be distributed to the farmers.

#### IMPROVED TECHNOLOGY FOR QUALITY APPLE PRODUCTION

A scheme was started in 1983/84 in the states of Himachal Pradesh, Jammu and Kashmir, and Uttar Pradesh to produce quality fruits, increase production, ensure remunerative price to growers, and offer direct employment to unemployed youths through panchayats and co-operatives. Subsequently, Arunachal Pradesh was also included in the scheme.

For controlling insects, pests, and diseases and to maintain good quality, foot sprayers and power sprayers were provided. Foot sprayers were given to individual farmers at 50 per cent subsidy and power sprayers at 50 per cent subsidy to service organizations like cooperatives and panchayats. Under the scheme 6359 foot sprayers, 494 power sprayers, and 1029 anti-hail nets have been distributed. An area of 4200 hectares has also been covered under a micro-nutrient application programme.

#### PRODUCTION AND SUPPLY OF QUALITY PLANTING MATERIAL OF FRUIT TREES

The pilot project for production and supply of quality planting material for fruit trees was implemented in 1986/87 for a period of three years. The main objective of the project was to strengthen the infrastructure of fruit nurseries for additional production of quality planting material. Under the project 21 government fruit nurseries in 19 states and union territories have been strengthened for production of an additional 125 million quality planting material per year.

#### DEVELOPMENT OF HORTICULTURE IN THE UTTAR PRADESH HILLS

The pilot project for development of horticulture in the Uttar Pradesh hills was implemented during 1986/87. The National Horticulture Board provided 100 per cent financial assistance for implementation of this project. The project was implemented for one year only. Its main objective was to demonstrate the technology for grading and packing of commercial fruits grown in the hills, particularly apples, and to ensure timely

supply of critical inputs such as fertilizers and insecticides to small and marginal apple growers through the provisions of a revolving fund. The project was implemented by the Directorate of Horticulture and Fruit Utilization, Ranikhet. Financial assistance was provided for construction of five grading and packing sheds and purchase of equipment. The Board also provided assistance for installation of a telex unit at Government Garden, Rudrapur (Nainital) through which daily market information from important terminal markets like Delhi, Bombay, Madras and Bangalore, is collected and supplied to farmers' organizations engaged in the marketing of fruit and vegetables.

#### ALTERNATE STRUCTURE FOR MARKETING OF FRUIT JUICE AND FRUIT-BASED BEVERAGES

A scheme for marketing of fruit juice and fruit-based beverages was initiated in 1987/88 for a period of three years. The main objective of the project was to ensure supply of nutritious fruit juices at a reasonable price within the reach of the masses and also to avoid gluts during peak harvest season and ensure remunerative returns to farmers. The project envisages the installation of 600 refrigerated juice vending machines at important locations, initially in cosmopolitan and metropolitan towns, at places which have a floating population: bus stands, railway stations, theatres, cinema halls, and canteens catering to large establishments. During the 1988/89 and 1989/90 period, the Board provided assistance to various organizations for installation of 548 juice vending machines.

#### POST-HARVEST MANAGEMENT OF HORTICULTURAL CROPS

A project was started in 1987/88 for a period of four years to strengthen the post-harvest management infrastructure and all its important components except processing. The National Horticulture Board is paying attention to: (1) construction of grading and packing centres for marketing of graded products and store-cum-office for marketing of graded fresh fruits and vegetables for assured supply of critical inputs; (2) supply of recyclable rigid plastic containers and crates; (3) organizing better transportation system; (4) arranging retail outlets to ensure speedy sale and reduce the middleman's margin; (5) development of an appropriate type of cold chain for pre-cooling to ensure retention of quality during transport and adequate storage facility at the production centres to avoid seasonal gluts and distress sale. The benefit of these facilities is being given to organized sectors, namely, cooperative societies, corporate sector and registered farmers, and voluntary organizations and associations of farmers. The Board is providing 50 per cent financial assistance for such facilities. The project has had good response from the cooperative societies.



## MARKET INFORMATION SERVICE OF FRUITS AND VEGETABLES

The market information project was initiated in 1987/88 for a period of three years. Now it is proposed to extend the project further during the Eighth Plan period. The group on Perishable Agricultural Commodities headed by Dr. M.S. Swaminathan, in their report, had expressed concern for the urgency of strengthening market information service for fruits and vegetables, where price support operations are not possible due to limited budgetary support. The group had also stressed that such a service should be organized under the aegis of the National Horticulture Board. Therefore, with a view to providing the latest information about rates, market trend, and market behaviour, three markets in the mountain region, Srinagar, Shimla and Guwahati, have been linked to 18 other important terminal markets connected to a computer at Delhi, interfaced with the main computer at the National Horticulture Board, headquarters at Gurgaon. The information is being provided daily through newspapers, All India Radio, and Doordarshan.

## PACKAGE PROGRAMME ON PINEAPPLE

A package programme on pineapple was initiated in 1975/76. Its main objective was to improve the production of pineapple and banana by high-density planting. For this purpose, demonstration plots were laid out in farmers' fields with 100 per cent subsidy. The banana programme was implemented in Goa and the pineapple programme in Andaman and Nicobar Islands and Arunachal Pradesh. The size of each demonstration plot for banana was 3.22 hectares and for pineapple 0.4 hectare. For pineapple 900 demonstration plots were laid out covering 360 hectares, and for banana 124 demonstrations were laid out covering about 400 hectares.

## INDO-AUSTRALIAN APPLE TECHNOLOGY EXTENSION PROJECT

The apple technology extension project was implemented only in Jammu and Kashmir from 1983 to 1987. The main objectives of the project were: (1) to demonstrate scab control measures; (2) to demonstrate various pruning training methods; (3) to trace and monitor periodic nutrient requirements; and (4) to demonstrate the management and integrated control of insects and pests. An area of 150 acres has been covered under this project.

## INDO-ITALIAN PROJECTS ON DEVELOPMENT OF TEMPERATE FRUIT CROPS

The project on development of temperate fruit crops was started in August 1984 in the states of Jammu and Kashmir, Himachal Pradesh, and Uttar Pradesh. It broadly envisaged improvement and development

of temperate fruit production, processing and marketing, adoption of imported fruit varieties to local conditions with a special emphasis on olive, and training of Indian personnel on the basis of Italian experience in India by Italian experts. Under the project so far 14,360 plants have been planted in the demonstration plot, of which 5433 are of olive the remaining 8927 are other temperate fruits. Under the project, six trainees, two from each state, have been trained in Italy for six months. Four senior officers, one from each state and one officer from the Ministry, went on a study tour for two weeks. Two persons were also trained in olive oil processing.

#### INDO-BULGARIAN APPLE TECHNOLOGY PROJECT

A project was initiated in Jammu and Kashmir to improve apple technology with the assistance of the Bulgarian Government. The main objectives of the project were: (1) to introduce high-yielding spur type Red Delicious Apple strains and assorted clonal rootstock for use under high density plantation system; and (2) to develop drip irrigation system to meet the farm requirements and demonstration for its adoption on a large scale. The project envisaged import of improved apple seedlings and rootstocks from Bulgaria for plantation at the pilot project site in Jammu and Kashmir on an area of 50 hectares. Half the area has been covered with grafted planting material of commercial variety Red Delicious from Bulgaria and the other half has been covered with Ambri variety grafted on Bulgarian rootstocks.

#### INDO-DUTCH PROJECT FOR DEVELOPMENT OF MUSHROOM CULTIVATION

The project was started with the assistance of the Dutch Government in 1986. It is being implemented in Himachal Pradesh, Jammu and Kashmir, Uttar Pradesh and Karnataka. The aims of the project are twofold: to increase the yield of mushroom by improving the quality of compost, spawn, and casing soils and to generate employment opportunities and income for small and marginal farmers. The duration of the project is four years. About 250–300 farmers will be benefited around each centre.

#### INTENSIFICATION OF VEGETABLE CULTIVATION THROUGH DISTRIBUTION OF MINIKITS

The scheme for intensification of vegetable cultivation through distribution of minikits was sanctioned by the Government of India in September 1985 for a period of two years 1985/86 and 1986/87. Its main objective was to increase vegetable production and popularize high-yielding disease-resistant varieties of vegetables among farmers for increasing yield per unit area. The Board provided 100 per cent assistance for dis-

tribution of vegetable minikits, which contain seeds of high-yielding varieties, adequate quantity of fertilizers to cover 1/20th part of an area, and pesticides to control diseases and pests. During that period 178,760 minikits were distributed.

### *Constraints*

The major constraints faced by the horticulture industry in general, and by fruit and vegetable growers in particular, are described.

#### **WEAK DATA BASE**

The data base for horticultural crops, including fruits and vegetables, is very weak and no authentic data except that for banana, potato, onion, and some other tuber crops, are available. Because of the lack of data base it is not possible to identify gaps or evolve perspective plans for the development of this industry.

#### **NON-AVAILABILITY OF QUALITY PLANTING MATERIAL**

There is an acute shortage of quality fruit and vegetable planting material in India. This problem will be further aggravated if additional area is to be planted. Moreover, uniformity in standardization of rootstocks and of planting material is not being followed. Even the Nursery Registration Act is not in operation in most of the states. The certification of planting material is not being undertaken at all.

#### **LOW PRODUCTIVITY**

Productivity of almost all the crops in India (except in the case of grapes), is much below international standards, which adversely affects the income of farmers. The processed food industry has also been making serious complaints about the high cost of raw materials. One of the basic factors contributing to the low productivity, apart from non-availability of quality planting material, is improper agro-techniques or orchard management. Farmers are unaware of the modern techniques, developed within and outside the country. While liberalization of the seed policy will help in overcoming this problem to some extent, other factors affecting productivity should not be lost sight of.

#### **LOW QUALITY OF THE PRODUCE**

Because of lack of awareness of appropriate inputs to be made and agro-techniques to be followed, the quality of most fruits is not at par with that of horticulturally advanced countries or the produce of farmers who are well versed in such agro-techniques.

**LONG GESTATION PERIOD AND HEAVY INITIAL INVESTMENT**

Most of the fruit trees grown on a commercial scale have a very long gestation period. In setting up an orchard a heavy initial investment has to be made which is beyond the means of the majority of individual farmers, particularly small and marginal farmers who take up this venture. Fruit growers face financial hardship during the period when the trees are not bearing. Investment has also to be made after the fruit trees have been planted.

**HIGH RATE OF INTEREST**

The present rate of interest on loan for horticultural crops is around 12.5 per cent. When an orchard is bearing and repayment has to be made, the liability of the fruit growers for repayment of the principal amount and interest thereon increases by around 100 per cent. This is a deterrent to the plantation of fruit trees. Most of the state governments also charge stamp duty on the funds borrowed from financial institutions, which further adds to the miseries of farmers.

**INADEQUATE BUDGETARY SUPPORT**

Horticulture in general and fruit trees in particular did not receive due attention in the past. Investment in central sectors and in most states is very meagre. In view of meagre budgetary support, very few schemes were taken up for the development of fruit and vegetable crops in the country.

**WEAK POST-HARVEST MANAGEMENT INFRASTRUCTURE**

The Group on Perishable Agricultural Commodities, in its 1981 Report, mentioned that post-harvest losses in fruits and vegetables are to the extent of thousands of crores annually because of weak post-harvest management infrastructure. In horticulturally advanced countries even the marketable surplus is used by the processing industry. In India we do not use more than 5 per cent in our processing. The absence of road linkages with market centres and the distant location of orchards further adds to the miseries of producers and increases post-harvest losses.

**INADEQUATE RESEARCH AND EXTENSION SUPPORT**

Fruits of different kinds are grown in almost all the states and union territories but extension support at village or block level either is not available or consists of only a skeleton staff. The same is the case at central level.



## LAND CEILING

The land laws in India do not permit the setting up of large-scale orchards and do not provide land on lease for the setting up of orchards.

## Future Directions

Keeping the above constraints in view, efforts are under way to place the Indian horticulture industry on a sound footing. Some of the steps described below have already been initiated by the government:

- (1) Liberalization of import of seed and planting material from anywhere in the world, subject to phytosanitary safeguards.
- (2) Placing the food processing industry in Appendix I, allowing entry of multinationals and large industrial houses into the setting up of a fruit processing industry.
- (3) Liberalization of import of technology, machinery, and equipment on preferential basis and reduced import levies.
- (4) Establishment of 26 agricultural universities, including one specially for horticulture and forestry in Himachal Pradesh. The mountain region, apart from having a horticulture university in Himachal Pradesh, has one agricultural university each in the states of Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh, Assam, and Nagaland and North-Hill University Campus with headquarters at Shillong and stations in almost all the hilly areas of the northeast region.
- (5) The All India Coordinated Vegetable and Fruit Improvement Project on major fruits and vegetables grown in the mountain region, already in operation under the aegis of the Indian Council of Agricultural Research.
- (6) Setting up of a National Research Centre on Mushroom at Solan, in Himachal Pradesh.
- (7) An Integrated Horticultural Development Project for NWHR with World Bank assistance, being negotiated.
- (8) Strengthening of the data base.
- (9) Regulating the supply of genuine seed and quality planting material in order to increase production and productivity both for local consumption and for export.
- (10) Elimination of shifting cultivation in the northeast region.
- (11) Encouraging the adoption of modern agro-techniques and strengthening the transfer of technology.
- (12) Strengthening of post-harvest management infrastructure.
- (13) Developing captive plantations around big processing units for an assured supply of raw materials and markets for the produce.

The following thrust areas have also been identified:

### *Area Expansion Programme*

An area expansion programme is proposed to be taken up for various fruits in areas suitable for growing different fruits. Apart from encouraging the individual farmers to plant more fruits trees, assistance is proposed for bringing an additional area of around 80,000 hectares under fruits which are of commercial importance for export, the processed fruit industry, and the domestic market.

### *Strengthening Supply of Quality Planting Materials*

The Elite Progeny Orchard Scheme, being implemented by the State Farm Corporation of India, is proposed to be continued during the Eighth Plan period also. The existing fruit nurseries in the states are proposed to be strengthened. Assistance is also proposed to be provided for establishing new fruit nurseries. Voluntary farmers' organizations would be encouraged to participate in the efforts of strengthening the supply of planting materials. The need for strict implementation of the Nursery Registration Act and certification of planting material would be impressed upon the state governments.

### *Increasing Productivity and Quality of Fruit Trees*

Major factors contributing to low productivity are: non-availability of quality planting material; unproductive old orchards; non-adoption of improved agro-techniques; insect pests and diseases; uneconomic holdings; and inadequate input supplies. To increase the productivity, the following measures are proposed:

- Rejuvenation of old orchards
- Re-planting of gaps
- Supply of plant protection equipments
- Making available drip irrigation facilities
- Adoption of improved agro-techniques

All these programmes are proposed to be taken up in the central sector through state governments. Besides the major areas indicated above, thrust will also be given to the following areas to put the horticulture industry on sound footing:

- Strengthening of data base
- Increasing producers' share in consumers' price
- Utilization of cull fruits



- Strengthening grading, packing and storage facilities
- Reduction in transit losses
- Export-oriented horticulture estates
- Development of captive plantation for the benefit of both the producers and processors
- Customs services for control of insect pests and diseases
- Supply of maturity kits
- Human resources development
- Setting up of a publication and propaganda unit
- Transfer of technology through training and visits
- Fruit shows, Udyan Pandit competitions, seminars, symposia and workshops

Similarly, the main thrust areas proposed in vegetables during the Eighth Plan period are:

- Production of planting materials
- Area expansion of vegetable crops
- Promotion of Nutrition garden
- Training and publicity
- Intensification of vegetable cultivation around big cities
- Promotion of vegetable cultivation in tribal and non-traditional areas having potential
- Promotion of rainfed cultivation of vegetable crop varieties in peninsular India and hills

In recent years a potential market has developed for flowers in the Middle East, which India could profitably exploit. India has the advantage of growing most of the flowers during winter also. At present there are no centrally sponsored schemes on floriculture in any state. Realizing the importance of floriculture in the country, the working group on horticulture has identified production of planting material and demonstration-cum-training as essential to its promotion.

Introduction of desired varieties from sources within the country and from foreign countries, evaluation of their performance in different agro-climates and rapid and mass multiplication of selected varieties for distribution are necessary. It is proposed to take up this programme initially in nine states during the Plan period. In each state demonstration-cum-training centres may be taken up in a few selected flower-growing states. At each such centre emphasis will be on propagation of selected material for distribution to growers and demonstration of the best agro-techniques for growing flowers. These centres will impart practical training to growers in flower cultivation, post-harvest handling, and packaging.

## Annex 1

## State-wise area and production of fruits for the year 1987-88

State	Area (in ha)	Proportionate % Share	Production (tons)	Proportionate % Share	Productivity (tons/ha)
Andhra Pradesh	284,720	10.06	3,184,330	11.94	11.18
Arunachal Pradesh	11,130	0.39	26,030	0.09	2.34
Assam	57,410	2.11	621,760	2.35	10.83
Bihar	227,710	8.04	2,232,040	8.07	9.80
Goa (including Daman and Diu)	4,600	0.16	33,800	0.12	7.35
Gujarat	84,000	2.97	1,854,400	6.70	22.08
Haryana	24,570	0.87	380,623	1.38	15.49
Himachal Pradesh	142,000	5.02	309,000	1.12	2.18
Jammu and Kashmir	166,422	5.88	470,754	1.70	2.83
Karnataka	190,586	6.73	2,950,856	10.66	15.48
Kerala	195,820	6.92	893,068	3.23	4.56
Madhya Pradesh	52,068	1.84	733,433	2.65	14.09
Maharashtra	69,890	2.47	1,684,658	6.09	24.10
Manipur	17,730	0.59	175,260	0.63	10.48
Meghalaya	21,935	0.77	190,480	0.69	8.68
Mizoram	3,848	0.14	18,959	0.07	4.93
Nagaland	2,810	0.10	5,880	0.02	2.09
Orissa	146,980	5.19	1,422,020	5.14	9.67
Punjab	56,925	2.01	521,800	1.89	9.17
Rajasthan	16,787	0.59	1,178,760	4.26	70.22
Sikkim	9,450	0.33	19,500	0.07	2.06
Tamil Nadu	119,440	4.22	2,311,900	8.35	19.36
Tripura	35,435	1.25	128,326	0.46	3.62
Uttar Pradesh	779,000	27.51	5,320,000	19.22	6.83
West Bengal	104,451	3.69	932,204	3.37	8.92
Andaman and Nicobar	2,677	0.09	21,086	0.08	7.88
Chandigarh	110	0.00	12,080	0.04	109.82
Dadra and Nagar Haveli	760	0.03	6,890	0.02	9.07
Delhi	29	0.00	150	0.00	5.17
Pondicherry	430	0.02	5,907	0.02	13.74
Lakshadweep	215	0.01	442	0.00	2.06
Total	2,829,938	100	26,648,096	100	9.42

## Annex 2

## State-wise area and production of vegetables

State	Area (ha)	Proportionate % Share	Production (tons)	Proportionate % Share	Productivity (tons/ha)
Andhra Pradesh	79,958	2.01	705,152	2.03	11.97--
Arunachal Pradesh	18,062	0.44	62,969	0.13	3.49--
Assam	92,979	2.26	384,961	0.79	4.14*
Bihar	844,173	20.49	6,824,401	13.95	8.08--
Goa (including Daman and Diu)	170	0.00	590	0.00	3.47--
Gujarat	88,000	2.14	1,461,000	2.99	16.60---
Haryana	51,887	1.26	621,870	1.27	11.99--
Jammu and Kashmir	15,500	0.38	107,300	0.22	6.92--
Karnataka	169,953	4.12	2,741,691	5.60	16.13---
Kerala	207,740	5.04	3,317,587	6.78	15.97-
Madhya Pradesh	119,636	2.90	2,348,137	4.80	19.63-
Maharashtra	142,980	3.47	858,627	1.75	6.01--
Manipur	51,734	1.26	94,760	0.19	1.83--
Meghalaya	24,327	0.59	301,170	0.62	12.38--
Mizoram	2,110	0.05	6,263	0.01	2.97--
Nagaland	2,988	0.07	32,480	0.07	10.87-
Orissa	685,000	16.62	5,710,000	11.67	8.34--
Punjab	78,200	1.90	1,331,000	2.72	17.02---
Rajasthan	52,100	1.26	158,215	0.32	3.04--
Sikkim	8,950	0.22	56,200	0.11	6.28--
Tamil Nadu	115,627	2.81	2,640,560	5.40	22.84--
Tripura	25,250	0.16	210,500	0.43	8.34--
Uttar Pradesh	1,103,000	26.77	15,985,000	32.67	14.49--
West Bengal	103,500	2.51	1,994,830	4.08	19.27--
Andaman and Nicobar	2,700	0.07	16,200	0.03	6.00--
Chandigarh	NA	NA	1,970	0.00	***
Dadra and Nagar Haveli	1,520	0.04	13,560	0.03	8.92-
Delhi	4,381	0.11	287,642	0.59	65.66---
Pondicherry	709	0.02	12,039	0.02	16.98--
Lakshadweep	325	0.01	368	0.00	1.13---
Total	4,117,282	100	48,588,890	100	11.80

- 1987/88

-- 1986/87

--- 1085/86

Source: Ministry of Agriculture, Horticulture Division (1988).

**Annex 3****Estimated area, production and productivity of important fruits in India (1987/88)**

Fruit	Area	Percentage of total	Production	Percentage total area	Area in '000 hectare Production in '000 tons	
					Productivity (ton/ha)	Potential production
Apple	205.4	8.74	1540	4.83	7.5	30.00
Banana	336.61	14.32	8085	25.34	24.02	—
Citrus	279.34	11.89	2940	9.22	10.52	30.00
Grape	8.29	0.78	496	1.55	27.1	—
Guava	191.46	8.14	3390	10.63	17.71	—
Mango	1206.5	51.32	12540	39.31	10.4	30.00
Pineapple	113.3	4.82	2970	9.31	26.21	80.00
Total	2350.9	100.01	31960	100.19		

**Annex 4****National income contribution of horticultural crops**

Crop	1970/71	1984/85	1970/71
Banana	1,378.9	7,235.94	24.7
Potato	2,423.3	8,410.8	47.1
Chillies	2,295.6	8,167.1	255.8
Tapioca	1,113.0	1,512.7	35.9
Other fruits and vegetables	12,688.0	51,061.2	307.4
Coconut	3,623.2	15,917.0	426.5
Areca nut	688.0	3,975.3	477.4
Cashew nut	305.0	2,080.5	582.0
Pepper	137.0	634.8	363.3
Other spices and condiments	1,770.5	8,925.7	404.1
Tea	1,208.4	8,586.4	610.5
Coffee	604.7	3,187.6	427.1
Rubber	307.7	2,142.2	596.2
	27,943.9	121,836.6	336.0
Total value of agricultural crops	17,564.5	646,734.0	268.3
Percentage of horticultural crops to total agricultural crops	15.91	18.84	

Source: National Accounts Statistics 1970/71 to 1984/85 compiled by the Central Statistical Organization of India.

**Annex 5**

Important varieties of fruits and vegetables grown in states of the Himalayan Region

**A. Apples****1. Himachal Pradesh**

Delicious group, 90 per cent —Red, Starking (Royal),  
Golden delicious,  
Rich-a-Red

Others, 10 per cent —Red June, King of Pippin, Worcester Pearman  
(early varieties), Red Gold, Granny Smith, Rust  
Pippin, Winter Delicious (late varieties).

**2. Jammu and Kashmir**

Maharaji (white dotted red), 40 per cent

Delicious group, 30 per cent

Kesari, 5 per cent

American (Apirouge), 5 per cent

Ambri, 1 per cent

Others, 14 per cent

**3. Uttar Pradesh (hills)**

Red, Starking, Golden Delicious, Rymer, Buckingham, Fanny, Benoni,  
Early Shanberry, Jonathan, Chaubatia Princess (Red Delicious ×  
early Shanberry).

**B. Other Fruits****1. Northwest hill region**

Peach—Elberta, July Elberta, J.H. Hale

Plum—Santarosa, Mariposa, Greengage

Apricot—New Casetel, Safeda, Kaisi and Ambrosie, Nari

Cherry—Red and Black Heart

Walnut—Mostly plants from seedlings

Almonds—Thin-shelled, nonpareil

**2. Northeast region**

Pineapple—Giant Kew is the major variety. Queen and Mauritius are  
also grown.

### C. Vegetables and Potato

A large number of varieties of vegetables are grown in this region. Certain high-yielding varieties have been identified under the All India Coordinated Vegetable Improvement Project of the Indian Council of Agricultural Research and are given below:

Brinjal—Pusa, Purple Long, Pusa Purple Cluster, PH-4, Pusa Kranti, Pant Samrat, Azad Kranti, Arka Navneet, Pant Rituraj, T-3, Jamuni, Arka Kasumkar, Punjab, Bahar

Chilli—Andhra Jyoti, Bhagyalakshmi, Kovilpatti

Cauliflower—Pusa Deepali, Pant Subhra, Improved Japanese, Pusa Synthetic, Pusa Snowball-1, Pusa Snowball K-1

Carrot—Pusa Yamdagni

French bean—VL-Boni-1

Musk-melon—Hara Madhu, Pusa Sarbati, Pusa Madhuras, Arka Rajhans, Arka Jeet, Durgapura-Madhu

Onion—Pusa Red, N-2-4-1, N-53, Pusa White Round, Pusa White Flat, N-780, N-257-9-1, Agrifound Dark Red, Arka Kalyan, Arka Niketan

Peas—Arkel, Bonneville, Jawahar Matar-1, Jawahar Matar-4, Early December Pant Uphar, P-88

Tomato—Pusa Ruby, HS-101, S-12, Sel.-120, T-1, Sweet-72, Pusa Early Dwarf, Sious, Pusa Gaurav, Pb. Chuhara, KS-2, Pant Bahar

Water-melon—Durgapura Madhu, Sugarbaby, Arka Manik

Garlic—G-41 (Agrifound White)

Potato—Kufri Chandramukhi, Kufri Sandhuri, Kufri Badshah, Kufri Jyoti, Kufri Jeevan, Kufri Deva

### D. Spices

1. Cardamom (large), mainly grown in Sikkim:

Export (1978/88)—154.88 tons

Value—Rs. 7,021,990

2. Tejpat

Export (1978/88)—9.00 tons

Value—Rs. 60,050



### 3. Ginger

Total production 135,460 during 1987/88 as detailed below:

State	Area (ha)	Production (tons)
Himachal Pradesh	2,050	300
Manipur	350	600
Meghalaya	6,030	30,100
Mizoram	1,240	4,500
Nagaland	170	70
Tripura	720	1,190
Arunachal Pradesh	720	3,600
Sikkim	2,600	12,600
West Bengal	4,690	7,460
Kerala	15,410	42,980
All India	53,690	135,460

Source: Directorate of Economics and Statistics—All India Estimate on Ginger 1987/88.

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