

Prospects for Development in the Far Western Hills of Nepal**

(a case study of Mugu District)

— Sharad Sharma★

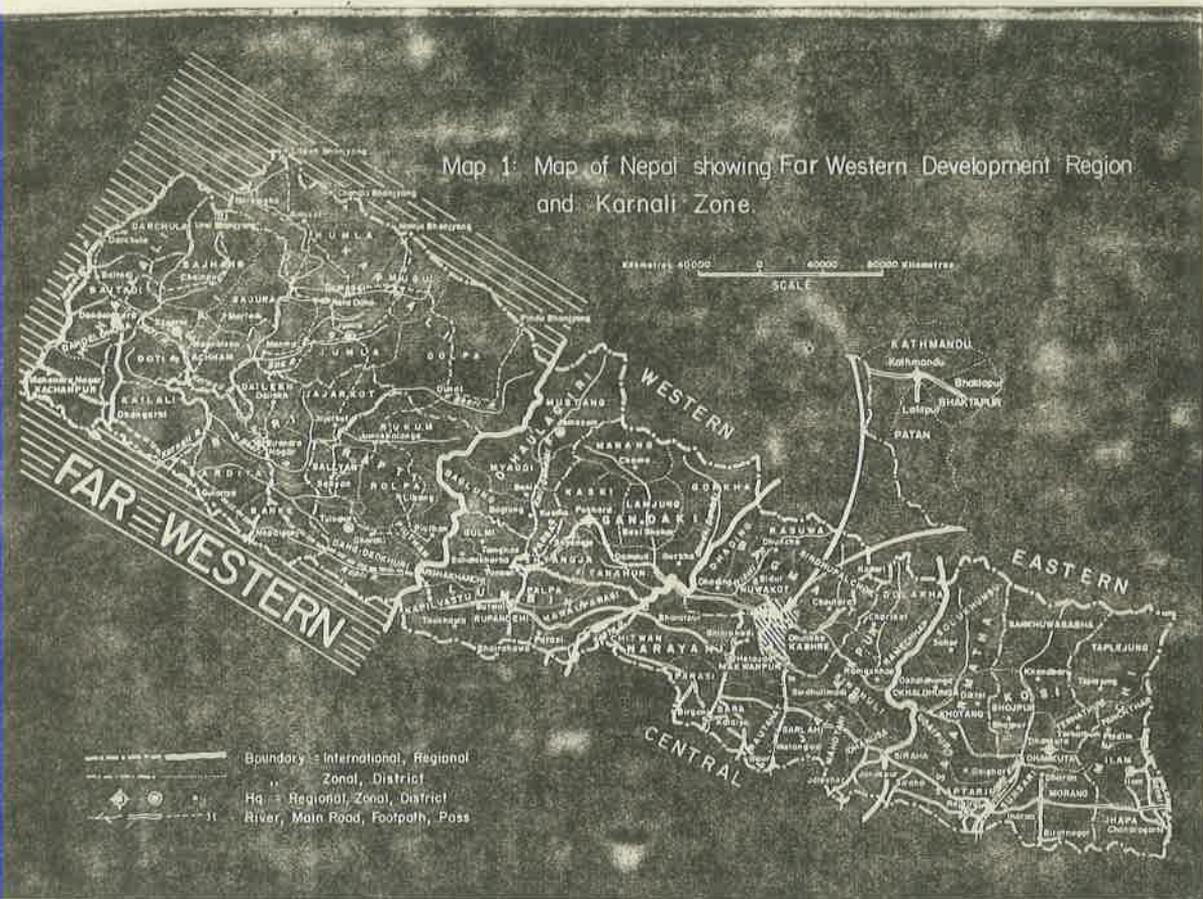
INTRODUCTION

Far Western Development Region (56413 sq. km.) which covers 38% of Nepal has only 14.2% plain area and the rest is hills. Out of 24 districts in the hills of this Region, the Karnali Zone (table: 1) consisting of 5 Districts has become the largest Zone among the six Zones in the Region as well as in the whole kingdom of Nepal (Map: 1). Karnali Zone is also one of the four Zones in the kingdom which do not touch their administrative boundries with India. This Zone consisting of Jumla, Humla, Kalikot, Dolpa and Mugu all mountainous, remote and isolated has its boundries mostly traced by show capped mountains and showfed rivers. As there is a market difference in terms of physical landscape and cultural heritage both between the North and the South Resions of the country, Karnali zone falling under the mountaineous and hilly regions is therefore having the cultural heritage of the hills which infact is very different from those found in other hill areas of the country. The Hindus and Buddhist aae found in the settlements. These two groupf have direct contact with each other. But Gurungs, Magars, and Rais normally found in the high altitude mountaineous Region are completely absent in this Zode. But however, direct contact between Hindu and Buddhist group has brought some aculturation through time. Mugu district (Map: 2) which was

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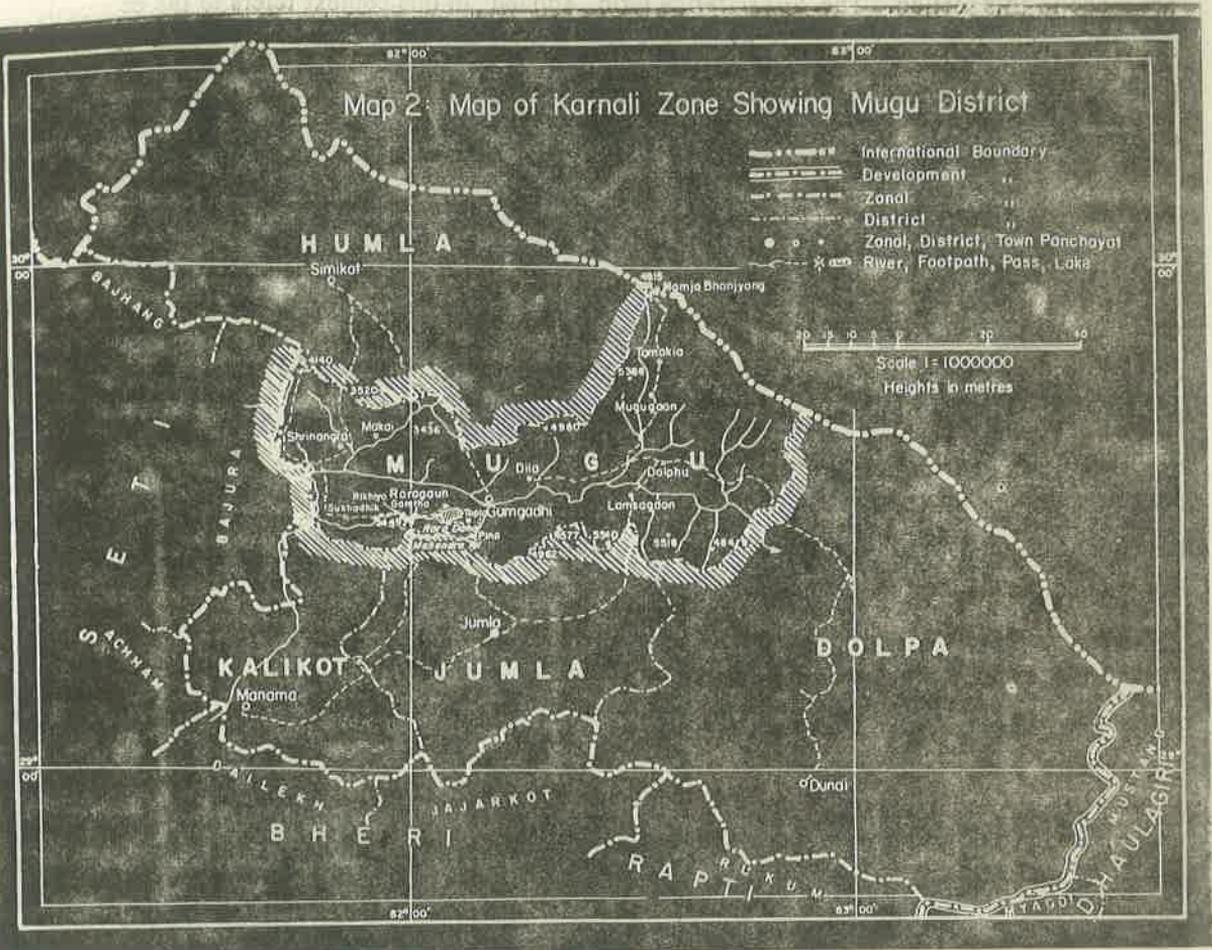
Map 1: Map of Nepal showing Far Western Development Region and Karnali Zone.



until recently governed by the Jumla administration was annexed to the Kingdom of Nepal in the beginning of winter in 1789 A. D. This research work was done in this district mainly in the spirit of understanding the realities in the sphere of economic and social activities which will hopefully help for future programmes for development in the area. The basic purpose of this study was to identify the existing economic and social practices in the area so that some useful conclusions could be derived for useful planning for the isolated and deprived population of the region.

My approach has been primarily based on my own impressions of the area. Besides field survey in selected areas as well as some case studies were also done to collect quantitative data and to interpret the results qualitatively.

This paper has been divided into eight parts. The first part highlights the subsistence



economy and society of the area; second and third parts deal with primary and the secondary sources of living in the area where part four throws some light in the infrastructure and social service situation in the area; attempts have been made to explore some potentials for tourism development in the area in part five; natural environment and the administration for development are discussed in part six and seven respectively and the conclusions are stated in the last part.

I. SUBSISTENCE ECONOMY AND THE SOCIAL CONDITIONS:

Description and analysis of the existing system of the economy along with the primary source of income, viewed in terms of social and economic framework within the area

are made in this section. The *Subsistence* term applied in this context refers to the economic activities primarily associated with the means of livelihood and a small scale inter-regional, intraregional barter trade and some international trade playing crucial role to sustain the more or less self-contained economy and society of Mugu district.

Economic Setting:

With the totality of agricultural industrial, infra-structural and social system operating within the broad framework of the ecological balance of the Karnali zone, the Mugu district can be considered as a microcosm of the area. Since the long past, the peasant population has been engaged in exploiting the available resources and therefore contributing to the changes in the resource base of the area. The primary means of livelihood is agriculture. The peasant culture has been able to adjust itself with different natural environment to fulfill the basic requirements for its livelihood. But agriculture, however, can not be completely separated from animal husbandry and small scale trade, and some industrial activities. Manpower and other resources used to earn the subsistence living is concentrated for each particular seasonal activities in a year. Other activities are however temporary and limited to a specific period of time.

In the context of Mugu as in the context of the whole Karnali Region, the movement of the people every year during a specific period of time is very common. However, it is subject to manpower requirement in the household in any particular season. The movement of goods, people, and animals reflects the seasonal household need of the peasant families and their climatic adjustments in the area. It is through this seasonal movement a Mugu subsistence peasant household is capable of fulfilling its seasonal requirement of household needs.

In the farming season starting from the end of March to the beginning of November peasants are mostly engaged in their farm activities. Therefore outmigration does not normally occur in this season. However, some other practices such as food exchange for salt with Tibet Region of China for the yearly requirement, animals taken to the upland pastures for grazing, collection of medicinal herbs also continue during this period. During the peak season in the field, reciprocal labour and hired labour are also used by households where family labour force is insufficient. The time bound situation is much more severe in those areas where rice is planted after Barley, therefore, following the plantation of another crop instantly after one is harvested. This makes the total yield more despite the fact that it is hard to judge about the

efficiency involved in the allocation of optimum time period for each crop planted.

From early November through the middle of March heavy outmigration takes place to the districts of South and to India. This period is mainly spent in trading activities. Animals are taken to the South by families living in high altitudes. Young members from relatively poorer families go to the Tarai and Kumaon and Garo districts of India to work manually in the construction of timber industries. Those who go to Nepalganj town and Surkhet valley work in the construction of buildings and roads. At the end of the season majority of the outmigrated young population returns with the purchase such as readymade cloths, cooking utensils, kerosene and other household goods. Some of them remain for more than a year in those areas and return with some cash at hand. Generally, inspite of the heavy input of labour the yield of cereals, beans, vegetables and fruits is meagre, even insufficient to support a household. Therefore, the farm income is supplemented by raising forest products, trading animals and animals products and employment outside. Absence of improve agricultural inputs and systematic rotation of crops also are the reasons for low yield.

Keeping bee-hives for honey, collecting and trading of medicinal herbs for sale to the South, exchange of grains for potatoes between low and high elevation and exchange of grain for salt and wool between Mugu district and Tibetan region of China are the major pillars of the trading network.

Social setting

The close economic interaction in farm activities among households is not followed parallaly in the sphere of social activities in the area. The dependency relationship between low and high caste people is based on traditional predominant caste hierachy system. As found normally in other hill areas of the kingdom, the wealthier peasants are generally upper caste group who own dispropotionate area of cultivated land and other economic assets.

Although, the villages are having Panchayat organizations, the traditional or conventional committees still exist and are influential i.e. a number of day to day decision making. Some examples are traditional system of dividing pasture grazing land among peasants themselves, allocating irrigation water for each paddy land belonging to different individuals, and receiving guests travellers in villages.

Traditional social practices include a variety of role played by the healers (Dhami, Shankris). Traditionally, they were performing even the judicial functions autonomously of their own in intra community as well as household land disputes. Religious and conventional ceremonies at present are performed in the presence and under the direction of these healers. Besides, these people are also regarded as prophesiers in many instances such as whether, crop yield, and other natural events.

The status of woman is generally considered inferior to that of man. Mostly, the decisions regarding household affairs go to men.

Child marriage and polygamy are commonly practiced. Breaking marriage ties is also frequently done and adultery is normal. Violation of marriage ties and social beliefs regarding a wife's boundary of chastity are easily transferred by paying a certain amount of money as "Jari" (a compensation) by the male abductor. This is common and in some cases up to five or six times the abductor's marriage reaches.

The first marriage, the birth of a son, and the annual festival are celebrated with great rejoicing. These Hindu religious practices are events which release the population for an eventual resting period from the hardship of seasonal labourious farm and household activities.

II. AGRICULTURAL PRACTICES AS THE PRIMARY SOURCE OF SUBSISTENCE

Except the upper part of Mugu District where soil contains very low fertility and the climate is very cold, the rest of the district population earns its livelihood from mixed agricultural practices. The principal crops grown (Table 2) are paddy, wheat, maize, barley, buckwheat and potatoes depending upon the altitude (Table 3). Cotton growing is scattered in the lower reaches of Mugu Karnali river. Oats are primarily grown for exchange with Tibetan salt. A number of other crops such as beans, mustard, soyabean and vegetables are also grown. Each household has a small kitchen garden where ginger, chilli, garlic and onion are grown along with vegetables such as tomato and a kind of radish called Choto in the area. Citrus fruits are grown in the river belts. Apples and walnuts are other major fruits of the area.

The average land holding is very small, mostly of 1-5 ropanis. Except those landless, the cultivators are the owner tillers. Although the mountaineous areas are uniform food deficit areas, however, there are also areas with surplus food grain production. The oldest paddy growing practices in Karnali, as legend says, was introduced more than 5 hundred years ago from Kashmir. Now the peasants are constantly trying to increase the land area used for paddy

cultivation despite the fact that rocky slopes and lack of irrigation facilities have limited the production of paddy. In some instances paddy is grown even up to 3,000 meters where the alluvial soil is found.

High fragmentation of landholding (Table 4) has increasingly been the obstacle for the efficient use of agricultural inputs. Peasants are aware of the problems associated with this but seem unable to find any solution within their own social system. It was observed that there is a great chance for negative correlation between the number of plots and the use of manure and labour. The distance decay factor seems to be operating in input-yield relationship in agricultural production.

A number of different kinds of animals are kept by the households. Yaks and sheep above 3,000 meters mostly in the eastern part of the district whereas below this the cross breed of yak and cows, buffalo and horses are husbanded. The animals serve peasant household providing means of transportation, planting, fertilizer and dairy products. Yak tails are traded.

In the absence of chemical fertilizer, livestock manure plays important role in agriculture, by recycling the organic matters needed to maintain soil fertility. Sheep and cattles are subject to annual migration to high pasture and to lower elevation in summer and winter respectively. Kind and the number of animals kept by the household varies considerably within the district and also from one household to another. Large sheep and goat farm are found mainly in those households engaged in trading activities. Farm size, family size and the availability of pasture land have also influence the number and size of the livestock (Table 5). Almost all peasant households have pasture land in the high altitude. In Mugu village the whole population of sheep follow a nomadic life cycle. In some villages overgrazing was observed although some pasture areas were found still controlled and regulated by local traditional headasmen. Sheep and goats play invaluable role in the local economy by supplying raw materials for industry and serving as an important means of transportation particularly when salt trade takes place in the northern area. But the lactation period was found short and the yield not more than 1.5 kg of milk from cow and 2.2 kg from the buffalo until six months from carving.

The constituents of the existing technology in agriculture are wood-tipped plough and a very few iron-tipped plough, digging tools and sackles. Researcher's observation and the information collected have revealed that in the whole Mugu district, probably with few exceptional cases, lack of sufficient iron and the weak strength of the bullock are some of the reasons

put forward by the local people for not using iron tipped plough. But it seems that the use of wood tipped plough is traditional and does not change easily in spite of the fact that a peasant farmer may destroy half a dozen wood tipped plough in a week ploughing rocky soil of his farm. Systematic and widespread distribution of improved seed is lacking, where distributed the success has been remarkable.

Various kinds of vegetables which can be grown are not grown because of the Peasants perception of lack of marketing facilities and low knowledge about growing these crops.

Where irrigation facilities exist, peasant farmers have the general tendency to overirrigate the field.

The Karnali sheep farm established in 1972, however, is successful but the activities are very limited. The Jumla horticultural farms established in 1967 suffers from lack of adequate staff and is not able to extend its services to the peasants of Mugu.

However, potentials exist for the improvement in the existing agricultural technology.

Although, there are some arguments against the increase in cereal grain production in the area that—high transport cost of fertilizer limit the use of science in food grain production, that the results of experiments of improved varieties of good grain are not generally transferable to the hill—(these arguments are also consistent with the HMG policy for development of agriculture through specialization). But the necessity of growing more food in the area does not arise from the need for specialization but from reducing the problem of food scarcity.

With limited efforts at the lower cost, food grain production can be increased well above the existing level. It involves inputs such as—Trial of improved variety of foodgrain, experiment in rotation practices and chemical and bacterial tests.

Change in the existing agricultural technology should also involve pit digging because it was observed that most of the animal manure and plant residue mixed together are taken to the field before they are fully decomposed.

— The local resistance to change seems very dominant for altering the agricultural tools and implements unless new tools are less expensive and very easily available and match with the

bullock strength as perceived by the peasant farmers.

- The technology of carrying ripe cereal grain also involves loss of foodgrain since the grains have loose adherence to their stalk. Alternatives should be carefully examined.
- Potential for irrigation exists but minor repair of canal heads and distribution lines are needed. The traditional aqueducts should be repaired and maintained efficiently.
- Since vegetable growing can supply a number of nutrients replacing need for large consumption of cereal grains, this practice should be intensified.
- Fruits development is also possible but the technical help is lacking. However in the absence of technical studies done earlier, recommendations may not be easily acceptable. However, it will not be much to say here that the fruits grown in terrace bund and waste land will not compete for scarce land and labour and therefore can be fitted with the existing agricultural practices with minimum technology constraints. Export of dried and processed fruits have chances to expand in the area.
- Technical studies on the optimum ratio between the size of pasture land and the stock of animals should be made as soon as possible.
- Mobile health service may provide veterinary services to the animals which follow the nomadic pattern.
- Poultry and pig farming should be encouraged for the promotion of health and increase the cash income of the farmers.
- Although bee-keeping in the area practised mainly in unichambered hollow tree trunks is very unorganized and underdeveloped, potential exists for its development. Constraints such as competition for land scarce labour requirement both are absent in bee-keeping practice. Slight change in the technique and replacement of hollow tree trunks by modified bee-hive will make possible the production of pure quality and vegetarian honey. Demand for honey is increasing rapidly in the area.
- Some of the immediate steps needed are-introduction of low cost beehives to modify the present system; introduction of hill variety of bees from outside, particularly the queen; change in the existing practice of processing honey; supply of bee keeping tools and the transmission of knowledge and technique to maintain high quality bees.

III SECONDARY SOURCES OF SUBSISTENCE LIVING

As regards the secondary sources of subsistence living the manufacturing and trading activities are important in the area.

However, the industrial activities are generally limited to household needs. Major items produced are woolen and cotton carpets and clothes manufactured with almost uniform design and primitive technology. Woolen knitted goods such as blankets, sweaters, jackets and mufflers, the bamboo products such as baskets, raincoats, and various containers are manufactured. Factors which determine the level of home industrial activities are household needs, traditional occupation, market facilities and the availability of raw materials. Those households producing surplus agricultural commodities are less engaged in industrial activities partly because of their time during the year is spent in the field and partly because they are able to exchange their surplus foodgrain for other household needs (Table: 6).

The inhabitants of Mugu and Karanali villages since they receive very low agricultural production mainly from potatoes, are engaged in trading woolen goods, and leather sole boots suitable for mountain climbs. Woolen goods are sold to the villagers and traded in Nepal-ganj and India.

Trading Activities

According to household survey few people in the sample case study areas earn their livelihood from government employment and wage labour.

The most popular mercandizing items are sugar, tea, spices, cooking oil, cooking utensils, cloths, cigarettes, matches etc. There are only two shops in Mugu, two in Rara and one each in Gamtha and Rikhiya Panchayats. All are retail shops receiving most of their goods from Jumla stockist and occasionally from Nepaiganj.

An organized market system is virtually non-existing in Mugu district as well as in the whole Karnali zone compared to the eastern hills of Nepal.

Relatively the largest town of Karnali Zone, the Jumla Khalanga bazar on the upper valley of Tila river also does not serve as an organized nucleus market. Khalanga was originally developed for administrative purpose since the old Malla dynasty to cover the 18 Daras the administrative division of the region. Between 100 and 150 years ago the Newars serving as civil servants during their long stay started shops in Khalanga which helped them to establish

market centre for customers coming from surrounding villages. Mostly the clientele were government officials and army posted there.

In the following years the native Brahmans, Chhetris and Thakuris of the area also started shops. The annual average sale of goods for 1978 in Jumla Khalanga amounted to 23 thousand rupees for 18 Kirana shops and 35,500 rupees for two cloth shops (Table: 7),

At present there are 28 commercial establishments in Jumla selling 250-300 items. A small *haat* type market also has recently emerged in the open courtyard of Jumla Khalanga. Most of these shopkeepers came from surrounding villages. Still now Jumla bazar is primarily serving the government officials and the population of nearby villages. Edible oil, rice, and kerosene are rationed by the Nepal Food Corporation giving first priority to the government officials. The local population has not been much active in developing market partly because goods are very expensive mainly due to transport cost which is normally Rs. 130 for 40 kg of goods from Nepalganj. To fulfill their domestic requirements, the household member who goes to work in the plains in winter when they return back bring cloth and other necessary goods.

- Majority of peasants are engaged in processing of animal and agricultural produce and the forest product to sell them in the Terai. Selling of ghee, vegetables and fresh fruits at the administrative headquarter and the main trails give supplementary income to peasant farmers. Medicinal herbs collected are sold to Indian drug industries almost unprocessed, other trading activities include horse raising also (Table: 8).
- Barter trade between household is common depending upon the demand and supply as well as means to transport and the distance to be covered. Deficit months are generally after the harvest of barley and wheat (March to June) and from September and October before the summer crops are harvested. The most usual way to solve the problem of foodgrain shortage is to borrow foodgrain against the advanced payment of labour or cash.
- Skilled manpower seems to be available but the technology used in producing handicrafts is very primitive, for example to manufacture one Radi the local technicians have to undergo 7 different stages of processing and knitting which is very time consuming and resource intensive. Mugu village has prospects for cottage industries.
- Among the industrial activities flour mills run by streams is a significant possibility.
- The wastage of timber when constructing a house encourages the possibility of establishing

small saw mills where viable. The net saving potential for huge quantity of timber should be far more greater than the cost incurred in the establishment of such mills.

- Forest based industries such as soap and paper, exploitation of mineral resources such as Silajit, and copper mine (in Tihar Panchayat), iron (in Rugha Panchayat) and Fatkiri (in Pina Panchayat) should be examined in detail.
- Marketing channels may be established through haat bazar also.

IV INFRASTRUCTURE AND SOCIAL SERVICES

The nearest roadhead is 291 kilometers from the district in the South at Surkhet. The East-West Highway has only been the road connection between Far West and other Development Regions of Nepal.

Even within the district boundry, snowing in winter restricts the movement of people, animals and flow of goods. Forested slopes and the high passes are inaccessible and difficult for human and animal travel. In summer season, floods and monsoon rain also restrict travel. The bridges on the trail of the primitive style are difficult and risky to cross with help of few wooden planks installed and straw ropes serving for the iron-wires. Very often bridges are washed away by heavy floods leaving many villages without any communication with the district and zonal headquarters for weeks or even months.

The most common means of transportation other than sheep are horses and mules in the district as used throughout the Karnali.

But, for the transportation of goods and the people, one has to go to Jumla which is 51 kilometers from Gambadi. Recent attempt to transport goods by stol plane service from Nepalganj to Jumla has not been reliable of weather reasons. Usually, transportation of goods is done through the most common porterage route which normally takes 10 to 12 days a porter to carry 30 kg of goods from Nepalganj to Jumla and 3 days from Jumla to Gamgadi.

Since last 10 years, the restrictions, imposed by the Chinese Government in the traditional trade of Mugu and Jumla district with its Tibet region has been another reason for declining trade practices of the district. The traders mainly the Bhote group from Mugu village mostly engaged in such trade have to travel for 12 to 15 days from Mugu to Nepalganj along the main trail to sell medicinal herbs and travel about 1100 kilometers across the Indian Border

to Darjeeling district of West Bengal to buy tea, leather goods, Tibetan Jackets and other Chinese woolen goods for trade.

General Situation

Nutritional and health deficiencies are growing in the district. Continuous growth of population, major deficiencies in diet, and the lack of adult education are responsible for the rapidly deteriorating social condition of the area.

Health

The protein diet has been constrained by the cast taboos and superstitions. Eating of goat, sheep and poultry meat is done only on special occasions. The major diet components are rice or the bread made of wheat and barley flour. Consumption of large quantity of chillis and spices has resulted sickness among several household members as ulcer and other related diseases. Due to the lack of iodine component in the unmedicated Indian as well as Tibetan salt, goiter is widespread.

Although yaks are many in the Mugu village, they are never milked. Sheep ewes are also never milked. They are used as pack animals.

Family planning has not virtually reached the area. The whole group of children are often found suffering from child diseases making some of them crippled for the whole life. The kind of diseases prevalent in the district includes low order infections, respiratory diseases, cold and fever, tuberculosis etc. Communicable disease like whopping cough, injuries and accidents are caused by mishandling of tools, and burns are frequent.

Until 1970, the whole Karnali zone was almost without medical treatment. At present there are only three health posts in the district. One at Mugu, one at Dhain and one at the district headquarters Gamgadi. Besides, there is a small Ayurvedic health post. Although, there is one fifteen bed hospital established in 1971 in Jumla which is 51 k.m. from Gamgadi, the peasant villagers are always facing shortage of medicine. In the three district health post, lack of trained medical assistants and shortage of medicine are the everpresent constraints. The stationed medical personnel have also become frustrated when realizing their inability to provide adequate service to the population. The faith on health services provided by the government is decreasing (Table: 9).

There is no medical store in Jumla, under these miserable conditions, the decisions

made to go to the traditional A yurvedic Vidyas, coumpounders, and healers by the sick peasant seem very sensible. Since it appears at present that there is no opt-out for this (Table: 10).

Population and the Living Conditions

People's condition of the Mugu district is more or less a microcosm of the situation of the whole Karnali zone,

Due to the high mortality rate among children, the probability of a child to survive childhood is more or less 50 per cent. Therefore wives must have many children which is conditioned by the need for more manpower required to meet the seasonal labour requirement in the household from activities.

Even if the child mortality rate is reduced drastically with the aid of adequate and timely health services, the chance to get enough success in establishing the feelings and inclination towards family planning practices in the mind of the people seem very poor at the present situation unless agriculture is made specialized and requiring less labour. Interviews with the local people in the case study areas revealed that there were neither any cases using contraceptives nor any case of operation. Where family planning practices were found, the follow-up rate was below 5 percent.

Houses are very unhygienic and dirty. They serve both human and animal living which is unhygienic for both. Generally, the houses are dark, very ill-ventilated and smoky inside. The burning of raisinsoaked pine wood in the house for cooking and light produces eye infections and respiratory diseases. Since the skin moisture is higher than the environmental moisture content, the skin moisture evaporates from human bodies. Besides, the ultra-violet unfiltered sun rays directly affect the human bodies and the exposed parts of the human body become dark. Random disposal of animal and human waste causes the growth of flies and other pests.

Traditional Values and Beliefs

Deeply interwoven in the socio-political situation of the area, many kinds of traditions, beliefs, customs, attitudes and practices are found in the district which should be properly investigated and studied by sociologists. Most of the traditions and practices are interwoven with the religious aspect of the cultural life led by people. Orthodoxy and traditionalism rule

the social practices. Political history of the area, and the remote insolation from the the rest of the culture of the country may also be partly responsible for the uniqueness of this area. The pre-dominance of local healers in the villages has made loss of animal property of the villagers. Often animal sacrifice is done in the belief of curing a sick person (Table: 9 & 10). Besides, longer delays in treatment by the healers has also caused loss of life of sick people. Since most of the households and farm operations are subject to the directions of the healers, the agricultural practices are unscientific and result in low farm yield. The social pressure of celebrating religious days often hampers other worker, and involves unproductive expenditure. The common practice is that traditionally the healers are empowered to decide upon the cases in their villages, and the dispute will not be final until both parties agree with the decision given. This also involves loss of time and produces social hardship to the villagers. There are many healers (Dhamis) in each village totalling about 800 Dhamis in the total 99 villages of Mugu district. Only in Sri Nagar and Tharpu villages there are 27 Dhamis.

The role of healers was not just confined to treatment to diseasee but also in settling disputes over land buying and selling. A group of Brahmins in the ancient fuedal system was enjoying as priestly class without performing agricultural tasks.

Even a well organized effort to change the established traditional practices seems to take a long time.

Education

Although, campaign of education were launched in the district since 1951, the present educational level is extremely low: compared to the rest of the nation, literacy rate calculated in a few districts in Karnali zone in 1975 shows: Jumla 7.2 p.c., Mugu 6.5, Kalikot 7.7 p.c. and Karnali zone as a whole 7.1 p.c. It is a very low rate compared to the national average of 19 percent.

Literates, as it was presumed, tend to be the high caste people. Women literacy is less than one per thousand in the district. There is one vocational High School at Gamgadi and a few primary and the lower secondary schools in the district.

There is one Balmandir at Gamgadi where pre-primary school education is given to about 10-15 children.

Seasonal absences in school often occur when child labour is required by the

household for farm work. Dropout rate is more than 50 percent at the primary school level. Schools often lack trained teachers. Despite a number of holidays given, the attendance rate is very poor. The school buildings are also severely inadequate in their physical conditions.

Improvement in Transport System

Since the area does not seem to be developed on its own, supports of necessary inputs are required. It is expensive and not very justifiable to construct road in area without any proper assurance of its economical use and proper maintenance in the future. But, however, a modest increase in the communication facilities as well as improvement in the existing mode of transport is undoubtedly necessary.

Until 1974, the whole area was isolated from the air transport. The scheduled flight to Jumla started in 1971 both from Kathmandu and Nepalganj. Now the actual run way is 500 meters wide and located at the altitude of 750 feet above the sea level. There is always excess capacity in the airbus which can carry 1700 kg within the allowable limit. According to the Royal Nepal Airline Corporation, the Jumla-Kathmandu and Jumla Nepalganj flights are paying only 57.7 and 78.2 percent of the cost incurred. The organization is facing a loss of more than 200 thousand a year. The income from charter flight to the same location, however, is covering the loss.

Air transport should be made more efficient for timely supply of medicine for human treatment as well as for animal vaccination, for the supply of fruit tree saplings, vegetable seeds and materials for pasture development, for, the provision of rural development with maximum dependence on outside support also need certain initial assistance.

Improvement in Social Services

Health

Sufficient scope lies in the treatment of the prevalent diseases and prevention of other possible diseases. At present, preventive programme is completely lacking where curative measures are extremely inadequate. The immediate step should be concentrated in the reduction of infant mortality, worm infection, better and increasing level of child nutrition and expansion of the curative service to the local people.

Slow improvement in housing and living conditions should be emphasized. This should include enlargement of windows and changes in roofing for improvement in ventilation

and more comfortable and more spacy room inside the house. But any change introduced should be based on the level of adoptiveness on the part of peasant farmers.

The hospital at Jumla should be supplied with medicines directly effective to wipe out the existing diseases. The staff situation should be improved by attracting more devoted middle level health personal. A model health clinic consistent with the national health norm of providing **minimum health service to maximum number of people** can help regular dependable health service to the population. This extension of mobile health clinic should include curative measures but emphasis should be given to preventive measures as much as possible.

Iodization of salt imported from India is being done on the national scale. Salt imported from Tibet should also be iodized to make Goiter control compaign more effective.

The above mentioned measures in fact, do not necessarily require highly sophisticated level of medical manpower and huge amount of resources. Selected, voluntary minded and dedicated middle level medical manpower with timely guidance and supervision can give encouraging results.

Education

It seems reasonable to suggest that a uniform type of school building design be prepared for the whole area with some flexibility in materials to be used depending upon the resources available in a particular area. Ventilation and roofing structure should be improved. Necessary furniture for school children, visual aid for teaching should be supplied initially by the authorities concerned. Followo-up should include the necessary instruction to the care taker of the school in repairing furnitures when they are broken. They should also be adviced on keeping intact the visual aids protected from vandalism. A more disciplined school management is needed.

Other Improvements

Along with the supply of safe water to communities and also near school buildings, introduction of appropriate technology viable in the hills also can generate electricity in the area. To the large scale operation, the cost per unit generally has inverse relation with the scale of production. But, due to low level electricity consumption, such relationships do not require huge installations. A simple 50-60 kilowatt electricity generating plant operating through small streams with adequate yearly flow can viably supply sufficient electricity for two to three settle-

ments in the area. Moreover, the minimum access principle to the rural poor makes such arrangements as equally justifiable as the installation of huge electricity plant in the urban centres. The same principle seems to have been applied in Jumla electricity project (the cost of 60 hundred thousand for 150 k.w. electricity production with a return rate of only 4 percent) despite long delay in the implementation of this project.

V PROSPECTS FOR TOURISM DEVELOPMENT

Mugu district with its lake **Rara**, several major Himalayan peaks, the culture of Tibetan life in Mugu village and several flora and fauna holds a good prospect for tourism development.

- Situated at an altitude of about 3050 meters above the sea level with its area of 10.6 kilometers Rara is the largest lake in the kingdom. A recently made survey has found that its depth is 165 meters. Blue pine, deodar and other forest species have contributed to maintain the green scenery in the lake area. The water in the lake has a clean blue colour. The alpine pasture at the height of the surrounding hills are the best places for watching of the birds. The wind starts blowing in the afternoon which reflects the subtle variation of colour in the lake water.
- Mugu village situated at an altitude of about 3811 meters is on the left bank of Mugu Karnali river. This village has inhabited the people of Tibetan origin. This village is the most densely populated village in the district, surrounded by Sise Himalayan range in the north and Chhaya Nath mountain peaks. This village is a part of the western extension of Terchha Bhot region.

Besides these places the culture, the tradition and the customs of the district people themselves represent their unique identity to the travellers.

On the basis of researcher's observation, discussion during field survey and information collected from tourists the study area can reasonably be said to be a tourist centre.

- At present there is a small air strip on the south west bank of Rara where a pilatus porter can land. There is no facility of air transport other than this to reach the lake from Jumla. Observation have also shown that direct access to Rara from Kathmandu will not contribute to the regional income distribution. Many of the tourist who had visited Rara also have recommended a trek starting from Jumla Khalanga to Rara. Although the natural attraction

for the two days trek from Khalanga to Rara may not be overestimated compared to other Western and Eastern trekking areas of Nepal, the importance for a tourist to be in the Karnali Zone as a trekker is not to be compared only with the natural beauty which is also found elsewhere, but also with relatively untouched natural environment, and relatively unexposed social and cultural practices in that remote roadless Karnali Region.

- The growth of tourism in the area its contribution to the regional income distribution should depend upon.
 - a. Arrangement of food and accommodation.
 - b. Provision of portorage and local guide services.
 - c. Availability of improved quality of handicrafts for sale.
 - d. Frequent an service to Jumla from the capital and other places and the encouragement to less organized tourist trip to the area.
 - e. Maximum local participation in providing the above facilities to the tourists.
 - f. Special care of the wastages to avoid polution in the area.

At present, the income earned by the local population from tourist visit is very small. (Table 12). The possibility that local animals can be used for transporthtion and portorage has not been explored so far despite the fact that this possibility continues to exist. The present situation in the context of the above points indicate the following realities:

- The locally produced handicrafts are not of higher quality and often lack a good design. Therefore the demand for them is not high.
- A systematic approach to help tourist in understanding the local culture and traditions and very interesting religious ceremonies has not yet developed.
- The trails and bridges need repair, resting places are almost non-existing between short intervals. And also it is hard to get food and accommodation very easily in the area. In a long internal of a day or more the trekker is able to be supplied with a cup of tea and some food which is often staple.

Despite this, increasing number of tourists have registered their interest in visiting the area (Table 11 & 12). The number of tourist going to the area in undoubtedly encouraging.

For the development of tourism industry in the area consideration should be made of a number of physical difficulties a tourist has to face during his trek. However, there is sufficient scope for organizing activities which help promote the growth of tourism development as well as the overall development of the area.

VI NATURAL ENVIRONMENT IN THE STUDY AREA

Because of the high moisture content the broad leaved species are found in the area. The southern aspect is so dry that the conifer, the extreme dry vegetation is also absent. In the northern aspect high evaporation is just suitable for conifer mainly the blue pine. The maximum humidity recorded were 78-79% at 8.40 AM and 31% at 5.30 PM in August 1971.

It is the general rule of vegetation that khair, sisoo, and populus are found between 6000' and 10000' above the sea level and silver fir is found above 9000'. But in the study area blue pine is also available even up to 11500'. The area is such that humidity is very low with high evaporation which makes blue pine to be dominant, therefore complicating the general rule of vegetation. There is an excellent continuous belt of species in the area. Spruce is found in plenty and fir is not commercially available, yellow rhododendron is found upto 13500' and white rhododendron upto 12500'.

Mammal species in the area include wild boar, bear, musk deer, porcupine, lesser panda and some leopard. Jackals are mostly found below 10,000'.

Although the peasant household has lived in harmony with the existing natural environment of the area, the increasing needs and subsequent further exploitation of natural resources have resulted the disruption in the natural environment in several ways. For the human use, animal fodder, fuel wood, construction materials, medicinal herbs, the organic matters for animal bedding in the farmstead and composting and the medicinal herbs are collected regularly. The non-migrating animals are taken to the forest for grazing. During months of cold winter the population consumes a large quantity of firewood, particularly the fast burning local species. Resinsoaked blue pine which is a food construction material is frequently used for firewood (Table: 13).

In many areas the firewood collection is more than a day's task and the number of hours spent for this purpose is increasing (Table: 14). The peasants do not seem to afford a longer time for the considering the labour bound problem in their farm activities. Because the

time spent in it will result less time available for farm and household work. This would lead them to use cowdongs for cooking purposes to supplement the insufficient amount of firewood collected in the regular time period. Since the manure available for farming is already insufficient dung making will further reduce the manure supplied to the farm. A negative chain reaction is gradually developing in the broad ecological system of the area.

Change in the ecosystem of the forest in the region has detrimental effect upon the local economy. The mammal species which exist in the forest are gradually becoming extinct because of crown fire and tree cutting. The wild species of vegetation including medicinal herbs are gradually being less available and facing extinction. Because of high price musk hunting of musk deer is also frequent.

Attempts to conserve the watershed and protect soil erosion and forest destruction through administrative action have proved irrelevant in the area. Because, the decay of the natural environment has also much to do with the social situation in the area. Therefore, an educational programme at each village level should be launched to control the arbitrary destruction of forest resources. Forest regulation and the need of local population should be balanced on the basis of more developed understanding between the two sides, reducing the existing hostility between forest users and the so called forest protectors. In the more remote and inaccessible areas where forest agencies cannot effectively control the degradation of natural resources, local authorities should be empowered to carry out such tasks.

A certain amount of land in the forest zone should receive continuous afforestation with the use of funds derived from the introduction of the fee system imposed upon the forest resource users.

Pasture development activities should be undertaken by growing more plant species such as populus and fodder trees along with controlled use of pasture grass. Use of more appropriate species for firewood should be investigated. Multipurpose plant should be developed to solve the problem of soil erosion, fuelwood supply and the fodder supply. If these plants are edible fruits or nuts or protecting soil it is even good. One example is the planting of black locust.

Plantation of fast growing trees for example salix, populus and the development of forest nursery and research on the more appropriate burning species are needed. Establishment

of **small scale sawmills** and careful handling of the logs can save remarkably the wastage of forest products.

It is also necessary that younger generation learn the importance of preserving natural resources for their own advantage in future. This can be done through lessons in schools and making students participate in the management of these resources.

VII ADMINISTRATION FOR DEVELOPMENT

Mushroom growth of a number of offices have been observed in the zonal as well as district headquarters. This has resulted the confusions for the local people in understanding the relationship between different offices as well as between the offices and themselves. Although, the procedure of village development programme is clear, the mechanism is so complex and local political connection play very crucial role in decision-making.

Local technical manpower is very scare and those officials appointed are often not experienced ones. Staff inadequacy has been felt both in quality and quantity. Due to transport difficulties there is always uncertainty about starting and completing date of the projects. For example, it was observed that in study area after 18 months of starting date few iron-ropes were transported by helicopter from the Jumla Airport to the bridge construction site over Mugu Karnali, which joins Humla and Mugu district. Lack of proper designing of projects make development prospects dim. For Example, most of the Panchayat houses and school buildings are ill ventilated and ill roofed.

The institutional arrangement also needs motivation and devotional attitude among the staff who work within the frame-work of various development agencies. These things are mostly lacking. Mugu district is very unpopular and difficult area for assignment of civil and technical workers. Disappointment, frustration, and discontentment about facilities and allowances are widespread among the officials. High turn-over rate and absenteeism are the tokens of their morale. Almost all high level officials are outsiders.

Civil servants often regards local people far below their level or a sort of inferior population which is expressed in their regular behaviour of disgust and low level response. The reciprocal feelings are also manifested by the local population toward the civil servants. The term *Gorkhali* is used for them and the officials are regarded as outsiders, often corrupt and with no good intension to develop the area for which they are assigned. These feelings are

expressed in local songs and community discussions. Under such circumstances, mutual cooperation and understanding is almost nonexistent and a good service to the local population is not possible. Moreover, lack of confidence of the local people on local leadership is also frequent, local leaders find themselves lacking information and skill to lead the population. Therefore, suspicions, mistrust and understanding gaps have taken the place of team spirit, confidence, dedication and cooperation. The government agencies are not even able to spend the total budget sanctioned for the development of the area.

Potential exists for the creation and functioning of a more efficiently structured administrative framework within the social and economic fabric of the existing realities. But the spirit of experimentation, however should not ignore the already distorted level of co-operation between local population and government agencies. A more thorough structuring of the programmes developed through different development agencies seem crucial at this stage. Clearcut method and principles have to be established relating to the degree of responsibility to be vested upon directly responsible body for project implementation.

The traditional working organizations such as irrigation water user's committee, pasture management associations and social activities. The merit of doing this is that local people will feel respect bestowed upon the traditional practices and they are more easily convinced about certain modifications in their social system and practices.

Since the local task is more sensitive and complex certain immediate attraction should also be provided to the selective village workers to make the development activities run smoothly than making it a government routine job. Development as a process of change in positive line in terms of physical construction and more progress in the thinking of the population should be to screen and incorporate the merits of local values and traditions. Each individual village level project should be judged from the point of maximum use of local resources, maintaining balance between technical skill requirement and the availability of technical manpower plus materials for a definite period of time.

Mutually supportive schemes are essential for the upliftment of the socio-economic condition of the population. Development of human resources through opportunities of training and education gives a feeling to the population in accepting development projects as their own property and makes them to handle the projects more efficiently.

VIII CONCLUSION

The subsistence economic system of Mugu district with its components: agricul-

ture, animal husbandry and the social conditions have long been survived in isolation. Until 1951 the whole Karnali zone was administered by a group of civil servants privileged with power and position. The region may have been considered a periphery supplying resources to few civil servants who were acting autonomously because of the distance from the capital.

Since 1951 AD steady influence in the sphere of social, political and economic activities from outside have been noted in the area. These influences include closure of trade routes at many points by the Chinese government, decisions made by His Majesty's Government about changing the zonal and district boundaries; extension of educational as well as other social services to the area; and a recent declaration of the establishment of Rara National Park in the Mugu district. Many national leaders and planners have visited the area. Therefore the present period is the period of transition.

In the absence of cadastral survey and detailed and specific studies undertaken in the past, there is an enormous amount of difficulties involved in making recommendations. The complex and varied dimensions of natural economic and social forces acting in the system under the present situation create problems in judging more viably the extent to which prospects should be evaluated and assured for the future development of the area. However, on the basis of the field research of this study, some factors have been analysed and discussed. This leads the researcher to conclude that there is certainly a need to take immediate step to carry out a number of social, economic and technical studies in the area for specific development programmes.

Table 1

Population in the Karnali Zone

Nepal	Total	Male	Female	Population Density persons per sq. KM.
Karnali Zone	207122	108430	98692	13
Jumla District	122753	62630	60123	43
Mugu District	25718	13248	12470	8

Source : Central Bureau of Statistics 1971 and figure of Dolpa adjusted.

Table 2

Summer and winter crops in Mugu District

Summer Crops	Planting time	Harvesting time	Winter Crops	Planting time	Harvesting time
Kodo	May	September	Nafal	June	September
Chinu	April	September	Barley	August	July
Kaguno	March	September	Wheat	May	October
Paddy	June	October			

Table 3

Production of Foodgrain in the Sample Case Study Area

(in kg.)

Crops	Mugu	Rara	Gamtha-Rikhiya
Paddy	-	1804.12	14827.24
Wheat	-	6863.38	4783.30
Nafal	-	-	-
Barley	9150.42	37890.32	1692.22
Millet	-	2361.54	-
Beans	-	2492.91	9906.52
Chinu	-	552.23	1901.59
Maize	-	1442.30	-
Potatoes	19772.63	2791.95	-

Total Population (average of 20 household in each case study area, symbol refers to insignificant production or no production) Source: Household Survey 1978.

Table 4

Fragmentation of Land Holding in the Sample Case Study Area

Land Type/Location	Mugu	Rara	Gamtha-Rikhiya
No. of Khet Plots	-	63	77+8
1- 5 ropanis	-	63	57+6
6-10 ropanis	-	-	9+2
11-15 ropanis	-	-	- -
16-20 ropanis	-	-	11+-
No. of pakho plots	100	97	88
1- 5 ropanis	81	-	9
6-10 ropanis	8	50	-
11-20 ropanis	11	12	7
20-30 ropanis	-	-	12
30+ ropanis	-	35	60

No. of owner households: 20, Household Survey 1980.

Table 5
Family Size Occupation and Livestock Keeping in Case Study Areas

Mugu	Agricultural group				Trade-manufacturing group				Occupation group			
	Occupational group						group					
	Cow & oxen	Goats & sheep	Yak	Horse	Cow & oxen	Goats & sheep	Yak	Horse	Cow & oxen	Goats & sheep	Yak	Horse
Family members (2-5)	-	-	-	-	-	91	97	12	-	-	-	-
Family size (6-8)	-	-	-	-	-	280	10	12	-	-	-	-
Family size (9-12)	-	-	-	-	-	270	18	11	-	-	-	-
Total	-	-	-	-	-	741	105	35	-	-	-	-
Rara												
Family size (2-5) (HH3)	19	150	-	3	21	139	-	7	1	-	-	-
Family size (6-8)	-	27	-	2	18	218	-	1	3	-	-	-
Family size (9-12)	4	67	1	-	9	88	-	-	1	-	-	-
Total	23	244	1	6	48	445	-	8	5	-	-	-
Gantha-Rikhiya												
Family size (2-4)	24	35	-	-	3	140	-	-	4	-	-	-
Family size (6-8)	23	65	-	1	17	170	-	3	-	-	-	-
Family size (9-12)	13	40	-	1	5	11	-	-	-	-	-	-
Total	60	141	-	2	25	321	-	3	4	-	-	-

Source: Household Survey 1971.

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Table 9

**Respondents' Perception of Reasons for Sickness in the
sample case study Areas**

Reasons	Mugu	Rara	Gamtha Rikhiya
Lack of Medical facilities	3	7	9
EVIL and spirits ¹	11	16	16
Dirt and filth	2	2	4
Lack of healthy drinking water	-	-	1
Cold weather	5	4	4
Dietary deficiencies	3	3	2
No response	7	4	4

Source : Health Survey : 1978.

Total number of respondents 13, 15, 16 respectively.

- 1/ The common belief is that when God "Masto" becomes angry with some one the person fales sick.

Tabel 10

Respondents' Perception of Solutions to cure Diseases

	Mugu	Rara	Gamtha Rikhiya
Healer and local medicine	12	17	17
Medical facilities	2	11	9
More agricultural Production	14	12	17
No response	6	3	3
Total number of respondents	20	20	20

Source : Health Survey : 1978.

Table 11

No of Tourist visit in Rara

B.S.	year A.D.	No. of Tourists who visited Rara	Those who also visited Mugu village	Total no. of Tourists to visit Nepal (Excluding Indians)
2033/34	1977	77	N.A.	106277
2032/33	1976	73	22	85769
2031/32	1975	77	22	74559
2030/31	1974	47	1	72601
2029/30	1973	36	17	64047
2028/29	1972	30	12	52934
2027/28	1971	28	7	49914

Source : Annuar Statistical Report 1977, Depart of Tourism Aug. 2978 and local interviews.

Table 12

Tourist Trek Expenditure (Private and Organized) in Mugu (1978)

	Private Trekking (in Rs)	Organized Travellers (in Rs)
Total expenditure in Nepal	47314	N.A.
Total expenditure made during trek	35914	7271
1. Food	7020	1280
2. Accommodation	1477	300
3. Porter	7224	450
4. Drinks		12
5. Transportation	4719	1217
6. Purchase of goods	15474	3960
Total average individual expenditure during trek	2565	2424
No response (4)		
No. of respondents (17): Private trekkers 14 and organized travellers (3)		

Source: Tourist survey: 1978.

Table 13

**Annual fuewood Consumption (Seasonwise) by household in the
Case study areas**

(in bundles)

	Winter	(6 months/ day) Kg average	Dry	(2 months/ day) average	Rainy	(4 months/ day) Kg average
Mugu	1.75	61.25	0.85	29.75	0.70	24.98
Rara	1.30	45.50	1.00	35.00	0.75	26.25
Gamtha Rikhiya	1.15	40.25	0.50	17.50	0.60	21.00
Average HH Consumption/ day	1.40	49.0	0.78	27.41	0.68	24.07
1 Average per capita Consumption/ day	0.25	8.90	0.14	4.98	0.12	04.37

Source: Household Survey, Ecology Section 1978.

1. Note : Estimating one bundle equivalent to 35 Kg and in average, one household having the average family size of 5-5 persons in the case study areas.

Tabl 14

One way distance to be Covered to fetch on bundle of firewood
or timber in Sample Case Study areas

	Mugu	Rara	Gamtha Rikhiya
Fire wood			
5 years ago	2.0	2.7	1.5
2 years ago	4.0	3.0	1.7
Present level	7.0	3.5	2.0
Timber :			
5 years ago	2.5	2.2	2.0
2 years ago	3.7	4.3	2.0
Present level	5.2	5.5	3.7

Source : Household Survey 1978, Ecology Section.

List of Reference

- Bezruchka, Stephen, 1974, **A Guide to Trekking in Nepal** Sahayogi Prakashan, Kathmandu, Nepal.
- Bishop, Lila and Maud Barry, 1971. **Karnali Roadless World of western Nepal** National Geographic Society Washington D.C., U.S.A,
- Bishop, Barry, **A Cultural Ecological Analysis of Karnali Zone**, A preliminary Report unpublished.
- CEDA, 1974 **Regional Development Study (Nepal) Parts I-IV**, Kathmandu.
- Durgam Chetra Vikas Samiti, 2027, **Durgam Chetra Vikas Samiti Antargat Ka Bibhinna Zilla Haruko Serbekshan Pratibedan**.
- Gautam, P.C., 1974 **Health Problem in Karnali Zone: A hospital based compre-**

hensive Study Remote areas and Local Development Department and UNICEF.

- H.M.G., 1970, Ministry of Food and Agricultural, and Irrigation, Department of Irrigation, Hydrology and Meterology **Climetological records of Nepal**, Kathmandu.
- , 1974, Department of Tourism, **Annual Statistical Report**, Kathmandu.
- , 1977, Department of Tourism, **Annual Statistical Report**, Kathmandu.
- , 2030, **Saishaik Tathyanka Pratibedan** (Nepal) Statistical Sub-section, planning Section, Ministry of Education.
- N.M.G., 1967-1971-72, Ministry of Water and Power, Department of Hydrology and Meterology, **Climatological Records of Nepal**, Kathmandu.
- , 2031 Ministry of Information and Communications Department of Information, **Mechi Dekhi, Mahakali** (Nepal) Vol. No. IV, Kathmandu.
- Haimendorf, Christoph Von Furer 1975 **Himalayan Traders Life in Higland Nepal**, Jhon Murray Ltd., London.
- Malla, Mohan Bahadur 2033 **Sinja Itihas Ko Doreto** Kathmandu.
- Mauch, S.P. 1974, **The long term Perspective of the region's forest resources and the associated availibility of firewood, cattle fodder and Material for local Population** Integrated Hill Development Project, Zurich.
- Nelson, Deven O. Nov. 1977 **A National Watershed Inventory** Integrated watershed Project Department of Soil and Water Conservation, Ministry of Forest.
- Nath, Yogi Narahari **Karnali Pradesh**.
- National Pianning Commission 1974, **Regional Development Policies** Report of the task force on Regional Development , Kathmandu.
- , 2032, **The Fifth Plan**, Kathmandu'
- New ERA 1976, **Jumla Small Area Development Programme Survey Report**, Kathmandu.
- Rara Milan Kendra 2034, **Ardha Varshik Bulletin**, Gandagi Mugu.

- Regmi, M.C. 1976 **Land Ownership In Nepal**, The center for South and Southeast Studies, University of California, Berkeley, U.S.A.
- Reiger, H.C. etal, 1976, **Nepal Report** Himalaya Economic system Research Mission Heidelberg, Germany.
- Revelle, Roger, 1978, **Requirements for Energy in the Rural Areas of the developing countries**, in Normally Brown edited **Renewable Energy Resources and Rural Application in the Developing World** 1978 PP .21-24.
- Royal Nepal Academy, 2028 **Karnali Lok Sanskriti**, Vol. I-V Kathmandu.
- SATA, 1976 **Mountain Environment and Development**, A Collection of papers published on the occasion of the 20th anniversary of the Swiss Association for Technical Assistance in Nepal.
- Shrestha, Bhim Prasad 4028 (Editor) **Karnali Pradesh, Yek bito Adhayan** Samajik Adhayan Samudaya, Jumla.
- Shrestha, R.B. 1976, **Accessibility to Educational opportunities in the Remote areas and New Education System Plan**, CEDA Tribhuvan University, Kathmandu.
- Tribhuvan University 1976, **Nepal : The Energy Sector**, Energy Research and Development Group. Institute of Science.
- Worth and Shah 1966, **Nepal Health Survey**, University of Hawai.