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on Himalayan Ecology

Volume 2, 2005

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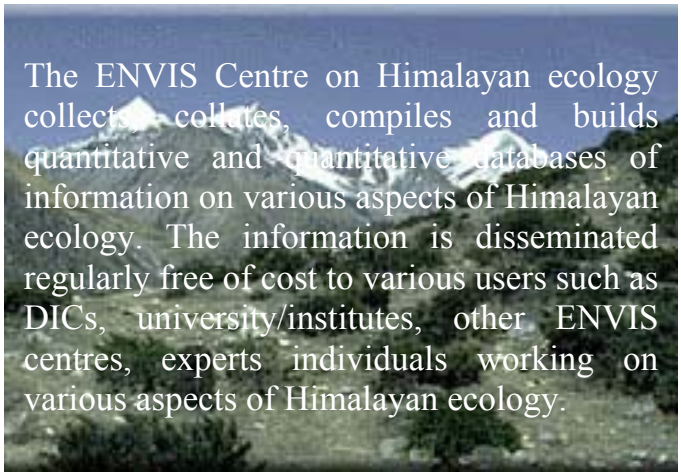

Editorial

ENVIS Newsletter on Himalayan ecology is an annual non-priced publication of the ENVIS Centre, which was established at the headquarters of the G.B. Pant Institute of Himalayan Environment and Development (GBPIHED) in the financial year 1992-93 with the fiscal support of the Ministry of Environment and Forests, Government of India, New Delhi.

The second volume of this Newsletter contains three articles received from the researchers of this Institute. The opinions expressed in these articles of the Newsletter do not necessarily reflect the official views of the GBPIHED. The content of the Newsletter may be quoted or reproduced for non-commercial use provided the source is duly acknowledged. The contributions to the next volume of the Newsletter in the form of research/popular article(s) and news item(s), etc., related to various aspects of Himalayan ecology, are welcome. The matter supplied by the individual/organization may be edited for length and clarity. Request for subscription of the Newsletter may be sent to the Executive Editor of the Newsletter. The comments/suggestions for the improvement of the Newsletter are also welcome.

P.P. Dhyani
Executive Editor

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Institute URL: **http://gbpihed.nic.in**
ENVIS URL: **http://gbpihed.nic.in/envis/envis**
E-mail: **himenvis@gbpihed.nic.in**, **gbpihed@envis.nic.in**

G.B. Pant Institute of Himalayan Environment and Development
(An Autonomous Institute of the Ministry of Environment and Forests, Government of India)
Kosi-Katarmal, Almora - 263 643, Uttaranchal

Valley of Flowers designated a World Heritage site

The World Heritage Committee of UNESCO has declared the picturesque Valley of Flowers as a World Heritage site on 14th July this year during a meeting held in Durban, South Africa. Earlier in 1982, the Valley of Flowers was notified as a National Park in order to conserve a representative area of alpine meadows in the high altitudes of the Himalaya. The Valley of Flowers is located in the Chamoli district of Uttaranchal state, about 500 km northeast of Delhi. The Valley of Flowers is one of the two hanging valleys lying at the head of the Bhyundar valley and surrounded by various snowy mountain peaks, the other featuring Hemkund, a sacred lake to the east of the Valley of Flowers. The area is drained by the Pushpawati, which originates from the left of the Tipra glacier near Bhyundar Khal. The most picturesque and species-rich meadows are located on its south-facing slopes and the entire area harbours 498 species of flowering plants.

The Valley of Flowers has acquired the World Heritage status on the basis of two major criteria: 1) superlative natural phenomena or beauty and aesthetic importance, and 2) biodiversity and threatened species. The Valley of Flowers is an outstanding beautiful high altitude Himalayan valley that is encircled by attractive snowy mountain peaks. The kaleidoscopic mountain landscape and lush green breath-taking beautiful meadows with varieties of spectacular alpine flowers and ease of access complement the rugged mountain wilderness. From the context of the second criteria, i.e., biodiversity and threatened species, the Valley of Flowers is internationally important as a representative of the west Himalayan alpine biodiversity. It is also the first World Heritage Site that has been protected by the Government of India especially for its flora. The rich diversity of species reflects the valley's location within a transition zone between the Zanskar and Great Himalaya and the eastern and western Himalayan flora. The Valley of Flowers possesses a number of threatened plant species and the diversity of threatened medicinal plant species is higher here than that has been recorded in other Indian Himalayan protected areas.

Primula macrophylla in the Valley of Flowers

The author was one of the independent external reviewers as nominated by the IUCN to judge the Valley of Flowers nomination. Enormous data collected by the Institute and the author, in particular, on all the major aspects of the Valley of Flowers and subsequent publication of the data in from of two books and a number of articles in various national and international journals and magazines helped in strengthening the valley's nomination. The Institute played a significant role in IUCN's nomination of the Valley of Flowers as world heritage site.

Chandra Prakash Kala

Glacial lake outburst flood - a glacial hazard in the higher Himalaya

The Himalaya is the highest and the youngest fragile mountain system on the earth, extending over 2500 km. Natural hazards of Himalayan region are associated with its inherent fragility due to immature geology and climatic extremes. This area is considered geo-dynamically active and it is prone to violent crystal movement causing seismicity. The common natural hazards in the region are earthquake, landslide (due to seismicity), landslide induced flood, cloudburst, ice/snow avalanches and glacial lake outburst flood (GLOF).

Presently the earth is passing through a transition phase in terms of climatic change (the global mean surface temperature has increased by 0.5-1.0^{o}C) since the late 19th century and rapid receding of glaciers to a major extent is the consequence of global warming (WMO/UNEP, 1990). Warming trend caused by climate change could have a dramatic effect on glaciated area. In snow-covered mountainous regions, warmer temperature may melt snow, reduce the reflective snow cover and allow more solar energy to be absorbed by the earth's surface.

GLOF Mechanism

Glacial lakes are common in the high elevation of glacierised basin. They are formed when glacial ice or moraines impound water. There are varieties of such lakes, ranging from melt water ponds on the surface of glacier to large lakes in side valleys dammed by a glacier in the main valley. These lakes normally drain their water through seepage in front of the retreating glacier. The moraine creates topographic depression in which the melt water is generally accumulated leading to formation of glacial lake. When this lake is watertight, melt waters will accumulate in the basin until seepage or overflow limits the lake level. Such moraine-dammed lakes appear to be the most common type of glacial lakes. The impoundment of the lake may be unstable, leading to sudden release of large quantities of stored water. Failure of these ice or moraine dams as very destructive events has been documented throughout the world. Flash floods caused by the outburst of glacial lakes are well known in Himalaya where such lakes had been formed by landslides. The unabated shrinkage of Himalayan glaciers has resulted in the formation of more moraine-dammed lakes. Bursting of such lakes leads to flash floods and these floods redistribute sediments and modify the landscape.

A glacial lake in Meru glacier – a tributary of Gangotri

Impact of GLOF

GLOF causes massive devastation in downstream area in terms of agriculture land, loss of human lives, damage of roads, bridge, villages and infrastructures. Studies have found at least 44 glacial lakes in Nepal and Bhutan that are filling so rapidly that they may burst their banks in as little as five years' time. This research, which began in 1999, is based on topographic maps, aerial photographs and satellite images from Landsat, Spot and IRS craft. The survey has identified 3,252 glaciers and 2,323 glacial lakes in Nepal and 677 glaciers and 2,674 glacial lakes in Bhutan. Data from 49 monitoring stations reveal increase in temperature since the mid-1970s with highest increase in temperature found at higher altitudes in Nepal. Findings indicate that 20 glacial lakes in Nepal and 24 in Bhutan have become potentially dangerous as a result of climate change. In August 1985, a sudden out burst flood from the Dig Tsho glacial lake in Nepal destroyed 14 bridges and $1.5 million worth of damage was caused to the nearly completed Namche Small Hydropower Plant. In Nepal, the engineering works are underway to lower the water levels by 30 m on one of such critical glacial lakes (Tsho Rolpa Lake that feeds the Rolwaling and Tama Koshi valleys in the Dolakha District of Nepal). It was reported that as a result of the melting of a nearby glacier, the lake has grown six-fold, from an area of 0.23 km^2 in the late 1950s to one of 1.4 km^2 now. In Indian Himalaya Region (IHR), Gangotri glacier the largest ice mass in the Ganga basin, is receding and shrinking at an unsustainable rate. The Gangotri glacier system has a number of glacial lakes. These lakes are formed by displacement of transverse and longitudinal crevasses, rapid melting of glacial ice and high precipitation and seismicity. G.B. Pant Institute of Himalayan Environment and Development (GBPIHED) has been carrying out research on glacial hydrology and glacio-fluvial aspect of the glacier since 1999. The study found in the ablation period, the rising limb of hydrographs exhibited abrupt increase to peak flow attesting the GLOF dealings in the glacier. On 6th June 2000, large amount of sediments was transported from the glacier due to heavy rains and deposited as a huge bulk of debris into the valley near Bhujbas (4 Km downstream of glacier snout). This debris deposit blocked the Bhagirathi river to form a short-lived extensive lake. Bursting of this lake caused flash floods in the entire area sweeping a temple located on the riverbank and damaging the buildings at Bhujbas including a pre-fabricated hut and base camp located there. The water level of the river was elevated by about 3m. Similar devastating events were observed at Gangotri town (located 18 km downstream of the snout of Gangotri glacier) where minor damages occurred to the Gangotri temple and three lodges. The bursting of such lakes can also spell disaster for people living downstream.

Disaster Mitigation

GLOFs are not a new phenomenon, but there is evidence that the frequency of such events has increased over the past three decades. This needs urgent attention of the world community. The reports on GLOF are released in the International Year of the Mountain (2002). According to UNEP, "Mountains were once considered indomitable, unchanging and impregnable. But, we are learning that they are as vulnerable as the world's oceans, grasslands and forests to environmental threats and insensitive, unfettered, development". It is also reported that the International Centre for Integrated Mountain Development (ICIMOD) is working to help the governments of Nepal and Bhutan to find out and focus on potentially dangerous lakes and to develop early warning systems for communities of an impending GLOF and to carry out engineering works to reduce the threats. The incisive measuring systems and information technology to monitor GLOF hazard and of advanced computational techniques to stimulate its spatio-temporal evolution bring effective mitigation measures. Disaster management and mitigation action plan formulated for the preparedness of GLOF hazards, include:

- Reducing or eliminating GLOF hazard through technological interaction and avoiding habitation in hazardous area
- Preparedness for the mass to recover quickly from disasters
- Developing the ability to rapidly evacuate hazardous area
- Alternate arrangement of food and water supply, para-medical team, temporary shelter, etc.

- M.S. Miral and Kireet Kumar

An outlook of agricultural dependency in the IHR

The total land is one of the vital and constant resources of a nation. The availability of this finite resource is inversely proportional to the increase in population. According to the Agricultural statistics, per capita availability of land in India has declined from 0.89 ha in 1951 to 0.3 ha in 2001 and per capita availability of agriculture land has declined from 0.48 ha in 1951 to 0.14 ha in 2001. The declining availability of per capita land resources is further exacerbated by degradation and desertification of land. The decline in land resources affects the livelihood system of marginal farmers and livestock dependent people of whom women constitute a substantial portion.

Agriculture is the major livelihood option in India as only cultivators and agricultural labourers comprise more than 58.4% of total workforce in the country. Also in terms of country's landuse pattern the agricultural land constitutes the major share occupying about 55.8% of total geographical area followed by forest cover (20.6%) and wastelands (20.2%). But the Indian Himalayan Region (IHR) displays a different picture in landuse pattern and its dependency on agricultural land. Here forest is the major landuse pattern, which covers over 52% of total reporting area followed by wastelands and agricultural land. However, the dependency on its limited arable land is marginally higher in the IHR as cultivators and agricultural labourers together comprise about 59% of total workforce in the region.

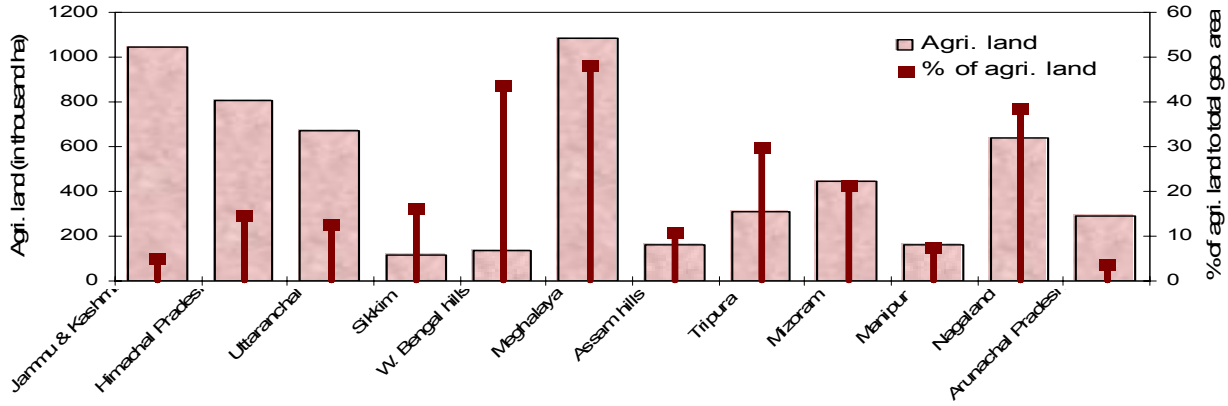


Figure 1. Distribution of agricultural land across the IHR.

The IHR comprises of 10 states and hill regions of 2 states of India covering an area about 5 lakh km^2, which is about 16.2% of the countries total geographical area. The share of area, population and ratio of non-working and working population in different states/regions of the IHR is as follows:

Mizoram is having the highest percentage of working population among all other IHR states resulting a lowest dependency ratio in the region. In contrast to the highest dependency ratio of West Bengal hills (1.83) signifies a large non-working population being dependent on a smaller workforce. However, this ratio signifies the proportion of non-working population but does not suggest the agricultural dependency of the region.

Himalayan state/region	Geographical area (in thousand km^2)		Population (in lakh)		Dependency ratio
Jammu & Kashmir*	222.24	(41.65)	100.70	(25.41)	1.73
Himachal Pradesh	55.67	(10.43)	60.77	(15.34)	1.03
Uttaranchal	53.48	(10.02)	84.80	(21.40)	1.71
Sikkim	7.10	(1.33)	5.40	(1.36)	1.05
West Bengal hills	3.15	(0.59)	16.06	(4.05)	1.83
Meghalaya	22.43	(4.20)	23.06	(5.82)	1.41
Assam hills	15.32	(2.87)	9.99	(2.52)	1.5
Tripura	10.49	(1.97)	31.91	(8.05)	1.76
Mizoram	21.08	(3.95)	8.91	(2.25)	0.9
Manipur	22.33	(4.18)	23.89	(6.03)	1.23
Nagaland	16.58	(3.11)	19.89	(5.02)	1.34
Arunachal Pradesh	83.74	(15.69)	10.91	(2.75)	1.27

Figures in parenthesis indicate the % share of the state/region to the IHR
*Area of Jammu & Kashmir includes 78.11 thousand km^2 and 37.55 thousand km^2 occupied by Pakistan and China, respectively, and 5.18 thousand km^2 handed over by Pakistan to China.

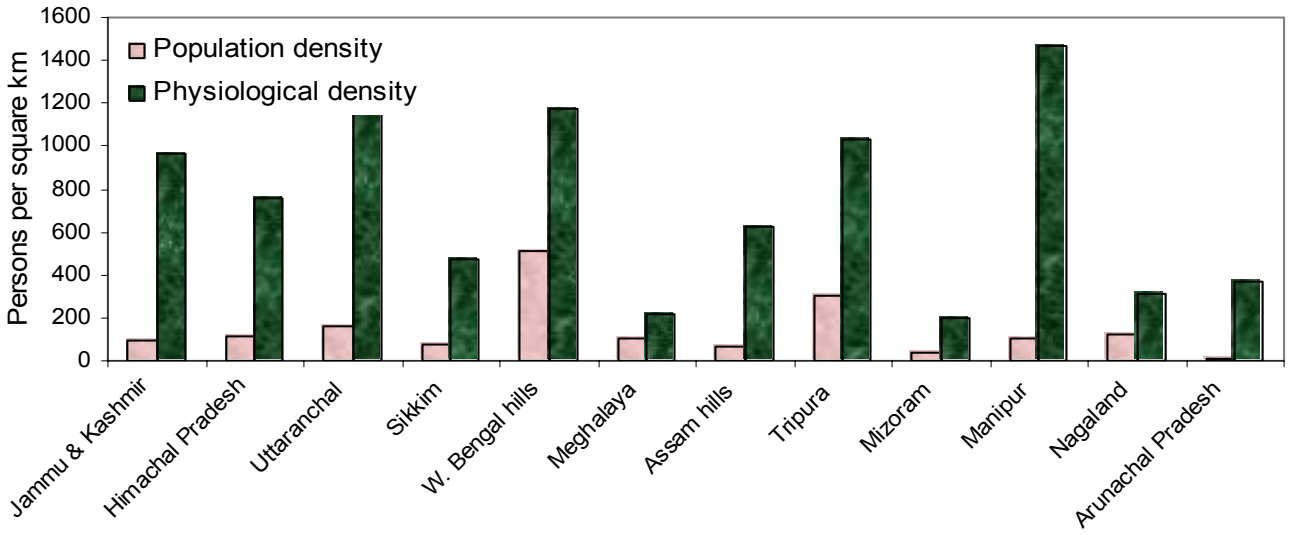


Figure 2. Population and physiological density of the Indian Himalayan states/regions.

The growth of human population is a natural phenomenon, which causes the increase in population density resulting decrease in share of natural resources for its inhabitants. The increase in population density has aggravated the physiological density, which is the more meaningful population measure where the inhabitants are dependent mainly on agricultural sector. As physiological density measures the people supported by unit area of agricultural land; difference in this density represents the differences of population pressure on crops production in unit area. The higher physiological density of a region indicates higher pressure on cultivated area to feed more people (Figure 2). However, with an insignificant cultivated land it is very natural that a state/region to have a very high physiological density and in that case it is not an important measure to depict population pressure on the small arable land and here the agricultural density could assess the number of farmers' dependence on per unit area of farmland, which accounts for economic differences.

- S.N. Nandy and P.K. Samal

IERP research projects in the Indian Himalayan region

G.B. Pant Institute of Himalayan Environment and Development, under its Integrated Ecodevelopment Research Programme (IERP), has been supporting about 115 ongoing research projects in the Indian Himalayan Region (IHR). During the year 2004-2005, following 34 new projects were sanctioned and funded.

Technology Development & Research (TDR)

- Anthelmintic activity of some traditional medicinal plants in Mizoram by **Dr. Bishnupada Roy,** Department of Zoology, Pachhunga University College, Aizawl, Mizoram.
- *Prodhyogiki pradarshan evam prasar yojana* by **Mr. Gaur Singh Kunwar,** Himalayan Paryavaran, Krishi evam Gramodyog, Shiksha Nagrik "HAVEN" Samiti, Premnagar (Parsari), Joshimath, Uttaranchal.
- Use of natural carotenoids as food colorant by **Dr. Bhabesh C. Goswami,** Department of Chemistry, Gauhati University, Guwahati, Assam.
- Biodiversity of Spider fauna in rice agro-ecosystems of Assam by **Dr. Prabal Saikia,** Regional Agricultural Research Station, Assam Agricultural University, North Lakhimpur, Assam.
- Documentation of ethnic invertebrate food resources and evaluation of nutritional content and their role in primary health care of selected tribes of Arunachal Pradesh, India by **Dr. Jharna Chakravorty,** Department of Zoology, Arunachal University, Rono Hills, Itanagar, Arunachal Pradesh.
- Changing landuse/landcover and soil loss in the Indian eastern Himalaya, a drainage basin input-output analysis, Arunachal Pradesh by **Dr. R.C. Joshi,** Department of Geography, Arunachal University, Doimukh, Arunachal Pradesh.
- Attitudinal parameters of human resource and development : A study of indigenous people of Arunachal by **Dr. S.K. Sharma,** Department of Commerce, Dera Natung Govt. College, Itanagar, Arunachal Pradesh.
- Survey and studies on wild mushrooms of Arunachal Pradesh by **Dr. Rishikesh Mishra,** Department of Botany, Dera Natung Govt. College, Itanagar, Arunachal Pradesh.
- Qualitative analysis of the faunal biodiversity of the Kane Wildlife Sanctuary, West Siang, Arunachal Pradesh by **Mr. B.B. Bhatt,** North East India Biodiversity Research Foundation, State Forest Research Institute, Van Vihar, Itanagar, Arunachal Pradesh.
- Studies on wild and semi-wild plants of Tripura with special reference to their diversity and socio-economic values by **Dr. R.K. Sinha,** Department of Life Science, Tripura University, Suryamaninagar, Tripura (West), Tripura.
- Documentation and evaluation on rice bean (*Vegna umbellate* (Thumb) Ohwi and Ohashi] diversity of Nagaland by **Dr. Sapu Changkija,** Department of Genetics and Plant Breeding (SASRD), Nagaland University, Medziphema, Nagaland.
- Ecology and management of bamboos in home gardens of Barak valley, North-East India by **Dr. Ashesh Kumar Das,** Department of Ecology and Environmental Science, Assam University, Silchar, Assam.
- Evaluation of different variant of Muskbala (*Valeriana jatamansi)* for enhanced productivity and quality under mid hill conditions of Himachal Pradesh by **Dr. Virendra Singh,** Natural Plant Product Division, Institute of Himalayan Bioresource Technology (IHBT), Palampur, H.P.
- Evaluation of indigenous wild types of Himalayan roses for rose rootstocks by **Mr. D. Dhyani,** Institute of Himalayan Bioresource Technology (IHBT), Palampur, H.P.
- Farm women training in value addition of indigenous products with emphasis on post harvest management by **Dr. Sangita Sood,** Department of Food Science and Nutrition, Himachal Pradesh Agricultural Universoty, Palampur, Kangra, H.P.
- Survey, collection and maintenance of promising large Cardamom germplasm in Himachal Pradesh by **Dr. R.K. Sud,** Institute of Himalayan Bioresource Technology (IHBT), Palampur, H.P.
- Inventory of hiomass resources and livelihood strategies by the rural populace of Mizoram by **Dr. H. lalramnghinglova,** Department of Forest Ecology, Mizoram University, Aizawl, Mizoram.
- Documentation of indigenous knowledge on traditional resources in Chakrata region, Dehradun, Uttaranchal by **Dr. V.P. Sharma,** Himalayan Environment and Agriculture Development Society, Maikoti, Rudraprayag, Uttaranchal.
- Unveiling the sacred: Documenting the conservational practices of the Dev Vans of Kumaun by **Dr. Girija Pande,** Himalaya Sansakriti Evam Vikas Sansthan (HSVS), Nainital, Uttaranchal.

- *Dhara vikas pariyojana* by **Mrs. Pushpa Sharma,** Nera, Pithoragarh, Uttaranchal.
- Studies on plant diversity in Rakchham-Chitkul Wildlife Sanctuary of district Kinnaur, Himachal Pradesh by **Dr. R.K. Verma,** Department of Ecology and Biodiversity Conservation, Himalaya Forest Research Institute, Shimla, Himachal Pradesh.
- Inventorization, documentation of plant diversity and to evolve site-specific management strategies for conservation of various sacred groves in Kullu Valley of Himachal Pradesh by **Dr. A. Rajasekaran,** Department of Non Wood Forest Products, Himalaya forest Research Institute, Shimla, Himachal Pradesh.
- Environment, tribal culture and resource management in the Kulki watershed of Zunheboto hills, Nagaland by **Dr. M.S. Rawat,** Department of Geography and Resource Management, Nagaland University (Kynanu), Mokokchung, Nagaland.
- Efficient use of mid-hill grasslands of Himachal Pradesh through participatory silage making by **Dr. Sudesh Radotra,** Regional Research Centre, Indian Grassland Fodder Research Institute, CSKHPKV Campus, Palampur, Himachal Pradesh.
- Mass multiplication and short to medium-term conservation of two rare and threatened orchids of Nagaland: An in-vitro approach by **Dr. C.R. Deb,** Department of Botany, Nagaland University, Lumami, Mokokchung, Nagaland.
- Arbuscular mycorrhizal diversity in disturb, conserved and cultivated system in Kumaun region in Uttaranchal by **Dr. A.K. Sharma,** Department of Biological Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttaranchal.
- Development, demonstration and dissemination of agro-technology for Rosemary (*Rosemarinus offcinalis*) in Uttaranchal by **Dr. Laiq Ur Rahman,** CIMAP Resource Centre, Purara, Bageshwar, Uttaranchal.
- Development of ecologically viable and socio-economically acceptable integrated models of arresting willow (Salix Spp.) mortality in Lahaul valley of Himachal Pradesh by **Dr. K.S. Kapoor,** Himalayan Forest Research Institute, Shimla, Himachal Pradesh.

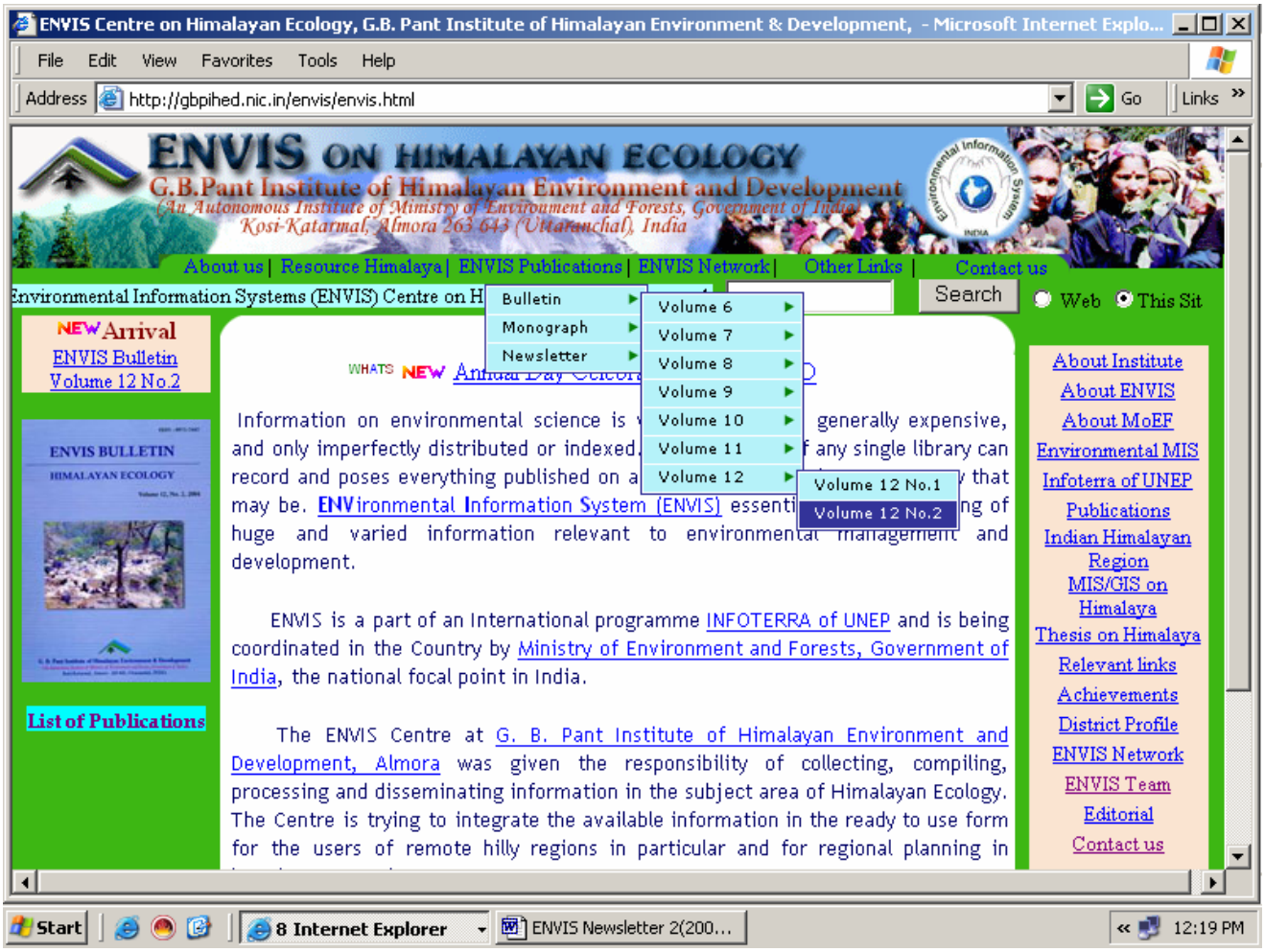
Technology Demonstration & Extension (TDE)

- *Geranium* farming: A new perspective in boosting economy of Uttaranchal by **Ms. Ritu Nautiyal,** Himalayan Institute for Environment Ecology and Development (HIFEED), Ranichauri, Tehri Garhwal, Uttaranchal.
- Strengthening occupations in vermicomposting for enhancing agriculture production and generating rural employment in block – Narendra Nagar, district – Tehri Garhwal (Uttaranchal) by **Mr. Narendra Singh Chauhan,** Society for Entirety, Efficacious Development and Awareness, Rishikesh, Dehradun, Uttaranchal.
- Cultivation and propagation of high value medicinal and aromatic plant species for sustainable development and germplasm conservation in subtropical and temperate agro-climatic zones in Apatani valley by **Mr. Rubu Buker,** Nature Care and Disaster management Society, Ziro, Village Lempia, Lower Subansiri, Arunachal Pradesh.
- Action and extension of appropriate technology for Jhum lands in the Papum Pare district of Arunachal Pradesh by **Mr. Vishal Nath Rai,** Arunachal Pradesh Sewa Sangh (APSS), Doimukh, Papum Pare, Arunachal Pradesh.
- Eco-restoration through involvement of religious institutions in Himachal Pradesh by **Dr. R.D. Singh,** Institute of Himalayan Bioresource Technology (IHBT), Palampur, H.P.
- Forest based community livelihood through sustainable protection and exploitation in Shiwalik and Shiwalik foothills of Himachal Pradesh by **Mr. Pushpendra Rana,** *IFS,* DFO-Paonta, Paonta, District – Sirmaur, H.P.

Recent events

G.B. Pant Institute of Himalayan Environment and Development celebrated its Annual Day on September 10, 2005 commemorating the 118th Birth anniversary of *Bharat Ratna* Pandit Govind Ballabh Pant Ji. On this event XI th Pt. Govind Ballabh Pant Memorial Lecture was delivered on **Of bamboos, basked-weavers and paper mills** by ***Padmashri Professor Madhav Gadgil***, Centre for Ecological Sciences, Indian Institute of Science, Bangalore, Karnataka.

A two-Day Workshop on **'Facilitating formation of State Biodiversity Management Committees in Indian Himalayan Region'** was organized by G.B. Pant Institute of Himalayan Environment & Development on 11-12 September 2005 at Almora, Uttaranchal, in collaboration with National Biodiversity Authority, Chennai.



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