

*Full Length Research Paper*

# Indigenous knowledge and sustainable development in the Tones Valley of Garhwal Himalaya

Vardan Singh Rawat<sup>1\*</sup>, Y. S. Rawat<sup>1</sup> and Shruti Shah<sup>2</sup>

<sup>1</sup>Department of Botany, D. S. B. Campus Kumaun University, Nainital Uttarakhand (India), 263002.

<sup>2</sup>Department of Forestry, D. S. B. Campus Kumaun University, Nainital Uttarakhand (India), 263002.

Accepted 14 July, 2010

**The inhabitants of the Tones Valley have survived on their traditional management practices for their needs. The paper has looked at traditional systems of forestry and agricultural system management in the west-central Himalayan region. Based on a detailed analysis of traditional knowledge that is linked with biodiversity, natural and human-managed, various possibilities for sustainable management of natural resources, with concerns for sustainable livelihood of local communities have been explored for the tribal region in Tons Valley. It is concluded that, if the development interests of local people are marginalized for a long period of time, they might adopt actions detrimental to the goal of conservation. Capitalization of the positive dimensions of traditional knowledge and overcoming its negative dimensions through conventional science-based inputs could ease the difficult process of securing people's participation in environmental conservation and management together with the socio-economic development of local communities.**

**Key words:** Indigenous knowledge, Tones valley, transhumant.

## INTRODUCTION

Himalaya, one of the richest hot spots of biodiversity in the world, offers immense opportunities in various fields of biological domains and associated patterns of sustainable life support systems (Gaur, 2004). Rich diversity occurs in Himalaya growing naturally under diverse environmental conditions that is, from dry deciduous forest of north west to rain forest of north east and extending up to the alpine meadows, though the region occupied only 15% of geographical area of the country, but about 30% of the endemic species of Indian subcontinent are found in this region. According to survey report of World Health Organization about 25% of prescribed human medicine derived from plants and cover 80% of the population in developing countries still depends on the traditional and folk system of medicine (Rawat and Chandhok, 2009).

Steps have been taken to preserve the biodiversity for future generations while trying to understand and document the indigenous knowledge of resource management

practices. The preservation of biodiversity is according to World Commission on Environmental Development (1987) through sustainable development. As a result the model of development which was foisted upon the developing and undeveloped countries for the last fifty years, a strong argument have been made that development dictated from outside rather anchored in the knowledge base on the target population is in principle modernization disguised and not fully concerned with local need (Nyere, 1990; Gegeo, 1998). This is evident by Marginalization of the tribals, pastoralist and marginal farmers in India at national level (Agarwal and Narain, 1985; Shiva, 1991).

Presently, it has been realized by the researchers that the indigenous knowledge system should constitute the core of development models in developing and undeveloped nations (Brush and Stabinsky, 1996). The indigenous knowledge system has permitted its holders to exist in harmony with nature allowing them to use its sustainability (Dhar and Samant, 1991). Indigenous Knowledge is a local knowledge unique to a given culture or society, it is regarded as a basis for local level decision making in agriculture, horticulture, pastoralism, food

---

\*Corresponding author. E-mail: [singhvardan@rediffmail.com](mailto:singhvardan@rediffmail.com).  
Tel: 05942235596.

preservation, health care and natural resource management. The indigenous knowledge highlights the knowledge possessed by poor and marginalized population and emphasis on empowering farmers to have greater control over their destinies; it is of crucial significance if one wishes to introduce a cost-effective, participatory and sustainable development process (Warren, 1991).

This paper tries to establish the significance of indigenous knowledge from conservation and sustainable development perspective and tries to examine how the subsistence economy of transhumant people of west central Himalaya have utilize and conserved their natural resources, how they have created management system by utilizing the available natural resources of the region and have conserved them from their eradication by domestication of many of them.

## MATERIALS AND METHODS

The present study was conducted in the tribal localities of Tones Valley (legally not notified as tribe) residing in around Govind Pashu Vihar National Park of Uttarkashi district of Uttarakhand located at 30° 35' and 30° 18' north latitude and 77° 49' and 78° 37' east longitude in the temperate part of the west central Himalaya at an altitudinal range of 1000 - 3200 m, characterized by its diverse climatic conditions. The valley is bounded in the north and north-east by Shimla district of Himachal Pradesh and in south-west by Dehradun district of Uttarakhand. The total area of the valley is 4500 sq.km. The Tones River forms the main drainage system of the Valley, Rupin, Supin and Power are the main tributaries. Geologically, the area forms the krol belt with metamorphic and sedimentary rock type. The soil is differentiated into red loam, brown forest podosol and meadow type (Rana et al., 2003).

The valley is a homeland of the several tribes dominated by Pravatis and Banganis (Similar to Jaunsari tribe of Dehradun). However in January, 2004 they are included in Other Backward Class (O.B.C.) under Raunwalta community. Pahari and Gujjar are nomad they perform transhumant and move from near villages to Bugyals (Fields for rearing of livestock) in June-September. The forest division allows permit for rearing the livestock in Mussorie, Raipur and Kalsi forest division of Uttarakhand in winter (November-April). The extreme ecological conditions of high altitude have shaped life styles which characterize the traditional system. Production system in the society has been agricultural and livestock based. Livestock and animal husbandry have made these people more dependent on their immediate environment, and accordingly they have diversified their resource use practices. Due to their seasonal movements between their summer settlements in higher altitude (3000 - 4000 m) and winter settlement (up to 1500 m) they are well informed and in touch with different floristic composition and a wide range of natural resources. The fragility of high altitude is best exemplified by the availability of few rare endemic aromatic medicinal herbs. As a result these people are compelled to utilize every available resource for their diversified needs, conserve them from their depletion for future. In the present investigation the following steps were undertaken:

- (1) Numbers of field trips were made in different seasons,
- (2) Commonly useful traditional plants were collected,
- (3) The plants used by traditional healers and tribal communities were identified with the help of taxonomist and later verified with the help of officials of forest department in the region of the study area,
- (4) Local Vaid, Gujjars, Sheperds and elder peoples were

interviewed to document their knowledge of occurrence and use of various plants, and

(5) The plant materials identified having potential medicinal importance were classified according to their local name, habit, binomial name and family to which it belongs, the different vegetative and reproductive plant parts used medicinally and the disease treated.

## RESULTS AND DISCUSSION

The vegetation is predominantly of forest communities with frequent interruption of scrub jungles, savanna, grassy localities and crop fields. Several environmental factors control the distribution of vegetation. However, usually in the hilly tracts vegetation is demarcated on the basis of altitudinal gradients because edaphic, topographic, climatic and associated factors tend to be altered with altitude. The second important factor in consideration is the aerial distance of the localities from the Greater Himalaya (Gaur, 1999). Livestock, which is the chief occupation of the mountain communities, is directly dependent on the forest. The local communities, therefore, attempt to manage the vegetation which has direct bearing on livestock and other livelihood activities. Woody perennials as well as herbaceous plants contribute to the livestock fodder supplies. Singh et al. (1995); Singh and Bohra (2005) have given a list of 50 fodder trees, shrubs and non-graminaceous herbaceous plants occurring in mountain habitats. These fodder species occur in the agro-forestry systems or in the tree-dominated rangelands.

The people of the valley evolved the mechanism of utility of various resources based on its availability. Some of the major species of plants used by these communities for their varied requirements have been classified under different categories. The variability in term of utilization of fuel wood and fodder based on their availability and altitudinal distribution is given in Table 1. Beside the plants are also used for other purposes like agricultural implements, wood carving and colouring agents (Table 2). The people of the valley have good knowledge about the properties of various plants spread over 1000 - 4500 m and are known to derive their food requirements from a numbers of wild plants. *Paeonia emodi*, *Asparagus adscendens*, *Amaranthus viridis*, *Commelina maculate*, *Diplazium esculentum* are the major wild vegetable while *Hippophae rhamnoides*, *Fragaria nubicola* species of *Rubus* and *Duchesnea indica* are the common wild fruits to their diet. The people have identified a number of wild plants grown in high altitude for their other needs (Table 3). Crops like *Fagopyrum tataricum*, *Amaranthus paniculatus*, *Triticum aestivum*, *Oryza sativa*, *Phaseolus vulgaris*, *Glycine max*, *Macrotyloma uniflorum*, *Phaseolus mungo*, *Pisum sativum* and vegetables like *Brassica oleracea*, *Lycopersicon esculentum*, *Solanum tuberosum* are common to diet of these people (Table 4). The availability of medicinal plants as a part of the surrounding natural vegetation and the knowledge of

**Table 1.** Plants used for fodder and fuel wood.

Botanical name	Altitudinal range(m)	Botanical name	Altitudinal range(m)
<b>Fodder</b>			
<i>Albizzia odoratissima</i>	Up to 1200	<i>Millettia extensa</i>	Up to 1500
<i>Apluda mutica</i>	2000	<i>Morus serrata</i>	1600
<i>Arundinella falcata</i>	1800 - 2500	<i>Pennisetum orientale</i>	1500
<i>Arundo donex</i>	1500	<i>Parthenocissus semicordata</i>	1400
<i>Cornus macrophylla</i>	140 - 2500	<i>Populus ciliata</i>	1550
<i>Dioscorea deltoidea</i>	2130	<i>Quercus leucotrichophora</i>	1700 - 2000
<i>Ehertia acuminata</i>	Up to 1500	<i>Quercus floribunda</i>	200 - 2700
<i>Euonymus tingens</i>	1500 - 2800	<i>Quercus semecarpifolia</i>	2500-3500
<i>Ficus fruticosa</i>	1800	<i>Saurauia nepaulensis</i>	Up to 1800
<i>Ficus hispida</i>	1600	<i>Spiraea canescens</i>	1500 - 2800
<i>Indigofera heterantha</i>	Up to 2000	<i>Smilax glaucophylla</i>	2000
<i>Melia azedarach</i>	Up to 1400	<i>Toona serrata</i>	1200-2000
<b>Fuel wood</b>			
<i>Alnus nepalensis</i>	Up to 1500	<i>Picea smithiana</i>	Above 2100
<i>Cedrus deodara</i>	200 - 3000	<i>Pinus roxburghii</i>	900 - 2000
<i>Cotonaester obtusus</i>	2200 - 300	<i>Pinus wallichiana</i>	200-3200
<i>Engelhardtia spicata</i>	Up to 1600	<i>Rhododendron arboreum</i>	1600 - 3200
<i>Euonymus hamiltonianus</i>	1000 - 2800	<i>Rosa macrophylla</i>	3000 - 4500
<i>Ilex dipyrena</i>	1000 - 2500	<i>Quercus leucotrichophora</i>	1700 - 2000
<i>Juniperus communis</i>	3500 - 4500	<i>Quercus floribunda</i>	2000 - 2700

**Table 2.** Major uses of important plants other than food, fuel and fodder.

Uses	Plants
Agricultural implements	<i>Juglans regia</i> , <i>Quercus</i> spp., <i>Morus serrata</i> , <i>Alnus nepalensis</i> , <i>Mahonia borealis</i> , <i>Saurauia nepaulensis</i> , <i>Ilex dipyrena</i> .
Basket, mat and ropes	<i>Dendrocalamus strictus</i> , <i>Arundo donax</i> , <i>Abutilon indicum</i> , <i>Urtica dioica</i> , <i>Millettia extensa</i> , <i>Cannabis sativa</i> .
Brooms	<i>Eriphorum comosum</i> , <i>Apluda mutica</i> , <i>Arundo donax</i> , <i>Neyraudia arundinacea</i> , <i>Sarcococca saligna</i> .
Colouring agents (Dye)	<i>Juglans regia</i> , <i>Berberis</i> spp., <i>Mahonia borealis</i> , <i>Symplocos paniculata</i> , <i>Euonymus tingens</i> , <i>Ardisia solanacea</i> .
Household construction	<i>Cedrus deodara</i> , <i>Abies pindrow</i> , <i>Picea smithiana</i> , <i>Pinus roxburghii</i> , <i>Pinus wallichiana</i> , <i>Taxus baccata</i> , <i>Castanea sativa</i> .
Insecticides and pesticides	<i>Sedum rosulatum</i> , <i>Tenacetum dolichophyllum</i> .
Incense	<i>Skimmia anquetila</i> , <i>Nardostachys grandiflora</i> , <i>Juniperus communis</i> , <i>Tenacetum dolichophyllum</i>
Thatching of huts	<i>Dendrocalamus strictus</i> , <i>Arundo donax</i> , <i>Themeda arundinacea</i>
Wood carving	<i>Juglans regia</i> , <i>Taxus baccata</i>

these plants acquired traditionally helped these people to collect process and trade them. Due to intensive utilization of medicinal plant and heavy biotic pressure many important plant species like *Acorus calamus*, *Aconitum heterophyllum*, *Delphinium denudatum*, *Picrorhiza kurroa*, *Saussurea costus*, *Zanthoxylum acanthopodium* have become rare and are at the verge of extinction. The traditional knowledge of medicine in this valley has developed over a long period of time and they were exposed to a wide variety of plants and herbs by

people residing in the remote areas. Even today they are not exposed to any other form of medical treatment. The indigenous treatment is mainly focused on ailments like gastric problem, diarrhoea, cough and cold, skin diseases, fever (Table 5).

The traditional society has control over production and conservation measures to the rationing of demand as well as adherence to the social sanction. All decisions regarding utilization of natural resources are done by elder people of the villages (Panch). They decide the

**Table 3.** Some important wild plants used as food.

Botanical name	Local name	Botanical name	Local name
<b>Vegetables</b>		<b>Fruits</b>	
<i>Asparagus adscendens</i>	Kairu	<i>Castanea sativa</i>	Himal
<i>Amaranthus viridis</i>	Jangli palak	<i>Duchesnea indica</i>	Bhuin kapahal
<i>Chenopodium album</i>	Bathua	<i>Hippophae rhamnoides</i>	Amlach
<i>Commelina maculata</i>	Kapla	<i>Fragaria nubicola</i>	Kiplaya
<i>Diplazium esculentum</i>	Lingura	<i>Rosa macrophylla</i>	Kujoi
<i>Paeonia emodi</i>	Chrndrain	<i>Rubus spp.</i>	Hinsalu
<b>Oilseeds</b>		<b>Condiments</b>	
<i>Juglans regia</i>	Akhrot	<i>Allium glauca wallichii</i>	Gopka
<i>Prunus armeniaca</i>	Chullu	<i>Angelica glauca</i>	Chora
<i>Prunus persica</i>	Baim	<i>Carum cara</i>	Thoya
<i>Prinsepia utilis</i>	Bhekali	-	-

**Table 4.** Lesser known domesticated plants of the valley.

Botanical name	Local name	Botanical name	Local name
<b>Cereals</b>		<b>Vegetables</b>	
<i>Eleusine corocana</i>	Mandua	<i>Brassica oleracea botrytis</i>	Phul-gobhi
<i>Echinochloa frumentacea</i>	Jhangora	<i>Brassica oleracea capitata</i>	Band-gobhi
<i>Sorghum halepense</i>	Chinna	<i>Capsicum annum</i>	Mirch
<i>Fagopyrum tataricum</i>	Phapra	<i>Cucurbita maxima</i>	Kaddu
<i>Fagopyrum esculentum</i>	Oogla	<i>Lycopersicon esculentum</i>	Bhindi
<i>Oryza sativa</i>	Chawal	<i>Pisum sativum</i>	Matar
<i>Triticum aestivum</i>	Gheuin	<i>Raphinus sativus</i>	Muli
<i>Amaranthus peniculatus</i>	Chaulai	<i>Solenum tuberosum</i>	Alu
<b>Pulses/Oilseeds</b>		<b>Fruits</b>	
<i>Phaseolus mungo</i>	Urd	<i>Pyrus malus</i>	Seb
<i>Phaseolus vulgaris</i>	Rajma	<i>Pyrus communis</i>	Nashpati
<i>Glycine max</i>	Bhatt	<i>Pyrus persica</i>	Plum
<i>Macrotyloma uniflorum</i>	Gahat	<i>Prunus persica</i>	Adu
<i>Brassica juncea</i>	Lai	<i>Prunus armeniaca</i>	Chullu
<i>Sesamum indicum</i>	Til	<i>Juglans regia</i>	Akhrot

dates for grazing in particular meadow. Similarly, the Panch fix the norms and responsibilities for the maintenance and repair of boundary wall and bridges for proper flow of water from forest, grazing lands, barren lands and water springs. The people accordingly adjust their requirements in terms of animal grazing intensity, seasonal collection and uses of food, fuel and fodder to the availability and potential of the resource base. After formation of the Govind Pashu Vihar Wild Life Sanctuary (22/03/1955, 481 sq.km area) now Govind Pashu Vihar National Park (26/02/1999) covering an area of 472.08 sq.km., slowly the government agencies were extended to such remote areas and brought the natural resources

under the complete control. Most villages of the valley lie in far remote areas about 15 - 40 km away from the road heads. Due to this remoteness there is illiteracy, unavailability of hospitals, electricity, schooling etc. As a result there begun migration of these people to urban areas and near town for employment and lure. With this process the control of communities over local resources weakened and the traditional resource management also getting disrupted. The recent developments have brought their traditional mode of production in serious danger of being displaced and replaced by money oriented economy. The community has literally no control over the individual's life as they are more dependent on market

**Table 5.** Traditionally useful medicinal plants.

Botanical name	Local name	Useful parts	Disease treated
<i>Abies pindrow</i>	Morinda	Resin	Cut, sore and body pain.
<i>Abutilon indicum</i>	Kanghe	Leaf/Bark	Fever, dysuria.
<i>Acorus calamus</i>	Bach	Rhizome	Dyspepsia, bronchitis, dysentery, snake bite insectifuge, asthma.
<i>Asparagus adscendens</i>	Kairu	Tuber	Diabetes, dysentery dysuria.
<i>Cedrus deodara</i>	Diar	Bark	Cough, bronchitis.
<i>Crotalaria prostrata</i>	Chunchui	Root	Dysentery.
<i>Delphinium denudatum</i>	Nirvishi	Root	Stimulant, toothache and snake-bite.
<i>Ephedra gerardiana</i>	Tutgautha	Root/Shoot	Blood pressure, joint pain.
<i>Geranium nepalense</i>	Ratanjot	Entire plant	Fever, renal disorder, eczema, itching.
<i>Melia azedarach</i>	Bakain	Entire plant	Skin disorder, rheumatic pain, antiseptic, wormicide.
<i>Nastertium officinale</i>	Jairi	Entire plant	Goitre, vermifuge, constipation.
<i>Paris polyphylla</i>	Satwa	Rhizome	Anthelmintic, tonic.
<i>Picea smithiana</i>	Rai	Resin	Cuts and body pain.
<i>Pittosporum eriocarpum</i>	Agni	Bark	Aromatic, narcotic, expectorant, bronchitis.
<i>Punica granatum</i>	Darim	Bark/Fruit	Cough, cold and fever.
<i>Smilax glaucophylla</i>	Srya	Root	Flatulence, aphthae, fever.
<i>Sonchus brachyotus</i>	Choply	Root	Cough, bronchitis.
<i>Stephania glabra</i>	Gindaru	Tuber	Tuberculosis, asthma, fever.
<i>Taxus baccata</i>	Thuner	Bark	Plaster, headache.
<i>Zanthoxylum acanthopodium</i>	Timru	Stem bark, seed	Toothache, tooth decay.

forces rather than community resources.

## CONCLUSION

The traditional system had maintained a symbiotic relationship between their ecology and traditional resource use practices. They conserve a number of plant and animal resources, however a sharp erosion of tribal culture is observed mainly due to modernization and general penetration of cash economy endangering the traditional crop system, therefore steps has to be taken for empowering the local people to ensure a culturally and regionally sensitive response that over the long term will serve to protect the traditional linkage of society with their natural ecosystem.

## ACKNOWLEDGEMENTS

Gratitude is expressed to the elder people of the valley for their ethical and logistic support and my friends during field work in the Valley.

## REFERENCES

Agarwal A, Narain S (1985). The state of India's Environment 1984-85. The second citizen report centre for science and environment, New Delhi.

Brush SB, Stabinsky D (Ed.) (1996). Valuing local knowledge:

Indigenous people and intellectual property right. Island Press. Covelo, Dhar U, Samant SS (1991). Endemic diversity of Indian Himalaya I. 1993. Ranunculaceae and II. Paeoniaceae. J. Biogeography, 20: 659-668.

Gaur RD (1999). Flora of the District Garhwal, North West Himalaya (with Ethnobotanical Notes). Transmedia, Srinagar, Garhwal.

Gaur RD (2004). Vegetational Diversity of Uttarakhand Himalaya and Scope of Regional Development. In Resource Appraisal, Technology Applications and Environmental Challenges in Central Himalaya. H.N.B Garhwal University, Srinagar.

Gegeo DW (1998). Indigenous knowledge and Empowerment: Rural Dev. examined Contemporary Pacific, 10(2): 289-315.

Nyere J (1990). The challenges to the south: The report of the south commission, Oxford University Press, Oxford.

Rana TS, Datt B, Rao RR (2003). Flora of Tons Valley, Garhwal Himalaya (Uttaranchal). Bishen Singh and Mahendra Pal Singh Publisher Dehradun, p. 410.

Rawat VS, Chandhok A (2009). Medicinal plants used by tribes of Uttarakashi District of Uttarakhand. Ind. J. Bot. Res., 5(3&4): 169-173.

Shiva (1991). The violence of the green revolution: Third World Agricultural, Ecology and Politics. Third World network, Penang.

Singh V, Bohra B (2005). Livestock Feed Resources and Feeding Practices in Hill Farming Systems: a Review. Indian J. Animal Sci., 75: 121-127.

Singh V, Sharma RJ, Kumar A (1995). Perspectives on the Utilization of Forest Fodder in the Mountains. In Singh V, Sharma RJ, Kumar A (eds.) Ecological Carnage in the Himalaya. IBD, Dehradun.

Warren DM (1991). Indigenous knowledge system and development. Agriculture and Human Value, special issue No.8.

World Commission on Environment Development (1987). Our common future. Oxford University Press, oxford.