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Horticulture Development in Uttar Pradesh Hills

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The hill region of Uttar Pradesh lies between 28° and 32°N latitude and 77° and 81°E longitude. It comprises eight districts with a geographical area of 51,125 sq.km and the altitude ranges from 400 to 8000 m above sea level. The total population of the hill area is 4,836,000 (1981) with a density of 95/sq.km.

Out of the net sown area of 1.346 million hectares, 85 per cent has no irrigation facilities, making the growing of agricultural crops totally dependent on weather conditions. Generally, once in four or five years, farmers are able to get normal yields, but more often they suffer a total loss. Therefore, horticulture is definitely a better economic proposition than growing cereal crops.

Fruit plants of different varieties, however, can only be successfully grown in such dry lands if the agroclimatic and soil conditions are right. In irrigated areas, the cultivation of off-season vegetables and off-season flowers and their seed production can give very high returns to growers who market them in the plains.

Considering these facts, the state government has given greater emphasis to horticultural development in the hill region of Uttar Pradesh. Due to its consistent efforts, the area under fruit cultivation has increased from 2400 hectares in 1952/53 to 100,000 hectares by the end of 1987/88. The development has been in apple, peach, plum, apricot, citrus, mango, and litchi cultivation, as shown in Table 4.1. Similarly, the area under vegetables has increased from 34,141 hectares in 1984/85 to 37,783 hectares by the end of 1987/88 and that under potato from 11,407 hectares in 1984/85 to 12261 hectares by the end of 1987/88. For

TABLE 4.1

District-wise area and production of different fruits in Uttar Pradesh hills

District	Apple		Pear		Peach		Citrus	
	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.
Almora	7,685	23,000	2,235	3,125	1,785	3,800	3,465	5,500
Nainital	12,073	27,000	1,480	2,550	3,340	6,300	1,825	4,250
Pithoragarh	4,723	19,000	997	2,450	1,149	2,280	2,640	5,300
Tehri	6,750	17,000	1,145	2,300	1,395	1,720	1,925	4,900
Pauri	6,504	16,000	827	2,590	727	2,150	2,641	3,550
Chamoli	3,785	17,000	1,007	2,075	1,266	2,465	3,331	7,800
Uttarkashi	6,033	16,000	785	1,310	1,040	2,036	1,150	3,500
Dehra Dun	3,590	18,000	936	2,180	970	1,230	1,600	3,200
Total	51,148	153,000	9,392	18,580	11,672	21,980	18,557	38,000

District	Mango		Plum/Apricot		Litchi	
	Area	Prod.	Area	Prod.	Area	Prod.
Almora	2,585	7,390	2,915	5,425	475	810
Nainital	4,485	18,580	1,295	3,660	745	1,062
Pithoragarh	1,065	3,000	1,905	4,020	855	936
Tehri	1,990	6,200	1,611	3,520	1,020	990
Pauri	2,900	5,500	1,888	4,200	1,710	1,230
Chamoli	328	830	1,510	3,630	367	756
Uttarkashi	301	800	1,249	3,420	80	350
Dehra Dun	3,795	3,700	1,112	2,320	2,362	2,270
Total	17,449	4,600	13,485	30,195	7,614	8,404

quick, scientific development of horticulture in the state, the government provides several facilities.

Supply of Plants, Planting Materials and Seeds

With a view to supplying true-to-type, disease-free plants of superior clones, 108 progeny orchards and nurseries have been established in different agroclimatic zones of the hill area. At least one nursery is functioning in each developmental block. There are 89 blocks in the hill region. These orchards and nurseries are on average supplying 2.5 million plant saplings every year. Some of the plants produced in these nurseries are also being supplied to other northeastern states and to Bhutan.

Recently, five more elite gardens have been established where virus-free cultivars of exotic temperate fruits as well as their rootstocks have been introduced. Locally selected clones, after being indexed against important viruses, have also been planted. Outstanding cultivars from them will be planted in all the progeny orchards as mother plants.

To supply healthy, disease-free seed of important vegetables such as cabbage, cauliflower, tomato, capsicum, European type carrot, and radish, eight vegetable farms have been established. The breeder seeds obtained from agricultural universities and research institutes are sown to raise foundation seed. This foundation seed is supplied to registered growers for certified seed production.

The hill region has 10 potato farms. In the main farms at Kashipur, Gagar (Nainital), Balanti (Pithoragarh), and Joshimath (Chamoli), breeder seeds obtained from the Central Potato Research Institute, Shimla, have been sown to raise Foundation-1 seed. This Foundation-1 seed is sown in departmental farms to raise Foundation-2 seed, which is given to farmers to raise certified seed.

Extension Support

Extension service is provided by the Department of Horticulture and Fruit Utilization to help orchardists and growers to lay out new orchards, select varieties of fruits and vegetables for a particular area, supply true-to-type planting material, and provide other technological guidance like training, pruning, pest and disease control, harvesting, grading, and packing. For vegetables, potato and flowers, the time of planting varies according to agroclimatic conditions, particularly altitude and aspect of the site, towards or against the sun.

For these extension activities 186 mobile teams function in the entire hill area. They are located in such a way that each developmental block has at least one mobile team and in horticulturally developed areas there are two to three mobile teams. These mobile teams also supply other inputs such as fruit plants, vegetable seeds, potato seeds, insecticides, and fungicides. The staff employed in these mobile teams are regularly trained at the horticultural and experimental training centres and at the agricultural universities.

The work of these mobile teams is supervised and coordinated by the District Horticulture Officer and the Potato and Vegetable Development Officer with the help of Zonal Senior Horticultural Inspectors located in a group of four to five blocks. The officers also regularly issue guidelines for extension workers as communicated by the department or the state government.

The knowledge of the officers as well as the inspectors is regularly kept up to date by regular training at the horticultural experiment and training centres, the Indian Council of Agricultural Research Institute, and the agricultural universities. The institute also arranges the training of external officers in different fields. Some of the extension officers are also exposed to the modern technology prevalent in other countries

through training and visit programmes or fellowships offered by these countries under various externally aided projects.

Financial Assistance of Growers

Initial investment in establishing orchards in the mountains is rather high because of heavy expenditure involved in operations like preparation of the land and terracing the field, digging of pits, and fencing. This has been found to come in the way of horticulture development work, especially among people with poor means. The difficulty is further enhanced because of the long waiting period involved in such crops before they reach economic bearing age. In order to encourage such people to take to fruit farming and improve their economic conditions the state government granted long-term horticultural loans on liberal terms and conditions, which has given a fillip to the development activities.

Means of communication in the mountain region have not yet fully developed. The situation is especially bad in the interior areas. Transportation of planting material, grafts, and seeds is not only cumbersome and time consuming, but very costly too. In order to provide relief to the growers, provision for a subsidy has been made by the government on the cost of transport of these commodities up to the block headquarters and village-level worker centres connected by motorable road.

Research Support

The department has its own set-up for research into various horticultural crops. There is one main Horticultural Experiment and Training Centre at Chaubattia (Almora) which is the oldest horticultural research station in India (1932/33). It has 12 main sections Pomology; Vegetables; Fruit; Vegetable and Medicinal Plant Breeding; Floriculture; Soil Science and Nutrition; Plant Physiology; Mycology; Virus and Mushroom Cultivation; Entomology; Production Economics; and Extension and Publicity.

This Centre has its sub-centres as well as field stations in different agroclimatic zones. The main sub-centres are at Jeolikote (Nainital), Pithoragarh, Matela (Almora—vegetables), Srinagar (Pauri), Chakrata (Dehra Dun), and Dunda (Uttarkashi). The field stations are at Rudrapur (Nainital), Kothiasen (Chamoli), and Kotdwar (Pauri).

The sub-centres are engaged in research on field-based problems such as varietal development, standardization of cultural practices, including propagation of aseptic planting material through tissue culture, improvement in productivity, and standardization of post-harvest handling of fruits, vegetables, and flowers, including marketing, storage, and processing. These centres also engage in research on mushroom cultivation, honey bees, and medicinal and aromatic plants to help local or-

chardists to have a subsidiary source of income. They also impart training on all these aspects to the staff of the Directorate of Horticulture and Fruit Utilization as well as to the growers of the areas.

All the infrastructural facilities created in the department have helped in the rapid development of areas under fruit, vegetable, potato, and flower cultivation. However, many new problems, such as low productivity, lack of marketing facilities, lack of storage facilities and wastage of fruits in transportation due to outdated modes of transport (e.g. on mules, by head loads, or by trucks on rough roads) have cropped up. The actions initiated to solve these problems are described.

Productivity

To increase productivity, a massive programme has been initiated since 1987/88 under which demonstrations are conducted in the growers' fields and orchards under the supervision of the technical staff of the department. In fruits, 10 fruit trees are selected in an orchard, preferably that of a small or marginal farmer. All the cultural operations such as training, pruning, fertilizer application, control of pests and diseases, including physiological disorders, provision of proper pollinizers, gap filling with modern cultivars, and changing of unproductive cultivars through top-working or frame working are done under the supervision of technical staff. Each demonstration is repeated every three years on the same tree so that the effects of weather conditions on the productivity of fruit trees may also be assessed.

Marketing

To solve the problem of poor marketing facilities, the state government has started a price support policy for apple since 1988 which will be extended to other fruit crops. Under this scheme, Rs. 1.50 per kg is paid for cull apples at the collection centres and Rs. 3.00 per kg is paid for A and B grade apples. Besides this, the orchardists are also provided with a 50 per cent subsidy on transport charges from orchard to road head (collection centres), if their orchards are more than 2 km away from the road head.

The department has also prepared a future plan which will concentrate on plantations with one or two types of fruit trees in a particular area to which it is most suited. This will help to facilitate marketing operations like harvesting, packing, grading, and transportation of fruits, because a large quantity of fruits will be available in concentrated pockets. It will also help in conducting pest and disease operations effectively, as the medicines and equipment necessary can be made available in good

time. The staff posted to these pockets will also get expertise through training and experience with these fruits.

In this plan, a block has been taken as a unit and fruit species have been identified on the basis of their agroclimatic and soil conditions. The guidelines prepared to plant specific cultivars in different agroclimatic conditions are given in Annex 1.

Soil Analysis

Soil profile and the chemical status of soil are always to be studied before new orchards are laid out to select suitable plant species. Soil analysis of existing orchards is also to be done every third or fourth year. For this, two soil testing laboratories are working in the area—one at Chaubattia (Kumaon division) and one at Srinagar (Garhwal division). They give regular recommendations regarding the type of crops to be grown or planted and the fertilizer doses to be applied. They also recommend soil amendment treatment if there is need due to high acidity or alkalinity.

Vegetable Development

Vegetable cultivation in the hills is a highly remunerative venture.

Vegetables such as cabbage, cauliflower, pea, capsicum, carrot, radish, tomato, and French bean can be produced in those seasons when they are not available in the plains, where there is a large demand for them in the big cities. In the hills the cultivation of these vegetables can be extended for 8 to 10 months if they are grown at different elevations.

The seeds of vegetables such as cabbage, cauliflower, capsicum, turnip, spinach, lettuce, and European carrot can only be produced in sub-temperate and temperate climates, but their seed is required for the entire country. There is also great scope to export these seeds to Middle Eastern and Southeast Asian countries.

There are several highly populated cities in the hills where it is difficult and costly to transport even the cheaper vegetables from the plains. These vegetables deteriorate in quality by the time they reach the consumer. Therefore, it is always better to produce vegetables locally. The purchasing power of the population of these areas is also quite high.

Off-season vegetable cultivation in Uttar Pradesh hills has already developed in certain pockets of three hill districts—Almora, Nainital, and Tehri. The main emphasis is on early cauliflower, cabbage, capsicum, tomato, French bean, and green pea. By taking up cultivation of these crops the farmers of these areas have considerably improved their economic condition. The government now envisages the development of such areas in other districts which are suitable either for off-season vegetable

cultivation or for seed production. Encouragement is also being given to vegetable cultivation around hill cities.

For this purpose 5498 demonstrations are being conducted every year on growers' fields where all the inputs like seed, fertilizers, pesticides, fungicides, and bacterial cultures are given for 1/50th of a hectare. All the modern practices are adopted in these areas under the supervision of technical staff.

Floriculture

Gladiolus, carnation, lily, dahlia, tuberose, and other flowers are produced in the hills at a time when they cannot be produced in the plains. Similarly, tulips, daffodils, red-hot poker and other flowers can only be produced in the hills, and the planting material of these flowers can also be produced there. Cut flowers and their planting material fetch remunerative prices and large-scale testing and multiplication of different cultivars of these varieties is being done at selected orchards in Dehra Dun and Nainital districts. Large-scale distribution of gladiolus corms at 50 per cent subsidy has been made for the last three years. This has helped to considerably augment the income of orchardists.

Olive Cultivation

It is a well-known fact that olive oil is now considered one of the best edible oils in the world and is also being used in medicines. The country imports Rs. 3 to 4 million worth of oil every year. The agroclimatic conditions of Uttar Pradesh hills are favourable to the growing of olive plants, particularly in the outer hills up to 1200 m above sea level. The wild plants of *Olea cuspidata* are to be found in these areas. Hence, a project in collaboration with the Italian Government was started in 1985 to develop olive cultivation in the Uttar Pradesh hills. In this project, 17 cultivars of olive, suitable for both oil and pickling, were introduced. For rootstock purpose, plants as well as seeds of *Olea europea* were imported. Two centres for the maintenance and propagation of these plants were established at Dhakrani (Dehra Dun) and Jeolikote (Nainital). These centres have all the facilities required for mass multiplication of plants, mist-chambers, glasshouses (temperature controlled), net houses, and sprinkler and drip irrigation. Ninety-three demonstrations both at government farms (27) and at private farms (66) were planned in agroclimatically selected localities. Some of the cultivars such as Pendolino, Leccino, Coratina, Frantoio and Cipressino are already doing well in some of these areas. Large-scale multiplication of these cultivars has been started both by cutting and by grafting. The plants raised by grafting will be planted under rainfed

conditions, while those raised from cutting will be planted in irrigated areas.

Mushroom Cultivation

Mushroom cultivation was taken up to provide an extra source of income to hill growers. For this, a loan of Rs. 10,000 was provided for a 100-tray unit at a nominal rate of 5.5 per cent interest. The loan is recoverable in five years and recovery starts from the third year. Now the quantum of loans has been increased to Rs. 25,000 and the loan will be distributed by the Land Development Bank and other commercial nationalized banks with an interest of 5.5 per cent. The difference in interest rates will be borne by the Department of Horticulture.

Besides this, spawn is supplied by the Horticultural Experiment and Training Centre, Chaubattia (Ranikhet) on a no-loss no-profit basis. This centre, along with its sub-centre Valley Fruit Research Station, Srinagar (Pauri Garhwal), also organizes 15 days' training of prospective growers in different districts. A stipend of Rs. 75 is given to the trainees. These centres also provide technical supervision with the help of extension staff to all units producing mushroom in the hills.

This has helped in the establishment of about 125 units with the production of about 800 quintals per year. A pasteurization tunnel of 50 tons per shift compost capacity is being set up at Jeolikote (Nainital) under the Indo-Dutch Project. This will further help mushroom production in the area. A similar project is envisaged at Dehra Dun.

Beekeeping

Beekeeping not only helps to provide a subsidiary source of income to the hill population, but also increases the production of fruits and vegetables, particularly of cross-pollinated crops such as apple, pear, plum and litchi and seed production in cabbage, cauliflower, carrot, turnip, radish, and other vegetables.

The Department of Horticulture, to develop the beekeeping industry, provides the following facilities to the local population:

- *Training in beekeeping:* Progressive beekeepers are provided four months' (200 persons) and 45 days' (900 persons) training on all aspects to beekeeping at two centres located at Jeolikote (Nainital) and Talwari (Chamoli).
- *Distribution of bee colonies:* The two centres give bee colonies at subsidy rates developed at the centres. About 350 colonies are distributed every year.

- *Distribution of beehives:* Small and marginal farmers are given beehives at 50 per cent subsidy to encourage them to take up beekeeping on commercial lines. About 400 boxes are distributed each year by the two centres.
- *Extension support:* The two centres, with staff posted in the districts, also help beekeepers to solve their day-to-day problems like control of pests and diseases, division of colonies, and arranging migration of colonies in winter.

Fruit Preservation

About 25 per cent of total fruit produce is cull fruit which is not suitable for table purposes. Similarly, a large amount of vegetables are wasted in storage and transport. For the proper utilization of cull fruits in the interior areas, as well as to cultivate the habit of consuming preserved fruits to enrich the local diet, fruit preservation was started by the Department of Horticulture.

The department has established 40 Community Canning Centres in several areas of the hills and two Food Craft Institutes at Nainital and Kotdwar (Pauri). The Community Canning Centres help the local population to preserve fruits and vegetables to the extent of 400 metric tons and imparts 15 days' training in home preservation techniques to local housewives and students. About 12,000 people are trained every year. The two Food Craft Institute give a one-year diploma in three courses: fruit preservation; cookery; and bakery and confectionery. Ten students per course are enrolled at each centre. Besides this, refresher courses for the staff engaged by the department are also arranged.

Annex 1**Cultivars recommended for different zones in Uttar Pradesh hills**

Climatic zones	Fruit	Varieties
1. Tarai-Bahar and area, Dehra Dun valley	Mango	Bombay Green, Bombay, Yellow, Langra, Chausa, Dasehri
	Citrus	Eureka Lemon, Kagzi kalan
	Litchi	Early Large Red, Calcutta, Rose Scented, Dehra Dun, Late Seedless
	Guava	Lucknow-49, Safeda
	Jackfruit	Local
	Papaya	Ranchi Dwarf, Pusa Nanha, Coorg Honey Dew (mainly Bahar areas)
	2. Humid valleys and hills of outer Himalayas up to 1500 m above sea level	Mango
Citrus		Sweet orange, Lemon (Round) (Malta Common), Mandarin (Hill Orange), Kinnow, Hill Lemon, Eureka
Sand pear		Gola
Walnut		Grafted plants on terraces and seedlings in ravines
Peach		Florida Sun, Crawford Early, Early Alberta
Plum		Santa Rosa
Apricot		Kaisa, Shipley's Early
3. Hot and dry valleys and low hills up to 1500 m above sea level	Peach	Same as in 2
	Pear	Same as in 2
	Citrus	Sweet orange (Malta Common), Mandarin (Srinagar and Kinnow). Hill Lemon, and Kagzi lime
	Mango	Same as in 1
	Almond	California Paper Shell, Brig's Hard Shell, Ne Plus Ultra, Drake
	Walnut	Same as in 2
	Apricot	Same as in 2
4. Mid-hills from 1500 to 2500 m, 1600 to 2200 m above sea level in outer hills	Apple (early)	Early Shanberry, Chaubattia Princess, Fanny and Benoni

Contd.

Annex 1: Contd.

Climatic zones	Fruit	Varieties
	Apple (middle)	Red Delicious, Royal Delicious (preferably in Uttarkashi, Dehra Dun, Pauri and Tehri), Red Gold and Golden Delicious as pollinizers, Spur varieties like Red Chief, Oregon Spur and Stark Spur Red.
	Apple (late)	Buckingham and Rymer
	Hazelnut	Daviana, Homischezeller, and Ronnda Roman
	Walnut	Same as in 2
	Peach	Crawford Early, Early Alberta, Peregrine
	Plum	Same as in 2
	Apricot	Charmagz, Royal, Turkey, Moorepark, New Large Early, Chaubattia Madhu

the mid-hills, and the high mountains. The terai, accounting for about two-thirds of the country's total cultivated area (2,553,397 hectares), is the bread basket of Nepal. The mid-hill region has considerable potential for horticultural development. The high mountains, usually under perpetual snow, are largely unsuitable for cultivation. Administratively, Nepal has been divided into 75 districts, 14 zones, and 5 development regions (Figure 3.1).

At present, the population of Nepal is over 17 million, out of which 44 per cent live in the terai and 56 per cent in the hills. The population is growing with an annual growth rate of 2.4 per cent.