INTRODUCTION

Indigenous knowledge in the Himalayan region is the inter-generational wisdom of local inhabitants to perform their livelihood operations in a most eco-friendly manner under remote, isolated and inaccessible conditions, characterized by harsh climate and limited survival options. Since this knowledge is transferred orally from one generation to the next, it is dynamic in dissemination and scientific in indigenous experimentation; receiving constant stimuli from outside. However, indigenous not only stands for ingrained intrinsic knowledge, but is also amenable to modifications based on latest technical know-how by local inhabitants through native means to suit their daily requirements. Therefore, to discard any indigenous knowledge on connotations of superstition, conservatism, primitivism etc. by modern science would only result into a failure of the development networks. Evidences have shown that the developmental projects which overtly rejected already acquired knowledge of the local inhabitants, have failed to achieve their targets.

Throughout Himalayan region, watershed resource use and productivity is based on crops, horticulture, pastures and forestry which is largely influenced by geographical and environment diversity prevailing in its different zones.

The wide variations in altitude and other agro-climatic parameters such as rainfall and temperature, broadly classify Himalayan region into four major agro-climatic zones. These include (1) the low hills and valleys near the plains, (2) the middle hills and valleys with sub-humid climatic, (3) high mountains and valleys with temperate climate and (4) cold dry desert zone.

Located in the interior of continents, Kinnaur manifests remarkable ecological variety and biological diversity. Its geographic remoteness and unfriendly climatic conditions greatly constrain economic growth and development. Environmental degradation, which is on increase, is an additional cause for concern.

A rainfed atmosphere, fast blowing winds-eroding the immature sandy soils, extreme variations in daily and seasonal temperatures along with scanty or no precipitation during spring and summer ensure short growing seasons (2-5 months) with exposure to harmful infrared and ultraviolet radiations. Unharvested glacial melts, frozen soil moisture during early spring and low relative humidity during the growing season are some abiotic features.

Sparse natural vegetation results from over-exploitation by a variety of agencies e.g. grazing by both domestic and migratory animals, harvesting (of vegetation) to meet energy needs viz. fuelwood and dry fodder for winter besides demands from pharmaceutical agencies. Additionally, both migratory birds and rodents utilize dispersed seeds as a means of sustenance thereby jeopardizing natural regeneration.

Features such as high transpiration due to excessive heat (often causing morta-
ity), inadequate photo-hours especially during winter, injury due to frost causes poor seed germination, poor plant growth, poor root formation, deformed canopy, reduced radial growth etc. and other physical signs/phenotypic manifestations which in turn affect the productive biomass production in the region.


The herbaceous elements is comprised of *Thymus, Medicago, Trifolium, Anemone, Potentilla, Epilobium, Verbena, Allium, Aconitum, Delphinium, Aquilegia, Primula, Geranium, Polygonum* and *Cannabis*. This abundance of the herbaceous element, in cold desert, has been the mainstay of the traditional medicinal system prevalent in this region. The nature of flora along with man made interventions have ensured a land use pattern typical to this region.

These features also place constraints on economic growth. Fundamentally these are re-enforced by the biophysical features discussed earlier. Society steeped in religion along with class/ caste hierarchies, absence of adequate means of livelihood, absence of women’s organizations accompanied by rudimentary infrastructure viz. poor communication network, inadequate development/ vocational facilities and inadequate outreach for relevant transfer of technology characterize the society here. The result, quite obviously, is that there remains a largely untapped and underdeveloped industrial potential even in the agriculture/horticulture sector that are the mainstay of communities inhabiting here.

In this region as a whole the initial land use pattern was purely agriculture. It has, however, changed over a period of time to agri-horti-silvi-pastoral. Apple, almond, apricot, Potato, walnut etc. are some important horticultural crops while poplars and willows have been popularised to increase both the green cover and also to augment fodder and fuel needs. Millets followed by wheat are the most important cereal crops. These are followed, in order of importance by fodder crops, barley and pulses. *Alfalfa* is the most popular fodder crop. Fruits and vegetables- the horticultural component, are a recent development. Since they yield high economic returns increasingly more and more area is being brought under crops such as apples, raisin grapes and apricots. Mustard, Pea, Lathyrus, millets and turnips are also grown. The central belt (3000-3500 m amsl) is very well suited to the production of vegetable seeds. Rotation in the cropping pattern is hardly practiced.

The fauna of this entire region is quite unique. Due to poor/rudimentary communication facilities the yak has been the major animal for burden. Besides yaks, livestock comprise mainly sheep and goats.
As mentioned, yak and sheep dominate livestock composition. Additionally land extensive management and transhumance along with the barter system of converting livestock into other usable commodities are features that characterise animal husbandry practices. Chief among the many problems faced by the livestock sector are insufficient supply of fodder, over-grazing right up to alpine meadows and difficulty in stall feeding in snow bound areas etc.

This zone is characterised by mountainous tracts of varying altitudes, steep slopes etc. Steeper slopes receive higher intensity of radiation and are not conducive to the growth of vegetation. Conversely, vegetation abounds on the relatively gentler slopes. Moisture from snow-melt and rich organic matter generate dense vegetation of fruit and forest trees. Most of this zone consists of granite and other crystalline rocks of unforseliferous sediments.

An average rainfall of about 100cm received during the monsoon months. A calender year is generally divided into three main seasons viz. winter (October-February), summer (March-June) and monsoon (July-September) with a brief spring (mid February-March) and autumn (late September-October). Winter temperatures generally remain below 5°C and precipitation in the form of both rainfall and snow result from the western depression. The cold wave sets the migration of the nomadic shepherds to warmer valleys in the Himalayan foothills.

Summer temperatures remain above 20° especially during April-June. The relative humidity remains about 40 per cent and the occasional hailstorms are known to cause extensive crop damage especially to apple, plum, apricot and peach. Rainfall during this period amounts to approximately 30 per cent of total annual rainfall.

Monsoon results from the South-west monsoon and about 50 per cent of total annual precipitation is received during this period. The temperatures are known to drop by 2-4°C and the relative humidity reaches 60 per cent. In addition to precipitation the "directional aspect" is crucial for development of vegetation. The Northern aspects receiving less direct sunshine and facing the snowline has consequently, lower temperatures and high moisture retention which in turn create ideal agro-climatic conditions for the cultivation of temperate crops, especially fruit crops. The southern and western aspects suffer high moisture loss since they receive more direct sunshine and consequently they support a poor vegetation cover. The difference in temperature on the different aspects of hills can also be explained in terms of differential isolation i.e. by proximity or distance from the equator, for example isolation factor for the southern aspect is about 1.5-2.4 times higher than that for the northern aspect.

With horticulture occupying a prime position the land use system can be defined as horti-agri-pastoral. Forests account for about 25 per cent of the total geographic area of this zone. The forest cover varies from thick to sporadic. The chief species are kail, deodar, walnut and oak etc. varying of course with altitude. The grassland here are heavily grazed both by draught animals and by migratory graziers. The grass cover comprises mainly of Themeda, Arundinella, Hamertheria, Heteropogon etc. and the
legume component is mainly made up of white clover. While traditional millets such as Kangni, Cheenee, Kodda and Bathu, etc. are fast disappearing. Cash crops such as potato and apple form the backbone of the economy with apple alone accounting for more than 78 per cent of the area under fruits. Pome and stone fruits are also grown in this zone. It is estimated that this zone contribute 96 per cent of the total temperate fruit production in the state. The traditional almost static farming has changed into a dynamic horticulture led system. Further, with the emergence of the market, farm strategies are no longer focussed only on security and precautionary motives.

Livestock composition is dominated by small ruminants due to availability of larger ‘support’ area. Cattle form the bulk of livestock rearing and are dependent on natural grass alone. Significantly, fodder is not grown. Hay, collected from natural grasslands is the main source of livestock feed.

The introduction of apple to this zone (in Himachal Pradesh) was the corner stone of other overall horticultural development strategy. Apple production accounts for nearly 40 per cent of the fruit area and about 90 per cent of fruit production. The economic transition was facilitated by the simultaneous development of supporting infrastructure by way of research and extension mechanisms, higher budgetary allocations, government policy initiatives (e.g. launching of the small farmers development agency, SFDA etc., an ever increasing focus on infrastructure e.g. roads, market development and Agricultural credit concentration, especially for capital demanding cash crops, in zone of the state is truly impressive.

For decades prior to economic transformation/transition societies in the both temperate and cold desert regions, as elsewhere, were part of economic conditions that centred chiefly around the security and precautionary motives. As such, production of hardy crops e.g. millets etc. was common practice. In the absence of structured markets as we have today, barter trade was resorted to. The absence of physical infrastructure, low economic resource base etc. translated people to adapt their life styles to suit their specific locational situations. Stated simply, subsistence farming with a focus on crops that met this goal was the common practice. These ‘adaptations’ ensured that agriculture was practiced on ‘sustainable’ lines with better income distribution and equity consequences. Undeniably, such farming/ agricultural practices evolved under low population pressure in the different agro-ecological regions and depended entirely on locally available resource, yet, they do hold lessons for us even today. This is to be appreciated in light of the realization that increasing populations and the consequent reduction of per capita resource availability dictate that a more efficient resource utilization regime be adopted. Such a regime is embodied in indigenous technological practices. Attempts to document such ITK also serve the purpose of preserving such knowledge for posterity, otherwise much of it would be lost due to thelargely oral tradition of transferring such knowledge to successive generations. Such an exercise also has relevance for development agencies and extension services for providing relevant (technical) support for sustainable development and management of natural resources.