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Early Spatial Diffusion of Orchards in Himachal Pradesh; India (1950-1995)

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ABSTRACT

Himachal Pradesh has conducive climate for the cultivation of fruits ranging from apple and stone fruits in the northern high hills to citrus and mango in lower hills. At present about 34 types of fruit species are grown in Himachal Pradesh on a bigger or smaller scale. Among these apple, pear, cherry, peach, plum, apricot, almond, walnut, pecan nut, mandarin, sweet orange, kagzi lime, hill lemon, mango, litchi, guava, kiwi fruit, olive, strawberry *etc.* are important. Apple is the most prominent fruit grown in Himachal Pradesh and occupies about 49 percent of the total area under the fruits. All other fruits together account for the rest 51 percent. However the other fruits of Himachal have also contributed reasonably to the financial pool of the state hence there is a need to study these in detail. Diffusion of Apple orchards has already been highlighted by N. Kaur in her paper titled 'Diffusion of apple orchards in Himachal Pradesh' hence the present paper is an attempt to analyse the process of diffusion of other fruits in Himachal Pradesh which also hold an important place in the economy.

1. Introduction

The State of Himachal Pradesh has a vast potential for producing different varieties of fruits ranging from tropical to temperate. The agro-climatic conditions of Himachal Pradesh are extremely suitable for growing varied fruits hence almost every district specializes in the production of one kind of fruit or the other. Even the districts such as Lahul-Spiti where no fruit cultivation was considered possible have appeared on the fruit map of the state. On the other hand, districts like Shimla, Kullu and Mandi are well known for fruits like apple besides other temperate fruits. The lower regions and valley areas of Kangra, Hamirpur, Bilaspur, Una and Sirmour districts, adjoining the plains grow citrus, mango and litchi. Pangi and Kinnaur produce dry fruits. Solan district and Kullu are famous for plums; Shimla, Kangra, Mandi, Kullu and Sirmour for pear and peach of development. Although other fruits have contributed reasonably to the economy of the state but the people's conception of development of Horticulture in Himachal Pradesh is related to apple. However Apple occupies 49 percent of area in Himachal Pradesh and rest 51 percent by other fruits.

This paper particularly deals with fruits other than apple. These fruits at present occupy 1,17,306 hectares (2016-17). The Diffusion of Orchards in Himachal Pradesh has been the result of many factors such as Government plans and policies, development of roads, setting up of fruit processing plants *etc.* in the state.

2. Objectives

This paper is an attempt to analyse the early phase of diffusion of orchards in Himachal Pradesh from 1951-1995.

Data base and methodology

Both primary and secondary data has been used in the present paper. The data relating to area under fruit cultivation has been taken from the Directorate of Horticulture, Himachal Pradesh. Primary data has been collected, by interviewing about 100 orchardists from different parts of the state on

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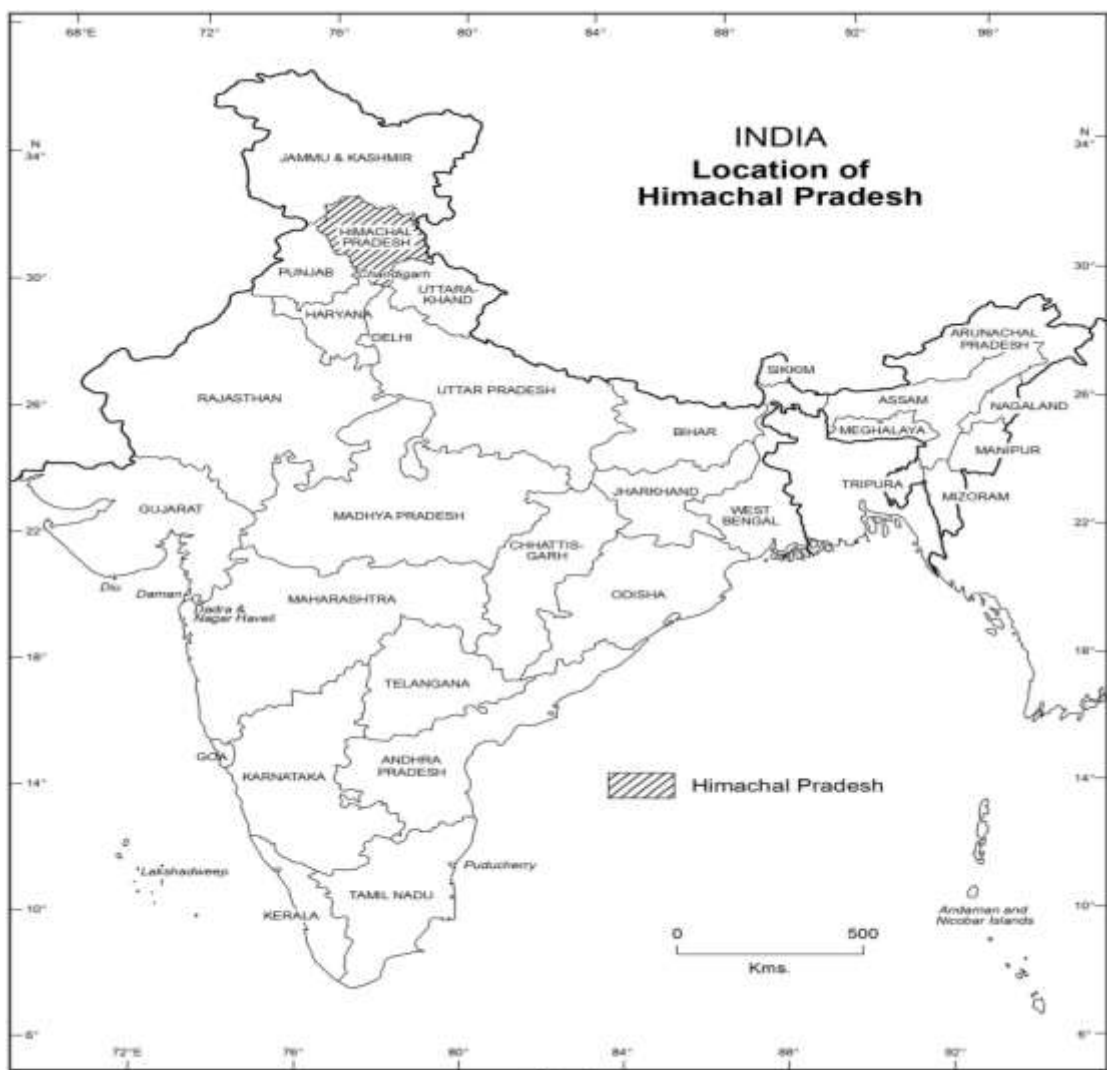


Fig. 1

random basis through a well structured questionnaire. Maps have been used to present the picture of diffusion in the early phase.

Diffusion of fruits (other than apple)

The diffusion of wide variety of fruits other than apple may be broadly categorized into the following three sections:

- A Diffusion of temperate fruits other than apple
- B Diffusion of sub-tropical fruits
- C Diffusion of other fresh fruits

The pattern of diffusion has been analysed by dividing the study period into two phases *i.e.* from 1951 to 1974 and 1974-1995.

A. Diffusion of temperate fruits other than apple

The temperate fruits such as peach, pear, apricot and plum occupy an important place in the orchards of the state of

Himachal Pradesh. The area under these fruits has increased remarkably from 114.5 to 31053.3 hectares during the study period along with the production from a mere 40 tonnes to 1,050 tonnes. the Kullu, Mandi, Solan, Sirmaur and Hamirpur areas grow these fruits from where they diffused to other parts of the state. Nuts and dry fruits like walnut, almond and hazelnut falling in the category of temperate fruits have recorded an increase in area from 232.6 hectares to 14908.3 hectares and a rise in production from 10 tonnes to 2351.6 tonnes during the study period. The temperate fruits require low to medium heat and can resist intensive cold winters. Severe winter conditions are important to enable the fruit trees to begin with normal growth in spring. The soil conditions required vary from well-drained heavy soils to light sandy and silt loam. Peach, Plum and apricot require a rainfall ranging between 100 and 150 cms while walnut and almond do well between 60 to 70 cms. Owing to the spatial variations in all these conditions, along with the combined role of many other factors, different fruits recorded differential diffusion in the state during the study period.

(I) Peach

Peach is an important stone fruit cultivated in Himachal Pradesh. The Maharaja of Patiala started its cultivation at Gaura (then, Kandaghat) in the year 1951, under the advise of an American, R.W. Hodgson. Further the first Chief Minister of Himachal Pradesh, late Sh. Y.S. Parmar initiated peach cultivation at Rajgarh (Sirmaur) in 1955. These two locations formed the nodes from where peach diffused to other areas. The diffusion has taken place to a number of areas largely from the Kandaghat node.

During the First Phase of Diffusion(1951 -74)

peach cultivation started on a commercial scale in Kandaghat (Mahasu) in 1951 as well as the Rajgarh valley (Sirmaur) in 1955. The area covered was 1 percent of total fruit area by the end of the phase. From these traditional nodes peach partially diffused towards west including Solan, Arki, Nalagarh and Kasauli tahsils of Solan and mainly diffused towards south covering Nahan, Renuka, Pacchad ,Paonta, Shillai tahsils of Sirmaur.

The diffusion has been of expansion type whereby the growers have been influenced by neighbouring growers the National Highway 22 passing through Mahasu district having a link road connecting Sirmaur in south enabled the orchards to diffuse along these major routes. The climatic conditions, soil and terrain have been important factors contributing to the spatial spread of peach from Rajgarh and Gaura to other areas. The first progeny-cum-demonstration orchard/nursery established at Chail followed by others in Kandaghat, Rajgarh, Arki and Kasauli also played a decisive role in the diffusion process. The government through its various five year plans laid emphasis on the development of State Highways along with metalled and rural roads. The progress recorded in this regard gave a boost to fruit cultivation. Provision of loans and subsidies to the growers for purchasing plants, fertilizers and pesticides and establishment of the Horticulture Department published in 1970-71 and it further gave an impetus to the diffusion process. By the end of this phase, the "cultivation of peach displayed a varied spatial pattern. In some parts, area under peach was higher while in some others it was lower than an average value of 12 percent for all tahsils together. Accordingly all peach growing areas were classified into two parts (Figure 2).

Areas where peach covered above 12 percent of the area under fruits The tahsils of Pacchad, Rajgarh. Renuka and Shillai of Sirmaur district were the areas where peach occupied higher (more than 12 percent) proportion of fruit

area. The proportion of peach varied between 12 percent in Shillai tahsil to 48 percent in Pacchad tahsil. Analysis of the primary data collected from these areas reveals that about 80 percent of the orchards came up within a distance of less than 5 kms from the motorable roads. The concentration of the orchards along the roads is basically due to the perishable nature and the efficiency required in the disposal of the fruit in the market. Thus roads also acted as important channels of diffusion. Further six progeny - cum -demonstration orchards / nurseries established in Sirmaur district during this phase provided the farmers with saplings of good quality on reasonable rates hence increasing the production. Fruit canning units of H.P.M.C. and privately run fruit processing at Sarahan and Paonta Sahib were processing nearly half of the fruit produced. In this way, the initiatives of the government encouraged the farmers to increases the area under their orchards. Besides, the favorable climatic conditions, soil and terrain, played their own role in the areal spread as well as increase in number of growers of this fruit.

Areas where peach covered below 12 percent of the total fruit area include the

Nahan tahsil of Sirmaur district; Solan, Arki, Kasauli and Nalagarh tahsils of Solan district; Sundarnagar, Jogindernagar and Mandi tahsils of Mandi district; and Kullu and Nirmand tahsils of Kullu district. Availability of favourable physical factors on a limited scale and absence of efforts by the government were largely responsible for lower area under peach here. It was not a very profitable venture in these parts. Thus, the direction of diffusion of peach during this phase was greatest towards the south and weak towards while it was lowest towards center north. However the cultivation of peach consolidated its position in its core area of Rajgarh, which became the main peach growing area of Himachal Pradesh.

The Second Phase of Diffusion, 1974-95

The peach orchards had already established in the first phase but a few areas showed a higher percentage of acerage under peach in the second phase spanning over 1974-1995. A few areas present in the first phase, however, made an exit in this phase while a few new entrants like the Nohra tahsil of district Sirmaur and Krishnagarh of Solan with a moderate percentage ranging between 13 and 19 percent of the total fruit area under peach were there. The transport facilities along with the help provided by the Horticulture Department in the form of good quality saplings to the growers on subsidized rates gave a fillip to the diffusion process in the second phase too. At the end of this phase in 1995, peach covered the following areas.

The areas where peach covered (above 12 percent)

area under fruits included the tahsils of Rajgarh, Renuka. Pacchad, Nohra of district Sirmaur and Krishnagarh tahsil of district Solan. The percentage area covered under peach varied between 13 percent in Krishnagarh and 71 percent in Pacchad tahsil. The peach fruit has shown a remarkable increase of 29 percent area in Pacchad and 20 percent in Renuka tahsils. Most of the new orchards came up along the transport routes in all the tahsils growing peach. State Highways and other metalled roads here acted as major channels of diffusion. Also the nurseries and demonstration orchards established in this phase continued to influence the growers

Areas where peach covered relatively low (below 12 percent)

fruit area comprised Solan. Arki and Nahan tahsils. There has not been much spatial spread of peach in these areas as other fruits were dominating the scene. Mango and citrus are mostly the main sub-tropical fruits ideally suited to the region. Apple gave a strong resistance to peach in Shillai whereas mango dominated in Paonta and Nahan tahsils. In brief, peach is an important stone cultivated in Himachal Pradesh. Sirmaur continued to be the main peach growing region followed by Solan. Suitable terrain, soils and climatic conditions along with infrastructural facilities and government support, have significantly contributed to strengthen the hold of peach in the core areas of peach in Himachal Pradesh

(II) Nuts and Dry Fruits

Almond, walnut and hazel nut are important nuts grown in Himachal Pradesh. Walnut is grown at an elevation of 1219 to 2134 meters above sea level. In Himachal, Kangra and Kullu valley are ideal for growing these nuts. The climate required by walnut should be free from frost as well as extreme heat. Rainfall of about 70 cms and deep well drained silt loams containing organic matter are ideal for growing walnut. Almond is the most common nut grown at an elevation of 763 meters and at times even upto 2439 meters. It is grown especially in Chini (Kinnaur) and Lahul (Lahul and Spiti) in Himachal Pradesh where deep, fertile and well drained soils, cold and dry climate for nuts provide ideal conditions, for nuts. The hazel nut grows wild is prevalent in Shimla hill areas which are most ideal for growing nut. The cool temperate climate of these areas with a moderate rainfall and little frost is ideal for cultivating this nut. In Himachal Pradesh, nuts and dry fruits in 1995 covered 2.29 percent of the total area under fruits.

These have shown nearly 70 times increase in area from 232.6 hectares to 15216.6 hectares during the study period. The production has also increased tremendously from 10 tonnes to 2731 tonnes during the same time span. The pattern of diffusion of nuts and dry fruits during two main phases of the study period is being analysed as under (Figure 2).

In the First Phase of Diffusion, 1951 -74,

Nuts and Dry fruits that too in wild form could be traced at Chini '(Mahasu) in 1952 but their commercial cultivation started in 1961-62 after which the fruits spread to Sangia, Kalpa, Moorang and Pooh tahsils of Kinnaur district. As a result these fruits covered only 0.42 percent of the total area under fruits by the end of the first phase in 1974. As in the case of other categories of fruits, the development of road transport has been quite helpful, in the spread of these fruits. Nearly 86 percent sample orchards of these fruits are reported to have come up within a distance of 5 kms from the main road. Besides, the conducive terrain, climatic conditions and soil facilitated the spatial spread of these fruits. The Regional Research Station at Sharbo established in 1956 was carrying out research in dry fruits. A Walnut development station was set up at Nohra in 1972. Also 7 progeny-cum-demonstration/orchards and nurseries were established in the nuts and dry fruit growing tahsils in the region, during the same period which proved instrumental in the dispersal of these dry fruits around the core areas mainly along the major transport routes. also set up at Nohra in 1972. Along with all these factors, the conducive physiographic, climatic and soil conditions proved instrumental in the dispersal of these dry fruits around the cores and mainly along the major transport routes.

During the Second Phase of Diffusion, 1974-95

penetration of orchards into many new areas took place whereby nuts and dry fruits covered a small acreage in Una and Amb tahsils of district Una. The diffusion also took place towards the south- west and extreme south covering Kumarsain and Theog tahsils of district Shimla and extreme south including Pacchad, Rajgarh and Nohra tahsils of Sirmaur district.. These had a very low percentage of area under the fruits varying between 0.47 percent in Kumarsain to as high as 4 percent in Theog tahsils and between 1 to 5 percent of the total area under fruits in the southern tahsils. Almond was mostly being cultivated in Sirmaur district. The traditional nodes consolidated their position in this phase. There has been an overall increase in the percentage area under dry fruits during this phase in the state from 0.42 percent to 2.29 percent. A few tahsils such as Nichar, Sangia,

Moorang also portrayed considerable increase in area in this phase. Two progeny -cum - demonstration orchards / nurseries i established in this phase in Kinnaur and a fruit processing unit established at Rekong Peo along with suitable physical factors and development of road network had a major role to play in the spatial spread of nuts and dry fruits in the region. Thus, Kinnaur forms the major area where these fruits continued to occupy an important place.

B Diffusion of Sub-tropical fruits

Grown in low hills and valley areas, the fruits such as citrus, mango, litchi, loquat, ber, banana, guava and papaya are included in this category. Among these fruits, mango and citrus are more important and have been discussed in detail. The rest of the fruits have been discussed under the category of "other fresh fruits".

(I) Citrus Fruits

Citrus is the most important sub-tropical fruit cultivated in Himachal Pradesh It's cultivation for the market started about 40 years ago. Covering only 2.51 percent of the total area under fruits in the state, which increased to be only 3.21 percent in 1994-95. The fruit diffused mainly after the opening up of sub-tropical fruit research station at Dhaula Kuan in 1960 and due to the efforts of the government along with the availability of suitable growing conditions. Citrus requires a temperature ranging between 30°C and 40°C and deep, well-drained, loamy and fertile soil. Citrus was first of all introduced in Paonta Sahib and Nahan tahsils of Sirmaur district and later in Palampur, Indora and Nurpur tahsils of Kangra district; Hamirpur and Sujampur tahsils of Hamirpur districts: parts of Chamba tahsil of Chamba district: and Mandi Sadar, Jogindernagar, Chachyat and Sundarnagar tahsils of Mandi district. Later, from these areas it diffused to many other areas of the state (Figure 3).

During the first phase of diffusion,

most of the citrus produce started entering the market and its area increased to 2.54 percent of the total area under fruits in 1974. The cultivation of these fruits for the market started first in the initial areas such as Paonta Sahib, Nahan, Palampur, Nurpur, Mandi Sadar, Jogindernagar, Chachyat and Sundarnagar. From here citrus diffused to other parts of the state. Under the given conditions of climate, terrain, soil *etc.* the cultivation of citrus fruits also spread through interpersonal contacts among growers. The construction of State Highways, metalled roads, rural roads proved helpful in the diffusion process. Also the Agro-industries Corporation set up in early 70's rendered assistance in

marketing of horticultural produce. Further, the establishment of packing stations, cold stores and warehouses *etc.* benefited the growers to a notable extent thereby accelerating the diffusion process. As a result of its dispersal during all these years, in 1974 Palampur, Jogindernagar, Nahan had more than 20 percent of their total fruit area under citrus. Analysis of the primary data gathered from these tracts revealed that above 30-50 percent of the orchards in all these areas were located within a distance of 5 kms from the motorable road because of highly perishable nature of the fruit. This also increased the efficiency of the orchardists while transporting their produce to the market. In addition to this, the initiative taken by the government fastened the diffusion process of citrus fruits in these areas. Citrus fruits covered less than 20 percent area in the tahsils of Chachyat, Sundarnagar, Karsog of Mandi, Ani of Kullu and Rajgarh, Paonta, Pacchad and Renuka of Sirmaur district. The progeny-cum-demonstration orchards in Kullu provided saplings and the required knowledge to the growers thus helping in the spread of orchards in the region. But citrus faced a competition here from temperate fruits being cultivated here and diffusion was on a limited scale during this phase. During the following phase, (1974 onwards,) the area under citrus fruits increased from 2.54 percent to 3.21 percent of the total fruit area. By the end of this phase, the state had two types of areas growing citrus. Firstly, those areas where citrus fruits covered above 20 percent area under fruits. These were the the tahsils of Dehra, Palampur, Nurpur, Fatehpur, Indora and Hamirpur in the west; Nalagarh in the south-west and Paonta and Nohra in the south. The development of roads helped the fruit to diffuse further in this region as well. The progeny orchards/nurseries established in the first phase continued to provide services to the growers in both the phases facilitated the emergence of new citrus fruit orchards in new areas besides providing technical support to the already existing one.

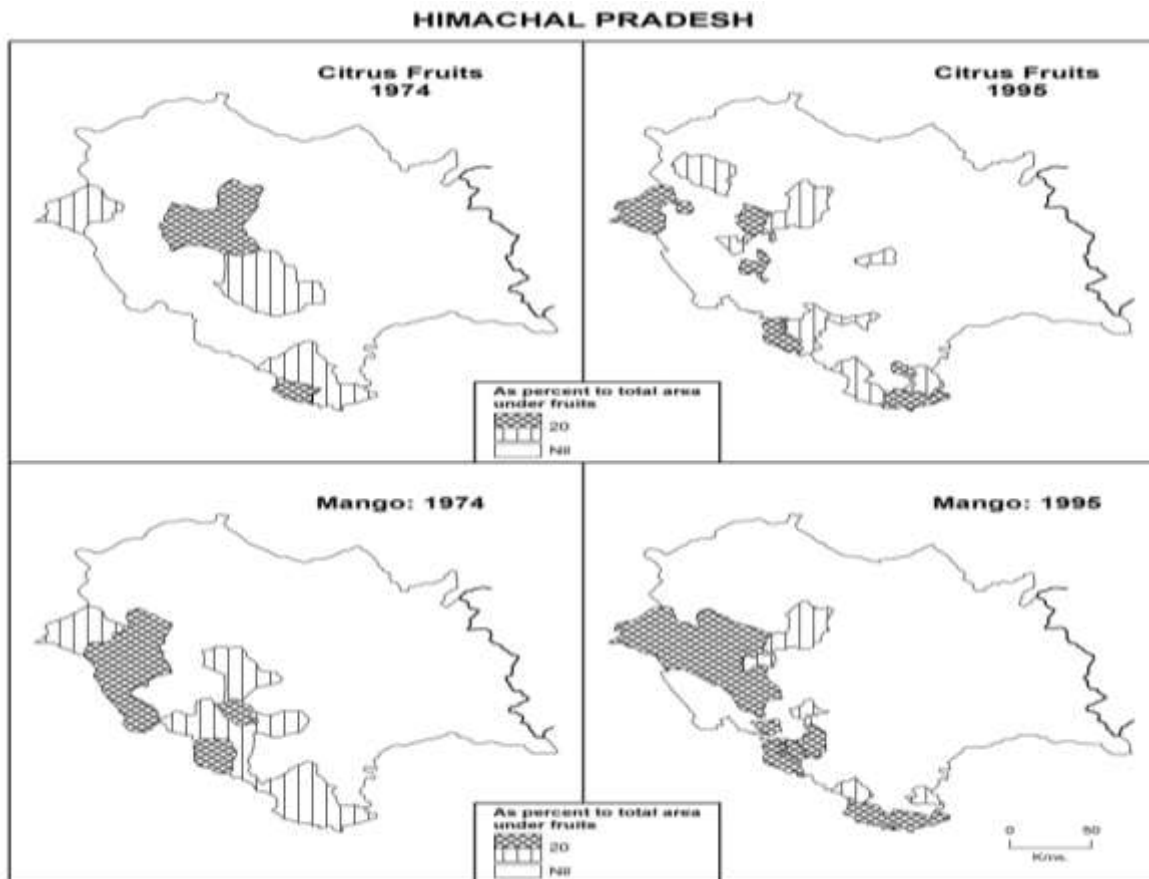
Secondly, are the extreme north, central western and southern most parts of the state, where citrus covered below 20 percent acreage of total area under fruits. Lower acreage under citrus in all these parts is explained by the resistance offered by apple, litchi and stone fruits in their respective hot spots. Thus, citrus fruits covered relatively small proportion of fruit area during the study period in the state due to largely tough competition from other more favourable fruits. It was not very dominant in Himachal Pradesh and contribute marginally to the economy of the same.

(II) Mango

Mango is an important sub-tropical fruit grown in Himachal Pradesh. It covered 2.22 percent (30.66ha) of the total area under fruits in the year 1951 and recorded spatial spread in

area to cover 5.85 percent (31.12 ha) of area under fruits in 1995. Mango generally is cultivated all upto an elevation of 914 and thrives best in comparatively dry regions which, receive good rainfall in hot weather from June to September, followed by a more or less dry spell in the subsequent period. These areas include Una, Hamirpur, parts of Bilaspur, Kangra, Sirmaur and Solan districts of the state. In the beginning of the study period in 1951, mango covered an area of 2.22 percent of the total area under fruits which increased to 3.98 percent by the end of the first phase of diffusion in 1974 (Figure 3). In early years, orchard cultivation of mango was confined to areas falling over Nahan, Paonta. Renuka, Pacchad, Arki and Bilaspur tahsils. Gradually, the activity dispersed to engulf the neighbouring areas. Nearly eighty percent of the total sample orchards were located within 5 Kms belt along major roads hence roads acted as important channels of diffusion. The progeny-cum-demonstration orchards / nurseries established at Kangra, Una and, Solan were dealing in sub-tropical and citrus fruits. The marketing operations for mango were initiated at Kangra and Una by the Agro-Industries Corporation in a joint venture with Department of Horticulture thus providing some efficiency in. Mango covered below 20 percent of fruit area in scattered patches comprising of Nurpur, Jogindernagar and Karsog in the northwest; Bilaspur, Ghumarwin, Arki, Kasauli in the west

and Rajgarh, Pacchad, Renuka, Nahan and Paontg in the south. In all these areas, its proportion varied between 16-84 percent in Nahan tahsil and 0.57 percent in the Pacchad tahsil. The progeny-cum-demonstration orchards / nurseries dealing in sub-tropical and stone fruits functioning at Bilaspur and Mandi provided useful knowledge to the growers as well as saplings of good variety, but in these areas the growers who had already established, extended their own orchards and motivated few others to adopt the activity of growing mango orchards especially in western Himachal. Fruits such as stone and citrus also competed with mango for space in these areas. In the State as a whole, there was a major competition from apple and nuts and dry fruits and stone fruits, which were becoming more profitable and popular under the prevailing market conditions. The second phase of diffusion in the present study, is marked by the dispersal of mango orchards to a few new areas mainly Palampur, Jaisinghpur. Baijnath, Baroh, Khudra. Rakkar, Fatehpur, Indora, Jawali Khas, Dharamshala, Jaswah, Dheera. Barsar, Nadaun, BhoranJ and Sujanpur tahsils in the center-west .The Ramshahar, Krishnagarh and Kamaru tahsils in southern parts and Seoni towards the center-east also attracted mango growers. On the other hand, in few areas, mango gave way to other fruits, which were coming up dominantly on account of being more profitable.



Source: Unpublished revenue records by tahsils.

Fig. 3

As a result of differential spatial spread during this phase, mango emerged to cover different proportions of fruit area in different parts of the state in 1995. In the traditional mango growing cores of south-western and southern parts of the state, mango orchards covered more than 20 percent of the total area under fruits. In these areas between 70 and 80 percent of the sample orchards were found located within 5 km distance on both sides of the motorable roads.

The fruit is mainly concentrated in the western, central western and extreme southern parts of the state, where requisite conditions are easily available. It could diffuse a little due to the help provided by research stations, progeny-cum-demonstration orchards/nurseries, fruit processing unit in Dhaula Kuan. Dr Y.S. Parmar University for Horticulture and Forestry at Solan.

C Diffusion of other fresh fruits

The temperate as well as the sub-tropical fruits such as plum, apricot, pears, persimmon, cherry, grapes, olives, guava, litchi, ber, loquat, banana are included in this category. Among these, plum and apricot are the important temperate stone fruits and litchi is the important sub-tropical fruit being cultivated in the state. The Maharaja of Patiala started cultivation of plum first of all in 1951 in Kandaghat (Solan) along with peach under the advice of an American expert Dr. R.W. Hodgson. The European plums are cultivated in the Kullu valley while the Japanese plums are grown at lower elevations *i.e.* the areas where sub-tropical fruits are grown in parts of Solan and Sirmaur district. Apricot on the other hand does not enjoy a position of much importance in the state. The dried type of apricot found in Chini area of district Kangra is of high commercial value. All these fruits together, however have recorded notable spatial spread during the study period and their pattern of diffusion has been analysed (Figure 4). During the first phase, cultivation of 'other fresh fruits' began on a commercial scale. The area covered by these fruits was 17 percent of the total area under fruits in 1974. These fruits dominated the fruit scene in Mahasu, Mandi and Sirmaur in the early 1950's. With the passage of time, these were ranked out by other more profitable fruits. The 'other fresh fruits' however consolidated their position in Sirmaur belt, with Plum and apricot dominant the scene. Further the region formed by Una, Bilaspur, Hamirpur and Kangra tehsils was also rich in sub-tropical fruits. Since these fruits require varied types of soils, different climatic types and terrain, these were found widely scattered over the state area. The role played by the roads and the government was not different than that for the temperate and sub-tropical fruit categories as discussed earlier. By the middle of 1970's area under these fruits displayed marked regional variations as were discussed below (Figure 4)

i) High proportion of area under other fresh fruits was a feature of only four tahsils located in western parts of Himachal Pradesh. These included Bhattiyat, Hamirpur, Sarkaghat and Arki tahsils. Entire fruit acreage in Sarkaghat tahsil of Mandi district was under this group of fresh fruits. The primary data reveals that nearly 35 percent of the sample orchards were located within a distance of less than 1 km from the motorable road whereas nearly half were located within 5 kms distance. Thus, these fruits too, are strongly associated with the road network available in the area. In their case also, the progeny-cum-demonstration orchards / nurseries at Chamba, Mandi, Hamirpur. Solan and Kinnaur, proved instrumental. Fruit farm established at Palampur in 1936 was preparing a number of varieties of almost all the fruits especially peach, plum, apricot and almond. These provided the farmers with saplings and demonstration regarding the cultivation of fruits in these areas which helped in the spatial spread of other fresh fruits in these areas.

ii) Areas where other fresh fruits covered moderate proportion of fruit area too existed in scattered pockets in western half of Himachal Pradesh. These comprised the Pangi, Chamba, Kangra, Dera Gopipur, Palampur, Nalagarh, Solan, Kandaghat, Kasauli, Nahan and Paonta tahsils. In these areas also, most of the orchards were found located within a distance of 5 kms from the motorable road due to obvious reasons. The Northern Railways running through Kangra district and a rail track passing through Solan provided additional impetus to the diffusion process in these areas. Besides, various incentives by the government in the form of loans during the initial years, progeny-cum- demonstration orchards /nurseries established at Chamba, Pangi by the year 1965 and the oldest nursery at Kandaghat which was dealing in temperate fruits since 1915 proved helpful in the diffusion process. The region also possesses varied climates and soil conditions making it possible to grow many types of fresh fruits here. Besides, adequate rainfall and availability of irrigation proved helpful for growing these fruits here. Thus other fresh fruits have made a place for themselves here.

iii) Areas where other fresh fruits covered low percentage of total fruit area formed isolated patches in the central parts comprising of Churah and Moorang tahsils. Still lower percentage in western and southern patches of Jogindernagar, Mandi Sadar, Pacchad, Ghumarwin, Sangla and Pooch tahsils and lowest in southern most patch falling over Shiilai, Rajgarh, Renuka tahsils of Sirmaur. This is because other fresh fruits had to compete with dominant fruits like mango, citrus, stone and nuts and dry fruits of these areas. Thus, other fresh fruits had expanded in the first phase besides consolidating their positions at the traditional nodes.

In the second phase, however area under other fresh fruits declined by 6 percent. Interestingly, certain areas experienced an increase in acreage under these fruits due to the development of road transportation and further development of infrastructural facilities. As a result of the varied spatial spread during the study period, these orchards displayed the following three types of areas in 1995 (Figure 4)

(i) Areas where other fresh fruits covered high proportion (above 90 percent) of total area under fruits

included mainly Una, Bilaspur, Mandi and Solan district. In a few tahsils such as Bangana, Ghumarwin, Naina Devi, Jhanduta, Jogindernagar, Baldwani, Lal Bharol, Sarkaghat, Sandhol, Padhog, Koti and Kasauli, other fresh fruits covered the entire area under fruits. Many of these parts received diffusion of said fruits during the second phase only. These western parts of the region were being served by State Highways and metalled roads which, not only attracted new orchards but also provided efficient modes of transport for the produce of already existing orchards. The various progeny-cum-demonstration orchards/nurseries which had already established, continued to provide saplings, latest techniques of planting these and other related orchard operations. The fruit processing unit which was functioning at Jabli (Solan) helped in further promoting the production of fruits.

ii) Areas with moderate proportion (40 and 90 percent) of fruit area

were located adjacent to the high concentration zone and tahsils forming this region included those of the Kangra, Hamirpur, Una, Mandi Lahaul & Spiti and Solan districts. Among these, a few tahsils with an acreage under other fresh fruits between 60 to 90 percent included Amb, Solan, Arki, Aut, Bilaspur Sadar, Baijnath, Khudra, Dheera and Spiti. The acreage under other fresh fruits was between 40 to 60 percent in Kangra, Jaswah, Lahul, Udaipur and Nadaun tahsils. The State Highways, metalled roads and kutchra roads acted as channels of diffusion of other fresh fruits in these areas. The schemes of the government under various five year plans, opening of progeny -cum -demonstration orchards/nurseries, establishment of Y.S. Parmar University of Horticulture and Forestry at Solan and setting up of processing unit at Bhawan (Kangra) were all responsible for the diffusion of these fruits to new areas.

iii) Other fresh fruits covered low (below 40 percent) proportion of fruit area

in the extreme the Chamba tahsil of Chamba, Palampur, Nurpur, Jaisinghpur, Baron, Rakkar, Fatehpur, fndora tahsils of Kangra ,Chachyat, Karsog, Bali Chowksi of Mandi district; Kullu, Banjar, Ani, Nirmand and Sainj of Kufli district; and Rampur Seoni, Kumarsain,

Junga of Shimla district. The Nalagarh and Krishnagarh tahsils of Solan district; the Nahan, Paonta, Pacchad. Rajgarh and Nohra tahsils of Sirmaur. Rest of the state showed no area under this category of fruits because the climatic, soil and terrain aspects of these areas were more suitable for growing apple, mango and citrus rather than other fresh fruits. Thus the proportionate area of these fruits reduced during the study period from 17 percent in the first phase to 11 percent in the second phase. This is largely attributed to the, fact that apple, nuts, mango and citrus invaded these fruits in areas around their respective cores. Whatever diffusion occurred in some favourable areas was brought mostly due to development of road transport. This was proved by the primary data that showed that about 80 percent of the orchards were located on either side of the road within a distance of 5 kms.

Conclusion

The temperate fruits (other than apple) such as peach, nuts and dry fruits, pear, apricot, plum *etc.* have shown a real spread during both phases of the study period. Peach has been the dominant fruit in this category and also the most important stone fruit. It covered the total acreage of about 1 percent of total fruit area uptill 1974 and was mostly confined to southern and some western parts of the state. In the second phase *i.e.* after 1974, although peach gave way to some other fruits in few parts but on the whole it further consolidated its position. Most of its dispersal is confined to first phase of the period under focus. The nuts and dry fruits also occupied an important place among "temperate fruits other than apple". These were basically confined to the eastern part of the state during the first phase. Their proportion increased by more than 5 times over the two phases. The fruits emerged to cover a small proportion of area in the western and southern Himachal Pradesh, strengthening their hold in eastern parts where they had already diffused in the 1970's. The sub-tropical fruits comprised of mango, citrus, litchi, loquat *etc.* However, citrus and mango have been dominating the category. Citrus has diffused very slowly in the state, mostly into the western parts. There has been a very marginal increase in area of citrus between the two phases. It has not been an important fruit in the state and has very little to contribute to its economy. It continued to cover some pockets in the center-western and southern parts of the state and is facing tough competition from other fruits grown here. Mango, an important sub-tropical fruit is spread over most of the western and south-western parts of the state. It has also exhibited a notable areal spread in the state whereby its acreage increased from 2.22 percent to 5.85 percent in the 45 years span. The first phase of diffusion of mango included areas comprising of partly western, the north-western and the south-western Himachal.

In the second phase, mango strengthened its position in these areas. The diffusion has been greater during the first phase as compared to the second phase. Other fresh fruits, both the temperates and the sub-tropicals, together represented a fair percentage of acreage among fruits in the state. The area under these fruits although has decreased during the study period. However, a few areas were still experiencing an increase in acreage. These mostly contained the western and partially the central western parts. These fruits have been invaded by the comparatively more profitable fruits such as apple, nuts, mango and citrus in the concerned areas.

The process of diffusion of all kinds of fruits in the state has been provided an impetus by the various plans and policies of the government, the road network and the physical aspects. The diffusion has been mostly contagious where the friends, relatives or neighbours spread information through contact. Therefore participation of people has contributed in its own way towards the diffusion process.

The cultivation of all these fruits in Himachal Pradesh is steadily poised to move towards a multi-dimensional phase by which the pressure on cereal cropping would be reduced further. It is expected that in the present century, horticulture in Himachal will develop as an industry with a huge turnover in the rural sector. It might develop as next only to electricity sector in terms of total investment and

turn over but first in terms of employment generation. Thus, the state is quite close to be termed as the "Fruit State" of India rather than the "Apple State" as at present.

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