COMMON PROPERTY RESOURCES AND THEIR MANAGEMENT: A CASE STUDY OF DISTRICT KINNAUR IN HIMACHAL PRADESH

Thesis

by

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CERTIFICATE - I

This is to certify that the thesis entitled **"Common Property Resources and Their Management: A Case Study of District Kinnaur in Himachal Pradesh"**, submitted in partial fulfillment of the requirements for the award of degree of **Doctor of Philosophy** (FORESTRY) in the discipline of **Natural Resource Economics** to Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (HP) 173230 is a bonafide research work carried out by **Mr Chaman Lal** S/o Late Sh. Pratap Chand under my supervision that no part of this thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of investigations have been fully acknowledged.

(Dr RS Prasher)
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CERTIFICATE-II

This is to certify that the thesis entitled, **"Common Property Resources and Their Management: A Case Study of District Kinnaur in Himachal Pradesh",** submitted by **Mr Chaman Lal (F-2011-10-D)** S/o Lt Pratap Chand to the Dr Yashwant Singh Parmar University of Horticulture & Forestry, Nauni, Solan (H.P.) 173230 India in partial fulfillment of the requirements for the degree of **Doctor of Philosophy** (FORESTRY) in the discipline of **Natural Resource Economics** has been approved by the Advisory Committee after an oral examination of the student in collaboration with an External Examiner.

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This is to certify that all the mistakes and errors pointed out by the external examiner have been incorporated in the thesis **"Common Property Resources and Their Management: A Case Study of District Kinnaur in Himachal Pradesh",** submitted by **Mr Chaman Lal (F-2011-10-D)** S/o Lt Sh. Pratap Chand to the Dr Yashwant Singh Parmar University of Horticulture & Forestry, Nauni, Solan (H.P.) 173230 India in partial fulfilment of the requirements for the degree of **Doctor of Philosophy** (FORESTRY) **Natural Resource Economics.**

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PLACE: NAUNI

Date: **(CHAMAN LAL)**

ACRONYMS

Acronyms	Descriptions
ACU	Adult Cattle Unit
ADB	Asian Development Bank
APL	Above Poverty Line
BPL	Below Poverty Line
CCA	Culturable Command Area
CGR	Compound Growth Rate
Cm	Centimeter
CPRs	Common Property Resources
CPRM	Common Property Resource Management
DRDA	District Rural Development Agency
e.g.	For example
etc.	*et cetra*
et al.	*et alii* (Co-workers)
Fig.	Figure
FYM	Farm Yard Manure
FRA	Forest Rights Act
GA	Geographical area
GHNP	Great Himalayan National Park
GoI	Government of India
Ha	Hectare
HH	Household
HP	Himachal Pradesh
i.e.	That is
IFRI	International Forestry Research Institute
ISFR	Indian State of Forest Report
ITDP	Integrated Tribal Development Programme
IWMP	Integrated Watershed Management Programme
JFM	Joint Forest Management
JFMC's	Joint Forest Management Committees
JFMP	Joint Forest Management Programme
Kg	Kilogram
Km	Kilometer
LC	Lower Caste
LU	Livestock Unit
amsl	Above Mean Sea Level
MD's	Mandays
MFPs	Multiple Forest Products
m ha	Million hectares
Mm	millimeter
MPS	Mean Perception Score
NH	National Highway

NRC	National Research Council
Acronyms	**Descriptions**
NREGA	National Rural Employment Guarantee Act
NSS	National Sample Survey
NSSO	National Sample Survey Organization
NTFPs	Non-Timber Forest Products
NW	North Western
PMGSY	Pradhan Mantri Gram Sadak Yojana
Qtl.	Quintal
SHGs	Self Help Group
SFR	State of Forest Report
Sq. Km.	Kilometer square
Sr. No.	Serial Number
UC	Upper Caste
VFDCs	Village Forest Development Committees
viz.	that is to say
%	Per cent
˚C	degree Celsius
`	Rupees
@	At the rate
&	And
>	Greater than
<	Less than

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Chapter-1

INTRODUCTION

Common property resources (CPRs) are important forms of natural resource endowments, defined as the class of resources for which exclusion is difficult and joint use involves sub-tractability, i.e. an identifiable group of people hold the rights in common and the use and management of these resources are governed by the traditional or mutually agreed upon rules (Berkes 1985; Chen 1988; Moench 1985; Singh 1993). The common property resources are important not only for the rural poor who meet many of their subsistence needs from them (Chopra *et al.,*1990; Jodha 1986 & 1992; Moench 1985; Negi 1993; Negi *et al.*1997; Sharma and Bhati, 1995) but also for the society as a whole because of many positive economic and ecological externalities that these resources generate.

Broadly speaking, common property resources include all such resources that are meant for common use of the villagers. CPRs include all resources like village pastures and grazing grounds, village forest and woodlots, protected and unclassed government forests, waste land, common threshing grounds, watershed drainage, ponds and tanks, rivers, rivulets, water reservoirs, canals and irrigation channels.

In the pre British India, a very large part of the country's natural resources was freely available to the rural population. These resources were largely under the control of local communities. Gradually, with the extension of state control over these resources and the resultant decay of community management system, CPRs available to the villagers declined substantially over the years. Today, in almost all parts of the country, the villagers have a legal right of access only on some specific categories of land and water resources. Nevertheless, it is widely held that CPRs still play an important role in the life and economy of the rural population. This declining Common Property Resource (CPR) extent and quality is important both for sustainability of CPR dependent livelihoods and the natural resources themselves (Chopra and Dasgupta 2002). The continued production of an adequate food supply is directly dependent upon ample fertile land, fresh water, energy plus the maintenance of biodiversity. As the human population grows, the requirement for these resources also grows. Even if these resources are never depleted, on a per

capita basis they will decline significantly, because they must be divided among more people (Pimental *et al.* 1994).

In developing countries, the role of common property resources is very widely spread especially in the rural areas, where there is coexistence of both community ownership of the natural resources and private property rights. The collection of common property resources not only helps to sustain their livelihood, but also helps to generate additional income. Collection of common property resources by the rural poor have therefore helped to mitigate poverty to large extent. The common property resources are the singular source of human sustenance in the household that constitute a large section of rural India. CPRs are integral part of the social and institutional arrangements made to meet the day to day requirements of the rural poor. The rural poor, especially the landless, are highly dependent on the CPRs for their subsistence. Earlier studies have also suggested that both the poor and not so poor also depend on the CPRs for their livelihood. CPRs not only act as a buffer during the economic crisis arising due to crop failure but also act as an additional source of income during normal times. Forests have provided ample resource in the form of Non Timber Forest Products (NTFP's) for the subsistence of the rural poor. The rural poor collect several NTFP's in the form of fuel wood, shrubs, dry leaves which are used by them for cooking and heating. The bamboo and cane are used for construction of house, while the wild grasses and shrubs are used as animal fodder. The forest is also a rich source for several medicinal plants used for curing diseases. Fruits, vegetables and roots are collected by the rural poor for consumption and sale. The critical role of natural resources in the sustenance of the rural livelihood can be traced to time immemorial. In India, the extent of dependency on CPRs ranges from 15 to 29 per cent (Chopra *et al.,* 1989; Jodha, 1986; Singh *et al.* 1996).

Though the Indian economy is growing at a rate of around 7 per cent annually, the geographies in which this development is located and the constituency it benefits remains narrow. Commons or common pool resources form critical components that supplement and support rural communities dependent on agriculture, livestock and forests in large parts of India, but especially across dry land and tribal areas. The role of land and water resources in strengthening the viability of the agro-pastoral production systems and the resilience of household livelihoods has been insufficiently recognized so far.

A recent study by the Foundation for Ecological Security (2012) further documented the importance of the commons for rural livelihood support. The study conducted in seven states; Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh and Odisha, which included 3000 household in 100 villages in arid, semi-arid and sub-humid parts of the country. Dependence on the commons was very high, with 98 per cent of household accessing the commons for different types of use, with 69 per cent using the commons for grazing, 30 per cent for fodder collection, 53 per cent using the commons for agriculture and 38 per cent for food, 74 per cent deriving fuel wood, and 38 per cent collecting non-timber forest products. In sub-humid areas, people largely utilized the commons for meeting agricultural needs, while in arid and semi-arid regions, the commons were critical for livestock grazing. Moreover, in the next decade, the feed balance may worsen further as production of green fodder is projected to decline by 2030 (Suresh *et al.,* 2012). But at the all India level, the estimated deficit of dry fodder, concentrates and green fodder is 10 per cent, 33 per cent and 35 per cent respectively, which is likely to be enhanced to 11 per cent, 35 per cent and 45 per cent by 2020 (GoI 2012). Dependence on community sources of water, such as tanks, ponds, rivers was also high, as dependence on forests for timber, fuel wood and non-timber forest products. Resources from the commons contributed to a substantial proportion of household income, about 25% and an even higher proportion of 31 per cent of net income for the landless, who were highly dependent on fuel wood from the commons.

The survey data from the National Sample Survey (NSS) 54th round, suggest that 48 percent of the rural household collect material from CPRs. Further, studies on poverty with relation to CPR collection from forest indicate that poverty increases by as much as 28 per cent, when income from forest is set to zero in poverty calculations (Reddy and Chakravarty, 1999).

According to the agricultural statistics of India, total CPR land in the 16 states of India was 70.04 m ha in 1990-91. Of this, 44.98 m ha or about 64.23 per cent was non-forest land. This estimate did not include north-eastern states of India due to lack of reliable land record statistics. On the basis of available estimates, it can be concluded that had these states been included, the total CPR would have increased to 74.57 m ha. Further, CPR area varies from 25 to 52 per cent of geographical area in these states (Kadekodi 1997). There are changes over time in the magnitude of CPR land both as percentage of the geographical area and in per capita terms.

The percentage of land over which CPR rights exist has decreased over the years in the majority of the Indian states.

Today, approximately 22 per cent of India´s land area is under forest, with around 275 million rural poor depending on it for their livelihood. Approximately India´s 45 million tribal people, live in the periphery of the forest areas and have a close cultural and economic link to the forest (World Bank 2005). However, the quality of these forests has been significantly reduced since Independence in 1947. Although, there has been a large increase (50 %) in the forest land under control by the Forest Department from 1960 to 1980, there has been a steady degeneration of these government managed forests (De Lacy 1997). An estimate by the World Bank states that 41% of the forest lands have been degraded over the last several decades.

In Himachal Pradesh, since the cultivated area in different parts of the State is limited, animal-rearing is also a significant component of household activities. Animals are mainly open-grazed and only improved breeds of milch animals are stall-fed. As a supplement to pasture grasses (hay) and a small amount of cultivated fodder crops, tree fodder is also used for stall-feeding the animals. Similarly, for climatic and difficult topographic reasons and for reasons of lack of electricity, the household energy use is typically wood-based. As a result of these characteristics, the state is highly dependent on various natural resources which are mostly in the common property regimes. This close dependence on CPRs amply projects their importance to the local economy. In fact, continued pressures on these resources, with a little emphasis on their replenishment has led to the present situation where sustainability of many of these economic and ecologically important resources is in jeopardy (Negi 2002). Thus, mountain ecosystems in this region, previously seen as rugged and resilient, now constitute one of the most vulnerable ecosystems. Villages and household situated within these rapidly changing and vulnerable environments are involved in and routinely planning for risk and uncertainty management in respect of natural resources (Chen, 1988; Ham, 1995). Many of the activities carried out as day-to-day routines are in fact, aimed at minimizing such risks. As in any management process, so too in CPRs management an assessment of the magnitude and health of the resource base is thus important. Such information provides a platform to the resource managers for setting management targets and enabling them to plan for the attainment of the same. Himachal Pradesh has had a rich heritage of maintaining common property resource systems, as well as institutions

related to the use of these resources (Agarwal and Singh 1996; Berkes *et al*. 1995; Singh, 1961; Thakur 1996; Thakur *et al*. 1998). The present management crisis, therefore, can at best be termed paradoxical. It is in this regard that historical and current management strategies or efforts need to be analyzed so as to draw up future plans of action.

Classified forests in India are under the sole proprietorship of the state according to the Indian Forest Act, 1927. However, Himachal Pradesh bears the distinction of being the only state in which the traditional rights of the local people have been maintained in various degrees under the colonial and post-colonial periods (Gadgil and Guha 1995). All households in a community share the same use and access rights to the forest. This aspect of forest rights in Himachal Pradesh makes it conducive to use the International Forestry Research Institute (IFRI) definition of user group or community as the unit of analysis. This definition does not require the group to be a formal organization, be involved in collective action or have institutionalized rules for collective decision-making.

The use pattern and sustainability aspects of various common property resources in a region are influenced by their structure and reliability (Baker 1995). A common property resource structure can be viewed in terms of its physical and social complexity from the management point of view. Reliability, the second influencer of CPRs use, relates to the carrying capacity of the resource in relation to the varying human and livestock pressures. Another dimension of reliability is the stability of the user's rights in the long run (Negi 2002). The present study assesses the status of a few representative CPRs and their management patterns in this tribal tract of NW Himalaya.

Kinnauras constitute the third largest ethnic group of Himachal Pradesh. Though their existence is known since ancient times, yet they have been among most obscure ethnic groups of India. Kinnaurese form a mixed lot; Buddhism is quite prevalent but the majority of them are Hindus. However, irrespective of religion, everyone follows Buddhist rituals and practices due to strong influence of neighboring Tibet.

On account of the high altitude and resultant cold-arid climate, the district of Kinnaur is among the environmentally very difficult regions to live in. Moreover, the society is still in early stages of development, therefore, influence of environment is pronounced. In response to

environmental compulsions, *Kinnauras* developed pastoral-cum-agricultural economy to meet the basic requirements. It traditionally has been a self subsistence region. Its relative isolation helped towards making of the culture and economy quite specific to this region. Kinnaur remained isolated until recently. It was a restricted area where no foreigner was allowed till early 1990's and even Indians had to acquire permit to enter the district. Indo-China border conflict of October 1962 brought Kinnaur into focus. It acquired strategic importance and a large number of armed forces personnel moved into the district. This resulted in obvious and stepped up initiatives for socioeconomic development. Main objective behind this was to broaden their social horizon and bring economic contentment among the people who till then were 'backward' and formed a 'closed society'. Thus, followed the process of induced immigration, spread of educational facilities and construction of roads; most importantly NH-22 and initiation of many developmental projects under the District Rural Development Agency (DRDA), Integrated Tribal Development Plan (ITDP). Consequently, it helped the acceptance of new ideas and technology by the people and led to gradually opening up of the region.

Population and income driven diverse extractive pressures on these CPRs pose economic and ecological threats to the region. Natural forests, community forests, common grazing lands, some mining areas, rivers, community ponds and other sources of community drinking and irrigation water are the major common property resources that are under tremendous pressures in district Kinnaur. Although the *de jure* control of some of these resources may rest with the government or an agency, yet *de facto* many of these resources, in most cases, are used as common properties. Sustainability of these resources is now crucial; not only for the economic well-being of the people in this hilly region but also from the point of view of the larger economic and ecological implications for the country as a whole.

As the region has been remote and isolated; it helped people evolve indigenous way of managing their resources. Though not in its entirety, this resource use pattern is still largely in practice. In general, Kinnaur is bestowed with considerable extent of pastoral resources. *Kinnauras* have always relied on these resources to raise and support their animal wealth. Animal rearing has been one of the important economic activities in this harsh land and in line with subsistence and sustainability.

The objective of the study was to analyse the present role of CPRs in a resource rich, mountainous environment and to identify factors that influencing their use. This study was based on an analysis of historical usage trends of CPRs in the district. With its approximate 85 per cent forest area and 10 per cent forest cover, rich biodiversity and plentiful water resources, it can be considered as a resource rich environment. The most important common property resources in the district are: forests, NTFP's, pastures, water resources. There were many indigenous agreed arrangements about the management and use of these resources, especially in areas where resources were scarcer and where some level of resource competition occurred.

Taking these scenarios into account the present study was carried out in the following objectives:

- ✓ To examine the status of CPRs in the study area.
- ✓ To study the linkages of CPRs with livelihood of the rural people.
- ✓ To study the role of CPR management local institutions for the efficient production, utilisation and benefit sharing of CPR based products.
- ✓ To examine the socio-economic heterogeneity of CPR users.
- ✓ To analyse the problems and perception in the management of village commons and suggest measures for improving their efficiency and management.

Chapter-2

REVIEW OF LITERATURE

Before framing a research problem it is imperative to go through the thorough review of literature. In this context, an effort has been made to understand the problem of commons in respect to CPR utilization and their management by the locals and to support the present research work, a thorough insight into studies already conducted relating to current problem will give rise to conceptual clarity, development of sound methodology and identifying the critical gaps for further improvement in research work.

An attempt has been made in this chapter to present the literature review from the works of various researchers in India and abroad under the following sub-heads:

2.1 Pioneering works on Common Property Resources

2.2 Common Property Resources (CPRs) and their role in village socio-economy

2.3 Linkages of CPRs with livelihood of rural people

2.4 Role of village level institutions in CPRs management

2.5 Socio-economic heterogeneity amongst CPR users

2.1 Pioneering works on Common Property Resources

Gordon (1954) was among the first to deal on the economic theory of optimum utilisation of natural resources. He believed in the conservative dictum that everybody's property is nobody's property and therefore the common natural resources were free goods for the individual but scarce for the society in large and advocated that regulation of the natural resources is possible only through conversion of the common property into private or public (Government) property.

Demsetz (1967) examined the concept of ownership of property rights for the first time and advocated that there are three ideal types of ownership: i) Communal ownership where all members of community can exercise this right; neither citizen nor state can interfere; ii) Private (owner can exclude others) and iii) State (state can exclude anyone from using the property).

Hardin (1968) was the first scholar to publish an article on the concept of over exploitation of common natural resources, titled 'The Tragedy of the Commons' and focused on the depletion of a shared natural resource by individuals in a group who acts independently and rationally according to each one's self-interest, in spite of the fact that they understand that the depletion of the resource is contrary to the group's long term best interests. As the access to the natural resource is shared by all, the benefit of using it goes to the individual user while the consequence of misuse of the natural resource gets disbursed to the entire community. The reason for this over exploitation of the natural resource, according to the author, is free access and unrestricted demand of the finite resource. The author asserts that this problem can be resolved either through privatisation, polluter pays or regulation.

The argument of Hardin on the common natural resources was criticised by several authors. The scholars emphasised that Hardin had confused between common property and open access and had failed to distinguish between 'collective property' and 'no property' (Ciriacy-Wantrup and Bishop, 1975). The scholars were of the view that the example cited by Hardin was more appropriate for national rangelands and parks. The decline of the traditional common system was not due to any inherent flawed land use policy but primarily due to variety of other reasons like abuse of rules governing the commons, improved agricultural techniques and effects of industrial revolution (Cox, 1985).

Breaking the myth of the 'Tragedy of the Commons', Berkes (1989), defines Common Property Resources as a 'class of resources for which exclusion is difficult and joint use involves subtractability'. The common property regime would be effective only if it has efficiency, stability, resiliency and equitability. Thus a decentralised collective management of the common property resources by their users would help to mitigate their depletion. The authority system may be centralised and diffused to varying degree so as to provide the common property resource users assurance about the expected behaviour of other users and thereby enable coordination and minimise 'free riding'(Runge,1986).

2.2 Common Property Resources and their role in village socio-economy

Jodha (1986) found that the per household (HH) income per year derived from the CPRs ranged between ₹ 530 to ₹ 830 in different areas of India and was higher than the income

generated by a number of anti-poverty programs. In some areas the rural poor derived as much as 25 per cent of their sustenance from the CPRs. If they get degraded and disappeared, the prospective technology will have produce 25 per cent extra for maintaining the existing levels of living of such groups (Jodha, 1995).

Singh *et. al.* (1986) in their study at Kandi area of Punjab found that the CPRs contributed 27.3 per cent of total gross income of the landless and 22 per cent of the income of the cultivating households. Per household income from the CPRs was estimated at ` 3669 per annum for the landless and the ` 5169 for the cultivators of which 80 per cent was from the imputed value of biomass brought free from the CPRs.

Jodha (1990) concluded that Common Property Resources plays a vital role in sustaining the income and employment of the rural masses by contributing about 30 per cent of inputs to the farm activities. The dairy and other livestock activities on agricultural farms were highly dependent on CPRs. The CPRs saved substantial proportion (48-55%) of arable for crop husbandry, otherwise in the absence of CPRs it would have been used for the production of fodder crops.

Shah (1992) in his findings in Himalayan region on tribal economy and important development issues observed that most of the tribal population in the country dependent on natural resources for their livelihood. However, government has to play a great role in technology development in laying the infrastructure and enabling laws and enforcing them strictly.

The National Sample Survey Organization (NSSO) (1998) undertook an All India survey of CPRs common property resources estimation for the whole country. In addition, there was enquiry into village facilities, rural water supply and sanitation. Conceptual clarity was sought in definition of CPRs. Two concepts were used viz. *de facto* and *de jure* in deciding identification of CPRs. By usage, many times private property recognized as such *de jure,* became *de facto* CPRs. The data set covered 78,990 household in 10,978 villages. According to the survey, percentage of common property land resources to total geographical area was 15 per cent

household reporting any collection from 'commons' were 48 per cent and nearly 58 per cent of total consumption of fuel wood from commons.

Gupta (2003) in his work on forest resource management in Himalayas emphasized that socio-economically important products obtained from the forests are edible pine nuts, black cumin, morels, medicinal plants and grasses. There are numerous traditionally in vogue successful cases of people's active participation in forest resource management, especially in the regulated collection and distribution of forest products in the inner Himalayas, especially amongst the inhabitants of Kinnaur district have organized themselves for their protection, collective collection and management of these products through local deities i.e. village *devta* committees.

The importance of common property resources in different agro-climatic zones of India was analysed by Menon & Vadivelu (2006). The study was based on the secondary data of National Sample Survey (NSS) 54th round on CPRs. According to the survey data, 48 per cent of the household collect CPRs. In the Eastern Plateau and Hills, the collection of CPRs by the households is highest (71 %) whereas in the western dry regions it is the lowest (13 %). The average annual household value of CPR collections at the all-India level is ` 693. It is highest in the western Himalayas (` 1939) and lowest in Trans Gangetic plain (` 230). At all India level, around 58 per cent of the household collect firewood and 25 per cent collect fodder from the common forest.

Sapkota & Odén (2008) have analysed the household characteristics and the high dependence of the rural households on community forest in the Terai region of Nepal. The study was mainly based on the primary data through survey of 52 households in Rupandehi district in western region of Nepal popularly known as 'Terai'. The empirical results suggest that there is high socio-economic heterogeneity among the rural households. According to the authors, the forest collection by the households depends on their wealth, proximity to the common forest area, landholding size and labour allocation. The authors conclude that in order to prevent over exploitation of the common forest, the poor households should involve in other income

generating activities like cultivation of Non Timber Forest Products inside (NTFP's) the common forest area.

Saha and Kuri (2013) analysed the critical role of CPRs in sustainable development of the rural poor. Based on the field surveys of 300 households in the districts of Bankura and Purulia, the authors conclude that the rural poor, especially the landless, are heavily dependent on the CPRs for their subsistence. The quantum of extraction of CPRs for a household depends on several factors relating to household and the village level characteristics which have far reaching implications to rural poverty and environmental degradation.

2.3 Linkages of CPRs with livelihood of the rural people

Narain *et al.* (2005) using survey data from 537 household in 60 different villages of the Jhabua district of M.P. in India, investigated the extent to which rural household depend on common-pool natural resources for their daily livelihood and concluded that common pool resources contribute a significant fraction of the income not just of the desperately poor, but also of the relatively rich.

Pathania *et al*. (2008) in a study of the hilly region of Himachal Pradesh revealed that the average size of operational holding in the region is small (0.69 ha) and therefore the common property resources (CPRs) assume significant importance for sustaining the livelihood of people. The '*kuhls'* emanating water of CPRs are the main sources of irrigation. The consumption of different products from CPR lands has been found to increase with decrease in the size of landholdings which underlines the need to increase the productivity of CPR lands. The analysis of linkages between different farm sectors has revealed strong forward linkages of CPRs with livestock. Study also suggested to strengthening the management and conservation of common property resources.

The dependence of the rural poor on the community forest in South Eastern Nigeria and the impact of forest income to the total household income were studied by Fonta *et al.* (2010) based on the report of empirical findings on the survey of 1457 heads of the households from 18 communities. According to the authors, a 10 per cent increase in income from forest collections has helped to decline in the number of households in poverty by about 4.9 per cent. The study

advocates the need for change in the policy in order to ensure reduction in income inequalities for households who are heavily dependent on the forest.

Sarkar (2010) in her study of district Kinnaur found that the locals have devised immaculate ways of adapting to resource constraints for sustaining livelihood related activities. These production systems have had reverberating implications in the social and cultural arena where a high degree of cooperation and collective action has been observed through effective village level authority structures under the surveillance of personified local deities. However, over the years, the region has become economically buoyant due to improvements in accessibility as well as government policies and programs that have led to a marked improvement in the economic wellbeing of the local population. New forms of local governance mechanisms have evolved for accessing and using the more commercially viable village common resources in response to changed needs and volatile circumstances. The environmental outcomes of these demand-driven resource regimes have not always been desirable. Meanwhile, these trends have also enhanced preference for sedentary living which seems to be exerting anthropogenic pressure on open-access common property resources.

Mahanta and Das (2012) concluded that deterioration of common property resources increases the incidence of poverty level because poor people depend on forest resources. Earnings of rural people are mostly the combination of income from private property and common property resources. Reduction in common property resources reduces earnings of rural people leading them to migrate to nearby urban areas in search of livelihood. Thus, there is a link between common property resource degradation, poverty and migration. The study finds that decreasing common property resources will trigger migration of rural people to urban areas in search of livelihood.

Prasher *et al.* (2014) in their study of communities that dependent on Great Himalayan National Park (GHNP) emphasized the need to resolve people policy conflicts through increased community participation and alternative options of generating/ augmenting family incomes have to be supported with a range of measures.

Consistent with growing theoretical literature, there is enough empirical research in India dealing with commons and the dependence of poor on the CPRs (Chen, 1991; Pasha, 1992;

Jodha, 1985a, 1985b, 1986, 1990, 1995; Iyengar, 1997, 1989; Beck and Ghosh, 2000; Beck, 1994, 1998; Agarwal, 1997, 1999, 2001; Singh *et al.,* 1996; Iyengar and Shukla, 1999).

2.3 Role of village level institutions in CPRs management

Olson (1965) and Ostrom (1990) in their research demonstrated the importance of communication among players in the context of repeated games. Face to face communication enhances player's payoffs in non-cooperative games, even in the absence of binding agreements and sanctioning. Communication beyond that necessary to develop an agreement and a strategy should not, according to game theory, influence the game's outcome, but it does. As they suggested this is because mere jawboning serve to establish trust among the players and to signal their reaction to players tempted to violate the agreement (Ostrom, Gardner and Walker 1994). Other, using an evolutionary model of decision making, note the positive effect of communication on game theory outcomes (Schotter and Sopher, 2003). In the case of intergenerational games, communication in the form of word of mouth advice giving and learning from one generation to the next, is important in forming conventions. Social conventions establish norms of behavior that guide subsequent actions in ways that reinforce past decisions.

Gadgil and Malhotra (1983); Gadgil and Iyer (1989); Gadgil and Guha (1992) argue that many commonly used resources such as fuelwood, were controlled by small multicaste village communities. Here the different caste groups were linked to each other in web of reciprocity which has been disturbed due to the conversion of communal resources into open access resources by the state. Pockets of good resource management under communal control, however, have persisted, e.g. sacred groves, protection of individual tree species which may serve models of reasserting for communal control for natural resources.

Chopra *et al*. (1989) in their study of Haryana highlights the importance of participatory management in controlling the CPRs. They argued that government's failure to preserve CPRs together with their excessive exploitation for developmental activities has led to serious degradation of the environment with ecological repercussions. In a similar study in NW Himalayan region, Singh *et al*. (1996) argued that the success of a strategy for CPRs often depends upon local participation and institution. Though assessing the impact of CPR institutions on environmental sustainability is extremely difficult, Meinzen-Dick *et al*. (1997) noted that

property rights affect the time horizon for resource use, and incentive for conservation, as well as for investment in improving the resource. Most of these literature emphasized that efficient institutional arrangements are very important in many common property resource management systems to ensure equity and sustainability of resource management at the local level.

Gibbs and Bromley (1989) noted that a well functioning common property regime will probably be distinguished by i) a minimum (or absence) of disputes and limited effort necessary to maintain compliance, i.e. the regime will be efficient; ii) a capacity to cope with progressive changes through adaptation, such as the arrival of new production techniques, i.e. the regime will be stable; iii) a capacity to accommodate surprise or sudden shocks, i.e. the regime will be resilient; and iv) a shared perception of fairness among the members with respect to inputs and outcomes, i.e. the regime will be equitable. CPR institutions serve a number of important economic functions like coordinating the formation of expectation, encouraging cooperation and reducing transactions costs. The importance of transaction costs in any economic exchange is highlighted by many scholars (Coase, 1960, Williamson, 1975, 1985; Cheung, 1983, North, 1990). Some economic and social science literature emphasises that homogeneity in any society reflects the levels of trust, which influences the emergence of local management institutions through its impact on costs of transactions. Transaction costs associated with trading are reduced by an increase in levels of trust between trading partners and the development of institutions that provide incentives for lasting cooperation (Coleman, 1988; North, 1990; Woolcock, 1998).

Chand (1994) stated that the *kuhls* are the mainstay of irrigated hill farming in HP. The farmers have water rights from ruler's time and confirmed by the state at the time of land settlement. This has encouraged the water users to form organizations. The organizational setup of *kuhls* is formal, generally called as *kuhl* committee. The government intervention in farmers managed *kuhls* through financial assistance for repairs, channel linings; erection of *kuhls* has made the farmers dependent on the government for the *kuhl* management as well. Author concluded that financial assistance should be given for strengthening user's organization for maintenance and management of irrigation system on sustainable basis.

Recent literature on CPRs management criticized Hardin's 'Tragedy of the Commons'

often results, not from any inherent failure of common property, but from institutional failure to control access to resources, and to make and enforce internal decisions for collective use. These critiques argue that Hardin's tragedy of commons is applicable only to the situation of appropriation of 'open access resources' and not to commons i.e. common property resources (Ciriacy-Wantrup and Bishop 1975; Bromley and Cernea 1989). In case of open-access and unregulated common property individuals do not get proper incentives to act in a socially efficient way. In the literature of common property broadly three different schools of thought have emerged on the institutional arrangements to avert the tragedy of commons. According to property rights school the problem of over exploitation and degradation of common property resources (CPRs) can be resolved only by creating and enforcing private property rights (Demsetz 1967; Johnson 1972; Smith 1981; Cheung 1970). Private property is considered to be the most efficient way to internalise the externalities generated from over exploitation of the commons. The scholars of second school of thought advocate that only the allocation of full authority to regulate the commons to the external agency i.e. state property regime can reduce the overexploitation of CPRs (Hardin 1968).

Institution building at the community level for managing common pool resources has emerged as a third possibility. An increasing number of scholars advocate that decentralized collective management of CPRs by their users could be an appropriate system for overrating the 'tragedy of commons' (Berkes 1989; Wade 1987 1988; Chopra *et al.* 1989). Ostrom (1990) argues that collective action for CPR management will be long enduring and successful under conditions of well-defined boundaries, congruence between appropriation and provision rules, graduated sanctions, efficient conflict-resolution mechanisms and effective monitoring.

Hill and Shields (1998) observed that the community incentives in Joint Forest Management (JFM) in India are not so clear-cut; however, the main losers in JFM are fuel wood head loaders who are often from the poorest subgroup within the village. Ribot (1995) for Senegal and Andersen (1995) for India report how wealthy and influential villagers in control of supposedly democratic forest councils are able to use state resource laws to their personal benefit and to the detriment of the poorer and powerless resource users. In addition, it may be the richer members of the community that dominate local politics and organizations as found in JFM in India where benefits from the system goes to certain sectors of the community (Saxena 1989).

The assertion that institutions are always optimal is foolish when confronted with reality. Institutions created by man are not always optimal, efficient and egalitarian. Without careful empirical analysis (which is rare) functionalist explanations may become justifications for irrational or non-functional institutions (Bates 1995). There seems no reason to suppose a priori that competitive pressures are always sufficient to break up less than optimal institutions (Basu *et al.* 1987). Institutions do not always decrease transactions costs but might actually, when they are inefficient, increase transaction costs (Olson 1999). North (1990) pointed out that not all institutions are efficient and powerful groups to serve their particular interests can capture institutions of collective action.

On the basis of field survey of Sirmour district in Himachal Pradesh lying in the outer western Himalayan range, Bon (2000) observed that the communal forest not only provides timber for households and agricultural implements but also fodder, grass, food and medicines. The common pastures and wastelands and river beds are used by the rural poor for grazing. Privatisation and nationalisation of the CPRs have greatly affected the lives of the poor. The author feels that collective action through social bindings could be an efficient alternative to privatisation and nationalisations of the CPRs.

Adhikari (2001) in his findings argues that restricting the access of poor people to natural resources through changes in property rights structure in common-pool resources is likely to increase the level of poverty unless specific measures of compensatory transfer schemes are in place to safeguard the interests of the most vulnerable section of the community. There seems no reason to suppose a priori that institutions are always efficient and equitable and they serve the purpose that the institutions were created for. Understanding the determinants and impact of common property institutions and distributional implication of CPR regime is essential for informing forest policies and programs in Nepal and other South Asian countries where much policy emphasis currently is being placed in promoting community-based institutions for forest resource management and poverty reduction through better management of the commons.

Vira (2001) in his study found that the “natural resource management” has become pro-poor. Which is illustrated by the focus on poverty reduction at both the national level (e.g. the approach paper to the Tenth Plan seeks to reduce the poverty ratio by 10% by 2012) and international level (with the commitment to halve poverty by 2015). This is also increasing

recognition of the overlap between rural livelihoods and natural resources as safety nets in extreme circumstances, as sources of (market) opportunity, and of (political) empowerment.

Balooni (2002) found that the need for participatory community forest management was felt by the policy makers because there was continuous deforestation and the degradation of forests leading to a huge decline in forest cover in India, primarily due to misdirected forest policies. The author concludes that for the success of JFM, we need to ensure equity in representation and participation of the poor and the women, equitable benefit sharing among the forest department and the village communities.

Negi (2002) emphasized that to achieve CPR management goals in Himachal Himalayas, it is important to create stakes for the local people in the resource and also to influence resource use through the push and pull strategies. People do respond to an improved market situation and also to improved household incomes through better management of their resources and through incorporating new farm activities to meet these ends. Push strategies would seek pressure relieving opportunities out of CPR command area where as, the pull strategies would focus on employment generation in the command area. Creating stakes in the resource imbibes a sense of belongingness and the same acts as a catalyst for bringing management efficiency.

Singh (2002) probed the status of utilisation and resource management in Chenani watershed of Jammu & Kashmir. Based on the primary data of 300 households in 37 villages falling under 30 micro-watersheds and secondary data, the author is of the view that common forest lands are being converted into agricultural lands leaving very little scope for their rehabilitation as agricultural lands are more prone to soil erosion problems. The author concludes that the natural resources in the study area is badly affected and hence conservation and regeneration, awareness, use and benefit sharing of the resources and effective management can help to improve its status and conditions in the long run.

Based on the study of Adimaly, Neriamangalam, Munnar & Marayur Forest Ranges in South Western Ghats in Idukki district of Kerala State in South India, Aravindakshan (2011) observes that the Joint Forest Management committee, now known as Village Forest Council and also termed as *Vana Samrakshana Samithis* (VSS) in Southern states was established to bridge the gap between people and the forest department and have paid dividends with respect to long

term conservation of the forest and development of the local communities. However ambiguity with respect to recognition and legal status of VSS could hamper the effectiveness of sustainable utilization of natural resources.

Basu (2010) examined the deforestation and people's participation in JFM in the district of Bankura. Based on the empirical findings of the survey of 65 households in villages of Kalaberia and Kalyanpur in the district of Bankura, West Bengal, the author observes that the control of the forestry by the community through JFM has helped to reduce illegal felling of trees and encroachment. The FPCs under JFM have helped to protect and manage the common forest area for sustainable forest management by restricting over extraction of firewood and NTFP's.

2.4 Socio-economic heterogeneity

Heterogeneity in social identity negatively affect cooperation under discriminatory and exclusionary norms (Agarwal 1999; Agrawal 2001). Social inequities can transfer into power inequities that create a payoff differential. This decreases incentive for participation in collective action and rule compliance (Boyce, 1994). Evidence suggests that social heterogeneity negatively affects collective action (Alesina and La Ferrara 2000; Bardhan 2000; Khwaja 2000; Molinas 1998). We find that social capital is lower in more unequal and heterogeneous communities. Community governance in the absence of complete contracting relies on social capital. But socio-ethnic hostility and differences in power decrease the level of trust, increase problems of asymmetric information, and make regulation of collective action harder to monitor and hence less effective (Alesina *et al.,* 1999).

However, in the last two decades, theoretical and empirical work by Acheson (1988); Baland and Platteau (1996); Berkes (1985); Chhetri and Pandey (1992); Ostrom (1990) and Wade (1988) have brought communities to the forefront of discussions of the social dilemmas associated with natural resources. They have argued and demonstrated that communities are capable of avoiding the 'tragedy of the commons' by creating and sustaining institutions to prevent degradation of natural resources. However, there is an incomplete understanding of what motivates this group-level behavior: why are some communities better adept at solving collective action problems than others? This question has produced literature "regarding the importance or insignificance of some variables and how best to specify key relationships" (Ostrom, 1990).

Hechter (1990) postulates that in a group, cooperation is determined by the extent of member obligations and the degree of compliance with these obligations; the former depends positively on the cost of producing the common good and the degree of members' interdependence, while the latter depends positively upon the monitoring and sanctioning capabilities of the group. Moreover, frequent and multifaceted social interaction among members contribute to the level of trust, generosity and other regarding behaviors among group members and these govern member obligations as well as monitoring and sanctioning within the group.

Bakers (1997) in a study of 39 *kuhl* irrigation systems in Himachal Pradesh considers the effect of differentiation, which is high when a *kuhl* irrigates more than one village, the irrigators of the *kuhl* are comprised of multiple castes and land distribution is relatively unequal. Baker proposes that in the presence of high differentiation, increased opportunities for non-farm employment can place intolerable stress on traditional *kuhl* management regimes.

The study of Richards *et al.* (1999) on economic aspect of community forestry in Nepal, indicated that poorer household, especially landless and wage earners are actually benefiting less from community-based forest management. Efficiency aspect of natural resource management have failed to consider that resources often have multiple uses and that there tend to be sub-groups of users who may not benefit from changes in property rights (Meinzen-Ruth and Sallow, 1997). Based on the above discussed literature, it can be argued that socio-economic differences among the members of a resource-using group might be associated with different degree of control to and access over the local commons. Divergence of interest among heterogeneous agents is likely to emerge when socio-economically heterogeneous groups are sharing common resources since their interests in resource management may significantly differ from one another.

Bardhan and Johnson (2000) noted a U-shape relationship between inequality and collective action for conservation of resources. Very high and low levels of inequality are associated with better performance of community management for conservation, while moderate level of inequality leads to poor performance. Conservation there occurs through individual's decision to exit from commons for better earning outside. This has been reinstated by Bardhan *et al.,* (2002) in the context of voluntary collective action in contribution to the public goods. It shows that efficiency in collective action increases with greater equality within the group of

contributors and non-contributors to resources, producing collective inputs. In some situations, it notes down the existence of an optimal degree of inequality between the groups. Baland and Platteau (1997) argue that inequality in resource entitlement leads to greater conservation in those cases where resource-use technology shows decreasing returns to effort, deployed for resource use and it is indeterminate if there is increasing returns to efforts.

Varughese and Ostrom (2001) found from a study of 18 forest user groups in Nepal that heterogeneity is not a strong predictor of the level of collective action. Rather, heterogeneity is a challenge that can be overcome by good institutional design when the interests of those controlling collective-choice mechanisms are benefited by investing time and effort to craft better rules.

Poteete and Ostrom (2004) found that despite considerable progress in identifying factors that affect the prospects for collective action, no consensus exists about the role played by heterogeneity and size of group. The debate continues in part because of a lack of uniform conceptualization of these factors, the existence of non-linear relationships and the mediating role played by institutions. Also the research draws out the interrelations among group size, heterogeneity and institutions. Institutions can affect the level of heterogeneity or compensate for it. Group size appears to have a non-linear relationship to at least some forms of collective action.

Naidu (2005) argued that heterogeneity has three dimensions: wealth, social identity and interest in the resource and each may significantly affect collective action related to natural resource management. The study focuses on heterogeneity and its effect on collective management of forests and argues that the heterogeneity is not uni-dimensional and hence three aspects are particularly dealt with wealth, social identity, and interests. Wealth is interpreted as ability to contribute to collective action; interests reflect the incentives to contribute whereas, social identity indicates the social cohesiveness of the community. The concept of wealth and interest in co-operation can interchangeably used even though it may not always coincide therefore it suggests that heterogeneity in both variables may affect cooperation differently. Instead of aggregating individual behavior, the study focuses on the effects of group

characteristics and institutions on aggregate outcomes. It complements theoretical modeling and the case-study approach typical in the literature on CPRs.

The divergent conclusions of a large number of empirical studies suggest that similar kinds of group heterogeneities may produce different effects under different circumstances (Adhikari and Lovett 2006; Neupane 2003) Recognizing the important and unclear effects of heterogeneity on the governance of the commons, Baland and Platteau (1996) provided an initial attempt to classify them into three types: in endowments, interests, and identities and hypothesized that heterogeneities of endowments have a positive effect on resource management, whereas, heterogeneities of identity and interests create obstacles to collective action. The categories into which they classify heterogeneities are not mutually exclusive. For example, heterogeneities of interests or identities may lead to different types of economic specialization and different levels of endowments, which could in turn lead to mutually beneficial exchange. Nor is it clear that heterogeneities in identities and interests are necessarily obstacles to collective action. Other scholars have distinguished between the role of heterogeneity in assisting the emergence of collective action, but hindering its maintenance. Most of the recent literature on heterogeneity and collective action presume that socio-economic differentiation and group heterogeneity makes cooperative arrangements more difficult and innovation of local management institutions becomes impossible due to high transaction cost.

The studies reviewed above clearly demonstrated that continued access to the commons helps to provide stability and security in an unpredictable environment. Not only to critical or landless households but common property resources are also very important for large rural land owners. Yet land use data from Indian states demonstrates that common lands have seen an overall reduction in area, with a marked decline in grazing lands and cultivable wastelands. The crisis is a manifestation of institutional apathy, followed by neglect of traditional institutional arrangements and the customary rights of people in the institutional solutions proposed under different Government of India and state policies and programmes for decentralization, based on a prescriptive top down approach without understanding local socio-cultural dynamics or the economic and ecological conditions have failed to meet expectations.

It is amply clear from the review of literature that farmers are adopting combination of different cropping systems (Crop diversification) and each system has unique production boundaries and input output inter-linkages. It has been found that irrigation is the lifeline of sustainable agricultural development. However, management of water resources, particularly *kuhl* irrigation is dwindling, affecting productivity of crops. Therefore study of farming system of hills in general and common property resources in particular needs to be pursued in a holistic manner to determine the optimum combination of different farming activities.

It has been pointed out in various studies that farmers were operating at sub-optimal level with low adoption of technology. However, there is a lack of holistic approach and most of the studies contemplated theoretical issues. The *kuhl* management and people's participation also need in-depth analysis to plan further strategies of development. Therefore, the present study is a timely endeavor to examine these issues in detail to provide necessary input for policy makers and overall welfare of the farmers.

Chapter-3

MATERIALS AND METHODS

A sound and systematic methodology is pre-requisite for a scientific inquiry. In fact, precision, reliability, validity and acceptability of scientific facts and findings solely depend on the methodology adopted for investigation of a phenomenon. The selection and application of appropriate methodology bears more relevance in socio-economic studies based upon sample surveys. Therefore, the chapter comprised of selection of the study area, sampling procedure, nature and sources of data and analytical framework employed for the present study.

3.1 Selection of the study area

3.2 Sampling procedure

3.3 Data collection

3.4 Analytical procedure

3.1 Selection of the study area: The study area i.e. Kinnaur District of Himachal Pradesh in NW Himalayan region that lies between 31°05'55" N and 32°05' 20" N latitude and between 77°45'E and 79°00' 50"E latitude along NH 22 (Hindustan Tibet Road) was purposively selected for the study. Being a tribal area and divided into distinct social strata, the ownership rights to CPRs in the study area vests with the government and usufruct rights to local peoples. These local communities have rights in the forests, community pastures, wastelands and derives many benefits from the CPRs with their peculiar benefit sharing mechanism.

3.1a Pilot survey:

The main aim of the pilot survey was to gain background experience about the local communities and become familiar with the local cultural diversity which helps the researcher to establish rapport with the local people. It was believed that with the collaboration of the local people and their involvement in research design builds mutual trust, encourage a true dialogue and leads to a deeper analysis of behavior of the locals. An attempt was made to understand the

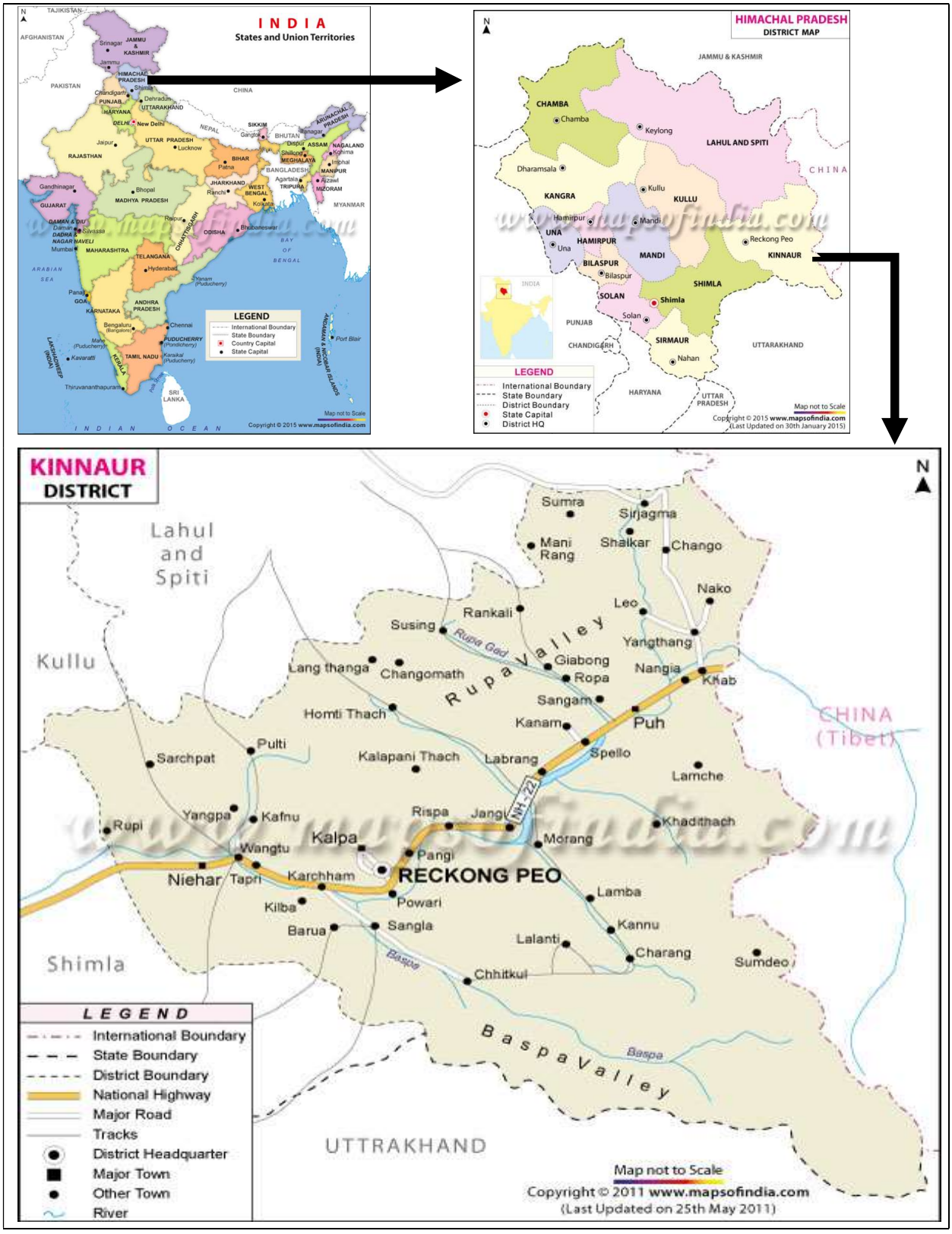

Figure 3.1: Map of the study area (Kinnaur district)

local peoples approach to natural resource management, their livelihood pattern and social environment, as these were perceived to be critical in understanding the interaction between institutions and resource management. In this connection a pilot survey was conducted during 2013, wherein intensive interactions were carried out with the locals of Kinnaur.

3.2 Sampling procedure:

Multistage stratified random sampling technique was used for the selection of household in the study area. Whole sampling plan was divided into three stages. At the first stage, all three development blocks of district Kinnaur were purposively selected because these blocks differs in lifestyle, agro climatic conditions and resource utilization pattern. In the second stage, a list of panchayat villages was procured for the each development blocks. Nearly 15 per cent panchayat were selected randomly (nine panchayats), three from each development block. In third stage, from selected panchayats, a cluster of villages around a nucleus village falling in the close proximity of a common property resources was formed in consultation with panchayat pradhans of the respective panchayats. While making clusters, adequate care was exercised in the selection of major CPR categories, especially common pasture lands, protected and unprotected forests, water resources (*kuhls*) falling in a particular selected panchayat in view of dependence of villagers on these resources. The household were further categorized into marginal (<1 ha), small (1-2 ha) and medium (>2 ha) categories on the basis of land holding as per the revenue records. From all panchayats 20 respondents each were interviewed with personal interview method. Thus, in total 180 respondents were interviewed i.e. 60 respondents each from the three selected developmental blocks.

Table 3.1: Category-wise distribution of sample households in the study area

Farmers category	Farm size (ha)	Numbers	Size of land holdings			
			Min.	Max.	Average	CV
Marginal farmers	< 1	82	0.32	0.96	0.62	19.00
Small farmers	1-2	89	1.04	1.92	1.32	32.36
Medium farmers	>2	9	2.0	4.56	2.52	32.66
Total		180	0.32	4.56	1.10	50.67

It can be seen from the table that about 49.40 per cent respondents were small farmers followed by marginal farmers. Only nine farmers were categorized as medium farmers having

more than 2 ha of land holdings. The average size of holdings varied between 0.62 to 2.52 ha among different category of the sampled households. The highest variation (32.66 %) in holding size was found in medium farmers followed by small farmers (32.36 %). The variation in holding was less (19 %) in case of marginal farmers.

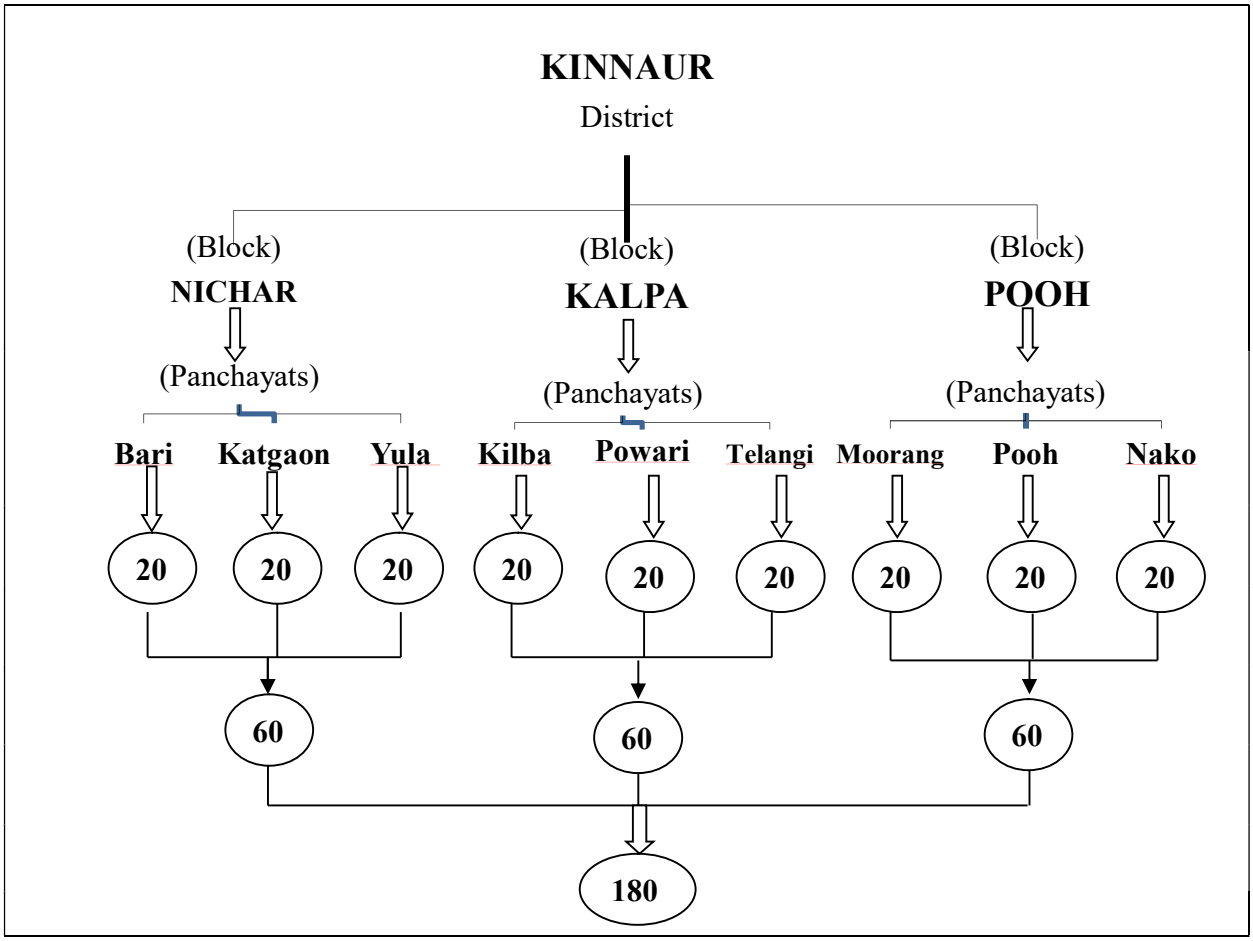

Figure 3.2: Schematic representation of sample plot of the study area

3.3 Data collection:

This study is based upon both primary and secondary information collected during the course of investigation.

3.3.1 Primary Data: The details of primary data covering following aspect were collected.

- Demographic features (age, education, sex, marital status etc.);
- Social participation;
- Quality of housing;

- Assets (landholdings, livestock inventory etc.);
- Indicators of livelihood outcomes(fuelwood and fodder collection, animal litter, grazing into common and pasturelands);
- Income pattern (occupation, farm income, off farm income);
- Similarly, the detailed information concerning the *kuhl* irrigation system i.e. organizational set up, distribution of *kuhl* irrigation system, *kuhl* management, repairs and maintenance and the problem faced by the household were collected.
- Increasing population pressure and degradation of these common property resources poses numerous problems to the beneficiaries. So these problems, constraints and suggestions of the respondents were also recorded for the better management and sustainable use of these resources.

3.3.2 Secondary Data: Secondary data pertaining to various aspects like

- Demographic details of inhabitants of the study panchayats;
- Historical information;
- Production and income generating activities;
- Land holding wise categorization of farmers;
- Institutional and organizational structures and
- Records pertaining to common property resources were collected from various government offices like revenue, forest, animal husbandry, agriculture & horticulture departments of Kinnaur district and other govt. departmental offices.

For collecting the data on the selected parameters, following schedules were used:

a) **Household survey schedule**: Households in the study area were interviewed for their socio-demographic details, land holdings, cropping patterns, livestock inventory, people's perception regarding common property resources, their status (present and past) utilization pattern and management aspects.

b) **Questionnaire for CPR management institutions:** A separate questionnaire for common property resource management institutions was prepared. With the help of different institutional functionaries were interviewed regarding year of establishment, organization structure, activities and their role in common property resources- benefit sharing mechanism, their management and conflict resolution.

3.4 Analytical tools and techniques:

Certain analytical tools and techniques are required to infer meaningful information from the acquired data which include both quantitative and qualitative methods of data analysis. To meet out the objectives of the study, tabular analysis, viz., averages, percentages, index numbers and regression analysis etc. were used.

On the other hand institutional analysis of community level management systems of CPRs is very complex. Usually these kinds of resources are frequently characterized by multiple users. In addition, there is a need for arrangement for negotiation and mechanisms for conflict resolution among different stakeholders. Rules for sharing the resources comprise property right, which are useful in resolving conflicts and creating incentives for investment for the development of the resource. At the same time, there is need to have institutions for collective action, either in the form of formal or informal organizations of cooperation, to abide by the property rights as well as act collectively for betterment of the community. These characteristics of irrigation institutions become a bit difficult to be analyzed quantitatively. However, qualitative approaches are increasingly used in conjunction with quantitative approaches and such combinations can enhance the validity and reliability of analysis and evaluation (Bamberger 2000). Therefore, a mixture of both quantitative and qualitative approaches were appropriate in this case because it provides the quantifiable results of factors which determine collective action and its effectiveness in the systems of CPRs management.

3.4(a) Calculation of Socio-economic parameters

$$\text{Sex ratio} = \frac{\text{Total Population of females}}{\text{Total Population of males}} \text{ x } 1000$$

$$\text{Literacy rate (\%)} = \frac{\text{Total no. of literate persons}}{\text{Total population}} \text{ x } 100$$

Note: Children's in the age group of 0-5 years treated as non school going and not included for the calculation of literacy.

$$\text{Literacy index} = \frac{\Sigma WiXi}{\Sigma Xi}$$

Where;

W_i = Weights (0, 1, 2, 3, 4, 5, 6 & 7) for illiterate, primary, middle, matric, secondary, graduate, post graduate & others respectively.

X_i = Number of persons in respective category.

$$\text{Dependency ratio} = \frac{\text{Average number of dependents}}{\text{Average number of workers}}$$

3.4(b) Gini coefficient:

Gini coefficient was used for the estimation of overall household income inequality, income inequality of collection from common property resources. The coefficients were estimated following Deaton, (1997).

$$\gamma = \frac{N+1}{N-1} - \frac{2}{N(N-1)\mu}\sum_{i=1}^{n}\rho_i x_i$$

Where,

γ is the Gini coefficient

μ is the population's mean income and

ρ_i is the income rank ρ of person i with income x.

In this model the household with the highest income is accounted for rank 1 and the poorest household receives a rank of N.

3.4(c) Mean Perception Score

The mean perception score of the respondents were calculated for CPR status i.e. condition of pastures for forage grass availability in the study area. Scores were allotted as 1, 2, 3 and 4 for the forage availability condition for very poor, poor, good and very good respectively. Depending upon the scores of the respondents, the Mean Perception Score (MPS) was calculated as follows:

Table 3.2: Procedure for MPS calculation

Category	**Allotted Score (a)**	**Frequency (b)**	**Total Score (c) = (a)(b)**
Very good	4	n_1	$4*n_1 = 4n_1$
Fair	3	n_2	$3*n_2 = 3n_2$
Poor	2	n_3	$2*n_3 = 2n_3$
Very poor	1	n_4	$1*n_4 = n_4$
Total		$n_1+n_2+n_3+n_4$	$4n_1+3n_2+2n_3+n_4$

The mean perception score is given by:

$$\text{MPS} = \frac{\text{Sum of total score}}{\text{Sum of frequency}}$$

The forage availability score was developed by allotting score according to the feed availability from a particular pastureland during the grazing period. The condition of pastureland was classified in the following categories; (a) very good, if fodder availability > 75 per cent and score allotted was 4; (b) fair, if fodder availability 50-75 per cent and score allotted was 3; (c) poor, if fodder availability 25-50 per cent and score allotted was 2; and (d) very poor, if fodder availability <25 per cent and score allotted was 1, respectively.

3.4 (d) Scoring of the people's perception: CPR user group members were asked to indicate their opinion regarding factors responsible for the degradation of CPRs on a Likert type of scale (i.e., agree=3, no opinion=2, disagree=1) on all indicator statements.

3.4 (e) Compound Growth Rate (CGR**):**

Compound growth rates were calculated to find out the status of common property resources (CPRs) over the years in the study area.

$$\mathbf{Y_n = Y_0 (1 + r)^t}$$

Where,

Y_n = area at time, T_n

Y_0 = area at time, T_0

r = rate of growth

t = time period

3.4 (f) Econometric model for the determination of dependency on CPRs

An econometric model was tested to understand the relationship between households CPRs dependency and their socio-economic characteristics. It was hypothesized that households level CPRs collections is inextricably associated with households socio-economic attributes. The relationship can be represented as income from collection of the CPRs (Y_i) = f (Social participation, caste, education, family size, land holding, livestock inventory, non farm income, labour allocation for CPR activities and distance from CPRs).

The corresponding regression equation was defined as a log linear model as given below:

$$ln\ \mathrm{Y}_i = \beta_0 + \sum_{j=1}^{9} \beta_i \ln X_i + \epsilon_i$$

Where,

Y_i= income from CPR collection
β_0, β_1= Coefficients
X_1= Social participation (Member=1, Non-member=0)
X_2= Caste (Upper caste=1, Lower caste=0)
X_3= Education (Literate=1, Illiterate=0)
X_4= Family size
X_5= Land holding
X_6= Livestock inventory
X_7= Non-farm income
X_8= Labour allocation for CPR activities
X_9= Distance from CPRs
i= Number of observations, 1……...n &
ϵ_i = Error term
j= Number of explanatory variables

3.4(g) Income from CPRs

The income of CPRs derived from different sources were obtained based on prevailing market price of the resources whereas, the value of some non-marketed forest products was estimated by using the time spent to collect the product (Adhikari 2005). In general, the values so obtained reflected the gross economic values of the CPR. The share of income derived from CPRs was obtained by taking the ratio of income derived from CPRs to the total income of the household (per annum). Attention was paid to avoid unrealistic estimation because the accuracy of recall information drops when people were asked to remember events in the distant past (Bernard *et al.* 1984).

3.5 Limitations of the study

a. The study is based on primary data collected by survey method through personal interview. This may have induced memory bias.
b. The study was based on the data collected for one year, (2013-2014) which may not necessarily hold true for other periods as well.

Chapter-4

RESULTS AND DISCUSSION

This chapter explains the theory, concept, historical background and the findings of present study, which has been presented under following major sub-headings:

4.1 Common property resources: Theory and Concepts

4.2 History of administrative control over land and resources

4.3 Common property resources and its status

4.4 Socio-economic profile of the study area

4.5 Linkages of CPRs with livelihood

4.6 Heterogeneity and Common Property Resources

4.7 Role of CPR management local institutions for the efficient production, utilization and benefit sharing of CPR based products

4.8 Problems and perceptions in the management of village commons

4.9 Measures to improve the efficiency of CPRs

4.1 Common property resources: *Theory and Concepts*

The Common Property Resources (CPRs) are community assets that provide both tangible and intangible livelihood (Shyhendra 2002) to their dependants. They include land used for cultivation and grazing, forests from which NTFPs are collected, wastelands and panchayat land, watersheds, rivers, rivulets, ponds and other community assets. Some define the CPRs on the basis of their ownership and others according to their use (Menon and Vadivelu 2006). Most include among the CPRs only the natural resources like land, forests and water resources. Others include the sustenance of all the subalterns such as marine fisheries (D' Souza 2001). Thus the term CPRs is used in different ways. In general, they refer to resources which are used in common and which have the physical characteristics of being difficult to demarcate. The dependents get benefit from these, such as NTFPs like edible fruits, leaves and vegetables, small timber and medicinal herbs (Lobo and Kumar 2007).

In the Indian context the CPRs can be described as the resources on which a community sustains itself mostly through equal usufruct rights. This right of being co-owners is conferred by some type of membership of the community or group such as a village or town. Its central purpose is not only the use or administration of the resource (Ahmad 1998) but also sustenance that includes people's culture, economy, social systems and identity. Most tribes have customary laws and rules on how to manage and exploit these resources and on their protection and benefit-sharing (Recognition of Forest Rights Act, 2006).

What are Common Property Regimes?

To facilitate understanding of common property resources, it is necessary to define four categories of property rights within which common property resources are held i.e. open access, state property, private property and common property. However these are ideal and analytical types. In fact, more usually resources are found in conflicting and overlapping combinations of these regimes and further there are variations within each regime types. Nevertheless, it is important to distinguish between these four basic property rights regimes (Ciriacy-Wantrup and Bishop 1975; Bromley 1989). A resource regime is a structure of rights and duties that characterizes the relationship of individuals to one another to that particular resource (Bromley 1989). A resource management regime is a collection of legal correlates that defines the relationship of individuals (or groups) to one another with respect to that particular environmental resource. According to Fuchs (2003), property regimes are "property arrangements characterized by different combinations of property rights, in terms of ownership, access, and withdrawal regulations". Property regime thus comprises specific aspects of the broader institutional structure in a society. Hence the rationale of a property regime is to create a authority system, which underlines the rules and regulations as to how appropriators will act with respect to each other and with use and access to common resources. Sets of institutional arrangements are continually established to define the property regimes over land and related natural resources whether that regime is one we would call state property, private property, or one of the common property.

The term "common property regime" refers to a particular social arrangement that regulate the consumption, preservation and maintenance of common pool resources. Many scholars argued that the fundamental point of difference between common resources, open

access or public resources is the concept of 'Property'. It refers to a benefit stream (tangible and intangible), which the title holder enjoy against all others, and hence there is a trivial social relation involving benefits, right holders and duty bearers. It is for this reason that Bromley (1992) argued that there is no such thing as a common property resource, but only "Property Regime" wherein resources are controlled and managed as common property, private property, state property or open access. Common property regimes make assure us that the resources will be available sustainably. Examples of common property regime are found in the management of common pastures, forests, water resources, fisheries etc. Thus under a common property regime, identifiable users would obtain higher total net benefit due to their direct and harmonized management. Common property regimes are not free for all that they have been described to be, but structured ownership arrangements within which management rules are developed and enforced, group size is known, incentives exist for co-owners to follow accepted institutional arrangements and sanctions work to ensure compliant (Bromley and Cernea 1989). It is necessary to mention here that particular resource may be held under more than one regime as explained below i.e. open-access regimes, state property regimes, private property regimes, common property regimes.

a. Open access:

In this type of regime, there is no formal property right over the resource or it may not present at all. So access and appropriation of resources are free and open to all. Hardin's 'The Tragedy of the Commons' refers to an open access situations where due to the absence of exclusion, well-defined property rights and authority systems, people will use the natural resources before someone else does (and hence there is more possibility of degradation). Gibsen *et al.,* (2000) asserts that open access regimes are suitable for situations when there is low pressure over the resources and no need to manage resources at all, "when demand is too low to make the effort worthwhile". However, in the long term even the most abundant resource cannot bear the pressures of economic and population growth.

b. State property regime:

Under the state property regime, the resources access and use are completely under the control of the state/government. It attempts to protect their resources either by passing laws, by

nationalizing natural resource, creating national parks or wild life sanctuary. In such types of regimes individuals can access resources with the permission of the state authority. But the government can also fail to manage these resources sustainably either due to high cost of monitoring or not having enough financial resources (Meinzen-Dick and Knox 2001; Bromley 2003).

c. Private property regime:

Under private property regime an individual or a conglomerate has the right to exclude others and to control the use of the resources. Bromley (2003) claims that "private property regimes appear to be stable and adaptive because they have the social and legal sanction to exclude excess population and effectively to resist through the power of the state unwanted intrusions". Under these regimes users have incentives to protect and manage resources because they are assured that they will receive the benefit from the resources. In contrast common property regimes provide no such incentives and are overexploited (Scott 1955; Hardin 1968). Though these regimes provide inducement (from economic point of view) to private user to regulate these resources but not always from sustainable approach. The resources may degrade or over exploited under private regimes either in order to maximize profit, uncertainty of availability of resources in future or in unstable economic situations.

d. Common property regimes:

Under this type of regime the resources are held by an identifiable group of users who can exclude outsiders and they devise a number of sound practices, over a period of time, to regulate the resource use. According to Fuchs (2003) "common property generally refers to resources for which the exclusive title is in the hands of a group of individuals". These all regime types are ideal type and in reality few resources can be absolutely under any of the above regimes. Thus it is possible to find fisheries, forests, or any other natural resource nationalized, privatized, managed by a group of individuals, or even unmanaged (Berkes 1989).

Netting (1976) based on his extensive study of private and common property in the Swiss Alps, and developed a clear set of resource characteristics that he argued would be associated with diverse forms of property. He predicted that when the value of per-unit production was low, the frequency and dependability of yield was low, the possibility of improvement was low, the

area required for effective use was large and the size of the group needed to make capital investments was large, communal property would be developed by the users. Similarly, when the opposite conditions were present, the author predicted that users would develop some form of private property (Netting 1981).

A. Common property resource management:

The crucial question addressed by different studies on commons by scholars relates to the issue of equity, efficiency and sustainability (Agrawal 2001; Di Gregorio *et al.* 2004). It may be reiterated here that common resources, by their very nature, run the risk of misallocation, over exploitation, degradation and over capitalization. Solution to this problem is often seen as the need to establish either public property or private property rights over these resources as they emphasized the difficulty of collective action. Issues of sustainable management of commons over the last few decades have thus caught the imagination of researchers to look for a fundamental solution.

Throughout the world, the degradation of natural resources has become rampant. The major issue is how to achieve sustainable resource management to ensure its long-term economic viability. There is no consensus among policy makers, scholars on whether management systems should come from the 'top down' or the 'bottom up' or should the resources be managed by indigenous and local level institutions. As it is evident from the various studies that common property resources are in a state of decline so it is of critical importance for sustainable use of such resources. The debate over sustainable management of common resources and appropriate property right regime began with Hardin's (1968) "tragedy of the commons" term implying, likely outcome of non-private tenure regime, wherein individual self centered actions would inevitably leads to degradation of common resources. Olson (1965) attributed lack of collective action or collective goal among appropriators for overexploitation of common resources. Theorist and scholars responded to this claim with a burgeoning literature on the sustainable management of common property resources (Ciriacy-Wantrup and Bishop 1975; McCay and Acheson 1987; Ostrom 1990, 2007; Ostrom *et al*. 2002; Runge 1986; Poteete *et al*. 2010).The interest of the scholars on this aspect is also due to the importance of common property resources

in relation to today's global environment threats climate change and biodiversity loss. Also the dependence of rural poor's over common property resources is hard to overstate.

There are three dominant paradigms in the literature of commons on the management of these resources which specifies the conditions under which users will sustainably govern these resources. One of the paradigm favours privatization of property rights over common resources nor the individuals will maximize gains without bearing the cost. This arrangement will incentivize the individuals to rotationally manage the resources (Hardin 1968; Runge 1985; Gordon 1954). Other favors nationalization of common resources and management of it under state control. But the last paradigm disfavor these both and wants these resources to be governed by community management (local users) as these people are dependent upon these resources for their survival and they have stake and better knowledge about natural resources (Agrawal 1999; McKean 1992; Ostrom 1990).

B. The three models:

Theoretically three influential models are most frequently used to provide a foundation for recommending either state or market solutions to overcome the decline and for better management of CPRs (Ostrom 1990). Common property regimes have been left aside because it is believed that without external forces people are unlikely to cooperate. Therefore, the only solution would be private enclosure or state regulation. These three models: the tragedy of the commons, prisoner's dilemma and the logic of collective action, predict the same. Collective action problem related to common resources cannot be resolved without external help.

i) The tragedy of the commons:

Since, Garrett Hardin's article, 'the tragedy of the commons' has came to denote the degradation of natural resources, that is held in common, to be expected when individuals (rational and self-interested) uses these scarce resource in common. It generates a negative view of collective action for managing common resources in the absence of an external authority. That means Hardin's model predicts that eventually all resources held in common will face 'the tragedy of the commons'. It generates a negative view of collective action for managing common resources in the absence of an external authority. That means Hardin's model predicts that

eventually all resources held in common will face over exploitation or degradation. Thus Hardin concluded that “freedom in the commons brings ruin to all”.

Consider a situation of a common pasture where there is no restriction to entry for the herdsmen. In primitive times, overpopulation of the pasture by herds did not occur because of natural attrition. However, in modern times, it is not so and the balance will be tipped as adding one more animal to the grazing land will cause it to be overpopulated. In spite of this, each rational herdsman wants to maximize his gains by adding one more animal to the herd. The marginal utility of adding one more animal to the herd has one positive and one negative component. The positive component is a function of the increment of one animal. Now that the herdsman receives all the benefits from the sale of the additional animal, the positive component can be considered to be almost equal to +1. The negative component is the function of the additional overgrazing which resulted due to addition of one more animal to the herd. In this particular case it may be noted that the effect of over grazing due to addition of one more animal to the herd by a herdsman is shared equally by all the herdsmen. Hence the negative utility for a herdsman is a fraction of -1. Thus the rational herdsman concludes that it is logical to add one more animal to the herd since it maximizes his gain while the cost is distributed equally amongst all the herdsmen. Since all the herdsmen reach the same calculation, overgrazing is inevitable. Each herdsman will continue to impose costs on all of the others, until the pasture is depleted, which is detrimental to all. Thus the ‘free riding’ leads to ‘tragedy’. Hardin had recommended that the tragedy of the commons could be prevented by strict regulation by the government. He also felt that privatization of the common property could solve the problem.

Long before Hardin, Aristotle anticipated the tragedy of the commons. He observed that “what is common to the greatest number has the least care bestowed upon it. Everyone thinks chiefly of his own, hardly at all of the common interest”. Hobbe’s (1960) account of man in a state of nature (in a state of war) is an example of the tragedy of the commons. Men seek their own good and end up fighting one another. The French naturalist, Marcet (1819) wrote in Conversations on Political Economy (1819, cited in Baumol and Oates 1988) that open access to natural resources results, depletion and over harvesting of these resources.

Dales (1968) noted at the same perplexing problems related to resources “owned in common because there is no alternative”. Modern resource economics conclude that where a number of users have access to the common pool resources, the total of resource units withdrawn from the resource will be greater than the optimal economic level of withdrawal (Clark 1976 1980; Dasgupta and Heal 1979).

This paradigm provided the framework to environmentalists, resource scientists, economist and policy makers to understand resource issues and related problems of its sustainable management (Berkes and Feeny 1990; McEvoy 1988). The “Tragedy of The Common” has been used to describe diverse problems as the ‘Sahelian famine’ of the 1970s (Picardi and Seifert 1977), firewood crises throughout the Third World (Norman 1984; Thomson 1977), the organization of the Mormon Church (Bullock and Baden 1977). Much of the world is dependent on resources that are subject to the possibility of a “Tragedy of The Commons”.

Limitations:

Hardin fails to distinguish between situation of no property and common property. He begins his argument by assuming a pasture open to all. Wade points out that the case can be quite different where a joint ownership unit exists and access is open only within the bounds of this unit. The chances of getting compliance with rules of restrained access are much better. The logic in the 'tragedy of the commons’ literature assumes that the value of a common is instrumental. The nature is valuable in so far as it constitutes a resource, something to be exploited. Grazing lands in the original paradigm have value because they form the foundation for livelihoods, and therefore concrete material interests are identifiable.

In the classic formulation of Hardin, the tragedy was the failure of collective social institutions to prevent the externalities of private maximizing behaviour from mining a common resource to the detriment of all individuals in the local social system. The tragedy is simply another, though one of the most dramatic examples of what Satre calls counter finality, the unintended negative consequences at the collective level of individually rational decisions.

The utility of the Hardin's model depends fundamentally on two core assumptions: (a) material self-interests as the motivating force in the use of natural systems by individuals and (b)

incapacity for social learning. His parable further does not distinguish between commons where the resource is linked to the individual survival and those where it is not. It can be said that the model is more applicable in situation where resource is not vital (Wade 1987). It is possible that where individual survival is at stake and his self interest in the long run is important, a rational individual will exercise restraint at some point. This is where the incentive or a condition for cooperation becomes meaningful.

Hardin's model is insightful but incomplete. His conclusion of unavoidable tragedy follows from his assumptions of (1) open access, (2) lack of constraints on individual behaviour, (3) conditions in which demand exceeds supply and (4) resource users who are incapable of altering the rules. All these four assumptions do not go with actual common property situations. The Hardin's argument overlooks the significant role of institutional arrangements that provide for exclusion and regulation of use. It also overlooks cultural factors (Feeny 1986; Charles 1988; McCay 1980). To analyse outcomes one needs to know the nature of the resource, the whole array of decision making arrangements including the property rights regime and the nature of interaction among the users and the exploiters (Oakerson 1986; Godwin and Shepherd 1979; McEvoy 1988)

ii) The prisoner's dilemma:

The Prisoners Dilemma can be seen as a formalization of Hardin's expression into a game model. There are number of writings on the game situation (Wagner 1983; Runge 1984, 1992; Ostrom 1990). It is a simple game model in which collective decision produce outcomes harmful to the group as a whole without intervention by some higher authority. It is conceptualized as a non-cooperative game in which all the players possess complete information. In non-cooperative games, communication among the players is forbidden or impossible or simply irrelevant as long as it is not modeled as a part of the game. If communication is allowed, verbal agreements among players are presumed to be non-binding unless it is so mentioned in the game structure.

A classic example of the prisoner's dilemma (PD) which is presented as follows with a hypothetical example of forest management. If the forest department and the village community agree to participate, then both the forest department and village community may share the forest produce equally at Rs 5 lakhs each. If the village community alone participates and not the forest

department, then the forest department may collect all the forest produce and auction it and earn a forest revenue to a tune of Rs 7 lakh, but the village community gets nothing and will be the net loser. If the village community does not participate, it may indulge in illegal cutting of some timber and get its market price worth Rs 7 lakhs and the forest department gets nothing and is the net loser.

The parable of the "Prisoners Dilemma" is quite well known and can best be illustrated with the game where forest department and the village community do not participate in the forest management, then the forest department may collect some timber and other forest produce and the village community may collect some forest produce illegally, thereby each gaining revenue equal to just ` 2 lakh.

Table 4.1: Payoff matrix showing 'prisoners dilemma'

Forest department (` lakh)

Village community		Participate	Do not participate
	Participate	5, 5	0, 7
	Do not participate	7, 0	2, 2

In the classic form of this game, cooperating is strictly dominated by defecting, so that the only possible equilibrium for the game is for all players to defect. No matter what the other player does, one player will always gain a greater payoff by playing defect. Since in any situation playing defect is more beneficial than cooperating, all rational players will play defect, all things being equal. In the above example, both the village community and the forest department do not participate in the forest management and settle for a pay-off of Rs 2 lakh each. However the best set of pay-offs could have been each getting Rs 5 lakhs.

According to Amartya Sen, all it takes to make cooperation individually optimal is 'assurance' that others will cooperate. Hence, this is an assurance problem. (Sen 1967). It may be possible to overcome the prisoner's dilemma by converting the dilemma into an assurance problem by changing either incentives or personal motivations.

The prisoner's dilemma argument has been taken recourse by Olson to suggest that collective action problem can be solved in a group endogenously through the practice of

'selective incentives'. The 'prisoner's dilemma' was of great interest to social scientists for it seems to justify the conclusions that rational people cannot achieve rational collective outcomes. It seems to be applicable to all situations in which it is possible for some to refuse to cooperate while others are willing to cooperate (Ostrom 1990). There are two assumptions, which are dominant in a situation modeled as prisoner's dilemma game. One, there is a lack of information among the players in the game. The players choose in ignorance of each other's choice. The second is that each player chooses once before the payoffs are received and so cannot change his mind upon finding out what the other has done. The first assumption has the important implications that the players cannot negotiate among themselves to change the rules of the game, so as to secure more desirable collective outcomes. If at all the changes in rules must come, it should be from outside the group.

However, if the situation is a consistent phenomenon or a recurrent one, then in those case the logic changes. If the players in a "prisoner's dilemma" know that the game will be played repeatedly into the future, the chance that they will cooperate today in the hope that the others will then do so are much higher where the game is played only once (Taylor 1987; Axelrod1981; Hardin 1982). In fact economists in their recent work on game theory have drawn heavily on the theory of repeated games in arguing that cooperative behaviour grow out of self interest (Seabright 1993). The basic question is that if the game is repeated a number of times, can the two players find a way to cooperate? The idea that repetition can sustain cooperation is based on the premise that individuals who are tempted to defect may be dissuaded from doing so from the fear of losing the benefits of cooperation in the future. This dissuasion becomes effective only in the presence of some incentive structure that is accompanied by assurances at different levels provided by the system in which one is operating.

Limitations:

There are few key difficulties with this model, which makes it unrealistic empirically. First, in the 'prisoners dilemma', free riding is an imperative (Runge 1984; Kimber 1981; Sugden 1986). This assumption leaves no option for cooperative rules unless they are enforced from outside. Secondly, the dominant strategy mechanism by ruling out the importance of changing expectations of other's behaviour fails to capture the interdependence of decisions in a village economy. Third, by side stepping the role of mutual expectations in the formulation of

individual strategy, it fails to deal explicitly with the problem of uncertainty regarding the actions of others (Runge 1981). These objectives have raised serious questions over the validity of this theoretical approach, which asserts that private property is uniquely suited to optimal resource allocations and that common property rules cannot be solution to problems of resource use in developing economies. It fails to consider a variety of institutional alternatives. Although "prisoner's dilemma" provides important insights into the breakdown of social institution, it gives no explanation of how or why institutions begin and are maintained. Instead they imply that within any group no internal incentives exist to initiate or maintain institutional arrangements (Runge 1984).

iii) The logic of collective action:

Another view closely related to 'Prisoners Dilemma' model, expressing difficulty in getting individuals to look after their joint welfare rather than individual welfare, was developed by Mancur Olson (1965) in his work 'The Logic of Collective Action'. His basic postulate is that a large group, through voluntary contributions, cannot provide collective goods. His contention is that the reason the rational individuals will not act in their common interest is that individual's trade in collective or common goods, which are characterized by non-excludability. So they want to enjoy the benefits of collective goods without contributing to the cost. It points out the difficulty of collective action because there is little incentive in voluntary action to further collective good when free rider can, in such situations, obtains the benefits of these goods. Olson also contested optimism of group theory which is based on the idea that individuals would voluntarily act to further the common interests. Olson observed that economists and political scientists typically took it for granted that individuals in groups with a common interest, or with a prospective collective benefit to be attained, would act to further that common interest; indeed, it was assumed that groups would act much in the same way as individuals act, to pursue their interests. The idea that groups tend to act in support of their group interests is supposed to follow logically from this widely accepted premise of rational, self-interested behavior. In other words, if the members of some group have a common interest or object, and if they would all be better off if that objective were achieved, it has been thought to follow logically that the individuals in that group would, if they were rational and self interested, act to achieve that objective.

The core position of his contention is “unless there is coercion or some other special device to make individuals act in their common interest, rational self interested individuals will not act to achieve their common or group interests.” His argument rests on the premise that whenever individuals cannot be excluded from the benefits that other provide, thereby individuals are not motivated to contribute to the joint effort, but to free ride on the efforts of others. If all participants choose to free ride, the collective benefit will not be produced. The temptation to free ride, however, may dominate the decision process, and thus all will end up where no one wanted to be. Alternatively, some may provide while others free ride, leading to less than the optimal level of provision of the collective benefit.

Olson divided groups into small, intermediate and large. He argued that the problem of free rider, where in appropriators achieve their self interest at the cost of group interest, is a problem associated with large groups and not with small or intermediate groups. In larger groups free rider problem remains unidentified and there is a tendency of decreasing importance of each individual to collective action. In small groups contribution of individuals will be perceptible.

Limitations:

Olson limits his argument to large interest groups only in taxonomy of small, intermediate and large groups. A small group is one in which a single individual has an interest in providing the public good irrespective of the contribution of others. Intermediate and large groups are those where no one individual has this interest and where some cooperation is therefore necessary. Intermediate groups differ from large groups in that the actions of a single member with regard to whether he contributes or not are noticeable to others in an intermediate group, but not to others in a large group. Therefore the possibility of detecting free riding is relatively easier in intermediate groups. Olson argues that small interest groups are more likely to participate in voluntary collective action i.e. without selective punishments or inducements. The logic is low for large groups and intermediate ones. However he gives little guidance as how to distinguish the three types of group in practice. Wade (1988) study of 31 irrigated villages in a single district of south India exemplifies the proposition that it is possible for an interest group organisation to emerge voluntarily and be sustained on the whole voluntarily i.e. without selective benefits or costs, if the net collective benefit is high enough.

Further, Olson (1999) seems to leave the question open as to whether the source of selective punishment or inducement is inside the group or it is outside. If one interprets his arguments, his basic premise seems to be that negative selective sanctions are an essential part of the organizational design needed to sustain collective action. At the same time, this can also be argued that he is suggesting that the sanctions must be organised from outside the group itself, specifically by the State.

Thus, 'The Tragedy of The Commons', 'Prisoners Dilemma' and 'The Logic of Collective Action' are closely related concepts in the models that have defined the problems that individuals face when they want to achieve collective benefits. The central issue in each of these models is the free rider problem. As Ostrom (1990) points out that whenever one person cannot be excluded from the benefits that others provide, each person is motivated not to contribute to the joint effort but to free ride on the efforts of other. These models are thus extremely important in explaining how perfectly 'rational' individuals can produce under some circumstances outcomes that are not 'rational' when viewed from the perspective of all those involved. At the same time as the foundation for policy, these models have been used more often other than not metaphorically. The limitations that are taken to be fixed for the purpose of analysis are taken as faith and as being definite in empirical settings and continue to be so unless one takes recourse to external authorities to change them. In the process certain key questions remain unanswered like how individuals who are jointly using a common property resource might achieve an effective form in governing and managing their own commons.

4.2 History of administrative control over land and resources

a) Himachal Pradesh

Discussions on the human use of ecological resources in pre-colonial times must be very tentative, since no systematic study has yet been carried in this mountain region. Much therefore must be speculation, based in part on the survival, long into the colonial era, of earlier adaptation and extraction systems. The social dimension largely concerns the customary law of common property systems and collective patterns of use of non-timber resources. In Himachal Pradesh a key distinction must be made between settled farming systems and tribal hunter-gatherer systems. Over an era approaching two thousand years, Hindu farmer castes gradually expanded

their settlements and terraced agriculture up the alluvial soils of the region's many river valleys. Hill peasants practiced mixed cropping systems on terraces, primarily for local use but to a limited degree for monetary regional markets as well. In principle, ownership of all lands, including arable lands, lay with the hill *rajas*, but in practice the peasants generally inherited the use of their terraces down generations and landholding was distributed relatively equitably, with far less presence of landholding elite as compared to many parts of lowland India.

A brief review of history seems to suggest that the 'customary' management of the natural resources by the so-called 'village community' was not an undisputed fact in the region. Nor were the colonial rulers, from the very beginning, keen on obtaining complete and exclusive control over the resources of all non-arable areas. Many of the officials, in fact, felt that by including the forests in *mauja* (local term for habitation) boundaries and 'partially assigning' them to the landholders of the *mauja*, the village officials and village communities would be induced and compelled to look after the forests and pay the *rakhas* or watchmen. This hesitation of the British to stake a larger claim is explained by the fact that forest conservation initially had lower priority than the extension of cultivation.

Attitudes towards land (as property and as a means of livelihood) changed over time. So did the interpretations of its 'ownership'. Initially, much seems to have rested upon the British administrators' perception of the nature of land rights and what they regarded as the 'traditional' land ownership structure. In areas of Himachal that came under direct colonial rule, the government proclaimed itself the inheritor of the privileges and authority of the traditional rulers who had been dispossessed. In order to justify the unprecedented powers that they now began to claim, the British administrators probably exaggerated the powers that the pre-colonial *rajas* had enjoyed. By this manipulation the new rulers were able to lay claim to greater authority than the earlier rulers had ever been able to actually assert, even if their powers were theoretically extensive and normally acknowledged by the peasantry. This was of much significance for the region because the Himachal hill state ultimately came to be viewed rather differently from the other agrarian areas of the north Indian plains. To be fair to the early revenue settlement officers, they may have been justified in taking such a position. They were inclined to compare the political structure of the princely states of Himachal with that which prevailed in Europe under feudalism. This seems to have formed the basis of their subsequent understanding regarding the

respective claims that the ruler and his subjects had on the land and its produce. The early British administrators in Himachal had to face several difficult questions. Who owned the village wastes? Was there a village community? What were the rights of the cultivators on uncultivated land around their farms?

British administrators certainly encouraged amongst the peasants of a village the emergence of a co-proprietorship in the smaller wastes. But there was a hidden set of implications in this. By giving the shape of a property to the *de facto* control of peasants over the village wastes, the British, it seems, sought to establish for themselves an exclusive and absolute control over the resources of the larger non-arable areas and forests. A clear cut demarcation of 'ownership' carried out in these terms undoubtedly gave to the agriculturists a more definite authority over their immediate environs. It simultaneously allowed the colonial rulers to put forward a proprietary claim of a corresponding nature on the larger expanse of uncultivated area. This seemed to carry with it the implicit understanding that the domains of the state and the peasant had been differentiated in so far as the use of natural resources was concerned. Theoretically his subjects did not seriously dispute the claim of the *raja* over such resources in earlier times. In reality, however, he was probably unable to even procure them without the latter's mediation. The rulers and the ruled did not operate in mutually exclusive proprietary fields.

Having virtually prompted the emergence of a clearer sense of property in the village wastes amongst the peasantry, the British administration seems to have moved in the direction of creating clearer notions of individual 'proprietorship'. Undeniably the emphasis here has been on the changing relationship between the peasants and the state over the question of the village 'wastes'. This is because the latter category of land has become the focus of attention amongst environmentalists and is today the source of much contention. The debate on 'common property resources in its present form have its origins in the uncertainty that prevailed for long over the control and management of these 'wastes'. One need hardly clarify that the term 'waste' is, in fact, itself a misnomer. These were the most important pieces of land from which 'resources' could be exploited and there were few other such areas around the village which were of such immense utility. Yet it might be somewhat of an exaggeration to argue, as many scholars have done, that the 'village community' and not the state was the undisputed master of this land in

pre-colonial times. The right to make use of the resources of wastelands was very closely tied to the peasants' obligations towards the state. The one was incomplete without the other and both were the products of a particular historical stage.

To make the analysis more complicated, the western Himalayas were administratively complex: large areas outside the Britishers were left as intact 'Princely Hill States'. These States tended to maintain older forms of discretionary management more nearly intact until they were administratively absorbed into independent India in 1947. But most of them, under diplomatic pressure from the British, gradually adopted approximations of the British forest management system. The effect of this on management of non-timber products is even more uncertain than for the districts of British India, but some indication can be gained from the Forest Rules, which the Chamba and Bushahr states adopted by 1900. These rules stated that Reserved Forests would be under the direct control of a British Forest Conservator appointed by the *raja*, whereas Unreserved Forests were under the *raja*'s control. In the Reserved Forests the villagers had rights only to building timber, fodder grass and fuelwood. In the *raja*'s forests, villagers had rights to the collection and sale of dry and fallen timber and inferior trees for fuel, grass, wild animals, birds, honey, wax, fruit and flowers, taking care that such collection is effected in such a manner as not to injure the forest. In sum, both British India and the Princely States under Western hegemony experienced a trend toward managed forest ecosystems, with an accommodation between European and traditional systems of use.

This naturally would have far-reaching implications for the idea of 'common property resources'. But it does not mean that the *rajas* had always been able to assert these rights. The increasing British presence in the area must have had its impact. The reinterpretation of the political economy of the hill states by the British, keeping their own interests in the forefront, was responsible for bringing about very important changes. It also provided the *rajas* with the justification and means of accessing natural resources directly instead of through peasants and pastoralists.

Quite evidently, the notion of property prior to the coming of the British was very different from what it subsequently came to mean. If this was the case with regard to 'valuable' agricultural land, the idea of a 'common property resource' in the 'wastes' and the forests can hardly be perceived as a straightforward matter. To a considerable extent the rights of peasants to

'common property resources' were in the nature of 'users', not 'owners'. These rights were, moreover, linked to their position both as members of a village community and as proprietors of agricultural land. Their unequal position in the latter situation, in particular, may have led to resulting inequalities in their access to resources.

About the village 'wastes' and other adjoining uncultivated land, some confusion still prevails. It is often suggested that prior to the colonial intervention in the hills, village communities owned and regulated the use of wastes and forests as 'common property resources'. In this context it has been argued that the British administrators encouraged and brought about a change from a collective to individual use of forest resources. It has, therefore, been suggested that during the early years of British rule the cohesion of India's village communities was destroyed and along with them their control over 'common property resources'.

It is these assumptions that finally bring us to the question of whether there ever existed an idea of 'common property resources' (or community conserved areas). To begin with, were uncultivated wastes near villages 'owned' or 'managed' by village communities in pre-colonial times? This may certainly have been the case in many other parts of India, but Himachal was, probably, not one of them. Consider some of the 10th and 11th century land grants made by the *rajas* of Chamba to certain individuals: the conferred rights included '... grass, grazing and pasturelands, with fallow land ingress and egress together with gardens and resting places...' There are references to officials being specifically instructed to not cut the grantee's pasture or seize his wood, fuel, grass, etc. Individual beneficiaries of these grants, therefore, almost exclusively utilised the 'waste' adjoining the cultivated land. There is no mention whatsoever of either the 'village community' or of its control over 'common property'. The transfer of rights seems to have taken place straight from the state to the individual. It comes as no surprise therefore, to find that British officials who attempted to understand the nature of rights in village 'wasteland' during the early years of British rule often arrived at conflicting conclusions. The wasteland both within village boundaries and outside came to be treated simply as surplus land available for cultivation. By the end of colonial period much of this primeval waste had been appropriated by communities and later privatized by partition. This process of partitioning common lands or cultivable waste within and outside villages eroded the adhesive element in communities of cultivating owners (Kaul 1996).

In principle the claim of the *raja* to the ownership of the 'wastes' was normally never challenged. There were many occasions on which he very clearly asserted it. This claim, nevertheless, coexisted with certain rights of the peasantry, which were close to being proprietary, albeit in a manner that was not entirely in conformity with modern market rationality. By making some broad divisions we may be able to better appreciate the individuals and institutions that were involved. There was, to begin with, the interaction between the ruler and the village communities wherever such communities existed. At the next administrative or territorial level were the different villages. Finally, within the village, of course, were the claims made by individual peasants on the wastes of their respective villages. In so far as different villages were concerned, the recognition of an essential distinction between cultivated and uncultivated areas was initially intended to be more 'an internal frontier between cultivated and uncultivated land than as a boundary with the neighboring villages'. It was perhaps only with increasing pressure on village wastes that it become necessary to demarcate the territories of villages (Sharma 2000).

The pre-colonial setting:

Around 2000 BC, it appears that extensive forest cover, interspersed with grasslands, dominated this region of the Shivalik and outer Himalayan tracts. Grasslands were sustained by natural factors like isolation, slope, aspect, landslips, natural fires and erosion. Human settlements and agricultural activities were at a minimum, concentrated mostly along fertile river valleys. Hill regions were divided into small states (*riyasats*) ruled by local *rajas*. Arable land was under the control of settlers, while all pastures and forests were under the *raja*'s dominion, and maintained mostly in the form of hunting reserves. Lands were gifted by the *rajas* to their courtiers or in exchange for military services to the state. Local grazing rights were granted to the villagers.

The *raja*'s proprietary claims did not readily translate into unrestricted control. Nor would the *raja* have had any use of such control before the appearance of a market with global colonial dimensions. An important distinction needs to be made at this point between the ownership of land on the one hand and the resources it possessed on the other. When during the pre-British period the state claimed ownership of all unenclosed waste, the cultivators had 'rights of use' (*bartandhari*) on it. Amongst the most common of these was the right to pasture their

livestock, to cut grass and tree leaves for fodder, and to obtain dry fuelwood for everyday use. Not only were these activities important for the village economy, they were also, ultimately, factors that contributed to the income of the state in the form of both agricultural and non-agricultural taxes. Some other benefits that the peasants enjoyed with the permission of the local officials were to cut wood for house construction, for making farm implements, for marriages and funerals, etc. Barnes drew up a list of such rights and by the late 19th century these had been widely recognised even by British administrators (Sharma 2000).

Forest Settlement of Bushahr State (Kinnaur) of Glover clearly identifies the usufruct rights to the locals of then Bushahr *riyasat*. Since, then locals were able to access to *shamlats*, forests, pastures etc. for their livelihood.

These rights are:

i. Right to cultivate fields.
ii. Rights to grazing.
iii. Rights to timber for building and other domestic purposes.
iv. Rights to firewood and torchwood.
v. Rights to fallen pine leaves.
vi. Right to lop oaks and shrubs for sheep and to make charcoal.
vii. Right to take swarms of bees.
viii. Right to collect herbs, roots, wild fruits and seeds of the *neoza* pine for sale.
ix. Right to cut grass and leaves of pencil cedar for incense.
x. Rights to house sheep in pens situated in forests.
xi. Rights to hold fairs (*Phulaich*) on sites fixed by old custom.
xii. Right-of-way to springs and for cattle and browsers.

a) Historical background of the study area:

Little is known about the history of Kinnaur, except for the fact that it was once known as 'Kunawar'. There are, however, legends and myths among the inhabitants. It is known that the area was placed under the control of the Magadha kingdom, followed by the Mauryan Empire during the 6th century BC, which was then inhabited mainly by the Kirata, Kamboja, Panasika, and Valhika. Kinnaur also came under the influence of the Guge kingdom of Tibet

between the 9th and 12th centuries. Kinnaur was later divided into seven parts, known as '*Saat Khoond*'. Conflicts in the region eventually gave rise to the formation of many small chiefdoms, which fought amongst one another for power. These struggles also included the neighbouring *Bhots*. Several forts from this time, including Labrang, Moorang, and Kamru, serve as evidence of the region's history of conflict, which lasted until Emperor Akbar conquered the area. Akbar's conquest resulted in the incorporation of the Kinnaur valley into the Mughal Empire.

After the collapse of the Mughal Empire, the Kinnaur valley, then known as *Chini Tehsil*, played an influential role. When its dominant role in the region lapsed, it was merged to form part of the then Mahasu district upto April 30th, 1960. By May 1st, 1960 political, ethnic and cultural considerations led to the area being reorganised, forming the present Kinnaur district.

Kinnaur remained isolated until recently. It was a restricted area where no foreigner was allowed till early 1990's and even Indians had to acquire permit to enter the district. Indo-China border conflict of October 1962 brought Kinnaur into focus. It acquired strategic importance and a large number of armed-force personnel moved into the district. This resulted in obvious and stepped up initiatives for socio- economic development. Main objective behind this was to broaden their social horizon and bring economic contentment among the people who till then were 'backward' and formed a 'closed society'. Thus, followed the process of induced migration, spread of educational facilities and construction of roads; most importantly NH-22 and initiation of many projects under the District Rural Development Agency (DRDA) with the implementation of various development schemes like; Integrated Watershed Development Programme (IWMP), Mahatma Gandhi National Rural Guarantee Scheme (MGNREGS), Pradhan Mantri Gram Swarozgar Yojana (PMGSY), Integrated Tribal Development Programme (ITDP) etc. Consequently, it helped the acceptance of new ideas and technology by the people and led to gradually opening up of the region.

Kinnaur is among the remote and high altitude districts of India. It has rugged mountainous terrain with altitude ranging from 1300 to 7200 masl. District of Kinnaur is situated in the eastern part of Himachal Pradesh. It lies between 31°05'55" and 32°05'20" North latitude and between 77°45'00" and 79°00'50" East longitude with an area of 6401 Sq. Km. (Mamgain 1959). It is bounded on its Northern and North-western side by spurs of snowy mountains which

separate it from Spiti & Kullu and in the East by similar terrain, which separates it from Tibet. Shimla district of Himachal Pradesh and Uttarkashi district of Uttarakhand are situated to its South and South-West. Its climate ranges from moist-temperate to cold-arid. On account of the high altitude and resultant cold-arid climate, it is among the environmentally difficult regions to live in. In response to topographical compulsions, Kinnaurese developed pastoral cum agricultural economy to meet out the local food requirements. It traditionally has been a self subsistence region. Its relative isolation helped in keeping culture and economy quite specific to this region.

Administrative set-up:

Kinnaur as a separate district appeared on the map of Himachal Pradesh on 1st May, 1960.The district has 5 tehsils viz., Pooh, Kalpa, Morang, Nichar and Sangla and one sub-tehsil i.e. Hangrang. There are three sub-divisions viz. Pooh, Kalpa and Nichar. Pooh sub-division comprises the tehsils of Morang and Pooh and the sub-tehsil of Hangrang with headquarters at Pooh. This sub-division is biggest in term of area and administrative head of this sub-division is Additional District Magistrate (ADM) and is assisted by Assistant Commissioner, Development in discharging executive as well as development functions. Kalpa sub-division consists of the tehsils Kalpa and Sangla, while Nichar sub-division has only one tehsil of the same name. The headquarters of Kalpa sub-division is at Kalpa (Reckongpeo) while that of Nichar sub-division at Bhabanagar. Both sub-divisions are headed by Sub-divisional Officers (civil). There are three community development blocks in the district and their boundaries are co-terminus with the three sub-divisions.

General description of the study area:

The district is entirely rural and has total number of 660 villages spreading over 5 tehsils and one sub-tehsil of Hangrang sub-tehsil (57 villages): Pooh tehsil (97 villages), Morang tehsil (124 villages), Kalpa tehsil (84 villages), Nichar tehsil (188 villages) and Sangla tehsil (110 villages).

Table 4.2: Kinnaur district: an overview

Attributes	Nichar	Kalpa	Pooh	Overall
Area (km^2)	1189	1779	3433	6401
Human population	33,072	27,765	23,461	84298
Population density (per km^2)	27.81	15.60	6.82	13.0
Literacy rate	80.18	82.28	79.36	80.77
Sex ratio	790	815	860	818
Number of inhabited villages	85	77	81	243
Number of households	6681	7824	5471	19976
Approx. elevation (amsl)	2200	2500	3000	2769

- **Source:** District Statistical Abstract, 2013-14

Kinnaur district is entirely rural and is divided into three Development Blocks viz., Nichar, Kalpa and Pooh. These development blocks are further sub-divided into five Tehsils viz., Nichar, Sangla, Kalpa, Moorang and Pooh and one Sub-Tehsil i.e. Hangrang. Kalpa block have the highest population of 33,072 persons and Nichar is the second most populous block with 27,765 persons. Pooh block lies in Trans-Himalayan Zone with population of 23,461 persons. Sex ratio in Kinnaur district was 818 females per thousand of males and literacy rate of 80.77 %. This was quite below the state average of 974 females per thousand males (Census 2011). Kinnauras constitute the third largest ethnic group of Himachal Pradesh. Though their existence is known since ancient times, yet they have been among most obscure ethnic groups of India. Kinnaurese form a mixed lot; Buddhism is quite prevalent but the majority of them are Hindus. However, irrespective of religion, almost everyone follows Buddhist rituals and practices due to strong influence of neighbouring Tibet. Culture of Kinnaur is Tribal and fraternal polyandry is still present. This practice of polyandry was introduced in old times to balance survival as cultivated land is less and family planning was unheard. But with the passage of time and education, this custom is now very rare.

Area and climate:

Total geographical area of the region is 640100 ha which constitutes 11.92 per cent of the total geographical area of the state and ranks 2nd largest district after Lahaul and Spiti. The net area sown in the district is 8217 ha out of which 1473 ha is sown more than once. Net irrigated area is 5285 ha which is 64.32 per cent of the net sown area in the district.

Climate of Kinnaur is governed by its geographical location and topography. As these conditions vary in different parts of the district, climate also changes accordingly. From hot to near freezing temperature can be experienced here. These varied climatic conditions are conditioned by altitude, aspect, intensity of precipitation and nature of vegetation. As one advances towards the north, precipitation goes down and becomes scanty. Monsoon finds easy way up to Wangtu and there after it gradually weakens out on its way to Kalpa and after Kalpa i.e. in Trans- Himalayan part of the district, precipitation becomes quite low. That is why Nichar and Kalpa blocks have denser forest while Pooh hardly has a green patch.

According to the elevation, temperature varies in the different parts of the district. It begins to rise rapidly from about the end of February, till June. In the lower portion of the Kinnaur, June the warmest month and it is July and August in the upper reaches because it lies beyond monsoon range.

4.3 Common property resources and its status

a) India

The availability of common land however, varies widely from region to region in India mainly on the basis of different agro-climatic conditions and agricultural systems. These factors affect not only the nature and extent of common land but also the broader institutional framework that govern their management. A large number of field studies have been conducted since 1980's in this regard. These studies mostly deal with the nature and extent of dependence of the rural poor on common land and its contribution to the rural economy. National sample survey organization (NSSO 1999) provided, for the first time, comprehensive state and national level estimates of size, utilization and contribution of common resources. Tables 4.3 and 4.4 shows the magnitude of common property land resources and percentage of CPR land in different states in India.

The National Sample Survey Organisation (NSSO), in its 54th round has estimated the extent of CPR land per household at the state level. It mentions that CPR land constitutes, on an average 15 per cent of the total geographical area in India. The percentage however varies from 1 per cent in Punjab and Tripura to 32 per cent in Rajasthan. The average CPR area available to a

household thus worked out to be approximately 0.31 ha while average area of land owned by a rural household was estimated at 0.84 ha that signifies the relative importance of common property in land-based agricultural economy of rural India (Table 4.3).

Table 4.3: Estimated CPR lands in different States

State	Area owned per household (ha)	CPR land per household (ha)	Percentage of CPR land to geographical area
Andhra Pradesh	0.67	0.17	9
Arunachal Pradesh	1.52	1.15	-
Assam	0.79	0.05	7
Bihar	0.59	0.08	8
Gujarat	1.17	0.72	27
Haryana	1.00	0.05	3
Himachal Pradesh	0.73	0.33	12
Jammu and Kashmir	0.68	0.14	-
Karnataka	1.23	0.25	10
Kerala	0.28	0.12	-
Madhya Pradesh	1.52	0.74	22
Maharashtra	1.08	0.30	11
Manipur	0.66	0.17	-
Meghalaya	1.02	0.72	-
Mizoram	0.36	4.37	-
Nagaland	2.68	1.49	8
Orissa	0.58	0.28	11
Punjab	0.94	0.02	1
Rajasthan	2.21	2.04	32
Sikkim	0.49	0.25	14
Tamil Nadu	0.35	0.16	12
Tripura	0.30	0.01	1
Uttar Pradesh	0.74	0.14	12
West Bengal	0.33	0.03	2
India	**0.84**	**0.31**	**15**

*Source: NSSO, 1999

As is evident from the NSSO data reflected in Table 4.4, about 23 per cent of the reported common property land resources constitutes community pasture and grazing lands, while 16 per cent of these are village forests and woodlots and the rest 61 per cent is attributed to the other category which includes the village commons (*shamlats*), threshing grounds, barren and waste lands. Further the data shows that there is reduction in 19 ha of common property land resources per 1000 ha during last 5 years. More significantly, the NSSO data indicate the importance of common lands for the rural poor in India. It states that 45 per cent of all rural household in the country collect fuelwood from common lands and 48 per cent household reported collection of

any material from common resources. However, the average value of this collection is not high and it mostly consists of fuel wood 58 per cent.

Table 4.4: Common property land resources in India

Items	Estimates
Percentage of Common Property Land Resources in total geographical area	15 %
Common Property Land Resources per household (ha)	0.31
Common Property Land Resources per capita (ha)	0.06
Components of Common Property Land Resources:	
i) Community Pastures and grazing lands	23 %
ii) Village forests and woodlots	16 %
iii) Others (village commons, threshing grounds, barren and waste lands)	61 %
iv) Reduction in CPR land during last 5 years (per 1000 ha)	19 ha
Use of Common Property Resources:	
i) Household reporting any materials from CPRs	48 %
ii) Average value of annual collections per household	` 693
iii) Ratio of average value of collection of average value of consumption expenditure.	3.02 %
iv) Household reporting grazing of livestock on CPRs	20 %
Household reporting use of common water resources for:	
i) Irrigation	23 %
ii) Livestock rearing	30 %
iii) Household enterprise	2.8 %
Collection of fuelwood from CPRs and their sale:	
i) Share of fuelwood in value of collection from CPRs	58 %
ii) Percentage of household reporting use of fuelwood	62 %
iii) Household reporting collection of fuelwood from CPRs	45 %
iv) Average quantity of fuelwood collected from CPRs in last 1 year	500 Kg
Dependence on CPRs for livestock rearing:	
i) Household possessing livestock	56 %
ii) Household collecting fodder from CPRs	13 %
iii) Household cultivating fodder on CPRs	2 %
iv) Average Quantity of fodder collected from CPRs in last 1 year	275 Kg
Household reporting irrigation using Common Property Water Resources owned/ managed by:	
i) Village panchayat	1.1 %
ii) Community	0.8 %
iii) Government	1.8 %
iv) River/ Govt. canal etc.	10.3 %

Source: NSSO, 1999

Further, the survey highlights that the average value of annual collections per household from common resources is ` 693, which amounts to 3 per cent of the average consumption expenditure of the rural household. Apart from this, 30 per cent of the rural household use common resources for livestock rearing and about 23 per cent of the household use common

water resources for irrigation purposes. The survey thus highlights the fact that the landless, agricultural workers and household with the largest share of income coming from wage-paid manual labour tend to rely mostly on CPRs for food and livelihood security.

It may be stated here that the sustainability of common resources are in the interest of all generations as it is linked to the issues of resilience, equity and growth. As far as equity is concerned, the poor people are significantly dependent upon common resources. Common resources are also development drivers as they provide significant component of income and growth of the masses. Moreover these resources provides resilience and livelihood support during distress situation like droughts, flood etc. The contribution of common resources to rural economy in terms of poverty alleviation and to rural poor in particular is substantiated by several regional studies using village level data and other information sources. For example, Jodha (1986) in his study based on data from over 80 villages in 21 districts in dry regions of seven states, showed that there was significant contribution of common resources towards employment and income generation for the rural poor.

What is important to note here that in an economy like that of India, common resources have more than a limited significance. It may be noted here that out of a total land area of approximately 330 m ha in India only about 140 m ha are cultivated. The remaining 190 m ha consisting of forest woodlands, grass land, deserts and marshes. River, lakes, shorelines and other forms of common properties support many other activities like forestry, fishery, and livestock rearing and provide daily requirements like food, fuel, fodder and medicines. Estimate shows that on an average 20 to 25 per cent of the rural income are obtained from these common property resources. This is the existing situation even after decades of complete neglect and rapid degradation and more can be obtained if there is systematic development of this marginally used resource.

b) Himachal Pradesh

According to Surveyor General of India, the total geographical area of the State is 5567300 ha by professional survey. In comparison to the geographical area, the total cadestrally

surveyed area by village papers in the state comes to 4575638 ha revealing thereby that 991662 ha of area is not surveyed and not appearing in revenue records.

Data presented in the Table 4.5 clearly shows the perceptible decrease in protected and un-classed forests, permanent pastures/ grazing lands, cultivable wastelands and land under miscellaneous trees. Protected and un-classed forests recorded an increase from 57.12 per cent in the year 1980-81 to 65.31 per cent in the year 2010-11, cultivable wastes decreased from 7.15 per cent in the year 1980-81 to 2.38 per cent in the year 2010-11, area under miscellaneous trees has shown minute decrease from 1.26 per cent in the year 1980-81 to 1.25 per cent in the year 2010-11, permanent pastures and other grazing lands has shown very little decrease from 31.53 per cent in the year 1980-81 to 28.95 per cent in the year 2010-11.

It is worked out from the study that common property land resources in Himachal Pradesh has shown decadal decreasing trend over the past 30 years i.e. at a compound growth rate of 4.44 per cent during 1980-81 to 1990-91, 0.81 per cent during 1990-91 to 2000-01 and -0.05 per cent during 2000-01 to 2010-11. Per capita availability of common property land resources in the state have more or less same trend over the years (Table 4.5).

Table 4.5: Size and components of CPR-area in Himachal Pradesh over the years

(ha)

Year / Particulars	1980-81	*CGR*	1990-91	*CGR*	2000-01	*CGR*	2010-11
Protected and unclassed forests	1785965 (57.12)	6.72	3421830 (70.85)	-0.06	3401934 (64.97)	-0.001	3401600 (65.31)
Permanent pasture & other grazing lands	985900 (31.53)	1.42	1135400 (23.51)	3.02	1529200 (29.20)	-1.44	1507522 (28.95)
Land under miscellaneous trees	39400 (1.26)	2.04	48200 (1.00)	1.65	56800 (1.08)	1.34	64905 (1.25)
Culturable wastelands	223700 (7.15)	-5.65	125100 (2.59)	-0.05	124500 (2.38)	-0.30	124121 (2.38)
Total	**3126783** (100)	4.44	**4829987** (100)	0.81	**5236090** (100)	-0.05	**5208088** (100)
Per capita availability of common land	0.73		0.95		0.88		0.76

- **Source:** State Statistical Abstracts
- Figures in parenthesis indicates the percentage of the total CPR area

The quantum of rainfall and its distribution are the most crucial variables for the State like Himachal Pradesh where the development of irrigation infrastructures is restricted by its topography. The extent of assured irrigation is limited and net irrigated area as per above report is 109940 ha which is only 21.41 per cent of the net sown area, thus approximately 80 per cent of area is still rainfed and the production of crops depends upon the quantum of timely rainfall and its proper distribution during the crop seasons.

c) Kinnaur

The study area is bestowed with lots of CPRs and the locals whether rich or poor in the study area were actively involved in the collection of CPRs as a safety net for the livelihood security. Different kinds of CPRs were found in the region and utilized by the locals were:

- ✓ Food, vegetables, wild fruits, flowers, nuts and medicinal herbs.
- ✓ Fodder, fuelwood, timber, small timber/bamboo used for agriculture implements and other domestic articles, leaf litter (animal beddings).
- ✓ Pastures (alpine meadows), grazing grounds, *kuhls* (gravity irrigation system), tank irrigation system, high density polyethylene pipe irrigation system.

Mixed-farming is the main occupation in this tract that consists of agriculture, livestock and forest products. Hence, communal forests (*mushtarka*), alpine meadows (pasturelands), common grazing lands (*ghasnies*) and gravity flow irrigation systems (*kuhls*) were taken as the major common property resources for the present study. People combined various types of resources such as private resources, state-owned resources and commonly-owned resources in their day to day functioning. Due to several factors like increasing population pressure, socio-economic disparities within village communities, codified environmental laws and public sector interventions, many changes have taken place in the field of natural resource management, especially those resources that lie under the category of CPRs.

This study attempted to survey common property resource management in nine panchayats of the district Kinnaur, Himachal Pradesh, according to the modes of access to and usage of resources in the context of historical development and changes over property right regimes.

i) Availability of CPRs in the district Kinnaur:

It has been assumed that partial or complete rights of access to the community is either *de facto* followed or *de jure* permitted on landuse categories of the barren and unculturab1e land, permanent pastures and other grazing lands, cultivable wastelands and other fallow lands. Hence, these landuse categories have been designated as part of CPR-area. On the other hand, net sown area and current fallows have been considered as private property resources because they are mainly owned by individuals and has no common rights of access over them. As far as landuse category of 'area under forest' is concerned, the forest policies and Acts, from the very beginning of their implementation, provide partial or full rights of access to the forest dwellers and other local communities on protected and un-classed forests and the reserved forests. All the studies excepting Chopra *et al.* (1990) and Singh (1994) have erroneously designated whole forest area as CPRs. Thus, only the area under protected and un-classed forests has been treated as part of CPRs in this analysis. The land put to non-agricultural uses has been considered common property resources in the present study. It is a significant omission as this landuse category consists of the area occupied by inter alia roads, pathways, *kuhls*, rivers and other water bodies etc., which by all accounts are used for common purposes of grazing and biomass resource collection. Though, it is not feasible to get separate estimates of the area under these common uses.

Table 4.6: Identification of common property resources of the study area

Classification of land	Current property rights	Can it be accounted as a CPRs	Included in source of sanction for access (as assumed in the estimation)
Net sown area	Private	No	On uncultivated owned land: limited user rights
Current fallows	Private	No	On uncultivated owned land: limited user rights
Fallows other than current fallow	Private	Yes	Partial user rights by convention
Cultivable wastelands	Revenue department	Yes	User rights by convention
Pastures and other grazing lands	Panchayat	Yes	User rights by law
Forest areas • Reserved • Protected • Un-classed	Forest department	 No Partial Yes	 No access Partial user rights User rights by law

The total CPR-area identified in the study area:

a) protected and un-classed forests
b) permanent pastures and other grazing lands
c) land under miscellaneous tree species
d) cultivable wasteland

ii) Changes in size and components of CPRs

Data presented in the Table 4.7 clearly shows the perceptible fluctuations in protected and un-classed forests, permanent pastures/ grazing lands, cultivable wastelands and land under miscellaneous trees. Protected and un-classed forests recorded an increase from 8.06 per cent in the year 1980-81 to 10.63 per cent in the year 2013-14, uncultivated land including cultivable wastes decrease from 3.25 per cent in 1980-81 to 0.89 per cent in the year 2013-14, area under miscellaneous trees decrease from 0.06 per cent in 1980-81 to 0.02 per cent in the year 2013-14, permanent pastures and grazing lands little decrease from 88.62 per cent in 1980-81 to 88.45 per cent in the year 2013-14. Agricultural cumulative command area that can be brought under *kuhl* irrigation system in the district has shown steady increasing trend over the decade i.e. 0.73 % from 1980-81 to 2010-11.

From the village papers it is clear that the geographical area of district Kinnaur has increased significantly, which may be due to demarcation of the boundaries with the neighbouring districts over the years. The common property resources has shown decadal increasing trend over the past 30 years i.e. at a rate of 5.70 % during 1980-81 to 1990-91, 7.2 % during 1990-91 to 2000-01, 0.14 % during 2000-01 to 2010-11. Protected and unclassed forests which is major supplier of CPRs is steadily increasing from the year 1980-81 to 2013-2014. Per capita availability of common property land resources in the study area has shown increasing trend over the years i.e.1.72 ha in the year 1980-81 to 4.32 ha in the year 2010- 2011.

(iii) Forest resources as CPRs:

The *Kinnauras* are primarily agro-pastoral people and their land utilization and management practices are crude and primitive. Large scale felling of forest tracts within and outside reserved and demarcated forests took place in an unrestricted manner for house construction, for the extension of cultivation and for finding grazing grounds for the ever increasing cattle during early days when newly district was constituted from erstwhile *mahasu* state. These felling combined with fires, loppings and over grazing resulted in the destruction of large area of forests and pasture lands.

Table 4.7: Size and components of CPR-area in district Kinnaur over the years

(ha)

Year / Particulars	1980-81	*CGR*	1990-91	*CGR*	2000-01	*CGR*	2010-11	*CGR*	2013-14
Protected and unclassed forests	8294	9.85	21239	5.75	37172	0.37	38582	0.10	38702
	(8.06)		(11.86)		(10.36)		(10.60)		(10.63)
Permanent pasture & other grazing	91092	5.51	155729	7.40	317941	0.13	322114	-0.02	321884
lands	(88.62)		(87)		(86.61)		(88.47)		(88.45)
Land under miscellaneous trees	60	5.03	98	-4.79	60	5.13	99	-1.89	85
	(0.06)		(0.05)		(0.02)		(0.03)		(0.02)
Culturable wastelands	3346	-5.38	1925	6.60	3649	-1.07	3276	-0.50	3227
	(3.25)		(1.07)		(1.02)		(0.90)		(0.89)
Total	**102792**	5.70	**178991**	7.20	**358822**	0.14	**364071**	-0.01	**363898**
	(100)		(100)		(100)		(100)		(100)
Per capita availability of common land	1.72		2.51		4.58		4.32		-
***Kuhl* CCA (ha)**	**4379**	1.70	**5182**	-1.49	**4459**	2.03	**5451**	14.71	**8229**
Chilgoza Forest	**3278**		**-**		**2845**		**-**		**-**

- **Sources:** District Statistical Abstract; 2006, 2011-12, 2012-13, 2014-15
- Figures in parenthesis indicates the percentage of the total CPR area

a) Forests:

The district has both protected forests and un-classed forests. The protected forest area is spread over 23686 ha, whereas un-classed forest area is spread over 353533 ha. As per State of Environment Report 2011 district Kinnaur has as the highest per capita availability of forest i.e. 0.78 ha whereas, the per capita availability of forests in the State is about 0.23 ha.

b) Chilgoza pine:

Chilgoza pine is an important ecological and economic species having a restricted distribution in India. It is very much restricted in dry temperate region of NW Himalayas between altitudes of 1600 m to 3000 m above mean sea level (Dogra 1964). In Himachal Pradesh, it mainly occurs in Kinnaur and Pangi divisions and Thareta range of Chamba division. Chilgoza assumes a great role in the local economy of the people in Kinnaur and Pangi areas of Chamba district, as species is considered to be a major CPR in middle and lower parts of upper Kinnaur. The species is under threat as natural regeneration of *Neoza* pine is very poor or entirely lacking in this zone. Severe biotic interference and lack of regeneration in this pine may result in the extinction of the species (Kumar 1986; Sehgal and Chauhan 1989). The most important factor responsible for poor regeneration is collection of cones by the locals/right holders (Tandon 1963; Singh *et al.* 1973). Due to collection of edible seeds by human beings, practically no natural regeneration can be expected and is limited to cliff rocks and areas where there are plenty of bushes to protect young seedlings from birds and rodents (Chandra and Kushdil 1977). If by chance the seeds are able to germinate the birds nibble away the young seedling because of their fleshy and tasty cotyledons (Singh *et al*. 1973). Two other biotic factors, added to these anthropogenic factors are, two parasitic insects, *Dioryctria abietivorella* (Grote), the Fir cone-worm (Sehgal and Sharma 1989), and *Euzophera cedrela,* the Cedar cone-moth (Beeson 1941), lay in the cones and their larvae consume seeds rich in proteins and goats grazing is also very inimical to natural reproduction, although some seedlings may appear under the protection of thorny bushes (Luna 2008). The seedling, which manages to escape the above inimical biotic factors, has to face the inhospitable climate of the tract. Intense heat of the sun, desiccating winds and shortage of soil moisture account for heavy mortality of seedlings. Sandy, shallow and dry with low water retentive capacity of soil is also responsible for high mortality of

seedlings during dry periods (Singh *et al*. 1973). Beside these, species has erratic and infrequent seed year and dormancy related problems which also reduces its regeneration in natural habitats (Malik and Shamet 2008).

It is noteworthy that the Chilgoza pine (*Pinus gerardiana*) forest covers about 2844.53 ha and are of great economic value to the local people who extract their seeds. The annual yield is estimated at about 200 tons.

Table 4.8: Area under *chilgoza* pine

Forest Range	Area (ha)
Kalpa	777.80
Moorang	1435.83
Pooh	630.90
Total	**2844.53**

- **Source:** Working Plan, Kinnaur Forest Division 1999-2000 to 2014-15

Maximum area of chilgoza is under Moorang forest range (1435.83 ha) followed by Kalpa (777.80 ha) and Pooh forest range (630.90 ha) (Working Plan, Kinnaur Forest Division 1999-2000 to 2014-15).

c) Pastures as CPRs:

The Kinnaur district has vastness in pasturelands. There are quite a good stretches of pastures/ grazing lands which extends up to deep in the Himalayas i.e. approximately 50 per cent of total geographical area of Kinnaur. These pastures are used only for about six months in a year during spring and summer. In rest of the year, animals are stall-fed. Stall-feeding requires drying and storing a lot of grass as well as farm residue. Collection of huge amount of grass from pastures and drying it up before storing is a bit too demanding as pastures are usually located at considerable distances. Fetching fodder from far away pastures demanded not only hard labour but also more time and man-power.

High altitude pastures are located between tree-line and permanent snowline. Altitude of tree-line and permanent snowline varies according to factors such as latitude, aspect, slope, availability of moisture and thickness of soil. Pastures located higher up in the valleys are also remote. These pastures are used in summer and autumn by driving herds there. However,

pastures located near villages are used for collecting fodder for stall-feeding during winters. Besides, animals are grazed in these lower pastures with onset of spring as higher meadows are generally snow bound at that time. Herds on their way down to valleys are again fed on these lower pastures for a short time before it gets cold and grass starts wilting at higher altitude from October onwards. Though pastures are commonly located above the tree-line but some pastures are also found on treeless slopes at lower elevation. Apart from pasture land, fodder resources are also found in other areas which have grasses and leaves. Agricultural fields are either situated close to pastures or these are separate. Land records data shows that agricultural area has increased over the years at the expense of grass growing areas. Increasing demand for natural resources during recent decades and resulting interference of people in their immediate environment make it difficult to mark lower extent of pastures. However, on an average, this area begins from the altitude of about 2400 m and extends till 4800 masl. Two types of pasture lands are available in the study area:

1. **Alpine Pastures:** The alpine pastures which are locally called *thach* or *Thachang* normally starts from 3000 m elevation and reach to about 4500 m. However, animals are generally grazed on meadows situated between 3000 m to 4000 m. Meadows above 4000 m elevation are mostly situated very far away from villages and have difficult approach. Moreover, these high altitude meadows remain snow-bound for longer time as snow melts late and winter snow arrives early. Thus, grasses of these high altitude meadows above 4000 m are available for short duration for grazing. Such meadows are normally used only on way to pastures situated across high altitude passes. A range of grasses such as wheat grass, millet grass, fescue, foxtail, poa, brome, etc. and flowering herbs grow in alpine meadows. These meadows get herds' droppings in grazing months which supplement nutrient requirements of gasses. Thus, pastures support animal herds and in turn animals provide manure to these pastures. Of late, overgrazing has become a problem in these pastures due to short grazing season on the one hand and changing traditional shepherd routes resulting in increasing number of herds grazing there on the other.
2. **Lower Grazing Lands:** These are located at lower altitude and are referred to as *Kanda/ Dogri* by *Kinnauras*. Many households have also developed small cultivable land here which they use to grow buckwheat or amaranths as one crop in a year and occasionally raise kidney-beans also on a few lower grazing lands. Households have marked individual patches of grazing-

land are demarcated with stones and boulders and only a small portion of such patches are cultivated. Rest of the grazing-lands are left out to let wild grasses and herbs grow which are collected during winter months. Lower grazing lands are usually situated at an elevation varying from 2400 to 3000 amsl.

Table 4.9: People's perceptions regarding status of CPRs (last 30 years)

Response	Increase	Decrease	No change	Remarks
Cultivated land	126 (70.00)	13 (7.22)	41(22.78)	Increase
Pastures/ other grazing lands	55 (30.55)	8 (4.45)	117 (65.00)	No change
Village common land/ *Shamlat* land	9 (5.00)	133 (74.00)	38 (21.00)	Decrease
River/Stream	60 (33.33)	15 (8.33)	105 (58.33)	No change
Local water bodies	65 (36.11)	10 (5.56)	105 (58.33)	No change
Irrigation water (*Kuhls*)	25 (13.87)	35 (19.44)	120 (66.67)	No change
Forests	103 (57.00)	20 (11.00)	57 (32.00)	Increase

- Figures in parenthesis indicates the percentage of total households perception

People's perception regarding the status of CPRs were analysed and presented in table 4.9. 70 per cent respondents were of the opinion that area under cultivation has increased during last 30 years, 22.78 per cent have the opinion that there is no change, 7.22 per cent have the response of decrease in cultivated land. As far as area of village common/*shamlat* lands is concerned, 74 per cent respondents have the opinion that there is decline, 21 per cent have the responses of no change and 5 per cent have the opinion that there is an increase in the area. In the opinion of 13.87 per cent of respondents irrigation water have increased in the region, 66.67 per cent respondents said that there is no change and 19.44 per cent have opined that there is decrease in irrigation water supply. The perception of 57 per cent respondents is that there is an increase in forests covers whereas 32 per cent of the farmers told that there is no change in forest cover in the study area.

Contrary to this pasture have shown an increasing trend i.e. in the opinion of 30.55 per cent respondents area under pasture is increasing, whereas 4.45 per cent opined that there is decline and 65.00 per cent have the opinion that there is no change in the pasture acreage in the study area.

It is evident from the peoples' perceptions that area under cultivation has increased at the cost of conversion of common village/*shamlat* lands and to some extent forest land

(encroachment) in the study area. Lal (2009) in his findings of the Kinnaur district also emphasized that there was an increase in cultivable area which is due to gradual increase in human population during last few decades that required more food, so a lot of grass growing area (*shamlat* lands, forest lands) was converted into agricultural farms. Restricting food requirements of rising population is impossible, so area under cultivation in the study district has increased enormously.

4.4 Socio-demographic profile of the sample households:

The detailed socio-demographic profile of the sample households (180) which includes 89 marginal, 82 small and 9 medium families is presented in table 4.10. The average family size in the study area was found to be 6.77 persons and highest family size (8.56) was found in case of medium farmers. It can further observed that proportion of male (54.60 %) was higher as compared to females (45.40 %) in the study area. Sex ratio of 831 was found in the study area. Joint family system dominated the area.

Table 4.10: Socio-demographic profile of sample households

Particulars	Farm Size			
	Marginal	**Small**	**Medium**	**Overall**
Number of Sample households	82	89	9	180
Number of upper caste households	46	60	7	113
Number of lower caste households	36	29	2	67
Average size of family (number)	6.11	7.19	8.56	6.77
Males (%)	55.49	54.06	53.25	54.60
Females (%)	44.51	45.94	46.75	45.40
Sex ratio	802.16	849.71	878.05	831.55
Structure of family				
Joint families (number)	31 (37.80)	67 (75.28)	5 (55.56)	103 (57.22)
Nuclear families (number)	51 (62.20)	22 (24.72)	4 (44.44)	77 (42.78)

- Figures in parentheses indicate percentage of the total

a) Literacy status of the family:

Education status of family member plays a catalytic role in scientific management of farms, adoption of new technologies and marketing of produce. It further helps in enhancing skills and general standards of awareness in the family. So, livelihood strategies supported with

literacy have higher chances of sustaining themselves for longer period of time. Keeping this in mind, the education status of the sample households were analysed and results are presented in table 4.11, which revealed that on overall basis the literacy rate was estimated at 81.90 per cent, while among different blocks it varied between 88.10 per cent in case of Pooh block followed by 79 per cent in case of Kalpa block and 78.60 per cent in case of Nichar block, respectively. Further, literacy indices for the different blocks in the study area varied between 2 in case of Pooh block followed by 1.90 in case of Nichar block and 1.74 in case of Kalpa block, respectively. The lower values of literacy indices revealed lower quality of education among the sample households.

Table 4.11: Literacy status of the family members of sample households

(Number per family)

Particulars	Block			Overall
	Nichar	Kalpa	Pooh	
Illiterate	1.28 (21.45)	1.37 (24.4)	1.12 (11.89)	1.13
Primary	1.22 (33.7)	2.32 (27.38)	2.42 (39.19)	1.99
Middle	0.63 (10.58)	1.12 (19.94)	1.97 (15.68)	0.91
Matriculation	1.05 (17.55)	1.10 (19.64)	1.45 (17.03)	1.07
Senior secondary	0.88 (6.41)	0.58 (1.49)	0.65 (7.3)	0.81
Graduate	0.72 (6.96)	0.62 (5.65)	0.75 (5.68)	0.71
Post graduate	0.16 (1.39)	0.03 (0.6)	0.08 (1.35)	0.07
Total	6.11 (100)	7.19 (100)	8.56 (100)	6.77
Literacy Rate	78.60	79.00	88.10	81.90
Literacy Index	1.90	1.74	2.00	1.88

- **Scores allotted:** Illiterate = 0; primary = 1; Middle =2; Matriculate =3; Plus two = 4; Graduate= 5; Postgraduate = 6
- Figures in parenthesis indicates the percentage of the total family members of households

b) Dependency ratio:

For working out the dependency ratio, it was assumed that persons in the age group of 18-70 years should be actively engaged in useful economic activities and were termed as working force. Above and below this age group were considered as dependents for the presents study. The highest dependency ratio (0.31) were found in the Nichar and Kalpa blocks and least (0.26) in the Pooh block with an overall dependency ration of 0.30 Kinnaur district which reflects on an average one worker has to support approximate three members in the family.

Table 4.12: Distribution of workers and their dependents

Particulars	Developmental Blocks			Overall
	Nichar	Kalpa	Pooh	
Average number of workers	4.55	4.28	4.89	4.56
	(76.09)	(76.43)	(79.26)	(77.03)
Average number of dependents	1.43	1.32	1.28	1.36
	(23.91)	(23.57)	(20.74)	(22.97)
Average family size	6.11	7.19	8.56	6.77
	(100)	(100)	(100)	(100)
Dependency ratio	0.31	0.31	0.26	0.30

- Figures in parenthesis indicates the percentage the average family size

c) Land use pattern in the study area:

Since time immemorial, farmers of Kinnaur district possesses two types of land holdings, uplands and lowlands. Upland land holdings acts as safety net against changing climatic conditions, as fields in upland are rarely prone to drought like situation and even under low rainfall condition produces sure yield of various crops like *ogla, phafra, rajmah*, potato and peas. On the other hand fields in lowland are more prone to drought like situations. On an average the size of land holdings in district Kinnaur is 1.10 ha and the households in Pooh Block (1.14 ha) that has highest holding size, followed by Nichar (1.11 ha) and Kalpa block (1.06 ha). Medium farmers have the land holdings of 2.52 ha followed by small farmers 1.32 ha and marginal farmers 0.62 ha, respectively. Maximum area under cultivation in Nichar block is under rainfed condition and only few panchayats of this block have irrigation facilities in the form of gravity irrigation systems (*kuhls*)/ pipe irrigation/ tank irrigation systems as per farmers' convenience and source of water availability. *Kuhl* irrigation system is more prevalent in other two blocks i.e. Kalpa and Pooh with the assistance of tank/ pipe irrigation systems.Though, the apple is the main cash crop of the district, other fruits like; apricot, almond, *chilgoza* and *kalajira* fetches high price in the markets which forms the backbone of the economy of the region. *Chilgoza* is the dominant nut which constitutes more than 90 per cent of the total wild edibles and is also the main source of revenue for the locals.

Table 4.13: Land utilization pattern of the selected households

(ha)

Sr No	Particulars	Nichar			Kalpa			Pooh			Kinnaur			Overall
		Marginal	Small	Medium	Marginal	Small	Medium	Marginal	Small	Medium	Marginal	Small	Medium	
1	Cultivated land (i+ii)	0.39	0.86	2.01	0.55	1.26	2.22	0.68	1.28	2.08	0.56	1.05	2.10	0.88 (80)
i	Area Under Field Crop	0.17	0.23	0.54	0.20	0.42	0.51	0.30	0.38	0.24	0.23	0.31	0.46	0.29 (26.4)
	Irrigated	0.04	0.04	0	0.12	0.28	0.24	0.17	0.26	0.24	0.12	0.17	0.13	0.15 (13.6)
	Un-irrigated	0.13	0.19	0.54	0.08	0.14	0.27	0.12	0.12	0	0.11	0.14	0.33	0.14 (12.7)
ii	Area Under Orchards	0.22	0.63	1.47	0.35	0.83	1.71	0.38	0.89	1.84	0.33	0.73	1.63	0.59 (53.6)
	Irrigated	0.03	0.11	0.13	0.15	0.66	0.78	0.33	0.66	1.52	0.18	0.42	0.66	0.33 (30)
	Un-irrigated	0.20	0.52	1.34	0.20	0.18	0.93	0.05	0.23	0.32	0.14	0.31	0.98	0.27 (24.5)
2	Fallow/ Barren Land	0.10	0.17	0.24	0.07	0.07	0.19	0.06	0.14	0.08	0.07	0.12	0.19	0.11 (10)
3	Ghasnis /Pasture	0.12	0.27	0.28	0.03	0.03	0.35	0.01	0.16	0	0.05	0.15	0.24	0.11 (10)
	Total (1+2+3)	0.61	1.30	2.53	0.65	1.36	2.76	0.75	1.58	2.16	0.62	1.32	2.52	1.10 (100)
a	Upland	0.11	0.31	0.49	0.14	0.37	1.10	0.09	0.39	0.12	0.11	0.33	0.61	0.25 (22.7)
	Irrigated	0	0	0	0	0	0	0	0.15	0.12	0.00	0.04	0.03	0.02 (1.8)
	Un-irrigated	0.11	0.31	0.49	0.14	0.37	1.10	0.09	0.24	0	0.11	0.29	0.58	0.23 (20.9)
b	Lowland	0.50	0.99	2.04	0.52	0.99	1.65	0.66	1.18	2.04	0.57	0.99	1.91	0.85 (77.3)
	Irrigated	0.08	0.14	0.18	0.22	0.62	0.37	0.47	0.75	1.72	0.27	0.45	0.59	0.38 (34.5)
	Un-irrigated	0.42	0.84	1.86	0.30	0.37	1.28	0.20	0.43	0.32	0.30	0.54	1.32	0.47 (42.7)

- Figures in parentheses indicate the percentage of per households total land holdings

Table 4.14: Per household livestock inventory

Animal type	Nichar			Kalpa			Pooh			Kinnaur			Overall
	Marginal	Small	Medium	Marginal	Small	Medium	Marginal	Small	Medium	Marginal	Small	Medium	
1. **Cattle**													
a) Local	2	3	4	1	4	5	2	2	4	2	3	4	3
b) Improved	1	1	2	1	1	1	0	1	1	1	1	1	1
Total cattle	3	4	6	2	5	6	2	3	5	2	4	5	4
2. Yak	0	0	0	0	0	0	0	1	2	0	0	0	0
3. Horse/ donkey	0	1	2	0	1	1	1	1	1	0	1	1	1
4. Goat	1	4	11	1	6	8	2	5	8	1	5	9	3
5. Sheep	2	10	5	3	4	5	0	3	3	2	6	5	4
Total	6	19	24	6	16	20	5	13	19	5	16	20	12
ACU	4	7	9	3	7	9	3	5	7	3	6	9	5

- **Conversion Factor:** 1 Adult cattle = 1 ACU; 1 Young (0 to heifer age) = 0.6 ACU; 1 adult buffalo = 1.2 ACU; 5 sheeps =1 ACU; 5 Goats =1 ACU

d) Cropping pattern:

The cropping pattern of the study area shows that amongst all household categories, the area under cultivation was dominated by fruit crops (57.76 %) followed by cereal crops (18.72 %), pulses (11.38 %), vegetables (7.90 %) and others (4.24 %). It can be seen from the table 4.15 that apple is the main crop which accounted for nearly 45 per cent of the total cropped area. Amongst cereals *rajmash* dominates (11.38 %) followed by wheat/barley (8.26 %), *ogla/phafra* (5.28 %) and among vegetables peas (4.55 %).

Table 4.15: Cropping Pattern of sample households

(Per cent)

Name of the crop	Nichar			Kalpa			Pooh			Kinnaur overall
	Marginal	Small	Medium	Marginal	Small	Medium	Marginal	Small	Medium	
1. Cereal crops	21.65	15.77	12.78	25.14	18.31	14.84	23.79	17.33	14.04	18.72
a. Wheat/Barley	8.12	7.89	4.75	9.42	9.16	5.51	8.92	8.66	5.22	8.26
b. Maize/*Koda*	6.77	3.94	3.65	7.86	4.57	4.24	7.43	4.33	4.01	5.19
c. *Ogla/ Phafra*	6.77	3.94	4.38	7.86	4.57	5.09	7.43	4.33	4.81	5.28
2. Pulses	8.12	11.83	9.86	9.43	13.74	11.45	8.92	13.00	10.83	11.38
a. *Rajmah*	8.12	11.83	9.86	9.43	13.74	11.45	8.92	13.00	10.83	11.38
3. Vegetables	6.77	7.89	5.48	7.86	9.16	6.36	7.43	8.67	6.02	7.90
a. Potato	4.06	3.28	2.19	4.71	3.81	2.54	4.46	3.61	2.41	3.35
b. Peas	2.71	4.60	3.29	3.14	5.34	3.82	2.97	5.06	3.61	4.55
4. Fruit crops	51.42	52.58	60.61	59.70	61.05	70.38	56.50	57.77	66.60	57.76
a. Apple	39.24	40.09	51.12	45.56	46.55	59.36	43.12	44.05	56.17	44.66
b. Grapes	4.06	3.29	2.19	4.71	3.82	2.54	4.46	3.61	2.41	3.69
c. Apricot	5.41	4.60	3.65	6.28	5.34	4.24	5.95	5.06	4.01	5.15
d. Almond	2.71	4.60	3.65	3.14	5.34	4.24	2.97	5.06	4.01	4.25
5. Others (*koni*, *chulai*, *bathu*, cabbage, tomato, chilli)	4.06	3.94	3.29	4.71	4.58	3.82	4.46	4.33	3.61	4.24
Total	100 (0.49)	100 (1.07)	100 (2.51)	100 (0.69)	100 (1.57)	100 (2.77)	100 (0.85)	100 (1.60)	100 (2.60)	100 (1.33)

- Figures in parenthesis indicates the total cropped area (ha) under various crops

The important cropping system identified (Table 4.16) in the study area was horti-agriculture. But under low rainfall and snowfall conditions, horti-agri-pastoral system was most prevalent where crop combinations like apple+wheat/barley - apple+ fallow, apple+rajmah - apple+ fallow, apple+potato - apple+ fallow, apple+vegetables - apple+fallow were followed. Under arid and snowfall conditions, agri-pastoral system with crop combination of peas-

barley/wheat, whereas, under horti-agri-pastoral systems, the crop combination was fruit crops+ peas - fruit crops+ fallow.

Table 4.16: Cropping system followed by sample households in the study area

Drought/ irrigated situation		
Conditions	**Farming systems**	**Cropping systems**
Low rainfall and snow fall	Horti-agri-pasroral	Apple+Barley- Apple+ Fallow
		Apple+Rajmah- Apple+ Fallow
		Apple+Potato- Apple+ Fallow
		Apple+Vegetables- Apple +Fallow
		Apple+Pulses - Apple+ Fallow
	Horti-agriculture	Apple+Peas- Apple+ Ogla/ Phafra
	Agri-pastoral	Maize- Wheat/ Peas/ Barley
		Fine millets+pulses/ soyabean- Fallow
		Potato – Wheat/ Barley/ Peas
		Maize+pulses- Fallow
		Buckwheat-Fallow
Arid and snow fall	Agri-pastoral	Peas- barley/ wheat
	Horti-agri-pasroral	Fruit crops+ peas- Fruit crops+ Fallow

a) Livestock Inventory:

Livestock (ACU) rearing in Kinnaur varies from 9 units (medium household) followed by 6 units (small household) and 3 units by marginal household. Nichar block has the higher livestock population as compared to Kalpa and Pooh block. Medium households lead in the livestock rearing i.e. 21 LU in all the three blocks followed by small (16 LU) and marginal household (5 LU). This might be due to larger and joint family system amongst medium and small household, which helps them in division of labour to a large extent. Study revealed that almost all households possessed at least one livestock (Table 4.14).

Since time immemorial, during the summers usually locals of Kinnaur adopted a trend of migrating their dry animals to alpine meadows at higher altitudes for 5-6 months during April-May to August-September. These animals are taken to pastures either individually by a single household or in conjugation with 2-3 households depending on degree of co-operation. Also animals brought to these alpine pastures varies in number of a particular household depending on number of dry animals or small animal heads, other than milking cow and bullocks which are to be used for ploughing their agricultural fields in the prevailing season. After completion of ploughing of their agricultural fields these bullocks were also brought to summer pastures. Because of highly nutritious vegetation and vastness of these alpine pastures animals relish a good diet and become healthy up to the end of summer season. In between time to time vigil is

kept either by their owners or through message via others about their conception or pregnancy of any cow and missing of animal heads. Hardly there is any chance of theft of the animal from these pastures. Occasionally the situation may arise when animals enters into the pastures of neighboring panchayats. After getting intimation of such situation, owner of missing livestock brings back to home. Otherwise all animals are kept there for entire season and brought back during autumn when temperature falls down i.e. indication of winter.

In the mean time, during *janmashtami* the villagers go to these alpine pastures and carry packets of salt with them. There is tradition of feeding salt to animals grazing in alpine meadows apart from feeding their own animal heads and others animals too.

Farmers in the village collect grass from pastures nearest to their vicinity in order to stallfed the animals during winters. Maintenance of animal herds has been part of economic and social personality of Kinnaurese. Traditional dresses which people mostly wove in their houses are made of wool. Many families maintain at least a couple of sheep just to meet this requirement of wool and meat and to gain manure. High cost of modern agricultural inputs for agricultural farms and requirement of manure to supplement immature mountain soil suggests significance of animals in the economy of Kinnaur. During the winter months when animals are stallfed, their droppings are used as manure to enhance fertility of agricultural land. These animals graze freely in natural pastures during summer. Thus, their droppings become beneficial to pastures in similar fashion. Apart from providing manure, wool and meat, livestock provide a range of other goods and services. Hence, it is significant to discuss pastures, livestock population, grazing system and the role of livestock in the economy.

4.5 Linkages of CPRs with livelihood:

Livelihood comprised the capabilities, material and social assets necessary for the means of living (Chambers and Conway 1992). A sustainable livelihood includes the idea of coping with and recovery from external stresses so as to maintain or enhance existing capabilities and assets. As the household were the ultimate beneficiary of the CPRs that assemble various resources from the commons for their sustenance. So an effort has been made to figure out the linkages between CPR arrangements of the study area and livelihood of the households. In this context a framework have been drawn on the basis of experience of the respondents.

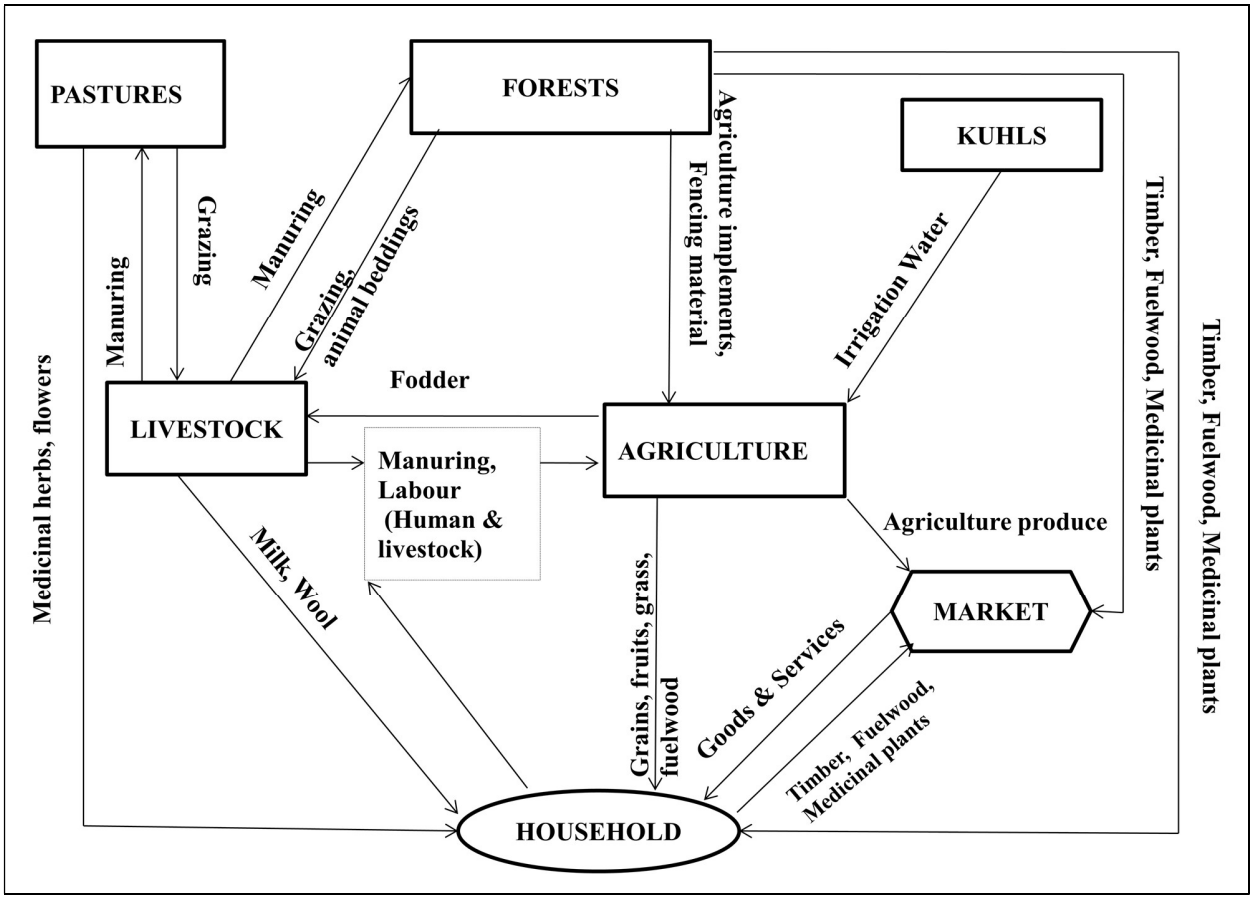

Figure 4.1: Linkages framework of household with various livelihood supporting components

Household sector directly depends on livestock for milk and wool. Contrary to this livestock depend on agriculture, forests and pastures for fodder and water but they also depend on household sector as a mediator to operationalise and maintain the things. Grasses, stubbles, leaves, animal feed, animal beddings to the livestock are supplied from agriculture sector, in turn from livestock sector manure is supplied to agriculture fields that enhances agriculture productivity. This sector also derives benefits from forests and pastures in terms of fuelwood, timber, food items (vegetables, fruits & other wild edibles), medicinal plants and as a grazing ground for their domestic animals. In return forests and pastures gets manure through the livestock grazing and the understory of forest gets cleared through the human activity that provides good condition to flourish the forests and its understory.

Kuhls in this cold drier tract of the study area acts as god gift to locals, otherwise it is not possible to imagine agriculture practices. The snow fed streams in the study area provide

drinking as well as irrigation water for agriculture. Hence, livelihood of the households based on the high value cash crops is almost secure which makes this community one of the wealthiest in the state.

Ultimately surplus from household sector goes to the market returning benefits to the local people in terms of cash that enhances livelihood security of the locals. An attempt has been made to list some of the major NTFPs collected and their usages by the locals of the study area (Table 4.17).

UTILISATION OF CPRs

The common property resources are used for various purposes by rural people. In fact, they are so intricately interlocked with other aspects of rural economy that it is very difficult to examine the actual degree of dependence of rural households on them. Some of the well discernible uses of CPRs in the study area are: food items, vegetables, fruits, flowers, nuts, medicinal herbs, fodder, fuelwood, timber, small timber/bamboo used for agriculture implements and other domestic articles, leaf litter (animal beddings) and pastures (alpine meadows), grazing grounds.

Table 4.17: Main NTFPs collection from CPRs in the study area

Sr No	Botanical Name	Common/ Vernacular Name	Habit	Mode of Usage
1	*Angelica glauca* Edgew	Chora, *sapal*	Herb	Root powder used as spice and condiments.
2	*Arisaema jacquemontii* Blume	*Zamashang*	Herb	Boiled tubers edible and is also used for making local beverages known as '*Zamashang phasur'*
3	*Berberis aristata* DC.	Kashmal, *Chutrum*	Shrub	Berries edible.
4	*Bunium persicum* (Boiss.)	Kalajira	Herb	Seeds used as condiments and spices.
5	*Castanea sativa* Mill.	*Poo*, sweet chestnut	Tree	Fruits edible.
6	*Celtis australis* L.	Khirk, *Koo*, *Kru*	Tree	Leaves used as fodder, Fruits edible.
7	*Corylus colurna* L.	*Ge* bija	Tree	Raw and roasted seeds edible.
8	*Diplazium esculentum* (Retz.)	Lingad	Fern	Fronds are used for making vegetables and pickles.
9	*Elaeagnus angustifolia* L.	*Shiulik*	Tree	Fruits edible.
10	*Ephedra gerardiana* Wall.	Somlata	Shrub	-do-
11	*Ficus palmata* Forsk.	*Phedu*, *Kog*	Tree	Fruits edible, Unripe fruits used for making vegetables
12	*Fragaria nubicola* Lindl.	*Balbalsho*	Herb	Fruits edible.
14	*Girardinia diversifolia* (Link)	*Khorgya*, Nupun	Herb	Tender leaves cooked as vegetables.
15	*Heracleum pinnatum* Clarke	*Hung-shuli*	Herb	Tender shoots filled with curd and eaten.
16	*Hippophae rhamnoides* L. sub sp. *turkestanica*	*Dhurchuk*, Charma	Shrub	Fruits edible, Juice obtained from the fruits is used for making curries.
17	*H. salicifolia* D. Don	*Surch*, Charma	Tree	-do-

Sr No	Botanical Name	Common/ Vernacular Name	Habit	Mode of Usage
18	*Lonicera angustifolia*Wall.	*Kuchang*	Shrub	Fruits edible.
19	*Malus baccata* Borkh.	*Khontli*	Tree	-do-
20	*Morchella esculenta Fr.*	*Jhangmu*, guchhi	Fungi	Fruitification has medicinal value and cooked as delicious food.
21	*Morus alba* L.	Shahtoot, *chemu*	Tree	Fruits edible.
22	*Nasturtium officinale* R. Br.	*Ti-kan*	Herb	Leaves used as vegetables.
23	*Phytolacca acinosa* Roxb.	*Jharka*	Herb	-do-
24	*Pinus gerardiana* Wall. ex D. Don	Chilgoza, Neoza, *Ree*	Tree	Nuts edible. Garlands made from seeds are offered to local deities, relatives during marriage and celebrations.
25	*Pistacia integerrima* J. L. Stewart	*Kakring*	Tree	Leaves used as fodder, fruits edible.
26	*Prunus armeniaca* L.	*Chul*, *Chuli*	Tree	Fruits eaten raw or as dry fruits. Edible oil is extracted from kernels. Dried fruits are also used for making local beverages and dishes '*Chul phanting*'.
27	*P. cerasoides* Buch.	Paja	Tree	Fruits edible, leaves used as incense.
28	*P. cornuta* Wall.	*Kron*, Jamu	Tree	Fruits edible.
29	*P. mira* Koehne	*Reg*, *Rok*, *Baimi*	Tree	Fruits eaten raw or as dry fruits. Edible oil is extracted from kernels. The dried fruits are also used for making local beverages .
30	*Pyrus pashia* Buch.	*Shegul*, Batangi	Tree	Fruits edible.
31	*Ramaria abietina* Quel.	*Chyun*	Fungi	Fruitification is used for making delicious vegetable.
32	*Rhododendron arboreum* Sm.	*Brass, Parag*	Tree	Flowers used for making juice and chutneys.
33	*Ribes alpestre* Wall.	*Shutum*	Shrub	Fruits edible.
34	*R. orientale* Desf.	*Jamey*	Shrub	-do-
35	*Rosa macrophylla* Lindl.	*Kuja, Benyl*	Shrub	-do-
36	*R. webbiana* Wall.	*Pashu*, Mangel	Shrub	-do-
37	*Rubus ellipticus* Sm.	*Cho-Sho,* Akh	Shrub	-do-
38	*Sinopodophyllum hexandrum* T.S.Ying	*Ulu-lu*, Bankakri	Herb	-do-
39	*Sparassis crispa* Fr.	*Chyun,* Cauliflower mushroom	Fungi	Fruitification is used for making delicious vegetable.
40	*Taxus wallichiana* Zucc.	*Yamdal*, Brahmi	Tree	Bark used to make salted butter tree, fruits edible.
41	*Viburnum cotinifolium* D. Don	*Khom pang, Bhutol*	Shrub	Fruits edible.

Collection of CPR products: The percentages of households and the quantity of different produce extracted as CPRs by local households is presented in the Tables 4.18 to 4.28.

a) Food items: Due to wide variation in the ecological conditions of the selected developmental blocks, the proportion of households extracting food items from CPRs varied across the selected blocks. On overall basis, 54.38 per cent of the total households used CPRs for collecting food items across the selected developmental blocks. However, 64.90 per cent of

the households obtained the food items from these resources in the Kalpa block followed by Nichar block (58.9 %) of the household and least in Pooh block (39.6 %), respectively.

Table 4.18: Percentage of the households collecting food items (vegetables/ wild edible fungi/ tubers) from CPRs in the study area

(per cent)

Strata/ Class	Nichar	Kalpa	Pooh	Overall
Marginal Farmers	67.50	68.60	50.75	62.15
Small Farmers	50.0	60.0	25.90	45.24
Medium farmers	-	-	-	-
Lower Caste	60.0	85.0	43.50	56.52
Upper Caste	58.30	54.0	37.10	47.78
Total households	**58.90**	**64.90**	**39.60**	**54.38**

The effect of class is quite discernible on the pattern of households making use of CPRs for collecting the food items in all the three development blocks wherein the proportion of the households obtaining food items from CPRs consistently decreased as one moves up on the class ladder. For instance, 67.50, 68.60 and 50.75 per cent of the marginal category in Nichar, Kalpa and Pooh blocks obtained food items from CPRs while none of medium farmers were involved in these activities because the collection of these items is a highly cumbersome and low paying activity and hence less attractive among those categories. The surplus labour with low opportunity cost in the bottom class compels them to accept this low paying activity for their survival.

Table 4.19: Quantity of food (vegetables/tubers) collected from CPRs in the study area

(kg/household/annum)

Strata/ Class	Vegetables					Fungi		Tubers		Overall collection of food items
	Lungdu	*Ti-kan*	*Zorgo*	*Khorgya*	*Bras*	*Jangmo*	*Chyun*	*Zamashang*	*Sapal*	
Marginal Farmers	7.87	5.76	2.88	2.19	1.08	0.69	0.70	8.47	0.45	30.35
Small Farmers	2.32	-	-	-	-	0.28	0.32	8.15	0.4	11.67
Medium farmers	-	-	-	-	-	-	-	-	-	-
Lower Caste	9.82	7.56	3.14	2.18	2.07	0.89	0.80	6.54	0.3	33.5
Upper Caste	4.32	3.43	2.12	1.63	1.0	0.74	0.56	8.51	0.5	23.11
Total household	**7.07**	**5.50**	**2.62**	**1.91**	**1.53**	**0.60**	**0.68**	**7.52**	**0.40**	**28.08**

As is evident from the Table 4.19, the collection of different types of food items (vegetables/tubers) from the commons still persisted in the study area. The quantity of food items (vegetables/tubers) collected from CPRs were found higher in marginal category with *zamashang* (8.47 kg/household/annum), *lungdu* (7.87 kg/household/annum), *ti-kan* (5.76

kg/household/annum), *zorgo* (2.88 kg/household/annum), *khorgya* (2.19 kg/household/annum), *bras* (1.08 kg/household/annum), *chyun* (0.70 kg/household/annum), *guchhi* (0.69 kg/household/annum) and *sapal* (0.45 kg/household/annum) respectively. Whereas, no households in medium category of farmers were not involved in collection of these items. Further this can be best understood as the activity is cumbersome, time and labour consuming that's why the category of farmers keep themselves away from such type of activities. On the class basis lower caste category were deriving large quantities of food items from CPR' as compared to upper caste category of farmers in the study area.

b) Fruits/nuts/bark: On aggregate basis, 88.33 per cent of the total households in the study area were using fruits/ nuts/ bark for household from consumption of common property resources (Table 4.20). It is also evident from the table that proportion of households extracting fruits/ nuts/ bark as CPRs more (98.30 %) in Kalpa block, followed by Pooh block (96.7 %) and Nichar block (70.0 %), respectively. The higher percentage of users of resources in Kalpa and Pooh blocks were because of the distribution of c*hilgoza* (wild edible nut) plants in these blocks. While in Nichar block collection of other fruit items like; walnut, horse chestnut, sweet chestnut was found more prevalent than *chilgoza* pine. Bark of *Taxus baccata* (yew) is extracted for the preparation of butter tea in all parts of Kinnaur district. Similar type of trend was found regarding the collection of food items as one move up in the category class and collection goes on decreasing because this activity is highly cumbersome i.e. time and labour consuming.

Table 4.20: Percentage of the households collecting fruits/nuts/bark from CPRs in the study area (per cent)

Strata/ Class	Nichar	Kalpa	Pooh	Overall
Marginal Farmers	76.46	96.77	100.0	92.62
Small Farmers	62.50	100.0	92.60	83.33
Medium farmers	55.0	100.0	100.0	83.50
Lower Caste	62.50	100.0	100.0	86.57
Upper Caste	75.0	97.30	95.0	89.38
Total households	**70.0**	**98.30**	**96.70**	**88.33**

Collection of fruit items per households per annum were found higher on marginal farms (116.16 kg) followed by small farms (106.99 kg) and medium category farms (56.99 kg), respectively (Table 4.21). On overall basis, per households per annum collection of fruit items

was found 125.60 kg in the study area, out of which maximum collection was of horse chestnut (44.32 kg) followed by *chuli* (35.80 kg), *baimi* (35.35 kg), walnut (4.65 kg), *chilgoza* (2.45 kg), sweet chestnut (1.55 kg), *chharma* (0.85 kg), yew (0.62 kg) and *kalajira* (0.25 kg), respectively. However collection of chilgoza pine was found higher in the Kalpa block and very scanty in Pooh and Nichar blocks of study area.

Table 4.21: Quantity of different fruit/nut/bark items collected from CPRs in the study area

(kg/household/annum)

Strata/ Class	Fruits/ Seeds				Nuts/ kernels				Bark	Overall collection
	Chuli	*Baimi*	*Chharma*	*Kalajira*	*Chilgoza*	*Walnut*	Sweet Chestnut	Horse chestnut	Yew	
Marginal Farmers	44.70	35.39	0.79	0.25	2.86	4.72	1.65	25.41	0.63	116.16
Small Farmers	24.15	32.42	-	0.20	2.18	4.17	1.13	42.35	0.59	106.99
Medium farmers	-	-	-	-	2.15	-	-	54.30	0.54	56.99
Lower Caste	43.19	37.16	0.94	0.20	2.75	4.75	1.68	38.47	0.60	129.54
Upper Caste	28.42	33.54	0.75	0.30	2.15	4.56	1.42	50.18	0.65	121.67
Total households	**35.80**	**35.35**	**0.85**	**0.25**	**2.45**	**4.65**	**1.55**	**44.32**	**0.62**	**125.60**

Chilgoza pine (*Pinus gerardiana*) is known to be one of the most important cash crops of the tribal people living in the district Kinnaur of Himachal Pradesh. *Chilgoza* is mainly extracted from the forests of the state and in a complementary way, from trees in private ownership. Locals have the rights over it to harvest and sale into the market. The mechanism of benefit sharing of this pine in the region was quite distinct. *Devta* committee or 'gram panchayat divides the *chilgoza* forests of the village in 3-4 blocks and accordingly beneficiaries of the village were divided. A meeting of the villagers to decide the collection of *chilgoza* cones is invited by the committee during the month of October when the villagers feel that *chilgoza* cones are ready for plucking. Villagers assemble at specified date and place, mostly in the temple premises. Members of the committee initiate proceedings of the meeting and the villagers collectively decide the system of collection and distribution.

***c) Flowers*:** Collection of flowers from CPRs was also found more prevalent amongst the locals in the study area, because such items were important especially as an offering for local deities during fairs and festivals. The user trends from Table 4.22 depicts that the collection of flowers was found more in Kalpa block (80.0 %) followed by Nichar (75.0 %) and Pooh block

(73.3 %). The flower collection activity is not much revenue generating and considered for leisure and entertainment during fairs and festivals of the locals. This activity was found less favourable amongst lower class as compared to higher strata.

Table 4.22: Percentage of the households collecting flowers from CPRs in the study area

(per cent)

Strata/ Class	Nichar	Kalpa	Pooh	Overall
Marginal Farmers	74.0	76.22	81.82	84.20
Small Farmers	86.2	80.0	84.0	84.05
Medium farmers	--	--	--	--
Lower Caste	51.5	75.0	70.0	65.22
Upper Caste	69.5	89.2	75.0	77.89
Total households	**75.0**	**80.0**	**73.3**	**75.00**

Different types of flowers like *Saussurea obvallata* (flowers) (2.62 kg/household/annum), *Delphinium brunonianum* (2.07 kg/household/annum), *Rhododendron arboreum* (leaves+flowers) (3.4 kg/household/annum), *Skimmia anquetilia* (leaves) (1.46 kg/household/annum) were collected from wild in the study area as an offering to their local *diety* as well as distributed among villagers at the time of fairs and festivals by the collectors.

Table 4.23: Quantity of flowers collected from CPRs in the study area

(kg/household/annum)

Strata/ Class	Brahma Kamal (*Saussurea obvallata*)	Losgar (*Delphinium brunonianum*)	Shashuri (*Skimmia anquetilia*)	Buransh (*Rhododendron arboreum*)	Overall collection
Marginal Farmers	2.21	1.91	0.35	3.15	7.62
Small Farmers	3.7	2.8	0.75	3.5	10.75
Medium farmers	-	-	-	-	-
Lower Caste	1.5	1.25	0.2	3.25	6.2
Upper Caste	3.5	2.5	0.65	4.0	10.65
Total households	**2.62**	**2.07**	**0.46**	**3.4**	**8.55**

d) Medicinal/spices/incense items: These items also play an important role in tribal domestic consumption, right from the local ailments to the overall economy of the residents of the study area. The overall collectors of these items in the study area were 55.38 per cent. The percentage of households collecting in poor household category were found higher number in all the development blocks and ranged from 53.80 per cent (Pooh block) to 57.75 per cent (Kalpa

block) (Table 4.24). The number goes on decreasing as one move up in the category because of higher time and labour consuming activity with least economic returns.

Table 4.24: Percentage of the households collecting medicinal/spices/incense items from CPRs in study area (per cent)

Strata/ Class	Nichar	Kalpa	Pooh	Overall
Marginal Farmers	78.87	71.62	72.13	73.52
Small Farmers	37.5	40.0	29.6	35.71
Medium farmers	--	--	--	--
Lower Caste	75.5	74.0	60.0	70.15
Upper Caste	38.9	46.0	50.0	45.13
Total household	**55.23**	**57.75**	**53.80**	**55.38**

An overall extraction of 21.65 kg/household/annum of different species of medicinal/spices/incense items were found in the study area with maximum extraction of 15.85 kg/household/annum by marginal and 0.35 kg/household/annum by small farm category, respectively. Households from lower caste category were extracting more quantity of such items (19.55 kg/household/annum) whereas upper caste categories were extracting lesser amount (13.75 kg/household/annum) (Table 4.25).

Table 4.25: Quantity of medicinal/ spices/ incense items collected from CPRs in the study area (kg/household/annum)

Strata/ Class	Kalazira	Ratanjot	Gugul	Dhup	Paja	Shingli-mingli	Nagchhatri	*Chukri*	Bach	Timbra	Chotra	Somlata	Overall collection
Marginal Farmers	0.65	0.37	0.91	0.89	2.13	4.55	4.47	0.57	0.22	0.43	0.35	0.30	15.85
Small Farmers	0.35	-	-	-	-	-	-	-	-	-	-	-	0.35
Medium farmers	-	-	-	-	-	-	-	-	-	-	-	-	-
Lower Caste	0.75	0.4	1.4	1.35	1.5	6.0	6.25	0.55	0.25	0.5	0.3	0.3	19.55
Upper Caste	0.3	0.35	0.3	0.5	2.0	4.25	4.25	0.75	0.2	0.45	0.2	0.2	13.75
Total households	**0.53**	**0.38**	**0.85**	**0.92**	**1.75**	**10.12**	**5.25**	**0.65**	**0.23**	**0.47**	**0.25**	**0.25**	**21.65**

e) Fuelwood/poles/bamboo/small timber for agricultural implements: The study revealed that almost all (100 %) households in the study area were engaged in the collection of these items from CPRs. No class differentiation in the consumption of these items were found as each and every households were collecting fuelwood/poles/bamboo/small.

f) Fodder (grass/tree leaf)/animal beddings: Overall 59 per cent of the households collecting these items from CPRs and the pattern of households making use of fodder (grass/tree leaf)/ animal beddings from CPRs in all of three development blocks is presented in table 4.26. Dependence of farmers for the collection of fodder and animal beddings from CPRs ranged from 53.3 per cent in Pooh to 63.33 per cent in Nichar block.

Table 4.26: Percentage of the households collecting fodder grass/tree leaf/animal beddings from CPRs in the study area (per cent)

Strata/ Class	Nichar	Kalpa	Pooh	Overall
Marginal Farmers	66.03	65.52	57.36	62.86
Small Farmers	62.5	52.0	48.1	54.76
Medium farmers	50.0	60.0	50.0	55.55
Lower Caste	83.3	70.0	60.0	71.64
Upper Caste	50.0	54.0	50.0	51.33
Total household	**63.33**	**60.0**	**53.3**	**59.00**

It is evident from the table 4.27 reveals that a handful quantity of these items was collected in the study area from CPRs with an average collection of 15.30 t/household/annum. Although every households in the study area was extracting more or less similar quantity of such produce from the commons, still household from marginal category were collecting more fodder, fuelwood, animal beddings and other items from CPRs. Similarly, lower caste category were extracting a little more i.e. 17.80 t/household/annum as compared to upper caste with extraction of 15.83 t/household/annum fodder, fuelwood, animal beddings, bamboo and small timber for agriculture implements. The reason being that lower caste families were involved in making of bamboo baskets/*kiltas* and other implements used in agricultural practices and domestic purpose, for which they were collecting raw materials from the commons.

Table 4.27: Quantity of other items collected from CPRs in the study area

(t/household/annum)

Strata/ Class	Fodder		Fuelwood	Poles (No.)	Bamboo/ small timber for agricultural implements	Animal beddings	Overall collection
	Green grass/ Straw	Tree leaf					
Marginal Farmers	9.43	3.71	1.90	2.50	0.35	0.36	17.30
Small Farmers	8.52	2.71	1.70	3	0.28	0.42	11.63
Medium farmers	7.38	3.06	1.56	2	0.25	0.58	12.83
Lower Caste	9.98	3.26	1.90	2	0.30	0.36	17.80
Upper Caste	9.58	3.07	1.29	3	0.35	0.54	15.83
Total household	**9.78**	**3.16**	**1.59**	**2.5**	**0.32**	**0.45**	**15.30**

g) Animal grazing: The local people keep cattle for their agricultural and domestic use. Their cattle graze freely in protected and unclassed forests. Cattle kept for agricultural and domestic use are normally grazed in forests and grasslands near to the habitations. Local graziers also keep small flocks of sheep and goat for wool and meat production, which is consumed locally. These small flocks migrate to alpine pastures during summer for grazing and during winters, they are stall fed.

The overall percentage of households grazing their livestock in village common grazing lands/ pasturelands was found to be 71.11 per cent, of which 79.90 per cent were marginal farmers followed by small farmers (69 %) and medium farmers (50 %). Whereas more number of lower caste category farmers (83.58 %) graze their livestock in common lands as compared to upper caste household (71.68 %). Because of lesser land holdings the lower category farmers have option of grazing their livestock in common lands. Although not in large but medium/ large category farmers also graze their livestock into the village commons/ pasturelands (Table 4.28).

Table 4.28: Percentage of the household grazing their livestock on CPR lands in the study area (per cent)

Strata/ Class	Nichar	Kalpa	Pooh	Overall
Marginal Farmers	82.09	77.69	80.07	79.90
Small Farmers	62.5	72.0	75.0	69.0
Medium farmers	50.0	50.0	50.0	50.0
Lower Caste	83.3	82.6	85.0	83.58
Upper Caste	66.7	72.9	75.0	71.68
Total household	**73.3**	**76.7**	**78.33**	**71.11**

Overall view: The overall scenario of CPR produce collection by different household category can best be explained through Figure 4.3, wherein 100 per cent user groups in the study area were categorized according to their involvement in the collection of CPR items.

Though CPRs in the study area were severely degraded due to rapid developmental activities during last 3-4 decades yet a considerable proportion of respondents having marginal holdings and lower caste category collected large quantity of items from CPRs. In fact, the paucity of private sources and unaffordability of sources from market forced them to depend on resources present as CPRs that has usage for livelihood security. Pathania *et al.,* 2011 in their study in the state of Himachal Pradesh have found the similar opinion about the consumption of

different CPR items. They also found that use of CPRs to increase with decrease in the size of landholdings, which underlines the need to increase the productivity of CPR lands.

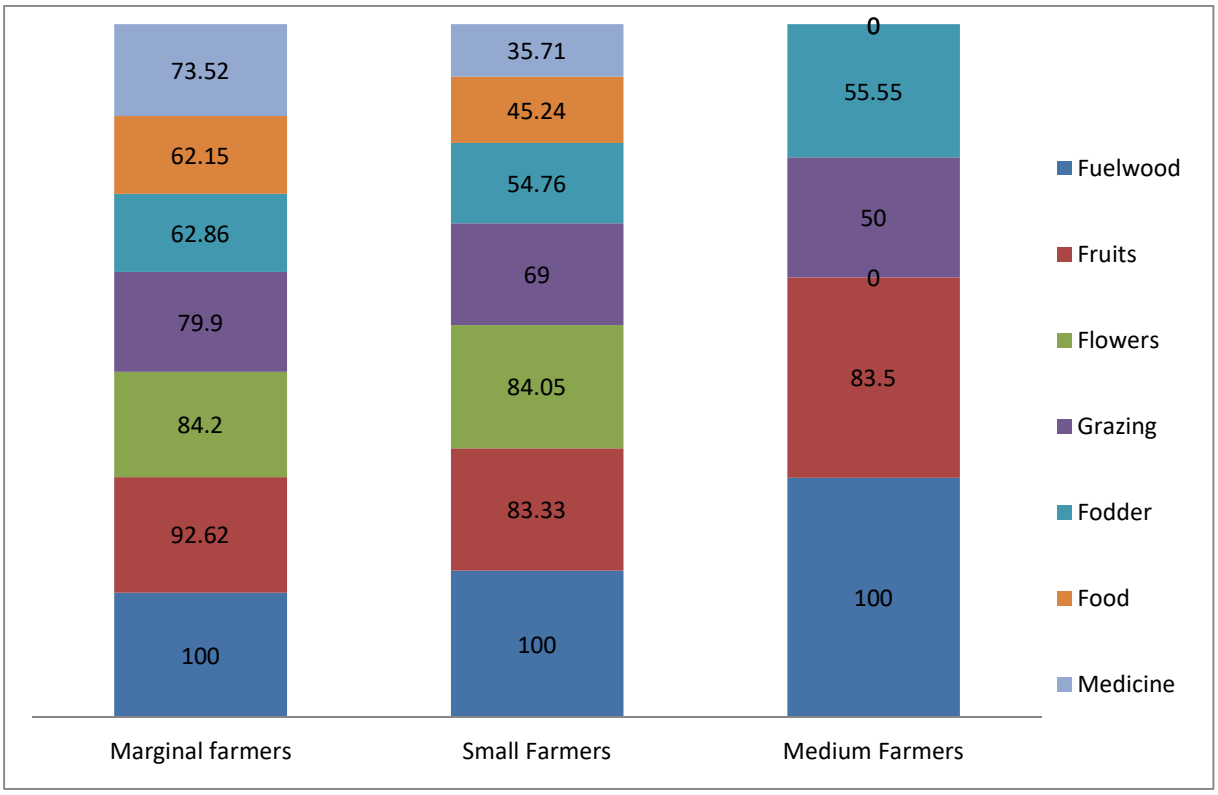

Figure 4.2: Structure of percentage distribution of CPR collectors in study area

Employment generation through CPR activities:

In order to estimate the contribution of CPRs in employment generation, the number of employment man days generated from the various CPR based activities were estimated. The employment generated through CPRs was estimated by analyzing the average time spent by the household in collection of CPR products in the last one year. From the survey data, it is observed that the time spent on collection of CPR products not only varied between the members of the household but also between households. The time spent in the collection of the CPRs depend upon the distance of the forest area from the residence. Moreover, the number of household members also influences the decision on the allotment of labour time for collection of CPRs. Marginal farmers spent little more time as compared to other two categories in CPR based activities. The data revealed that female adult members consider CPR collection as an important household activity as compared to the male adults in the study area and female members of the household spent more time in CPR collections as compared to the male members. The income

generated through the collection from CPRs by the household members supplement the total household income. In other words, collection of CPRs by the household members is a means of employment.

Table 4.29: Employment provided through CPR based activities in the study panchayats

Block	Name of the panchayat	Average no. of hours spent on CPR collection per household per year				Estimated total employment (Man days/household/year)			
		Marginal	Small	Medium	Overall	Marginal	Small	Medium	Overall
Nichar	Bari	2190	2025	1215	2060	274	253	152	257
	Katgaon	2321	2179	1924	2231	290	272	240	279
	Yula	2295	2149	2051	2211	287	269	256	276
Kalpa	Kilba	2096	2018	1155	2010	262	252	144	251
	Powari	2070	2006	1416	2006	259	251	177	251
	Telangi	2044	1958	1890	1993	255	245	236	249
Pooh	Moorang	1995	1909	958	1901	249	239	120	238
	Pooh	1980	1883	1826	1924	248	235	228	241
	Nako	1946	1853	1763	1891	243	232	220	236
Nichar		2269	2118	1730	2167	284	265	216	271
Kalpa		2070	1994	1487	2003	259	249	186	250
Pooh		1974	1881	1516	1905	247	235	189	238
Overall		2104	1998	1578	2025	263	250	197	253

***Source:** Field Survey, 2014

The present study revealed that on an average employment of 271 (Nichar), 250 (Kalpa) and 238 (Pooh) man days were generated respectively (table 4.29), in the study area during last one year which can be converted into monetary terms to calculate opportunity costs of the respondents so that valuation of CPRs can be done.

Sources of income: Agriculture plays an important role in the economy of the tribal's in the study area. They grow traditional crops for subsistence in large and the surplus is sold to the local and outside markets. By doing so, some of the locals earn handful of income from agricultural activities also. Though locals of Pooh block grow cash crops peas, which fetches a good price in the markets earning good revenue.

1. Most of the *Kinnauras* have raised their apple orchards and obtain a large revenue by selling them in various markets of the state and outside.
2. Though dairy is not much preferred farming components amongst locals because they use milk and by-products only for domestic purpose still few of them sell milk and bi-products to locals.

3. Goatary plays an important role the in economy of the local Kinnauras. As most of the people in the study area were non-vegetarian, there is great demand of meat in the district, supply of which can be met either from outside or from the local herders to large extent. So, a population of *Kinnauras* having a herd of sheep and goat, earn a substantial amount of revenue by selling them in local markets.

Income from the CPRs:

For several remote villages, sale of valuable NTFPs is an important way to earn income. This is reflected by the high dependency of people on forest products in all three development blocks. Some of forest products collected for local consumption and sale to the market are *nagchhatri* (*Trillidium govanianum*), *guchhi* (*Morchella esculenta*), medicinal plants like; *Atis* (*Aconitum heterophyllum*), *karu* (*Gentiana kurrua*), *gugal* (*Juniperus macropoda*) and aromatic plants like; *dhup* (*Jurinea macrocephala*), *kalajira* (*Bunium persicum*), *nesar* (*Pleurospermum candollei*). Other CPRs which were traditionally harvested for subsistence use are now increasingly used to generate cash income (e.g. grazing of communal pasture and forest for dairy products). The CPRs in remote areas which are facing increased pressure includes forests (for grazing), common pastures (for grazing), valuable NWFPs (for sale and handicrafts) and beautiful landscapes (for alternative types of tourism).

Among the different CPRs categories in the study area, the main contributors were fuelwood, fodder/grazing, multiple forest produce like medicinal and aromatic plants, flowers, fruits, nuts and leaf litter for animal beddings and the last but not least *kuhls* (Table 4.30).

Table 4.30: Per household income from various CPRs

(per annum)

Particulars	Nichar			Kalpa			Pooh			Kinnaur overall
	Marginal	Small	Medium	Marginal	Small	Medium	Marginal	Small	Medium	
Fuelwood	13687 (18.32)	10740 (15.90)	9600 (17.42)	12033 (13.02)	11100 (17.87)	10200 (14.63)	10440 (12.01)	8700 (13.04)	8220 (11.89)	11065 (14.82)
Fodder/ grazing	27477 (36.77)	34911 (51.67)	36781 (66.74)	33130 (35.85)	29833 (48.04)	41393 (59.39)	31752 (36.54)	30017 (44.97)	37750 (54.59)	31544 (42.25)
MFPs	31892 (42.68)	19958 (29.54)	6147 (11.15)	38166 (41.30)	8836 (14.23)	5009 (7.19)	37860 (43.57)	15513 (23.24)	7584 (10.97)	24827 (33.26)
***Kuhls**	1670 (2.23)	1958 (2.90)	2586 (4.69)	9076 (9.82)	12336 (19.86)	13099 (18.79)	6845 (7.88)	12513 (18.75)	15598 (22.56)	3216 (9.67)
CPRs	74726 (100)	67567 (100)	55114 (100)	92405 (100)	62105 (100)	69701 (100)	86896 (100)	66743 (100)	69152 (100)	74652 (100)

Note: *Difference in productivity of irrigated land and un-irrigated land

- Figures in parentheses indicate the percentage of total household income from CPRs

The proportion contributions of CPRs under various categories of different blocks were:

Nichar block: The income derived from CPRs was found to be highest in case of MFPs i.e. (42.68 %) for marginal households followed by fodder and grazing (36.77 %), fuelwood (18.32 %) and *kuhls* (2.23 %) whereas, for small households the income trend was fodder/ grazing (51.67 %) followed by MFPs (29.54 %), fuelwood (15.90 %) and *kuhl* (2.90 %) and similar trend was observed in case of medium households categories i.e. fodder/ grazing (66.74 %) followed by fuelwood (17.42 %), MFPs (11.15 %) and *kuhl* (4.69 %).

Kalpa block: The income derived from CPRs in this block was highest in case of MFPs i.e. (41.30 %) for marginal households followed by fodder and grazing (35.85 %), fuelwood (13.02 %) and *kuhls* (9.82 %) whereas, for small households the income trend was fodder/ grazing (48.04 %) followed by fuelwood (17.87 %), *kuhl* (19.86 %), MFPs (14.23 %), and similar trend was observed in case of medium households categories i.e. fodder/ grazing (59.39 %) followed by *kuhl* (18.79 %), fuelwood (14.63 %) and MFPs (7.19 %).

Pooh block: The income derived from CPRs in this block was highest in case of MFPs i.e. (43.57 %) for marginal households followed by fodder and grazing (36.54 %), fuelwood (12.01 %) and *kuhls* contributes only (7.88 %) whereas, for small households the income trend was fodder/ grazing (44.97 %) followed by MFPs (23.24 %), *kuhl* (18.75 %) and fuelwood (13.04 %) and similar trend was observed in case of medium households categories i.e. fodder/grazing (54.59 %) followed by *kuhl* (22.56 %), fuelwood (11.89 %) and MFPs (10.97 %).

Income through sale of the MFPs: Sale of MFPs generates higher income in case of marginal farmers in all of the three developmental blocks followed by small and medium farmers that shows the high dependency of marginal farmers in forests for the collection of MFPs.

Sale of MFPs in the study area:

During the study it was found that most of the CPR produce was locally disposed off to local traders and village agents, though seeds of *neoza* pine and *kalajeera* were largely sold during the 'International Lavi Fair' at Rampur Bushehr and Tribal Festival at Rekongpeo directly

by the farmers in the month of October-November. MFPs however auctioned to direct contractors; the amount received was then equally distributed among the beneficiaries.

Overall household income distribution:

The household income is considered as the means of livelihood security of the people. The different sources of income for marginal, small and medium households were analysed and results are presented in table 4.31. The overall household income in district Kinnaur was found to be ` 429402 of which medium households has the average income of ` 820368.54 followed by ` 564827.53 in case of small households and ` 26588.94 in case of marginal households. The contribution of farm income in total household income of study villages was 67.67 per cent whereas non-farm income contributed 32.33 per cent which shows that population is highly agrarian in nature. In farm income category orchards contributed the highest share (47.18 %) followed by CPRs (17.39 %), goatry (1.76 %), agriculture (0.79 %) and dairy (0.56 %). Amongst non-farm category service (23.07 %) contributed the highest followed by business (5.00 %), wages (3.15 %) and rentals (1.11 %).

Block wise income distribution:

Nichar block: In this block medium households have the highest income i.e. ` 624489.50 followed by small households ` 405005 and marginal households i.e. ` 178379 respectively. Similar type of trend was observed with income from orchards i.e. medium households (65.05 %), small households (40.53 %) and marginal households (20.98 %) whereas reverse trend was observed in case of contribution of CPRs i.e. marginal households have highest (40.96 %) followed by small households (16.68 %) and medium households (8.83 %) per cent incomes derived so far.

Kalpa block: Medium households have the highest income i.e. ` 745701 followed by small households ` 612040.14 and marginal households i.e. ` 284452.72 respectively. Similar type of

trend was observed with income from orchards i.e. medium households (69.58 %), small households (51.97 %) and marginal households (31.28 %) whereas reverse trend was observed in

Table 4.31: Household income derived from different sources

(per household/annum)

Particular	Nichar			Kalpa			Pooh			Kinnaur overall
	Marginal	Small	Medium	Marginal	Small	Medium	Marginal	Small	Medium	
Farm income										
Agriculture	3104 (1.74)	2484 (0.61)	6250 (1.00)	1833 (0.64)	2125 (0.35)	5000 (0.67)	2847 (0.84)	6972 (1.03)	8800 (0.81)	3376 (0.79)
Orchard	37417 (20.98)	164141 (40.53)	406250 (65.05)	88981 (31.28)	318083 (51.97)	521667 (69.58)	114516 (34.45)	411019 (60.67)	705713 (64.93)	202574 (47.18)
Dairy	1896 (1.06)	2485 (0.61)	0 (0.00)	3685 (1.30)	2167 (0.35)	5000 (0.67)	2194 (0.66)	2259 (0.33)	0 (0.00)	2414 (0.56)
Goat/Sheep rearing	2864 (1.61)	13594 (3.36)	29375 (4.70)	3611 (1.27)	10431 (1.70)	8333 (1.11)	3145 (0.95)	10222 (1.51)	8750 (0.81)	7561 (1.76)
CPRs	74726 (41.50)	67567 (16.68)	55114 (8.83)	92406 (32.49)	62104 (10.15)	69701 (9.30)	86896 (26.14)	66743 (9.85)	69152 (6.36)	74652 (17.39)
Subtotal-I	120007 (66.65)	250271 (62.00)	496989 (80.00)	190516 (67.00)	394910 (65.00)	609701 (81.00)	219598 (63.00)	497215 (73.00)	792415 (73.00)	290576 (67.67)
Non-farm income										
Service	32250 (18.08)	125750 (31.05)	125000 (20.02)	64269 (22.59)	153733 (25.12)	120000 (16.01)	89935 (27.05)	116148 (17.15)	250000 (23.00)	99058 (23.07)
Wages	19458 (10.91)	7422 (1.83)	2500 (0.40)	18519 (6.51)	96667 (1.58)	3333 (0.44)	18710 (5.63)	9407 (1.39)	4500 (0.41)	13539 (3.15)
Business	8333 (4.67)	16875 (4.17)	0 (0.00)	9815 (3.45)	41897 (6.85)	0 (0.00)	11613 (3.49)	45926 (6.78)	40000 (3.68)	21470 (5.00)
Rentals	0 (0.00)	4687 (1.16)	0 (0.00)	1333 (0.47)	11833 (1.93)	16667 (2.22)	2581 (0.78)	8741 (1.29)	0 (0.00)	4759 (1.11)
Subtotal-II	60042 (33.35)	154734 (38.00)	127500 (20.00)	93936 (33.00)	217130 (35.00)	140000 (19.00)	122839 (37.00)	180222 (27.00)	294500 (27.00)	138826 (32.33)
Total (I+II)	180049 (100)	405005 (100)	624489 (100)	284452 (100)	612040 (100)	745701 (100)	332437 (100)	677437 (100)	1086915 (100)	429402 (100)

- **Note:** Figures in parentheses indicates the percentage of total household income

case of contribution of CPRs i.e. marginal households have highest (32.49 %) followed by small households (10.15 %) and medium households (9.30 %) per cent incomes derived so far.

Pooh block: In this block medium households have the highest income i.e. ` 1086915 followed by small household's ` 677437.45 and marginal households i.e. ` 332436.28 respectively. Similar type of trend was observed with income from orchards i.e. medium households (64.93 %), small households (60.67 %) and marginal households (34.45 %) whereas reverse trend was observed in case of contribution of CPRs i.e. marginal households have highest (26.14 %) followed by small households (9.85 %) and medium households (6.86 %).

It can be concluded from the above table that the marginal households enjoy a greater proportion of income from CPRs, both in relative as well as absolute terms and this can primarily be attributed to the dependence of marginal households on various products obtained from their ecosystem.

Inequality in income from CPRs and overall household income among sample households:

From the study it was found that there is inequality in the income from CPRs and overall household's income among different strata. The inequality in income from CPRs among upper caste (0.51) which is higher than the lower caste (0.44) which is because of less involvement of upper caste group in the collection from CPRs as compared to the lower caste, who were found more actively involved in the collection from commons due to less land holdings. Among the selected blocks the same trends were found in the distribution of income among these castes (Table 4.32).

Table 4.32: Inequality in household income from CPRs

(Gini coefficient)

Block	Income from CPRs	
	Upper caste	**Lower caste**
Nichar	0.52	0.45
Kalpa	0.50	0.46
Pooh	0.53	0.43
Overall	**0.51**	**0.44**

The Gini coefficient which shows the degree of inequality in the distribution of overall income among different caste groups i.e. upper caste and lower caste in different blocks were calculated to determine the level of inequality. The value of Gini coefficient for total income was found lower among upper caste (0.35) and high among lower caste (0.51). Amongst different blocks, this value varied between 0.38 (Nichar block), 0.36 (Kalpa block) and 0.32 (Pooh block) among upper caste which shows that the upper caste have more or less equal household income

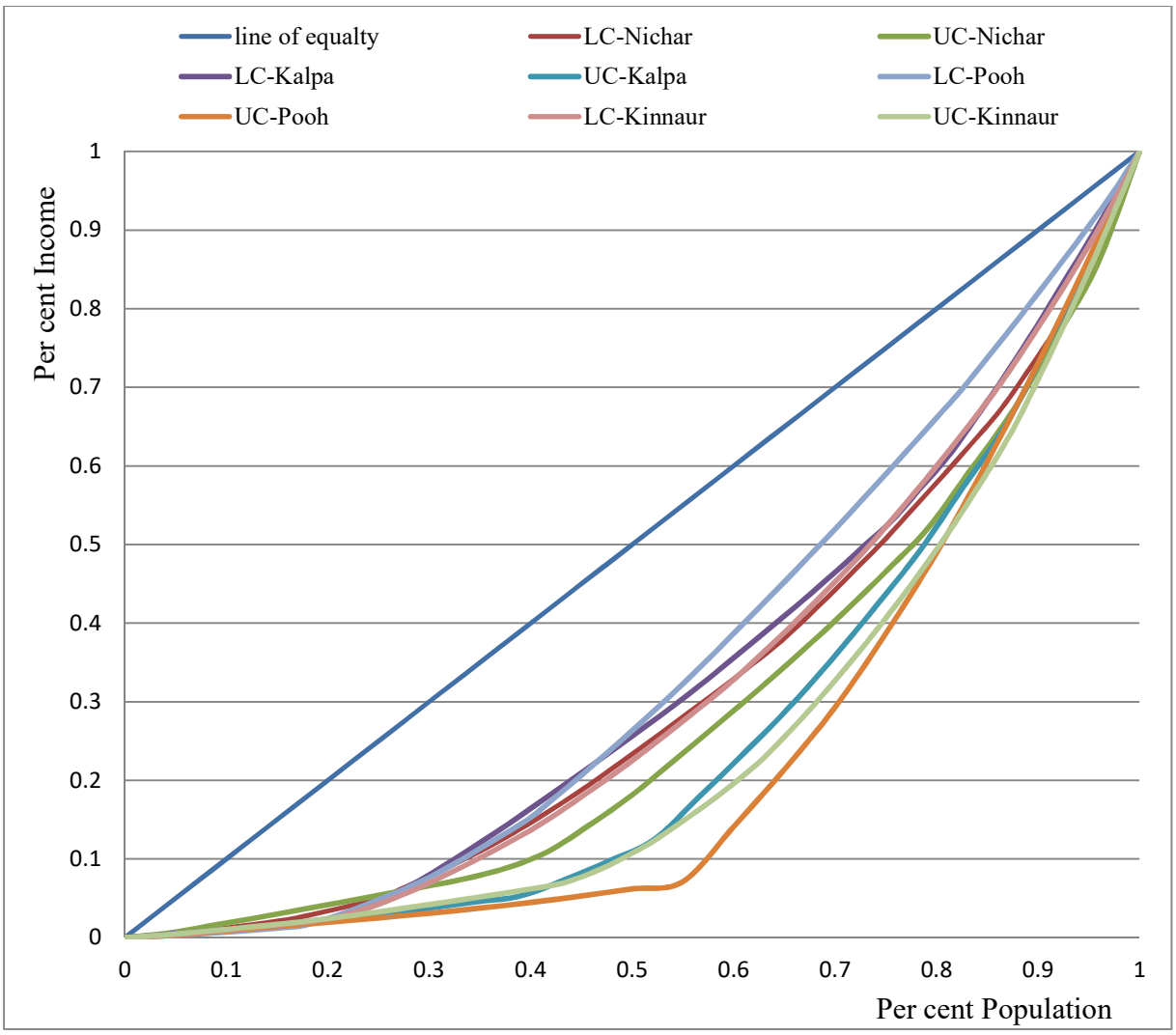

Figure 4.3: Inequality in overall household's income from CPRs among two castes in the study area

distribution. The coefficient of inequality among lower caste was found 0.43 (Nichar block), 0.49 (Kalpa block) and 0.54 (Pooh block) showing the lower caste have more inequality in overall household income distribution (Table 4.33).

Table 4.33: Inequality in overall household income

(Gini coefficient)

Block	Household Income	
	Upper caste	Lower caste
Nichar	0.38	0.43
Kalpa	0.36	0.49
Pooh	0.32	0.54
Overall	**0.35**	**0.51**

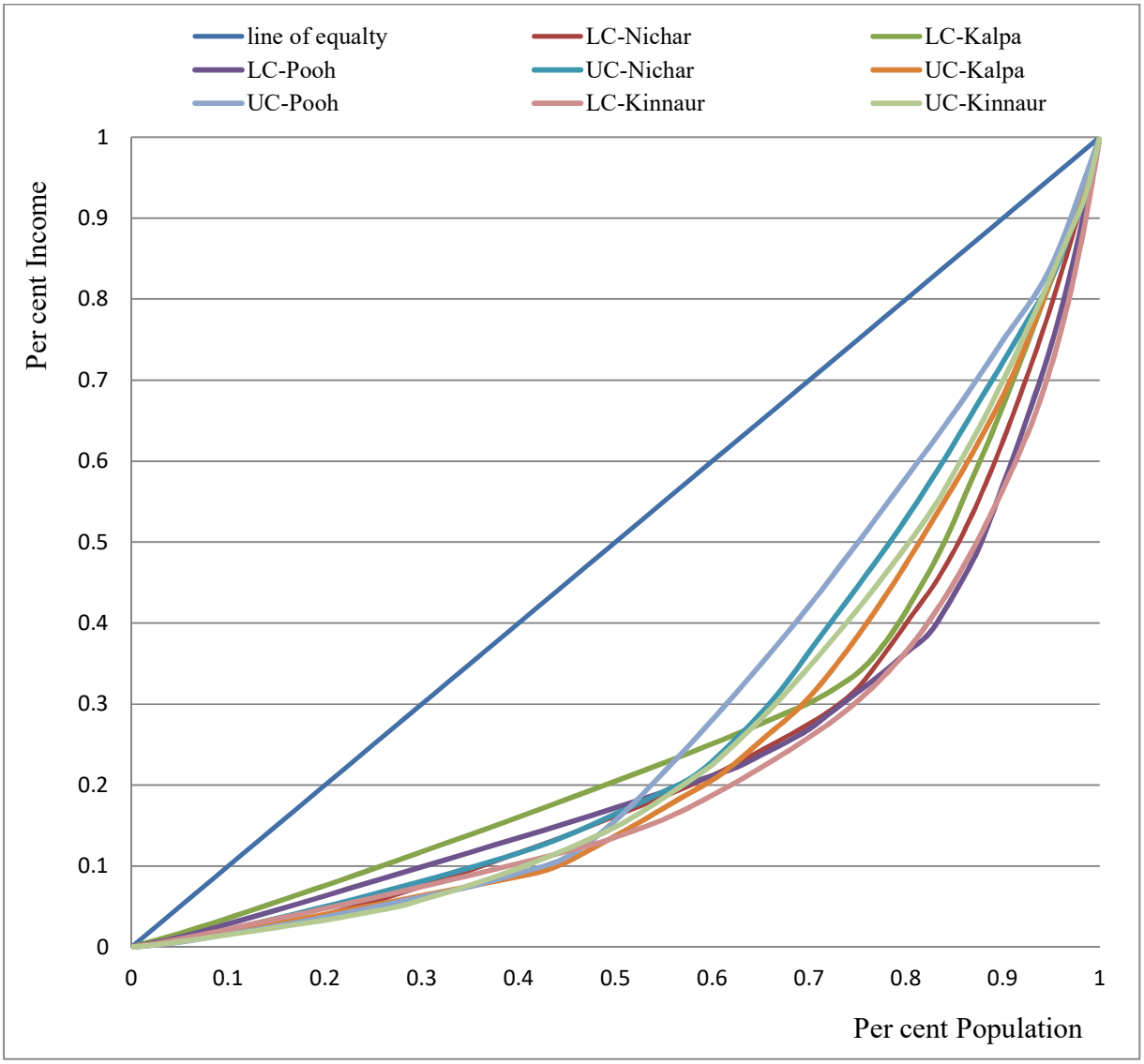

Figure 4.4: Inequality in overall households income among two castes in the study area

4.6 Heterogeneity and Common Property Resources:

One of the emerging issues related to common property resource management is the group inequality and appropriation of resources from the commons. The relationship between socio-economic heterogeneity and distributional implications of community based resource management is becoming a growing concern in participatory resource management. Bardhan and Dayton-Johnson (2000) extensively reviewed the case-study literature on heterogeneity and commons management and noted a U-shaped relationship between inequality and commons management. Very high and very low levels of inequality are associated with better commons performance, while mid-range levels of inequality are associated with poor outcomes. However, heterogeneity and income inequality in community-based property rights structure is also said to be conducive to the successful outcome of the collective action. Olson (1965) hypothesized that the possibility that groups where considerable heterogeneities exist may be privileged if those with the most economic interests and power were to initiate collective action to protect their own interests. Baland and Platteau (1997) also discussed the theoretical possibility of Olson's hypothesis especially when management of common pool resources involves important non-convexities in its production function.

To understand the relationship between household income generation through CPRs and socio-economic determinants, an econometric model was developed for the present study. It was hypothesized that household level benefits from common property resources would be inextricably associated with household and community attributes. So variation in CPRs among household can be explained by socio-economic status of user households. A log-linear model similar as suggested by Adhikari (2003) and Di Falco and Perrings (2002) was used to understand the effect of socio economic heterogeneity. The dependent variable (Y) measures the household returns from common property resources (i.e. gross value output from CPRs). The independent variables hypothesized in this model were social participation, caste, education of the household, family size, land holding, livestock inventory, non-farm income, labour allocation in the collection of CPR items and households distance from CPRs.

The log linear model was run to observe the relationship between income generation through various CPR activities and household socio-economic determinants. The results of log linear model are presented in the following table 4.34. The fit was found significant and value of R^2 was 0.46.

It can be concluded from the analysis that social participation was found positively and significantly related with the dependency on CPRs, whereas education affects negatively but non-significantly with the income generation activities from CPRs means un-educated peoples were acquiring more benefits from CPR activities.

Table 4.34: Socio-economic determinants of CPRs collection in the study area

Variables	*Coefficients*	*Standard Error*	*t Stat*
Intercept	4.1381	0.1246	33.2181
Social Participation©	0.0350**	0.0170	2.0602
Caste©	-0.0199	0.0146	1.3603
Education©	-0.0225	0.0328	0.6858
Family size	0.1997*	0.0540	3.6959
Land Holding	-0.1817*	0.0408	4.4517
Livestock inventory	0.0031**	0.0131	0.2365
Non Farm Income	-0.0072	0.0074	0.9665
Labour allocation for CPR activities	0.3585*	0.0662	5.4168
Distance from CPRs	-0.1043**	0.0401	2.6004
R^2	0.46		
F value	92.49		

Note: Dependent variable = income from CPR collection

*, **, *** indicates significant at 1, 5 &10 % level of significance.

© Dummy variable, taking binary value of 1 and 0.

A significant relationship between family size and income from common property resources was also observed; signifying that with the increase in family size, income from CPRs is also increasing in the study area. Also the finding highlighted the fact that collection of CPR items is a labor intensive as labour allocation in the collection of CPR items was positively and significantly affecting the income generation from the CPRs.

Size of land holding was negatively and significantly related with income from CPRs i.e. with increase in land holding of the respondents it was found that income from CPRs is decreasing and vice-versa. A decrease in land holding may increase dependency on common property resources for livelihood security. Livestock population in the study area positively but

significantly affecting the income from CPR collection which was due to dependence of locals in the collection of more quantity of fodder, animal beddings and grazing more number of livestock's into the pastures.

On the other hand, employment (non-farm activity) displayed negative sign indicating that an increase in non-farm income will decrease dependency on common property resources.

Distance from the CPRs source showed negative and significant relationship with collections from the commons. Household residing close to the forests were more likely to acquire higher amount of the common property resources and reverse was true for the distant users. Kerapeletswe & Lovett (2002) also found similar observation in Botswana and argued that the distance involves walking and carrying the harvest resulting into difficulty in the collection.

Caste was negatively associated, however not significant, with amount of drawing benefits from CPRs implying that lower caste collect higher benefits from common property resources. This may be due to the fact that lower caste households who have less land holdings and livestock population as compared to higher castes that forces them towards alternate source of income, which is met through CPRs for their livelihood security.

Hence it can be concluded from the fore going analysis that social participation, size of the household, land holding, livestock population, distance from the CPRs, labour allocation in various CPR activities were the significant factors contributing heterogeneity in income from CPRs. Other variables were found non-significant.

Poteete and Ostrom (2004) suggested that it is difficult to identify direct relationships between heterogeneities and resource governance outcomes because the effects of heterogeneities are mediated by institutions, and relatively little research on the subject has attempted to identify the independent and mediating effects of institutions. Their argument is an important extension of earlier suggestions that institutions mediate the effects of contextual variables such as population, markets, and other socioeconomic factors on resource conditions. But despite the increasing amount of work on group level heterogeneities and inequalities, both theoretical and empirical evidence on the subject is highly ambiguous. It is possible to ensure effective resource governance even in groups that have high heterogeneities in interest through coercive enforcement of conservationist rules (Jodha 1986; Peluso 1993; Libecap 1989).

However, the impact of intra-group heterogeneities on distribution of benefits from forests may be more amenable to definition (Adhikari 2005). Significant research on forest-based commons suggests that the economically and politically better off group members are often likely to gain a larger share of benefits from a commons resources (Agrawal 2001a). This is not to say that intra-group inequalities are a result of collective action; rather, it is simply to point out that inequalities within a group are not necessarily reduced because group members are willing to cooperate toward a collective goal when there are high levels of existing inequalities.

A related user group characteristic over which there has been significant research concerns poverty. Poverty directly relates to the ability of users to generate the necessary resources and capacity to protect and regulate common pool resources. But precisely what this truism means for the success of institutionalized protection and allocation of resource-based benefits is still not certain. Does poverty leads to a greater reliance on the commons (Jodha 1986) and therefore incentives for their conservation or for higher levels of harvesting and degradation, or do increasing levels of wealth, at least initially, lead to greater degradation of commons? These are questions whose answers are not certain. Likewise, there is at least some divergence of views over whether the poor benefit more from the commons in comparison to those who are better off. However, one major contribution of scholars of forest-based commons on this issue has been to highlight the importance of equity concerns and poverty issues in the regulation and use of commons.

In summary, whether the relationship between different measures of successful governance of forest commons, and group characteristics such as size, heterogeneity, interdependence, dependence on forests, and poverty is negative, positive, or curvilinear seems subject to a range of other contextual and mediating factors, not all of which are clearly understood (Agrawal 2001b). Broadly speaking, smaller, interdependent, more homogeneous, and relatively well off groups that are dependent on their resources and do not suffer sudden shocks in their demands upon the resource are more likely to be successful in creating institutions that help regulate forest commons more effectively. But the effects of these variables in specific conditions can vary. The theoretical work related to inequalities and heterogeneities by commons scholars has an important bearing on how specific forms of social heterogeneities such as those related to gender, indigeneity, ethnicity, class, and income affect outcomes. The

politics of gender and indigeneity has been especially prominent in this regard in the contributions of scholars of forest commons (Freudenberger *et al.,* 1997; Holt 2005; Larsen 2003).

Kuhl irrigation system as common property resources:

Kuhls are commonly found in Western Himalaya wherever a gentle slope prevails. The technique for the preparation of *kuhls* for irrigation purposes seems to have originated since' Babylonian times; it is still one of the commonest ways of bringing water to the crops. If the river has steep gradient, water is diverted into a canal some distance upstream and led along a contour so that it can flow to fields by gravity. The irrigation channels (*kuhls*) are diverted from river tributaries by making use of the natural gradients thus rendering flow of irrigation water easy through canals to the cultivated fields. In Himachal Pradesh *kuhls* (water channels) are built along the hill gradient for maintaining proper gravity for irrigation.

The traditional *kuhl* is constructed with a dug-out main diversion channel that has structures that can be temporary or permanent. Due to annual floods that might destroy the temporary channels, which are built using boulders, rocks, bamboo, and tree branches, are preferred. In recent years, people have also started using concrete. These *kuhls* flow through different distribution points creating a diversion-based system.

Moreover, this system can range from hundreds to thousands of meters long to allow water (floodwater) to be diverted to farmlands. The canals are aligned to draw water from the hill streams or springs. *Kuhls* also collect rainwater and melted snow running from the slopes above them. In addition, lands that are to be irrigated are usually situated on hill-sides and are supplied on terraces where water flows due to the gravity that "traverses the contours of a mountain slope". *Kuhls* in this rain shadow tribal tract is the single entity besides rainfall which is responsible for the yield of agricultural/ horticultural crops.

Construction of _kuhls_ in district Kinnaur:

Taking into consideration, regular shortage of availability of the irrigation water to the agricultural fields in the study panchayats, the village level institutions and District Rural

Development Agency (DRDA) is actively involved in the construction of *Kuhls* in Kinnaur district under various development schemes like; Integrated Watershed Development Programme (IWMP), Mahatma Gandhi National Rural Employment Guarantee Scheme (NREGS) etc. With the consultation of '*gramsabha'* various panchayats of the study area put their resolution in front of gram panchayat, after which village panchayat brings the matter to the concerned department and Irrigation and Public & Health department is also actively involved in the construction of *kuhls* in various panchayats of the district Kinnaur. *Kuhls* are simply dug in the ground to regulate the flow of water. However, where the digging of channels is difficult or the channel has to pass through a village path, channels are covered with slates or cemented. However, during older days the wooden/iron channels were also used which were put like a bridge over the path. These channels were made by making a deep grove in the tree trunk or a thick branch. The users were responsible for upkeep and maintenance of these water channels.

In dry temperate zone, *kuhls* are generally made by making notches at the natural water sources and the water is diverted to the fields for irrigation to different terraces, using the natural gravitational flow of water. Since the topography of the area consists of very high slopes and rocky terrains, wooden/ iron water channels are used at many places as water passes from one place to another. The water channels are built and managed by the villagers with governmental assistance.

Distribution of *kuhl* irrigation system to the fields:

In the cold deserts of Himachal Pradesh, participatory management is employed for distribution of water. All disputes regarding the distribution of water through *kuhls* are amicably settled without hampering the water requirement of any period.

The *kuhls* cannot be run satisfactorily due to non-availability of sufficient water from *Khads* (streams) in perpetuity. This is because of scanty snowfall during the winter months. The majority of hamlets, which lie on the plateaus on the sides of main river get water from the streams which trickles down from the cliffs overhanging the plateaus. These hamlets receive deficient irrigation water during scanty snowfall, the streams dwindle quickly and dry up in the beginning of August. Additional snowfall in winter results in more water in natural springs

during the summers, whereas less snowfall in winter result in the reduction of level in natural springs during summer and consequently less availability of irrigation water to the field crops.

As information gathered from the farmers of various panchayats in the study area, the distribution mechanism of *kuhls* that is passing through a village are harvested on turn basis called *pala*. Temporary channels are dug by the farmers towards their fields. The whole community is divided on the basis of number of farm families and one family gets one full water day to irrigate their fields turnwise. For example, if there are 20 farm families in a village, the turn falls after every 20 days. However, two adjoining families may share the water for half day each when there is turn of either of the two families. This way these two families get a chance to irrigate their fields after a gap of 10 days rather than 20 days and the distribution of water is so well managed that maximum use of water takes place in a particular village. The farmers have developed the irrigation water distribution system on the basis of their land holdings, in which every field is irrigated timely. So there are rare chances of disputes regarding distribution of irrigation water and the maintenance of *kuhls*.

Similarly, information gathered from the farmers of Pooh block where the irrigation technique were much more pronounced, the fields are generally divided into small compartments by making earth bunds to allow water to stand in the fields for a longer duration for saturating the soil. Hence need for the second irrigation arises only after 20 to 25 days. At the first turn of irrigation, first compartment is irrigated; followed by second and so on. On the second turn of irrigation, however these compartments are irrigated in reverse order, i.e. sixth compartment is irrigated first followed by fifth and so on.

More often the streams run away from cultivable grounds or are incised deeply below it, so that a long canal is necessary to bring water. The arrangement of this is so to avoid natural observations. It is not easy to maintain a uniform gradient and it requires considerable traditional expertise. The bed of the canal is often made of very porous material- loose stones and boulders, so there are considerable losses from seepage. The bushes and trees growing around channels confirm that these losses are occurring. Wherever it is possible farmers have skillfully channelized the water through construction of long canals, some of them running over few

kilometers traversing through rocky mountains. Some of the canals were constructed in very early stage of the history of the region.

Management of *kuhls*:

The major source of irrigation is the stream water and spring water. The villages are endowed with water springs. The water from these springs are diverted through *kuhls* and brought to the fields through main and sub channels directly to the agricultural fields. To a great extent the fields in the lower part are irrigated through these channels whereas, the fields of upper part (*kandas*) are mostly rainfed. The amount of snowfall in the preceding winter season and prevailing weather condition determines the amount and time of arrival of melted snow water. During peak days of irrigation the *palas* irrigate their agricultural fields during day as well as night time. There may be chances of water theft during these days. For this very purpose *palas* act as watchman particularly during their turn of irrigating to the fields. If any conflict arises due to such incidences, can be resolved either by village *kuhl* committee/*devta* committee or village panchayat or if the case gets serious goes to the police for conflict resolution. If someone found guilty of irrigation water theft, the person may be penalized in terms of fine or a ban can be imposed on using irrigation water for 1-2 seasons.

In temperate areas of cold deserts crop cultivation without irrigation is not possible because precipitation takes place in the form of snowfall. People take advantage of glacial water and perform collective operations for effective distribution and ensure supply of this scarce source. The management of water in a particular field is regulated by apportioning into different compartments because of the season. The mouth of first compartment is closed to regulate the flow of water towards the second compartment. The same method is adopted to irrigate the following compartment. This results in raising the height of channel in front of the first compartment than the channel in front of the second compartment and so on. Now when this field is irrigated during its second turn, the water flows straight towards the fourth compartment. This practice prevents the washing off the upper fertile layers during irrigation.

Nako panchayat, which was one of the study site, villagers devote a full day before the start of crop season to clean the previously damaged water channel. For this a day is finalized

and announcement is made well in advance to villagers so that at least one participant from each household can take part actively. When the day comes the villagers climb uphill early in the morning with great enthusiasm, dress up traditionally and singing folklores carrying with them equipments, lunch with uncooked materials like *sattu* (flour of roasted barley), flour, vegetable oil, ghee, *dhup* etc. in common as worship material to please mountain gods. In between on the way to source of irrigation *kuhl* there in uphill the group takes their lunch. Slow and steadily crossings numerous hillocks and travelling several miles the group finally reaches the destination. After reaching the destination the group gathers, prepares worship items by cooking the material that was carried with them. Then a group of males go to the top where the mountain god is supposed to be seated and start worshipping via offering local wine, *halwa*, *puri* and *dhup*. Simultaneously, the females there in downhills keep on singing folklore to please the god. When the worship is over the group shares the *halwa* and *puri* as a *prashad*. At last the group goes to the stream from where *kuhl* originates and water is diverted towards the *kuhl*. Water gushes down to *kuhl* bringing happiness on the faces of *kohlis* and travels several miles to reach the agricultural fields lying downhill in the villages. Then they start downward journey in the evening reaching the village almost at dark.

Respondent's problem perceptions regarding conflicts over *kuhl* irrigation system in the study area:

Kuhls are supposed to be mainstay of the agriculture productivity in this rain deficit area of the country. Demand for irrigation water becomes larger during cropping season and/ or deficit rainfall that creates the tense like situation amongst farmers. Ultimately, there are chances of conflicts over distribution of irrigation water amongst the users in the study area. Through the present study an attempt has been made to figure out the reasons for the same which have been presented in following tables:

According to table 4.35, 40 per cent of beneficiaries suggested that they get enough water when needed for their agricultural activities. However, significant number of water users (60 %) said that they could not get enough water for their farm activities when they needed due to water

Table 4.35: Responses related to getting enough irrigation water and reasons for not getting enough irrigation water

Do you get enough water?		**Frequency** *N=140*	**Percent**
Responses	Yes	56	40.0
	No	84	60.0
	Total	**140**	**100**
What are the major reasons for not getting enough water?			
Reasons	Water scarcity	48	57.14
	Water theft	12	14.28
	I am tail-end irrigator and water do not reach there	24	28.57
	Total	**84**	**100**

According to table 4.35, 40 per cent of beneficiaries suggested that they get enough water when needed for their agricultural activities. However, significant number of water users (60 %) said that they could not get enough water for their farm activities when they needed due to water scarcity. This problem may have been arisen due to the erratic nature of annual rainfall, the presence of plants around the earthen canal and children's/ aged persons assigned to irrigate the farm who could not manage the job properly. These in turn result in water scarcity in the command area. Tail ender irrigator and water theft were the other important problems that constrained the supply of adequate water in the command area of the irrigation scheme, respectively.

Table 4.36: Farmers' response on major causes for water scarcity

If there is water scarcity, what are the most important causes for you?		**Frequency** (N=48)	**Per cent**	**Rank**
Causes	Declining level of water from the source	19	39.60	1st
	Increasing number of users	17	35.40	2nd
	Seepage losses	9	18.75	3rd
	Poor scheduling of distribution	3	6.25	4th
	Total	**48**	100	

According to table 4.36, the declining level of water from the source was one of the factors responsible for water scarcity in the command area which may be due to shortage of snowfall during winters. The other cause of water scarcity in the command area was seepage loss

(18.75 %) and this may be due to the fact that in the study area except some parts of the main conveyance canal made from cement, the secondary canals are earth canals and malformed due to lack of timely and proper maintenance activities. As a result of this, excessive seepage was observed during the study time. Moreover, poor coordination of scheduling, inadequate coordination of water distribution and increasing number of water users in the command area have had also contributed to the problem of water scarcity in the study area.

Table 4.37: Water users' opinion about the performance of water committee in water distribution

What do you feel about the performance of the water committee in the management of water distribution?		**Frequency** (N=140)	**Per cent**
Opinion	Enough water is not received due to mis-utilization of water (adequacy)	73	52.14
	Water is not received when needed (timeliness)	42	30.00
	Water distribution is unfair (equity)	25	17.86
	Total	**140**	**100**

More than half of the water users (52.14 %) have opined the mis-utilization of irrigation water by the water committee (Table 4.37). About 48.00 per cent irrigators replied that they could not receive water when they needed and the distribution of water was unfair. However, according to the performance indicators designed by the World Bank in 2000 in the distribution of irrigation water include adequacy, timeliness and equity in the supply of water, the irrigation water users were found to be inefficient in managing the water distribution in terms of these three performance indicators.

Table 4.38: Water users' opinion about major management problems related to water distribution

What is the major management problems related to water distribution?		**Frequency** (N=140)	**Per cent**
Opinions	Sanctions not imposed against illegal water users	72	43.40
	Rotation does not accomplish equality	21	17.50
	Rotation is not strictly implemented	19	15.80
	Poor coordination of water distribution by Water committee	28	23.30
	Total	**140**	**100**

Perceptions of water user's about the major weaknesses of the water management committee is presented in the table 4.38. Of the total users, 43.40 per cent reported that sanctions are not imposed against illegal water users who extract and use more water by abusing turns.

Few of the illegal water users may be intimate friends or relatives of the water committee members. Hence, sanctions were not imposed on them. 23.30 per cent of the beneficiary farmers stated that they were not able to obtain water in a reliable manner because of poor coordination in water distribution by water committees. The study further revealed that other management problems selected to water distribution were irrigation users did not obtain the quantity of water they needed because, among others, rotation does not accomplish equality. This may be due to the fact that rotation is based on the type of crops and vegetables planted and the size of the farmland in the command area as a result of this rotations were not strictly implemented .

Table 4.39: Beneficiary farmers' response to the presence and causes of conflict over irrigation water

Have you ever faced any conflict over irrigation water?		**Frequency** (N=140)	**Per cent**
Responses	Yes	72	51.43
	No	68	48.57
	Total	**140**	**100**
What are the causes for water conflict?		**Freq.** N=140	
Causes	Water theft	12	16.60
	Water scarcity	48	66.60
	Competition due to increase in number of water users	9	6.70
	Lack of proper control of water distribution	3	4.16
	Total	72	**100**

Majority of beneficiaries (51.43 %) acknowledged the presence of conflict arising from distribution and allocation of irrigation water (Table 4.39). They mentioned water scarcity, water theft, lack of proper control of water distribution and competition due to increasing number of water users as the prominent factors for water conflict. 66.60 per cent of the beneficiaries reported that due to the erratic nature of snowfall/rainfall and the declining of volume of water conveyed into the streams (water scarcity); there had been intense competition and conflict over water. 16.6 per cent beneficiaries stated that water theft has also been one of the prime factors for water disputes within groups and between groups. Informants also expressed that lack of enforcement of bylaws for water allocation has also been one of the most important constraints that led to unnecessary water disputes. They also expressed that 'the stated bylaws are good in written form but when we see them

in practice, they are not well applied. Some irrigators break the bylaws and commit water theft but the penalty is not proportional to the mistakes that they made. The remaining 6.7 per cent and 4.16 per cent of irrigators said that the conflict arises due to competition (increasing number of water users') and lack of proper control of water distribution respectively.

Table 4.40: Farmers' response on conflict over irrigation water by their farm location

Have you ever faced any conflict over irrigation water?		Where is your farm location from the water source?			
		Upper-catchment	Middle-catchment	Lower-catchment	Total
Responses	Yes	25	23	30	78
	No	35	21	6	62
	Total	**60**	**44**	**36**	**140**

Water users in the lower catchment area of the irrigation scheme have faced more disputes over irrigation water than other two locations (Table 4.40). From this we can understand that conflict over irrigation water is severe in lower catchment of the water source. When a farmer's farm location is far from the water source, the probability of getting enough irrigation water is low. This in turn results in water scarcity and conflict.

Table 4.41: Farmers' opinion about the performance of *Devta* committee/ Gram panchayat in resolving conflicts in the irrigation system

How do you evaluate the performance of the *Devta* committee/ Gram panchayat in resolving conflict?		Frequency N=140	Percent
Opinions	They take immediate actions on cases	80	57.14
	Conflict management has been improved	16	11.43
	They suspend cases	44	31.43
	Total	**140**	**100**

Table 4.41 represents that a significant number of beneficiary farmers (57.14 %) responded that the water committee takes immediate actions on cases to resolve conflicts when they arose, whereas, rest 31.43 per cent were of the opinion that the water committee suspended the cases. This may be due to the fact that whenever there are violators, the water committee takes such perpetrators to the gram panchayat/ court of local deities. Nevertheless, the court

always demands witnesses for the offences done. Because of these procedural problems, cases may be suspended. Informants also indicated that when fellow farmers who had witnessed the wrong doing are asked to stand as witnesses; they decline from cooperating; in case the perpetrator might resent against them. Most beneficiaries of the scheme do not want to risk consequences from such feelings of resentment from any one endured legal actions for being found guilty. So, the committee often finds itself powerless to ensure observance of the regulations set for the irrigation water management. About 11.43 per cent of beneficiaries said that conflict management has been improved in the irrigation system.

Table 4.42: Beneficiaries opinion about the maintenance of the scheme

How do you evaluate the maintenance of the scheme?		**Frequency** (N=140)	**Per cent**
Opinions	Very good	40	28.57
	Good	72	51.42
	Acceptable	19	13.57
	Poor	8	5.7
	Very poor	1	0.7
	Total	**140**	**100**
If your answer is poor or very poor, what are the causes?		**Frequency** (N=9)	**Per cent**
Causes	Siltation	**3**	33.33
	Poor imposition of sanctions on reluctant users	**2**	22.22
	Absenteeism of some members on maintenance Days	**2**	22.22
	Breaching of canals by illegal water users	**1**	11.11
	Poor coordination of maintenance activities	**1**	11.11
	Total	**9**	100

A significant number of beneficiaries (51.42 %) and (28.57 %) responded that maintenance of the irrigation scheme is in a good and very good condition. However, according to beneficiaries who said the maintenance of the scheme is poor and very poor, the major causes were siltation (33.33 %), poor imposition of sanctions on reluctant users (22.22 %), absenteeism of some members on maintenance days (22.22 %), breaching of canals by illegal water users (11.11 %) and poor coordination of maintenance activities (11.11 %) (Table 4.42).

Table 4.43: Farmers' ranking of the reasons for under use of the irrigable land

Do you use all of your irrigable land in full potential		**Frequency** (N=140)	**Per cent**	
Responses	**Yes**	65	46.43	
	No	75	53.57	
	Total	**140**	**100**	
What are the major reasons for under use of your irrigable land?		**Frequency** (N=75)	**Per cent**	Rank
Reasons	Water scarcity	48	64.0	1st
	The plot I possess is large	11	14.66	2nd
	Shortage of labour	10	13.34	3rd
	Shortage of oxen	6	8.0	4rd
	Total	75	100	

According to table 4.43, 53.57 per cent of beneficiaries in the irrigation scheme responded that they did not fully irrigate their farm land. The table also shows farmers ranking of the constraints that discouraged them from participation in irrigated farming and led to the underutilization of the irrigable farm land. The results obtained also shows that water scarcity, large land holdings, shortage of labour and shortage of oxen were the most important factors responsible for under use of the potential irrigable land respectively.

Table 4.44: Irrigation beneficiaries' response on the frequency of harvest in a year

How many times do you produce crops in a year by applying irrigation?		**Frequency** (N=140)	**Per cent**
Responses	Once	20	14.28
	Twice	83	59.28
	Thrice	37	20.55
	Total	140	100

Table 4.44 shows that 59.28 per cent and 20.55 per cent of farmers responded that they produce the crops, twice and thrice in a year whereas, 14.28 per cent respondents grow the crop only once in a year in their fields. This clearly shows that irrigation can facilitate agricultural production intensification that means irrigation schemes helps to increase agricultural productivity of a given land in the study area, consequently helping in the crop diversification.

Table 4.45: Farmers' responses on crop failure and perceptions on possible causes of crop failure

Have you ever faced a problem of crop failure while you are using irrigation?		**Frequency** (N=140)	**Per cent**
Responses	Yes	82	58.50
	No	58	41.50
	Total	**140**	**100**
What are the possible causes for crop failure?		**Freq. (**N=82)	
Causes	Water shortage	48	58.54
	Damage by disease/ insect-pests	15	18.30
	Poor adoption of improved crop varieties used	19	23.16
	Total	**82**	100

Table 4.45 shows that 58.54 per cent of the beneficiary farmers responded that they faced a problem of crop failure while they were using irrigation. The prevalence of crop and vegetable disease, water shortage and poor adoption of varieties used were the most important constraints that dictate and brought about a change in cropping pattern in the irrigation scheme. 18.30 per cent of beneficiary farmers responded that they have faced crop failure due to disease. The rest 58.54 per cent and 23.16 per cent of beneficiary farmers faced crop failure due to water shortage and poor adoption of varieties used respectively. Bakers (1997) in his findings of *kuhl* irrigation systems in Himachal Pradesh considers the effect of differentiation which is high when a *kuhl* irrigates more than one village the irrigators of the *kuhl* are comprised of multiple castes and land distribution is relatively unequal. Baker proposes that in the presence of high differentiation, increased opportunities for non-farm employment can place intolerable stress on traditional *kuhl* management regimes.

Conflict over commons:

Conflict poses a serious challenge in governing the commons. It may be mentioned here that commons, such as land and forests, exhibit specific characteristics that give rise to unavoidable conflicts like multiple actor groups, complex institutional arrangements, important material and cultural values, and free riders (Ostrom 1990; Clark *et al. 2*000). Conflict, in fact is a part of the day to day aspect of resource management. In fact with contested tenure, it is a common issue in the battle over land and forests. The problem arises because the State tend to retain most, if not all, ownership to land and this is supported by legislations *(de jure)* that can

often be traced back to colonial periods. Simultaneously, local people possess customary rights reflecting their *de facto* management of natural resources for decades. The clash between the two systems underlies conflict over the commons almost everywhere in the world and India is no exception to this.

The most immediate victims of such conflicts are the weak and poor and they constitute approximately 65 per cent of the world population. They are not only poor but are also heavily dependent on forest resources for their livelihoods (ADB 2003). While there has been much research on this topic, most focuses on conflict over high value extractive resources. There is relatively less analysis regarding the natural resources that underpin rural livelihoods in agricultural systems. In fact this conflict, which occurs between local and resource dependent peoples (communities) and between developers and governments, exhibit a struggle that is characterized by serious power imbalances.

In recent times factors like debts, low resource base, upper caste violence and social boycott have compounded the matter even more. Moreover, there are increasing incidences of conflict between the rich and the poor and particularly between the upper and marginal castes over access, struggle or bargain over distribution of *kuhls*. It is predicted that in the coming years factors like agricultural development, commoditization of the economy, population pressure will further result in the encroachment of the right of the poor over commons. Beck (1994) based on his study in West Bengal revealed, how dominant castes discriminate the tribal and scheduled caste communities in the region over common resources resulting into severe conflicts among them.

4.7 Role of CPR management local institutions for the efficient production, utilization and benefit sharing of CPR based products:

Institutions are humanly created formal and informal mechanisms that shape social and individual expectations, interactions, and behavior. The institution can be classified into public (bureaucratic administrative units, and elected local governments), civic (membership and cooperative organizations), and private sectors (Uphoff and Buck 2007). Institutions influence the livelihoods of rural household in three important ways:

1. They structure the distribution of CPRs. How particular social groups and populations will be affected by inequality in resource usage. It also imparts the functions of how macro and micro level institutions in a variety of domain affect the distribution of CPRs.

2. They constitute and organize the incentive structures for household and community level adaptation responses which shape the nature of these responses. Institutional incentives are key in determining whether adaptation responses will be organized individually or collectively because institutions affect the emergence of leadership in different contexts, costs of collective action, and the extent of transactions costs.

3. They mediate external interventions into local contexts, and articulate between local and extra-local social and political processes through which adaptation efforts unfold. External interventions in the shape of finances, knowledge and information, skills training, new institutional inputs, and technological support can assume many different forms. Local institutions shape the acquisition and distribution of these interventions in fundamental ways, thereby affecting the degree of success of such interventions.

A common property regime at the village level constitutes private property for the group with the attendant coequal rights and duties for the individual members. It can be therefore confidently argued that to deal with the commons problem often stated as 'commons dilemma' common property institutions provide an alternative institutional arrangements where the authority structure stems from within the system of that particular regime i.e. the rule of law does not come from any external authority but emerges endogenously. This arrangement is not the only way to solve the 'commons dilemma' but it has been reflected both in policy analysis and in formal theory and literature. For example, the alternative that commons theorists have identified is community and common ownership and management that are rooted in the practices of millions of household around the world. Based on field research, scholars of commons have in-fact, produced case studies of successful community management of forests, pastures, coastal fisheries, irrigation, and ground water (Bromley 1992; McCay and Acheson 1987; Peters 1994; Tang 1992).

Thus, the multiplicity of institutions at village level reflects a very similar scenario that exists at the government level; multiple institutions with different roles that very often overlap and all having no future direction to evolve and transform or multiply their scope. Most (though not all) village forest institutions are of recent origin. Village consultations carried out as part of the research work showed that many such local forest institutions have succeeded in bringing greater focus and awareness of the need for protection and conservation of forests, and they have carried out practical work such as reforestation, soil conservation, fire protection activities.

Problems of collective action emerge from several sources, including inadequate information and conflicting interests, as well as the nature of the good itself. When people lack information, co-ordination is difficult despite common goals (assurance games). If multiple solutions exist but have different distributional consequences, competition over distributional issues can result in failures to co-operate (chicken games). Rivalry in consumption and difficulty of exclusion make provision and protection of common-pool resources particularly challenging. The temptation to let others bear the costs of providing joint benefits threatens provision of these goods. Obstacles to exclusion encourage individuals to free-ride on the efforts of others, resulting in under provision or degradation of the common resource (e.g., social dilemmas). There is no guarantee that actors in any given situation will overcome co-ordination or social dilemma problems. Many groups fail to solve these problems. Others experience an unraveling of collective action after initial success. Failures to overcome collective action problems contribute to the degradation or loss of natural resources around the world. Sustaining these resources in the face of demographic and economic pressures depends upon successful co-ordination and co-operation. An understanding of the factors influencing prospects for collective action for sustainable management among resource dependent populations has important policy implications.

Work of Olson and other collective action pessimists are surely right is in the need for some sanction to back up the agreements like co-operative management of commons. Their emphasis on the difficulties of strictly voluntary collective action which proceeds from moral commitment, or habit, or a calculation of the benefits to each if each complies is a useful counter to the simple optimism of those who believe that community development projects, people's

participation, water users' associations and the like are mainly a matter of teaching people what their real common interests are, or a matter of changing their values in a less individualistic direction. On the contrary, the ability to make people do what they may not immediately want to do, by means of sanctioned rules, is a necessary ingredient of any arrangement for common pool resource management.

In the light of this it becomes imperative to develop voluntariness in collective action amongst users groups of natural resources. This can further be considered at two levels. At the constitutional level people can negotiate voluntarily a set of rules of restrained access or financial contributions, their incentive to do so being the prospective net collective benefit. At the action level, most of the compliance with the rules must also be voluntary, not the result of a calculus of evasion and punishment. But the rules must be backed by a system of punishment, the existence of which helps to reassure any one person that if he follows the rules he will not be punished or at the times of crisis can directly be prosecuted. This argument makes the size of the net collective benefit the major factor in explaining the presence or absence of corporate organisation in groups like Indian villages. Besides in a large country like India, interventions need to take regional variations in existing institutional bases into consideration and aimed at centralized drafting of decentralized participatory governance. Co-management involves participation of peoples which give them the right to access, exclude and alienate, manage and withdraw the common pool resources.

Designing institutions that co-ordinate expectations of different classes of rural producers in a manner in which income disparities are reduced, common property is better managed and in fact rejuvenated (if possible), and redundancy for coping with uncertain contingencies are continually created is indeed a tremendous challenge.

Table 4.46: Social participation of local households in the management of natural resources and other activities (per cent)

Particulars	Development blocks			Overall (180)
	Nichar (N=60)	Kalpa (N=60)	Pooh (N=60)	
Members of the social organization	44	48	47	46.33
Non-members	56	52	53	53.67
	100	100	100	100

Name of the social organization involved				
Gram Panchayat	5	6	6	5.67
Mahila mandals	5	5	6	5.33
Yuvak mandals	4	5	4	4.33
Self-help groups	5	5	4	4.67
Devta committee	12	11	10	11.00
Vikas (development) committee	3	4	5	4.00
Village Forest Development Committee	2	--	--	0.67
kuhl (irrigation) committee	--	6	5	3.67
Co-operative society	5	3	6	4.67
NGOs	1	1	1	1.00
Others	2	2	-	1.50

From the study multiple responses were obtained regarding social participation of the local residents in district Kinnaur. In overall 46.33 per cent interviewed households have said that they were the members of the one or more than one village level organizations. Whereas 53.67 per cent have told that they were not at all the members of any village level organizations. Per cent involvement of interviewed household members with village level institutions were found to be maximum with *Devta* committee (11 %) means most of the villagers were involved in village level common activity through *Devta* committee, followed by Gram panchayat (5.67 %), *Mahila mandals* (5.33 %), self-help groups (4.67 %), co-operative society (4.67 %), *yuvak mandal* (4.33 %), *vikas* committee (4.00 %), *kuhl* committee (3.67 %), NGO's (1.00 %), village forest development committee (0.67 %) respectively (Table 4.46). Emphasis should be given to bring 100 per cent participation of locals to different local institutions prevailing in the district so that each and every one should acquainted with various government schemes and get maximum benefit out of those schemes.

Kinnaur is also called as 'Land of Gods' and there is convincing evidence that the institution of deity in this tribal district provides the essential context for cooperative action. Adherence to religious beliefs amongst the residents of this tribal district is strong. *Devta* Committees are the oldest and most honoured institutions within the village system. These are neither ad hoc nor promoted under any project and there is complete ownership among people. There are more than one *Devta* Committees in each villages of Kinnaur, based on caste or village as a whole. Generally, *Devta* committee consists of 10-15 members, usually male, including *Pujari* (the priest), *Mali* (the oracle), *Motami* (the manager) and *Kardars* (the members).

Throughout the Kinnaur district the *Devta* Committ25ees have responsibilities for maintenance and upkeep of temple premises and organising religious ceremonies or fairs.

Local deities of Kinnaur have known to exercise influence over a fairly well-defined territory within which a village evolved as a cohesive social unit with strong bondage ties amongst the inhabitants and with the local deity in particular (Singh 2006b). More importantly, religion is an institution of governance in itself. Social sanctions had religious overtones. Fear of religious spirits, believed to cause harm and anguish, drove people to abide by customary codes of social behavior which included adherence to communal norms of resource use. In Kinnaur district the role of *Devta* Committees surpasses all other institutions including panchayats, and all major decisions are facilitated with the guidance of committee members. Formerly these committees looked after all aspects of the area development, however with the increasing influence of the outside world, their importance is on the decline, though they remain revered institutions. Other institutions like Panchayati Raj Institutions (PRI's) also play a significant role in distribution, management and conservation of commons property resources. Apart from this, due to the poor delivery structure offered by the village panchayats, other village level organisations like the *mahila mandal* (women's group), *Yuvak mandal* (youth group for boys), Self Help Groups (SHG's), *Kuhl* committee, co-operative societies etc. have been set up through various functionaries like the Sub-divisional office (civil), Block development office and Directorate of youth and sports. In most cases these organisations operate informally, but in order to make them more effective, a formal constitution is necessary, for instance they are powerless to act against those who continue to use the resources illegally and depend upon agencies such as Forest Department to enforce sanctions against the same.

The Department of Youth Affairs and Sports facilitates the organisation of youths for involving in developmental activities. The youth groups are primarily involved with literacy programmes and *shramdan* (voluntary labour) in development works. Those *Yuvak mandals* visited had between 10-20 members, but meetings were irregular and there was little involvement in forest related activities. However there lies ample scope to involve youth in income generation activities, conservation and protection of forests, etc.

One or more than one *Mahila Mandals* existed in every panchayats of the district. The membership comprises women in the age group of 18-45, who meet monthly. Non-membership

of lower castes in these organisations sometimes leads to critical dissention and conflict between different users of a forest resource. For this very reason, women from deprived section have made their own independent groups. Further, focus is being given by department of Rural Development for the promotion of such deprived section of the society. An emerging role of *mahila mandals* is seen in the formation of active SHG's of women under different schemes. Most of the NGO's also work through these *mahila mandals*. *Mahila mandals* are the only traditional institutions which consider fuelwood, fodder and water as important issues, not because they are forestry focused groups, rather because their members are the most dependent on forests for these three basic requirements. These groups do take into consideration the equity and gender issues.

Benefit sharing mechanism of chilgoza pine as common resource:

Chilgoza pine (*Pinus gerardiana*) is known to be one of the most important cash crops of the tribal people who live in the district Kinnaur of Himachal Pradesh. *Chilgoza* is mainly extracted from the forests of the state and in a complementary way, from trees in private ownership. Locals have the rights over it to harvest and sale into the market. The mechanism of benefit sharing of this pine in the region was quite distinct. *Devta* committee or 'gram panchayat divides the *chilgoza* forests of the village in 3-4 blocks and a meeting of the villagers is held to decide the collection of *chilgoza* cones during the month of October when these are ready for plucking. Villagers assemble at specified date and place, mostly in the temple premises and then the members of the committee initiate proceedings of the meeting and the villagers collectively decide the system of collection and distribution. Generally one male and one female from each family are nominated for collection on the specified date. Teams of one male and one female (mostly of the same family) spread in the forests and male member climbs on the trees and pluck the cones while female member gathers the dropped cones. Trees contain three kinds of cones viz., old opened cones of last year crop, freshly matured cones which contained ripe nuts and the small immature cones which will mature in the following year. Only cones with ripe nuts are harvested. Collection starts in the morning, lasts for all day and in the evening when the every collection party brings the collected cones to one place and the collections are entered in the record maintained by a person at collection site. In good seed years, a team collects about two gunny bags containing about 150 cones per bag. Entire day collection is heaped at designated

place and then equally distributed among all the collection partners through locally employed distributors. Distributors get about 50 additional cones for performing this job. Second day too, people spread in the forests for collection of cones but the collected cones are heaped near the collection site and distributed in the evening. The collection in the area lasts for the entire season. Sometimes families forego their share as they do not participate in the collection while in some others they engage labor on payment basis to ensure the share of the collected produce.

Gravity irrigation water distribution system (*kuhls*):

The water distribution mechanism of *kuhls* which are passing through a village is based on turn called '*pala'*. Temporary channels are dug by the farmers towards their fields from the main channel. The whole community is divided on the basis of number of farm families and one family gets one full water day to irrigate their fields turn wise. If there are 20 farm families in a village, the turn falls after every 20 days. But two adjoining families may also share the water for half day each when there is turn of either of these two families. This way these two families get a chance to irrigate their fields after a gap of 10 days rather than 20 days. This way the distribution of water is so well managed that maximum use of water takes place in a particular village. All the members of the family are engaged in the job on its turn and the farmers have developed the irrigation water distribution system on the basis of their land holdings, in which every field is irrigated timely. So there are less chances of disputes regarding distribution of irrigation water and the maintenance of *kuhls*.

Similarly, information gathered from the farmers of Pooh and surrounding areas where the irrigation technique were much more pronounced, the fields are generally divided into small compartments by making earth bunds to allow water to stand in the field for a longer duration for saturating the soil. Hence need for second irrigation arises only after 20 to 25 days even in those agricultural crops which otherwise require irrigation after a gap of 10-15 days. At the first turn of irrigation, first compartment is irrigated; followed by second and so on. On the second turn of irrigation, however these compartments are irrigated in reverse order, i.e. sixth compartment is irrigated first followed by fifth and so on.

More often the streams run away from cultivable grounds or are incised deeply below it, so that a long canal is necessary to bring water and to avoid natural evaporation. In these hilly

terrain it is not easy to maintain a uniform gradient and it requires considerable traditional expertise. The bed of the canal is often made of very porous material- loose stones and boulders, so there are considerable losses from seepage. The bushes and trees growing around channels confirm that these losses are occurring. Wherever it is possible farmers have skillfully channelized the water through construction of long canals, some of them running over few kilometers traversing through rocky mountains. Some of the canals were constructed in very early stage of the history of the region.

Alpine meadows (pastures):

Since time immemorial, during the summers months locals of Kinnaur sends their dry animals to alpine meadows at higher altitudes for 5-6 months i.e. April-May to August-September. These animals are taken to pastures either individually by a single household or in conjugation with 2-3 households depending on degree of co-operation. Animals brought to these alpine pastures varies in number of a particular household depending on number of dry animals or small animal heads, other than milking cow and bullocks which are to be used for ploughing their agriculture fields in the prevailing season. After completion of ploughing agriculture fields these bullocks are also brought to summer pastures. Because of highly nutritious vegetation and vastness of these alpine pastures animals relish a good diet and become healthy up to the end of summer season. In between time to time vigil is kept either by their owners or through message via others about their conception or pregnancy of any cow and missing of animal heads. Hardly there is any chance of theft of the animal from these pastures. Occasionally the situation may arise when animals enters into the pastures of neighboring panchayats. After getting intimation of such situation, owner of missing livestock brings back to home. Otherwise all animals are kept there for entire season and brought back during autumn when temperature falls down i.e. indication of winter.

In the mean time, during festival of *janmashtami* the villagers go to these alpine pastures and carry packets of salt with them. There is tradition of feeding salt to animals grazing in alpine meadows apart from feeding their own animal heads and others animals too.

Farmers in the village collect grass from pastures nearest to their vicinity in order to stallfed the animals during winters. Maintenance of animal herds has been part of economic and

social personality of Kinnaurese. Traditional dresses which people mostly wove in their houses are made of wool. Many families maintain at least a couple of sheep just to meet this requirement of wool and meat and to gain manure. High cost of modern agricultural inputs for agricultural farms and requirement of manure to supplement immature mountain soil suggests significance of animals in the economy of Kinnaur. During the winter months when animals are stallfed, their droppings are used as manure to enhance fertility of agricultural land. These animals graze freely in natural pastures during summer. Thus, their droppings become beneficial to pastures in similar fashion. Apart from providing manure, wool and meat, livestock provide a range of other goods and services.

Joint forest management activity as conservation of CPRs

The concept of forest management is not new to Himachal Pradesh and it existed in the erstwhile princely states and was codified and sanctified under the British rule. It effectively disappeared from the time of independence to the early 1970's, when the emphasis was on afforestation, consolidation of the forest department, and the establishment of the forest based industries. A report by the National Agriculture Commission in 1976 emphasized the need to orient forestry programmes to meet the daily needs of the rural people for fuelwood, fodder and timber, and in 1980's many donor agencies supported the implementation of people oriented forestry programmes through special forestry projects.

The national forest policy of 1988 recognized the fact that the economy and livelihood of the rural people was dependent on forests, and thus that people and communities must have the first charge on the use of forest resources.

The Himachal Pradesh Government issued JFM Notification on 12.05.1993 for constitution of Village Forest Development Committees (VFDCs) and made HP Participatory Forest Management Rules 2001 for registration of VFDCs under Societies of Registration Act, 1860. Himachal Pradesh had 1562 JFMC's till 1st February, 2016.

Taking into consideration of such a splendid success of JFM programmes in the state, forest department in district Kinnaur also tried to implement JFM programmes in the district to

ensure people's participation in the conservation and management of village forest resources during late 90's.

Table 4.47: Perception of respondents about the benefits of JFM Programme

Benefits	Response (N=120)		
	Agree	No opinion	Disagree
Helps in proper utilization of land	90 (75.0)	10 (8.33)	20 (16.67)
Provide additional supply of fuel wood, fodder & grasses	95 (79.17)	8 (6.67)	17 (14.17)
Assures monetary benefits after felling trees & grass cuttings	75 (62.5)	21 (17.5)	24 (20.0)
Reduces Encroachment	83 (69.17)	17 (14.17)	20 (16.67)
Control of forest fires	100 (83.33)	6 (5.0)	14 (11.67)
Helps in soil conservation and moisture retention	80 (66.67)	18 (15.0)	22 (18.33)
Helps in flood control	80 (66.67)	12 (10.0)	28 (23.33)
Provides employment to rural people	88 (73.33)	10 (8.33)	22 (18.33)
Improves harmony among the people	99 (82.5)	6 (5.0)	15 (12.5)
Increase awareness among villagers regarding natural resources	103 (85.83)	5 (4.17)	12 (10.0)
Improved usufruct sharing	105 (87.5)	5 (4.17)	10 (8.33)

Quite a mix of benefits were realized by the beneficiaries' when JFM was prevalent in the study area. Now due to budgetary crunch/non responsiveness of locals towards JFM has restricted the activity to few villages. Although an effort has been made through personnel interview to find out the benefits derived by the locals from the forests via JFM programme which is mentioned in table 4.47.

4.8 Problems and perceptions in the management of village commons

There remain challenges within CPR management institutions such as the dominance of traditionally powerful groups; inability to counter manipulation and malpractice amongst the users of the commons and the recent proliferation of village institutions with unclear boundaries and responsibilities. In general, primary stakeholders lack an institutional and legal framework to enable equitable participation in the processes of decision making concerning common property resources, both at village and district level. Designing institutions that co-ordinate expectations of different classes of rural producers in a manner in which income disparities are reduced,

common property is better managed and in fact rejuvenated (if possible), and redundancy for coping with uncertain contingencies are continually created is indeed a tremendous challenge.

Generally, it is assumed that access to markets and commercialization has affected local communities' attitudes and behavior regarding utilization and benefit sharing of common property resources (CPRs), making them less inclined to cooperate and more likely to engage in destructive practices of over-harvesting, which sometimes creates situation of non-cooperation. The pre-modern society, in essence, portrayed a scenario intensively characterized by adaptation and collective strategies for coping with an inhospitable terrain and resource constraints both in the sphere of agro-pastoral production systems and also while accessing village commons. Analytically speaking, the ecological outcomes as regards common property resources, during this period, are fairly predictable. Due to a predominantly subsistence based economy, low population density and limited labor supply, the natural resource base of the region must have been much in excess of levels of extraction and use, to supply common property resources on sustainable basis in the region.

Besides making markets imperfect, transaction costs may make markets incomplete too. When transaction cost is higher than the benefit from an exchange and when there is no device to reduce the cost, certain markets do not develop at all. Such is the situation of missing markets. One of the major functions of institutional structure is to reduce these market imperfections and substitute for missing markets by facilitating information and by reducing risk and uncertainties (Bardhan 1989; Bell and Srinivasan 1989; Platteau and Abraham 1987).

The problem arises when the community is composed of more than one caste group. While caste based social inequities are less common in these parts of the country, caste loyalty is a prominent feature which drives social interactions within communities. At low levels of social heterogeneity (when the probability that two households do not belong to the same caste is low), a majority of households in the community belong to one particular caste group. While interaction among households from the majority caste may be high, households from the minority caste groups may be viewed as 'outsiders'. This could result in social discrimination and exclusion from the decision-making process and hence lower participation in collective management process from the latter. In one of the study panchayat (Bari) such arose conflict

over the benefit sharing mechanism of CPRs that is due to suppression of lower caste by the upper caste in extraction of *nagchhatri*. *Nag Devta* committee of Upper caste imposed fine of ₹ 25000 per person whosoever found digging of roots of *nagchhatri* from wild without prior permission from the *Nag devta* committee. Also the auction of Bari alpine meadows was done for ₹ 10,00,000 for the extraction of medicinal plants (season 2016) to the outside contractor by the *Nag Devta* committee. Other committee of *Narayan Devta* which was dominated by lower caste group was deprived of sharing the amount received from the auctioning by the *Nag Devta* committee. For this reason *Narayan Devta* committee have put up the matter in front of court of law which is under jurisdiction.

Matter become more serious when outside graziers in the alpine meadows of same panchayat offered 2-4 goats/ sheeps before devta committee as grazing fee (molang) for every grazing season. The *Narayan devta* committee intervened and demanded two goats as grazing fee from the outside graziers. The members of *Nag devta* committee opposed the interference of another *devta* committee that resulted into the conflict between the two communities.

The results show that social homogeneity is not a pre-requisite to cooperation and that the inherent problem is not necessarily the degree of social heterogeneity but what it implies for the marginal sub-groups in the community. High levels of cooperation may be achieved in socially heterogeneous communities if exclusion and discrimination are minimal.

a) Factors affecting people's participation in Joint Forest Management (JFM) programme:

Factors affecting peoples participation in activities under JFM through various VFDCs in different blocks of district Kinnaur is presented in table 4.48. It is evident from the table that all the 10 factors considered have influenced people's participation in the JFM programmes. But foremost reasons for the poor participation in JFM activity were the lack of awareness/ knowledge about the Joint Forest Management Programmes (85 %) and Non availability of routine funds (77.5 %) in Nichar block and lack of co-ordination with forestry officials (70 %), lack of awareness/ knowledge about Joint forest management (65 %) in Kalpa and Pooh blocks. Whereas, factors like lack of awareness/knowledge about joint forest management (66 %) and

Table 4.48: Factors affecting people's participation in JFM activities at block level

Factors affecting people's participation	Nichar (N=40)			Kalpa (N=40)			Pooh (N=40)			Overall (N=120)			χ^2
	R#	% age	Rank	R#	% age	Rank	R#	% age	Rank	R#	% age	Rank	
Lack of awareness/ knowledge about JFM	34	85	I	26	65	II	19	48	II	79	66	I	10.39*
Lack of co-ordination with Forestry officials	29	72.5	III	28	70	I	20	50	I	77	64	II	4.74
Non availability of routine funds	31	77.5	II	22	55	IV	14	35	V	67	56	III	16.19*
Lack of training and visit programmes	29	72.5	III	24	60	III	14	35	V	67	56	III	13.06*
Clash between agriculture and JFM activities	27	67.5	V	22	55	IV	16	40	IV	65	54	IV	7.00**
Lack of emphasis on quick economic activities.	25	62.5	VI	16	40	VI	18	45	III	59	49	V	5.68
Village politics	24	60	VII	18	45	V	16	40	IV	58	48	VI	4.48
Lack of transparency	28	70	IV	13	32.5	VII	12	30	VI	53	44	VII	22.74*
Improper usufruct sharing	24	60	VII	16	40	VI	12	30	VI	52	43	VIII	10.77*
Poor economic status	16	40	VIII	13	32.5	VIII	9	23	VII	38	32	IX	4.56

#R = 'yes response' and * &** shows that respective perceptions are significant at 1 % & 5 % level of significance

Table 4.49: The mean perception scores regarding the condition of pastures in different blocks

Category	Allotted Score (a)	Frequency (b)			Total Score (c) = (a*b)		
		Nichar	Kalpa	Pooh	Nichar	Kalpa	Pooh
Very good	4	18	0	0	72	0	0
Good	3	20	18	15	60	54	45
Poor	2	15	33	22	30	66	44
Very poor	1	4	3	18	4	3	18
Total		57	54	55	166	123	107
Mean perception scores					2.91	2.28	1.94

lack of coordination with forestry officials (64 %) were the reasons behind low participation in joint forest management activities in the district as a whole.

Chi-square test of goodness of fit revealed that problems like lack of awareness/knowledge about participatory forest management, non-availability of routine funds, lack of training and visit programme, lack of transparency and improper usufruct sharing were found significant at one per cent significance level, while the problem of clash between agriculture and JFM activities was found significant at five per cent significance level. The factors like lack of co-ordination with forestry officials, lack of emphasis on quick economic activities, village politics and poor economic status have shown non-significant results. Similar types of perceptions were recorded in their individual studies by various authors across India; Brahmi and Sehgal (2008), Naidu (1992), Loganandhan and Mondal (2005), Purushotam and Singh (2005), Badal *et al*. (2006).

b) People's perception regarding condition of pastureland in the study area:

People's perception, especially shepherds, were obtained to know about the condition of pastureland and its carrying capacity in the study area. Based on Mean Perception Score (MPS) the Nichar block scored 2.91 indicating that the pasturelands in this block are in good condition (table 4.46). Whereas, MPS of 2.28 in Kalpa block indicates near to poor condition of the pastureland and MPS of 1.94 Pooh block indicates poor conditions of pasturelands due to which livestock rearing becomes very difficult in this region (Table 4.49).

c) People's perception regarding the degradation of common property resources

There are number of factors which are responsible for degradation of CPRs of which main were rampant construction of hydroelectricity projects (last 20-25 years), excessive lopping for fodder and firewood, population pressure, challenges like excessive rainfall/ snowfall, encroachment for cultivation, forest fires (Table 4.50).

This constraint often renders insecurity towards farming system that forces young generations of the study area to leave this profession. Youth are migrating at large from the district in search of employment opportunities outside.

Table 4.50: People's perception regarding the degradation of CPRs

Causes	Response (N=180)		
	Agree	No opinion	Disagree
Hydroelectric projects	140 (77.78)	18 (10.00)	22 (12.22)
Excessive lopping for firewood/fodder	133 (73.89)	15 (8.33)	32 (17.78)
Population pressure	139 (77.22)	11 (6.11)	30 (16.67)
Due to challenges like excessive rainfall/ snowfall	109 (60.56)	13 (7.22)	58 (32.22)
Encroachment for cultivation	76 (42.22)	32 (17.78)	72 (40.00)
Forest fires	73 (40.56)	30 (16.67)	77 (42.78)
Construction of roads	39 (21.67)	84 (46.67)	57 (31.67)
Over grazing	73 (40.56)	14 (7.78)	93 (51.67)
Deforestation	51 (28.33)	34 (18.89)	95 (52.78)

Decline and Degradation of Common Resources in India

Despite CPRs significance in the agrarian economy of rural India, these resources have witnessed steady decline over a period of time. In the period before colonialism, there was a strong bond among local communities and endogamous caste groups. In contrast the hold of central authority on these resources was relatively weak. The situation however changed with the coming of the British which then established a strong state control. The profit motives of the colonial government led to the establishment of public control over much of country's natural resources which were earlier controlled by individuals or communities. With the introduction of railways and other commercial needs, the British government under the direction of D. Brandis, a German forester standardized the management of forests and classified them into two categories: reserved and protected. The local users were thus gradually deprived from the commons due to this classification. It may be mentioned here that common natural resources of the indigenous peoples were declared as *terra nullius* (empty land) and was occupied by the colonial state as their eminent domain. Community managed forest lands, which once existed over large part of India, were steadily dismantled during the 19th century. The process of state usurpation was consolidated in the Indian Forest Act, 1878 (Gadgil and Guha 2000). However, management under communal control still persists in certain pockets. For example even today, some of the woodlots in Himalayan villages are still harvested in a sustainable fashion.

After independence the situation further changed. Jawaharlal Nehru, the then prime minister of India, wanted the country to be modernized and industrialized. The state policies which were formulated during this period were based on this vision. The consequences of such policies were that they kept rural population away from the management and utilization of common resources, be they forests or fisheries (Gadgil and Iyer 1983). All these government measures and subsequent acts and the processes of globalization and privatization, not only deprived the local users of their communal right over these resources but also led to degradation and decline of common resources.

One therefore witnesses that in recent decades common resources are in a state of decline. The reasons behind such decline are the weakening of institutions of collective actions by local communities. This is so because of the gradual breakdown of social cohesion, over exploitation and encroachment of common resources for private gains. The process of over extraction of common resources were however due to population growth, public interventions like converting forest into protected areas, transferring management to public agencies and market forces (Jodha *et al.* 2012). Further the control of the commons by the state has adversely been affected due to traditional and historical management systems. The collapse of traditional management and the inability to enforce obligation of common resources has also led to its poor upkeep and degradation (Jodha 1985a; Roy 1987; Singh *et al.*1985).

The NSSO (1999) report produces evidence of large-scale depletion of CPRs in both size and productivity. According to the survey, reduction in CPR land during the last 5 years (per 1000 ha) was 19 ha. Further studies on the subject show that between 1950-52 and 1982-84, common land in the selected 82 villages from 7 states in the dry region, as a percentage of total village area, declined by 31 per cent in some states and by 55 per cent in others (Jodha 1987). Another study recorded the decline of area under common land by about 33 per cent over a period of 20 years (Pasha 1992). Using the secondary data on land use, the study by Chopra (1989) reveals that the size of common land, including forests has been reduced by 4 percent in states like Maharashtra and to 30 per cent in states like Haryana during the periods of 1970-71 and also in 1986-87. Further, intensive agriculture development programmes in different regions also placed limitations on collection of land and water based common resources (Beck and Ghosh 2000). In addition to these reasons, Iyengar (1998) in his study argues that there are large

number of analysts who tend to link this decline with modernization of rural economies that destroyed local community institutions and practices.

Another significant reason behind degradation of common property resources is privatization. It may be mentioned here that the total area under common pool resources declined by 26 to 63 per cent during last three decades. Though privatization of these resources was done to help the poor, it was found that 49-86 per cent of the privatized common resources ended up in the hands of non-poor in different areas (Jodha 1986). The policy of the government to mitigate rural poverty by converting open access into common resources and distributing it to rural poor, was a failure due to the absence of well-defined property rights regime and necessary techno economic inputs. According to Jodha (2000), 50 to 80 per cent of the privatized common land went to people who already had relative more land. Government policies to redistribute land among different socio-economic group for purposes of housing and cultivation also failed. It has been argued that the 27 to 45 per cent of the poor household receiving land disposed it off because of lack of technical skills, and complementary resources. Case studies from different regions of India also show how big farmers monopolize common resources like water for irrigation and became water lords (Singh 1998) because of their access to better water harvesting technology and capital resources, which poor people generally can't afford.

d) Encroachments on the common property land resources

Encroachment for agriculture was encountered in almost all the panchayats of the study area declining commons land resources. Encroachment exacerbates the inequality of the land distribution that creates competition among villagers to bring more area under cultivation, bitterness and conflicts that negatively affect the likelihood of collective action among villagers. Therefore, *De facto* privatization of the commons does not appear to be a feasible solution and can be inequitable and too controversial.

As per government records, the study revealed that among all the developmental blocks; Kalpa block leads the encroachment in the commons land i.e. 89.22 ha, followed by Pooh (78.96 ha) and Nichar block (25.61 ha) with a total encroachment of 193.80 ha in the district (Table

4.51). Such situations are responsible for the decrease in common property land resources, resulting into more pressure on the common property resources.

Table 4.51: Total encroached land in district Kinnaur

Development Blocks	Area (ha)
1. Nichar	25.61
2. Kalpa	89.22
3. Pooh	78.96
Overall	**193.80**

Source: Report on declaration of illegal land encroachment, HP Revenue Department.

4.9 Measures to improve the efficiency of CPRs

There is a need to adopt improved system of Common Property Resource Management (CPRM) in this fast changing society. Devising a framework related to human organisation is a very complex problem and subjected to various errors. Nevertheless, an attempt has been made to formulate best fit alternative to common property resource management system in accordance with location specific factors. The suitability of different institutional options in the study area has been determined by taking into account both the conceptual insights and empirical evidences, under the following sub-heads:

a) Centralised Public Management:

The appropriation of CPRs by central authority has been a widely pursued policy to solve CPR problem by several countries including India (Guha 1983; NRC 1986; Singh 1986). The underlying rationale behind bureaucratic control on CPRs is that government can better serve the interests of people at large, can raise investment funds more easily and has a longer planning horizon and hence a lower discount rate than individuals (Singh 1994).

It is evident from the study that that only 10 per cent respondents were in the favour of giving the management of commons in the hands of government and most of the respondents disliked such type of arrangements (Table 4.52). They feel that through the imposition of government rules over their rights, the locals were made deprived off of the resources which is utilized and conserved by tribal's since time immemorial. Hence, such modal cannot fit for the study area under such circumstances.

There are evidences also according to which imposing centralised public management on CPRs have resulted in disastrous consequences (Guha 1983; Arnold and Campbell 1986; Blaikie *et al.,* 1986; Kisangani 1986; Messerschmidt 1986; Singh 1986; Thomson *et al.,* 1986; Wynne 1986; Mishra and Sarin 1987; Fernandis and Menon 1988; Agarwal and Narain 1989; Gadgil 1989).

b) Privatisation:

Inspired by the capitalist and free market economics' argument that private property is more efficient than common property, establishing private property rights on all CPRs has been another widely prescribed and pursued policy to solve commons' problem in almost all countries including India. The privatisation of CPRs can be accomplished in many different ways and can involve their partitioning into units owned by individual or putting entirely under the control of one authority which can be an individual, a private firm, a corporation or a voluntary agency. In India, common lands have been distributed in two different ways: (i) confer full property right on individuals, especially poor under various poverty alleviation programmes, and (ii) lease-out to poor household or to corporations for specific purpose of afforestation with technical and financial support (Jodha 1985, 1987; Agarwal and Narain 1989; Iyengar 1989; Saint 1992; Sahoo and Misra 1994; Negi 2002).

Study revealed that only 28.33 per cent respondents were in the favour of creating private stakes over the commons. They have the opinion that CPRs of the study area is prone to creating inequality in resource endowments. Besides this, the physical and technical attributes of CPRs in sample villages also indicate that their privatisation will either be impracticable or uneconomic. The CPRs consist of not only meager but highly degraded areas under hills, water bodies, common grazing lands etc. Thus, the partitioning of CPRs into individual units is not feasible in some cases like areas under hills, around water bodies, and common grazing lands. The privatisation of other CPR land, which can be divided into individual units (*shamlats*/common grazing lands) is uneconomic for poor allottees because its reclamation needs huge investments, generally much above the capacity of a poor household. The multi-ownership on CPRs will further increase the obstacles in the way of privatisation as a solution of commons' problem. To sum up, any type of privatisation of CPRs in the study area would be a short sighted exercise and bound to produce several undesirable outcomes.

The privatisation of CPRs in almost all cases has proved dangerous for both i.e. beneficiaries as well as for resources. Such privatisations have been found against two basic principles of social welfare: Pareto efficiency and equity (Bromley 1989; Saint 1992; Bardhan 1993). In other words, the distribution of common lands to poor household into economically unviable holdings and without taking into account the carrying capacity of lands; financial, technical and managerial ability of the allotees, has led them towards more inefficient and unsustainable use (Jodha 1990a; Singh *et al.* 1993; Sahoo and Misra 1994). The privatisation also failed to minimise the inequality in rural society because (a) the distribution of land to poor has frequently been manipulated by rich and influential people in their own favour in hand and glove with political leadership and administration, and (b) since providing economically viable land holdings to all poor household is not feasible in a densely populated country like India, allotting CPR lands to a few household by reducing the access for large number of remainder has increased inequality. Thus, social cost of creating private property in a densely populated area seems to be much higher than social benefit.

c) Community-based collective management:

Co-management programs assign local communities shares in control over and benefits from renewable resources (Anderson *et al.,* 2006; FAO 1999). Around the world, more than 50 countries have now begun to involve local communities and lower-level decision-making units in protecting and managing the environment (FAO 1999). These new policy trends are based on the recognition that the fiscal capacity of the state to undertake coercive conservation is limited and that communities can often manage their resources better than either private actors negotiating through market-based exchanges or state actors regulating through command and control policies.

No single player in isolation is efficient in the management of commons. People's preference of commons management clearly argued that the participatory/joint management i.e. governmental interventions with locals are of utmost importance. In a joint management regime, control activities could be monitored and enforced by local people complementarily to judicial, technical as well as financial provision from the various state agencies. This bottom-up strategy for better regulation can lead to new face of traditional commons.

Table 4.52: People's perception regarding management of forests & pastures

Blocks / Perception	Nichar	Kalpa	Pooh	Overall
Pure village management	12 (20)	18 (30)	21 (35)	51 (28.33)
Joint management	36 (60)	39 (65)	36 (60)	111 (61.67)
Pure government	12 (20)	3 (5)	3 (5)	18 (10)
Total	60 (100)	60 (100)	60 (100)	180 (100)

- Figures in parentheses indicates percentages of the total households surveyed

Findings of the present study revealed that 61.67 per cent of the respondents were in favour of community based management system with the assistance of governmental arrangements for management responsibilities (Table 4.52). It is bottom-up not top-down approach that is successful under present scenario of changing world where each and every individual of the society keeps himself updated. Though some section of the society still needs awareness regarding tribal rights over their common resource endowments due to which elites of the society and bureaucrats are taking advantage of their ignorance.

Table 4.53: People's perception regarding management of irrigation channel (*kuhls*)

Blocks / Perception	Nichar	Kalpa	Pooh	Overall
Pure village management	3 (15)	18 (30)	20 (33.33)	41 (29.28)
Joint management	12 (60)	36 (60)	38 (63.33)	86 (61.44)
Pure government	5 (25)	6 (10)	2 (3.33)	13 (9.28)
Total	20 (100)	60 (100)	60 (100)	140 (100)

- Figures in parentheses indicates percentages of the total households surveyed

In one of the experiments under JFM in Bari panchayat of Kinnaur district participants carried out plantations of medicinal plants on forest land and fast-growing tree species of *Robinia*, *Ailanthus* etc. for fuel wood and fodder on *shamlat* land which reduced their dependence on forest products. It was also clear from behaviour of the stakeholders during the experiments that tribal communities are able to address the issue of equity while sharing the benefits from collective forest protection measures. Thus it can be concluded that if forests are collectively managed by communities which are not degraded below the critical minimum, communities are capable of successfully protecting and regenerating these resources.

Common property resources with effective management by village communities is admittedly the most optimum option to remove the CPR management problems in many

situations, including present one. The evidences of success of collective management of CPRs by their co-users abound in the literature on CPRM (Martin 1989). The underlying rationale for recommending collective management is that in comparison to other two options it is more cost-effective (less expensive), more flexible and sensitive to change in social environment, easier to enforce and monitor, and self-sustaining (Wade 1988; Berkes 1989; Ostrom 1990; Singh 1994).

Nevertheless, the success stories of many efforts to regenerate and manage CPRs in India as well as in abroad shows that collective management is indeed feasible provided some problematic variables are solved (NRC 1986; Mishra and Sarin 1987; Gupta 1988; Agarwal and Narain 1989; Berkes 1989; Malhotra and Poffenberger 1989; Chopra *et al.* 1990, Ostrom 1990; Arnold and Stewart 1991; Singh 1994). It is clear from foregoing discussion that solution of CPR problems in the study area lies in strengthening the village based collective management. An effective organisation is must for the development and management of CPRs. Thus, structure and nature of village level organisation responsible for planning, implementation and monitoring (decision-making arrangements) of CPRM are the most significant determinants of success of the institutional arrangements.

Alternative Policy for Sustaining Commons:

Given the above mentioned complexities and tensions surrounding common resources; conservation and management of common resources, then is a formidable task. There is increasing demand today by policy makers, researchers and indigenous communities, of involving local councils, indigenous communities in resource management. It is evident from protests from all over the country that communities are increasingly trying to assert their role in the management of common resources. In this context various alternative formulations of rural development programmes have been attempted. The government has also taken some initiatives in the last few decades which aim at introducing a more participatory approach to manage the 'commons'. These programmes aimed at people at the grassroots level. For example, the Government initiated programmes enabling people's involvement in resource management like in National Wasteland Development Board, the Joint Forest Management (JFM), and the Panchayati Raj Institutions, provisions of Panchayats Extension to Scheduled Areas Act 1996 and Forest Right Act 2006. All these efforts thus embodied and recognized the rights of the

people over national resources. For instance, programme like the JFM also emphasizes the need for people's participation in natural forest management. Indian Parliament enacted the 73rd Constitutional Amendment Act and created the village panchayats at the grassroots. Most of the common properties of villages like irrigation tanks, grazing lands, fisheries and minor forests have been managed by them. Out of the 29 subjects allotted to panchayats at least 14 subjects are related to common property resources (Ragupathy 2008). Various studies acknowledge the important role played by panchayats in sustaining the commons. According to Guha (1985) the strength of van panchayats of Uttarakhand made forest management easy. He argues that the panchayats were strong, not only in the enforcement of rules relating to forest management but in other spheres too. In institutions like *Pani panchayats* every rural household has an equal share in irrigation and water resources (Deshpande and Reddy 1990). The water rights are tradable, so that even the landless labourers' gain from the irrigation resources generated. Grass roots democracy is used to integrate environmental regeneration and rural development to alleviate poverty.

Another significant step in strengthening people's involvement in the governance of resources was "the scheduled tribes and other traditional forest dwellers (Recognition of Forest Rights Act) 2006." This Act aims to restore the forest rights of tribal communities across India especially the collective rights to control, manage and use forests as common property. It also gave the right to protect, regenerate or conserve or manage any community forests which the communities have been traditionally protecting and conserving for sustainable use like rights over common property resources such as produce of water bodies; grazing rights and other customary rights and usufruct rights over non timber forest produce.

Despite their visions in enhancing and promoting participatory governance in the management of natural resources, these initiatives attracted criticisms from various quarters. It has been argued that in most cases these schemes did not help or improve access of local people to common resources. In most cases like in the JFM, the pre existing institutional structures were ignored and that resulted in a deterioration of commons (Sunder 2001). Though government through various legal measures is trying to give local communities access to and the right to manage common resources, there is lot to be done to achieve this in a substantive sense. In a large country like India, interventions need to take into account the regional variations creating

institutions and should not merely aim at ‘centralized’ drafting of ‘decentralized participatory governance (Chopra and Dasgupta 2002). The policies need to be grounded in the realities of Indian situation. The diversification of common resources and its use by different groups is of considerable significance in this context. It is vital for the government to create new institutions keeping in mind the diversity of resources and communities dependent on it. In order to address such concerns, Ragupathy (2008) for instance, favours pluralistic institutional arrangements for the management of commons. Based on case studies he concludes that in spite of the fast changes that are taking place, there are number of examples from villages where community based organizations are functioning and managing some of the critical common property resources. What perhaps is needed is to synergize the activities of formal panchayats and local community organizations so that more opportunities exist for common resources management.

In the context of the above mentioned discussions, it is therefore not difficult to comprehend the consequences when CPRs are closed, encroached upon, or access to them are denied to local communities. Apart from food insecurity, loss of CPRs results in nutritional insecurity among rural communities. They are also increasingly recognized to provide a wide range of services to the environment particularly to conserve biodiversity, maintaining hydrological cycle. So, these resources are not only critical for the rural economy of India but also have an indispensable role to fight climate change and protect the biodiversity. While framing policies to conserve common resources, the government needs to take into consideration, the widespread inequality of private wealth and market imperfections in the society. It should frame policies in a holistic and inclusive manner respecting both the regional variations of common resources and the pluralistic users dependent on commons. The whole process therefore should revolve around the people and for this there is a need of empowering them.

Chapter-5

SUMMARY AND CONCLUSIONS

Common property resources include all such resources that are meant for common use of the villagers. A very large part of the country's natural resources was freely available to the rural population during British period. These resources were largely under the control of local communities. Gradually, with the extension of state control over these resources and the resultant decay of community management system, CPRs availability to the villagers declined substantially over the years. Today, in almost all parts of the country, the villagers have a legal right of access only on some specific categories of land and water resources. Nevertheless, it is widely held that CPRs still play an important role in the life and economy of the rural population. As the human population grows, the requirement for these resources also grows. Even if these resources are never depleted, on a per capita basis they will decline significantly, because they must be divided among different categories of the community. This declining CPR extent and quality is important both for sustainability of CPR dependent livelihoods and the natural resources (Chopra and Dasgupta 2002).

On account of the high altitude and resultant cold-arid climate, Kinnaur is among the environmentally very difficult regions to live in. Moreover, the society is still in early stages of development, therefore, influence of environment is pronounced. In response to environmental compulsions, *Kinnauras* developed pastoral-cum-agricultural economy to meet out basic requirements. It traditionally has been a self subsistence region. Its relative isolation helped towards making of the culture and economy quite specific to this region and helped people to evolve indigenous way of managing their resources. *Kinnauras* have always relied on CPRs to raise and support their animal wealth. Animal rearing has been one of the important economic activities in this harsh land and in line with subsistence and sustainability.

Keeping in view the present role of CPRs in a resource rich tribal mountainous environment and to identify factors that influence their use, the present study was undertaken in Kinnaur district of Himachal Pradesh with the following objectives:

Objectives:

1. To examine the status of CPRs in the study area.
2. To study the linkages of CPRs with livelihood of the rural people.
3. To study the role of CPR management local institutions for the efficient production, utilisation and benefit sharing of CPR based products.
4. To examine the socio-economic heterogeneity of CPR users.
5. To analyse the problems and perception in the management of village commons and suggest measures for improving their efficiency and management.

Methodology:

Three stage stratified random sampling technique was employed for selection of household in the study area. At the first stage, all three developmental blocks of district Kinnaur were purposively selected because these blocks differs in lifestyle, agro climatic conditions and resource utilization pattern. In the second stage, a list of panchayat villages was procured for the each development blocks. Nearly 15 per cent panchayat were selected randomly which comes out to be a total of nine panchayats, three from each development blocks. In third stage, from selected panchayats, a cluster of villages around a nucleus village falling in the close proximity of a common property resources were formed in consultation with panchayat pradhans of the respective panchayats. While making clusters, adequate care was exercised in the selection of major CPR categories, especially common pasture lands, protected and un-classed forests, water resources (*kuhls*) falling in a particular selected panchayat in view of dependence of villagers on these resources. The households were further categorized into marginal (<1 ha), small (1-2 ha) and medium (>2 ha) categories on the basis of land holding as per the revenue records. From all panchayats 20 respondents each were interviewed with personal interview method. Thus, in total 180 respondents were interviewed from all three developmental blocks. Both primary as well as and secondary data were collected to meet out the different objectives of the present study. Both, quantitative and qualitative statistical techniques were employed to analyse the data.

Main Findings:

- The socioeconomic survey of the sample households in the study area revealed an average family size of 7 members of which joint family system (57.22 %) dominated the study area(55 per cent males and 45 per cent females).
- The overall sex ratio in the study area was found to be 831 females per 1000 males which was very much lower than the state average.
- The overall literacy rate of sample farm was 82 per cent with the literacy rate of 89 per cent of males as compared to females (70 %).
- On an average the cultivated area was found more (0.59 ha) under fruit crops followed by field crops (0.29 ha) and fallow land and *ghasnis* (0.22 ha).
- Major crops like wheat, barley, maize, rajmah, peas, potato etc. were being grown in the study area besides traditional crops like olgla, phafra, koda, chulai, koni, china and bathu were also grown for subsistence.
- On an average the land holding was worked out to be 1.10 ha per farm. However, the medium farmers had higher land holding (2.52 ha) followed by small farmers (1.32 ha) and marginal farmers (0.62 ha). Pooh Block had the highest land holding size (1.14 ha), followed by Nichar (1.11 ha) and Kalpa blocks (1.06 ha).
- The livestock production system exhibited the dominance of local cows, sheeps and goats. On an average, the livestock population was found 12 Livestock Unit (LU) and medium households lead in the livestock rearing i.e. 21 LU in all the three blocks followed by small (16 LU) and marginal households (5 LU). Nichar block had the higher livestock population as compared to Kalpa and Pooh block.
- At all India level the share of community pasture and grazing lands in CPRs was found about 23 per cent of the reported common property land resources, whereas 16 per cent of resources were village forests and woodlots and the rest 61 per cent is attributed to other category which includes the village commons (*shamlats*), threshing grounds, barren and waste lands. As far as the Himachal Pradesh is concerned the share of protected and un-classed forests in CPRs recorded an increase from 57.12 per cent in the year 1980-81 to 65.31 per cent in the year 2010-11, cultivable wastes decreased from 7.15 per cent to 2.38 per cent, area under miscellaneous trees showed minute decrease from 1.26 per cent to

1.25 per cent, permanent pastures and other grazing lands marginally decreased from 31.53 per cent to 28.95 per cent during the same period.

- In the Kinnaur district share of protected and un-classed forests in CPRs recorded an increase from 8.06 per cent (1980-81) to 10.63 per cent (2013-14), cultivable wastes decreased from 3.25 to 0.89 per cent, area under miscellaneous trees decreased from 0.06 to 0.02 per cent, permanent pastures and other grazing land marginally decreased from 88.62 per cent to 88.45 per cent during the same period. The area under common property land resources showed an increasing trend (3.90 % per annum) over the past 33 years i.e. during 1980-81 to 2013-14 of which permanent pastures showed highest proportion of increase (3.90 % per annum) and least (1.06 % per annum) was the area under miscellaneous tree species.
- Agricultural cumulative command area that can be brought under *kuhl* irrigation system in the district has shown steady increasing trend (0.73 % per annum) during 1980-81 to 2010-11.
- Per capita availability of common property land resources also increased from 1.72 ha in the year 1980-81 to 4.32 ha in the year 2010-11.
- A sufficient quantity of livelihood products was collected from CPRs in the study area. Some of them were food, vegetables, fruits, flowers, nuts, medicinal herbs and fodder, fuelwood, timber, small timber/bamboo used for agriculture implements and other domestic articles, leaf litter (animal beddings), pastures (alpine meadows), grazing grounds (*ghasnis*) etc. Therefore, CPRs are means of subsistence for all the households in the surveyed villages.
- The grazing of livestock is a traditional practice in the study area. Among different livestock unit, the extent of grazing in CPRs was highest for sheep and goats followed by bullocks, dry cow and young stock.
- The total quantity of fodder for feeding the livestock was met through CPRs by marginal farmers (13.14 t/household/ annum) and least by medium farmers (10.44 t/household/ annum) whereas, lower caste categories were extracting more quantity from the same source (13.24 t/household/annum) and least by upper caste category (12.65 t/household/annum). Similar trend was also found in case of fuelwood collection where maximum demand was met through CPRs by marginal farmers (1.90 t/household/annum)

and least by medium farmers (1.56 t/household/annum) whereas, households of lower caste categories were extracting more quantity of fuelwood from same source (1.90 t/household/annum) and least by upper caste category (1.26 t/household/annum).

- The collection of food items from CPRs by marginal farmers was 30.35 kg/household/annum and least by small farmers (11.67 kg/household/annum), whereas, lower caste categories were extracting more quantity from the same source (33.50 kg/household/annum) as compared to upper caste category (23.11 kg/household/annum). Similar trend was also found in the collection of fruits and medicinal items from CPRs.
- The field survey data revealed that around 26 per cent of the household income in Nichar block, around 22 per cent in Kalpa block and around 19 per cent in Pooh block is coming from the CPR based activities. For lower caste households, 26.87 per cent of the household income comes from CPRs based activities, whereas, in case of upper castes it is 11.64 per cent. This implies that lower caste households enjoy a greater proportion of income from CPRs both in relative as well as absolute terms and thus act as a life supporting resource in the tribal villages.
- CPRs plays an important role in employment generation in the study area as there is very little scope of employment in non-agricultural sector due to poverty, illiteracy and lack of technical skills of the tribal households. It is interesting to note that an average household could generate around 253 mandays per annum from CPRs based activities with an opportunity cost of ` 63250 annually.
- Almost all the surveyed households collect fuelwood from the common forest land for the purpose of cooking and heating.
- Most of the households utilize common forest area/ common grazing land for animal grazing and fodder collection. The dependency of the households on CPRs in the study area for animal grazing were estimated, which showed that CPR supported 113 animal unit grazing days per household, which confirms the heavy dependence of the tribal people on the CPRs for animal grazing.
- The value of Ginni coefficient of inequality in income from CPRs in case of upper caste was found 0.51 which varied between 0.50 to 0.53 in different blocks, whereas, in case of lower caste it was 0.44 with a range of 0.43 to 0.46 in different blocks.

- The value of Gini coefficient of overall income among upper caste was 0.35 with a range of 0.32 to 0.38 in different blocks whereas, in case of lower caste it was 0.51 with a range of 0.43 to 0.54 in different blocks.
- Factors like social participation, family size, and labour allocation in various CPR activities were found positively whereas, land holding, livestock population, distance from the CPRs were negatively and significantly contributing heterogeneity in income from CPRs however, caste, education and non-farm income were found non-significant.
- Contribution of the *kuhls* in the total household income was high in Pooh block (12.89 %) followed by Kalpa block (11.03%) because these blocks receive deficit rains during monsoon.
- The participation of marginal farmers in different *kuhl* maintenance operations was comparatively low as compared to other farm categories. This may be because of small size of holdings which requires less quantity of irrigation waters for their fields.
- Households responses related to getting enough water revealed that 60 per cent respondents were not having enough irrigation water during peak season and the main reasons elicited were the water scarcity (57.14 %), followed by tail-end irrigator (28.57 %) and water theft (14.28 %), respectively. The major causes of water scarcity were decrease in water discharge from source level (39.60 %) followed by increasing number of users (35.40 %), seepage losses (18.75 %) and poor schedule of distribution (6.25 %), respectively.
- Major management problems in water users opinions were sanctions not imposed against illegal water user (43.40 %) followed by poor coordination of water distribution (23.30 %) and poor rotation of water distribution (17.50 %). The major causes of conflict over irrigation waters were water scarcity (66.60 %) followed by water theft (16.60 %), increased number of users (6.70 %) and lack of control of water distribution (4.16 %). In the opinion of respondents as far as performance of irrigation water management committee (*Devta*/*Kuhl*/Gram Panchayat) over resolution of conflict is concerned, they take immediate action against violators.
- In the opinion of beneficiaries, siltation (33.33 %), followed by poor imposition of sanctions (22.22 %), non participation of members (22.22 %), breaching of *kuhls* by

illegal water users (11.11 %) and poor coordination of maintenance activity (11.11 %) were the main causes of poor maintenance of irrigation water channel.

- *Chilgoza* pine (*Pinus gerardiana*) which is collected from CPRs contributes substantially to the economy of the tribals in Kinnaur district. Locals have the rights to harvest and sale it in the market. The distribution and management of this species is quite distinct in this region.
- Pastures have been an important economic resource for Kinnaurese. Of late, there has been more pressure on land. Consequently, pastures and other grazing lands are increasingly being brought under cultivation. Thus resulting in shortage of fodder for winter stall-feeding.
- Prominent management institutions engaged in the management of CPRs in the study area were *Devta* Committees, Gram Panchayats, village level organisations like *Mahila Mandals*, *Kuhl* committee and VFDC's. They keep vigil on malpractices, imposition of fines against violators, proper benefit sharing mechanism, sparing *shramdhans* for commons management etc. *Devta* committee leads in many ways where each and every villagers wholeheartedly attached with them. Highest participation of locals with *Devta* Committee i.e. 11 per cent clearly indicates the faith and bindings of locals with such type of institutions followed by Gram Panchayat (5.67 %) and *Mahila Mandals* (5.33 %).
- The management and conservation of CPRs and during last two decades in the study area awareness have been made among the user groups through governmental intervention by constituting Village Forest Development Committees (VFDC's) under Joint Forest Management Programme (JFMP). The main factors responsible for poor participation in JFM activity were lack of knowledge about joint forest management (66 %) and lack of coordination with forestry officials (64 %).
- In the opinion of respondents the main factors responsible for the shrinkage and degradation of CPRs in the study area were the rampant construction of hydroelectric projects during last 20-25 years followed by excessive lopping for fod
- der and firewood, local and in migration population pressure, overgrazing, forest fires, challenges like excessive rainfall/ snowfall, encroachment for the orchard establishment by the locals over the *shamlats* and forest land.

- To improve the conditions of CPRs in the study area community-based collective management system in which government and beneficiaries come together for the benefit sharing and sustainable management of resources should be strengthened.

Suggestion and policy implications:

On the basis of findings of the present study some important policy suggestions have been made for betterment of the CPRs in the context of surveyed villages of Kinnaur district.

- The people of the study area are highly dependent on common property resources especially forest resources due to the lack of alternative livelihood opportunities. However, during the research study it has also been observed in many situations where this dependence on forest resources has lead to forest degradation. Hence, there is an urgent need to expand economic opportunities especially through the development of non-farm activities like small scale eco-friendly industries including handicrafts, weaving and unconventional energy resource like solar energy so that the dependency of locals on CPRs is reduced.
- Heterogeneity in resource endowment was encountered among users groups in the study area for the utilization of common property resources. Hence, heterogeneity can be removed through adoption of unbiased benefit sharing mechanism among different strata of the community.
- Since, most of the households utilize CPRs for animal grazing and fodder collection. Hence, the demarcation of pastureland, its ownership to the community or the users, tenureship should be clearly documented and authorized. For the betterment of pasturelands, scientific management through adoption of rotational grazing through dividing grazing *chaks*/ opening the area for collection of medicinal herbs for limited time period on rotational basis should be implemented.
- Empirical evidence of the study confirms that collective action of the communities in CPRs management has an important role in the common property resource conservation. Hence, there is a need to motivate the local villagers to actively participate in the conservation and regeneration of the CPRs through JFMP's, ITDP, DRDA and MGNREGA.

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ABSTRACT

The study analyzed the common property resources and their management systems in Kinnaur district of Himachal Pradesh. Multistage stratified random sampling design was used to select a sample of 180 respondents from three different developmental blocks. The selected samples were further classified as marginal (<1 ha), small (1-2 ha) and medium (>2 ha) category farmers on the basis of their land holdings. The results of the study revealed the average family size of 7 members per household of which joint family system (57.22 %) dominated the study area, literacy rate 82 per cent, sex ratio of 831, average land holding of 1.10 ha and average livestock population of 5 ACU per household. Survey further revealed that around 18 per cent of the household's, income being derived from CPRs based activities and lower caste households were found highly dependent on CPRs (26.87 % of total income). The Ginni coefficient of income from CPR's in case of upper caste was 0.51 and in case of lower caste it was 0.44. On an average the employment generated through CPR based activities were found 253 man days with an opportunity cost of ₹ 63250 annually. The dependency of households for animal grazing showed that CPRs supported 113 animal units grazing per households, which confirm heavy dependence of tribal people on these resources. Factors like social participation, family size, livestock population significantly and positively affected the dependence on CPR's whereas, caste, education and non-farm income affected negatively. *Devta* committee leads in the benefit sharing and management of CPR's (11 per cent involvement of locals) followed by *Gram* Panchayat (5.67 %) and *Mahila Mandals* (5.33 %). The main factors responsible for the degradation of CPRs were the construction of hydroelectric projects followed by excessive lopping of trees for fodder and firewood collection, population pressure, overgrazing, forest fire etc. So, to improve the conditions of CPRs in the study area community-based collective management system in which government and beneficiaries come together for the benefit sharing and sustainable management of resources should be strengthened.

Signature of the Student **Signature of the Major Advisor**

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