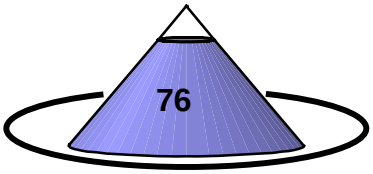

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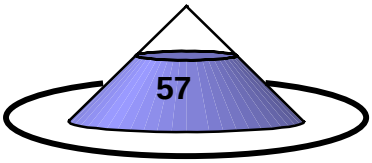

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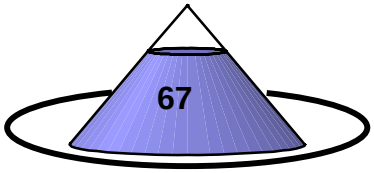
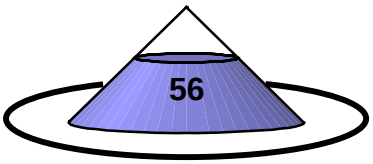


Naini Tal

Where Are The Empty Thalis In Uttarakhand?

District Level Food Insecurity Analysis

Ravi Chopra & Santosh Passi



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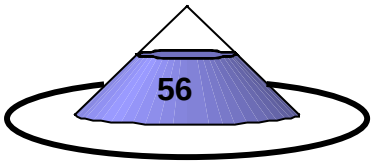

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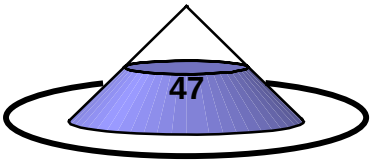

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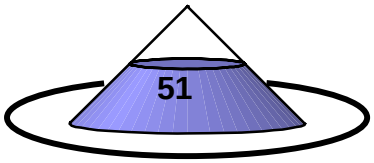
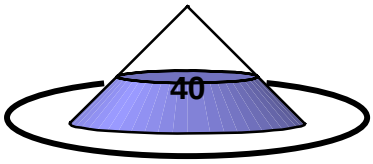


Tehri Garhwal



Uttarkashi

Hardwar

* Food Security Index (April 2002)

ABSTRACT

The primary focus of this paper is a mapping exercise to identify the food insecure parts of Uttarakhand, using official, secondary data. The statistical analysis is essentially a remote sensing exercise. To mitigate the intrinsic weakness of such an effort, an attempt has been made to provide some ground-truths from micro-studies. Thus, food insecurity is determined in terms of three broad aspects – availability, access and absorption. Data have been compiled for 11 indicators for the 8 old districts of Uttarakhand (Almora, Nainital, Pithoragarh, Chamoli, Dehra Doon, Pauri Garhwal, Tehri Garhwal and Uttarkashi) and Hardwar.

For each indicator, the districts are ranked 1 to 9. The best situation is given the highest rank 9 and the worst situation, the lowest rank1. The ranks for all the 11 indicators are then summed up for each district and the cumulative ranks divided by 11 to calculate a Food Insecurity Index. Using natural breaks in the various mapping indices the following categories emerge:

District	Availability	Access	Absorption	Food Insecurity Status
Almora	MFS	MFIS	MFS	MFS
Naini Tal	FS	MFIS	MFIS	FS
Pithoragarh	FI	MFIS	MFS	MFIS
Chamoli	FI	MFS	FS	MFS
Dehra Doon	MFIS	MFS	FS	MFS
Pauri Garhwal	MFS	FS	FS	FS
Tehri Garhwal	MFS	MFIS	MFIS	MFIS
Uttarkashi	FI	MFIS	FI	FI
Hardwar	MFIS	FI	FI	FI

Note: FS = Food Secure: MFS=Moderately Food Secure; MFIS= Moderately Food Insecure; FI=Food Insecure.

Thus, no district is entirely food secure or insecure. There are areas of weakness and strength in each of them. Most critically, the present districts of Chamoli, Rudraprayag and Pithoragarh face problems of food availability. These districts require public action. Production of pulses is most inadequate in every district.

In terms of the social indicators for food access, all the districts have a low juvenile sex ratio. Female literacy requires a major push in Hardwar, Uttarkashi and Tehri Garhwal. Though the official data suggests that overall Uttarakhand is food secure, particularly in terms of food availability, data from micro-studies indicates that the official figures may be over estimates.

The authors recommend programmes of community-led natural resource management focusing on (1) the felt needs of the local population, including food security and (2) reducing the drudgery in the daily lives of women. It is also necessary to devise a mountain specific framework for analyzing Uttarakhand's food security. A similar exercise done at the block-level can be more useful in targeting the populations that need help on a priority basis.

Where are The Empty *Thalis* in Uttarakhand[1] ?
District Level Food Insecurity Analysis of Uttarakhand

Ravi Chopra and Santosh Passi[2]

I. INTRODUCTION

India emerged as an independent nation not long after the Great Bengal famine of 1944. Food security has therefore always been an important area of policy-making for India's political leaders and administrators. Over the years, a comprehensive understanding of food security has evolved. It enables policy-makers and administrators to reach those facing food insecurity more effectively. (FAO defines food insecurity as, 'food insecurity exists when all people, at all times, do not have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life'. [3])

Initially, the focus of Indian policy-makers was simply on food grains production and availability. Later, it became apparent that even if adequate grains were grown, the poor often could not afford to buy them. Amartya Sen popularized the concept of entitlements. [4] Food procurement for public distribution and a number of employment guarantee schemes emerged to enable the poor to access the available food stocks. Today, food security also implies an individual's ability to absorb a nutritious diet. [5]

On November 9, 2000 Uttarakhand became the 28th state of India. It is primarily a mountain state that is divided into five distinct geological-physiographic zones -- Terai-Bhabar, Shivalik Doons, the Lesser Himalaya , Greater Himalaya and Trans Himalaya –

[1] The official name of the state is Uttaranchal, even though the historical name of the region has been Uttarakhand. Local sentiments favour use of the name Uttarakhand.
[2] Dr Chopra and Mr Passi are Director and Research Associate, respectively, at People's Science Institute, Dehra Doon. This paper has been prepared for the State Consultation on Food Security, Dehra Doon, April 2002.
[3] Food and Agricultural Organization (1996).
[4] Sen, A.K. (1977).
[5] WFP-MSSRF (2001)

Fig. 1 : **Administrative and geomorphic/physiographic divisions of Uttarakhand**

by four major faults (See Figure 1). Uttarakhand's mountain character imposes inherent limits on its food production potential, since there is very little flat land for cultivation. Farming in the mountain districts is largely done on terraced fields. The Himalaya are a young mountain chain and are very active tectonically. Earthquakes are relatively frequent, while flash floods following cloud bursts and landslides are an annual phenomenon. Thus the state is highly disaster prone adding to its food insecurity. Despite these handicaps, the food grain production in the state is reported to be relatively high compared to many other parts of India. This is a tribute to the people of the state, particularly the women, who are the backbone of the mountain society.

The primary focus of this paper is a mapping exercise to identify the food insecure parts of Uttarakhand, using official, secondary data. The statistical analysis is essentially a remote sensing exercise. To mitigate the intrinsic weakness of such an effort, an attempt has been made to provide some ground-truths from micro-studies. The next section briefly explains the analytical framework and the method of analysis. Data related to food availability, access and absorption are presented and discussed in separate sections thereafter. A comprehensive food-security index is developed for ranking different districts in Uttarakhand. Recommendations for policy and government action are made in the concluding section.

II. THE ANALYTICAL FRAMEWORK

Our analysis is based on the conceptual framework and analytical method developed in the "Food Insecurity Atlas of Rural India".[6] In this Atlas, food insecurity is analysed in terms of three broad aspects – availability, access and absorption. Data for 19 different indicators and indices – grouped under the three broad aspects -- were analysed to prepare a food insecurity index for the rural areas of various Indian states.

In the present paper, we have compiled data for eleven indicators and indices similar to those used in the all-India exercise. These are listed below. The data used are the latest available and they all pertain to the last decade, 1991-2001.

Food Availability

1. Deficit in per capita net cereals production over requirement
2. Instability in cereals production
3. Environmental Unsustainability Index; Components: (1) Area without adequate forest cover (2) Per cent area under non-leguminous crops to cropped area (3) Wasteland area as a per cent of the total geographical area and (4) Ratio of the gross cropped area to the forest cover.
4. Unirrigated area as a percent of the net sown area.

Food Access

5. Percentage of rural population below the poverty line.
6. Rural juvenile (0-6 years) sex ratio.
7. Per cent rural female literacy.
8. Per cent rural Scheduled Castes/Scheduled Tribes population.
9. Rural Infrastructure Index; Components (1) Per cent rural households without electricity (2) Per cent rural households without safe drinking water (3) Road length per lakh persons (4) Per cent villages not electrified.

[6] WFP-MSSRF (2001)

Food Absorption

10. Infant Mortality Rate.

11. Health Infrastructure Index; Components (1) Percentage of children without complete immunization (2) Number of persons per PHC (3) Number of persons per doctor.

For each indicator, the districts are ranked 1 to 9. The best situation is given the highest rank 9 and the worst situation, the lowest rank l. The ranks for all the 11 indicators are then summed up for each district. In principle then, the cumulative ranks can vary from 11 to 99. To derive the Mapping Index, the cumulative ranks are divided by the number of indicators, 11. The higher the Mapping Index, the better off the district. Using natural breaks in the Mapping Index, it is divided into categories of food insecurity. These are colour coded and reproduced in a map. **The importance of this exercise lies not so much in the actual numerical values of the indicators, but in the final categories of food insecurity and the relative ranks of the districts.**

Though Uttarakhand has 13 districts, we have reported data for the eight old districts of the UP hills (Almora, Naini Tal, Pithoragarh, Chamoli, Dehra Doon, Pauri Garhwal, Tehri Garhwal and Uttarkashi) and Hardwar, since comparative figures are available only for them. Some districts like Rudraprayag and Champawat have been carved out of more than one of the older districts. But, for purposes of data analyses, data for the new districts have been merged with the major parent district. The combined districts reported here are made up as follows:

District reported here	:	Merged present districts
Naini Tal	:	Naini Tal + Udham Singh Nagar
Almora	:	Almora + Bageshwar
Pithoragarh	:	Pithoragarh + Champawat
Chamoli	:	Chamoli + Rudraprayag

III. FOOD AVAILABILITY

In this section, factors affecting the present and future food availability are examined. These include, current local food production, instability in cereals production, environmental sustainability and the degree of protection against droughts as expressed by the unirrigated agricultural area. The latter is taken as a proxy for estimating drought-proneness of the districts. The issue of disasters is also discussed, though no indicator for this is reported due to lack of comparative data for all the districts. Comprehensive data at the district level of food consumption are also not available.

III.1 Food Production in Uttarakhand

It is a paradox that in a mountain state like Uttarakhand, with minimal flat areas for farming, the primary livelihood source is agriculture. Nearly 72 per cent of the rural main workers are cultivators and agricultural labourers. [(7)] But the net sown area in 1999-2000 was barely 12.25 per cent of the geographical area. It has shrunk from 13.22 per cent in 1980-81. Simultaneously, the fraction of barren and uncultivable land, culturable wastelands and fallow land has increased. In 1991-92, 71 per cent of the landholdings were less than one ha, the average size being 0.37 ha. **Despite these adverse features, according to official data, agricultural production in Uttarakhand has risen. This is primarily due to productivity gains in the plains areas of the Terai zone.**

Table 1: Percent Change in Area, Production & Productivity 1982-2000

	% Change, Mountain Districts			% Change, Plains Districts		
Food grains	**Area**	**Production**	**Productivity**	**Area**	**Production**	**Productivity**
Coarse Cereals	-9.7	30.5	44.7	-30	-25	8
Fine Cereals	0.2	17.8	17.5	3	50	46
Pulses	77	92	8	-64	-15	138
Oilseeds	207	750	176	-14	21	41
Tubers	161	244	32	43	90	33

Notes: (1) Plains include only the erstwhile Naini Tal and Dehra Doon districts. Mountains include the former Uttarkashi, Chamoli, Tehri Garhwal, Pauri Garhwal, Almora & Pithoragarh districts.
Source:(1) For 1981-82 data, A.Joshi et al (1999); (2) for 1999-2000 Directorate of Agriculture, GOU.

[7] Census of India (2001)

The cropping patterns in the mountain and plains districts are also quite different as shown in Fig 2 below. **Given the higher content of coarse grains in the mountain areas' production, it is likely that the mountain diet is more nutritious.**

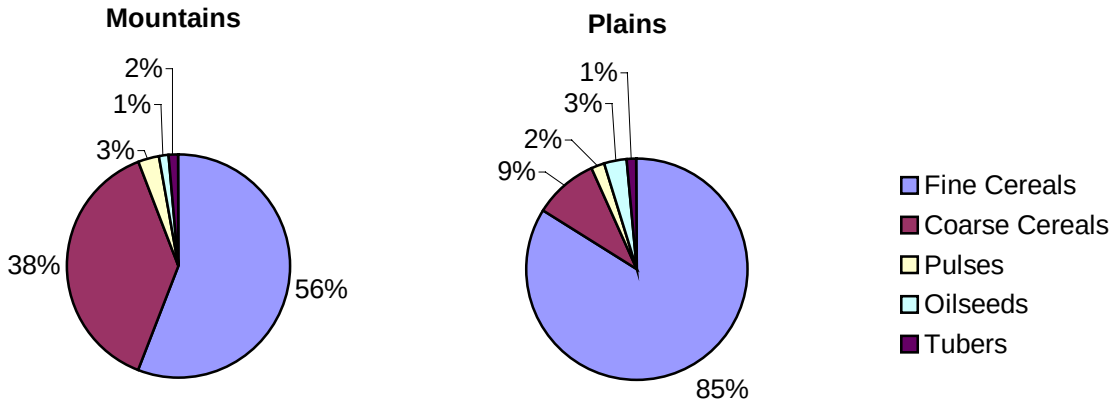


Fig 2: Area Under Different Crops, 1999-2000

Horticulture has grown significantly. The area under fruit crops increased from a mere 2500 ha in the 1950s to almost 184000 ha in 1995-96. The area under fruits and vegetable cultivation has also increased as indicated below:

	1985-86	**1995-96**
Vegetables	36443 ha	69182 ha
Fruits	147726 ha	183920 ha

The availability of food is determined by local production, commercial trade and public distribution. **Since data for private trade is not available, the net per capita production is taken as an indicator of per capita food availability.** District-wise net production per capita for vegetative food items are given in Table 2. For cereals and pulses the production figures are based on the average for the triennium ending in 2000 AD and the population for the same year. For the remaining food items, the production and population data are for 1995-96. As indicated in the notes to the table, the net

production is obtained by deducting a certain amount from the total production to account for seed, feed and wastage.

Table 2: Per capita net production of vegetative food items (gms/day)

		1	2	3	4	5	6
S.No	Districts	Cereals	Pulses	Potatoes	Edible Oil	Fruits	Vege-tables
	ICMR norms	**420**	**40**	**75**	**22**	**50**	**125**
1	Almora	515	6.5	145	1.1	82	111
2	Naini Tal	820	5.6	89	10.7	79	112
3	Pithoragarh	486	17.6	131	2.3	159	131
4	Chamoli	360	3.7	151	1.0	152	167
5	Dehra Doon	179	2.4	58	1.2	74	129
6	Pauri Garhwal	515	7.9	25	0.8	105	150
7	Tehri Garhwal	484	6.8	126	1.8	100	173
8	Uttarkashi	407	5.4	389	3.4	293	300
9	Hardwar	312	4.7	19	3.8	70	108
10	**Uttarakhand**	**482**	**6.2**	**95**	**3.9**	**102**	**134**
11	All-India	430	31.9	66	18.1	58	179

Notes: (1) Net Production = Production less seed, feed and wastage @ 13% for cereals, tubers, pulses, vegetables; @70% for edible oils; @ 50% for fruits. (2) Pop. For the relevant years has been estimated from Census of India (2001).
Source: Col.1&2 average for triennium ending 1999-2000; Directorate of Agriculture, GOU.
Col 3 & 4 data for 1995-96 from the District Statistical Handbooks (1999).
Col 5 & 6 data for 1995-96 from Joshi, A. et al (1999).

Except for cereals production in the erstwhile Naini Tal district, specifically the present Udham Singh Nagar district part, and fruits, vegetables and potatoes in Uttarkashi, the production is fairly uniform across the districts. **The production of pulses and edible oils is insignificant in all the districts.**

District-wise data for food production from animal sources – milk, eggs, meat and fish – are not available. According to one report, in 1992-93, the annual milk production in Uttarakhand's eight erstwhile districts was 571 million litres.[8] This works out to an average of about 250 ml/cap/day.

[8]Mehta, G.S. (1996)

III.2 Deficit of Cereals Production over Requirement: The Macro-Picture

Adequacy of the available foods is judged in terms of the average national consumption norms recommended by the Indian Council for Medical Research (ICMR). The latter are specified at the top of Table 2 for each food item. At the state-level, the daily net production per capita in Uttarakhand exceeds the suggested all-India norms for cereals, potatoes, fruits and vegetables. In the case of cereals, potatoes and fruits, the state averages exceed the all-India average, but not for vegetables. The production of pulses and edible oils is woefully inadequate in comparison to the national average and the ICMR norms. **It should be pointed out that agricultural production during the 1997-2000 triennium was better than normal.**

Besides the insufficiency of pulses and oil production in Uttarakhand, there are pockets of concern with respect to the other food items in Table 2. Cereals production falls short of the ICMR norm of 420 gms/capita/day in Dehra Doon (179 gms/day), Hardwar (312) Chamoli (360) and Uttarkashi (407). Inadequate production also exists if we look at the new Naini Tal and Rudraprayag districts for which the net daily production/capita works out to 417 gms and 385 gms, respectively. The new Pithoragarh district just manages with 431 gms/day. Dehra Doon has a majority urban population while Hardwar and Naini Tal have large urban populations. (Hardwar is also the most densely populated district in the state.) **The actual food availability in the rural areas of these districts is therefore likely to be substantially better, with Hardwar and Naini Tal being able to meet the normative requirements. It may also be surmised that the inadequacy in production in these districts is made up by inflows from traders and purchases from the market. Hence public action is an important need for the present districts of Chamoli, Rudraprayag, Uttarkashi and Pithoragarh, which have almost 90% or more rural populations.**

It has been reported that in India the rural poor derive about 80 per cent of their daily energy and protein requirements from cereals, the staple food in most Indian diets.(9) When the local production of cereals is inadequate, the poor become more

[9] WFP-MSSRF (2001)

vulnerable to inadequate food availability. The deficit in production over the consumption correlates significantly and positively with the percentage of population consuming less than 1890Kcal. It also correlates significantly but negatively with the calories consumed by the lowest income deciles across the various states of India.

The Food Insecurity Atlas has selected the deficit in production of cereals over consumption as an important indicator of food insecurity. Since district-level consumption data for Uttarakhand is not available, we have chosen the deficit of production over requirement – as defined by the ICMR norms – as an indicator of food availability. This is shown in Table 3. **A value less than 1 indicates a deficit situation.**

Several voluntary organizations (VOs) have gathered production and consumption data of various food items through PRA exercises while preparing micro-watershed development plans. Data from five micro-watersheds in Uttarkashi, Dehra Doon, Chamoli and Naini Tal districts have been analyzed. The data are from 1997-2000. The food consumption patterns for all the watersheds combined are shown below:

Food Item	**Av. Consumption (gms/day)**	**ICMR norms**
Cereals	456	420
Pulses	41	40
Oil	23	22
Vegetables	121	125
Milk	183	150

In Garhwal, a housewife typically measures half-a-*maani* of grain per person per day. This is equal to about 450 gms. Using the average consumption of cereals, 456 gms per day per person, as a consumption norm, a consumption deficit is also shown in Table 3 for comparison.

Table 3: Deficit of Cereal Production over Requirement

S. No	District	Per capita net Production gms/day	Consumption Deficit p/c ratio	Normative Deficit p/r ratio	Rank
1	Almora	515	1.13	1.23	7
2	Naini Tal	820	1.80	1.95	9
3	Pithoragarh	486	1.07	1.16	6
4	Chamoli	360	0.79	0.86	3
5	Dehra Doon	179	0.39	0.43	1
6	Pauri Garhwal	515	1.13	1.23	7
7	Tehri Garhwal	484	1.06	1.15	5
8	Uttarakashi	407	0.89	0.97	4
9	Hardwar	312	0.68	0.74	2
10	Uttarakhand	482	1.06	1.15	-

Note: Normative deficit is the shortage of the per capita net production compared to the ICMR norm. Consumption deficit is the shortage of the per capita net production compared to the average consumption from the various watershed studies, mentioned in the text.

III.3 Deficit in Production Over Consumption: The Micro-Picture

The official data present a somewhat reassuring production situation at the state-level for vegetative foods, except pulses and edible oils, (Table 2). To knowledgeable persons, the production would appear to be over-estimated particularly in Almora and Pauri Garhwal; the figures for Tehri Garhwal and Pithoragarh also appear to be high. Micro-level data of actual consumption levels paint a different picture.

A survey of over 4000 rural households spread over the 8 erstwhile UP hills districts was undertaken by People's Science Institute (PSI) in 1998-99. For each household, the number of resident household members was recorded. Each household was asked to estimate the amount (in '*bori*') of food grains harvested during the previous agricultural year. The results are shown in Table 4. Though there is an inherent weakness in data based on memory recall, **these data show much lower levels of food grains production as compared to the official figures. The relative production levels as indicated by the districts' ranking – except for Chamoli – correlate well with the conventional understanding in the region** (See Box : Reality Check). The correlation between PSI's data and the drought-prone areas of various districts, except Chamoli, is also very good.

Table 4: PSI's Households Survey (1998-99).

S.No	District	Per Cap. Net Daily Foodgrains Production gm/d	Normative Deficit p/r/ (ratio)	No.of Responding Households
1	Almora	241	0.57	514
2	Naini Tal	522	1.24	507
3	Pithoragarh	369	0.88	488
4	Chamoli	555	1.32	537
5	Dehra Doon	422	1.00	553
6	Pauri Garhwal	133	0.32	353
7	Tehri Garhwal	367	0.87	510
8	Uttarkashi	410	0.98	573

Note: Normative deficit is the shortage of the per capita net production compared to the ICMR norm.
Naini Tal district included only one or two villages from the present Udham Singh Nagar district.

III.4 Instability in Cereals Production

Instability is the year-to-year fluctuation in production. A fall in food grains production raises prices and hurts agricultural labourers and marginal farmers who are net food grain consumers. Instability in food production has been determined for the last decade. The standard deviation of the year-to-year growth rates has been taken as an indicator of instability. The results are shown in Table 5.

Table 5: Percent Year-to-year Variation in Cereals Production

Year	Almora	Naini Tal	Pithora-garh	Chamoli	Dehra Doon	Pauri Garhwal	Tehri Garhwal	Uttar-kashi	Hardwar
91-92	1.71	3.09	1.55	-5.11	12.35	-2.86	-1.10	7.35	
92-93	-0.42	-5.88	11.07	5.21	-7.08	-4.75	-0.81	-10.83	-7.04
93-94	1.65	11.79	-11.57	15.65	-7.38	0.32	-15.95	-1.14	-.7.25
94-95	3.46	0.21	42.82	3.35	-5.01	5.70	12.15	17.38	16.10
95-96	-4.78	-7.98	-30.67	-2.70	6.05	6.32	5.68	-0.25	-1.25
96-97	-7.40	5.83	11.65	-18.88	-1.82	-13.63	-5.80	-1.11	8.99
97-98	1.75	-6.97	11.53	9.64	3.21	4.20	-3.43	-11.62	-2.13
98-99	4.68	0.78	-34.63	8.73	-11.71	13.26	-13.01	6.53	-3.62
99-2000	25.34	13.84	41.81	15.06	16.58	-9.01	19.19	-0.81	11.07
S.D.	**9.27**	**7.88**	**27.47**	**10.97**	**9.63**	**8.39**	**11.28**	**9.02**	**8.92**
Rank	**5**	**9**	**1**	**3**	**4**	**8**	**2**	**6**	**7**

Note: Procedure used to calculate instability: (1) Variation in cereal production over the previous year is calculated for each listed year. (2) Then the standard deviation of the year-to-year variation is calculated which represents instability
Source: Uttar Pradesh Ke Krishi Ankade, 92,93,94; A.Joshi et al (1999): 91-92; District Statistical Handbooks 95,96,97. Agricultural Directorate, Uttarakhand for 97-98, 98-99, 99-2000 (provisional)

The instability in production is high for Pithoragarh (27.47). But it varies over a modest range, 7.88 for Naini Tal to 11.28 for Tehri Garhwal. The districts with high irrigation and good rainfall, Hardwar and Naini Tal record low instabilities. Dehra Doon

is surprisingly higher at 9.63. **The overall moderate level of instability reflects perhaps also the relatively high proportion of coarse cereals in the cropping pattern of most districts.**

A Reality Check
(There Is Nothing Official About It !)

Generally, poverty in rural areas is a major factor for rural to urban migration. Migration from the mountain districts of Uttarakhand is a historical phenomenon. It is reflected in the data for decadal population growth rates for the various districts, in the last century. The migration, however, is not uniform and varies significantly across the districts. It is usually the result of an interplay between a variety of push and pull factors. In the context of Uttarakhand's mountain districts, inadequate land holding – or, an inability to produce or purchase adequate food for subsistence – is an important cause for migration. Lower income groups, or populations with smaller land holdings have reported higher migration rates. (a)

It can, therefore be surmised that, lower foodgrain production should lead to higher migration rates. This is turn would lead to a higher adult sex ratio and a lower population growth rate This is reflected with respect to PSI's data on district-wise food production, but not so for the official data. PSI's data correlates well with the data of drought-proneness for most districts, except Chamoli. **The comparative data, therefore, raises some doubt about the accuracy of the official data.**

District	Juvenile Sex Ratio F/1000M (2001)	Adult Sex Ratio F/1000M (2001)	Decadal Pop. Growth Rate 1991 2001 %	Per Cap Net Daily Food Production (PSI data) gms/day	Per Cap. Net Daily Food Production (Official data) gms/day	Drought prone area as % of total area
Almora	930	1129	4.8	241	515	57.8
Naini Tal	911	904	29.7	522$^{\lambda}$	820	-
Pithoragarh	917	1028	13.0	369	486	19.3
Chamoli	930	1067	13.5	555	360	64.1
Dehra Doon	903	893	24.7	422	179	-
Pauri Garhwal	925	1104	3.9	133	515	74.8
Tehri Garhwal	931	1051	16.2	367	484	23.8
Uttarkashi	945	941	22.7	410	407	-
Hardwar	852	868	26.3	-	312	-
Uttarakhand	**919**	**986**	**17.85***	**-**	**482**	**-**

Note: *Excluding Hardwar; $^{\lambda}$Includes only one or two villages from the present U.S.Nagar district.

(a) Mehta, G.S. (1996)

III.5 Environmental Sustainability in Uttarakhand

The long-term food security of a region is influenced by current human activities and natural processes that affect the productive capacities of its ecosystems. Thus environmental sustainability influences future food security. In the all-India Atlas, four indicators have been chosen for determining environmental sustainability. Of these, we have dropped the one pertaining to groundwater exploitation, since it is not extracted for irrigation purposes – the major exploitative use – in the mountain districts. (Data for the same are also not available.) Instead, we have added another, the gross cropped area in a district as a ratio of its forest cover, since mountain farming is critically dependent on forests as a source of fodder which is converted into farmyard manure. The specific indicators for Uttarakhand are briefly discussed below. Since the overall analysis is in terms of food insecurity, the selected indicators are framed in a negative context.

Area Without Adequate Forest Cover: Forest cover, rather than forest area has been chosen as the parameter for assessment. The former refers to areas with 40 per cent or more canopy cover, whether it is statutorily designated as a forest or not. Forest area refers to the area statutorily designated as a forest whether it has trees on it or not. The erstwhile Naini Tal district has the maximum forest cover, while Hardwar with only 11.23 per cent of its land area under forest cover is last. A comparison of the forest cover with the designated forest area for each district shows that among the mountain districts Uttarkashi has lost the maximum forest cover while Naini Tal and Almora have managed to retain almost three-quarters of their forests. **These figures, however, reveal nothing about the quality of the forests. Much of Almora is covered with pine plantations which have little undergrowth.**

Ratio of Gross Cropped Area to Forest Cover: Forests perform several functions to sustain the environmental resource-base of a region in a general way. They enhance the probability of rainfall, conserve the soil, and conserve as well as help produce water. In the mountain districts of Uttarakhand, consumption of inorganic fertilizers is negligible. The main dependance is on farmyard manure. Since forests are the main source of green fodder, the ratio of gross cropped area to the forest cover has greater and more direct relevance for mountain farming than just the forest cover. The ratio is the most in

Hardwar. Uttarkashi with almost six times as much forest cover as gross cropped area, is at the other extreme.

Area Under Non-Leguminous Crops: Leguminous plants fix nitrogen in the soil and enhance the fertility of the farmland. In the case of Uttarakhand, we have considered the area under pulses and soyabean to calculate the area under leguminous crops. The area under pulses and oilseeds cultivation is uniformly small in all the districts of Uttarakhand. Dehra Doon has the least area under leguminous crops while Pithoragarh with only 6.7 per cent has the maximum area under leguminous crops.

Area under Wastelands: Degradation of the soil through erosion of top soil, salinization, water-logging, etc, reduces the natural productive capacities of the land. The Wasteland Atlas of India includes several types of problem soils under degraded lands, including areas permanently under snow and glacial cover.(10) Despite the fact that the latter regions are water producers, in the present analysis we have used these data. The three northernmost border districts of Uttarkashi, Chamoli and Pithoragarh have the maximum area under wastelands, primarily because large fractions of these districts are under permanent snow and glacial cover. **Dehra Doon district emerges as the next worst case because of a very high proportion of 'steeply sloping land'. The proportion is so high compared to other mountain districts that it is suspect.**

Environmental Unsustainability Index: The index has been computed by first calculating indices separately for each one of the parameters. Each index is a ratio:

$$\frac{\text{District Parameter Value-Minimum P.V.}}{\text{Maximum P.V.} - \text{Minimum P.V.}}$$

The average of the four indices for a district multiplied by 100 is its environmental unsustainability index. **The Unsustainability Index only indicates the extent of the present problems. It does not refer to the rate of change.**

Table 6: Unsustainability Index

District	Area without forest cover		Area under non-Leguminous crops		Area under w'lands/total area		Gross cropped area/forest area		Unsustainability Index	Rank
	%	Index S1	%	Index S2	%	Index S3	%	Index S4		
Almora	61.54	0.14	97.65	0.89	11.7	0.14	79.8	0.096	31.65	6
Naini Tal	57.03	0.00	95.82	0.51	4.4	0.00	114.1	0.149	16.48	9
Pithoragarh	75.29	0.58	93.30	0.00	48.0	0.83	62.6	0.070	37.0	4
Chamoli	72.27	0.48	94.33	0.21	49.2	0.85	27.5	0.016	38.90	3
Dehra Doon	59.88	0.09	98.21	1.00	21.4	0.32	60.9	0.068	36.95	5
Pauri Garhwal	59.60	0.08	97.63	0.88	4.6	0.00	59.8	0.066	25.65	8
Tehri Garhwal	59.13	0.07	97.03	0.76	12.7	0.16	58.6	0.064	26.35	7
Uttarkashi	67.18	0.32	95.91	0.53	56.9	1.00	16.8	0.00	46.25	2
Hardwar	88.77	1.00	95.35	0.42	15.7	0.22	669.8	1.00	66.0	1

Source: (1) S1- The State of Forest Report 2000; (2) S2-Average for 1996-97 & 1997-98; Directorate of Agriculture, GOU; (3) S3-Wasteland Atlas of India 2000; (4) S4-As in (1) & (2)

Hardwar with a minimal forest cover ranks lowest. Uttarkashi, Chamoli and Pithoragarh, in that order, with very high fractions of their land under permanent snow and glacial cover follow Hardwar.

III.6 Natural Disasters In Uttarakhand

Uttarakhand ranks among the most disaster-prone states of India. The Himalayas are a young mountain chain where land formation processes are continuing natural phenomena. In recent times, however, significant human activities have added to the hazards in the region. Earthquakes, landslides, floods, forest fires occur frequently in the region. And ironic though it may sound, for a region with an overall high annual rainfall, droughts also occur.

Natural disasters can lead to food insecurity in the short, medium or long term. Earthquakes can dislocate administrative and social coping systems. The experience of the last decade when India experienced five major earthquakes, two of which were in Uttarakhand, showed that in the first two to four weeks after each occurrence the social response – led by VOs – largely took care of the food and shelter needs of the survivors. The administrative system takes that long to organize itself for the medium and long-term

[10] GOI, Wastelands Atlas (2000)

rehabilitation response. But earthquakes rarely affect food production activities beyond one agricultural season. Arya has estimated a return period of 10 years for earthquakes of magnitude 6 or more in the western Himalayas. [11] According to one compilation, Uttarakhand experienced 17 earthquakes of magnitude 5 or more on the Richter scale, in the 20th century.[12]

Floods and landslides are often linked in Uttarakhand. Intense rainfall over short periods of a few days – often described locally as 'cloudbursts' – tends to destabilize weak or fractured slopes. Thousands of tons of debris descend into the valleys, permanently wiping out villages, hamlets, roads and damming streams or rivers. When these dams burst, devastating floods follow. Landslides alter the local landscape permanently, affecting local food security. A recent report has listed 40 major landslides and/or floods in Uttarakhand in the last century that led to loss of life and property.[13]

Forest fires have immediate and long term effects. Besides the burning down of trees and vegetation, they dessicate the top soil, leading to enhanced erosion during the subsequent rainy season. In 1995, 2115 sq km were affected by serious forest fires. The maximum damage was in Almora district, covering an area of 694 sq km, followed by Tehri Garhwal (684 sq km), Chamoli (394 sq km) and Pauri (343 sq km).[14] In 1996, forest officials recorded 1000 forest fires in the mountain districts which were quickly brought under control.

III.7 Droughts In Uttarakhand

In general, annual precipitation in Uttarakhand is high. A large fraction of the rain falls during the monsoon months and drains out immediately. This rain is unevenly distributed. The southern faces of the outer ranges and the high altitudes of the middle Himalayan belt receive heavy rainfall while many inner valleys and leeward slopes are

[11] Arya, A.S. (1994)
[12] Himantar (Fall 1999)
[13] Ibid
[14] Juyal, N. et al (1998)

drier. Thus several parts of Almora, Pithoragarh, Pauri Garhwal and Chamoli districts routinely experience periods of moisture stress every year. Official data lists the area covered under DPAP as follows:

	Area Sq. km	% of Geog. Area
Almora	3114	57.8
Pithoragarh	1709	19.3
Tehri Garhwal	1053	23.8
Chamoli	5850	64.1
Pauri Garhwal	4070	74.8

District-wise data of the impact of the various types of disasters are not available. We have decided to use the irrigated area as an indicator of the extent of protection against droughts (Table 7). Food production for 1999-2000 as a function of the ratio of net irrigated area to the net sown area shows a correlation coefficient of 0.95 for the nine selected districts. It may be a weak indicator of drought-proneness, however, since many of the irrigation systems are dysfunctional. An investigation in Chamoli district showed that out of 92 canals in the district, 49 were totally non-functional while 26 were only partially functional. [(15)] The unirrigated area also correlates only moderately with the instability in cereals production.

Table 7: Unirrigated Foodgrains Area (1997-98)

District	Irr.Area, ha (Foodgrains)	Total Foodgrain Area,ha	% Unirr.Area	Rank
Almora	21452	153216	86.0	4
Naini Tal	209725	242942	13.7	9
Pithoragarh	11487	123796	90.7	2
Chamoli	18466	97248	81.0	5
Dehra Doon	22799	55930	59.2	7
Pauri Garhwal	13677	124627	89.0	3
Tehri Garhwal	9383	33778	72.2	6
Uttarkashi	4985	61374	91.9	1
Hardwar	64019	76929	16.8	8

Source: Directorate of Agriculture (1997-98), GOU.

[15] Dharti Par Utro (1999) in Hindi.

III.8 Mapping Food Availability in Uttarakhand

In Table 8, the cumulative ranks for all the nine districts have been determined by adding the ranks for all the four indicators. Pithoragarh ranks the lowest according to this analysis, while Naini Tal scores a perfect 36 out of a maximum possible 36. The next best is Pauri Garhwal with a total of 26. Dehra Doon does poorly because its large non-farming urban population reduces the net per capita production. Also, its high proportion of steep slopes raises its environmental unsustainability, despite its good forest cover. Pithoragarh the lowest ranking district records the maximum cereals production instability, a very high environmental unsustainability index and very low irrigated area.

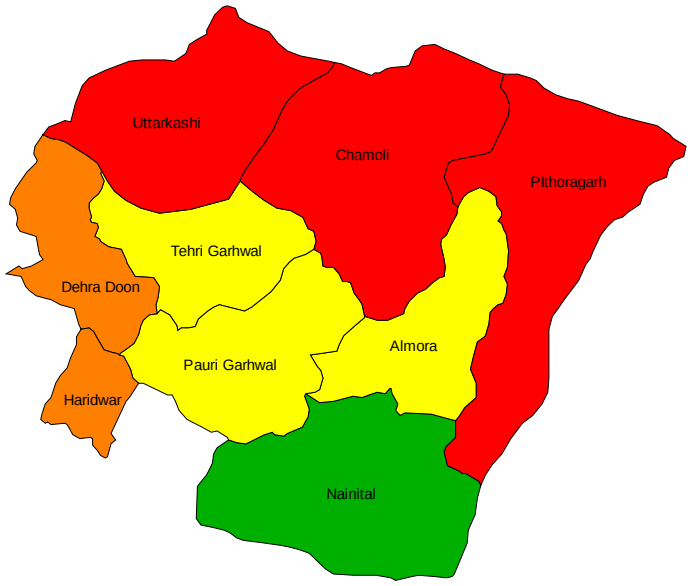
Table 8: Mapping Index of Food Availability

S. No	District	Indicators Rank				Ranks Total	Mapping Index	Mapping Rank
		1	2	3	4			
1	Almora	7	5	6	4	22	5.50	6
2	Naini Tal	9	9	9	9	36	9.00	9
3	Pithoragarh	6	1	4	2	13	3.25	1
4	Chamoli	3	3	3	5	14	3.50	4
5	Dehra Doon	1	4	5	7	17	4.25	2
6	Pauri Garhwal	7	8	8	3	26	6.50	8
7	Tehri Garhwal	5	2	7	6	20	5.00	7
8	Uttarkashi	4	6	2	1	13	3.25	3
9	Hardwar	2	7	1	8	18	4.50	5

The results of Table 8 reveal four distinct categories of districts (Fig 2)

(1) Naini Tal, including the present Udham Singh Nagar, is secure in terms of food availability.
(2) Pauri Garhwal, Almora and Tehri Garhwal are moderately secure.
(3) Hardwar and Dehra Doon are moderately insecure.
(4) Chamoli, Uttarkashi and Pithoragarh are insecure.

It must be reiterated that there is reason to believe that the official food production figures appear to be overestimated. This issue needs to be investigated.



North

Insecure
Moderately_Insecure
Moderately_Secure
Secure

Map not to scale

Fig. 2 : Food Availability Map of Uttarakhand

IV. FOOD ACCESS

Once food is available through production, people can acquire their needs depending on their ability to access it or their entitlements. Access is based on physical, economic and social factors. In India, food access and livelihood opportunities are not equally available to all. Amongst the most disadvantaged are women, the Scheduled Castes and Scheduled Tribes. The indicators chosen to determine food access, therefore, relate to food consumption, poverty, livelihoods, gender discrimination and caste discrimination. In this section, five such indicators for Uttarakhand for which district-wise data are available, have been determined.

IV.1 Access To Adequate Food

Access to adequate food is revealed through food consumption patterns and the calorie intake. Unfortunately, district-wise data on these parameters are not available. The National Sample Surveys have not uniformly covered all the districts in Uttarakhand. An idea of the consumption patterns in various parts of the state can be obtained from the data of the six micro-watersheds referred to earlier. This is given in Table 9.

Table 9: Daily Per Capita Food Consumption Levels (gms/day)

Watershed	Cereals	Pulses	Oil	Vegetables	Milk
ICMR Norm	**420**	**40**	**22**	**125**	**150**
Ghatt Gad, Ranikhet	537	58	37	183	200
Ghat Gadhera, Chamoli	542	36	26	159	145
Chiori, Naini Tal	394	34	22	112	-
Bhagirathi, Uttarkashi	442	49	23	65	216
Suharna-Nimmi, Ddn	392	28	23	109	-
Uppalgaon, Ddn	430	39	6	98	170
Watershed Average	**456**	**41**	**23**	**121**	**183**
All India Average	**430**	**32**	**18**	**179**	**184**

Source: Various watershed development plans available at PSI.

This data shows that in two of the six watersheds, the consumption of foodgrains is inadequate, in terms of the ICMR norms. There is very low consumption of oil in one watershed. Vegetables consumption is significantly low in two watersheds and moderately deficit in two others. The two watersheds in Dehra Doon – one in Chakrata Tehsil and one not far from the western end of Dehra Doon's urban agglomeration –

show either a deficit or just adequate consumption levels of the various food items. **Taken together, however, the watersheds show adequate consumption levels, despite poor production levels, implying good entitlements for their population as a whole.**

The subject of calorie intake is clearly an area that merits major studies to determine the populations with calorie inadequacies.

IV.2 Number of Rural Poor in Uttarakhand

Food access for those who do not produce enough food, to a large extent depends on their ability to purchase it. The urban and rural poverty lines determine the ability to purchase enough food to fulfill the calorie intake norms for the respective populations. Thus the number of people below the poverty line in a district is a measure of the extent of poverty in that district. These are the people who are especially vulnerable to food inadequacies. In this paper, we have reported data on rural poverty for the different districts in Uttarakahand. These figures, taken from the Department of Rural Development, are used to determine allocations of funds and foodgrains for various programmes of rural development.

Table 10: Rural Families Below The Poverty Line (BPL), 2000

District	No.of Rural Families	No.of BPL Families	% BPL Families	Rank
Almora	151551	57342	37.8	4
Nainital	172996	59402	34.3	5
Pithoragarh	110315	35889	32.5	7
Chamoli	57368	29651	51.7	3
Dehra Doon	95881	30890	34.2	6
Pauri Garhwal	120941	32342	26.7	8
Tehri Garhwal	104424	59028	56.5	2
Uttarkashi	48949	33534	68.5	1
Hardwar	128171	22528	17.6	9
Uttarakhand	**1290596**	**360606**	**27.9**	**-**

Source: Data supplied by the Ministry Of Rural Development, GOU.

The data in Table 10 shows that the percentage of rural poor is the highest in Uttarakashi and least in Haridwar. The four districts -- Uttarkashi, Tehri-Garhwal, Chamoli and Almora – with the highest number of rural BPL families are also the

districts with the minimal urban populations. **The situation in Tehri Garhwal, Chamoli and Uttarkashi appears to be extremely serious with more than half to two-thirds of the rural families listed as BPL.** It should be pointed out that the Department of Civil Supplies also prepares estimates of APL and BPL families. But their norms are different and so are the numbers.

IV.3 Gender Discrimination

Women in India are discriminated against from womb to the grave. This is revealed through data of female foeticide, infant and child mortality, juvenile and adult sex ratios, female literacy levels and life expectancy.[16] This kind of persistent discrimination throughout a woman's life translates into gender differentials, in the amount of food consumed, which are higher than the differences in the Recommended Daily Allowance (RDA). [17] In the Indian cultural context rural mothers typically tend to eat after all the other family members have been fed. The differentials in the amount of food consumed within a household become more pronounced in poor families.[18]

Women are the backbone of the mountain society. Due to the heavy out-migration of able-bodied males from Uttarakhand, women are forced to take on a greater share of agriculture-related work, in addition to all the other household tasks. In Uttarakhand, married women are typically engaged in resource-gathering, livelihood-related and other household activities (work) everyday. This work is shared between daughters, mothers and grandmothers. While seasonal and other variations have been determined, the average year-round work hours for mountain women have been estimated as: [19]

	Work hrs/day
Daughters	10 (including school work)
Mothers	11.75
Grandmothers	8.5

[16] Ghosh, D. & Chopra, R. (2000)
[17] Vepa, S.S. (2001)
[18] WFP-MSSRF (2001)
[19] Ghosh, D. & Chopra , R . (2000)

As the resource-base in the mountain areas degrades, the women's burdens increase. Thus women are especially disadvantaged in the mountain regions. Though their work participation rates are high, most of it is related to non-remunerative activities, like agricultural work on the family's farm. [20]

Following the Food Insecurity Atlas, we report on (i) Rural Juvenile Sex Ratio which suggests the present state of gender bias, and (ii) the Rural Female Literacy levels, which is more indicative of likely future trends in gender discrimination.

Rural Juvenile Sex Ratio: Discrimination against females begins at home. If a choice has to be made between a boy and a girl in a family, on who gets preferential treatment in terms of work, education, health care, food, leisure, etc, the boy is likely to be favoured. This kind of discrimination leads to higher mortality rates among female infants and children. Coming on top of practices like female foeticide and infanticide it skews the juvenile gender ratio against girls. **In 2001, the juvenile sex ratio (0-6 yrs) for Uttarakhand was the worst among all the Himalayan states of India, except for Himachal Pradesh. On the contrary. Uttarakhand's overall sex ratio is the best among all the Himalayan states, probably due to higher adult male outmigration.**

The district-wise rural juvenile sex ratio for Uttarakhand data is shown in Table 11. Hardwar (850), Dehra Doon (917) and Naini Tal (922), in that order, have the worst juvenile sex ratios. They are also the three most urbanized districts in the state. **This data suggests a strong possibility of sex selective abortions by rural families in these districts, after sex-determination tests.** In Pithoragarh, Almora, Chamoli, Tehri-Garhwal and Pauri Garhwal, the rural juvenile sex ratio varies from 931 to 936. Uttarkashi with 956 young girls for every 1000 young boys has the best juvenile sex ratio among all the districts. **This is clearly a major area of concern for the new state of Uttarakhand.**

[20] Minocha, A.A. (2001)

Table 11:Rural Juvenile (0-6 yrs) Sex Ratio, 2001

S.No	District	Population in 0-6 age group	Males in 0-6 age group	Females in 0-6 age group	F/1000M	Rank
		Rural	Rural	Rural	Rural	
1	Almora	130217	67382	62835	933	5
2	Naini Tal	223691	116405	107286	922	3
3	Pithoragarh	97819	50659	47160	931	4
4	Chamoli	84240	43543	40697	935	6
5	Dehra Doon	90097	47008	43089	917	2
6	Pauri Garhwal	88434	45690	42744	936	7
7	Tehri Garhwal	89482	46221	43261	936	7
8	Uttarkashi	45920	23478	22442	956	9
9	Hardwar	196925	106429	90496	850	1
	Uttarakhand	**1046825**	**546815**	**500010**	**914**	**-**

Source: Census of India 2001, Provisional Population Totals, Uttarakhand, Paper 1 of 2001.

Female Literacy: Education enhances human capabilities, enabling them to overcome constraints to their development. (21) Female literacy is seen as a 'first step to empowerment', with a variety of social, political and economic benefits. (22) Growth of literacy in Uttarakhand kept pace with the national rate upto the end of the seventies decade. Male and female literacy levels in Uttarakhand outstripped India's averages in the next two decades. The slower rate of decrease in the literacy gender gap in Uttarakhand, compared to the national figure, indicates an unexpected higher gender bias in the mountain state. (See Table 12)

Table 12: Literacy levels in India and Uttarakhand, 1951-2000

Year	Uttarakhand			India		
	Male	Female	Total	Male	Female	Total
1951	32.15	4.78	18.93	27.16	8.86	18.83
1961	28.17	7.33	18.05	40.40	15.34	28.31
1971	48.95	18.61	33.26	45.95	21.97	34.45
1981	62.35	25.00	46.06	56.37	29.75	43.56
1991	72.79	41.63	57.75	63.86	39.42	52.11
2001	84.01	60.26	72.28	75.96	54.28	65.38

Source: Census of India (2001) and Bose, A. (1992).

Within Uttarakhand, Hardwar district has the lowest rural female literacy rate, while Pauri Garhwal reports the highest rural female literacy (see Table 13). This is

[21] Wazir, R. (2000)
[22] WFP-MSSRF (2001)

almost in keeping with the overall literacy trends where Hardwar has the lowest total literacy level and Pauri Garhwal is a close second to Dehra Doon. In Hardwar, Uttarkashi and Tehri Garhwal, less than half the rural women are literate, whereas in Pauri Garhwal, Dehra Doon and Chamoli, at least three out of every five rural women are literate.

Table 13: Rural Female Literacy in Uttarakhand, 2001

District	Total Females (Rural)	Females (0-6 yrs) (Rural)	Females above 6 yrs. (Rural)	Literates Females (Rural)	% Female Literacy (Rural)	Rank
Almora	441,137	62,835	378,302	221,614	58.6	6
Naini Tal	633,729	107,286	526,443	298,934	56.8	4
Pithoragarh	306,997	47,160	259,837	150,033	57.7	5
Chamoli	284,353	40,697	243,656	146,787	60.2	7
Dehra Doon	287,669	43,089	244,580	150,592	61.6	8
Pauri Garhwal	325,048	42,744	282,304	180,689	64.0	9
Tehri Garhwal	287,055	43,261	243,794	115,405	47.3	3
Uttarkashi	132,927	22,442	110,485	49,829	45.1	2
Hardwar	467,022	90,496	376,526	166,245	44.2	1
Uttaranchal	**3,165,937**	**500,010**	**2,665,927**	**1,480,128**	**55.5**	**-**

Source: Census of India (2001)

IV.4 Caste Discrimination

Nationally, it is known that Scheduled Caste (SC) and Scheduled Tribe (ST) people form a relatively high fraction of the low expenditure population. In rural India, two out of every five SC and ST persons were in the lowest expenditure category of Rs 190 per capita per month in 1993-94. [23] These populations are generally the worst sufferers during disasters.

SCs (19.2%) and STs (3.7%) constitute a little less than a quarter of Uttarakhand's rural population. Both these groups are relatively more disadvantaged in terms of landownership, food production, access to clean drinking water and education – amongst other developmental criteria. Data from PSI's statewide survey of over 4000 rural households (see Table 14 below) shows the social differentials very clearly.

[23] WSP-MSSRF (2001)

The rural SC and ST populations tend to be concentrated in certain districts (see Table 15). Districts in the Kumaon division have a relatively higher proportion of SCs, compared to the Garhwal districts. Naini Tal, Almora, Pithoragarh and Hardwar account for almost two-thirds of the state's rural SC population. On the other hand, Dehra Doon alone has over 40 per cent of the state's rural ST population – largely concentrated in the western Jaunsar-Bawar region. Dehra Doon, Naini Tal and Pithoragarh together, are home to over 92 per cent of Uttarakhand's rural ST population.

Table 14: Rural Development Caste Differentials in Uttarakhand (1998)

Parameter	Unit	SC & ST	Other Castes
Sex ratio	F/1000M	936	965
Juvenile sex ratio	F/1000M	969	832
Male literacy	%	65.4	84.5
Female literacy	%	31.6	50.7
Total literacy	%	48.9	67.4
Immunization	%	77.6	79.5
Drinking water supply	% homes	10.3	13.9
Electric power supply	% homes	45.2	63.3
Av. Land holding	ha	0.31	0.51

Source: PSI's Household Survey (1998-99)

The Scheduled Tribes population of Dehra Doon is 'tribal' more as a result of an administrative misclassification rather than an accurate representation of the social situation. The Jaunsar-Bawar region of Dehra Doon was a Scheduled Area under the British rule. After Independence, all the people living in such areas were declared to be Scheduled Tribes. In reality there are a large number of Brahmins and Rajputs among them. The Harijans in Jaunsar-Bawar – Koltas, Doms and Bajgis – are amongst the poorest communities in Uttarakhand. The Tharus and Buxa tribals are concentrated in the erstwhile Naini Tal district, particularly the Khatima block of the new Udham Singh Nagar district. They are also a vulnerable lot. The Bhotias are concentrated in the northernmost districts of Uttarkashi, Chamoli and Pithoragarh.

Table 15: Per Cent SC & ST Population, 1991

District	Rural Population	SC Rural) Population	ST Rural Population	Total SC& ST(R) Pop	% SC & ST (R)	Rank
Almora	783110	175702	2044	177746	22.7	6
Naini Tal	1037210	186858	88061	274919	26.5	3
Pithoragarh	524295	109234	15140	12374	23.8	5
Chamoli	414331	72837	7939	80776	19.5	7
Dehra Doon	510199	77287	81005	158292	31.0	1
Pauri Garhwal	601353	83640	1358	84998	14.1	9
Tehri Garhwal	547258	79013	548	79561	14.5	8
Uttarkashi	222448	52355	2210	54565	24.5	4
Hardwar	776346	205386	2004	207390	26.7	2
Uttarakhand	**5416550**	**930312**	**200309**	**1130621**	**20.9**	**-**

Source: Census of India-1991.

IV.5 Uttarakhand's Rural Infrastructure

In the context of food security, rural infrastructure determines not only access to livelihoods and markets, but it also facilitates the backward and forward integration of the rural economy with the rest of the world. Here we have compared the hard infrastructure in Uttarakhand's districts by examining four parameters:

(1) Percentage of villages without electricity to the total number of villages in the district.

(2) Percentage of households without electricity to the total households in the district.

(3) Percentage of households without safe (piped) water supply to the total households.

(4) Road length per lakh persons.

The data, the Rural Infrastructure Index and the ranks are shown in Table 16. It is noteworthy that the percentage of villages without electricity is generally much lower than the percentage of rural households without electricity. This implies that even if a village has been electrified, not all the families in it have a legal connection. It should also be noted that there is very little correlation between the percentage of villages and the percentage of rural households that have electricity.

Table 16: Uttarakhand's Rural Infrastructure

S. No	District	Villages without electricity 1991-92		Rural Hholds without electricity 1991		Rural Hholds without safe water 1991		Road length per lakh persons 1993-94		Compo-site Index	Rank
		%	RI 1	%	RI 2	%	RI 3	km	RI 4		
1	2	3		4		5		6		7	8
1	Almora	18.3	0.52	74.7	0.83	37.5	0.81	229	0.36	63.03	3
2	Naini Tal	0.0	0.00	63.6	0.52	22.3	0.33	151	0.65	37.32	8
3	Pithoragarh	32.5	0.92	80.6	1.00	43.5	1.00	201	0.46	84.46	1
4	Chamoli	25.8	0.73	73.1	0.79	25.7	0.44	251	0.28	55.67	5
5	Dehra Doon	2.95	0.08	45.4	0.00	18.0	0.19	129	0.73	25.00	9
6	Pauri Garhwal	35.5	1.00	71.5	0.74	28.1	0.51	326	0.00	56.30	4
7	Tehri Garhwal	28.9	0.81	73.7	0.80	32.2	0.64	213	0.42	66.98	2
8	Uttarkashi	10.0	0.28	65.8	0.58	33.7	0.69	301	0.09	41.11	7
9	Hardwar	8.03	0.23	73.2	0.79	12.0	0.00	55	1.00	50.44	6

Note: All the basic data have been rounded off to the first decimal place while the indices have been calculated to the second decimal place

Source: Cols 4 & 5 : Population Foundation of India (2001); Cols 3 & 6: Singh, A.K (2001)

The quantitative data reported here only gives an idea about the extent of the rural infrastructure, but not its quality. For example, the percentage of households with access to safe drinking water supply, only indicates that the infrastructure for the supply exists. It is not a guarantee of either year-round supply on the actual quality of the water.

Dehra Doon and Naini Tal, the two districts with the most urban population, also top the ranks for rural infrastructure. Hardwar, the next most urbanized district, however, falls one rank behind Uttarkashi, to fourth place. With regard to electric and water supply, Hardwar, Naini Tal and Dehra Doon generally outperform the other districts. In the case of road length, the districts closer to the national borders – Uttarkashi, Tehri Garhwal, Chamoli, Pauri Garhwal, Almora and Pithoragarh – perform much better. This is perhaps a reflection of the needs of national security.

IV.6 Mapping Food Access In Uttarakhand

The cumulative ranks for all the districts are presented in Table 17. Hardwar, which scores poorly for the gender and caste discrimination indicators, ranks the lowest. Pithoragarh, which ranked the lowest for food availability stands second lowest for food access, along with Tehri Garhwal. According to the data presented here, Pauri Garhwal

with a scores cumulative rank of 37 out of a possible 45 has the best food access situation. It does very well on all the indicators except the rural infrastructure index, where it stands roughly in the middle of the rankings. Chamoli with a more modest total of 28 is second to Pauri, followed closely by Dehra Doon at 26.

Table 17: Mapping Index of Food Access In Uttarakhand

S. No	District	Indicators Rank					Cumulative Rank	Mapping Index	Rank
		1	2	3	4	5			
1	Almora	4	5	6	6	3	24	4.8	6
2	Naini Tal	5	3	4	3	8	23	4.6	4
3	Pithoragarh	7	4	5	5	1	22	4.4	2
4	Chamoli	3	6	7	7	5	28	5.6	8
5	Dehra Doon	6	2	8	1	9	26	5.2	7
6	Pauri Garhwal	8	7	9	9	4	37	7.4	9
7	Tehri Garhwal	2	7	3	8	2	22	4.4	2
8	Uttarkashi	1	9	2	4	7	23	4.6	4
9	Hardwar	9	1	1	2	6	19	3.8	1

The results of Table 17 can be divided into four categories.

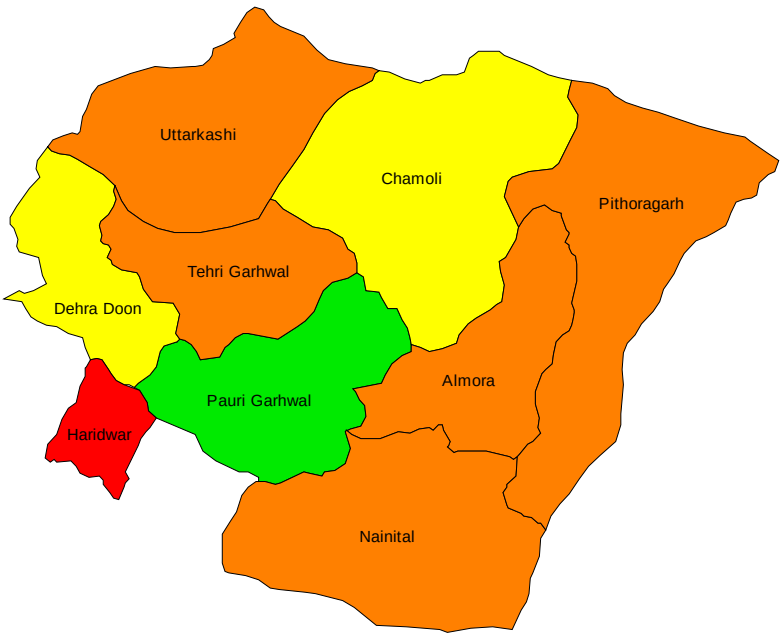
(1) Pauri Garhwal is the most secure district in terms of food accessibility.

(2) Chamoli and Dehra Doon are moderately secure.

(3) Almora, Naini Tal, Uttarkashi, Pithoragarh and Tehri Garhwal in decreasing order can be classified as moderately insecure.

(4) Hardwar is insecure with reference to food access.

The two indicators of gender discrimination match reasonably well for six out of the nine districts. But the indicators for percentage of the rural BPL population and the rural SC & ST population do not correlate well at all. This is probably due to the inaccurate data of rural BPL families that has been highlighted earlier.



North

Insecure
Moderately_Insecure
Moderately_Secure
Secure

Map not to scale

Fig. 3 : Food Access Map of Uttarakhand

V. FOOD ABSORPTION IN UTTARAKHAND

Food absorption refers to a person's ability to assimilate the food consumed. It depends on the individual's dietary practices and his/her state of health. The important issues to be considered in terms of food insecurity are the nutritional status of the population, health services and infrastructure and hygiene, including the supply of safe drinking water. [24]

In the Food Insecurity Atlas, six indicators have been selected to determine the food absorption capacities of the various states' populations. Data for most of these indicators are unavailable on a district-wise basis for Uttarakhand. In the present analysis, we are therefore constrained to report only on the following parameters.

(1) Total IMR (rural & urban areas).
(2) A Health Infrastructure Index.

V.I Infant Mortality Rates In Uttarakahand

IMR is the number of infant deaths before age one year, per 1000 live births. The data reported in Table 18 are for the entire district's population rather than just the rural population. These data are somewhat surprising. Almora reports very low IMR and CMR. Its IMR was the lowest in 1991, whereas neighbouring Naini Tal, with a higher degree of urbanization has an IMR twice that of Almora

Table 18: District-wise IMR, 1991.

District	CMR*	IMR	IMR Rank
Almora	84	40	9
Naini Tal	111	80	2
Pithoragarh	99	76	3
Chamoli	82	65	7
Dehra Doon	76	53	8
Pauri Garhwal	90	69	5
Tehri Garhwal	93	69	5
Uttarkashi	142	96	1
Hardwar	98	76	3

*Mortality below five years
Source: Office of the Commissioner of Census of India, New Delhi.

[24] WFP-MSSRF (2001).

The Food Insecurity Atlas states that IMR is related to malnutrition among pregnant women, maternal mortality and female literacy; it is higher among SC & ST communities. High IMRs also result from inadequate immunization, access to safe drinking water and medical services. [25] The data for Uttarakhand's districts, however, do not bear this out very well, as shown below.

Table 19: District-wise IMR and related factors

S. No	District	IMR per 1000 births 1991	% Hholds* without safe drinking water	Female* literacy % 1991	SC & ST* Population % 1991
Cols	**1**	**2**	**3**	**4**	**5**
1	Almora	40	36.0	39.6	22.7
2	Naini Tal	80	16.8	43.2	26.5
3	Pithoragarh	76	41.1	38.4	23.8
4	Chamoli	65	24.7	40.4	19.5
5	Dehra Doon	53	11.6	59.3	31.0
6	Pauri Garhwal	69	25.9	49.4	14.1
7	Tehri Garhwal	69	30.4	26.4	14.5
8	Uttarkashi	96	31.2	23.6	24.5
9	Hardwar	76	10.3	-	26.7

Note: *Rural & urban;
Source: Col 2: Office of the Commissioner of Census of India, New Delhi; Col 3: PFI (2001); Col 5: Census of India-1991.

V.2 Health Infrastructure in Uttarakhand

A Health Infrastructure Index has been compiled, based on the following factors:

- Total number of children not completely immunized.
- Number of persons per PHC in the entire district.
- Number of persons per doctor in the entire district.

Data for safe drinking water has not been included here since the percentage of population with access to safe water is not available. Data for per cent households with safe drinking water have already been reported in the Rural Infrastructure Index. The data reported in Table 20 are for the district as a whole, rather than just the rural areas.

[25] WFP-MSSRF (2001)

Table 20: Health Infrastructure Index

S. No	District	Children without complete immunization		No.of Persons per PHC		No. of Persons per doctor		Composite Index	Rank
		%	HI 1	No.	HI 2	No.	HI 3		
Col	1	2	3	4	5	6	7	8	9
1	Almora	20.6	0.00	17798	0.05	6374	1.00	49.77	2
2	Naini Tal	27.9	0.23	19570	0.18	3193	0.35	25.40	6
3	Pithoragarh	20.8	0.01	17477	0.03	2809	0.27	10.23	9
4	Chamoli	22.0	0.05	18833	0.124	3941	0.51	22.47	7
5	Dehra Doon	35.1	0.47	22183	0.36	1462	0.00	27.63	5
6	Pauri Garhwal	21.5	0.03	18792	0.121	4024	0.52	22.40	8
7	Tehri Garhwal	33.5	0.41	18242	0.08	3894	0.50	32.97	4
8	Uttarkashi	49.8	0.94	17111	0.00	3297	0.37	43.67	3
9	Hardwar	51.8	1.00	31054	1.00	5319*	0.79	92.83	1

* Estimate based on number of doctors/lakh persons, District Statistical Handbook, Hardwar, 1997-98.
Source: (1) Data for columns 4 and 6 are taken from the Directorates of Health Services & Family Welfare, Lucknow, 1993 as reported in Narayana, G. et al (1994). (2) Population figures for 1993 have been estimated from Provisional Population Totals, Uttarakhand , Paper-1 of 2001. (3) Column 2, PFI (2001)

V.3 Mapping Food Absorption In Uttarkhand

There is a paucity of indicators and data for this aspect of food security. The following table should therefore be seen only as a very tentative typology. A four-fold categorization can be done. Chamoli, Dehra Doon and Pauri Garhwal are secure in terms of food absorption. Almora and Pithoragarh are moderately secure, whereas Naini Tal and Tehri Garhwal are moderately insecure. Uttarkashi and Hardwar are insecure.

Table 21: Mapping Index of Food Absorption in Uttarakhand.

S.No	District	Indicators		Cumulative Rank	Mapping Index	Rank
		1	2			
1	Almora	9	2	11	5.5	5
2	Naini Tal	2	6	8	4.0	3
3	Pithoragarh	3	9	12	6.0	6
4	Chamoli	7	7	14	7.0	9
5	Dehra Doon	8	5	13	6.5	7
6	Pauri Garhwal	5	8	13	6.5	7
7	Tehri Garhwal	5	4	9	4.5	4
8	Uttarkashi	1	3	4	2.0	1
9	Hardwar	3	1	4	2.0	1

VI. FOOD INSECURITY IN UTTARAKHAND

VI.1 Food Insecurity Typology

The food insecurity status of the various districts in Uttarakhand has been determined by combining the relative ranks for all the 11 indicators (Tables 21 & 22). A Food Insecurity Index (FII) has been calculated by normalizing the rank totals for each district. The FII ranges between a minimum of 3.64 (Uttarkashi) and a maximum of 6.91 (Pauri Garhwal). Based on natural breaks in the FII, the different districts can be classified into four categories of food insecurity. These are:

6.00< Food Secure (FS) < 7.00	**: Pauri Garhwal, Naini Tal**
5.00 < Moderately Food Secure < 6.00	**: Almora, Chamoli, Dehra Doon**
4.00 < Moderately Food Insecure < 5.00	**: Tehri Garhwal, Pithoragarh**
3.00 < Food Insecure < 4.00	**: Uttarkashi, Hardwar**

This typology has been used to prepare the overall Food Insecurity Map of Uttarakhand (Fig 4). There is a common tendency to link food security with food availability (read production). But Fig 4 is the result of the combined effect of 11 indicators, representing food availability, access and absorption aspects of food security. Some of the indicators are themselves multi-faceted; since they are based on more than one parameter. **Therefore, as mentioned earlier, the absolute numbers are not as important as the relative ranks of the different districts.**

Table 21: Food Insecurity Situation in Uttarakhand

	1		2		3		4		5		6	
District	**Net/Capita deficit cereals Production 2000**		**Instability in Cereal Production 1990-91 to 99-2000**		**Sustainability Index**		**Unirrigated foodgrains area**		**Rural BPLFamilies**		**Rural Infrastructure Index**	
	gms/day	**Rank**		**Rank**		**Rank**	**%**	**Rank**	**%**	**Rank**		**Rank**
Almora	521.5	7	9.27	5	31.65	6	86.0	4	37.80	4	63.03	3
Naini Tal	825.6	9	7.88	9	16.48	9	13.7	9	34.30	5	37.32	8
Pithoragarh	503.6	6	27.47	1	37.00	4	90.7	2	32.50	7	84.46	1
Chamoli	363.7	3	10.97	3	38.90	3	81.0	5	51.70	3	55.67	5
Dehra Doon	181.4	1	9.63	4	36.95	5	59.2	7	34.20	6	25.00	9
Pauri Garhwal	522.9	8	8.39	8	25.65	8	89.0	3	26.70	8	56.30	4
Tehri Garhwal	490.8	5	11.28	2	26.35	7	72.2	6	56.50	2	66.98	2
Uttarkashi	412.4	4	9.02	6	46.25	2	91.9	1	68.50	1	41.11	7
Hardwar	316.7	2	8.92	7	66.00	1	16.8	8	17.60	9	50.44	6

Continued

	7		8		9		10		11	
District	**Rural Juvenile Sex Ratio (0-6 yrs) 2001**		**Rural Female Literacy 2001**		**% SC & ST Rural Pop 1991**		**Infant Mortality Rate 1991**		**Health Infrastructure Index**	
		Rank	**%**	**Rank**	**%**	**Rank**	**Per1000**	**Rank**		**Rank**
Almora	933	5	58.6	6	22.70	6	40	9	49.77	2
Naini Tal	922	3	56.8	4	26.50	3	80	2	25.40	6
Pithoragarh	931	4	57.7	5	23.80	5	76	3	10.23	9
Chamoli	935	6	60.2	7	19.50	7	65	7	22.47	7
Dehra Doon	917	2	61.6	8	31.00	1	53	8	27.63	5
Pauri Garhwal	936	7	64	9	14.10	9	69	5	22.40	8
Tehri Garhwal	936	7	47.3	3	14.50	8	69	5	32.97	4
Uttarkashi	956	9	45.1	2	24.50	4	96	1	43.67	3
Hardwar	850	1	44.2	1	26.70	2	76	3	92.83	1

Table No. 22:Mapping Index of Food Insecurity

	INDICATORS														
	1	2	3	4	5	6	7	8	9	10	11	Cumulative Rank	Mapping Index	Mapping Rank	Mapping Typology
Almora	7	5	6	4	4	3	5	6	6	9	2	57	5.18	7	MFS
Naini Tal	9	9	9	9	5	8	3	4	3	2	6	67	6.09	8	FS
Pithoragarh	6	1	4	2	7	1	4	5	5	3	9	47	4.27	4	MFIS
Chamoli	3	3	3	5	3	5	6	7	7	7	7	56	5.09	5	MFS
Dehradun	1	4	5	7	6	9	2	8	1	8	5	56	5.09	5	MFS
Pauri Garhwal	7	8	8	3	8	4	7	9	9	5	8	76	6.91	9	FS
Tehri Garhwal	5	2	7	6	2	2	7	3	8	5	4	51	4.64	3	MFIS
Uttar Kashi	4	6	2	1	1	7	9	2	4	1	3	40	3.64	1	FI
Hardwar	2	7	1	8	9	6	1	1	2	3	1	41	3.73	2	FI

Note: FS=Food Security, MFS=Moderately Food Secure, MFIS=Moderately Food Insecure, FI=Food Insecure.

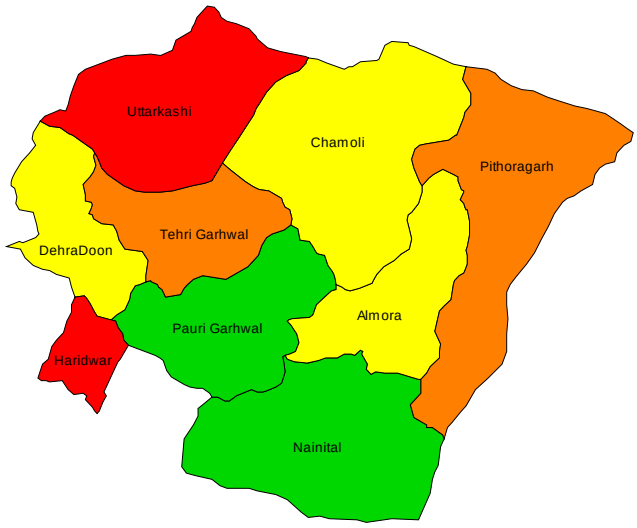


Fig. 4 : Overall Food Security Map of Uttarakhand

Thus no district is entirely food secure or insecure. There are areas of strengths and weaknesses within each of them. This can be understood by listing the qualitative indices for availability, access and absorption as shown in Table 23.

Table 23: District-wise Qualitative Categorization of Food Security Aspects

District	Availability	Access	Absorption	Total
Almora	MFS	MFIS	MFS	MFS
Naini Tal	FS	MFIS	MFIS	FS
Pithoragarh	FI	MFIS	MFS	MFIS
Chamoli	FI	MFS	FS	MFS
Dehra Doon	MFIS	MFS	FS	MFS
Pauri Garhwal	MFS	FS	FS	FS
Tehri Garhwal	MFS	MFIS	MFIS	MFIS
Uttarkashi	FI	MFIS	FI	FI
Hardwar	MFIS	FI	FI	FI

Note: FS = Food Secure: MFS=Moderately Food Secure; MFIS= Moderately Food Insecure; FI=Food Insecure.

The strengths and weaknesses of the districts are summarized below.

Food Secure Districts

1. **Pauri Garhwal** ranks the highest with a cumulative score of 76 out of a possible 99. It scores well across most indicators, except for unirrigated area and Rural Infrastructure Index. It also has a relatively larger area under non-leguminous crops as compared to the other districts.

2. The erstwhile **Naini Tal** district has a perfect score of 36 for the food availability indicators. But it scores only 23 out of a maximum 45 for the food access indicators and 8 out of 18 for the food absorption indicators. It stands second lowest in the IMR rankings. It also has a relatively high percentage of SC & ST populations. Its juvenile sex ratio is low. It is the second most urbanized district in the state and therefore may have greater access to sex selective abortion services. The natural resource base of the new district, **Udham Singh Nagar** has been weakened due to a loss of good forest cover. The latter

district has also fallen to the bottom third in terms of several indicators of food access, including SC & ST population, rural female literacy and the juvenile sex ratio.

Moderately Food Secure

The Food Insecurity Index values for the three districts in this category range from 5.09 to 5.18, very close to 5.00, the lower end of the category.

3. **Almora** does moderately well in terms of food availability and absorption, but fares poorly with regard to food access indicators. It has a relatively high percentage of rural households without electricity and safe water supply, leading to a poor Rural Infrastructure Index. Its health infrastructure rank (2) is also very low. The number of doctors in the district appears to be low in comparison to its population. The new **Bageshwar** district faces a greater pressure than the remaining Almora district in terms of the indicators of food access. It also has a relatively lower per cent of net irrigated area. It has a greater proportion of wasteland area.

4. **Dehra Doon** is the most urbanized district in Uttarakhand. More than half its population lives in urban areas. Not surprisingly, it fares very poorly in terms of food availability, particularly cereals production. But, as mentioned earlier, this is most likely partly offset by the fact that most of its urban population is able to purchase its requirements. Its wasteland area is surprisingly high, though, as mentioned before, the data appears to be suspect. (Dehra Doon has been shown to have by far the highest area under steep slopes.) It does moderately well for the food access indicators. Like the other urbanized districts of Naini Tal and Hardwar, it has a low juvenile sex ratio. Dehra Doon also recorded the highest concentration of SC & ST populations. It has the highest rank for rural infrastructure and the second highest ranks for rural female literacy and infant mortality rates.

A Second Reality Check

The Food Insecurity Index derived in the main text (section VI.1) is a composite index based on the three aspects of food security, i.e., availability, access and absorption. While Pauri Garhwal does well on these three aspects, and Uttarkashi and Hardwar perform uniformly poorly, the other districts display some strengths and weaknesses on the three counts (see Table 23). The Food Insecurity Index should reflect the overall well-being and health of the districts' populations. We have tried to cross check this by comparing the final Food Insecurity Index with the limited life expectancy data available with us. The match turns out to be surprisingly good.

District	**Food Insecurity Index**	**Life Expectancy, years**
Pauri Garhwal	FS (6.91)	65
Naini Tal	FS (6.09)	65
Almora	MFS (5.18)	57
Chamoli	MFS (5.09)	56
Dehra Doon	MFS (5.09)	-
Tehri Garhwal	MFIS (4.64)	51
Pithoragarh	MFIS (4.27)	47
Hardwar	FI (3.73)	-
Uttarkashi	FI (3.64)	64

5. **Chamoli** is insecure in terms of food availability. It has a low per capita net cereal production, its cereals production is unstable and with almost half its geographical area under snow and glacial cover, it has a relatively high wasteland area. The erstwhile Chamoli district also listed half its rural families as BPL families. Hence public action may be a prime need here. Its relative strengths are in female literacy, low infant mortality rates and its health infrastructure. The new **Rudraprayag** district has a lower juvenile sex ratio and rural female literacy. Its irrigation resources are almost negligible.

Moderately Food Insecure Districts

6. **Tehri Garhwal** has a high instability of food production, a poor rural infrastructure and relatively high proportion of rural BPL families. It has a relatively low SC & ST

population. It is moderately insecure in terms of the food access and absorption indicators.

7. **Pithoragarh** is insecure in terms of food availability. Its cereal production is unstable and its net irrigated area is low. It reports a high infant mortality rate and has a poor rural infrastructure index. Consequently, it is moderately insecure with respect to food access indicators. After its breakup, the new Pithoragarh district has retained most of the wasteland area in the form of snow and glacial cover. Its irrigated area and juvenile sex ratio are much lower compared to the Champawat district that has been carved out of the old Pithoragarh district. Champawat district also has higher food production and forest area.

Food Insecure Districts

8. **Hardwar** is insecure in terms of the food access and absorption indicators. It is also moderately insecure with respect to food availability. Despite good irrigation facilities, its per capita net cereals production is low. This is due to the fact that it is relatively more urbanized than the mountain districts and it also has the highest population density, about 612 persons per sq km against a state average of 159 persons per sq km. Fortunately, Hardwar's food production is relatively stable. It has the lowest percentage of rural BPL families, but the second highest percentage of SC & ST population. It has the worst rank for the juvenile sex ratio, rural female literacy and health infrastructure.

9. **Uttarkashi** has the lowest cumulative rank. It is insecure with regard to food availability and absorption indicators. It has the lowest net irrigated area. It has a high unsustainability index. Two-thirds of Uttarkashi's rural families are reported to be BPL families. The district also has the highest infant mortality rate. It has a poor rural female literacy level. Though it does well in terms of the rural infrastructure parameters, it has a low health infrastructure index. Yet, Uttarkashi's population has the second highest life expectancy in the state. It appears that there are some district-specific features that the present analysis has not been able to capture, e.g., low population density.

VI.2 Uttarakhand In The National Context

Uttarakhand fares reasonably well on most indicators when compared to the rest of the country (Table 24).

Table 24: Uttarakhand in the National Context

S.No	Parameter	Unit	U'Khand	India	U'Khand's Rank[2]
1	Per cap net cereal production	gms/day	482	430[1]	5
2	% Wasteland area	%	30.4	20.2 [3]	15
3	% Forest cover	%			
4	Rural BPL families	%	27.9	33.60[1]	6
5	Total JSR (2001) [4]	F/1000M	906[5]	927 [5]	-
6	Total Female literacy (2001)[4]	%	60.3[5]	54.2[5]	6
7	SC & ST Population (1991)	%	20.9	-	-
8	IMR (1999)	/1000 live births	52[6]	70[6]	-
9					

Notes: [1]16 major states of India represented in WFP-MSSRF (2001); [2]Out of 17 states; Source: [3]Wasteland Atlas of India (2000); [4]Rural + Urban; [5]Census of India (2001); [6]Population Foundation of India (2001).

VII. CONCLUSIONS AND RECOMMENDATIONS

Overall, on the basis of official data, Uttarakhand can be classified as a moderately food secure state, though there are pockets of concern. In the Food Insecurity Atlas, there is some confusion in a similar ranking exercise. While the text refers to Uttarakhand as being moderately secure, the map depicts it as moderately insecure. (26)

Secondary data of agricultural production indicate that **the new districts of Chamoli, Rudraprayag, Uttarkashi and Pithoragarh face problems of adequate food production and availability. These districts require public action more than the other districts. The data also show that the production of pulses in the state is woefully inadequate. Pulses are an important source of protein in a vegetarian diet**

[26] WFP-MSSRF (2001)

and hence their production needs to be enhanced. Fortunately, the mountain diet has a higher component of coarse grains which are more nutritious than fine grains. **(27)**

In the present exercise, we have not been able to obtain adequate nutritional data. Hence the exercise remains incomplete. Only when such data, disaggregated for different social groups, are available can we answer the question: Whose thali is empty in Uttarakhand ? Such an answer can lead to improved targetting of the beneficiaries. In the absence of nutrition and consumption data, the most serious cause for concern regarding food access is **the low Juvenile Sex Ratio in Uttarakhand.** This **demands immediate action from government and voluntary agencies. Female literacy also requires a big push in Hardwar, Uttarkashi and Tehri Garhwal districts.**

It is important to recognize that **Uttarakhand is one of India's mountain states in the Himalayan region.** Its newly acquired statehood status can help it overcome its basic natural constraints of low agricultural area and high disaster proneness. **For ensuring food security in such conditions, Uttarakhand's forest cover must not only be extended, but the diversity and productivity of the forests must be increased.** Agricultural output is critically dependent on the state of the forests in Uttarakhand. They are essential for the supply of green fodder and for maintaining the perennial nature of the mountain streams. Therefore, comprehensive programmes of rural development, like watershed management, which focus on increasing the productivity of the natural resource base to meet the felt needs of the people, are critical. But such programmes yield meaningful results only when there is genuine participation of the local people. Very often such programmes are conceptually well-framed, their implementation pays only lip service to the basic principles.

Until recently, local communities in Uttarakhand managed their own natural resource base. The institution of *Van Panchyats* survives even today in many villages. More recently, the *Chipko Andolan* has shown the abilities of *Mahila Mangal Dals* to

[27] Gopalan, C. (1987)

plant and raise mixed dense forests.[28] Water bodies and structures constructed centuries ago are still functional. On the other hand, water supply pipelines laid just a few years ago are dysfunctional. The farmers of Uttarakhand have shown the ability to produce high yields despite severe constraints. **Since forests and water provide resources that are critical for raising the productivity of mountain farms, a strong case can be made for restoring community control over local natural resources.** This is in keeping with the spirit of *Panchayati Raj*. Community representatives have reiterated the willingness of rural communities to manage their natural resources at a number of workshops held recently in Uttarakhand.[29]

Due to male out-migration, Uttarakhand has a relatively higher proportion of women to men as compared to many other parts of the country. Once again, **natural resource management programmes that can reduce the drudgery of their daily lives become critical.** Fortunately there are outstanding examples of such programmes which are relevant for the different regions of Uttarakhand. These include the work of Dasholi Gram Swarajya Mandal [30], Dudhatoli Lok Vikas Sansthan[31] and the Central Soil and Water Conservation Research and Training Institute[32].

The issue of the mountainous character of Uttarakhand also has implications for the analytical framework chosen for this work. For example, Uttarakhand appears to have a relatively vast wasteland area. Most of it is due to a large part of the state being under snow and glacier cover. Only Himachal Pradesh and Rajasthan among the major states of India have a greater fraction under wastelands, and Rajasthan only marginally so. But given the very low population density of the snow bound districts, it is unlikely to pose any major constraints. On the contrary, the glaciers supply over half the water in the major river systems. Their loss would pose a real threat to Uttarakhand's and the nation's food security. **Therefore, it is important to create an analytical framework that is specific to Uttarakhand's mountainous character.**

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[28] Kimothi, M.M. & Juyal, N (1996)
[29] Jal Sanskriti, No.3, forthcoming.
[30] Pahari, R. (1997)
[31] Sheena and Sharma, P. (1998)

Finally, a word about data. Good data are essential for good decision-making. But important data on nutrition and consumption are unavailable. Even when they are available, their veracity is questionable. The District Statistical Handbooks preparation is laggard and careless mistakes abound. As mentioned earlier, primary data on agricultural production suggests that the official figures may be over-estimates. There is also a vast difference in the figures on BPL families between different departments. It is hoped that with the formation of the new state, this issue will be addressed seriously and soon. The value of this entire exercise can be enormously enhanced if it can be done at the block-level.

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[32] Dhyani, B.L. et al (1997)

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