

A Glimpse over the Horticulture Production Zones in The Garhwal Region



Sajimon Philip

Research Scholar
Deptt. of Geography,
SDM Govt. Post graduate college,
Doiwala, Dehradun, India



Santosh Verma

Associate Professor
Deptt. of Geography,
SDM Govt. Post graduate college,
Doiwala, Dehradun, India

Abstract

Himalaya is gifted with varied agro-climatic and physiographic conditions and offer tremendous potential for the cultivation of horticulture crops. Horticulture is one of the important areas in the economy of the hilly regions of Garhwal. The conventional crops are limited in the hilly regions due to the peculiar topography and agro-climatic conditions of the hill regions where the scope for production of conventional field crops is limited so horticulture provides the much needed opportunity for diversification in agriculture especially in the context of Horticulture development which is an effective tool for accelerating development in hilly areas. A large variety of vegetables can be grown at various altitudes both under rain fed and irrigated conditions. The entire regions could be categorized various Geo-Physical Zones such as Tarai-bhabar regions, humid valleys and hills of outer Himalayas (up to 1500m.), hot and dry valleys and low hills up to (1500m.), high hills(2500m. to 3000m.), mid -hills (1500m to 2500m.) and above 2200 m. to 2550m. in the outer hills. Furthermore, the region has tremendous scope for growing ornamental plants and flowers such as Rose, Gladiolas, Liliyum, Carnation, Rajani Ghanda, Marigold, etc. Cultivation of aromatic and medicinal plants in the Himalayas slopes which otherwise are amenable to soil erosion would, not only make best use of the land but also improve the social economy of the region. For developing the region, horticulture promises the development of several ancillary industries such as preservation, dehydration, refrigeration and transport. The cultivation of fruits in Uttarakhand is the main and an age old occupation of farmers. The fruit cultivation in Uttarakhand is carried on are varying elevations. In the hill zone (2000 to 3000m.) walnut, grapes are cultivate, while apple, pear, apricot, peach, plum, walnut, amount, hazelnut are common in the mid hills(1300m to 3000m.) zone. In the valley areas and intersecting hill zone, peach , plum, mango sweet orange, hill lemon are cultivated while the Bhabar and Tari zones. The horticulture revolution in the region has brought about an economic revolution and improved significantly the standard of living in the backward areas.

Keywords: Horticulture, Topography, Geo-Physical Zones.

Introduction

In developing countries, the growth rate of economy is mostly dependent on growth of agriculture sector. But economic development does require a transformation along with major diversification. The mountainous ecosystem of Uttarakhand is constituted of young and unconsolidated mountains, where the slopes are steep and unstable. So, scientific land use does not favor for growing of conventional crops on such slopes.

The hill regions are economically backward, sparsely populated and isolated from the hustle-bustle of modern city life, suffers from poor communication and transport facilities. In recent years interest in fruit cultivation has increased because of its role in improving income along with preserving ecological balance, in multiplying aesthetic and artistic value of the landscape and in diversifying cropping pattern.

Horticulture is the area of agriculture that deals with garden plants cultivation, the science and art of growing fruits, vegetables, ornamental trees, bushes and flowers. Horticulture (from Latin word hortus 'garden' and cultura, 'cultivation') is distinguished from agronomy (from the Greek Argos,

'field' and nomus 'arrangement') which is concerned with the large scale cultivation of field crops such as wheat, cotton, hay and the like. The distinction has become somewhat blurred in recent decades, because many horticultural plants particularly vegetables are often grown as field crops and are considered horticulture commodities rather than garden products. Along with forestry, horticulture and agronomy constitute three broad branches of agricultural science and practice. (Encyclopedia Britannica, 2008)

Horticultural crops provides improvement in the income of the rural people enhancing their economy. Lots of employments are created as the cultivation is labour intensive and many other ancillary activities associated with the cultivation hike the opportunity for more opportunities of employment. Improvement in the cultivation of horticultural crops gives prosperity for the life of people and improvement in the statues of life of the people and development of the nation. Fruits and vegetables are not only used for domestic consumption and making many by products like Jam, Jelly, Juice and many other edible things and these are exported to the foreign countries also which improve the earning of the cultivators. Horticultural crops are environment friendly which is a boon for the mother earth and helps in maintaining ecological balance.

Objective of the Study

The objectives of the present study is to identify the various agro-climatic conditions and physiographic zones favorable for the maximization of production of various crops in the region. The primary data will be compiled by site visiting, gathering information through questionnaire cum interview schedule.

Methodology

Research methods are the course of action by which a research carries out his work by describing, explaining and prediction observable facts. These are the means and ways through which a research is conducted. Since research is a combination of both observes facts and reasoning and is regarded as the most successful approach to the discovery of truth, both empirical and qualitative techniques have been used is the current research.

The study in have is based on both deductive and inductive approaches. Existing studies explaining the economic and ecological impacts of apple cultivation will be reviewed by surveying the literature in order to formulate hypotheses and deduce the implications in the under study.

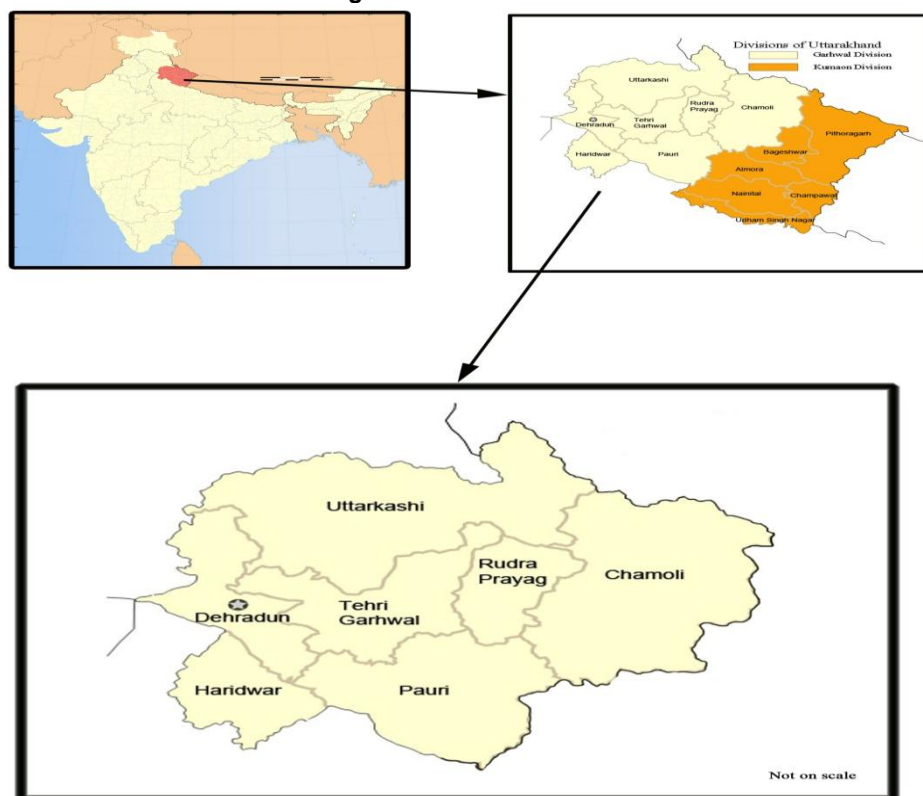
The primary data will be compiled by gathering information through constant field trip, and by using questionnaire cum interview schedule and through observation techniques.

Study Area

Garhwal is part of the mountainous regions of Uttarakhand State. The region was included in Uttarakhand after the state was carved out of Uttar Pradesh on 9th November 2000. Tehri Garhwal districts of Uttarakhand is a mountainous area with varied environment, bracing climate and great scenic variety.

Garhwal region is an administrative unit in the north western part of Uttarakhand. Lying in the Himalayas, it is bounded on the north by Tibet, on the east by Kumaon region, on the south by Uttar Pradesh state, and on the northwest by Himachal Pradesh state. Garhwal is administratively, comprised of seven districts of Uttarakhand which includes the districts of Chamoli, Dehradun, Haridwar, Pauri Garhwal, Rudraprayag, Tehri, and Uttarkashi. The people of Garhwal are known as Garhwali and speak the Garhwali language. The administrative center for Garhwal division is the town of Pauri. Having unique geographical location between lesser Himalaya to greater Himalaya, it lies between the parallels of 29°26' to 31°28' north latitude and 77° 49' to 86° 6' east longitude. Total area of the region is 30090 sq.kms which is more than half (54%) of the Uttarakhand and about 7.01% of the total India with the population of 5857294 (census 2011). Historically this region has the long prestigious background, well documented in the puranic literature. Ever since the puranic times, it has been a religious sanctuary of the Hindus and thus most favored pilgrim zone. The land is closely associated with legendary heroes of Ramayana and Mahabharata epics that left their imprints in many places.

Fig.1. Position of Garhwal



Agriculture and Horticultural Zone/ Profile

Agriculture is the one of the main occupation of the people of hilly areas. Since Himalaya is gifted with varies agro climatic conditions and offer tremendous potential for cultivation of number of fruits species at various elevation, so horticulture is relatively more important in hills where varies climatic and relief is available. Potential for growing vegetables during the period of non availability in plains are another factor for the utilization of Himalayan watershed through Horticulture. The Himalayan zone is the one of the three major horticulture grazing area in India, other than Hydrabad and Maharastra regions¹. A large number of vegetables can be grown at various altitudes both

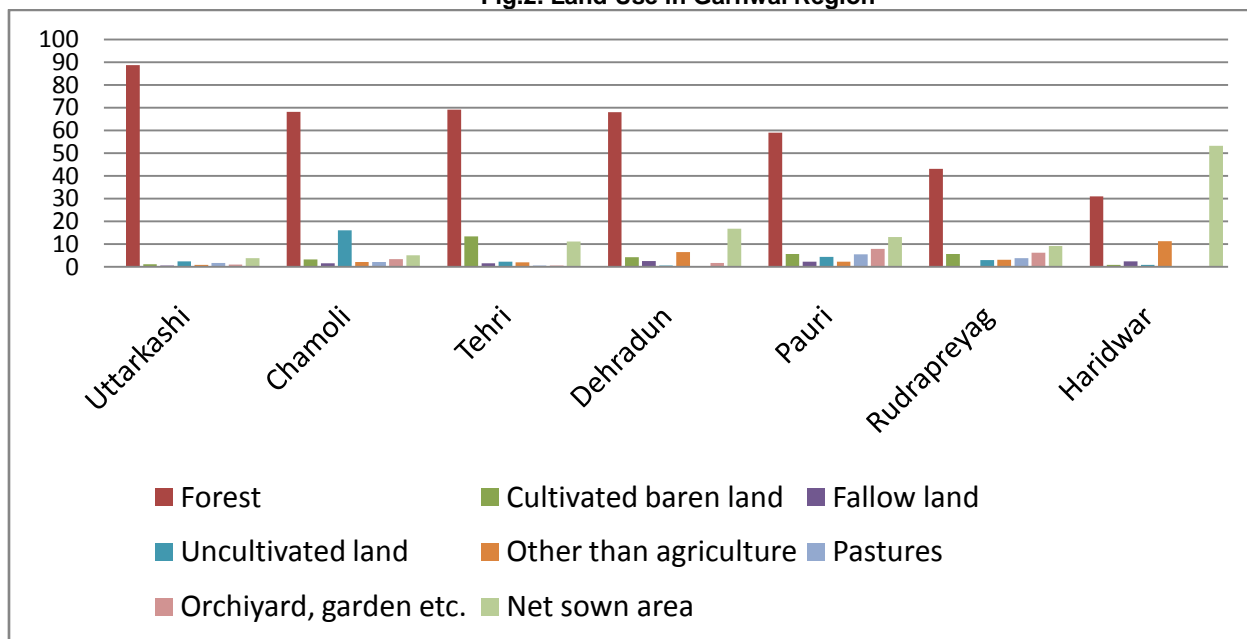
under rain fed conditions and irrigated lands. Ornamental plants and flowers and various aromatic and medical plants are also grow abundantly in the Garhwal regions which gives income to the cultivators throughout the year. For the enhancement of the economy of the region, horticulture promises the development of several ancillary industries, such as preservation, dehydration, refrigeration and transport.

The people of Garhwal mostly engaged in agricultural activities and more than 85% people depend on agriculture. The cultivable land is only 14.3% of the total Geographical Area. Land holdings are fragmented and 88 percent are scattered in small and marginal farms.

Table-1: Uttarakhand Land use

District	Reporting area	Forest	Cultivated baren land	Fallow land	Uncultivated land	Other than agriculture	Pastures	Orchiyard, garden etc.	Net sown area	Intensity of cropping
Uttarkashi	817631	88.8	1.1	0.5	2.4	0.8	1.7	0.9	3.8	157.5
Chamoli	644395	68.2	3.2	1.6	16.0	2.1	2.1	3.4	5.1	152.4
Tehri	574542	69.1	13.4	1.6	2.2	2.0	0.5	0.0	11.1	162.2
Dehradun	304894	68.0	4.2	2.5	0.6	6.5	0.0	1.6	16.7	153.1
Pauri	752728	59.0	5.6	2.3	4.3	2.2	5.5	7.8	13.1	152.9
Rudrapreyag	202682	43.1	5.7	0.3	2.9	3.1	3.8	6.1	9.1	147.8
Haridwar	233506	31.0	0.9	2.4	0.9	11.3	0.0	0.1	53.3	144.4

Fig.2. Land Use in Garhwal Region



It is evident from the above table that most of the land is under forest. Net sown area is only very less and some areas are under uncultivated waste land. The wheat, rice, Mandua, Jhangora and barely are the main crops covering more that 90% area of the total cultivated land. The agriculture is of subsistence nature which only to meet the domestic needs. The cultivation of crops in this region is uneconomic because of the small and fragmented fields on the hill slopes. The land degradation has

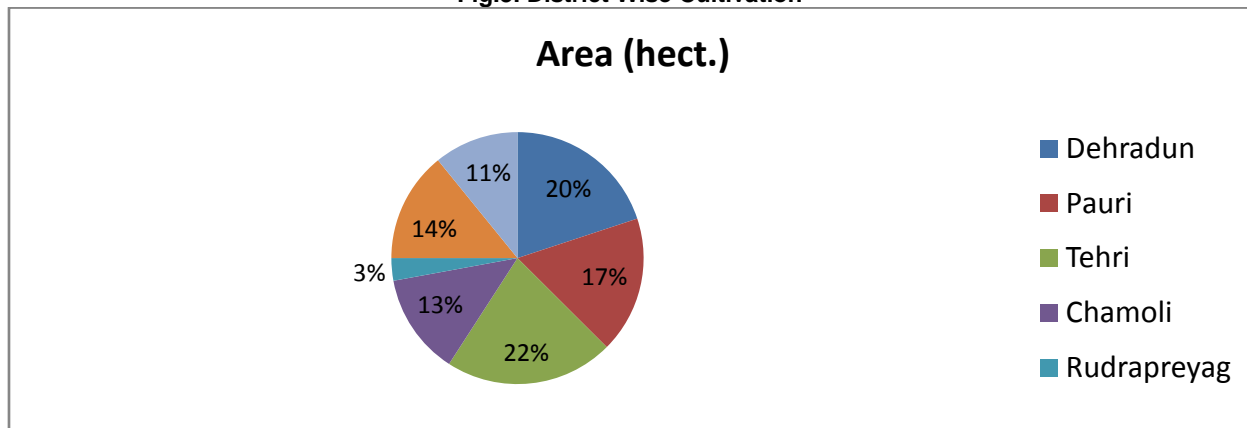
increased and agro eco system has degraded in many regards.

The cultivation of fruits in Uttarakhnad is an age old occupation of farmers. The agro climatic conditions of the Garhwal hills are supposed to be most economically sound base for human occupation. Therefore animal husbandry and horticulture may be the best alternatives to reduce the burden on agriculture and also diversify it. There is very important advance for the horticulture and the scientific development of agriculture recent years.

Table-2: District Wise Area of Cultivation

S.No	District	Area Hect.	Area %	Fruits	(% yield /het)	Vegetables	(% yield /het)	Potato	(% yield /het)	Efficiency
1	Dehradun	33851	11.3	65.8	1.29	29.1	6.50	5.1	25.9	84.2
2	Pauri	29783	10.2	68.5	0.90	26.7	2.92	4.8	15.9	78.8
3	Tehri	36791	12.5	72.7	0.21	21.2	1.83	6.1	21.1	19.8
4	Chamoli	22051	7.5	69.5	1.50	21.0	4.53	9.5	12.8	76.0
5	Rudrapreyag	4898	1.6	71.0	3.15	17.6	6.91	11.4	1.6	149.2
6	Uttarkashi	24012	8.2	64.0	1.50	28.1	6.35	7.9	22.4	88.0
7	Haridwar	18439	6.3	27.4	3.78	67.6	12.21	0.04	20.0	197.7

Fig.3. District Wise Cultivation



The fruit plantation in Garhwal is relatively young. The fruit cultivation in Garhwal is carried at

various elevations. Up the hill zone (2000 to 3000m) walnut, grapes are cultivated, while Apple, Pear,

Aircot, Peach, Plum, Walnut Almount, Hazelnut are common in the mid hill (1300 to 2600m) zone. In the valley areas (300 to 1350m) and intersecting hill zones, peach, Plum, Mango, Sweet Orange, Hill

Lemon are cultivated while the fruits of subtropical variety(Mango, Guva, Citrus, Banana, Papaya etc) are grown in the Bhabar and Tarai zone.

Table-4: Geo-Physical Zonation- Fruits and areas of Cultivation.

Geo Physical zone	Fruits	Main arreas of cultivation
Tarai-bhabar and Regions-	Manago, Citrus, Litchi, Jackfruits and Papaya	Dehradun, Haridwar regions
Humid Valleys and hills of outer Himalayas (up to 1500m.)	Mango, Citrus, Sand pear, walnut, Peach, Plum, and Apricot	Dehradun- Kalsi to Damta and Sayha Tenri- Muni ki reti to Narendra nagar and to Chamba
Hot and Dry Valleys and Low hills up to (1500m.)	Peach, Pear, Citrus, Manago, Almond, Walnut and Apricot.	Dehradun- tone valley and Teoni Area Pauri- Panar Valley, alakanada Valley, Srinagar, Rudrapreyag, Pojhara block Tehri- Bhagirathi Valley from Tehri to Dharasu, Bhilangana Valley. Uttarkashi- Bhagirathi valley from Dehradun to Uttarkashi, Yamuna Valley, ton valley, Purola. , Mori to Naitwar.
Mid -Hills (1500m to 2500m.) Above 2200 m to 25500 in the outer hills.	Apple, Hazelnut and Walnut finger millet, Maize, rice, wheat, pulses, mango, guava, plums and peaches. Livestock: Buffalo, cattle and goat	Pauri- Pauri, Buakhal, Khandusain, Khirsu, Dhumakote, Biraunkhal, Pkhra and Yemkeshwar. Dehradun- Chakrata, Chusal, Bawrotha, Naugaon, Mussoorie. Tehri- Jaunpur, Magra, Thatyur, Majaf, Pratapnagar, Fakote, Maletha, Ranichuri, Thauldhar, Saklane. Chamoli- rudrapreyag, Bachher, Dasholi, Ghat, Mahal churi, Gwaldum, Talwari, Lithi, Joshimath, Sahid, Dugra anf Rabigram, Parasari. Uttarkashi- Bhatwari, Hasil, Raithal, Maneri, Dwari, Naugaun, Brahmshal, Seroi, Barkot, Gangani, Purola, Jermola, Ringali, Thadiyur, and Balcha.
High hills(2500m. to 3000m.)	Wulnut and Hazelnut maranth, buckwheat, peas, Cole crops, apple and potato. Livestock: Sheep & goat	Chamoli- Parsari, Tapovan, Mana. Uttarkashi- Balcha, Harsil, Gangotri, and Yamunotri.

Fig.5. Apple Cultivation in Garhwal Region



Table- 5: District wise Concentration of Fruit crops Area in Garhwal (data in per cent)

District	Apple	Pear	Peach	Plum	Apricot	Walnut	Mango	Citrus	Litchi	Others	Total
Dehradun	9.3	9.8	9.0	8.1	11.1	12.5	21.7	9.0	4.9	8.3	11.3
Pauri	11.3	8.1	5.2	9.1	14.2	13.3	9.9	12.5	14.6	9.2	10.0
Tehri	14.0	11.8	13.0	11.8	14.3	13.3	9.5	10.5	14.2	14.5	12.5
Chamoli	7.4	8.6	8.7	9.8	11.7	12.0	2.3	13.5	3.0	4.0	7.5
Rudrapreyag	1.0	1.8	2.4	1.8	2.1	2.7	0.4	4.0	0.0	3.5	1.6
Uttarkashi	13.6	7.8	7.6	10.2	-	9.3	1.0	6.3	0.0	3.5	8.2
Haridwar	-	0.1	0.2	0.1	-	-	19.4	0.2	0.7	11.0	6.3

Ecological Zones of Agriculture and their Cropping Patterns

Climate is the one of the most important ecological factors and it is primarily influence by altitude in Garhwal. From the ecological point of view, Garhwal can be divided into the following altitudinal zones with slight modification in S.D. Kaushic's scheme. These ecological zones offer favorable conditions for certain specific crops only. For example, rice, Kauni and Jhangora would not grow above 1950m. Kod grows up to 2400 m. Potato is both kharif and rabi crop in different altitudinal zones. Wheat, barley and red beans are winter crops below 2400m. and summer crops above this altitude up to 3600m. phaphra or buck wheat is a very hardly crop which can be grown without irrigation up to 3600m. Chua or massa is grown 2850m. Uva or naked barley is a crop of cool- temperate and cold one and is cultivated between 2100m. and 3600m. Pulses are not grown above 1800m. and their altitudinal limits are as follows:-

Urd (rayed kidney bean)- 1350m.

Arhar or tor (cajanus Indicus)- 1200m.

Ghath (horse gram)- 1800m.

Bhat or soyabean- 1800m.

Factors affecting the zones of agriculture

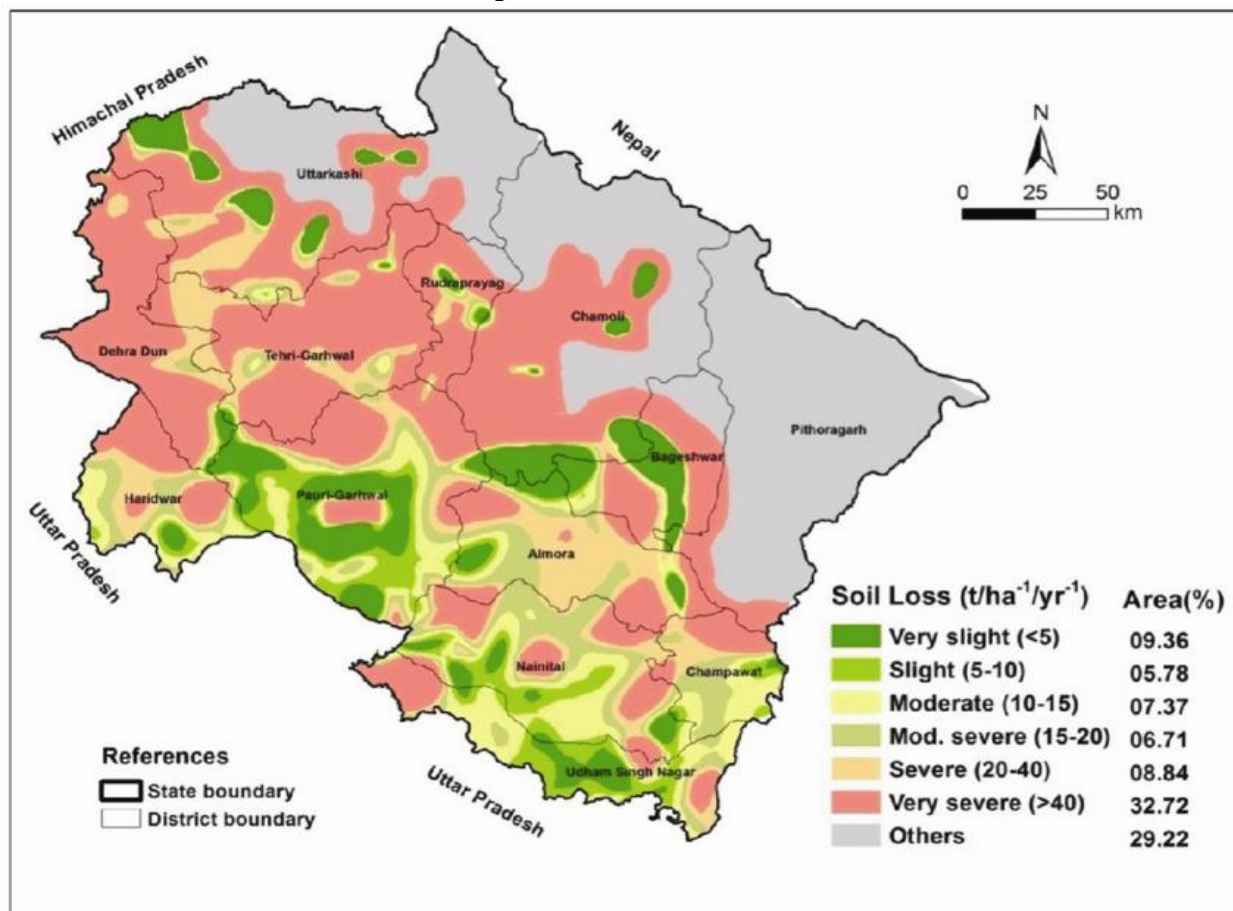
Agriculture as everywhere affected by three factors (i) the composition of the soil (ii) the position of the field higher above the sea level (iii) irrigation facilities

Soil

The differing properties of soils of different zones affect directly the yields of crops. The soils of the doons are fertile alluvium loam or clayey loam, with ph between 7.0 and 7.9. The soils of the lesser Himalayan Bhagirathi Alakananda zone are gravelly and mostly acid with ph between 6.0 and 7.0. However in may localities the oils developed from lime stones are very fertile and suitable for the cultivation of hill rice and wheat. Podzolic soils of the coniferous zone are leached and poor in fertility their PH varies between 6.0 and 6.6. These podzolic soils are suitable for potatoes and fruit gardening. Particularly for apples. Alpine zone soils are stony, glacial and acid with Ph below 6.0. They are suitable for only crops like potato, Phaphra and naked barley. The indigenous Garhwali system of soil classification is as follows.

1. Chikni or Chopri- heavy, clayey soils used for irrigated rice.
2. Khudra- fine grained, friable but more over stony
3. Kolthya or retili- gritty, porous soil essentially a sandy loam
4. Pathri Jamin- This is the stony land and it is any stony land having numerous stones, good drainage, and good madua.
5. Another indigenous classification based on exposure is as follows: 9I0 soil or name- cool or damp soils on shady sites (ii) Tapri-warm soils of sunny sites.

Fig.6. Soils in Uttarakhand



The Position of the field

The altitude is very important factor in the growth of different crops. In different altitudinal zones different crops are grown but the position of the field is also plays much important as the north faces lands considerable get less heat and the retain moisture much more than the field that is exposed to the direct heat of the sun. The land which is not directly exposed much to the agent of monsoon rain also found more richer and thicker. But sun light is very important in the case of cultivation so the lands in the southern sides are more favorable for cultivation and the northern sides are good for pastures and forests.

Types of Cultivation in Various Zones

There are three types of cultivation in different zones according to the relative location of arable arras in various location of valley section.

Katil Cultivation

This type of cultivation is practiced in the highest part of slopes, Just below the forest lands. Mostly occupying the forest cleared areas mainly hoe-cultivation exist. In Katil the burnt ashes are the only form of manure.

Upraon Cultivation

This type of cultivation is practiced in the unirrigated areas on the ridges with permanent

terraced areas. This type o d cultivation is called dry farming where the productivity of the soil is less and the availability of water is scare. The crops which can with stand in such situations are cultivated in these areas. Manures are need for this cultivation.

Talaon Cultivation

Lower situations near the river banks having high fertility and intensive agriculture, double cropped and well irrigated, have this type of cultivation. The talaon land may further be divided into three sub type- Sera, Panchar and Simar cultivation. In this region the silt and sediments brought by the rivers are sufficient o keep the land fertile.

The non irrigated land in the hilly areas s of two types- Abbal and doem. The former is related to the fields having relatively deep soil with little rubbles, where the latter belongs to the fields marginally productive due to little soil and large amount of rubbles. In the Himalayan region, the southern slopes are drier or sunny than the northern ones. Though the amount of rainfall is less on in the northern slopes as compared southern slopes, but due to less intensity of sunlight, the former have more moisture retaining capacity.

Fig- 7. Thematic Map of the Average Temperature

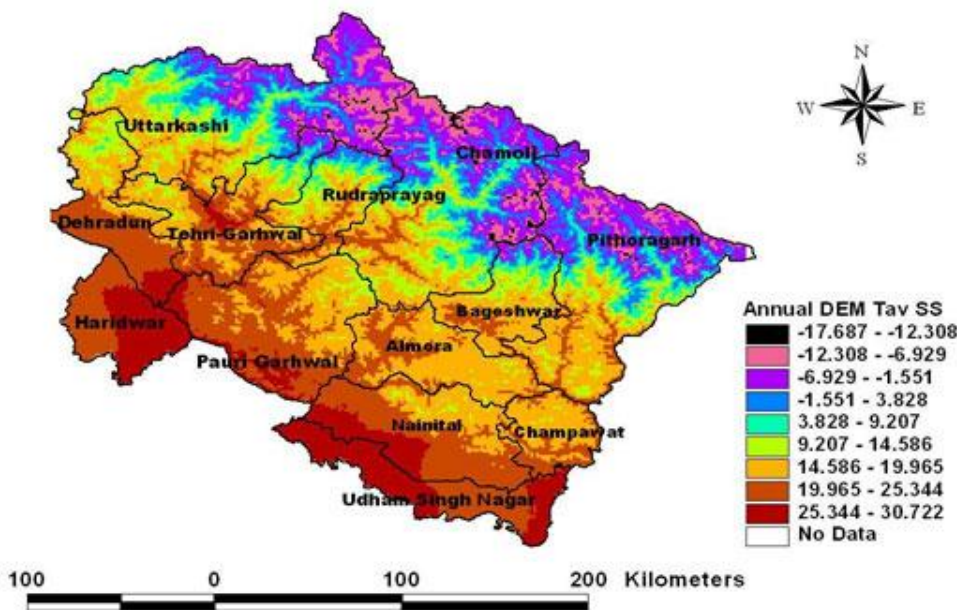


Table -6- Climatic Zones of Garhwal region

S.No	Climatic Zones	Altitude (m)	Temperature		
			Mean annual	Mean June	Mean January
1	Sub-Tropical	300-900	18.9-21.1	27.2-29.4	11.1-13.3
2	Warm Temperate	900-1800	13.9-18.9	21.1.-27.2	6.1-11.1
3	Cool Temperate	1800-2400	10.3-13.9	17.2-21.1	2.8-6.1
4	Cold	2400-3000	4.5-10.3	13.3.-17.2	1.7-2.8
5	Alpine	3000-4000	3.0-4.5	5.6-13.3	Below 0 for six months
6	Glacial	4000-4800	Ten months below 20	0,2 and 3.9	
7	Frozen	Above 4800	Cold dessert		No Vegetation

Conclusion

Horticulture is considered as the engine that would hike the economy of the hill regions. But it is very necessary to apply the knowledge, skills and technologies intensively for the growth and development of horticulture sector. The Himalayan zone is one of the important horticulture grazing areas in India and it has great significance for the people inhabiting the vast Himalayan regions. It is very necessary to equipped with knowledge of these zones of Himalayas for better enhancement of horticulture crops and productivity . Most of the hilly soils are shallow and sloppy. Considering this fruits trees on such lands provide much better sustainable substitute. It can be grown over the regions or areas left over after the cultivation of seasonal crops and thus, horticulture can fit into strategy of land conservation, reclamation.

Horticulture has been not only one of the potential sectors in agricultural activities, but also for enhancing overall development of the hill economy. The growth trend of area, production and productivity of the sector was found to be very significant in the recent past in the country. With in horticulture sector, the growth trend of area under floriculture, vegetables and fruits have been positive and found statistically very much important.

References

- Bhati J P and Zingel W P (1997), *natural Resource Use Pattern in Western Himalayan Agriculture: Implications for Biodiversity Conservation and Sustainable Development*, in Pushpangadan P, Ravi K and Santosh V (eds): *conservation and Economic Evaluation of Biodiversity*, IBH Publishing Co. Pvt. Ltd. New Delhi, vol.2, pp. 575-588.
- Chadha T R (1998), *Approaches for Optimising Productivity of Fruit Crops with Special Reference to Apple in Himachal Pradesh*, in Singh J, Sharma R P and Sharma V K (eds) *Hortivision-2020*, Department of Horticulture, H P, Shimla, pp. 168-171.

Dewan M L (2001), *People's Movement for Himachal Rejuvenation*, Concept Publishing New Delhi, p. 131.

Earles R Ames, Balasubrahmanyam G and Born R H (1999), *Organic and Low Spray Apple Production Horticulture Production Guide*, ATTRA- National Sustainable Agriculture Information Service Fayetteville, p.117.

Gautam D R (1998), *Pollination in Apples, Problems and Future strategies for Sustainable Production in Singh J, Sharma R P and Sharma V K (eds) op. cit.*, pp. 223-229.

Hasmi S (1991), *growth and Production of Horticulture Crops and Level of Self Sufficiency in West Asia*, *Asian Profile*, pp. 69-81.

Heron et al, (1991) *Pluriactivity in New Zealand's Agro- Commodity Chain*, *Proceedings of the Sociological Association of Acteearooa New Zealand, Discussion Paper-Agribusiness and Economics Research Unit, Lincoln College*, No 129, pp 41-55.

Hornsby AG et al (1998), *Managing Pesticides for Apple Production and Water Quality Protection*, FAIRS website at <http://hammock.ifas.edu>, pp. 1-10.

Jarosz L and Qazi J (2000), *Geography of Washington's World Apple: Global Expression in a Local Landscape*, *Journal of Rural Studies*, pp. 1-11.

Jindal K K, Chauhan P S and Mankotia M S (1998), *Effect of Changing Climate on Productivity of Apple in Singh J, Sharma R P and Sharma V K (eds)*, op. cit., pp. 254-262.

Karkara B K (1998), *Promising Cultivars of Temerate Fruits in Singh J, Sharma R P and Sharma V K (eds)*, op. cit pp. 186-192.

Teli B.L. *Horticulture: Economy and sustainable development in Uttarachel*. Trans media House, Srinagar:

Footnotes

1. Teli B.L. *Horticulture: Economy and sustainable development in Uttarachel*. Trans media House, Srinagar:2003.p.51.0