

**Impact  
Factor  
3.025**

**ISSN 2349-638x**

**Refereed And Indexed Journal**

**AAYUSHI  
INTERNATIONAL  
INTERDISCIPLINARY  
RESEARCH JOURNAL  
(AIIRJ)**

**Monthly Publish Journal**

**VOL-IV**

**ISSUE-II**

**FEB.**

**2017**

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**CHIEF EDITOR – PRAMOD PRAKASHRAO TANDALE**

## Physical and Agricultural Environment of Uttarakhand

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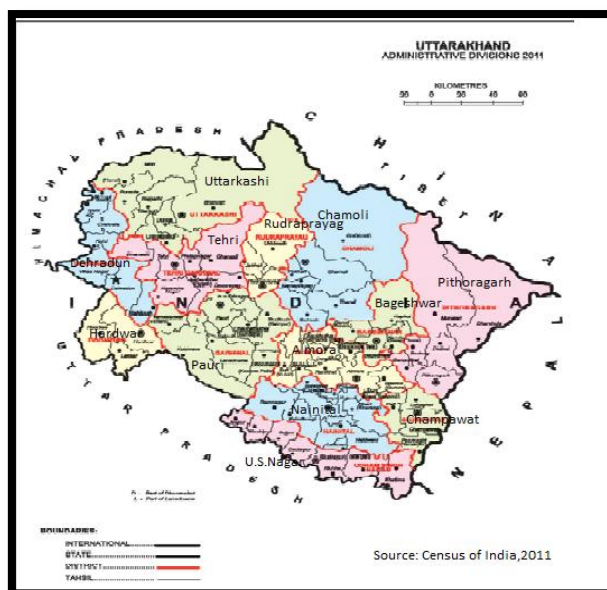
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### Introduction

The Himalaya constitutes one of the greatest and youngest folded mountain systems in the world rising from 200 m to more than 8000 m above sea level. The Himalaya makes the northern boundary of India extended from eastern border of Pakistan to the western border of Myanmar and having length of 2500 km and width varying from 250 to 400 km. The Himalaya encompasses an area of about 533606 km<sup>2</sup>. From east to west it has been divided into four sections 560 km long Punjab Himalaya extends from Indus to Sutlej, 320 km Kumaun Himalaya extends from the Sutlej to the Kali (Sharda), 800 km long Nepal Himalaya lies between the Kali and the Tista and 820 km long Assam Himalaya extend from the Tista to the Myanmar (Brahmaputra) or eastern most border of Arunachal Pradesh (Pant, 1995).

The Planning Commission of India has also divided the Himalaya into three broad regions- The Western Himalaya Consisting of the States of Jammu & Kashmir and Himachal Pradesh, the Central Himalaya Consisting of Kumaun and Garhwal Division (Uttarakhand) and North Eastern Himalaya comprising the states of Sikkim, Manipur, Tripura, Arunachal Pradesh, Nagaland, Mizoram, and hill districts of Assam and West Bengal. From Northern boundary of Ganga plain to the extreme north up to the Indian boundary with Tibet (China), the Himalaya is divided into several geo-physical divisions- the Outer Himalaya consisting of the Tarai, Bhabar, Shiwaliks and Duns, the densely populated Lesser Himalaya having a number of fertile river valleys, terraces, the Great Himalaya –a zone of high snow peaks, glaciers and a birth region of valleys, terraces, the Trans Himalaya-a region across the Himalaya. These latitudinal divisions are separated from one another by thrusts/faults such as Himalayan Frontal Fault (HFF) exist between the Upper Shiwalik and Bhabar, Main Boundary Thrust (MBT) lies between the Lesser Himalaya and Lower Shiwalik, Main Central Thrust (MCT) separated the Lesser and the Great Himalaya and Trans Himadri Thrust (THT) lies between the Great and the Trans Himalaya (Pant, 1995 and 1998). Total population of Indian Himalaya is about 47076046 persons in 2011 account 3.3.89% population of the country. Out of the total 48.55% are females in the Himalaya. It records about 10.96% population growths during 2001 to 2011(Pant, 2012 and 2013).

Being a distinct geographical entity Uttarakhand is selected for the present analysis. There are several social, lingual and ethnic groups such as Jaunsari, Raj, Bhotia, Tharu, Buksa, Jaunsari, Punjabi, Awadhi, Braji, Nepali, Thapa, Muslim, Christian, Bengali etc.



**Figure 1 – Administrative Division of Uttarakhand (District and Sub districts),2011**

(Source: Census of India,2011)

The Uttarakhand is considered to be densely forested area, place of God and Goddesses and the home of wild animals and also got recognition to be a confluence of various cultural groups came down from Central Asia in the north and the Ganga Plain in the south. It extends from the Tons-feeder of Yamuna River in the west to the Kali or Sharda in the east. Its northern boundary is demarcated by Indo-Tibet water parting ridge and southern boundary corresponds almost with the southern limit of Tarai belt separating it from Saharanpur, Bijnor, Muradabad, Rampur, Bareilly and Pilibhit districts. Administratively, Uttarakhand is one among four new states created after 1991 census. Historically, the region under the present study has been divided into two divisions - Garhwal (Kedarkhand) and Kumaun (Manaskhand) - presently Garhwal includes the districts of Hardwar, Dehradun, Uttarkashi, Tehri, Rudrapur, Chamoli, and Pauri and Kumaun spreads over the districts of Almora, Bageshwar, Pithoragarh, Champawat, Nainital and U. S. Nagar. Lying between  $28^{\circ}44'$  and  $31^{\circ}25'$  north latitudes and  $77^{\circ}45'$  and  $81^{\circ}1'$  east longitudes, it encompasses an area of  $53483 \text{ km}^2$  and supports 10086292 persons in 2011 (Fig.1). Approximately  $3144 \text{ km}^2$  of land form the Almora district,  $2241 \text{ km}^2$  Bageshwar,  $4251 \text{ km}^2$  Nainital,  $2542 \text{ km}^2$  U. S. Nagar,  $7090 \text{ km}^2$  Pithoragarh,  $1766 \text{ km}^2$  Champawat,  $8030 \text{ km}^2$  Chamoli,  $3088 \text{ km}^2$  Dehradun,  $5329 \text{ km}^2$  Pauri,  $1984 \text{ km}^2$  Rudrapur,  $8016 \text{ km}^2$  Uttarkashi,  $3642 \text{ km}^2$  Tehri and  $2360 \text{ km}^2$  forms Hardwar district (DCHB, 2011). Out of total 10086292 persons in 2011, there are 1696694 in Dehradun, 1648902 in U. S. Nagar, 954605 in Nainital, 687271 in Pauri, 483439 in Pithoragarh, 618931 in Tehri, 391605 in Chamoli, 2330086 in Uttarkashi, 259898 in Bageshwar, 242285 in Rudrapur, 622506 in Almora, 1890422 in Hardwar and 259648 persons in Champawat districts (Census, 2011).

An attempt has been made here to describe the physical –relief, geology, drainage network, climate, soils, natural vegetation etc and demographic scenario – distribution, growth of population, sex ratio, rural-urban population, literacy pattern, proportion of scheduled caste and scheduled tribe population, occupational structure etc. of the Uttarakhand. Physical portion of this article is based on various maps, records, literature, previous researches and personal field observations. Data released by the Census authority for the year 2001 and 2011 forms the base of demographic study.

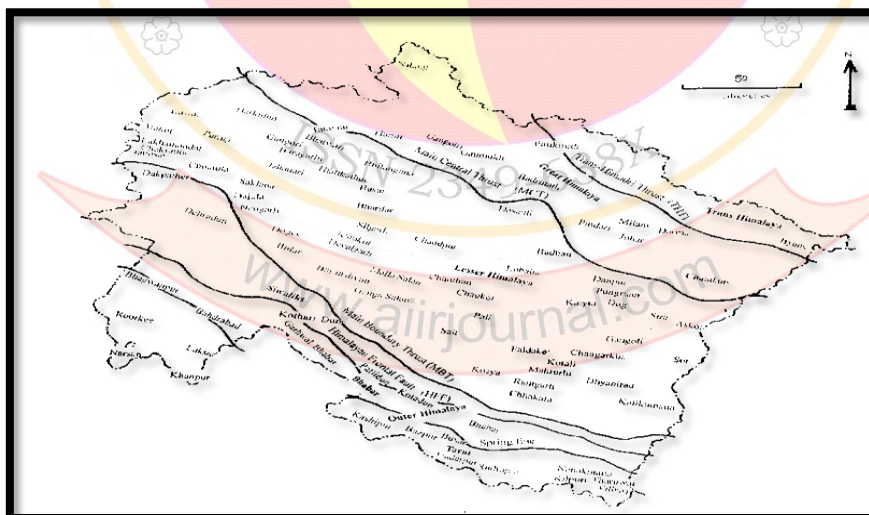
**Physical Environment**

**Relief**

Uttarakhand comprises all the five latitudinal Physiographic-geological zones-the Tarai-Bhabar, the Shiwalik with duns, the Lesser Himalaya, the Great Himalaya and the Trans Himalaya. The northern fringe of Indo- Gangetic plains, waterlogged in older times is known as Tarai. Due to the availability of fertile soil, hot climate coupled with abundant water, this 10-25 km. wide, once densely forested Tarai belt has been the home land of Tharus, Buksas and Gujjars, and is largely reclaimed for agriculture. Due to introduction of new agrarian techniques by the enterprising hardworking refugees from Pakistan and Bangladesh, retired army personnel and freedom fighters of Uttarakhand, the Tarai today is one of the most developed parts of the country. In the Tarai, Bhabar, Dun and adjoining Siwalik belts, there are about 13% of rural settlements and 60% of urban centers including Dehradun, Rishikesh, Kotdwar Kalagarh, Ramnagar, Kashipur, Haldwani-cum- Kathgodam, Tanakpur, Khatima, Rudrapur, Sitarganj, Gadarpur, Kichha, Bajpur, Jaspur, Pantnagar, (Nagla) etc. There are several reservoirs Nanaksagar, Bahgul, Haripura, Tumeria and Kalagarh.

With an altitude varying from 700 to 1200 m, the Shiwalik, like the Bhabar region, is sparsely inhabited because of thick vegetal cover and water scarcity. The gravel filled, almost plain latitudinal areas in the Shiwalik domain are known as Duns. There are five duns, namely, *Dehradun* between Yamuna and Ganga, *Chaukhamba* and *Kothari* duns between Ganga and Western Ramganga, *Patlidun* between Western Ramganga and Kosi, and *Kotadun* between Kosi and Baur. Course gravels in which all streams disappear form a 10-20 km wide belt between the Shiwalik and Tarai known as Bhabar. Consequently, the belt faces acute problem of water scarcity.

The 70 km wide Lesser Himalaya having relatively milder / stable terrain is situated north of the Shiwalik hills. This is the densely populated belt of Uttarakhand. The urban centers (37%) of Dwarahat, Ranikhat, Almora, Bageshwar, Dharchula, Pithoragarh, Lohaghat, Champawat, Bhimtal, Bhawali, Nainital, Lansdown, Narendranagar, Pauri, Srinagar, Tehri, Uttarkashi, Chamba, Mussoorie, Gopeshwar, Joshimath, Karnaprayag, Rudraprayag, Barkot, Purola etc. are located in the Lesser Himalaya. There are about 81% of the rural settlements in the Lesser Himalaya.



**Figure 2: Relief of Uttarakhand (Pant, 2010)**

The Great Himalayan region in the north is a belt of very high peaks from 3000 m to more than 7000 m in altitude, and of glaciers. It ranges in width from 30 to 50 km. The important peaks include Nandadevi, Panchchuli, Trishul, Kedarnath, Chaukhamba, Badrinath, Bandarpunch and

Kamet. Among the glacier Pindari, Milam, Gangotri and Khatling are the important ones. The harsh and rigorous climatic conditions together with extremely rugged topography are perhaps responsible for scanty habitation. Consequently, there are less than 70 seasonal settlements in the river valleys and *bugyals* (alpine pasture).

The Trans-Himalaya belt is 40 km wide. This is a rain shadow zone, as southeastern monsoon clouds cannot cross the Great Himalaya. The belt is scantily populated, there being just 20-30 temporary villages of the Bhotia tribes.

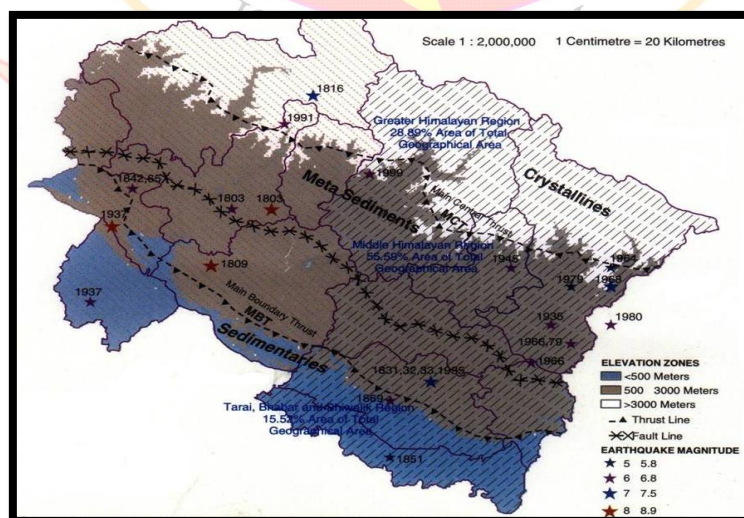
**Geology**

From the geological point of view, the Uttarakhand or Kumaun Lesser Himalaya is divided into five litho tectonic units. These units are demarcated by several thrusts and faults. Most of these faults/thrusts are active. The brief description of the geology/structure is based on Valdiya (1980a 1980b and 1988).

The foothill belt of the Uttarakhand (The Outer Himalaya) is made of sandstone, mudstone and subordinate conglomerates of the Middle Miocene to Early Pleistocene age. The Lower Shiwalik consists of fined grained calcareous sub greywacke and sub litharenitic alternating with dominant horizons of maroon mudstone and rare Para conglomerates while the Middle Shiwalik consists of predominant coarse-grained sub litharenitic and subordinate Para conglomerate. The Upper Shiwalik sediments comprising boulder conglomerate with maroon mudstone and sandstone. Himalayan Front Fault (HFF) separates Siwalik from the Bhabar. The gravel filled synclinal valleys are known as *Duns-Dehra, Chaukhamba, Kothari, Patli and Kota*. It include two lithotectonic units-(1) Tarai and Bhabar, and (2) Siwalik.

Lying between the MBT in the south and MCT in the north, the Lesser Himalayan terrain is made of three litho tectonic units: The autochthonous succession of the Precambrian strata forming the larger part of the inner belt. Late Precambrian to early Paleozoic sedimentary rocks formation forming the Krol Nappe includes slates, phylites sandstone, and limestone. The Precambrian metamorphic injected was granite body.

In summing up there are seven main lithological groups namely- Krol Succession, Ramgarh group, Almora Group, Damtha-Tejam group, Bhatwari-Barkot formation, Berinag Formation and Munsyari.



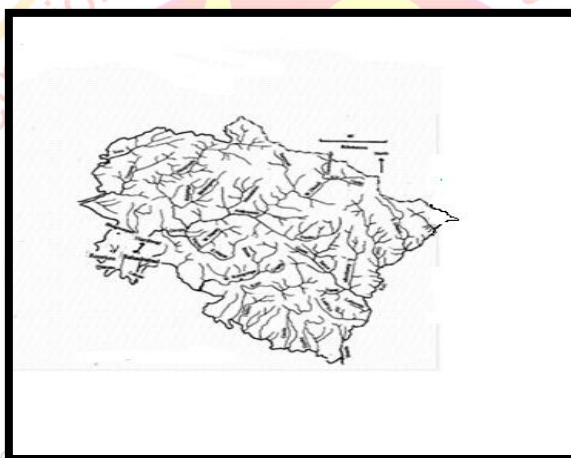
**Figure 3: Geology of Uttarakhand (Valdiya, 1980a, b & 1988)**

The Great Himalaya is made of high-grade metamorphic- the Vaikrita group of Precambrian age and intruded extensively by mid Tertiary granite. However, Jhingran referred it Central Crystalline Zone.

Trans Himadri Thrust (THT) - separates the Trans Himalaya from the Great Himalaya. The rock formations are shattered mylonolized or otherwise complexly folded

### Rivers

Uttarakhand is mainly drained by the Ganga and the Kali systems. The Yamuna originates from the Yamunotri hot spring and Saptrishikund on the southwestern slope of the Bandarpunch ridge and flows through the district of Uttarkashi and Dehradun. The Tons is the largest river in respect of volume of water flowing. Bhagirathi and Alaknanda join at Devprayag to make the Holy Ganga River. The Bhilangana is the main tributary of the Bhagirathi that rises from Khatling glacier. Western Dhauliganga originates at Untadhura and Niti pass on the Indo-Tibet water divide, and joins the Vishnuganga at Vishnuprayag. Saraswati, emanating near Mana Pass, makes the headwaters of the Alaknanda. Pindar (originating from Pindari glacier) and Mandakini (rising in the Kedarnath ridge) are the main tributaries of the Alaknanda. Nayar joining the Ganga from the west at Byasighat, drains the Dudhatoli – Pauri region.



**Figure 4: Rivers of Uttarakhand (Pant, 2010)**

Kali is the largest river in Kumaun both in respect of volume of water as well as extent of the catchment's area. It is also largest river in Uttarakhand in respect of length. The Kali originates at Kalapani near the Lipulekh pass and is fed by Kuti, Eastern Dhauliganga, Gori, Saryu, Lohawati and Ladhiya rivers. Gori emanates from the Milam glacier and Eastern Ramganga from Namik glacier. Eastern Ramganga and Panar are the principal tributaries of the Saryu. Saryu joins the Kali at Pancheswar. The Kali is known as Sharda River at Baramedeo mandi.

The Western Ramganga rises from the northeast slope of Dudhatoli ridge in Pauri district. Binau the headwater of Western Ramganga takes its rise from the Binsar spring located on the southern slope of Dudhatoli range (Baramdhungi). It joins the Masangaddi and Western Ramnagar at Deghat and Kedar, respectively. Rising from the Bhatkot ridge, Gagans joins the W. Ramganga at Bhikiasain. The Kosi River rises on the southern slope of Bhatkot- Kausani range and leave Kumaun near Sarkara eventually to join the Western Ramganga.

Minor rivers like Song, Khoh, Rispana, Dhela, Dabka, Baur, Bhakhara, Gaula, Nandhaur and Deoha; drain the outer belt of the Lesser Himalayan domain. Due to the porous nature of Bhabar

areas these rivulets became dry and reappear in the Tarai region where these are checked in the form of artificial reservoirs for multipurpose.

### **Weather**

Among all the environmental influences that control the human activities, climate seems to be the most effective constraint particularly in determining the life style in a region. Diversified topography of the region has offered different climatic features. Rainfall and Temperature is important factor which determines the cultivation and human activities. The altitudinal difference, slope aspect and forest cover of the area create complex climatic conditions which change frequently from location to location. The climate in the river valley is quite in contrast to the climate on the higher ridges. The Tarai-Bhabar and low-lying valleys below 800m of elevation have hot and humid climate. Between 800-1200m elevation, it is subtropical, temperate from 1200 to 2000m, cool temperate between 2000-2400m, between 2400-3000 m elevation cold temperate; and above 3000m of elevation very cold alpine.

In a large measure, the climatic distribution in the hills can best be explained by one of the fundamental principal of vertical distribution which is largely a result of the vertical distribution of temperature falls by as much as 6° C but large variations may occur depending upon such factors as location, time of the and the season (Joshi et al., 1983). The temperature decreases from valley upwards and finally reaches to the freezing point in the northern Trans Himalayan tract, the northern and western papers of the region have low temperature while in the central and northern part of the region the temperature increase along the valleys. Due to this character of temperature, the cropping season and duration of harvesting and agricultural practices differ from region to region.

The mean temperature in the month of January is about 21°C in the sub mountain belt of Tarai, Bhabar and Duns while 8°C in the inner valleys. The maximum temperature register is around 39.7°C in Tarai Bhabar (Pantnagar), 41.5°C in Dun valley (Dehradun) and 34.62°C in the Lesser Himalayan domain (Tehri) in year 2004 and minimum temperature, 3.2°C in Tarai Bhabar, 3.2°C in Dun valley and 0.6°C in the lesser Himalayas respectively. Similar trend has been recorded of temperature in the year 2005 and 2006.

There is general tendency of a decrease in the annual rainfall from east to the west though it is not well market. The mean monthly rainfall of the Uttaranchal region is about above 630 mm. The maximum rainfall occurs at two points, where a general rise in elevation takes place at the foot of the outmost range of hills, and at the foot of the snow. Most of the areas are rainfall data in not available lies along the high altitude zone of Himalaya, where precipitation always occur in the form of snow. About 80% of the total rainfall occurs in the monsoon months alone. The average annual rainfall is 150cm in the Tarai-Bhabar and Dun belts, while the Nainital hills receives the highest i.e. 250 cm. then decreasing northwards in the inner Lesser Himalaya where the average annual rainfall is only 90 cm (Pant, 1992). The Trans Himalayan region falls in the rain-shadow zone, because the southeast monsoon clouds cannot cross the Great Himalaya

The rainfall record in year 2004 is around 1415.3 mm in Tarai Bhabar (Pantnagar), 2026.8 mm in Dun valley (Dehradun) and 1205.6 mm in the Lesser Himalayan region (Tehri).

### **Flora**

The Himalayan uplift that took place in a series of evolution brought about a corresponding change not only in the climatic profile along altitudinal gradient but also in the soil factors. These changes influenced the immigration of plant species from far off regions, from east and west, their

establishment in the ecosystems speciation and extinction during various geological ages. The trend of colonization and formation of stabilized communities followed by speciation in the Himalaya continued even in the Modern age. Photo geographically and ecologically, it is therefore, one of the most complex areas in the Indian sub-continent with marked east-west and south-north transitions. The forest types identified below have been described according to Champion and Seth (1968). Tropical Moist Deciduous Forests, Tropical Dry Deciduous Forests, Sub-tropical Pine Forests, Sub-Tropical Dry Evergreen Forests, Himalaya Moist Temperate Forests, Himalaya Dry Temperate Forests, Sub Alpine Forests, Moist Alpine Forests and Dry Alpine Forests

### **Soils**

A complete soil survey of the Uttarakhand Himalaya has not been carried out so far. Based on the available data, it becomes difficult to determine the remarkable characteristics of the soil. Near Dehradun of foot hill is show the soils are loam to clay-loam in texture and acidic in nature. In Ranikhet area four broad soil groups have been identified – red loam, brown forest soil, podzolic soil and meadow soil (Ghildyal, 1981). On the basis of altitude, lithology, landscape, slope aspect, gradient, vegetation, drainage and field work, the soil of Kotadun, a south western part of Kumaun Himalaya is classified into seven groups – loamous soil, conglomeratic sandy soil, stony hilly soil, crushed salty soil, hill sandy soil, podzolic soil and rocky thin regolith soil (Pant, 1994).

Soil composition in the Himalayan belt indicates that two different and distinct types of soils are present in these areas, immature soils and nature soils. It is known as the cumulative interaction of climate, vegetation and topography work together on the weathered product of disintegration of rocks to make a type of soil. In the lofty mountainous areas of the study region, it is fairly evidence, that soils are not adequately mature due to only moderate chemical weathering, a low mass movement, fluvial erosion and slow wind action as coupled with very low temperature. Sedentary soils have low maturity and skeletal presence in spite of their grater erosion of slopes. The snow-clad areas do not allow adequate chance for the rocks to disintegrate and undergo all chemical process to make mature soils. The valleys, where soil from various slopes are gathered by the action of dashing water, bear the drift soils of varying composition as distinct from the sedentary soils.

The valleys have alluvial deposits and they afford a good crop-growth. Land use strategy, thus, may include the sub-regional soil demarcation and appropriate crop-combinations for them. The sedentary soil bring adequate humus content with them as these flow with water currents on forested slopes. Therefore, the alluvial soil collected at valleys has fineness, humus, phosphorus gained from bones on way, and the admixture of various plant nutrients. Land use is governed by the relief and nature of the terrain in the altitudes. The situation of the underground water table, stage of maturity of soil, air drainage and absence of frost has bearing on the potentiality of crops in the study region. Towards the 'Duns', Bhabar and Tarai, the texture of soil is good for cropping. In the Kosi valley and Katjur valleys, the soils of hills are superb.

### **Land Utilization Pattern**

Table 2 gives an overall picture of land use in Uttarakhand .The total reporting area of Uttarakhand is 5672568 hectares, out of which 61.5 % is under forests area but it is worth to mention here that it is not under full tree canopy, since it is the area owned by State Forest and Revenue Departments. A study conducted by Singh and his colleagues (1984) indicates that only 28.78 % area is now forested and only 4.4 % of the area has a forest cover with greater than 60% crown density while 60 % forest cover the minimum requirement for environmental balance in the



such Himalayan Region. About 4 % of the total reporting area is classified as barren and unsuitable for cultivation. It includes barren, river beds, steep stony areas etc. Land under other uses excluding agriculture is covered only 3.8 % of the total area. It includes settlements, roads, railways, cart tracks footpath, and natural and artificial water bodies. Out of total reporting area 5.3% area is classified as cultivable waste land. Cultivable waste land mean all lands available for cultivation but not taken up for cultivation after a few years. Such lands may be fallow for more than five years and may be covered with shrubs and bushes. It does not include the lands which are reserved for grazing. About 3.5% area is under permanent pasture and grazing while 6.8% is under trees, bushes, gardens etc. The fallow land covering an area of about 106128 hectares or 1.9% of the total area consists of current fallow (0.6%) and old fallow (1.3%). Out of total reported area 13.3% is classified as net sown area during 2008-09.

**Table – Land use in Uttarakhand**

Sl. No.	Land Use Categories	2006-07		2007-08		2008-09	
		Ha	%	Ha	%	Ha	%
1	<b>Reporting Area</b>	<b>5666878</b>	<b>100</b>	<b>5672590</b>	<b>100</b>	<b>5672568</b>	<b>100</b>
2	Area under Forest	3465057	61.1	3483872	61.4	3485847	61.5
3	Barren and Un suitable land for Agriculture	311849	5.5	224185	4.0	224480	4.0
4	Land under Other uses excluding Agriculture	160649	2.8	216682	3.8	216534	3.8
5	Cultivable Waste Land	366713	6.5	302240	5.3	303144	5.3
6	Permanent Pasture and other Grazing Land	220286	3.9	198720	3.5	198737	3.5
7	Land under Other Trees, Gardens and Bushes	269042	4.7	384229	6.8	383987	6.8
8	Current Fallow	44064	0.8	35795	0.6	35161	0.6
9	Old Fallow	64068	1.1	71832	1.3	70967	1.3
10	Net Sown Area	765150	13.5	755035	13.3	753711	13.3

**Table - 3: Source wise Net Irrigated Area in Uttarakhand, 2007-08 to 2009-10 (Area in ha)**

Sources	2007-08		2008-09		2009-10		Change 2007-08 to 2009-10	
	Ha	% of Irrigated	Ha	% of Irrigated	Ha	% of Irrigated	Ha	%
<b>Canal</b>	95205	27.59	88727	26.03	95922	28.2	717	0.8
<b>Tube well</b>	199333	57.78	2E+05	59.36	198193	58.27	-1140	-0.6
<b>Other Wells</b>	18544	5.37	14464	4.24	15587	4.58	-2957	-15.9
<b>Ponds</b>	138	0.04	114	0.03	770	0.23	632	458.0
<b>Other</b>	31800	9.22	35232	10.34	29657	8.72	-2143	-6.7
Net Irrigated Area	<b>345020</b>	<b>100</b>	<b>3E+05</b>	<b>100</b>	<b>340129</b>	<b>100</b>	-4891	-1.4

**Source:** Anonymous, 2009-10.

**Agricultural Environment**

The economy of Uttarakhand depends on agriculture which engaged more than 70% population of the region. But there is scarcity of agricultural land and the share of per capita land is

far below from the standard requirement. Only 0.18 ac land goes to per head share (as per 2011 population) of the net sown area in Uttarakhand while Madhav Ashish (1983) estimated it about 0.20ha as the optimum requirement in this region. Population pressure on cultivated land, forests and pasture land is considerably high. About 80% of fodder and 100% of fuel requirement is fulfilled from the forest by the inhabitants of some villages in this region (Singh *et al.*, 1984). Irrigation is the most significant constraint to determine the use of land and cropping choice.

About 45.13% of net area sown is irrigated in the region during 2009-10. The statistics shows that maximum net sown area of Haridwar (98.3%) and U. S. Nagar (91.4%) districts of the state is irrigated (Table 3). There are four main sources of irrigation in which maximum 58.3% irrigation is done by tube well mainly in Haridwar and U.S.Nagar districts. About 28.2% of the total irrigated area irrigates by the canal. Remaining sources are ponds (0.2%), other wells (10.1%) and other sources (8.71%). There are numerous streams, gad, gadhera, in the hills, but very little use of them is made for irrigation because of diverse topographic features and high costs of lift irrigation schemes in one hand, and silting and sliding of the gules constructed by the villagers on the other. Study shows that on an average about 1.4% irrigated area is decreased during 2007-08 to 2009-10 It may be the less discharge of water due to variation in rainfall amount during this specified periods in one hand and ignorance from the irrigation department.

**Fragmented Land Holdings**

The size of land holdings and field in the mountainous part of the region is very small.

**Table -4 :Number and Area of Operational Holdings in Uttarakhand, 2000-2001**

Sl.No.	Size Group (Ha.)	Holdings		Area	
		Numbers	%	Hectare	%
1	Below 1.0	628267	70.5	242511	28.7
2	1.0-2.0	158402	17.8	220726	26.2
3	2.0-4.0	78414	8.8	212384	25.2
4	4.0-10.0	24163	2.7	132200	15.7
5	10.00 and Above	1421	0.2	35629	4.2
	<b>Uttarakhand</b>	<b>890667</b>	<b>100</b>	<b>843450</b>	<b>100</b>

Source Anonymous, 2009-10.

Table 4 shows that more than two third (70.5%) holdings are less than 1 hectare in size and covers about one fourth (28.7%) of the cultivated area. In all 88.3% holdings are in below two hectare size and accounts 54.9% of the cultivated area. The study reflects that the maximum holdings are in the categories of marginal and small holdings in Uttarakhand. Table --- also indicates that only 2.9% holdings are 4 ha and above in size and covers 19.9% of the cultivated area. Big size of holdings is found mainly in the Tarai belt of Uttarakhand.

**Main Crops**

Table 5 shows that the main crops grown in the region. Paddy, madua, jhungora, maiz, urd, soyabean etc. are major crops in the kharif season while wheat, barley, gram, peas, lentil, lahi and mustard, etc. are produced in rabi season. Tur (Arhar) and sugarcane are grown once in two or three year cycle. In present time paddy crops is grown twice a year in Tarai belt of the region.

Out of total gross sown area cereals are grown in 83.8% area in which rice, wheat, barley, maize are grown respectively 31.1 % , 41.8%, 2.5, 3%of the total area is covered by the cereals

About 5% of gross area is covered by pulses. Among the pulses urd, peas, lentil, and gram are main pulses and covered 22.3, 9.8, 2.2 and 1.2% respectively. Oil seeds are covered only 2.6 % of gross sown area. Lahi (49.8%), ground nut (4.5%) and Til (8.2%) are main oil seeds in the region. Soyabean is used for both the purposes as pulse and oilseeds. Sugarcane covers only 8.5% area. Considering the change during 2007-08 to 2009-10, the area under cereals and sugarcane is decreased by 2.1% and 22.5% respectively while 11.2% and 8.8% area of pulses and oilseeds increased during the specified period. It shows the awareness of the cultivators for giving more attention in oilseeds and pulses production which are nutritionally very important sources of protein and fat. In the same time it is very setback that the area under sugarcane is alarmingly decreased because of the sugarcane cultivation is not much economically profitable. In the crop year 2009-10 the total production of the cereals is 1757148 m tons in which 34.9, 48.1, 1.5, 2.2, and 13.3 % production is respectively produced by rice, wheat, barley, maize and other cereals, Wheat is major crop contributes half of the total production of the region. Study reflects that the production of rice, wheat and barley is increased respectively 3.6, 3.8 and 1.8% during 2007-08 to 2009-10. The production of pulses is 42138 m tons in 2009-10. Maximum share 22.9% production provides by urd while 17.1, 12.9 and 1.1% is shared by lentil, peas and gram respectively. About 46 % productions are provided by the other pulses. It is very striking fact that average production of pulses is reduced by 16.1% during 2007-08 to 2009-10 but lentil production is increased by 35.6% during the same span of period while the production of urd, peas, and gram is reduced by 15.5, 37.5 and 41.6 % respectively. It is very negative indication for the society because the pulses are important source of protein. Table shows the production of oil seeds is 33185 m tons in 2009-10 which is increased by 11.6% during 2007-08 to 2009-10. Soyabean contributes maximum 54.8% of the total oilseeds production while lahi and mustared shared only 37.7%. Groundnut and til are shared 6 and 1.6% respectively. The production of soyabean is decreased by 5.6 % while others are increased.

**Table-5: Area Under Main Crops in Uttarakhand(Ha)**

Sl. No.	Crops	2007-08	2008-09	2009-10		Change 07-08 to 09-10	
		(Ha)	(Ha)	(Ha)	%	(Ha)	%
<b>1</b>	<b>Cereals</b>	<b>964957</b>	<b>964957</b>	<b>944982</b>	<b>100</b>	<b>-19975</b>	<b>-2.1</b>
	Rice	295670	295670	294223	31.1	-1447	-0.5
	Wheat	398301	398301	394633	41.8	-3668	-0.9
	Barley	28097	28097	23739	2.5	-4358	-15.5
	Maize	32922	32922	27960	3.0	-4962	-15.1
	Other Cereals	209967	209967	204427	21.6	-5540	-2.6
<b>2</b>	<b>Pulses</b>	<b>64035</b>	<b>64035</b>	<b>56895</b>	<b>100</b>	<b>-7140</b>	<b>-11.2</b>
	Urd	13910	13910	12707	22.3	-1203	-8.6
	Peas	6171	6171	5568	9.8	-603	-9.8
	Lentil	17212	17212	12500	22.0	-4712	-27.4
	Gram	617	617	663	1.2	46	7.5
	Other Pulses	26125	26125	25457	44.7	-668	-2.6
<b>3</b>	<b>Total Oilseed</b>	<b>27386</b>	<b>27386</b>	<b>29785</b>	<b>100</b>	<b>2399</b>	<b>8.8</b>
	Lahi and Musterd	14319	14319	14847	49.8	528	3.7
	Groundnut	1352	1352	1340	4.5	-12	-0.9

	Til	2364	2364	2445	8.2	81	3.4
	Soyabean	9351	9351	11153	37.4	1802	19.3
<b>4</b>	<b>Other Crops</b>						
	<b>Sugarcane</b>	<b>124008</b>	<b>104987</b>	<b>96072</b>	<b>100</b>	<b>-27936</b>	<b>-22.5</b>

Source: Anonymous, 2009-10.

The production of sugarcane is 5061727 m tons during the year 2009-10 which is 34.1% less than the year of 2007-2008. It is due to area is decreased and per hectare production of sugarcane is also decreased.

**Table-6: Production of Main Crops in Uttarakhand ( M.Tons)**

Sl. No.	Crops	2007-08	2008-09	2009-10		Change 07-08 to 09-10	
		( M.Tons)	( M.Tons)	( M.Tons)	%	( M.Tons)	%
<b>1</b>	<b>Cereals</b>	<b>1744976</b>	<b>1725691</b>	<b>1757148</b>	<b>100</b>	<b>12172</b>	<b>0.7</b>
	Rice	592177	581510	613312	34.9	21135	3.6
	Wheat	814293	797328	845438	48.1	31145	3.8
	Barley	26008	22173	26475	1.5	467	1.8
	Maize	43086	42404	38061	2.2	-5025	-11.7
	Other Cereals	269412	282276	233862	13.3	-35550	-13.2
<b>2</b>	<b>Pulses</b>	<b>50198</b>	<b>38769</b>	<b>42138</b>	<b>100.0</b>	<b>-8060</b>	<b>-16.1</b>
	Urd	11395	10227	9634	22.9	-1761	-15.5
	Peas	8725	2636	5455	12.9	-3270	-37.5
	Lentil	5304	6056	7192	17.1	1888	35.6
	Gram	758	219	443	1.1	-315	-41.6
	Other Pulses	24016	19631	19414	46.1	-4602	-19.2
<b>3</b>	<b>Total Oilseed</b>	<b>28852</b>	<b>25371</b>	<b>32185</b>	<b>100.0</b>	<b>3333</b>	<b>11.6</b>
	Lahi and Mustard	8880	9571	12127	37.7	3247	36.6
	Groundnut	773	1818	1917	6.0	1144	148.0
	Til	499	473	501	1.6	2	0.4
	Soyabean	18693	13509	17640	54.8	-1053	-5.6
<b>4</b>	<b>Other Crops</b>						
	<b>Sugarcane</b>	<b>7685903</b>	<b>5531848</b>	<b>5061727</b>	<b>100</b>	<b>-2624176</b>	<b>-34.1</b>

Source: Anonymous, 2009-10.

**Problem and Prospectus**

Many folds natural and anthropogenic problems are occurring in the Uttarakhand, such as landslides, soil erosion, floods, cloud burst, earthquake, receding of glaciers, deforestation, forest fire, drying up springs, extinction of medicinal plants and herbs, threat from wild animals, decreasing soil fertility, uncertain rainfall, endless migration, inequality in gender, malnutrition, etc. Uttarakhand is also facing cultural and political disasters. However, the region is endowed with vast resources of forest, tourism, agriculture, horticulture, fishing, social forestry, medicinal herbs, cottage industry, minerals, water and human. Despite the ample potentiality of its resources, the region is under developed. There is an urgent need to study the needs of the villagers and its remedy should be short out at the village level. All resources such as water, forest, grazing land, agricultural fields, gardens etc should be eco-friendly utilized. People participation particularly experienced women should be compulsory in preparing the village development schemes. Village people have

more traditional and indigenous knowledge for the better use and conservation measures of their resources.

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