

Socio-cultural Adaptations in Cold Deserts

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EFFECTS OF HIGH ALTITUDE ENVIRONMENT ON MAN

The areas situated above 3000 metres above mean sea level are called 'high altitude' areas. High altitude is a unified name given to a diverse group of areas in terms of the stresses they impose on the human population. They differ widely with respect to low oxygen/atmospheric pressure (depending on elevation) and cold (depending on longitude and latitude). If such areas are also characterised by low rainfall coupled with high wind velocity, these are cold deserts. In India, cold deserts are arid tracts lying in the rain shadow areas of the main Himalayan range. In remote and inaccessible valleys these areas are specialised ecological niches. Adaptation to such harsh environment reflects success of human species. Not all cold desert areas of India are located on high altitudes. Ladakh; Lahul-Spiti; Pooh and Hangrang valleys of Kumaun district; Lachen and Lachung valleys of North Sikkim are some of the high altitude cold deserts. The other areas exhibiting cold desert characteristics are at a comparatively low altitude e.g. Bharmour tehsil of Chamba District and pockets of northern Uttarakhand in Uttar Pradesh. Extreme weather conditions do not attract communities due to unpleasant physiological and physical conditions associated with the cold desert. However, these areas become attractive where there are mineral deposits or for people seeking refuge from political or religious persecution. For example, in Ladakh, presence of gold attracted people. Much of the economic life of Ladakhis is carried on at high altitude and so it has been for centuries. At this altitude Ladakhis built a habitation with incredible terracing and ingenious irrigation system, forts and Gompas.

In the high altitude areas biochemical, physiological and anatomical features of acclimatization become progressively more pronounced. People inhabiting these areas

have to face environmental hazards like low atmospheric pressure, severe cold, strong winds, solar radiation and humidity. Man-environment relationship is influenced by genetic make up and socio-ecosensitivity and cultural factors. The cold deserts experience certain special/peculiar climatic phenomena - gravity winds, western disturbances, visibility, jet streams and Lee winds or waves winds, blizzards, snow storms and avalanches.

The various high altitude populations are exposed to different degree of stress, some of the stresses may be unique to each high altitude area. Naturally than if they differ in kind and amount of stress, their response to exposure is likely to be different. Accordingly, it should not be astonishing that different high altitude populations adapt different pathways or different adaptational strategies to combat environmental stresses.

It is now clear that human beings can combine their bio-cultural capabilities to encounter environmental stresses. Some of these stresses are easily manageable by the socio-cultural factors while others are not. For example, it is much easier to overcome the stress of cold through technological innovations than the stress emanating from the low oxygen/atmospheric pressure which require biophysiological alteration. Maintenance of core body temperature is crucial for survival. This can be done either by increased heat production or reducing heat dissipation or being a balance of the two in a way that net heat exchange is zero. Heat is produced during liberation of energy. People tend to increase the production of heat by taking fat rich diet. Eskimos eat rich protein diet and Ladakhis take butter for the same purpose. Increased fat deposits in their body act as insulating 'layer'. On the other hand heat dissipation is reduced by wearing clothes or living in houses which are designed to avert cold and wind.

Traditional architecture, perhaps more than any other form, exemplifies the cultural val-

ues of a community in material form and has historically been an important channel of expression for a community's creative energy. Leh's architecture - an architecture without architects - encompasses the wealth in distinctive dwelling types, which reflect locally inspired solution to bioclimatic settings. In dry sandy Ladakh, Sun dried brick houses were built tightly bound together by narrow streets to deter invasion, avoid problems of dust, provide shade from sun in summer and allow forage and dung to be dried on the flat roofs of closely set houses.

The majority of Ladakhis rely heavily on local building material for house construction. The climate has influenced both the design and materials used in human settlements. The houses vary from one to two storeys. A Ladakhi house consists of ground floor where agricultural implements, fodder and animals are kept. Ascending the stairs is a spacious kitchen cum sitting room. This is the main functional room of the house. It is indeed the most essential room for a family, faced with scarcity of fuel and biting cold. Kitchen doors and windows are tightly closed to prevent cold wind from entering, the only outlet being one or two holes made in the roof to let the smoke out.

The distinctive physical environment of the cold deserts restrict economic processes. The ecological conditions in the cold deserts have several effects on the economic life of communities inhabiting these areas. The environmental stresses to which human population in cold deserts have to adjust are rugged topography, poorly developed soils, marginal availability of certain nutrients, low temperature, frequent frost, excessive snow and shortage of water. Communities inhabiting these areas practice marginal agriculture. They cultivate small patches of terraced land whose fertility is low as compared to other parts of Himalaya. Snow-melt is channelled to irrigate fields. The short growing season restricts the number of crops in a year to one and in some areas two. Agricultural activities come to stand-still in winter due to increasing snow fall. Heavy snow fall necessitates the transhumant mode of life. To compensate the agricul-

tural deficit, domestication of animals is a common strategy. The presence of pastures in the vicinity facilitate pastoralism. Although technology and environment prescribe that certain things must be done in certain ways, these activities are functionally tied to other aspects of culture. People can have several productive arrangements, but pastoralism remain the major strategy of survival in cold deserts. Alpine pastures play a vital role in the socio-economy of the local people, most of whom are transhumants and depend on animal husbandry for the livelihood. In the winter they move with their animals to lower hills to be grazed in forest areas. During their migration to and from the high altitude pastures, the animals graze on pastures/grass lands occurring within the sub-alpine areas.

Settlements in the cold deserts are either dispersed or agglomerates and located on lower and middle hill slope or in the valleys. During migration they camp in stone shelters/tents or under open sky with their flocks. The areas just below the snow line are visited in summer by these people. In winter, they return to their homes or to the shelter of valleys at lower altitude.

A social group adapts (*i.e.* responds over time) to its environment through a cultural system that contains several interrelated dimensions (Steward, 1955). The economic system and technology used by the group constitute one important dimension of cultural adaptation; they constitute an adaptive technoeconomic strategy with respect to the environment, *i.e.* that part of the culture that links directly with the physical aspects of the ecological niche. A second dimension of cultural adaptation is the social organisation and behaviours of the group *i.e.* the quality and quantity of social roles, relationships and interactions within and between groups. This social organization allows the group to utilize its technology for the completion of economic processes in response to environmental demands and pressures. Another dimension of adaptation to technology is ideology *i.e.* ideas, meanings and values. A group's ideology can be viewed as part of an adaptive response - it supports the shared interpretation of events

and circumstances, and helps to coordinate group activity with an adaptive frame work.

It has been found that techno-economic factors influence the other processes of social organization and ideology. Certain techno-economic elements constraint or trigger certain social processes, which in turn adapt to a changing organizational environment. There are, however, important feedbacks from social organization and ideology that influence and constraints techno-economic dimensions. Different configurations of techno-economic adaptations, socio-organizational and ideological dimension, show difference in adaptive pattern that reflect different types of niche. These different adaptive processes are expected to explain a substantial amount of variability across culture. Differences in relationships among and between adopting systems also should explain some of observed variability. Though range of adaptive adjustments is limited by physical environment, behaviour patterns can take different forms. It is reasonable to suggest that there are fewer ecological adaptations possible in any given environment than the behavioural patterns can develop in response to these adaptations.

In this study, cultural and social diversity as well as rich variety of social processes in the cold deserts of India have been taken.

Cold deserts of India are arid tracts lying in the rain-shadow areas of the main Himalayan range. Inner dry valleys of the Himalayas and trans-Himalayan areas remain uninfluenced by the monsoon system that brings rain to other parts of India. The cold deserts of India have typical climate and adaptive conditions created by their altitude, location and unique geological setting. As cold deserts are characterised by distinct physical environment, these areas are markedly different from their neighbours in the historical, political, linguistic, cultural and structural form. The cold deserts of India include Ladakh district in the state of Jammu and Kashmir, Lahul and Spiti, Kinnur districts and Bharmour tehsil of Chamba district in Himachal Pradesh; pockets of northern Uttarakhand in Uttar Pradesh; and Lachen and Lachung valleys of Sikkim. There is no consensus among scientists concerning what

attributes characterize cold desert regions in India. The above stated areas are characterized by distinct physical environment and consequently different biological, hydrological, anthropological conditions. However, the deserts of India can be divided into two classes on the physiography of the region.

1. *Trans-Himalayan Region*: The trans-Himalayan region across the main Himalayan region physiographically forms a part of the vast Tibetan plateau which lies further towards north with a great height. The average elevation of the region is more than 3000 metres. The cold deserts of Ladakh, Lahaul, Spiti and Pooh are extended like a flat table lands towards North in trans-Himalayan region. These deserts have been created primarily due to the rain-shadow effect of the high mountain ranges. The high mountain ranges of Karakoram and Zaskar have dissected these desert lands.
2. *Inner Dry Valley*: Within the main Himalayan range, there are valleys which do not receive adequate rainfall because of towering mountains and the rivers draining the area are deep. Parts of Kinnaur and Bharmour in Himachal Pradesh, Uttarkashi, Chamoli and Pithoragarh districts in Uttar Pradesh and Lachen and Lachung valleys of North Sikkim in eastern Himalayas are inner dry valleys formed by high mountain on all sides. They are in the form of deep gorges with rivers draining their bottom.

An ecological perspective places emphasis on feature of the environment, social as well as physical and biological, as a system of resources and constraints within which people act in obtaining, distributing and consuming resources. The relationship between nature and culture is both interactive and dynamic with human beings trying to mould the environment to their ends but always having to work within the limits set by nature.

ECOLOGY OF THE COLD DESERTS

The cold deserts of India have typical conditions created by their altitude, location and unique geological setting. The data on Ladakh, Lachen-Lachung and Bharmour come pri-

marily from my own research work in 1987-1990, 1981-84, 1976-79, respectively.

Location

Location wise the deserts of India are heterogeneous.

BHARMOUR

The Bharmour tract of Chamba district of Himachal Pradesh is an inner dry valley lying in the rain-shadow of the main Himalayan range. The terrain is extremely rugged and conditions resemble a cold desert. Bharmour receives low precipitation due to the barrier created by the imposing mountain range.

The Bharmour Tehsil is approximately between the north altitude 32°-11' and 32°-41' and the east longitude 76°-22' and 76°-53'. The lowest altitude is about 1340 metres and the highest about 5900 metres above the sea level. Bharmour Tehsil is remarkably mountainous. Because of the slope, in the rainy seasons the good soil cover is lost and soil conservation becomes a real hazard. Land sliding is a common feature in this area. People inhabiting these are Gaddis who raise large flocks of sheep and goats to compensate for agriculture deficit. For maintenance of large flocks, Gaddis have to move in summer and winter. Gaddis camp regularly in the open, with their sheep, goats, during summer on the pastures at high altitude (5500 metres) and are considered in a sense as semi-permanent high altitude residents.

LACHEN AND LACHUNG

The inner dry valleys of Lachen and Lachung at 3000 metres in North Sikkim are located in the southern slopes of western half of the eastern Himalayas across 27° and 28° N latitude and 88° and 89° E longitude. It is within the temperate zone not far from the tropics, yet the climate is influenced by the high Himalayas to the north and Gangetic plains to the south. Sikkim itself lies within the watershed of the river Tista. In the valleys of Lachen and Lachung the climate is cold and dry though aridity is much less than 3000 metres with an extremely rugged terrain. The

temperature varies with altitude and slope aspect (generally 6° to 10°C per km). The temperature decreases with an increase in the altitude. Lachen valley in the west is wider whereas Lachung valley in the east is rather short and steep. The areas comprising these two river valleys are comparatively dry and are in many ways different from rest of the state. The slopes here are gradual and valleys are broader compared to other valleys. The two main mountain ranges of the tract are the Donkya and Choma-Lhari mountains. Two important passes across them are the Jelep La and Nathu La, both having an elevation of more than 4000 metres. Due to inhospitable climatic conditions and terrain the area is sparsely populated. It must be noted that people inhabiting these areas, live at an altitude higher than 3000 metres and at a latitude of 28 degrees which are certainly exceptional conditions. The presence of pastures in the area facilitate pastoral activities. Though these communities are found at a height of nearly 3000 metres, these people lead a transhumant type of existence travelling from one ecological zone to another. They inhabit climatic zones varying from temperate (2,000 - 2700 metres) to sub-Alpine (2,700-4,000 metres) to Alpine (4,000-5,000 metres) and very high hills with Alpine climate above 5,000 metres.

LADAKH

Ladakh is in the Trans-Himalayan region—the impact zone where the Indian continental plate collided with the rest of the Asia. This monumental geological occurrence happened some 50 million years ago creating mountain ranges from west to east across Asia lying between 32°15' to 36° latitude and 75°15' to 80°15' longitude. There is hardly any place in this region which is less than 2,500 metres high. The most striking feature in the physical aspect of Ladakh is the parallelism of its mountain ranges, which run across it from south-east to north-west. The general direction of mountain chain determines the courses of rivers as well as the boundaries of the natural divisions of the area.

Climate

Two major features, temperature and precipitation, decide the climate of the region. These features in turn are naturally influenced by three physical attributes - location (latitude and longitude), altitude and exposure to powerful winds. From dry temperate to arctic conditions prevail in cold desert regions. The total annual rainfall is usually less than 50 cms, much lower in some regions.

Snowfall is heavy in the upper-reaches, because of the precipitation received each year in the form of snow. The seasons are marked by long snowy winters and short torrid summer. The areas lie under the thick blank of snow for a long period. The winter starts from mid-October and lasts till late May.

In Bharmour, depending upon the altitude the climate varies a good deal. Taken as a whole, the climate is temperate with well marked seasons. The winter lasts from December to February (both inclusive) and is characterised by snowfall, which is generally heavy and descends lower in the inner valley. Higher still, semi-arctic conditions prevail along the main ranges and from November to March the passes are blocked with snow. The change-over from winter to summer is gradual. March and April are cool and bright, but in inner valleys snowfall may occur even during these months. The temperature begins to increase rapidly after the middle of April and the rise continues till the break of rains in July. The average monthly rainfall in Bharmour valley is 1264.4 mm (Working Plan for the Upper Ravi Forests, 1954-55 to 1968-69).

In the upper dry valleys of Lachung and Lachen, the climate is Alpine with perpetual snow line at 5000 metres and above. The area is characterised by high altitude, comparatively less rainfall (than in other areas of Sikkim) and violent local winter winds. The mean monthly temperature (maximum and minimum) is 13.1 and 2.3, respectively. The relative humidity at Lachen (2,697 m) is 76. The rain-fall in the Lachung and Lachen is 1,250 (because Sikkim by virtue of being in the direct path of the monsoon is the wettest part of the area).

Ladakh at the extreme west is one of the driest region of the entire Himalayn range. Both southernly and westernly winds prevail in summer and winter making climate of Ladakh dry and cold. The excessive degree of Ladakh climate is chiefly due to elevation, by which the air is so rarefied as to be incapable of holding much moisture in suspension. It is partly due to the great radiation of heat from the bare soil, by which any moisture is rapidly evaporated. The temperature of the down-point is so low, that the deposition of dew is quite unknown in more elevated areas. The hottest month in Ladakh is July. The mean January temperature is as low as -13°C (Khan, 1987). The quantity of rain and snow that falls in Ladakh is exceedingly small. Winters are long and cold. In winter the rivers freeze and form natural roads. In winter, the snowfall in Dras is too heavy that by end of November, the Zoji-la pass is cut-off from other parts and supplies remain suspended. Snow fall seal the region effectively. Ladakh is connected by air link to other parts but the functioning depends on the weather.

As the temperature generally falls below the freezing point, it causes chilling effect in plants. Low temperature leads to the breakdown of more protein. Still more fall in temperature may lead to frost and snow, which kill young plants.

To all intent and purposes, there are only two seasons in Ladakh, a short, torrid summer and a long icy winter. Summer months are devoted to agriculture and winter which last from September to May is devoted to spinning and weaving, food preservation and religious activities.

Soils

Soil is a medium of plant growth. It is a complex natural material derived from disintegrated and decomposed rocks and organic material. Plants are dependent for their growth on the nutrients, moisture and anchorage provided by the soils. Plants and soils both sustain each other. Soil has four main components - minerals, organic matter, air and water which help in sustaining life.

The types of soils found in Bharmour are

Mid hill soils, High hill soils, Mountain soils and Dry hill soils. The soil holds water reasonably well but because of the incline water does not remain on the surface. Depending on altitude which determines the length of the growing season, the soil is suitable for maize, wheat, cereals, pulses, millets, potatoes, temperate fruits and certain spices. The potential quality of soil is largely dependent on the angle of incline. If it is too sharp, land slide and avalanches take a constant toll of the top soil. The mid-hill soils are good for wheat and maize crops. The high hill soils are suitable for growing potatoes and fruits. Mountain soil is not suitable for any cultivation.

No accurate data on soil types of Lachung and Lachen are available. It has been reported that soil and climatic conditions are well suited for growing temperate vegetables. The Lachung-Lachen area lags behind other regions in grain production because of harsh climate and small area under cultivation.

The soils in Ladakh are neutral to slightly alkaline. The soils vary from sandy to sandy loam and pure clay are also found at some places. These are derived from debris of weathering rocks. The feature of the soils are coarse. The range of sand in the soil varies from 20 to 68 per cent. The soils are thus loose type which have a good aeration provision. This leads to lack of capacity to absorb and hold sufficient moisture and nutrients. The soils of Ladakh are classified as 'High Altitude Desert Soils'. Due to the fact that the region comes under cryorthents' temperature regime, these soils may be grouped under 'Cryorthents'. The major category of soils are cryobasols and lithic entilsols (Murthy and Pandey, 1987). The soil pH ranges from 7.0 to 11.0 (Bhat, 1965). The organic matter varies from 0.01 to 1.56 per cent. Most of the soils show less organic matter which is due to lack of vegetation in the area.

Drainage

The cold desert regions drain both into sea and into inland lakes. The main river systems draining cold deserts are

Indus River System

Chenab (Chandra-Bhaga) River System

Satluj River System

Bhagirathi-Alkananda River System

Tista River System

In Bharmour, the streams and rivers are mainly snowfed and receive large quantities of water from the melting of high level snow during the hot weather. Perennial springs are also common. The water supply in the area is ample, but in localities which have been denuded of their forest covering, it becomes difficult to obtain an adequate supply of water. Agricultural lands are mostly rainfed. The gorges are so deep that no economic channels for irrigation have been taken out.

Two streams Lachen-chu and Lachung-chu are the sources of water in Lachen and Lachung respectively. These two streams join Tista at Chungthang which arises from Zemu Glacier. The terrain being hilly, with frequent occurrences of land slides, major irrigating projects can not be undertaken easily. There has been minimal exploitation of surface water. Apart from this, there is drainage problem in Lachen as the village is so situated that considerable amount of slush accumulates, in rainy season and when it snows.

The drainage system of the Ladakh division consists entirely of the three great mountain feeders of the Indus, the Indus proper, the Shyok and Zaskar rivers. The Indus, originates near lake Mansarover in Tibet and enters south eastern corner of Kashmir. It flows along the deep gorges all along the length of Ladakh. Water has historically been a critical limiting factor affecting agricultural development throughout Ladakh. Surface water resources through ingenious system of water distribution enabled agricultural communities to overcome the limitation of lack of ground water sources and insufficient rain.

There is regular flow of streams during summer season, which bring water from the glaciers. Water comes with great pressures from mountains, causing gully formation. Ladakhis are expert in water harvesting, they make check-dam for diverting water to their storage tanks. Storage tanks emanate small irrigation channels for irrigating individual fields. This is done throughout the growing period i.e. from May to September.

Pastureland

Cold deserts of India are characterised by presence of Alpine pastures. These pastures play a vital role in the socio-economy of the local people, who are mostly transhumants and depend on animal husbandry for their livelihood. These pastures have been classified as *Deschampsia deyeuxia* type in the classification of Indian grasslands.

In cold deserts, pastures occur at high elevation between the snowing and the line of trees. They extend to the lower slopes of the mountains in the core areas where trees are few and scattered. In the inner dry valleys, these pastures are situated at an altitude range from 2500 to 4000 metres. These areas are characterised by extreme cold, even in summer the temperature is around 20° to 23°C what to say of cold weather when it reaches below freezing point for a long time. Different important species of plants in these pastures are *Artemisia marit*, *Artemisia sacrorumia*, *Callianthemum kashmerianum*, *Droba gracilli*, *Kobressia dathe*, *Loricera* sp. and *Potentilla frutcoasa* sp.

Pastures occur in the cold deserts primarily due to the capacity of grasses of adapting themselves to changed conditions. Availability of moisture in the soil, particularly in the moist shady depression and sufficient warmth during the peak growing season (from May to September) help in the establishment of pastures in cold deserts.

The other vegetation of cold deserts is (i) Dry alpine scrub and (ii) Dwarf juniper scrub (after Champion and Seth, 1968; and Negi, 1969).

Land Use

Bharmour Tehsil is remarkably mountainous, level and flat pieces are an exception to be met with. Cultivation ranges, approximately between 1400 metres and 3700 metres. Out of the total geographical area (1,81,833) forest is 13.1 per cent, land under pasture and other grazing land is 83.2 per cent which supports a large livestock population. No fodder crops are cultivated in Bharmour. Agriculture waste and crop residue is a source of forage. Net area

sown is only 3.12 per cent. Several crops are grown on this meagre land; wheat, maize, barley, other coarse cereals, pulses, potatoes, other food crops, oil seeds and other non-food crops. Area under irrigation is 5 hectares only 2 hectare under wheat and 3 under maize.

In the rocky areas and those subjected to severe erosion, the vegetation is usually grass, scrub brush, dwarf oak and Chil (*Pinus longifolia*). Other vegetation falls into three classes: (a) fodder; (b) fuel and (c) commercial.

There is no cultivable land in and around Lachen and Lachung. As the cultivable land is in region at about 3,000 metres and far from residential areas, the crops are generally rain-fed. Forest areas for Lachung and Lachen have not been surveyed, so no details are available. On account of high altitude, terrain and little rainfall, land use is restricted. The climate of the area is suitable for horticultural development. Cultivation is restricted to limited regions which are either below the village or much above the residential areas. People grow small quantities of barley, wheat, maize and buckwheat (*Fagopyrum tataricum*). They raise yak and sheep to supplement their subsistence economy. The vast open space between 4,483 and 5,824 metres altitude is used for raising yak (*Phoephagus grunniens*) - robust animals that require little care and are perfectly adapted to high altitude. The yak provide its owners with milk, meat and wool (for saddle padding, blanket making) and transportation.

The vegetation of the area consists of fodder plants, oaks, firewood and dye yielding plants. The Lachen forests mainly consists of trees, shrubs, herbs and ornamental plants. The mountain sides are clothed with eight to ten species of brilliantly coloured rhododendrons. The Lachung forest consists of both temperate and tropical plants. Some very wild grasses grow here. The Lachung forest abounds in dye yielding plants *Juglana regia* (walnut), *Rubia cordifolia*, *Rumus crispus* 'Chucha' yields dyes of different colours.

The topographical features of the Ladakh division tend to restrict land use. The net area sown in Leh district is 9,940 hectares. In Ladakh, animal husbandry contributes to some extent to the economy of the household. The

extend to which a family depends for its subsistence on livestock varies according to the locality.

Ladakh mountains are almost devoid of vegetation cover and scattered green patches, stunted cedars and willows are found in the most scattered strips. The willow and poplar are the only timber trees, that are regularly planted along the irrigation channels. The forests of Ladakh have been classified as 'Alpine Forest Type'. These forest are found well above the temperate zone. Some of the common species found in zone are high level Fir (*Abies pindraw*), kail (*Pinus Willichian*), Junipers (*Quercus semicapifolia*), *Populus ciliata*, *Betula bhojpatra*, *salix* spp. *Rhododendron arbarium* and a variety of grasses and wild flowers.

Availability of fuel wood is an acute problem in Ladakh. This is due to the limited and inadequate forest resources of the region and higher per capita consumption due to extremely cold and prolonged winter. Generally people use brush-wood and dung for cooking. Cattle or horse dung is collected in a basket and is spread out on the flat roof. It is used as fuel after drying.

COLD DESERT COMMUNITIES

Cold deserts offer great cultural and social diversity as well as rich variety of social processes. The culture of these people has been historically marginalized. Extreme climatic conditions have led to the development of specialized ways of life. Cold deserts are inhabited by distinct people having a distinct language, special social and political institutions as well as traditions, art forms, religious practices and cultural values. These areas remained isolated and lagged behind in social and economic progress. The development programmes sponsored by the Government of India offer challenging opportunities for research in these areas because of their physical distinctiveness and cultural uniqueness. These people are historically marginalized and continue to face an unequal conflict with powerful external political and economic forces. These people have been, and continue to be, forced off their lands, formerly by

conquest, now by process of planned development (hydroelectric and irrigation projects) mining, military installation, roads, sanctuaries and parks or denied adequate political representation in matters which concerns them directly.

The population groups inhabiting different cold deserts are: Ladakhis, Bhutias of Lachen and Lachung and Gaddis of Bharmour. Ladakh Division comprises two districts namely Leh and Kargil. Ladakh Division is inhabited by followers of two major religions: Buddhism and Islam. 52 per cent of the total population is Buddhist while 44.6 per cent are Muslim. The people of Ladakh are a mixture of Mongolian and the Aryan racial elements. Ladakh is inhabited by: Buddhists group comprising Ladakhi Bodh/Bhot, Gara, Mon, Beda, Changpa (pastoralists of Changthang) and Brokpa (Buddhist Dards); and Muslim group consisting of Balti/Purigpa, Argons, Drokpa (Muslim Dards); and Tibetans, recently colonized in Ladakh.

The Bhutias of Lachen and Lachung are called Ha-Pa. They claim descent from immigrants from Ha in Bhutan and follow a mixed agro-pastoral and trade economy. They claim to be of the Lohan Lhunndrub caste. They are more like Tibetans than the Ha-Pa (people of south Bhutan) or other Bhutias of Sikkim.

Bharmour Tehsil in Chamba district of Himachal Pradesh in Mid Himalayan zone is inhabited by transhumant Gaddis who spend summer in their permanent homes in Bharmour and cultivate their lands. In winter, they migrate to lower hills along with their sheep and goats in and around Kangra hills. The term Gaddi is a generic term under which Rajputs, Khatri or Ranas and Rathis are included. Nowadays, however, even Brahmans and Sippis (lower caste) of this area call themselves Gaddis, because Gaddis of Bharmour have been given the status of a Scheduled Tribe by the Government of India and are entitled to certain financial benefits. The Gaddis are Hindus, both in origin and their social organization.

The dress habits and house designs prevalent in these areas are intimately linked with the local economy and availability of raw materials either locally or in close vicinity.

The costumes of people inhabiting these areas are characteristic and striking, though seemingly awkward and unweildy, are advantageous in rough weather. The voluminous fold created above the waist is often pressed into service for keeping anything from small articles to newly born kids and lambs. Utility and the adjustment of clothing to the wearer's activity, has been given the deserved attention. Aspects like freedom of movement, reinforcements of wear areas, receptacles for tools, loops for support of pouches and equipment, and proper distribution of weight over the body have been taken into account. Another important factor in the dress is the durability and availability of material. They spin and weave their own cloth material.

The cold desert communities are sparsely populated with most of communities inhabiting valleys along the rivers, streams and in the middle slopes. Villages in the cold desert are located on sloping ridges. They cannot live next to the rivers because of the steep sides and frequent floods, nor can they live above 3000 metres as the season is too short, between the melting of the snow and the new snowfall for the crops to mature. At places where the plain is wider, the villages are placed one above the other or adjacent to one another. Since the river bed is deep, water cannot be used for irrigation. In areas, where there is some rain the agricultural lands are rainfed. In Ladakh, the location of agricultural villages was important so as to fulfil the requirements of arable soil and water for irrigation and domestic purposes. The shortage of land for human settlements was aggravated by the geographical factors. Firstly, much of the territory consists of slopes and was not easy to develop such lands for residential purposes. Most of the natural flat areas can be better used as agricultural land.

Practically, all the agricultural villages in Ladakh centre around a stream, which brings water from the glacier at the higher altitude, where such a stream run through a broadening valley, it is possible to lay out a series of terraced fields, which can be irrigated in turn by directing the supply in to small irrigation channels. Above the area of cultivated terraces and at the floor of the actual hills where it is

too rocky and steep to plough or sow, the houses are clustered, approached by stony paths or tracks, and so built into hills side, so that convenient pieces of rocks are often used for wall or floor.

In the dry mountain of Ladakh the farmers are wholly dependent on artificial irrigation since in the summer it does not rain for weeks or even months. For Ladakhis water is a precious commodity and welfare of any settlement depends on its equal distribution. Strict laws regulate the building, maintenance and use of the village irrigation system. The division and partition of land is common everywhere, but in Ladakh, water rather than the land is the subject of careful distribution. Water is divided according to the inheritance fraction which each holders represents by virtue of his position in the geneological tree. Water has historically been a critical limiting factor affecting agricultural development throughout Ladakh. Surface water resources through ingenious system of water distribution enable agricultural communities to overcome the limitations of lack of ground water sources and insufficient rain. Once the irrigated food producing base was established and satisfactorily maintained, further social developments were necessarily associated with irrigation. In Ladakh, a social system characterised by the bond of community and work ethics help in maintaining the system. Each and every village has its own rotational scheme by which certain houses or channels are allotted water throughout the growing season as irrigation systems of Ladakh are fine tuned mechanisms for distributing water equitably and efficiently. The rotational scheme is largely determined by village topography, total cultivable land, relative exposure to Sun, average temperature, size of glaciers from which most villages draw their water, soil type and seepage in the irrigation channels. Generally villages draw their irrigation water from tributary streams that flow down from the glaciers high above and not from the major river along which they are situated (Bhasin, 1997).

As in Ladakh, water is the main requirement for any habitation, in Bharmour and Lachen-Lachung there is ample water supply

but other physiographic factors restricts the emergence of any habitation. In Bharmour, steepness of the slopes and the deepness of the rivers restricts the land use. The gorges are so deep that no economic channel for irrigation have been taken out and villages cannot be placed next to river bed because of the fear of flash floods.

The communities of Lachen and Lachung have adapted culturally to diverse natural landscapes and have established settlement patterns and production activities tailored to the limitations imposed by the region. Three major biogeographical provinces of human land use can be identified in both the valleys.

- (i) Fields and pastures at higher altitude (5003 metres to 5824 metres).
- (ii) The houses and small gardens in front of houses at Lachen and Lachung.
- (iii) The valley floor, peripheral valley bottom at lower altitude for fields and pastures (4601 metres to 5000 metres).

All the land in the area cannot be used for agriculture because of rocky and precipitous slopes, poor fertility and short growing season. In most of the area land is under forest, at some places the forest is dense and at other it is rocky with thin vegetation. Non-availability of manure, local or compost has resulted in the barrenness of land. Environmental hazards like hail storms, excessive snow, erosion, land slides and landslides pose problems for these people.

The cold desert communities cultivate small patches of terraced land whose fertility is low as compared to other parts of Himalayas. Snow melt is channelled to irrigate fields. The short growing season restricts the number of crops in a year to one and to some cases two. Agricultural activities come to stand still in winter due to the severe cold. To combat the environmental stresses, these people have developed a mixed economy. All the three communities - Gaddis of Bharmour, Bhutias of Lachen and Lachung and Ladakhis of Ladakh have a mixed agropastoral economy to a varying degrees. To compensate for the agricultural deficit Gaddis raise large flocks of sheep and goat. The mountain meadows and grazing grounds in the area facilitate the rais-

ing of sheep and goats. Accumulation of snow in winter months prevent the year-round sustenance of large flocks. Consequently, a pattern of transhumance is followed. Due to heavy snowfall for about three to four months during winter, the Gaddis generally migrate to lower hills and plains along with their flocks of sheep. During this period the main source of livelihood is sale of wool and employment of their children and women as domestic servants. The migration is necessitated because the pastures and grazing lands are covered with snow and it is difficult to maintain large number of sheep and goats and secondly, for the selling of raw wool which is available in large quantities without any local outlet. Other secondary pursuits in the area are collecting minor forest products, various kinds of household industries such as spinning and weaving, tailoring and beekeeping and specialized occupation such as carpentry, iron-smithy, medicine, religious and para religious activities. More recently the increase in mercantile and government activity has created new sources of income in transport, road building, construction etc. Horticulture, while not yet significant, may become a major source of income. It cannot however be said, that environment alone drives them out of Bharmour during winter, the economic reality is equally responsible. There are families in Bharmour who do not have enough land or do not rear enough sheep and goats to meet their economic needs throughout the year. They have to look for odd jobs in lower hills, where they migrate. They work on daily wages as road labourers, wood cutters etc. and their women and children work as domestic help, thus earning their livelihood for winter months. In the summer months they migrate to Alpine pastures (*Dhars*). Among Gaddis during winter migration, the whole family accompanies the shepherd or *Pahal*, but during summer migrations, only one or two members from the family or professional graziers accompany the flock. Women at this time are looking after the fields. The flocks of sheep and goats are usually cared for by men. While onerous work of farming may be done by a pregnant woman, the handling of stock re-

quires the masculine freedom from child bearing (For further details see Bhasin, 1988).

The Bhutias of Lachen and Lachung practice high altitude farming and animal husbandry. They raise yak, dzow, sheep, goats, horses and mules. Pastoralism is still a major economic strategy, but agricultural activities are carried on along. They move up and down the river valleys and exploit the grazing lands and arable land for cultivation along the valleys and surrounding areas. Lachen and Lachung present contrast as far as movement for agricultural activity is concerned while both grow more or less the same crops. The movement though vertical in both cases are in opposite directions and is controlled by the fact that they have arable land at different elevation at different places. The Lachung people are in the move for the whole year. They do not move along with their families as the Lachenpas do. Lachungpa families are dispersed, fulfilling their allotted duties. The interesting offshoot of this is that their movement for fuel and grazing is also in the opposite direction - Lachenpas going down and Lachungpas going upward.

Traditionally Bhutias of Lachen and Lachung practiced multifarious economy, in which animal husbandry, trading and arable farming combined to provide a wide range of income. The barter of timber wood, dye-stuffs and dairy products for Tibetan salt and wool formed the basis of this trade. They pursued it as an occupation intimately interwoven with their pastoral activities. They had a domestic industry for weaving clothes for themselves and were largely self-sufficient as far as clothing and food were concerned. Yet it is possible that despite their trading activities they were still basically a subsistence, non-cash economy, turning their products from trade into goods before they reached the village. Their main trend in the last hundred years would seem to be predominantly pastoral. With the closure of the border after Chinese aggression, Bhutias could no longer use pasture across the border which they used to do. Military encampments, supply bases, and defence posts were set up in the Northern border areas. The loss of pastures in Tibet caused

Bhutias to shift from a pastoral and trading economy to agriculture, small scale horticulture and wage-earning economy. Though Bhutias shifted from pastoral to agricultural mode of life, their life is not settled. They are still on move, but for different reasons. Scarcity of arable land in the near vicinity of permanent villages and other environmental features restrict land use (For details see Bhasin, 1989).

Like Bhutias of Lachen and Lachung, the traditional Ladakhi economic pursuits were trade, pastoral activities and agriculture. Barter was an important aspect of economy in Ladakh. Trade links extended to Southeast Asia, Central Asia, Kashmir valley and Himalayan Districts of Lahul, Spiti and the plains of Punjab. Pashmina wool, salt, dry fruits, gold dust, tea, were the main items of export whereas wool, gold, silver, turquoise cups, dishes and metal utensils were imported. After the closure of the border they had to reorient their economic system. Even with severe limitations on the land with irrigation facilities available for cultivation, shorter season and extremely simple agricultural technology, a Ladakhi farmer ensured that during the agricultural season, he must grow sufficient food to last through coming winter and perhaps little longer. Stall feeding is in vogue for seven months for all animals except sheep and goat (October to May) and during summer draught animals along with sheep and goats are taken to *Droksa* (high land pastures) for grazing. This traditional fabric of socio-economic system was shattered by development programmes and political events. The economy of Ladakh is changing from a traditional subsistence economy to a commercial consumer economy. The monetisation of economy is linking Ladakh to over all economy whereas traditional village economy was independent of outside world.

For the above techno-economic adaptations it can be said that cold deserts have some fundamental characters. (1) The communities in this category are few and are of low population density in relation of the total land mass. The cold deserts are sparsely populated with most of the human settlements at some distance away from the rivers, streams and in

middle slopes. The high altitude areas remain uninhabited because of harsh weather conditions. The settlements are either dispersed or agglomerated. (2) The areas below the snow line are usually pastures or grasslands which are visited in summer by transhumant populations who camp in their stone shelters/tents or under open sky with their flocks, it means that pastoralism is one of the component of their socio-economic structure. As these groups, do not stay permanently in their homes, they do not invest heavily in landed property. (3) They cultivate small terraced field whose fertility is low as compared to other parts of the Himalaya. The terrain, short growing season, low temperatures, soil structure and lack of irrigation facilities restrict the land use and number of crops in a year. Populations in these areas have to depend on an array of economic activities to maintain at subsistence level of existence. The traditional production strategy of these people is of converting temporary abundance into storable form that can be used throughout the year. There is low margin of surplus on account of low level of technology, little occupational specialisation, high participation of women in economy and highly flexible residence. These factors lead to structural flexibility in these communities. The emergent pattern of social structure helps in meeting the demands of a migratory mode of production. The kinship groups and functional groups help in smooth running of daily life. As all follow the same mode of production, there is little variation in economic level and behaviour from one household to another. The community governs access to the common resources, therefore a strong village organisation is needed. Common resource properties restricts mechanisms for status ranking. Local level leadership or prestige is not based on economic power or capacity to coerce but on charismatic personality, mediation ability and social work attitude.

Though there are few options for eking out a living among these people but permissible latitude for deploying surpluses is wide. The use of surplus time and resources is not socially or culturally stipulated or economically

dictated. In Bharmour, a grain-deficient area, seasonal movements to other regions where grains can be obtained either by working or exchange of wool for food do not leave surplus time or resources. But in Sikkim and Ladakh, as their work schedule is not so tight, their seasonal movements are local and they can exercise choice in the way they utilise their time and resources. Bhutias and Ladakhis pour their surplus time into religion and the maintenance of traditions. The winter time is also for spinning and weaving for all the three population groups.

Cultures cannot survive if the environment on which they depend is laid waste or improvised. Societies themselves have created elaborate procedures to protect and manage the resources. These procedures are rooted in their cultural values. People co-operate and follow the rules set down by the community only if the use of resources to be managed satisfied some of their very significantly felt needs.

In the economy of cold deserts role of Common Property Resources (CPR) is very important. Common Property Resources include waste lands, highland pastures, common thrashing grounds, watershed drainage, rivers/rivulets and river beds etc. Common Property Resources, broadly speaking are the resources accessible to the whole community of a village and to which no individual has exclusive property right. The necessity for collective regulation of CPR is an important factor. In the arid climate of Ladakh, the farmers are wholly dependent on artificial irrigation. They depend on the natural waters from glaciers melt for irrigation. Since time immemorial strict laws have regulated the construction, maintenance and the use of the irrigation channel. The division of water which is derived from a common source is a communal task and is managed accordingly. The allocation of water within the villages is managed by *Churpan* and village committee consisting of youths or members from each *Mohalla* (see Bhasin, 1997).

The Bhutias of Lachen and Lachung have communal forest/ pasture and agricultural land with family ownership of land but with

strong community regulation of land usage. The village is an important land holding unit. The organization of Bhutia migration and land use pattern is facilitated by *Dzumsha* (village court). The sowing and harvesting are synchronised at meetings of the *Dzumsha* so as to utilise the fallow land as common pastures. The whole system of distribution of land is known as 'Sago'. In this form of land tenure, the communal authority overrides any claim the state might extend on internal sovereignty or state landlordism. Sago represents a communal form of land tenure. In Lachen and Lachung, land is used on an individual basis though subject to the reversionary rights of the community as a whole. Members of community are permitted to use the land if it is not currently being used. If a member is away and not fulfilling his *Dzumsha* obligation, this land can be temporarily redistributed among the other members of the group. The two underlying characteristics of *Sago* as a form of communal land tenure are kinship and geographical location. The land under this system cannot be sold or otherwise permanently alienated outside the community. An area of 55 x 55 *Dhams* (land measure) is temporarily allotted to a married couple. The allotment is redistributed and reallocated after every three years. This keeps the land always in use. Among Gaddis, waste lands and village lands are equally important and are accordingly looked after by village Panchayat and traditional caste panchayats (*Biradari*). During winter, the families who stay behind to look after the draft animals have to pay extra for using the communal land forage.

SOCIO-CULTURAL ADAPTATION

Once a group has made a particular techno-economic adaptation, there still remains a certain latitude for socio-cultural variation. In a given situation nuclear families or joint families, extended families, polyandry/polygyny or monogamy have their respective advantages. Hierarchical or egalitarian social systems are equally adaptive and patterns of endogamy and exogamy remain unaffected by techno-economic adaptation. It is reasonable to

suggest that there are fewer ecological adaptations in any given environment than the behavioural patterns that can develop in response to these adaptations.

In the cold desert communities, social relationships are institutionalized between people who know one another personally. Person to person relationships are all important. Four basic social relationships - kinship, fictive kinship, reciprocity and associational ties are important. While consanguinal, affinal and ritual kinship provide important bonds on which close and enduring relationships can be established, the system of reciprocal obligations forges strong links, too.

Nuclear family is the basic social group among the Gaddis of Bharmour and is responsible for the total economic welfare. Further social ties are developed through the institution of *Al*, *Gotra*, caste and *Dharam Bhai* (Ritual brotherhood) bonds. This expansion of the circle of kinsmen and fictive kinsmen, may be seen as an effective adaptive mechanism to the harsh and rugged environment (Bhasin, 1998).

Likewise Bhutias of Sikkim and Ladakhis of Ladakh have family as the smallest and the most important unit of social organisation. Among Ladakhis, the nature and type of household is directly dependent on the form of marriage i.e. polyandry, monogamy or polygyny. Polyandrous households were norm in these societies, but things have changed. There are many kinds of living arrangements and sharing of property. Unmarried sons tend to remain together specially if the father is living. Because an economically viable unit requires at least two people and unmarried man may remain with a married brother, but one son usually stays with his parents. In these societies soon after the marriage of the eldest son when he (or sons collectively) begets the child the father hands over the undivided household property to him. However, he keeps a small part of the property for his old age. Further social ties among Ladakhis are developed through *Pha-spun*. The Ladakhi society is divided into named patrilineal *Pha-spun*. Every person inherits a *Pha-spun* affiliation from his or her father. *Pha-spun* is a Tibetan word which means a close brother-hood with-

in the village community, who though not necessarily related by blood; worship a common God (*Pha-lha*-father god). There are no structural groupings like caste, class or clan among the Bhutias of Lachen and Lachung. The individual households are related by unilateral consanguinal ties. The situation becomes more complex and relations overlap as the marriages within the society occur regularly. The Bhutia social structure is so adaptive and make such good use of ecological conditions where there is no need for competition, that households are integrated to form a community without any visible mediatory corporation or groups.

Communities living in seasonal environments organise themselves to accomplish their subsistence tasks. At times of peak work load, households are motivated to work in labour groups. They can thus, firstly complete urgent tasks and secondly, maximize labour efficiency for tasks which require the cooperation and pooled resources of many households. A group's social organization of social relations is an integral aspect of its adaptation to social as well as physical pressures in the habitat. The communities of cold deserts have employed different strategies to overcome the non-availability of labour. They shift their labour strategies with the change of season. Households alternate between family based labour and group based labour in response to seasonal shortages of time and manpower. There is great reliance on reciprocal labour exchange at times of urgent and intense labour activity.

In Bharmour, the life style of people bears the mark imprint of the ecological conditions of the place which brings into focus two distinct situations. The first is the limited nature of the resources and the second is the specific nature of agriculture and herding cycle. In months of summer, after their winter migration when they return to Bharmour, the agriculture season starts. The concentration of the most agricultural activities in the months from March to October produce a period of stress and strain for utilization of manpower. During this period every hand is needed to plant and reap the harvest. There is heavy demand

of labour but all hands are needed in their respective fields and no remuneration is sufficient to divert people from agriculture. Labour cannot be imported from the outside, as absence of markets and surplus prevented the immigration of labour into the area. There are no big landlords, so there is not enough cash to encourage the immigration of labour. The Gaddis have evolved two institutions to deal with this need for interdependence and to overcome the scarcity of paid labour. These institutions are co-operation between families and *Barton* (obligatory assistance).

Funerals, marriages and house building require participation of every household in a village. Each household that gives help at these times is said to have a *Barton* relationship with the household it assists. This help is always reciprocatory. Apart from the village *Barton* obligations which prevails in every village, there are certain other types of *Barton* obligations which people of one caste have for another. Under this obligation each caste group is expected to give certain standardized services to the families of other castes on the cash or kind basis. Each man works for a particular family or group of families, and he is said to have *Barton* relationship with his client's family.

The labour force is raised by means of an institution known as *Kwer*. Every family having a separate *chulah* for cooking has to send one person (male or female or child depending on the type of work involved) on the appointed day to the person or family that needs help. The labour force raised by *Kwer* institution is not paid for in cash. In return of their work they are provided with a free meal and free *Sur* (beer) in the evening after the work. The system of *Barton* reciprocal obligations among villagers forges strong links and ensures stable labour supply in case of need. *Barton* obligations often supersede kin obligations.

Occasional pastoral co-operation occur between families or relative (*Al* associates) is also common. A family with small number of animals makes arrangement with one of his *Al* associates for grazing.

The traditional polyandrous family of the Ladakhis was considered to be an ecological

structural unit adapted to the diversified ecosystem of agro-pastoralism. For making a living, Ladakhis manage the environment using all its human resources. The large family group could realize the idea of self-sufficiency and also that of security in the harsh environment. However, for the inherent need of co-operation, an extensive system of sharing resources throughout the village, called *Landge*, evolved so that the labour intensive activities such as sowing and harvesting can be completed without having to hire labourers. Another system called *Rares*, is prevalent, under which each family has to take it in turn all the animals of the village for herding for a day. In Ladakh, there is no pasture as such near the villages, steep slopes divided by sharp rock faces strewn with boulders, here and there a lump of tough, grey-green grass, few desert plants and grasses is all that animals can graze upon.

In Ladakh, further social ties are developed through the institutions of *Gyut*, *Pha-spun* and *Chospun* (ritual brotherhood). *Gyut* is an exogamous, patrilineal clan type of organization, the members of which consider themselves to be related by virtue of their descent from common ancestor. Regardless of explanatory myths, this clan type of thing is a land owning group. Its members offer help to each other at the time of marriage, conflicts and arranging feasts etc.

Larger than *Gyut* is *Pha-spun*. *Pha-spun* is a ceremonial brotherhood that has a common god and help each other in transition rituals, especially in death ceremonies. In case of death closest family members of the deceased are considered to be polluted and subjected to certain taboos. *Pha-spun* members help to take care of the elaborate ceremonies and disposal of the dead. *Pha-spun* is responsible for carrying out numerous ceremonies at the time of child birth, arrange betrothal and marriage ceremonies and funeral ceremonies. Further ties are expanded through *Chospun* (ritual brotherhood) wherein two friends or business partners come together to become brothers. This brotherhood is sanctified by *Gompa*. However, the inherent need for cooperation is less evident among Bhutias of Lachen and

Lachung, but in case of need, standing groups larger than the households yet smaller than the village are available. These are adhoc gatherings of relatives and friends impermanently united to assist person in whose interest the group carries out a defined job. Among Bhutias of Lachen and Lachung *Chuchi* the mutual aid group consists entirely of groups of neighbours, kinsmen related in one way or another to the person concerned. People from *Daro* (friendship group) also supplement labour in case of need. *Thogram* (the help extended by friends and neighbours at marriages, funerals etc.) is reciprocal. All families of the mutual aid group or friendship group are obliged to give each other gifts of food stuffs and personal labour at times of festivity or need. Help is needed at the time of house building or repairing, in the preparation and serving of large scale hospitality. They contribute money and grains to each other's hospitality expenses at times of marriage, birth, illness and death.

These types of neighbourhood based, helping networks are expressions of the social interdependence that can arise from a shared living environment. Mutual aid groups are the most visible and highly organized form of helping arrangements in these areas. It is important to note that these mutual aid groups are not based on kinship in general, but on residential and customary lines. Kins are special people, who can be relied upon but mutual aid groups are important in the working of these societies. The interrelation between social groups larger than the nuclear family and importance given to eating and drinking are similar among the three groups. Life in these areas necessitates relations beyond the limits of a village. All groups have bond brotherhood type of relations. These ties are not coincident with kinship, but which by virtue of reciprocal rights and duties have pseudokinship quality. This type of relationship can be contacted with any one, irrespective of age, social position, residence, caste or sex. Through this friendship a man endeavours to ensure that he has a potential support in most or all of the areas to which, in any part of the year he might wish to migrate. In an economic context these

ritual and special friends become preferential trading partners. This expansion of circle of kinsmen and fictive kinsmen may be seen as an effective adaptive mechanism to the harsh and rugged environment. Perhaps, the most important aspect of these relationships is that, these provide an institutionalized means of familizing a friendship between status equals or of bringing close together persons of high and low status. By virtually incorporating a non-relative into ones kin grouping one broadens its base of social help. In spite of the differences in ecology and ethnic origin between the three communities, all three probably represent the same form of social organisation and social net work.

The three cold desert communities still conform to age old system of community organization. Among Ladakhis *Goba* (headman), *Gatpas* (group of village elders) and members or *Ghansum* collectively, can be said to "run" the community affairs. They appoint *Larapa* (watchmen) to look after and develop village lands for agriculture and cattle breeding and to prevent stray animals from entering fields. Water use or irrigation facilities are looked after by *Churpan* who is selected by the village authorities. In this democratic form of government, the village council *Chogdus* select *Goba*. The village council consists of all the male heads of the separate households. Membership and affiliation in village council is founded on the formal recognition of both descent and residence rules (see Bhasin, 1997).

Correspondingly, Bhutias of Lachen and Lachung have their own local government organisation, *Dzumsha*, an assembly composed of the heads of the separate households. The system of autonomous governance by Bhutias of Lachen and Lachung is based on election held in two villages. *Dzumsha* elects two *Phipuns* (headmen) and two *Gyapons* who act as store keeper assistants. The body has jurisdiction over all aspects of Bhutia life. It is consulted by state government on development projects which can have positive or negative impact on all aspects of Bhutia culture (see Bhasin, 1993).

In Bharmour, *Panchayat* an elected village

body (judicial or executive) looks after the affairs of the village. In addition to its administrative activities, the *Panchayat* has judicial functions, but in practice the disputes are settled within the *Al* or *Gotra* by informal counselling by respected elders of the caste concerned. Social sanctions are imposed by caste *Panchayats*.

For the maintenance and continuance of socio-economic life, social kinship groups and temporary functional groups exist in these societies. These functional groups are formed and reformed for the proper functioning of the society during migration or performing other economic activities.

Although the three societies are partilineal, yet multifarious economic activities of family members let the family assumes a mother centreness with the children and some important decisions, falling to the sphere of the women intervention. Men are out for pastoral or herding duties, so the socialisation of children automatically becomes mother's business in the early years of their lives at least. But studies indicate that the position of women in such societies is not very high because the actual care of livestock and handling of economic affairs is entirely a male domain. However, in societies under study the women occupy an economically significant place which is reflected in generally high position and importance that they have. Yet the economic power of women in the household is not translated into corresponding community authority. They are not ignored at household level but are not given due credit and importance at official level (Bhasin, 1988, 1996).

Communities of cold deserts are greatly dependent on religion, rather it dominates their societies. As a matter of fact, their life is regulated by religious rhythm of village deities from household to district level. Though these areas are inhabited by different ethnic groups (in few cases professing separate religions) the evolution of these areas to its present form at each stage been regulated and expressed by a more or less unified religious system. In all the three areas before the advent of dominant religions (Hinduism among Gaddis; Buddhism and Islam among Ladakhis and Buddhism and

Hinduism among Sikkimese), it seems likely that the sort of animism still common in the areas comprised the whole of the religious tradition; but this tradition has proved, over the course of centuries, remarkably able to absorb into one synchronised whole. Thus today the village religious system of these areas commonly consists of a balanced integration of animistic and elements of great tradition prevalent in that area (Hinduism/Buddhism/Islam). Religious traditions of these people are made up of an extensive and intricate complex of spirit beliefs and a whole set of theories and practices of curing, sorcery and magic. These people worship in the hope that, "by the proper performance of religious action or observances they would obtain some specific benefit; health and long life, children to carry on their line, material well being rain, the growth of crop and multiplication of cattle ---- released by the extinction of personality from the round of reincarnation" (Radcliff Brown, 1952: 153).

The main function of religion in these societies is to help to cope with the problem of suffering and provide means for getting relief from the suffering. They perform curing and purification rites, and maintain similar beliefs about the supernatural and man's responsibility to it. The rites are held to produce a harmonious relationship between man and the supernatural. They also serve as social occasions where large number of people come together for conversation, drinking and general gaiety.

Feasts have special importance in these communities. A feast can be given in response to almost any occurrence one wishes to celebrate, ameliorate or sanctify. Birth, marriage, illness, death, house construction, house warming or starting off of important events, for carrying loans or any other matter. For each feast the emphasis is different. The mood changes somewhat, but the underlying structure of the ritual remains the same. There is always the special food, there is always incense and local beer. Communal feast symbolizes the mystic and social unity of those participating in it. Friends, neighbours, fellow workers, relatives, local spirits, dead ances-

tors and near forgotten gods all get bound, by virtue of their commensality into a defined social group pledged to mutual support and cooperation. These feasts form a kind of social universal joint together in a way which minimizes uncertainty, tension and conflict or at least it is supposed to do so.

Most feasts are held in the evening, just after the sun-set. If the occasion is other than death or birth, auspicious days are fixed. The day is spent in preparing the food. For a smaller feast, the women of household itself do this, for a bigger feast a wider range of kin may help. The people invited are all those who live in the neighbourhood whether relative or not, friend or not, who lives next door must come. They are called by a messenger of the host, only short time before the event. Despite the apparently haphazard procedure, almost every one turns up, as people are usually free and though no body has actually said about the event, everybody in the neighbourhood is aware of the coming event.

Population dynamics is embedded in cultural life. Family structures, marriage pattern, male and female roles, the division of labour between sexes and generation, and recognised pattern of social success has often turned out to be the important factors determining fertility. Where marriages follow extended negotiations, it was possible to delay the time of childbearing. But where marriage at puberty was traditional, this control was not possible. Societies have developed their own ways, and means to control the population. To achieve a sustainable pattern of resource use and population growth, technology, culture and values must be mediated.

It was seen that among the population groups of cold deserts, economic adaptations made by them are sufficient to maintain a stable population through time. Though the permanent and essential resources are protected and shared, the animals and land are owned privately. The stability of such groups through time can be maintained by balancing a equation between resources and human population. As the quantity and quality of pasture in an area set limits to the number of animals in a herd that can be supported in an area at a

given time. Similarly, the size of herd and other patterns of production and consumption can also set limits to the size of human population that can be maintained. But the equation is not so simple and straight, as it is not easy to keep the balance between human population and natural resources. These groups have adopted different methods to achieve this. Herding pattern, migration to different places where by animals and human population are dispersed or concentrated according to availability of resources. Apart from this they try to put effective control on human population by social processes. In the traditional Ladakhi society among Buddhists, there were several features like family structure, the marital system and the mode of inheritance which maintained population at surprisingly low level. Polyandry was limited to promogeniture precluding land fragmentation and assuring labour concentration in the family. The fraternal polyandry acts to reduce aggregate fertility. Brothers farmed their land in extended families in which a group of brothers ran the estate under the leadership of the eldest who was the prime inheritor. On the marriage of the eldest son, the estate passed on to him and some of his brothers who then worked it again in common. The original parents move out of the main house (*Khang-chan*) for a minor one (*Khang bu/ Khang chone*). In each generations the team of brothers married a single wife. There was, therefore only one marriage per generation on the estate. Goldstein named this as monomartial principle (Goldstein, 1971, 1976).

Another population controlling factor among Ladakhi Buddhists was monasticism. Traditionally, a second son born in the family was ordained to monasticism, implying a marked control on reproductive potential. Today, polyandrous marriages are becoming rare and since it is not a legal form of marriage, the cohabitation of brothers with a wife of one of them is purely informal arrangement of economic benefit. Moreover, the percentage of monks and nuns have also decreased, resulting in the increase of Buddhist population.

Bhutias of Lachen and Lachung with more

sons and limited resources went in for fraternal polyandry as the dominant form of marriage. Among Bhutias according to traditional inheritance laws, each male inherited equally. Consequently, the question arises as to why did younger brothers opt for fraternal polyandry. Many reasons are given like land conservation (the resources remained in the family) or as the Bhutias had mixed economy, the need for labour. One male would go with the herds, another could look after cultivation, the third could deal with the business. The most important reason was that the family could not arrange for the bride price for all the boys. Marriages in Bhutias are delayed because marriage is a financial problem for parents who loose their children's labour, have to finance their weddings and give them their share of property. All these factors helped in controlling population.

Among Gaddis, though there is no intentional strategy for controlling population growth, but their way of life has made it so. Little birth control is conscienceously practiced and female infanticide is rare. The low fertility rate can be explained by their habitat and transhumant way of life, which acts as an involuntary and prolonged abstinancy (Bhasin and Bhasin, 1993).

Culture is an adaptive strategy. It is devised according to the constraints and limitations posed by the environment. Changes have been introduced, especially with installation of the development programmes, among the three tribes. The primitive and conventional methods of agro-pastoral activities and operative techniques did not generate enough surplus except for local and to certain extent inner-regional trade-limited mostly to barter system. No society remains changeless it always changes because of self propelled forces. These changes may be technological, organisational or ideological. The three areas remained isolated and the contact with the outside world was minimal.

However, like most other tribes which have increasingly adapted to and adopted modern culture, technology and education, the Ladakhis, Gaddis and Bhutias still by and large zealously cling to their traditional mores. But this

does not mean that these people have not felt the thrust of development programmes at all. In substance, a comparison of the changes that have occurred in the three communities show that Bhutias and Ladakhis remained primarily in touch with the Tibetans and have only changed their life style in a limited economic sense. The situation of the Bhutias of Sikkim and Ladakhis of Ladakh is unlike that of other ethnic minorities and it does not conform to the usual pattern of integration into larger economic and political systems. Political events beyond their control have led to the transformation of their traditional economic system. Limiting factors operating in the subsistence economy of the region are elements of physical environment, socio-cultural environment and external factors. The opportunities as far as new government sponsored programmes are concerned, have been offered equally to three groups and the three groups have taken marginal advantages of new inputs. The Bhutias and Ladakhis placed as they are in the ecological setting where new inputs are not viable are obviously in a disadvantaged position. They accept hardships and discomfort as a natural way of things. Their main aim is to master the vagaries of environment not to alter or transform it. Their whole economy rests on the whims of environment, but they are confident that their traditional way of life helps in managing the environment for making a living.

Culture is an important instrument of development as well as an obstacle to development and cannot be assigned a subsidiary position as a mere promoter or an impediment to economic growth. Development and the economy are part of a people's culture. Unlike physical environment which cannot be improved upon, culture is the fountain of progress and creativity. In this sense the role of culture is constructive, constitutive and creative and development encompass cultural growth.

Governments cannot determine people's culture, but they can influence it by making policies for better or worse and thereby determine the path of development. Development is a phenomenon with strong intellectual and moral implication for individuals and communities. The values, symbols, rituals and institutions of a society affect economic divisions

and results; economic activities can undermine or reinforce various aspects of culture. Cultures are neither isolated nor static, but interact and evolve. Cultures cannot survive if the environment on which they depend for their existence deteriorates. Societies themselves create ways and means to protect and manage their resources. These procedures are rooted in cultural values that have to be taken into account of sustainable and equitable human development is to become a reality.

KEY WORDS Himalayas. Tribes. Castes. Ecology. Environment. Politics. Economy. Family. Religion.

ABSTRACT In India, cold deserts are arid tracts lying in the rain shadow areas of the main Himalayan range. In remote and inaccessible valleys these areas are specialised ecological niches. Adaptation to such harsh environment reflects success of human species. In high altitude areas biochemical, physiological and anatomical features of acclimatization become progressively more pronounced. Man-environment relationship is influenced by genetic make-up, socio-eco-sensitivity and cultural factors. The various high altitude populations are exposed to different degrees of stress, some of the stresses may be unique to each high altitude area. It is now clear that human beings can combine their bio-cultural capabilities to encounter environmental stresses. Some of these stresses are easily manageable by the socio-cultural factors while others are not. Cold deserts offer great cultural and social diversity as well as rich variety of social processes. Cold deserts are inhabited by distinct people having a distinct language, special social and political institutions as well as traditions art forms, religious practices and cultural values. These areas remained isolated and lagged behind in social and economic progress. In the present study an attempt is made to report three areas namely Bharmour tehsil of Chamba District, Himachal Pradesh; Lachen and Lachung of North Sikkim and Ladakh region of Jammu and Kashmir inhabited by Gaddis; Bhutias and Buddhist and Muslim groups, respectively.

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