

**PROPERTY RIGHTS AND SUSTAINABLE  
MANAGEMENT OF 'COMMONS' AN ECONOMIC  
ANALYSIS**

*Dissertation submitted to the Jawaharlal Nehru University  
in partial fulfillment of the requirements  
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**MASTER OF PHILOSOPHY**

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Date:28.7.2006


DECLARATION

I declare that the dissertation entitled “PROPERTY RIGHTS AND SUSTAINABLE MANAGEMENT OF ‘COMMONS’- AN ECONOMIC ANALYSIS”, submitted by me in partial fulfillment of the requirements for the award of the degree of MASTER OF PHILOSOPHY of this university is my original work. This dissertation has not been previously submitted for any other degree of this or any other University.

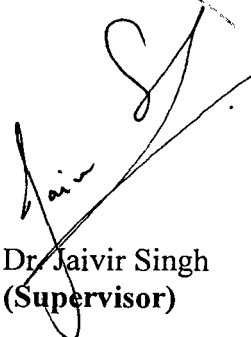
  
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CERTIFICATE

We recommend that the dissertation may be placed before the examiners for evaluation.



Dr. Amit Prakash  
(Chairperson)



Dr. Jaivir Singh  
(Supervisor)

*DEDICATED TO THE SUPREME*  
*SACRED MEMORY OF MY MOTHER*  
*LATE MADHURI PRASAD*

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## ACRONYMS

- NRM: Natural Resource Management
- PWD: Public Works Department
- CPR: Common Property Resources
- NEFA: North East Frontier Agency
- LPG: Liquefied Petroleum Gas
- FGD: Focused Group Discussion
- NGO: Non Governmental Organisation

## CONTENTS

	Page No
Acknowledgement	i
Acronyms	iii
<b>Chapter I Introduction</b>	<b>1-10</b>
<b>Chapter II Institutional Strategies for the Management of Open Access</b>	<b>12-35</b>
Development and Environment-Introductory	
Role of Institutions-Concepts	
Issue of Open Access	
Property Rights Regime-Theoretical Concepts	
Property Rights and Natural Resource Management	
<b>Chapter III A Review of Cooperative Management of Natural Resources</b>	<b>37-52</b>
Common Property Regime	
Resource Endowments and CPRs	
Incentives for Cooperative Behavior	
Social Capital and Community Action	
<b>Chapter IV A Case Study of the Apatani Tribe of Arunachal Pradesh</b>	<b>54-86</b>
<b>Section-I</b>	
A Brief Profile of Arunachal Pradesh	
Cultural History	
Administrative Systems	
<b>Section-II</b>	
Society and Culture of Apatani Tribe	
Apatani Natural Resource Management Institutions	
Structure of Apatani Village Council	
Management of Forests	
Specific Cases	
Management of Water	
Inferences	
Challenges	
<b>Chapter V Conclusions</b>	<b>88-93</b>
<b>Bibliography</b>	<b>94-98</b>
<b>Appendix</b>	

## LIST OF TABLES

S.No.	Description	Page No.
1.	Types of Goods.	22
2.	Resources Use Pattern in the Unclassed State Forest Among the Apatanis.	64
3.	Distribution of Households in Study Villages by Cooking Media & by Village type.	69
4.	District-wise Numbers of Forest Circle,Division,Range & Beat Offices in Arunachal Pradesh.	A-1
5.	District-wise Forest Cover Areas in Arunachal Pradesh.	A-2
6.	Common Village Land (ha) Per Household by Population Size-Class of Villages in Different States.	A-3
7.	Changes in Sectoral Composition of Income in Arunachal Pradesh.	A-4
8.	Sectoral Plan Outlay in Arunachal Pradesh Since Sixth Plan.	A-4(i)
9.	Input/output Pattern of Paddy-cum-Fish Agro-Ecosystem of Apatanis of Lower Subansiri District of Arunachal Pradesh.	A-5

# **CHAPTER I**

## **INTRODUCTION**



## Section I

Natural resources play an important role in developmental activities. However, in the last few decades the rapid economic growth pattern has posed a serious threat to the sustainability of these resources. In many countries these resources are increasingly exposed to unsustainable exploitation, pollution and conversion to other uses. The rapid degradation of natural resources led to disappearance of peoples' livelihood, exacerbating problems of rural poverty, food insecurity and rural-urban migration.

The urge for rapid economic growth has led to over exploitation of resources, consequently leading to massive resource depletion there by leading to environmental degradation on a large scale. Therefore there is a stress towards the environmental protection and sustainable development. Sustainable development can be achieved only if the environment is conserved and improved. Increasing population is one of the major threat for environmental resources.

There are several mechanisms through which population growth also puts pressure on natural resources and on resource management systems. First, expanding rural populations imply increased harvest and off take when more people use and harvest open access and common-

-property resources. Second, population growth often has a 'Ricardian' effect of pushing people to adopt farming on less productive lands, i.e. expansion into marginal farming areas, leading to reduced fallow periods, soil erosion, diminishing soil fertility and deforestation<sup>1</sup>. Third, increasing populations may cause traditional common property resource management systems to break down if rules regulating resource access and off take fail to respond in time<sup>2</sup>.

Economists describes four main basic factors causing environmental destruction. They are market failures (externalities), government failures (environmentally adverse policies),

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<sup>1</sup> Pinstup-Andersen and Pandya-Lorch, 1994.

<sup>2</sup> Jodha, 1985.

population growth and property rights failures<sup>3</sup>. The present research deals with the issue of property rights regime.

It has long been acknowledged that the ownership of a resource to a large extent moulds the way that the resource is used and managed for future use. The fundamental concept is univocal, when an individual owns a resource and can expect to own and profit from the resource in the future as well, he has the incentive to invest in the resource in the form of protective measures i.e. restrained use and careful management of resources. On the other hand, if access to the particular resource are open to all, these investments are characterised *as public goods*, which provides incentives for free-riding, resulting in overuse of the natural resources. These effects have been illustrated by Warming (1911) on fishing grounds and perhaps more notably by Hardin (1968) on grazing pastures.

In any case, any discussion of management strategy must be preceded by a proper understanding of the nature and scope of the problem. In order to understand the resource management systems, it becomes fundamental to take note of the institutional framework in which the resources are allocated for production and consumption. Ownership pattern plays an important role in management of resources<sup>4</sup>. This led to the question of property rights. As we know property right is defined as an institutional system in which the ownership and management of various resources is identified and specified.

When property rights to natural resources are absent and unenforced i.e. when there is open access, no individual bears the full cost of resource degradation. The result is 'free riding' and over exploitation, what Hardin termed the '*Tragedy of the Commons*'<sup>5</sup>. The concept has been used to explain overexploitation of forests and fisheries, overgrazing, air and water pollution, abuse of public lands, population problems, extinction of species, and other problem of resource misallocation<sup>6</sup>.

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<sup>3</sup> Pearce and Turner, 1990.

<sup>4</sup> Kadekodi, 2001.

<sup>5</sup> Hardin 1968.

<sup>6</sup> Stevenson, 1991.

The tradition in the literature has been to classify property rights into four different "property rights regimes"<sup>7</sup>, namely private property, common property, state property and open access. The debate has centred on identifying the regime that caters the best incentives for appropriate management of scarce natural resources. Most environmental problems can be seen as problems of incomplete, inconsistent, or unenforced property rights regimes. Property rights exist in a variety of combinations of ownership, locus of control, and the rights and duties of the owners.

One of the central difficulties in the management of natural resources is the design of governance systems that are effective, equitable, and efficient<sup>8</sup>. Effective management is difficult because of the recurring contradiction between the short-term interests of individuals and long-term objectives for resource sustainability. Individuals may be interested in promoting his own well-being without regard to the collective good. Equitable management is difficult because of the diversity of interests and values involved. Efficient management is challenged by various sources of uncertainty that result in high transaction costs of information gathering and enforcement.

Indigenous organizations are seen as a ready-made set of power structures that enable a group of people to organize themselves, to take decisions, to enforce regulations and to resolve conflicts<sup>9</sup>. The kinds of indigenous institutions that are examined here can be more aptly described as 'customary' or 'traditional' institutions. In recent years, customary institutions have been seen by some as particularly powerful resources for development because they are 'likely to have echoes of indigenous beliefs and values and will be the stronger for this....'<sup>10</sup> The way in which customary institutions are embedded in the 'shared memory of local people'<sup>11</sup> is said to make them particularly powerful.

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<sup>7</sup> Bromley, 1991.

<sup>8</sup> Susan Hanna, *Property Rights & the Environment*, p.60.

<sup>9</sup> Warren et al., 1995.

<sup>10</sup> Uphoff, 1996.

<sup>11</sup> Ibid.

An appropriate understanding of property rights and village institutions is important for many aspects of development policy, including land reform, land titling, conservation of forest, grazing and wildlife resources, fisheries management, water management and so on. Simplistic government and donor interventions based on the idea that institutions can easily be created, modified or influenced by government decree will not achieve the desired outcome. Institution building and institutional change are complex, and policies and incentives transmitted through institutions or through groups of people may work quite different from policies transmitted through individuals' responses.

Collective action is now gaining ground as an alternative institution to other forms of institutional arrangements such as that of privatization of property or state command. Common property resources(CPR) regime is the manifestation of collective action.

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, Williamson, Cheung, North,). Some economic and social science literature emphasizes that homogeneity or heterogeneity among agents 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.

An adequate theory of property rights on environmental goods must consider the full range of possible property rights and regulatory solutions to the tragedy of the commons, and recognize that no single regime is likely to work for every resource and in every institutional and ecological setting. According to Noll, Komesar and Eggertsson, each circumstance requires a comparative assessment of the costs of production, exclusion and administration. A private property regime based on individual ownership may be appropriate in cases where the costs of governance are relatively high, but exclusion costs are relatively low. However, in the converse situation of high exclusion costs and relatively low costs of administration, common or state ownership may be preferable. As

a matter of rule, that property regime is best (i.e. most efficient) which, in the circumstances, would achieve social goals at the lowest cost.

This research deals with the resource management of the 'common property' under the local governance system. It is the case study of Apatani tribe of Arunachal Pradesh.

## Section II

The north-eastern state of Arunachal Pradesh which falls in the eastern Himalayan region, a region known for its rich biological diversity<sup>12</sup>. The rich diversity in the state supports ethnic communities which can be divided into 25 major and over 125 sub-tribes. The indigenous population, which constitutes 63%, lives in close association with nature and utilizes a wide variety of natural resources for sustenance and livelihood. This state is a legally pluralistic state, which implies that several legal systems such as statutory laws and customary laws coexist within a political system<sup>13</sup>. Unlike other regions of India, here local customary laws play a dominant role. In such a system, many of the rights are conventionally defined, rather than imposed by the state. According to local laws, each community has its own set of rules regarding the use of resources and sharing its benefits. Natural resource management practices in Arunachal Pradesh are not of recent origin. These are age-old practices refined over the years and handed down from one generation to another. Since ownership over land, water and resources therein were considered to be common property; people had framed their own social norms, rules and regulations for the utilization of the resources based on the resource requirement and availability.

### Scope of Research on CPRs

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Though there is an extensive literature on success of CPR system in conserving local resources, empirical discussion regarding the interplay between poverty, institutional

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<sup>12</sup> Myers, N, 1988, Threatened biotas: 'hot spots' in tropical forests. *The Environmentalist*.

<sup>13</sup> Cathie, J. Willie, 1996. "Comparative Jurisprudence" in Hunter & Whitter(eds.), *Encyclopaedia of Anthropology*.

change, and distributional implications of CPR management is not properly settled. The economic importance of CPRs, as a proportion of total assets, ranges widely across ecological zones. In India they are most prominent in arid regions, mountain regions, and unirrigated areas; they are least prominent in humid regions and river valleys<sup>14</sup>. The need for study of CPR is due to its wide contribution to livelihoods:

- widen the range of income-generating activities available to people in rural areas;
- provide inputs to agriculture;
- provide inputs to the home;
- provide environmental services;
- serve as a safety net for people in drought years, in terms of income generation and/or food supply.

#### HYPOTHESIS/ PROPOSITIONS

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- There is a significant relationship between resource scarcity and collective action.
- Higher population growth rate affects the likelihood of collective action. It is responsible for degradation of CPRs, both directly as more users exploit limited, and indirectly through worsening poverty and disruption of management institution.

#### Focus of the Research

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The central question in this study is, how a group of agents, in an interdependent situation, can organize and govern themselves to obtain continuing joint benefits, considering utility-maximizing behavior of agents. The research is focused on the community-based property rights over natural resources such as forests and water, which affect the means of livelihood of the Apatani tribe of Arunachal Pradesh in particular. The primary focus of this study is an in-depth analysis of several long-standing and viable common property regimes.

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<sup>14</sup> Agarwal and Narain, 1989

In order to examine the efficiency of collective management of water by the villagers, agricultural productivity is taken as a proxy indicator. To determine the income levels of different households, their consumption levels have been considered.

#### SITE SELECTION: Uniqueness of Apatanis

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The Apatani inhabit in plateau of the Lower Subansiri district and were originally divided into seven villages around the district, but over the time it has gradually increased. The political organization of the *Apatani* has been the best described. Despite their lack of the plow, they have developed the capacity to raise two annual crops and are famous for their ability to use and develop even the smallest plots of land. This extremely efficient use of a small area is made possible by a very firmly organized corporate village culture.

They are one of the most advancing, enterprising and industrious tribal community and are unique in the whole of the state; they stand apart from other communities in having a highly developed system of agriculture. They are settled agriculturists from time immemorial. The present *Apatani* villages namely Bamin, Belo, Duta, Hari, Hija, Hong, Kalong, Lampia, Michi, Mudang Tage, Reru, Tage and Tajang are confined in a fertile valley of about 36 sq. kms. in area. Unlike other tribes of Arunachal Pradesh they have got a stable agrarian economy as this tribe is well known for its wet-rice permanent cultivation-cum-pisciculture practices. They have cultural affinities with *Abors* and *Nagas*<sup>15</sup>. They also use the most effective water-harvesting methods for irrigation. As the entire Apatani community depended mainly on agriculture, the management and use of land by Apatanis was done through very well laid -down traditional land-law system.

#### METHODOLOGY

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<sup>15</sup> Census of India, 1961, pp.246-250

The study covers two types of villages of Apatanis viz. one near to adjoining district town of Ziro and other which is far off this urban centre. The former village has been classified as type 1 and later as type 2 respectively. For accessibility to both types of villages the researcher had stayed at township of Ziro for a month. Maximum numbers of sample were collected from the biggest village of the tribe namely, Hong. In total 300 persons were interviewed. Both open ended and close ended questions were used to find relevant information. The researcher had to hire a local interpreter for few village(type 2), as they are not well versed with either Hindi or English languages. In both the villages the population sample was found different in terms of their economic capability. However, both types of villages are inhabited by the same tribe.

### **Sources of Data**

Primary Data: Information gathered through field work from the surveyed population constitutes as the primary data. This was generated through the following ways.

### **Focus Group Discussion (FGD)**

A general FGD guideline was prepared to collect information well in advance. In order to maintain the quality of data collection and to ensure validity and reliability of information the following standards were observed. Homogenous tribal key respondents including males and females were selected for FGDs. Common spots were selected for the conduct of FGD to ensure the respondents accessibility and acceptability. All the discussions were tape recorded and then later with the help of local interpreter it is translated. Summaries were made at the end of each FGD to cross check it with other interviews.

### **Non Participant Observation**

During the field work (March 2006), the researcher had stayed along with the tribal(Apatani) and collected relevant information required for this study. The day-to-day life of the Apatanis namely their indigenous way of cultivation, management of water, occupational pattern, social organization, community participation in local council, festivals etc were observed personally by the researcher. To substantiate the findings



photography of some relevant practices were also taken by the researcher. A mobile interview was also conducted with the people encountered enroute.

Secondary Data: Information relating the research issues and study population is collected through books, journals, reports of the government.

All the data were crossed checked.

## Chapterisation

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The entire study is presented in five chapters. Chapter one deals with some introductory debate on environment and framework for property rights regime. This chapter is exclusively introductory in nature and states the problem of research with a brief description of profile of area of case study.

Second chapter presents the significance of institutions. This chapter also address the central problem of absence of property rights which lead to resource degradation. Then the chapter moves to theoretical and empirical concepts of different regimes of property rights with its merit and demerits.

Third chapter exclusively deals with the common property rights regime. The chapter basically is a literature review of CPRs. It also explains the necessary conditions for the collective action within the domain of CPR.

Fourth chapter is mainly a case study of 'Apatani' valley of Arunachal Pradesh. The chapter starts with a brief profile of area in consideration. The chapter mainly focused on two type of community resources viz. water for irrigation and forest community land. It reveals the ground information about how the village council work. It is an attempt to employ an ethnographic study.

Finally, chapter five presents the concluding observations.

## Limitations

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Due to constraint of time, the research does not explore a big sample for its investigation. This is purely an exploratory and a descriptive study of particular tribe. It is very difficult to make any generalization from it. Further there is lack of uniform data on all the indicators tribe wise. So a trend line is difficult to quantify. There is no land records available village wise.

## **CHAPTER II**

### **INSTITUTIONAL STRATEGIES FOR THE MANAGEMENT OF 'OPEN ACCESS'**

## INTRODUCTION

Development is the most essential element for the improvement of living conditions and resources play a vital role in the development process. There is wide acceptance of the fact that problems relating to the environment have reached to such an extent that if immediate and drastic steps are not taken then the resources of the earth will deplete. A preoccupation with economic growth based on technology and its consequent impact on the environment has led to environmental degradation, both in developed and developing countries. Large scale developmental projects, which are seen around us, have caused misery to a large number of people, especially the tribals, as a result of their displacement and resettlement to serve the 'larger nation interest'<sup>1</sup>. A holistic approach must be taken towards solving this problem and redefine the notion of development making it more inclusive.

The underlying objective is to use the resources judiciously for the purpose of development and long term benefits i.e., taking utmost precaution to preserve the scarce resources for coming generations. This phenomenon is often referred as 'Sustainable development' in the literature of economics. The term sustainable development comprises of five elements, namely, efficiency, equity, proper valuation, resource stock recognition and resilience<sup>2</sup>. The last element mentioned is the most vital amongst all. The World Commission on Environment and Development (1987) defines it as:

*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

In other words, the process of sustainable development attempts to facilitate social and economic progress by balancing the utilization of resources for immediate purposes with its preservation for long term use. By striking such a balance it

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<sup>1</sup> M.V. Nadkarni, Poverty, *Environment, Development A many Patterned Nexus*, EPW, April 1, 2000, p.1184.

<sup>2</sup> Gopal Kadekodi, *Environmental Economics An Indian Perspective* (Ed.), chapter 4. p.166.

becomes possible to satisfy the impending needs of diverse social groups without abandoning long term goals.

The genesis of sustainable development paradigm could be traced back to the ongoing debates on the 'preservation of environment for its long term sustainability' in the early 1970s. One of the first literatures that brought into attention the ill-effects of environmental degradation is Rachel Carson's(1962) *Silent Spring*, which focused on the extent of ecological damage brought about by industrial effluents being dumped into the rivers. A plethora of writings emerged after this focusing on the issues and concerns of environmental degradation at global level. Some of these are, '*Only One Earth*' by Barbara Ward and Rene Dubois(1972), Club of Rome report(1972) entitled '*Limits to Growth*' etc. The most recent academic development in this area is the institution of Rio-Conference in 1992 involving the complicity of eminent scholars on governance from all over the world. The Rio-Summit concluded with the finding that socio-economic development and environmental protection are interdependent processes and are mutually reinforcing. This consensus is visible in the rapidity with which most countries have embarked upon the enactment of environmental laws and the establishment of regulatory agencies. All these have led to mushrooming of multiple regulatory agencies mainly concerned with prohibiting certain activities that are harmful to the environment and propose corrective action to maintain and sustain it. This consensus is further visible in the number of global treaties and protocols on environmental protection concluded in the recent past. The recent debate surrounding the issue of environmental preservation also centers around the adoption of the most prudent management strategy for solving the environmental problems.

In developing countries, natural resources form the key element of the life of majority of people, particularly the poor who depend heavily on the use of natural resources for their diurnal living. While promoting economic growth, it is found that a large amount of natural resources are used in the process of production causing its partial or complete depletion. Some of these resources have been categorized under what may be called as 'common property resources. Its importance lies in its common usage amongst the

destitute and poor masses who rely heavily on such resources to carry out their day-to-day activities. Although, it is a widely accepted fact that these resources have been vital to the sustenance of village economies since time immemorial, they have caught the attention of academicians and scholars only in recent years. These resources have become a matter of survival for the rural poor. While maintaining an ecological balance by checking soil erosion, deforestation and siltation, the common property resources provide fodder, fuel wood, small timber, mulch and manure, fruits and medicinal herbs to the poor masses.

These resources have either declined or almost at the verge of depletion. It plays a crucial role in the economies of the rural poor, who have a very low access to remunerative income-earning opportunities. Given the marginal position of the poor in relation to the mainstream economy and their meagre access to remunerative income-earning opportunities, a reduction in the access to CPRs would be a disaster for them<sup>3</sup>.

These disturbing trends have raised serious questions on the management of common property resources. The problem of environmental degradation being more severe in the developing nations, sustainability of current levels of exploitation of common property resources has become particularly significant in this part of the world. The larger question that needs prior attention is, what should be the most effective strategy to preserve the CPRs so that enough is left for future use. One way of dealing with such problems would be to devise appropriate institutional mechanisms for monitoring these developments and eliminating the loopholes in the existing framework.

Today institutions are seen as the drivers of development. The nature and the role of institutions is central to idea of promoting development. The significance of an institution lies in its ability to shape human behavior by placing restrictions on certain unrestrained human activities. In the words of Sen, “we need an appropriate evaluative framework; we also need institutions that work to promote

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<sup>3</sup> Rao, 1990.

our goals and valuational commitments, and furthermore we need behavioral norms and reasoning that allow us to achieve what we try to achieve”<sup>4</sup>.

In this chapter, an attempt has been taken to consider the problems of natural resource in the wider perspective of institutional paradigm i.e. can institution tackle the problem of open access.

#### Role of Institutions- Concepts

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Institutions play a vital role in influencing the way agents in a society act. In a way it helps in reducing uncertainty in the society by establishing a stable though not necessarily always efficient, structure to human interaction. It carries out a number of important economic functions, such as handling situations with missing or asymmetrical information, facilitating and enforcing market and non-market transactions, substituting for missing markets, coordinating the formation of expectations, encouraging cooperation and collective action and reducing transaction costs<sup>5</sup>.

It is found that, the concepts of institution and organization are often taken as synonyms. The pioneering work of economist, Douglas North, who explained, ‘Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction’<sup>6</sup>. It provides guidelines, allow for routines to develop and ultimately reduce the uncertainty by providing a structure to everyday life. He distinguishes between institutions as ‘the rules of the game in society’ and organizations, which he argues are akin to the players in the game, or ‘groups of individuals bound together by some common purpose to achieve objectives’<sup>7</sup>. North’s central hypothesis is that the purpose of institutions is to

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<sup>4</sup> A.K. Sen, *Development as Freedom*, p.249.

<sup>5</sup> Rasmus Heltberg, *Property rights & Natural Resource Management in the developing countries*, Journal of Economic Surveys, p.2.

<sup>6</sup> Douglas North, *Institutions, Institutional Change & Economic Performance*, p.3.

<sup>7</sup> Ibid. pp.3-5.

economize on transaction costs<sup>8</sup>. That is whenever transaction becomes costly to settle, institution matter a lot in such case.

Further North explains, it is the existence of an embedded set of institutions in our daily lives which removes many difficult choices, that, in the absence of institutions would have to be made in order to obtain social interaction.

A similar definition is used in the new institutional growth literature, which claims that institutions dominate policies. According to Acemoglu, Johnson, Robinson and Thaicharoen, institutions is “*a cluster of social arrangements* that include constitutional and social limits on politicians’ and elites’ power, the rule of law, provisions for mediating social cleavages, strong property rights enforcement, a minimum amount of equal opportunity and relatively broad-based access to education,etc.”<sup>9</sup>

Prominent economist in the field of institutional and development economics like Bardhan (1989) and Stiglitz (1989) distinguishes between two very distinct approaches to institutional analysis, (i) approaches based on transaction cost and imperfect information and (ii) approaches using collective action theory. Transaction cost and imperfect information approaches are suitable for analyzing the functional role of institutions in economic life (what could be called the demand for institutions), while collective action theory is the appropriate framework for understanding institutional change (what alternatively could be called the supply of institutions). An institution is said to be efficient if it minimizes the transaction cost for a given set of relative prices and technology. The idea is that institutions tend to adapt in a (socially) rational manner to information and other transaction costs. Hence, institutions are understood as

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<sup>8</sup> North and Thomas, 1973

<sup>9</sup> Stanley Fischer and Ratna Sahay, Article ,*Transition Economies: The Role of Institutions and Initial Conditions*, p.6.



cost-minimizing responses to transaction costs and imperfect information. It is to be noted that providing institutional change has its own costs.

The functional role of a particular institution does not explain how it was created, but possibly why it was. For example, while rightly arguing that property rights in land serve important purposes of internalization of environmental, farming and technological externalities, one has neither explained how property rights develop and change over time, nor the social processes needed to create them. The functions performed by any given institution, often to handle a specific transaction cost, can be seen as the source of its demand (Heltberg,2001). Collective action theory, by investigating group decision making, is useful for understanding how group members develop, reinforce and change institutions in which they interact. Thus, collective action theory can be said to analyse institutional dynamics and the supply of institutional change.

According to Leach, institutions are ‘regularized patterns of behavior that emerge from underlying structures of sets of “rules in use”.... (where) rules are constantly made and remade through people’s practices’<sup>10</sup>. Infact institutions in a sense are able to predict and shape what is possible in a particular situation<sup>11</sup>. Thus, institutions are broadly conceptualized and encompass sets of enduring ideas, rules (both formal and informal) and practices (*de jure and de facto*).Examples of *formal institutions* are laws and regulations, and contracts; among *informal institutions* are trust, ethics and political norms. *Organizations* include political (legislatures, political parties, government agencies, the judiciary), economic (private firms, trade unions, business associations), and social (NGOs, schools).

Further, institutions can take the form of formal (Statutory) and informal (Customary) rules. The distinction between formal and informal institutions is at the core of the economics of institutions. The rules that govern social interaction are generally not limited to formal institutions; they also include informal norms of conduct that individuals follow in their routine activities.

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<sup>10</sup> Watson’s article p.291.

<sup>11</sup> Ibid.p.291.

It is crucial to define what exactly informal norms are. The informal rules are part of what one may call “culture” or what economists also call “civic capital” or *metis* (*common knowledge*). The nucleus of the informal norms are based on close networking, mutual trust, group enforceability etc. which are the sub-sets of what is known as ‘social capital’. These norms are based on customs of the space, region, place and locality in general. For example, even in a particular house, there are certain norms which the family members followed. Usually, the members behave within that particular boundary of norms. In case of particular housing society also, the families frame their own norms which suits the need of that colony and helps them to stay in the state of mutual harmony. These norms are not necessarily be constitutionally enforceable. Empirical finding indicate the fact that such norms help its followers to minimize conflicts and hence internalize transaction cost to an extent<sup>12</sup>

Hence, institutions are broadly conceived as set of rules(formal and informal) and practices(*de jure* and *de facto*) to minimize the cost of transaction among the agents. In the light of the above theoretical argument, the institutions can be seen as a mechanism to settle the issues of natural resource management. The next section will deal with the environmental problem of ‘open access’.

#### Issue of Open Access

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In the world of scarcity of resources, the problem of ‘open access’ is central to it, especially in case of natural resource management. The economic theory of open access resources was first developed by Gordon (1954)<sup>13</sup>, who noted that ‘an asset that is everyone's property is in fact no one's property’. Gordon showed that resources to which access is open are overused.

However, it was the publication of Garrett Hardin’s influential article in ‘*Science* (1968)’, entitled the “tragedy of commons” that brings much of attention among the

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<sup>12</sup> However, if the group becomes too large then it becomes costly to manage the affairs within that boundary.e.g. arrival of heterogeneous group might threaten to the existing norms(Olson).

<sup>13</sup> Gordon, *The Economic Theory of common-Property Research: The Fishery*, 1954.

economists. The concept has been used to explain over-exploitation in fisheries, forests, overgrazing, air and water pollution, abuse of public lands, population problems, extinction of species, misallocation in oil and natural gas extraction, ground water depletion, and other problems of resource misallocation<sup>14</sup>. Hardin in his own words concludes:

Picture a pasture open to all...the rational herdsmen concludes that the only sensible course for him to pursue is to add another animal to his herd...the conclusion reached by each and every rational herdsmen sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit- in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom of commons brings ruin to all<sup>15</sup>.

An 'open access' resource is a depletable fugitive resource characterized by rivalry in extraction; it is subject to use by any person who has the capability and desire to enter into harvest or extraction of it; and its extraction results in symmetric or asymmetric negative externalities.<sup>16</sup>

The central implication is that in the absence of cooperation, actions not directly controlled by an agent-be the agent of the firm, or an individual, or a well defined group acting in concert- affect the set of outcomes that the agent can attain by the use of actions that the agent does in fact control i.e. open access generates negative externality due to absence of property rights or presence of weak (minimal) property rights. However, to the extent that the use or exploitation rates are below the carrying capacity of resources, the situation would not be turned into the tragedy. But evidences show that in the absence of well defined property rights, the use of resources often lead towards the open access.

In the case of open access, individuals have incentives to attract to resources, so long

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<sup>14</sup> Stevenson, 1991.

<sup>15</sup> Hardin, p.1244.

<sup>16</sup> Supranote, 13, *Common Property Economics*, p.8.

as their private marginal costs of access and production are less than or equal to the average returns for all parties from resource use. Under such circumstances, the values of resources are reduced. In the absence of property rights to a particular resource, individuals in their production decisions do not consider the full costs of their activities. As a result, the net private and social returns from individual production decisions diverge. For example, production by one individual lowers the productivity of others who are using the resource. These technological externalities are recognized by all parties, leading them to rush production before their competitors. Ultimately total output by all the individuals exceeds the social wealth maximization threshold, where social marginal costs equal social marginal returns. Further, the emphasis on competitive, short-incentive production overlooks the long-term investments. Since the investors cannot predict that they will capture the returns, their incentives to invest decline. It is often argued that open access to natural resources leads to lack of incentives to conserve, as no one person or group neither carries the costs nor reaps the benefits resulting from active management of the resource.

The potentially wasteful outcomes of the open access are recognized in the resource economics literature (Clark, 1976,1980; Dasgupta and Heal,1979). The open access has been formalized as a prisoner's dilemma, whereby the lack of cooperation among the two users of a resource leads to the least-optimal result for both- tragedy of commons(Dawes,1975).

In the absence of property rights, the externality of future scarcity is not internalized by individual users and the outcome is inefficiently high intensity of utilization. The outcome is overgrazing, overfishing, appropriation of irrigation water by head-enders, clearing of forest and so on. This way of using the resource is inefficient because at lower intensity of use, resource stock and output would be higher and harvesting costs lower. The overuse of natural resources to such an extent is a direct threat to its sustainability. Such a case arises where property rights are only nominal or at all absent. In many poorly protected national parks and forest reserves, villagers from the

surrounding areas may perceive it as legitimate and of little risk to encroach on resources<sup>17</sup>.


Graphical representation of 'open access':

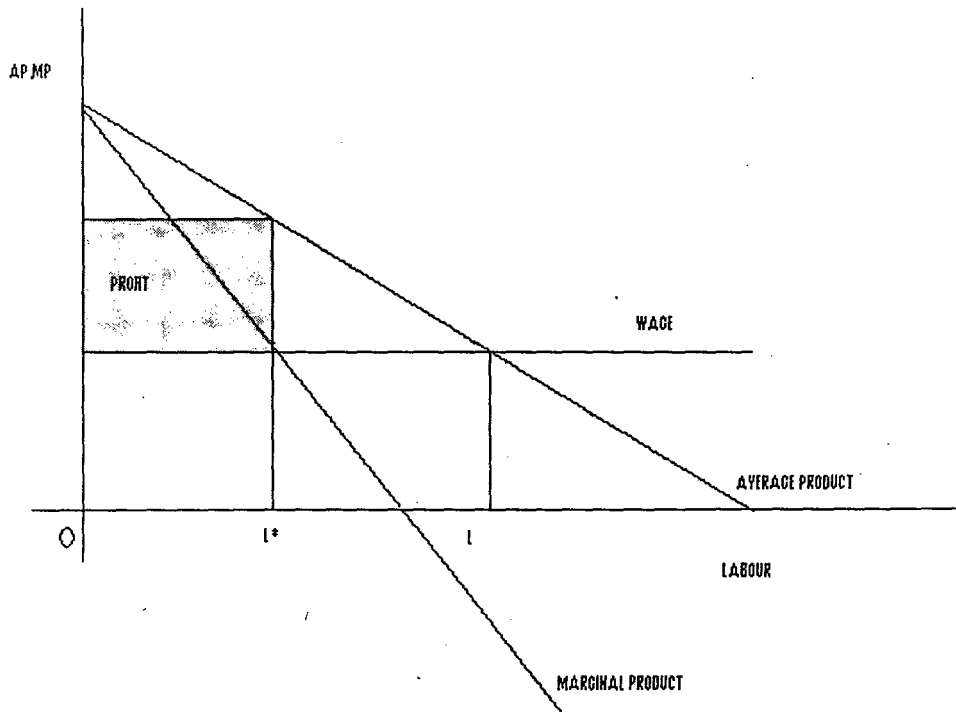
Suppose for the moment that title to the piece of land is privately held. The conventional micro-economic theory tells us that the landowner will hire additional labor to work the land until the marginal product of the last worker is equal to the market wage,  $W$ , at point  $L^*$ . This workload is shared equally among the employees, each of whom produces the average product. However, assuming *decreasing returns to labor*, each new worker hired reduces the average product of all workers. The marginal product of each additional worker is thus equal to his average product minus the decrease in the average product across all other workers. If an additional employee is hired beyond  $L^*$ , his cost to the producer,  $W$ , will be greater than his marginal product, and the difference will represent a net loss to the landowner. A profit maximizer will thus hire  $L^*$  workers, with a total output equal to average product  $AP^*$  multiplied by the number of workers,  $L^*$ . Rents collected by the landowner will equal to  $AP^*CDW$ . Society's total net benefit from land will be lower under a system of open access. If land is open to all, each worker is able to appropriate the entire product of his work, which is equal to the average product of all workers. Worker income will continue to exceed the wage until enough workers are attracted so that the average product falls to the level of the wage, at which point the labor force equals  $L$ . At this point entire profit falls to zero and it would be the same condition of ruin what is explored by Hardin in his "Tragedy of commons". This has been depicted in figure 2.1.



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<sup>17</sup> Heltberg, *Property rights and natural resource management in the developing countries*, Journal of economic survey, p.7.

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**Figure 2.1: Common Property Resources and Misallocation**

(Source: Economic Development, Michael P.Todaro, p.423)

In order to clarify the characteristic of open access, it is vital to know under which type of goods it is captured which is shown below with the help of table.

**Table 2.1 Types of Goods**

Characteristics	Exclusive	Non-Exclusive
Rival	Private Goods	Open Access
Non-Rival	Club	Public Goods

As far as open access regime is concerned, it depicts two defining traits: first it is costly to exclude potential beneficiaries from using them, as is the case with public goods. Second is its subtractibility: the resource units harvested by one

individual are not available to others i.e. rivalries in consumption just like private goods, and thus subject to depletion. The subtractability of consumption means that *de facto* open-access arrangements lead quickly to resource depletion.

In order to internalize the negative externality i.e. to avert the so called tragedy of commons, Hardin suggested some institutional solutions to avoid such problems. Coase (1960) also argued that many types of externalities can be optimally controlled by creating property rights to relevant agents.

Economists like North, Thomas, Demsetz, Alchain, Anderson, Johnson, Libecap, have argued convincingly that property rights emerge in response to conflict over resource use and conflicting claims over resources. Further they are of the view that well defined property rights help to promote more efficient use of resources and more responsible long term care of the resource bases. Demsetz is of the view that the primary function of property rights is that of guiding incentives to achieve a greater internalization of externalities<sup>18</sup>.

The institutional changes in terms of property rights is efficient only when the gains of internalization exceeds the cost of internalization; as we have seen in the last section while describing the institutions that institutional changes has its own cost. The solution of open access of resources thus lies within the domain of property right regime. As such it is pertinent to look up the existing literature of different types of property rights regime. In order to avert the problem of open access, it is important to address the issue of property rights in detail.

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<sup>18</sup> Demsetz, *Toward a Theory of Property Rights*, p.348.

### The Concept of Property Rights:

There have been tremendous discussions on the term 'property' in the literature of social sciences. The principle contributors like Plato, Aristotle, Hegel, Hobbes, Locke, Kant, Marx, Mill etc. advocate their own understanding of the term. Plato considers individual property to the Republic's 'guardian', on the ground that property would lead to distracting dispute among them. He is of the view that collective ownership was necessary to promote the pursuit of common interest. Rousseau holds the view that most of the times the seeds of war and domination were sown when human beings acquired the concept of 'mine and thine'<sup>19</sup>. Marx depicted the origins and evolution of property as a story of economic rapine. John Locke maintains that property offers an escape from an aggressive, warlike and chaotic state of nature, and that an evolving property rights regime might lead humankind toward a new kind of earthly Paradise<sup>20</sup>. Infact Law and Economics literature by and large acknowledge the idea of Locke. Further, Locke and the modern law & economics literature holds the view that property is such a chief institution that it can save us from the sorry state, because property mobilizes self-interested humans to labor as nothing else does.

Bromley defines rights as

... the capacity to call upon the collective to stand behind one's  
claim to a benefit stream<sup>21</sup>.

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<sup>19</sup> Carol M. Rose, *The New Palgrave Dictionary of Economics*, p.93.

<sup>20</sup> Merchant 1995, 1997 (As in Palgrave .....

<sup>21</sup> Bromley, 2003, (ed.) *The commons, common property, and environmental policy*, pp.83-89.



According to him rights do not simply depict the relationship between a person and an object, but also between persons with respect to an object. These rights are always protected by the state. Property, on the other hand, is the benefit stream<sup>22</sup>. It is just like saying that if I purchase a house, I am purchasing its benefit stream that I will accrue from it and that is my property. As such property rights is “a triadic social relation” involving the relationship between the individual who possesses the right, others that have to refrain from interfering with the right holder’s exercise of those rights, and an institution to back up the claim. So, there must be an institution to enforce the claims and decide which claim is valid. Bromley maintains the view that the claims to a benefit stream derived from the property rights, are enforced by “some higher body (usually the state), which will agree to protect through the assignment of duty to others who may covet, or somehow interfere with, the benefit stream<sup>23</sup>”.

Defining property as a stream of benefits or income implies two things. First, the right holder does not need to have physical possession of the property in order to enjoy the benefits thereof. In this sense of the concept, atmosphere can be property and the right to breathe clean air can be a property right even though nobody has actual possession of the atmosphere. Secondly, property does not refer to an object per se, but rather to streams of benefit flowing from assets and objects.

A well defined property rights system represents a set of entitlements that define the owner’s privileges and obligations for use of a resource or asset and bears the following characteristics<sup>24</sup>:

- a) Comprehensively assigned: All resources must be either privately or collectively owned, and all entitlements must be known and enforced effectively.
- b) Exclusive: It must be possible to prevent others from benefitting from a privately owned resource.

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<sup>22</sup> Ibid.

<sup>23</sup> Ibid, p.84.

<sup>24</sup> As cited in Hanley, Shogren & White, *Environmental Economics in theory & practice*, pp.24-25.

- c) Transferable: the owner of the resource may sell the resource when desired.
- d) Secure: Property rights to natural resources should be secure from involuntary seizure or encroachment by other individuals, firms or the government. The owner has an incentive to improve and preserve a resource while it is in his/her control rather than exploit the assets/resources.

Hardin confused common property with open access, failing to distinguish between collective property and no property (Ciriacy-Wantrup and Bishop, 1975). In order to clarify the discussion, a clear distinction between different types of management rules and property regimes is crucial (Runge, 1986). Thus, one can define management rules to consist of (i) access rules (flow management) that define rules of resource access and regulate sharing of output, and (ii) conservation rules (stock management) concerned with limiting total resource output, organize maintenance and undertake investments. Resource regimes, in contrast, are defined on the basis of the type of right users hold. In the majority of the literature, a distinction is made between open access, common property, state property and private property (Seabright, 1993).

Private property assigns ownership to named individuals, guaranteeing to those owners control of access and the right to a bundle of socially acceptable uses.<sup>25</sup>

State property is owned by citizens who assign rule making authority to a public agency<sup>26</sup>. In it citizens have the right to use the resources within the framework of rules. Open access (*res nullius*) has no ownership and its property is open to all. Here the owner does not have any liability in the form of duties to maintain the resource .

Common property is owned by some identifiable group which has the right to exclude the nonowners and it's their duty to protect the resources and have a restrain among themselves to an extent that resources should be safe-guard from being depleted.

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<sup>25</sup> Mohan Munasinghe, Susan Hanna (Ed.), *Property Rights and the Environment: Social and Ecological Issues*, p.18.

<sup>26</sup> Ibid.

However , it is not always easy to draw the line between these different kinds of property rights and one resource can fall under several property regimes at the same time depending on if the focus is on ownership, user rights, or access..

Property rights regimes must perform certain functions of limiting use, coordinating users, and responding to changing environmental conditions. These activities involve the transaction costs of coordination, information gathering, monitoring, and enforcement<sup>27</sup>. Further, property rights regime should be more account for more tradeoffs and spillover effects, and rules governing resource distribution and use increase in cost, as the resource become scarcer<sup>28</sup>. The performance of a property rights regime may be measured in any one or a combination of three dimensions: economic, social, and ecological. Economic efficiency is among one of the measure of performance of property rights regime. It measures focus on the extent to which the production of the “best” economic outcome is produced by means of the least-cost combination of inputs. In order to capture social measure of performance, equity properties of regime should be fair in the distribution of benefits and costs. Ecological measure can be gauged by the extent to which stocks of natural capital are maintained.

#### Property Rights and Natural Resource Management:

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The moot question is that how can the definition of property rights be operationalised in order to know the influence on the judicious use of natural resources in the realm of different property rights arrangement. As we stated that property rights is necessary to internalize the externalities ;this entail a cost to establish an institution of property regime. This cost is in the form of what is known as precisely a –transaction cost. Chicago economist Coase states that in the case of zero or insignificant transaction costs, externalities will be internalized by a mutually beneficial bargain between the generator of externalities and the victim ,irrespective of the prevailing

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<sup>27</sup> Ibid.

<sup>28</sup> Ibid.

arrangement of property rights. It shows that there is a relation between externalities and transaction costs.

The role of property right is to minimize the transaction costs so as to make it easier to overcome externalities. According to North (1990), property rights are important subset of institutions and as such the purpose of property rights is essentially to reduce uncertainty in economic exchange.

One of the main debate in the literature is that given the specific condition of the resource, which property rights regime can be considered most appropriate. If we consider the transaction cost as the basis to it, then that regime would be better which minimizes the transaction cost to minimum.

According to the private property rights school, the problem of over exploitation and degradation of open access can be resolved only by creating and enforcing private property rights.<sup>29</sup> The second school of thought advocates the allocation of full authority to regulate the commons to an external agency, in other words a State Property regime, can reduce over-exploitation of 'commons'<sup>30</sup>. The third school believes in the 'assurance problem approach' based on voluntary compliance. In recent years, an increasing number of scholars advocate that decentralized collective management of 'commons' by their users could be an appropriate system for avoiding the 'tragedy of commons'<sup>31</sup>. In practice, every society has its own means and adaptations to deal with natural environment common pool resources, its own 'Cultural Capital'<sup>32</sup> and local level systems of resource management, which are based on the knowledge and experience of the resource users themselves. Thus, there is need to give a deeper insight into the different arrangements of property rights regime.

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<sup>29</sup> Demsetz, 1967, Johnson, 1972, Smith, 1981, Cheung, 1970.

<sup>30</sup> Hardin, 1968.

<sup>31</sup> Berkes, 1989, Wade, 1987, Jodha, 1986, Chopra et al. 1989

<sup>32</sup> Berkes & Folke, 1994.

## Private Property Rights Regime:

This type of property right regime allows the holder of the asset to exclude others and to regulate the use of the resources. According to Berkes, this type of regime provides the institutional arrangement for a successful exclusion as it is strongly backed up by the government and it's more effective for the state to enforce the rights. In the words of Bromley, "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"<sup>33</sup>.

According to Smith, the only way to avoid the tragedy of commons in natural resources and wildlife is to end the common property system by creating a system of private property rights.<sup>34</sup>

Smith emphasized that it is "by treating a resource as a common property that we become locked in its inexorable destruction"<sup>35</sup>. Welch maintains that the creation of full private rights to a commons and asserts that "the establishment of full property rights is necessary to avoid the inefficiency of overgrazing"<sup>36</sup>.

There lies quite a majority of consensus among the economists that private property is an essential ingredient in economic development<sup>37</sup>. For example, a farmer who owns his own factors of production is likely to consider a direct relationship between investments and the level of benefit achieved over the long term. On the other hand, if compared with its counterpart, who is engaged in agriculture production in cooperative sort of system, may perceive only a loose linkage between personal contributions and benefits. Further, the more individuals in a society whose work is only loosely connected to their benefits, the more pervasive an attitude of free riding

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<sup>33</sup> Bromley, p.93.

<sup>34</sup> Smith, 1981, p.467.(As cited in Ostrom's, *Governing the Commons*,p.12)

<sup>35</sup> Ibid.

<sup>36</sup> Ibid.

<sup>37</sup> As cited in Ostrom , *Private & Common Property Rights*, p.334.

can become. The overall economic output will diminish if majority opts the trend to free ride on the work of others.

According to Demsetz, by assigning private ownership of land will lead to internalize many of the external costs associated with communal ownership. This would lead the owner of the asset(land here) by virtue of his power to exclude others, can generally count on realization of the rewards associated with husbanding the game and thus it motivates to increase the fertility of land. It creates incentives to utilize resources more efficiently<sup>38</sup>. Property rights are the basis of competitive markets, and they encourage both conservation and the technological innovation that are vital for environmental protection<sup>39</sup>.

The whole argument is that private property has the advantage that the decision making unit is a single person and internal 'cooperation' is easy to realize.

On the other hand, the burdens of enforcing the property rights (i.e. achieving external cooperation) may be too much to bear for one actor, especially since the more exclusive the property right the higher the costs of exclusion. There are sufficient literature present which states that private property regime suffers from many problems especially with reference to equity issue. Prof. Bardhan in his article put the argument that straight forward privatization of common property resources (open access) has serious distributional implications, particularly in the form of disenfranchisement of the poor marginalized class<sup>40</sup>. Seabright argues that the tradeability characteristic of private property hampers the reliability of a long- term relationship among beneficiaries of a resource<sup>41</sup>. Privatisation changes the relative bargaining power of those who depend upon the resource, directing more power to those who get hold of the property rights and makes vulnerable to those who do not have that rights. Thus it undermines the mutual dependence that was the incentive to cooperate originally. Seabright further says that it is possible that owning to

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<sup>38</sup> Demsetz, *Towards a theory of property rights*, p.356.

<sup>39</sup> [http://artsweb.uwaterloo.ca/~mr6smith/fi02.html#\\_edn6](http://artsweb.uwaterloo.ca/~mr6smith/fi02.html#_edn6)

<sup>40</sup> Bardhan, *Symposium on Management of Local Commons*, Journal of Economic Perspectives, p.88.

<sup>41</sup> Ibid.

diminishing incentives for informal cooperation, privatization may make both parties worse off<sup>42</sup>. Weitzman in his study showed that privatization of common property (open access) reduce the net returns to the variable factor (labor)<sup>43</sup>. For example, when the communally managed resources in England were transferred to privatization, it fails to raise considerable agricultural income and in contrary it changed its distribution. The intertemporal decisions of private users may not coincide with that of the society in which they operate due to divergence between private and social rates of discount<sup>44</sup>.

The notion of sustainability of resource is found vulnerable in case of private property regime. Berkes cite the case when this regime leads to the over-exploitation of the resources<sup>45</sup>. First, when the rate of the growth of the resource being endowed is less than financial interest rate; in such a case the proprietor of the concerned property might choose to rapid use of the resource in order to maximize gains. Secondly, if there is high probability that the resource is vulnerable in future due to any exogenous factors; in such a case proprietor use it in such a way that it ultimately be exhausted.

Privatization fails to internalize all the externalities involved. For example, the privatization of areas of forest for timber production( as there will still be excess production and inadequate replanting. It also fail to give some implicit entitlements of those who previously used the forest for food, fuel wood or medicine, in ways that are both inequitable and inefficient. They are inequitable because implicit entitlements are still entitlements; and they are inefficient as they fail to build on the fact that those who benefit from a resource may also be induced to contribute to its maintenance and infact some of them have a comparative advantage to do so<sup>46</sup>.

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<sup>42</sup> Seabright, *Managing Local Commons: Theoretical Issues in Incentive Design*, Journal of Economic Perspectives, p.125.

<sup>43</sup> As cited in Grafton, *Governance of the Commons: A role for the State?* p.505.

<sup>44</sup> Ibid.

<sup>45</sup> Berkes, 1996.

<sup>46</sup> Paul Seabright, *Managing Local Commons: Theoretical Issues in Incentive Design*, Journal of Economic Perspectives, p.125.

Moreover, it has been found even in the case of developed countries that enforceability of property rights entails high litigation expenses and other transaction costs. This insecurity is even more high in case of developing countries which often have its own governance problem and thus involves high transaction costs for the effective enforcement of property rights (Platteau,1994).

#### State Regulation:

State regulation is one of the main alternatives to avoid the so called 'tragedy of the commons'. This type of property regime captures a range of arrangement where the state owns the resource stock and frames the rules and regulation for withdrawal and access. It does not necessarily mean that state is the sole controller of the 'commons'. As in the case of fisheries, the *de jure* ownership rights to fishery may be vested in the state but if the fishers themselves find out through the use of individual harvesting or by some other mechanism that who has access and withdrawal rights, then it represent a sort of private property regime.

If the state is directly vested with the power to regulate over 'commons', then it can overcome or at least lessen the coordination failure inbuilt in the exploitation of such resources<sup>47</sup>. There is strong argument in favour of state as an efficient management of such resources vis-à-vis private regime i.e. the former has room for non-market benefits, distributional issues, and the use of societal rate of time preference unlike the latter. Due to its *leviathan* nature, state enjoys the monopoly of what is known as *economics of size* which other regime probably does not have. This lead to help it in faster monitoring and enforcing due to most updated benefits of information it has.

Ophuls argued that the rationale for government with major coercive powers is overwhelming<sup>48</sup>. He further added that "even if we avoid the tragedy of the commons, it will only be by recourse to the tragic necessity of Leviathan". Hardin argued that change would have to be instituted with "whatever force may be required to make the

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<sup>47</sup> Grafton, Op.cit. p.507.

<sup>48</sup> As cited in Ostrom, *Governing the Commons*, p.8.



change stick". In the words of Hardin, "if ruin is to be avoided in a crowded world, people must be responsible to a coercive force outside their individual psyches, a 'Leviathan', to use in Hobbes's term"<sup>49</sup>.

Heilbroner strongly recommended what he termed as "iron governments" and even supports for military governments to attain control over ecological problems<sup>50</sup>. Similar view is argued by Ehrenfeld who suggested that if "private interests cannot be expected to protect the public domain then external regulation by public agencies, governments, or international authorities is needed"<sup>51</sup>.

Citing the example of the problems in water resource management in developing countries, Carruthers and Stoner argued that consequence without public control would be "overgrazing and soil erosion of communal pastures or less fish at higher average cost".

There lie strong arguments against state regulation . There is argument that state being function through distant bureaucracy as such its management is subject to skepticism. It became malfeasance by influential interest groups<sup>52</sup>. This sort of regime can face the problem of valid local and reliable information and as such there is chance that due to lack of adequate information, the authority might sanction the herders who cooperate and reward the defectors in place<sup>53</sup>. Empirical evidence shows that regime transfer from communal to state would have lead to degradation of 'commons'. For example, nationalization of forest land by the Nepalese government in 1957 lead to deforestation<sup>54</sup>. Similar case is also found in Senegal, when nationalization of land in 1964 lead to over grazing on the previously community owned land.

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<sup>49</sup> Ibid.p.9.

<sup>50</sup> Ibid.

<sup>51</sup> Ibid.

<sup>52</sup> Bardhan, 1993.

<sup>53</sup> Ostrom,1990.

<sup>54</sup> Bromley & Chapagain (1984),Pradhan & Parks (1995) .

The crunch of financial and human resources in developing countries leads to monitoring problems and subsequently results in poor enforceability. This is exacerbated if resource site is far away or in remote location from the administrative head quarter as happened in Nepal<sup>55</sup> in 1957. Infact for the state it became costly and rather impossible to supervise the thousands of patches of forest lying in the remote hilly terrain, leading to left unchecked, and ultimately deforestation, an open access like situation (Arnold & Campbell,1986).

The principal-agent literature emphasize the problems faced by principals in monitoring the activities of their agents; here in this case, the problem of citizens in monitoring their government. Since the chain of delegation in case of governmental regulation is often longer as such it is not feasible atleast for local commons (Seabright,1993). The lethargic approach of the state mainly in the developing countries escalate high transaction cost on the part of the resource user especially the poor.

Besides these, the failure of governmental regulation are also due to its corrupt officials who are charged with enforcement , hostile relationship between the resource users and the state, consideration of only the revenue that generated from the resource, the presence of overriding objectives of the state that may supersede any long term concern about CPRs.

Olson maintains that the possibility of capture of the state by certain interest group is another threat for efficient governmental regulation. For example, in Canada the province of Ontario overrode a supreme court injunction and passed an act so that pulp and paper mill could continue polluting a river though this imposed significant costs on down-stream users. The cited example shows that state based rights were used to favour a particular group of resources over another. Another problem with state regulation can be sited from the state of Uttar Pradesh, where individuals from close proximate villages were restricted from benefiting from the sale of resin or

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<sup>55</sup> Ibid.

timber, but have some access rights for grazing. This lead to little incentive on the part of the villagers to protect the trees from fires or assist the state in anyways in fire control (Somanathan,1991). Seabright is of the view that where governmental management has worked , it has usually been through local involvement and empowerment of those who depend on the resource for their livelihood<sup>56</sup>.

Therefore, the mere assertion of a state right (a *de jure* right) to an open access, or the abrogation of pre-existing rights, does not necessarily create a well defined property regime unless the state ensure some exclusivity over the resource use.

The preceding debate shows that there are high transaction costs involved in both type of property regime especially in developing countries. Hence in such an environment, the role of collective action can be seen as an alternative solution to avert the tragedy of commons. The next chapter deal with the common property regime as a solution to open access in greater detail.

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<sup>56</sup> Paul Seabright, *Journal of economic Perspectives*, Vol-7, p.130.

## **CHAPTER III**

### **A REVIEW OF COOPERATIVE MANAGEMENT OF NATURAL RESOURCES**

The conventional growth-orientated top-down development strategy has not accomplished the desired trickle-down of the benefits of development to the marginalized sections. The programmes, administered by the 'outsiders' view people as 'object' of development and the agencies as providers of goods and services that is within their capacity. The services and goods so provided may not necessarily be enough to meet the diverse needs of people. The failures of plan and programmes directed the policy makers and administrators to understand the unfolding of grassroots realities. The need for the understanding the local realities saw the gradual emergence of the concepts of participation and empowerment in development literature<sup>1</sup>. In recent years these twin concepts have been positioned at the centre of both the radical and the mainstream perspectives on development. On the one hand participation is presented as the rightful claim of excluded sections, on the other hand it is also used to perpetuate and disguise continued top-down approaches<sup>2</sup>.

Community participation plays an implicit and inevitable role in deriving the fruits of development. As Gunnar Myrdal pointed out, "The ideal has always been that the plan should come from the people and meet their wishes and need and have their support in thought as well as deed. This is regularly stated in the plans as an important aim of planning and condition for their success"<sup>3</sup>. Jyothi's(2000)<sup>4</sup> study has found that people's participation is the most determining factor of bio-diversity conservation. For example, people living in and around the Periyar Tiger Reserve of Kerala can be taken as an example. It is not only taking care of the decentralized government control over forest but also ensuring the bio-diversity conservation a reality. Decentralized management now a days is gaining momentum in the policy framework. Its manifestation can be seen in the form of 73<sup>rd</sup> amendment., i.e. the greater devolution of power structure.

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<sup>1</sup> The concepts of participation and empowerment, dominant in the disciplines of sociology, anthropology and history for decades have been clouded by the state and market model of governance where people are either objects or clients of development and not the agency of development.

<sup>2</sup> P. Narayanan,2003.

<sup>3</sup> Myrdal,1968.

<sup>4</sup> S. Jyothi, Willingness to participate in bio-diversity conservation in Periyar tiger reserve: a contingent valuation, working paper, 2000.

The incentive for institutional change to resolve the issue of open access depends on the size of the rental stream that can be saved through controls on access and use. The larger the expected aggregate gains, the more likely a cooperative solution will be found to resolve the problem of open access. Economist often refers to collective action as a key to prevent the tragedy of the commons.

Institution building at the community level for managing the open access has emerged as third alternative. There is a wide ranging support from the scholars that decentralized collective management of CPRs by their users could be an appropriate system for overcoming the tragedy of the commons (Berkes, 1989; Wade, 1987; Jodha, 1986; Chopra *et al.*, 1989; Ostrom, 1990.)

A general accepted definition of common property resource is as a property on which well defined collective claims by an exclusive group are established, the use of the resource is subtractive, having the characteristic of a public good such as indivisibility. It exhibits three fundamental features. They are:

1. A well defined group or community has to have exclusive rights on the use of the resource.
2. There is non-excludability condition that no member of the community can be excluded from the use of the resource. At the same time no one has exclusive property rights on the resource.
3. The use of the resource is subtractive i.e. use of it by any user will lead to reduction of resources.

There are numerous evidence to state that how societies all over the world manage the common property by means of their traditionally framed norms which are in tune with their local ecological balance.

Literature on CPR provide a rich source of information that year long community rights can help resource users to avoid the conflict, uncertainty, rent dissipation problem or the destruction of resource involved. For example, here the state fails to regulate the forest resulting into either illegal cutting of forest by the dwellers or migrating, as such finally

government sanction 'timber rights' to villagers in Himachal Pradesh<sup>5</sup>. Similar is the case of forest user rights through Van Panchayats in Uttar Pradesh<sup>6</sup>, or *shamlat-deh* lands held jointly by the village community in Delhi and surrounding areas since the Mughal period (Chakravarty-Kaul,1996).

The property-owning group may vary in nature, size, and internal structure across a broad spectrum, but it is a social unit with definite membership and boundaries, with certain common interests, with at least some interaction among members, with some common cultural norms, and often their own endogenous authority system<sup>7</sup>.

It may be inappropriate to impose certain property rights structures on certain cultures at a particular point in their evolution<sup>8</sup>. Bottomley gave an example in which he recommends avoiding the violation of "hallowed rights" in land that would occur if a private property approach in tree planting in Tripolitania were undertaken. He strictly recommends to a common property solution. There are evidences in case of developing countries where the attempt to impose private property in natural resources has not increased efficiency but rather has lead to social disruption and even in extreme case lead to resource abuse. Even in developed countries, there are cases in which establishing private property have given rise to rather large costs. For example, one of the most famous cases of privatization of communal managed resources was of the enclosure of open land in England in the 18<sup>th</sup> century which did not raise the agricultural income, but rather changed its distribution (Allen,1982).

It needs to be acknowledged that resources under common property can serve vital economic functions that individual property can not. Not only may common property display lower transaction costs compared to private property under certain circumstances. CPRs role as insurance substitute often depend on secure and easy access to geographically dispersed resources. This is the case for management of resources where yields fluctuate widely across time and space. Herders in the arid and semi-arid tropics thus rely on common property to a very large extent because of the large spatial variability in rainfall, water and pasture, which makes it crucial to have access to very large areas. The argument extends beyond herding. McCloskey (1975) argued that plot scattering of peasants in medieval England was provided an insurance substitute

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<sup>5</sup> Kadekodi, *Common Property Resource Management*, p.22.

<sup>6</sup> Somanathan, 1991.

<sup>7</sup> Bromley, 1991.

<sup>8</sup> Ely 1914, Ciriacy-Wantrup 1952.

against rainfall risk, something that would not be achieved with consolidated land holdings. Blarel *et al.* (1992) have made the same point with respect to present-day farming in tropical areas, where scattering plots across microclimates (for example at different altitudes) hedges against rainfall risk. A similar argument could be made for fisheries and hunting. Individual property rights are not only clumsy and arduous to enforce in many cases, but would also ignore the need for fishermen and hunters to move spatially in search for movable stocks of fish or animals. In fact, Nugent and Sanchez (1993) argue that tribal institutions and chiefs play a larger role in herding as compared to agricultural societies because they fulfill crucial CPR management functions in herding communities requiring a large degree of flexibility for risk management.

Ostrom argues that local communities are well versed with the management of natural resources in their respective areas. Therefore, the intervention of an external agency like that of the state may not be required. The knowledge and the skills of the local people is both a necessary and a sufficient condition to provide complete autonomy to them for the management of natural resources. The rules and regulations imposed by the state in this regard are often found to be arbitrary in nature. The state officials and the concerned authorities lack the requisite skill and knowledge in this area and demonstrate administrative incapacity in the arena of monitoring and enforcement of its rules. State-imposed rules result in uncertainty and are beyond appropriators' control. The externality of these rules create superfluous obstacles to an effective management of natural resources.

Communities, in contrast are endogenous. The users exhibit enough capacity to monitor one another judiciously; impose sanctions consensually in case of default; and calculate the benefits and costs of litigation. What aids this are low individual discount rates, shared norms, speedy conflict resolution mechanisms and a sense of a common future. Far from this existing reality, it has been found that there are wide differences in individual discount rates and only few norms are commonly used most of the times. Hasty conflict resolutions are not always effective conflict resolution mechanisms. Diversity of users, resource endowments and cost-benefit ratios is a fact, and collective action dilemmas get resolved on the basis of these differences.

Resource Endowments & CPRs:

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Since the world is full of diversity, it is very difficult to adhere to a single generalization. This aspect become more important in the light of the fact that the world is facing the problem of resource scarcity. In such a situation, there are chances of both conflict and cooperation over the utilization of scarce resources. A standard practice in behavioral theories including New Institutionalism, to which Ostrom's theory also belongs, is to take individual motivation as the theoretical building block (Knight, 1990; North, 1992).

However, unlike North and Knight<sup>9</sup>, Ostrom's assumptions regarding human behavior are related more to the aspect of human ability to process information than human motivations. According to Ostrom, individuals have a limited ability to interpret complex information, try to make the best judgments they can in the face of uncertainty, and engage in trial and error learning. Perhaps assumptions on human motivation are avoided because motivations are situational. But it may be realistic to assume that individual behavior consists largely of strategic rationality and norm-driven behaviour (Knight, 1990), especially in the context of the commons, which are appropriated jointly by users. In fact, Ostrom does go on to state that appropriators adopt contingent strategies, but attributes this to dynamic (temporal) behaviour rather than jointness of appropriation per se.

Trial and error learning is based not only on learning from the CPR, but also on learning from agents' interactions with one another. Trial and error learning comes about through reflexive judgment on behavior (Knight, 1990). Appropriators reflect on their choices in the CPR arena, their choices in related economic arenas (and what others would do if they adopted these choices), and other's choices in the CPR and related arenas (and what they would do if others adopted these choices). The range of choices is often determined by actors' resource endowments .

The higher are actors' resource endowment, the greater are their choices, and the lower is uncertainty about the future. Lower uncertainty implies a future outlook, and a lower discounting of future CPR returns. Admittedly, higher resource endowments have a mixed effect on CPRs. The better off may not rely as much on 'low quality' CPR such as forest produce, and the less well off may not even have associated resources (such as land) to

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<sup>9</sup> North(1992) and Knight(1990) assume human motivations to a mix of self-regarding and other regarding behavior, and strategically rational.

appropriate water from an irrigation canal, a 'high quality' CPR. However, this also indicates that 'high-quality' and 'low-quality' CPRs get differentiated on the basis of resource endowments. Actors will have far higher benefits from the same investments in high quality than low quality CPRs, which has implications for inequality.

On the other hand, lack of resource endowments may inhibit a future outlook. Less well-off individuals may give far less weight to future returns than to current ones, and may not want to participate in protecting CPRs with low short-term returns. At the same time, people with low endowments typically have limited alternatives to the CPRs. They may then have low discount rates for future CPR returns, and be highly motivated to manage the 'low quality' commons that sustain them. Jodhas's 1992 study of India's dry lands revealed that the poor rely on CPRs more than the well-off for livelihoods and sustenance. Conversely, those with high resource endowments may have high returns outside the CPR, in which case CPR returns will be highly discounted. In dryland agricultural communities in India, people with higher resource endowments are more likely to have land and livestock that make them less dependent on community forests. If most people do not rely on the commons any more, then users who do may not be able to make them engage in protecting and improving the commons. In most communities however, 'low' and 'high' CPRs are not sharply differentiated. Typically, 'high' users can access 'low' CPR with ease while 'low' users cannot access 'high' CPRs. This is both due to the associated resources required in the case of high CPRs (as in the irrigation example) and because of power differentials between 'low' and 'high' users. Low CPRs typically have poorer exclusion mechanisms both because of the costs involved and the highly accessible nature of the resource, such as reserved forests in dry land rural communities in India. However, there is other view also among the institutionalists that the more others are able to use a good without having to pay for its cost, the more the value of the good is weakened (North, 1992).

When users' resource endowments are not so differentiated that their lifestyles are entirely different, high users often continue to access firewood and fodder from the forest. Studies on the commons in small-scale developing societies indicate that higher dependence on the commons increases the willingness to punish offenders (Ostrom,1990). However, which users

will be punished and to what extent will depend on whether users can harm one another to the same extent or not.

Though CPRs may benefit both less well-off and wealthier people, they tend to benefit both differently, and it would be incorrect to speak of collective benefits. Benefits are also linked to the quality and type of CPR. 'Collective' benefits would have to be disaggregated into the shares that go to different groups and the relative costs different groups incur for them. As physically large (lumpy) resources, CPRs are symbolic of power, and many power struggles take place over limiting and controlling access to a CPR. This is more easily done by those who have greater bargaining power and are less dependent on the CPR than others, and that they can 'hurt' others without getting affected as badly themselves.

Ostrom attributes a great role to shared norms in facilitating collective action, and shared norms can offset differences due to inequality. It is often thought that small-scale societies characterized by high interdependence have shared norms, but shared norms among appropriators may be the exception rather than the rule. Moreover, shared norms of a certain kind may be needed. Everybody may feel that commons should be protected, but stronger norms demonstrated by reciprocity may be needed to protect the commons.

One of the eminent scholars', Dolly Daftary<sup>10</sup> exemplifies this phenomenon of failure of reciprocity with her field study of *Bhils*, an indigenous community of agriculturists in western India. The fieldwork village consisted of two clans, with the numerically larger clan being more 'backward' while the smaller clan was more 'modern'. The village has existed for over 200 years, but sharp distinctions and differences in settlement, dress codes, diet, notions of purity and pollution, worship and division of labour are maintained over time. Reciprocity exists within each clan, but not between them. The greater power of the smaller clan combined with an absence of reciprocity between the two groups made it easier for the more powerful clan to dig the pond in a location that greatly favored it.

Not only may norms not be shared in a community, they are also constantly contested; and the outcomes of ongoing contestations may determine how CPRs will be governed. As migration patterns of sub-groups change, demographic distributions change, and the influence of external

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<sup>10</sup> Dolly Daftary, *Analyses of common property resources in micro contexts*, 2004.

agents modifies, which norms gain primacy changes as well, and this changes rules that govern CPRs.

Reciprocity is a manifestation of interdependence. The more interdependent users are, the more equally they can harm one another. Reciprocity also implies frequent interaction, which reveals people's preferences and develops shared norms, while increasing reliance on joint production. To the extent that all reciprocal users rely on the commons, uncertainty will be reduced. As Ostrom says, individuals try to solve problems as effectively as they can. But they will do so in a way that does not harm others if they are highly locked-in or interdependent. Appropriators will adopt independent strategies to access the commons if users cannot harm one another.

Ostrom argues that successful collective action is achieved when the structure of the system is well-understood. But the structure of the system on which people rely is not only the CPR system, but other local and extra-local systems as well. Knowing the CPR system alone will be adequate only to the extent that the CPR is independent of other structures. To the extent that other structures interact with it, they will play a role in forming the 'structure of the system'. Forests and irrigation systems have been the most widely studied CPRs in developing country contexts. But most forests systems are attached to villages that rely on agriculture and the market for sustenance as well. For example, physical and agricultural systems are highly integrated, forming an interconnected entity of forests-water-land. Therefore the CPR system needs to be seen in conjunction with other systems that influence it.

The whole issues of collective action in the CPR are interpreted differently in different discipline. While sociologist and anthropologist consider social norms and codes of conduct in understanding cooperative behavior, for economists it takes the course of minimizing transaction costs or incentives and penalties, and for historians it is an evolutionary process of learning and adaptation. Under community action, both information and search costs are comparatively minimal, as the talents and skills within the community, knowledge about all the households and families of the community are known. Now the moot question is about the group size. Olson and Runge gave theoretical framework to the evolution of collective action and CPR institutions. Olson challenged the fact that the likelihood of a benefit for a group is a sufficient condition to generate collective action to achieve that benefit. To quote Olson,

Unless the number of individuals in a group is quite small, or 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<sup>11</sup>.

#### Conditions Needed for Successful Common Property Regimes:

Factors that promote the ability of the local users to overcome their collective action problems are: homogeneity of the group, a clear definition of boundaries, the ability to exclude outsiders, the ability to learn from the resources and devise effective rules, and the government recognition of the common property rights.

- (a) Clear defined boundary: A well defined boundary of the CPR and its authorized users is one of pre-requisite qualification for collection action to be enforced. The CPRs are highly benefited when its users are local people as it reduces enforcement costs. It is desirable for the resource if the eligibility criteria do not allow the rapid expansion of number of its users<sup>12</sup>.
- (b) Transferability: There is argument that right of transfer of resources should be strictly restricted especially outside the groups as once outsiders are able to capture the share of it, but they have hardly any motivation or interest to bind by the dictum of community interest.

McKean in his own words,

forbidding the sale of shares in the commons, especially to 'outsiders', is one way to guarantee that co-owners of the commons all have fairly enough similar economic objectives and will be able to reach agreement about how to use the commons<sup>13</sup>.

(c) Rules as per Local Needs: In order to sustain the collective action it become imperative that any induction of technology, material, investments, rules etc., must be done in keeping tune with the local compatibility, otherwise it has serious repercussions. In many parts it happens that government agency try to impose some external developing technologies such as construction of dams in inappropriate site which might threaten the local sustainability. In

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<sup>11</sup> Olson, *The Logic of Collective Action*, p.2.

<sup>12</sup> McKean, 2000.

<sup>13</sup> McKean, 1992, p.262.

such a case there is a likelihood of low quality of compliance on the part of the users. It would be in the interest of the community and the resources if the users are given participation while framing or altering any rules as they are the one who are in constant interaction with the environment. In the words of McKean,

... first to detect evidence of resource deterioration and resource recovery and so need to be able to adjust rules to ecological changes and new economic opportunities<sup>14</sup>.

(d) Monitoring and Penalties: In order to be this regime in force, strict monitoring and vigilance is to be maintained. Literature suggests that it is always better if the monitoring of resources are done by someone among the users rather than by some external agency or person as former has strong incentive for strict and honest monitoring of the resource as his stake is involved in it. The sanction should be designed in such a way that it depends on the seriousness and context of the offense. Mild sanctions are imposed for first transgressions and severe for repeated offenses<sup>15</sup>.

Apart from that, literature also suggests that there is need of external agency such as government which can assist the local management to help it enforce its own norms. It is to be noted here that literature clearly states that the role of the government should be only in assisting the collective action and helping the users in course of any eventualities such as natural calamity but in no case to dictate its own norms and rules.

Now it become imperative to know that how and why collective action works. In the subsequent section an attempt is taken to find out the reason for mechanism of cooperation.

Incentives for Cooperative behavior:

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The cooperation behavior found in the communal management of resources can be reasoned out with the help of game theory. The theory of repeated games recommends a number of ways in which economic agents who interact repeatedly may have an incentive to cooperate in order to encourage future cooperation on the part of the others.

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<sup>14</sup> McKean, 2000, p.45.

<sup>15</sup> McKean, 1992.

**( Figure 3.1 Prisoners' Dilemma)**

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	(4,4)	(-10,5)
	Defect	(5,-10)	(0,0)

The figure 3.1 depicts the Prisoners' dilemma. Here, we consider the two players who know that they are playing the game only once, then player 1 thinks as, 'Player 2 might either cooperate or defect. If player 2 cooperates he is better off defecting, and receiving 5 rather than 4. On the other hand if player 2 defects then even he is still better off as still manages to get 0 rather than -10. When both players think this way, then both will end up defecting and sharing the pay off of 0 each. This is about if the game is played once and dominant strategy is here to non-cooperate which exactly happens in the case of 'tragedy of the commons' where entire rent is dissipated. However, if the game is repeated a number of times, the two players can find a means to cooperate. The plan that repetition can sustain cooperation is based on the thought that individuals convinced to defect may be offset due to fear of losing benefits of cooperation in the future. In order to sustain this inducement to be effective, following three conditions must hold good<sup>16</sup>. First, the future must matter enough to outweigh the immediate benefits to any individual of failing to cooperate; that is, other players must have at their disposal retaliatory strategies that 'hurt' the defector from a cooperative agreement sufficiently in future periods, even when future payoffs are discounted. For example, excluding those who breach their fishing quotas from the fishing grounds in the future must be a sufficiently damaging prospect to offset any immediate gains from over-fishing. Secondly, these retaliatory strategies must be credible, which implies that once an individual has defected, it must be in the others interest to let the retaliation enforced. Last but not the least, the gains from cooperation in the future must themselves be sufficiently possible to act as an incentive to cooperation in the present. For example, if the game is played for a fixed number of times,

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<sup>16</sup> Paul Seabright, *Managing Local Commons*, *Journal of Economic Perspectives*, pp.118-120.

then the players will defect in the penultimate round as they perceive about each other that in the ultimate round both will defect as defection in that round would not be punished.

For future cooperation to be sufficiently probable incentive, one of a number of conditions must hold. There must be sufficient uncertainty about how many times games will be repeated.

An alternate explanation is “reputation”: even a very small probability that the player prefers to cooperate act as an incentives to all types of players to cooperate provided game is of long lasting period. The possibility of cooperation will depend on how players weight the discount rates. If they heavily discounted future payoffs then the likelihood of cooperation declines. Another thing is close observability of actions of each other so that defection can be avoided.

It is generally been said that people will cooperate if they anticipate to gain in the future by cooperating in the present. Empirical literature on the management of common property resources stresses that historical consideration plays an important role in accounting for successful collective action. For example, cooperative institutions work more successfully when they are rooted in the context in which collective action has worked in the past. Cooperation can be habit-forming( Seabright,1993).

Trust is another vital variable which influence the cooperation behavior. The presence or absence of trust itself depend on past traditions and institutions. Trust is thus regarded as a kind of capital good, embodied either in individuals or in the organizations to which they belong, and which acts as a state variable whose value influences the probability of future co-operation independently of the direct payoffs associated with such co-operation<sup>17</sup>. This means institutions can channelized trust. For example, the study of milk cooperative societies in India where small farmers pool out milk at less than open market prices in return for the provision of a number of collective benefits such as access to finance and infrastructure. Here institution channel trust means can be clarified with an example. For example, in developing countries there are voluntary organizations which are engaged in promoting plays, festivals and other social activities among the marginalized disadvantageous groups; they do so not for some intrinsic value but they know their value in building ‘trust’. This study was empirically

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<sup>17</sup> Paul Seabright, *Managing Local Commons*, *Journal of Economic Perspectives*, pp.122-123.



been attempted by galaxy of social scientists like Fukuyama(1995), Putnam(1993), Sako(1992) and Seabright(1997).

Sometimes institutions in their own effort and for its sake promote the notion of what is referred as “collective reputation”. In 1990, Kreps state that the way in which the reputation of individuals undertaking market transactions will be influenced by the reputation of the firms to which they belong. Tirole(1993) suggests that the determination of corruption in a society may partly be explained by the fact that younger generations “inherit” the reputation of their elders.

Infact it was the mechanism of quality control that weaken the members to “cheat” in the cooperative societies of India which made it more successful. There are number of empirical studies which indicates the successful evolution within relatively short periods of time of collective management institutions whose primary function is monitoring and clarification of rules(Fenny *et al.*,1990). Runge and Stevenson on problems of collective action in developing countries have suggested that these may often be modeled better as a coordination game or an ‘assurance game’ rather than a prisoners dilemma. Unlike the prisoners dilemma, in this game, it is in the players interest to cooperate even when they play only once, provided they can be assured that others will do the same. This is based on the idea of reciprocity that cooperative behavior towards others tends to extract cooperative behavior from them in return, no matter whether the parties expect to meet again in future or not. However, such a hypothesis is hard to test empirically. A set of laboratory experiments by Ernst Fehr and colleagues has shown that individuals receiving generous treatment from others they know they will not meet again nevertheless respond generously to them in return. Mutual affection is one of the reason behind the cooperation behavior. Innumerable transactions take place only because the people involved care about one another and rationally believe that they care about one another ( i.e., each knows that the others know that they care about one another, each knows that the others know that each knows that they care about one another, and so on) and therefore trust one another to carry out their obligations. Economists model the situation as one where group members have interdependent utilities. The household best exemplifies institutions based on care and affection<sup>18</sup>. Cooperation works better in small groups with similarity of needs and clear boundaries, and shared norms and patterns of reciprocity. In such communities monitoring is easier, the “common

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<sup>18</sup> P.Dasgupta, *Economic and Political Weekly*, April 16, 2005, p.1614.

knowledge” assumption of models of strategic decisions is likely to be more valid, and social sanctions are easier to implement through reputation mechanisms and multiplex relationships of face to face communities.

Olsen (1965)<sup>19</sup> identifies two critical factors in the effectiveness of group action: the size of the group, and the use of social and psychological incentives for behavior. Small groups tend to be more effective in encouraging the active participation of all members in a thorough airing of the issues. Small groups which maintain face-to-face interactions also are more effective in the use of social pressures and incentives to construct consensus. Runge(1984) examines the role of individual choice in maintaining institutions that coordinate expectations and help individuals predict each other’s behavior( the assurance problem). Interdependence creates feedback loops that reduce the uncertainty to individuals. This reduction in uncertainty, in turn, may lessen the urgency of individual inclinations to ‘free ride’ by taking advantage of others actions.

Here it becomes pertinent to note that above all the type of network in the society matters. Social capital plays an important role for cooperation behavior in the society. The next section will deal with the interlinkages of social capital with that of common property regime.

#### Social Capital and Community Action :

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Studies on the commons have recognized various factors that are favorable to collective action and that assist in ascertaining the success of natural resource management at the community level. Among these the 'Social capital' of the community has come to evolve an important place.

Social capital refers to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions. It has been referred to as trust, norms and shared understanding by a group of actors that enable them to act together more effectively to pursue shared objectives (Blomkvist and Swain, 2001). It is "the institutions, relationships and norms that shape the quality and quantity of a society's social interactions". One of the most striking empirical conclusions on the relationship between social capital and economic outcomes is found in the groundbreaking work of Putnam (1993): that the forms of reciprocity and trust

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<sup>19</sup> As cited in Susan Hanna, Efficiencies of user participation in natural resource management,p.61.

which are key determinants of the relative economic success of Northern Italy in the late 1900s were established in the early 1200s. Robert Putnam asserts following reasons to highlight the importance of social capital. Social capital allows citizens to resolve collective problems more easily. Social norms and the networks that enforce them provide such a mechanism. Increasing evidence shows that societal cohesion is critical for societies to prosper economically and for development to be sustainable. It helps communities to plan and evaluate, make decisions, to mobilize resources and manage them, communicate with each other and coordinate activities, resolve conflicts etc. in the development debate, social capital is understood "as a resource, a propensity for mutually beneficial collective action that different communities possess to different extents (Krishna, 2002). It is created when people form social connections and networks based on principles of mutual trust, reciprocity, and norms for actions. The relationships can either be horizontal (egalitarian) or might be vertical( i.e. hierarchy might be present)<sup>20</sup>.

It acts like a lubricant that allows communities to advance smoothly<sup>21</sup>. There are basically three components of social capital. They consist of a network; a cluster of norms, values and expectancies that are shared by group members; and sanctions- punishments and rewards which help to maintain the norms and network.

First, social structures can affect information sharing among agents. When agents interact frequently in local organizations and networks and in the observance of local norms (for example, at an annual village festival), they are more likely to observe each other's behavior (one-way information sharing) and to exchange information about their daily lives (two-way information sharing). By contrast, when local organizations, networks and norms exclude different groups of agents (for example, lower castes), they can diminish the frequency of one-way and two-way information sharing<sup>22</sup>.

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<sup>20</sup> Putnam in his study of Northern and Southern Italy found that, in the northern part the society was by and large horizontal in nature and as such there is harmony where as the southern part was characterized by unequal power relations, widespread corruption i.e. society there in is vertical in nature and less harmonious.

<sup>21</sup> [http://www.infed.org/biblio/social\\_capital.htm#definitions](http://www.infed.org/biblio/social_capital.htm#definitions)

<sup>22</sup> As cited in Edward Elgar, Social Capital & well being in developing countries, <http://community.middlebury.edu/~jisham/papers/Isham%20-%20cost%20benefit%20framework.pdf>, p.4

Second, social interactions can affect the level of transactions costs associated with many market exchanges. When agents frequently and regularly interact in social settings, they establish patterns of expected behavior and build bonds of trust. Combined with the possibility of social sanctions, this lowers the likelihood of opportunistic behavior by agents that are in the same social structure. By contrast, the lack of cooperative norms within social structures can lead to higher transaction costs and more inefficient markets<sup>23</sup>.

Third, without selective constraints, agents in many settings will not have an incentive to participate in mutually-beneficial collective action (Olson 1965) like contributing to the construction of a community-based water system or maintaining a feeder road. Frequent and regular interactions in social settings lead to the development of institutions that can serve as such constraints, thereby lowering the incentives of individual agents to free ride<sup>24</sup>.

The recent research of Ostrom and Ahn (2001) shows that social capital is a crucial variable for the ability of the community to arrive at collective action to deal with resource allocation.

Social capital is a broad concept as it captures tangible characteristics like formal rules, procedures, networks, and intangible ones like trust, norms of reciprocity. There has been growing interest that why companies working in the same sector often cluster together, like the one Silicon Valley in California, though they are competitors<sup>25</sup>. Literature on it suggest that this clustering occurs because the companies may build on the back of an existing network of expertise. Cluster itself become pivot of the network once network is formed. Close proximity also helps in reducing transaction costs. It has also been observed that employees recruited through referral and ‘connections’ in the firm are generally of higher average skill<sup>26</sup>. Firms within industrial clusters benefit from fine-grained and tacit knowledge exchanges, and subtle local externality. Innovations and reductions in costs spill over to reduce both the firm’s own costs and those of its local rivals, setting up the conditions for a creative mix of local co-operation and competition known as ‘co-operation’<sup>27</sup>.

Based on the theoretical analysis of the problem under investigation, the following chapter is focused on the empirical findings of the field study conducted in the ‘Lower Subansiri’ district

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<sup>23</sup> Ibid.p.5

<sup>24</sup> Ibid.

<sup>25</sup> Leadbeater,1999 (As cited in David Halpren, *Social Capital* , p.54.)

<sup>26</sup> Montgomery,1991 (As cited in David Halpren, *Social Capital*, p.55.)

<sup>27</sup> Soubeyran & Weber, 2002.

of Arunachal Pradesh. The field study comprises of the survey of a tribal group called 'Apatanis' in the given area. The main objective of the chapter is to complement the inferences drawn from the empirical findings with theories that delve into the issue of management of common property resources.

## **CHAPTER IV**

### **A CASE STUDY OF THE APATANI TRIBE OF ARUNACHAL PRADESH**

## Section-I

### Profile of Field Area

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The north eastern state of Arunachal Pradesh is situated between 26°28' and 29°30' North latitudes and 91°30' and 97°30' East Longitudes<sup>1</sup> covering an area of 83,743 sq. km. The density of population is 10 persons per sq.kms, which is lowest in India. It borders the state of Assam to the south and Nagaland to the south east. Myanmar lies to the east of the state, Bhutan to the west. The McMohan line separates it from the zone of control of the People's Republic of China to the north. Since 1947, it was a part of the North East Frontier Agency (NEFA) and was later made a Union Territory. It was made a full fledged state on 20th February, 1987. The state is the habitat of about twenty-five major tribes and more than hundreds sub-tribes.

There are three types of forests, namely tropical, temperate and alpine, are found here. About 61,000 sq. km. of the territory is covered with forests, which are an important source of revenue for the state. The state is rich in forest products such as bamboo, cane and timber. Apart from these, a large variety of medicinal plants are found here. The *mithun* (*Bos frontalis*), a semi-domesticated animal, is the most important among the animals and plays an important role in the socio-cultural life of the people.

Bio-geographically it is situated in the Eastern Himalayan province, the richest biogeographical province of the Himalayan zone. The entire territory forms a complex hill system with varying elevations ranging from 50m in the foot-hills and gradually ascending to about 7000m, traversed throughout by a number of rivers and rivulets.

### Cultural History

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Arunachal Pradesh is visited by the recurrent patterns of traditional social institutions which regulate access to resources: communalistic notions of landownership; tribal councils and other public forums that resolve disputes over resource use; religious taboos and beliefs that serve to regulate resource use and to constitute human identity

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<sup>1</sup> A portrait of Population 1971. Arunachal Pradesh p.1.

with non-human imagery; a strongly entrepreneurial spirit; materialistic definitions of identity and personal worth. The new developments have brought in certain changes in the sociocultural complexes. However, they are still vital and provide an important resource for sustainable planning.

The traditional beliefs and practices have the effect of binding identity (individual and group) into the non-human landscape, creating strong attachment between a particular group and a particular ecosystem. In the words of Elwin,

The tribal people are bound to their land by many and intimate ties. Their feeling for it is something more than mere possessiveness. It is connected with their sense of history, for their legends tell of the great journeys they made over the wild and lonely hills and of the heroic pioneers who made the first clearings in the forest. It is part of their reverence for the dead, whose spirits still haunt the countryside. The land is the mother who provides for them in response to the labours of the hands and who, when supplies run short, feeds them with a hundred natural gifts. It is the setting of adventure, in love, in hunting and in war, which can never be forgotten.

Traditionally, the political organization ranged from aristocratic ranking or stratified chiefdoms to egalitarian clan or lineage-based societies and highly corporate villages run by democratic debate in traditional councils<sup>2</sup>.

#### Administrative Systems

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Arunachal Pradesh is a multi-linguistic state. Different tribes have different culture and traditions. They have different customary laws and a time tested dispute resolution mechanism. The disputes in tribal societies are resolved by a system of administration of justice founded on customs and customary laws of each tribes by the Village Council.

Though, there are no written rules for administration of tribal villages, but the customs and traditions are almost compatible with the modern concepts of jurisprudence. The tribal councils in NEFA function on the lines of the system evolved for parliamentary democracy, which is in vogue now a days. This is well illustrated in the utterance of the

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<sup>2</sup> Taylor, 1998.



leaders of the councils *Kebang, Buliang, Mela, Abela*<sup>3</sup> of different communities in their traditional speeches, which they recite at the beginning of their meeting.

Villagers and brethren, let us strengthen our custom and our council, let us improve our relations, let us make the laws straight and equal for all, let our laws be uniform, let our customs be the same for all, let us be guided by the reason and see that justice is done and the compromise reached that is acceptable to both parties. Let us decide while the dispute is fresh, lest the small disputes grow big and continue for the long time. We have come together for a council meeting and let us speak in one voice and decide our verdict. So let us decide and mete out justice.

The council derived their authority from the expression of the will and power of the people. They had the support of both social and supernatural. The notion of democracy is not new to the tribal society.

The above cited profile of the state will help us in deeper understanding of their local mechanisms in the subsequent sections.

## Section II

Apatani valley in Lower Subansiri district of Arunachal Pradesh lies between Panior and Kamla rivers at an altitude of 1524 m and is located at 93 degree 48'-93 degree 52' E longitude and 27 degree 32'- 27 degree 37' N latitude. The valley originally consisted of seven large villages, viz. Hong, Biila, Dutta, Hija, Hari, Mudang-Tage and Michi-Bamin with 25000 persons. Over the time the number of villages also grew up. The Apatani, an agricultural community of Arunachal Pradesh has their own indigenous knowledge on land management. In Apatani valley, about 48.38% land is under paddy-cum-fish cultivation, followed by 32.64% clan forest, 16.41% bamboo forest and 2.75% home garden.

### Society and Culture of Apatani Tribe

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The tribal society of Arunachal Pradesh is mainly organized on the basis of tribe, clan or villages, and the social order is determined on the basis of kinship or locality<sup>4</sup>. Like

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<sup>3</sup> These are the names of village councils of different tribes of Arunachal Pradesh.

<sup>4</sup> Pandey & Tripathy, *A Comprehensive History of Arunachal Pradesh*, p.64.

the mainstream India, all the tribes of the state are patriarchal in nature. In the Apatani society family comprises of the parents and their unmarried children. The parents assist their grown-up sons to establish their own house and to have a land holding of their own. The youngest son of the family usually lives and cultivates with his father even after marriage and inherits all the property of his father where as the elder son does not inherit any more property than he receives during his father's life time. Daughters do not have any right to share property other than the clothes and the ornaments at the time of their marriage. However, the Apatani wife enjoys substantial rights and privileges in the domestic affairs. She can sell grain and cattle of her own, while a man would seldom dispose off any part of his harvest without consulting his wife.

One of the most striking and perhaps contrast feature of Arunachal tribal society is the absence of 'caste system' which is very deeply rooted in mainstream India. Though there are certain social divisions in tribes and the society is divided into the chiefs, priests, and the middle class etc. But this does not act as a restraint on the societal solidarity of the tribe in particular and the village in general. People eat together on social occasions and take part actively in the village councils no matter what class they belong to, unlike main land India. Thus, the divisions are more horizontal in nature rather than vertical<sup>5</sup>. There are two distinct classes found in the Apatani society namely 'Mite' and 'Mura'. The former holds a higher status than the later and intermarriage among the two groups are not allowed. The social life of Apatanis is highly organized and there is a spirit of solidarity based on tradition, language and culture. There are two social institutions, the first being a sort of shrine which is locally called *Nago* (It is the centre for performing all the important rituals of the village community) and the other is known as *Lapang* (It is a large open platform where the members of the village community can sit).

Festivals:

Festivals form an essential aspect of Socio-Cultural life of the people of Arunachal Pradesh. As a matter of fact festivals are the mirrors of the people's culture. The people

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<sup>5</sup> Ibid., p.70.

of Arunachal Pradesh celebrate a number of festivals-agricultural, religious and socio-cultural, which give them ample opportunity to mingle with each other. These are the occasions for people to relax, to enjoy, to dance and eat and drink. Agriculture being the basic means of livelihood the festivals that are connected with agriculture are celebrated on a bigger scale either to thank the God for providence or to pray for bumper harvest. While the ritual part of each festival is performed by the priest other arrangements of the festivals are done by the people in a community basis.

The Apatanis celebrate 'Mioko' festival during the month of March to invoke and propitiate a number of deities and sacrifice is made for the welfare of the entire community.'Dree' is another important festival which is held for three days in the month of July when the young paddy plants grow lush green after the transplantation. This festival which is observed with agro-religious rationale is of great importance for them.

#### Apatani Natural Resource Management Institutions:

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The Apatani plateau is considered highly productive and is known for its wet-rice-cultivation and the success of their 'agriculture system' is usually explained with reference to the skill (or indigenous knowledge) of the Apatanis and their capacity to regulate access to the resources. The Apatanis have a set of indigenous institutions that is said to provide them with a coherent internal form of governance. Here I sketch out these institutions and show how they relate to natural resource management. The institutions that make up this form of Apatani- wide governance include the *Buliang*, the village council of this tribe, a generation-grade system that applies to and organizes this society which is dealt in detail as under.

#### Structure of Apatani Village Council- Buliang

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There were no representative institutions, except the village councils in the state till 1969. Each tribal community has its own village council that has been functioning as effective village government even after introduction of modern participatory political

institutions including statutory Panchayat systems<sup>6</sup>. One cannot say as to when and what point of time in history, these tribal councils emerged. These centuries old accepted forms of village councils evolved as a local managerial mechanism to fulfill purely local needs. It is supported by social and religious sanctions and are an expression of a genuine democracy representing the cooperation and communal temperament of the people<sup>7</sup>. The significance of these village councils lies in the fact that in Arunachal Pradesh society life and responsibility is so often corporate rather than individual<sup>8</sup>. Territorial demarcation, of the villages by noticeable marks as the courses of river, mountain, trees etc. provided a territorial solidity and political cohesiveness to each of them. In the words of Sir Charles Metcalfe,

The little republic having nearly everything they want within themselves and almost independent of foreign relations: they seem to last where nothing else lasts. The union of the village communities, each one forming a separate little state in itself is in a high degree conducive to their happiness and to the enjoyment of a great portion of freedom and independence<sup>9</sup>.

Further Elwin maintained that these tribal councils were a democratic court of the people and this sort of democracy at grass roots level will remain an identity of political rationality for generations to come<sup>10</sup>. The council has both Legislative and Executive wings. According to Krshnamachari, "Owing to the life in village communities and the measure of autonomy they enjoyed that social cohesion and stability was achieved and succeeded in preserving our traditional cultural values over many centuries"<sup>11</sup>. Infact village councils can be seen as competent enough to mitigate any sort of civic disorders or any chaos without any external agency.

A typical village council generally consists of village Chief, the local priest and elderly mature, influential persons of the village. It is to be noted that, though the ultimate decision lies in the hand of council members but everyone is free to state his or her consent. i.e. it clearly shows the ethos and spirit of true democratic institutions. The councils are bound to look after all the welfare activities of the tribe and village under

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<sup>6</sup> Sanjay Dubey, *Dynamics of Tribal Local Polity & Panchayat Raj in Arunachal Pradesh*, 2001, p.2.1.

<sup>7</sup> *ibid*, p. 2.1.

<sup>8</sup> Verrier Elwin, *Democracy in NEFA*, 1965, p.174.

<sup>9</sup> *ibid.*, p.23.

<sup>10</sup> *ibid.*, p.23.

<sup>11</sup> *Ibid.*, pp 23-24.

their jurisdictions, apart from maintaining law and order. According to Elwin, every kind of offence is within their jurisdiction except those committed against state<sup>12</sup>.

Judgments are delivered on the basis of a careful consideration of divergent statement of parties and the customary laws. This enables fast delivery of justice which is often free of cost unlike modern legal institutions. The tribal councils “afforded opportunities to the villagers to develop a sense of democratic spirit and also a sense of initiative and leadership. Those who are inspired with a sense of justice, fellow feelings and dedication were normally accepted as leaders of the communities and they were closely associated with the councils”<sup>13</sup>.

They all derive their authority from ancient times by the fact that they are the expression of the will and power of the whole people<sup>14</sup>.

The community held that to defy the norm means to lay oneself open to the annoyance of the God, who is operational vigor behind the command of village council. There are associated sanctions such as social boycott, fear of punishment behind the tribal laws.

There are various types of village councils as the number of tribes. According to Elwin, “The character of village council reflects the social polity and psychology of its tribe”<sup>15</sup>. The council is known differently in different tribes and has some substantial different functions from tribe to tribe. It is known as *Kebang* among Adis tribes, *Jung* among Sherdukpens tribes, *Mangjombana* among Monpas tribes and *Buliang* among Apatanis tribes.

The Apatanis, with their closely knit cooperative social system, their complex economy compared to the other tribes and their close proximity to one another developed their own system of government. According to Dr Haimendorf,

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<sup>12</sup> Ibid., p.21.

<sup>13</sup> Yojana, January 26, 1977, An article of Thugon, P.K.,: *Traditional Democratic Institutions in Arunachal*, p.99.

<sup>14</sup> Elwin: *A philosophy for NEFA*, p.160.

<sup>15</sup> Ibid., p.154.

The representative of the clans who in their plurality constitute a kind of village government are the *Buliangs*, men of character and ability, who are appointed either from among the members of a family, which owing to its wealth and status, always furnished one or two *Buliangs*, or on account of their personal influence in the community<sup>16</sup>.

The position of a *Buliang* is usually hereditary, but the persons who had been known for integrity, ability, wealth and social reputation are strained from the members of clan.

The customary village management and the enforcement of laws were the duty of selected persons who would be able to administer the affairs without any preconceived notion. These persons are called the *Buliangs* - a village council of Apatanis. Scholars like Elwin and Haimendorf, have categorized the *Buliangs* into three types, namely the *Akha Buliang*, the *Yopa Buliang* and the *Ajang Buliang*, depending on their age.

The *Akha Buliangs* were normally the old people of the community who were not accomplished of taking an active part in the day to day dealings of the village, but due to their experience gave the ultimate decision on every matter. The *Yopa Buliangs* were the middle aged men who took active part in the village supervision and then illuminated the *Akha Buliangs* on various matters. The *Ajang Buliangs* were the young people who were engaged as messengers and assisted the *Yopa Buliangs*. The post of *Buliang* is usually passed on in inheritance. The *Buliang* used to be the highest authority of socio-political and judicial administration of the Apatanis.

The customary laws of the Apatanis were essentially based on ethical principles having the endorsement and sanction of the entire society and as such were acceptable to all. This village council derived their potency from the community as a whole and did not have any explicit bureau to implement their decisions. They only acted as the spokesmen of the community and gave their decisions only after cross assessment of disputes. Normally people abide by the orders passed by this village council. In return *Buliangs* do not anticipate any personal benefit in lieu of service that they deliver to their community but are pleased with the reward of ritual gifts on various festivals. The proceedings and session of the *Buliangs* takes place in community platform called

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<sup>16</sup> Ibid., p.154.

*Lapang*<sup>17</sup>. Haimendorf has described it as a 'visual symbol of the social cohesion of the individual clan'.

It is in the common parlance among the Apatanis that their multifarious economy and the whole spectrum could be maintained only if harmony is maintained in the valley. This tranquility is ensured through the treaties of friendship between the individual villages called *Dapo*. These *Dapo* pacts between all the villages of Apatani were elemental part of their political system. They have a strong belief that there is a divine non-aggression pact between all the villages in the form of *Dapo* and they could not survive even for a month without them<sup>18</sup>. Ellickson explains that social norms, as 'customary law', can be superior to administrative or judicial dispute resolution among people with close social ties. Ellickson studied disputes between cattle ranchers and farmers in Shasta County, California and found that these disputes were usually resolved by appeal to generally accepted social rules.

Members of a close-knit group develop and maintain norms whose content serves to maximize the aggregate welfare that members obtain in their workaday affairs with one another<sup>19</sup>.

These strategies replace traditional legal remedies.

Law solves the problem of cooperation by altering the payoff structure in each game; relationships solve the problem by repeating the law<sup>20</sup>.

Informal norms, in these cases, replace statutory law. It is vital to note here that the area under investigation has presence of statutory laws as well i.e. it exhibits legal pluralism (statutory as well as customary laws). The presence of plurality of legal systems have led to the formation of a number of parallel institutions administering justice in the given region.

It is in general parlance that there is a close relationship between natural resources and tribal people; as their dependency of survival rest on these resources. The natural

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<sup>17</sup> A *lapang* is a assembly platform constructed of spacious wooden planks loosely thrown over a framework of stilts. The *lapangs* are generally centrally situated in each of the clan quarters. It becomes the focal centre of social activity for the members of each of the clan within certain radius.

<sup>18</sup> Pandey & Tripathy, A Comprehensive History....., Op.cit., p.219.

<sup>19</sup> Robert C. Ellickson, Order without law..., 1991, p. 167

<sup>20</sup> Cooter, Do good laws make good citizens? An economic analysis of internalized norms, 1993, p. 423

resources are managed by the Apatanis itself under the mechanism of their village council-*Buliang*. However, this jurisdiction of management is confined upto their private property or common natural resources<sup>21</sup>.

The next section deals with the cooperative mechanism of the tribe with special focus on forest and water irrigation system and also how they resolve the conflicts within their boundary in case of any eventualities.

Forests:

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Forests play an important role in environmental stability and contribute significantly in the process of economic development. The management of forests has been internalized in the tradition of indigenous communities and gets reflected in their traditional knowledge base through their practices of diverse forest dependence, product utilization and management. Norms were set up for the use of these resources by village institutions.

The Lower Subansiri district of Arunachal Pradesh where the Apatani Plateau lies have a forest cover area of 90.3%<sup>22</sup>. The forest used under community ownership in the state is known as Unclassed State Forest. It is to be noted here that the Forest department of the state considers all forest in the state which does not fall in the category of either reserved forest, anchal forest reserve, wildlife sanctuary etc as Unclassed. The distinct pattern of ownership of land including forest land, observed in the state varies from tribe to tribe. The Apatanis follow three types of ownership on the forests.

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<sup>21</sup> As in this part of the region, statutory laws are also working. Village council deals with cases of such as unclassified forest, water etc.

<sup>22</sup> Details of District wise Forest area cover is in Appendix No 1.



**Table 4.1 Resource use pattern in the Unclassed State Forest among the Apatani tribes.**

Source: Compiled from 'A Himalayan Tribe: From Cattle to Cash by Christoph von F. Haimendorf, 1980. (As cited in Pant, *Customs & Conservation*, p.62.)

The Apatanis managed their forest (Unclassed Forest) according to their own indigenous customs and norms as per their customary laws. Wood is the only source of fuel and energy for most of the Apatanis<sup>23</sup>. Their Mithun

Ownership Type	Resource Use Pattern
Individual / Family	Kitchen Garden. Bamboo-pine groves. Granary sites.
Clan	Burial ground. Hunting ground. Wood for house construction. Religious sites and sacred areas.
Community / Village	Burial grounds. Grazing grounds. Community hunting before festivals.

which is suppose to be their symbol of wealth and prosperity graze in the community field. Apart from it, other domesticated animal are also found grazing here. Out of the total sample(300) collected from different villages in the valley, on an average there are 8-11 numbers of Mithuns found per household. The economic vitality of this special variety Rs.10,000 and 25,000.

<sup>23</sup> Now a days due to better infrastructure LPG are also seen in their houses especially in those village which are in proximity to district town, Ziro.

## Field Findings:

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I surveyed two different types of villages taking in consideration that any divergence may led to discrepancies in the findings. I selected the villages in terms of distance from the district headquarter of Subansiri i.e. Ziro<sup>24</sup>. Type 1 villages are those which are near or in the very close range of the district town and Type 2 villages are chosen at considerable distance from this township.

Type 1 villages have lower community forests per household than as compared to type 2 villages. However, exact statistics are not available. But the village head-*gaon burah*<sup>25</sup> of both type of villages revealed that villages near to the Ziro area have comparatively less communal forest than their counterparts who are living distant of this township. The *gaon burah* cite the main reason for the lower forest cover to be urbanization i.e. some people came from other parts of the district to settle near this sort of forest to reap the benefits of the urban centre. This has led to decline in the availability of per household communal forest. One of my respondent of the type 1 village, Mr. Taje, 35 years old male<sup>26</sup>, narrates,

We normally allow the people to let their *Mithun* graze in the communal forest if he belongs to our tribe. However, over the period due to fast growth of Ziro many people of our tribe though not necessarily of our clan came to settle here Most of them are government servant but once they came in their home district they also started rearing the animal and as such it led to the presence of more of Mithuns then it had been some fifteen years back.

I got an invitation to dinner by one of the educated village gentleman named Mr. Hania (43,m) of the type 1 village. Over dinner near their traditional *chulahas*<sup>27</sup>, I enquired about this increasing pressure on communal forest. He said,

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<sup>24</sup> Ziro is the district headquarter of Lower Subansiri district and the only urban centre in the district.

<sup>25</sup> Gaonburah is the head of village council.

<sup>26</sup> Henceforth age and gender (m= male and f= female) are given in parenthesis.

<sup>27</sup> Chulahas is their traditional wood stove. Often one can find it in the entire tribals of the state that during night especially all the members are sitting near this traditional chulahas and having a glass of local rice beer, locally known as *Apong* in their hands. Even who so ever come during that time they offer the drink as their honor to their guest. Apatanis are also doing commercial business of the *Apong*.

...Yeh, things are now changing gradually especially in the villages which are near to Ziro. As a part of our hospitality we continued to allow our communal forest to use even by those who neither belong to our village nor to our clan, though they are from our tribe only. But now our council is thinking to restrain outsiders to use this forest. However, I think, those who were allowed so far would not be deprived for grazing their Mithuns. May be the council will fix some nominal user charges in the form of cash.

I shared the same problem with the village head of one of the type 1 village, and he told me ,

We are in plan to have some sort of mechanism to safeguard our communal forest...though we do not normally charges some premium in terms of money, but if we charge, then the premium will be use for the welfare of the village community may be invest on the forest or in other community welfare scheme of villages such as making of classroom of the school, as our class room of our village school needs repair or even replacement with the new one. These days government pays hardly any attention about the infrastructure of the school. So we need to care about that as it is the school where our children learn.

On my investigation I found that over the period number of Mithuns per household in type 1 village does not changed significantly except by the advent of other clan member's *Mithuns*. Where as in type 2 villages, the number of Mithuns have increased significantly. This is might be due to the fact that people who are living in type 1 village, due to proximity of town may find beneficial to invest their money in some other business. However, this is strictly to note that even in these (type 1) villages household have atleast 3-5 Mithuns minimally.

The forest is used mainly for fuel wood purpose. However, the dependency on the forest for fuel wood is found less in type 1 village as compared to type 2 village. During the field survey it has been found that due to proximity to the district town of Zero, people have now begun to use modern source of fuel for cooking such as LPG, kerosene, and electric heater also. I found use of LPG, kerosene and heaters along with their traditional fuel wood chulhas in most of the household of type 1 village. The same was not found in uniformity in the type 2 village. Only a few of them who are better off in the village have access to it. Even those who are better off cannot have round the year access to it especially during rainy season as it becomes difficult to transport any

goods. Here since most of the people are engaged in the agriculture, their consumption basket can be taken as their indicator of their income.

In case of type 1 village I found on average every second person has television, radio and cycle in their house; where as these was not found in case of type 2 village( its found in few household). Almost every fourth person has LPG in their house in type 1 village where as same cannot be found in case of type 2 village. Type 2 villages have a higher dependency on forest resources for their fuel wood and other purposes such as grazing of their livestock. Other consumer durables such as two-wheelers are more common in type 1 than in type 2 villages. This broadly suggests that type 1 village, on account of close proximity to the urban center have benefitted by alternative source of earning. This has been confirmed when I found the villagers of type 1 village in the evening in the Ziro township area, some were found selling their vegetables, some engaged in the business of *Apong*, the rice beer which the people of the valley and infact the state in general are very fond off. In my further enquiry about this business, one of my respondent, Mr. Tale (39,m), a contractor cum business man, told me,

Apong is not only our food but also our tradition. He further said as we offer tea to our guest, they used to offer apong in place. The people here takes it as source of energy and its one of the main food component in our festival. This business of selling apong is very much profitable here as we have our sufficient rice from the field which forms the major input for making it. This selling is done by our ladies and thus helps us economically.

Thus, it can be said that in compare to type 2 village, type 1 village are economically better off. However, it is to be noted here that even in type 1 village LPG is by and large found in every household yet they also cook their food in their traditional chulhas which they have been using generation to generation. Their sense of cultural ties become more apparent when I saw kitchen of some of the household who enjoy considerably higher status in society in terms of wealth(they are either doctors, engineers, contractors or government officers). Even these well off persons have, though their houses are made of concrete and marbles like any duplex bungalow of city, kitchen which are exactly found traditionally. This clearly reflects their adherence towards their norms and culture, no matter who and how rich they are.

This finding has led me for further investigation about how these people have been managing the forest resources especially in the community forest area. One of my respondents in the field survey, namely Mr. Bukur (39,m), a school teacher posted in type 1 village, explains

We have limited areas under forests. However, except in a few areas our forest have not degraded. So, sourcing wood has never been a problem. Keeping the forest intact requires constant work. We have to tend our seedlings and saplings, and replant at the first sight of open space, keeping the basic idea of silviculture in mind. The saplings from the deeper forests are transplanted into private groves in February or March.

The knowledge for the management of their resources in their own terms has been inherited from the time immemorial. They grow very different type of bamboo(locally known as *bije*). Bamboo can be considered as the one of their economic goods as a new Apatani house requires 2,500-3,000 bamboo culms and the entire valley required 391,400 bamboo culms for construction purposes, every year<sup>28</sup>. This signifies that bamboo is the lifeline of their economy. They harvest bamboos of 7-10 years growth for building their houses. *Pinus wallichiana* trees are also found at places. It has been found that the Apatanis greatly revered the old pinus trees. The huge pine tree 'Khoda Satnii' of the Khoda clan of Reru village is one such example<sup>29</sup>.

Use of community forest for fuelwood purpose:

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After use of forest for making houses, the next most widespread use of forest land is for collection of fuelwood for cooking. However, dependence on communal forest for fuel wood is not total in all the villages. The distribution of households by cooking media as per surveyed given below in the table.

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<sup>28</sup> R C Sundriyal estimates of G B Pant Institute of Himalayan Environment & Development, Itanagar.

<sup>29</sup> Source: A local well informed respondent working as interpreter in district court.

**Table 4.2 Distribution of Households in Study Villages by Cooking Media and by Village Type<sup>30</sup>**

(in Percentage)

Cooking Media	Type 1 Village	Type 2 Village
Fuelwood alone	37	97
LPG and Fuelwood combination.	63	3

It can be observe from table 4.2 that there seems to be shift , nevertheless modest , in favour of other sources of cooking energy such as LPG, kerosene, heater etc. This is more visible in case of type 1 village due to factors stated in preceding paragraphs and its almost negligible in case of type 2 village. This indicates two findings, either the village availability of fuelwood from CPR land is declining<sup>31</sup>over the time period especially in type 1 village or may be due to advent of LPG<sup>32</sup> and its easily accessibility led to shift in use of energy pattern. Interestingly, it was found in the field survey that the inhabitants of type 1 villages who have more access to LPG are also not using this source of fuel for cooking bulk of food. They use these alternative fuel only for making tea or some breakfast. The fact indicates that the dependency on traditional fuelwood does not change much than before.

Thus the source of fuelwood, grazing of Mithuns is an important indicator of the dependence on community forest. It becomes pertinent to note here that a part of demand of these are also complementated either by clan or by private forests of the tribe.

<sup>30</sup> Some households reported the use of kerosene to ignite fuelwood.(Source: Field Survey)

<sup>31</sup> As per field investigation some of the elderly old gentlemen told that some years back every village was totally dependent on forest for fuelwood.

<sup>32</sup> In the entire state of Arunachal Pradesh LPG has been supplied at comparatively lower rate compared to other states of India.

As per village council norms, every household is allowed to take a big truck of logs from the community forest. Its commercial value is about Rs. 4500 to 5000. It has been found further in the interview with the *gaonburah*<sup>33</sup> of one of the village that in case trees from communal land is cut for commercial purposes then the council is empowered to impose a fine on defaulters which exceeds more than its commercial value. This may act as deterrence for other violators for not repeating such act. However, for personal use even if it exceeds the limit of one truck per household, the council normally does not penalized it stringently.

My quest once again turned about the forest land where the Mithuns of the villages are found grazing. I asked a group of villagers, apart from my key respondent Mr. Bukur about the disputes due to common grazing land. They<sup>34</sup> explained me,

Hardly any people kills any animals of others at common grazing ground. We infact instead care about the others Mithuns as these animals are mostly left for months in jungles. Whenever anyone of us went to jungle to see our Mithuns we do take a care of others whether they have some injury or any kind of health problems. In case Mithun was found serious no matter whose it is, but the person who went to jungle and found it in that position often try to give some local first aid medicines might be some jungle antiseptics and later on returning he informs the same to owners.

In case anyone is found doing any harm to animals, belonging to others, his act is considered a very serious offence by the village council-*Buliang*, and the culprit is made to pay fine in terms of kind. This fine varies as per gravity of damage caused, which they assess according to their traditional system. In any case where an animal is found to have destroyed private property such as cultivation land, they do not harm the animal. In such a case the village council empowers the landowner whose premises have been wrongly attacked by animals to seize them as security for a claim to recover boarding costs and other damages. If the case fails to be settled between the victim and injurer, they pursue the village council for settlement. On determining the merit of the case council takes into consideration whether the animal entered the fringe area in the presence of either the owner of the animal or the victim. If the animal entered in the presence of victim and if victim is found to have deliberately allowed the animal to

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<sup>33</sup> Village council head man.

<sup>34</sup> This interview was taken on March 2006 in Hong village, which is the largest village of the Apatanis. About 800 houses are there in this village.

entered the land, then in such a case, the council penalizes the injurer nominally and reprimands the victim at the same time for allowing the animal into the land. The council consider it as the negligence on the part of both the injurer as well as victim<sup>35</sup>. The norms of council clearly stated that in no any such case the invaders(animal) should be harmed. This evidence is fully consistent with would resolve their disputes front by front or appeal for village council<sup>36</sup>.

Hunting is only allowed during festivals in the forest as per norms. For instance in the *Mioko* festival, which is celebrated by rotation by a group of villages together, requires a paw of a monkey and a monkey skull. Representatives of all the villages used to go for this annual hunt and only hunt one monkey a year from one community forest. This ensures the availability of the monkey for the coming years. According to Mr. Laliang (24,m), a post graduate student of the village narrates,

Our norms does not permit us for mass hunting whenever and wherever. Not everyday we go for hunting even during our festivals... This way we preserve our fauna for our coming generation. Infact we consider some animals as sacred and only used for extreme emergency such as if there is some calamity in villages; the village priest ask for sacrifice of some particular animal to get rid-off devil force.

I found this type of a statement that is narrative from many of the people I interviewed and is common in the entire Apatani tribe. Societal norms prohibit mass hunting of animals and thus helps in preserving the wild life of the valley.

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<sup>35</sup> This line of jurisdiction can be termed in the literature of law and economics as “comparative negligence”. This rule divides the cost of harm between the parties in proportion to the contribution of their negligence to the accident. For example, if the victim’s negligence is 20% responsible for her accidental harm, and the injurer’s negligence is 80% responsible for her accidental harm, then the victim may recover 80 % of her losses from the injurer. It can be compared with the statutory laws where most of the time in case of trespass damages, the rule of “strict liability” is followed and owner of the animal is fully liable to compensate the victim. The term ‘strict liability’ which in the law of torts denotes liability even in the absence of negligence. If efficiency requires only one party to take precaution, then “no liability” and “strict liability” are just efficient as a negligence rule. If efficiency requires bilateral precaution, then a negligence rule provides more efficient incentives for precaution than either “no liability” or “strict liability”. The victim is the residual bearer of harm under the simple negligence rule, whereas the injurer is the residual bearer of harm under the rule of strict liability with a defense of contributory negligence. In general, the residual bearer of harm internalizes the benefits of any of his actions that reduce the probability or severity of accidents, including more precaution and less activity. Reference: *Law and Economics*, Cotter and Ulen, pp. 309-312.

<sup>36</sup> Law and Economics scholars often employ models that explicitly assume that actors have perfect knowledge of legal rules which is not always practically found. Reference: *Order without laws*, R. Ellickson, p.52. foot note.



The Apatanis maintain several taboos associated with felling of certain tree species and animals. They have strong belief in taboo as they will worship the forces of nature and believe in supernatural powers. It seems that these taboos and social beliefs act as conservator of natural resources. Certain tree species are considered sacred while some fruits, flowers and animals hold a special position in their rituals and festivals. As such for Apatanis the controlled utilization of these species is vital. The sacred sentiment that people attached towards certain trees is due to the site where these are found or planted. They consider the ancient pine trees planted by their ancestors and forefathers as sacred. Even decaying trees of these species are not felled for private and commercial use. There are instances where fallen sacred trees have been used for the purposes of community welfare, e.g. planks are used as walks to cover marshy and muddy patches on dirt tracks during rains. Apatanis use flowers of the plum tree(*thakum*) in rituals and hence the tree is considered sacred<sup>37</sup>. During festival times and religious periods, people are restricted from entering the forests for cutting performing of rituals, customs and the preservation of natural resources such as forest.

#### Specific Cases :

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The field survey of the plateau provided deeper insights into different forms of penalties imposed in case of breach of norms, especially those concerning forests. Mr. Bukur, Mr. Taka and Mr. Tachang all well-informed persons about the area under investigation said, that the level of penalties are generally based on the seriousness of the case involved. They further added that the village council, while considering the merit of case, also underscore the personal trait of culprit. In this context, they would include the age of the person; the number of defaults committed by the concerned person, and the basis of committing the gaffe. Based on these factors the fate of the culprit is decided.

The other informant, Mr. Hari, a school teacher at Apatani village, informed me that in the usual course of felling trees, the council often imposed a fine in terms of procuring a

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<sup>37</sup> Pant , *Customs and Conservations*, p.65.

*Mithun*<sup>38</sup> from the defaulters. The Mithun depicts the level of prosperity of the local households. It has been observed that, Mithun is used for gift purposes in marriage ceremonies. In addition to this, the meat of the cow serves as a vital food product for majority of people in the state.. The market value of its meat averages around Rs. 60 to 90 per kg<sup>39</sup>.

The information also revealed that sometimes the penalty is taken, both in cash and kind. For instance, the procurement of Mithun as a fine is distributed amongst the people of the village for the consumption of its meat. At the same time, the defaulter is forced to pay a certain amount in cash, which is diverted towards the clan development fund. This cash is also used in the expenditure incurred to honor a guest to the village.

The transition from barter system to monetary transaction has led to greater use of money than exchange in terms of goods or products such as that of Mithun. It is noteworthy to exemplify this phenomenon with a particular incident in the village, involving illegal felling of trees by one of its inhabitants . This case can be dated back to 2001-02, in which a person was found guilty of felling trees illegally. Recognizing this activity as a serious breach of norms set by the village council, the defaulter was compelled to pay a sum of Rs.50,000 as penalty. Above all, the person was debarred from using resources for which he was fined<sup>40</sup>. The stringency of rules and regulations is well reflected in the nature and intensity of penalties imposed on the defaulter. However, his son could use the disputed resource once the father paid the required fine. As far as the time required to settle a case is concerned, it was revealed by one of the informants that it usually ranges between a week to a fortnight. However, in certain cases the time limit exceeds the given range and lasts upto a month or so. The time required for the settlement is generally based on the level of complexity involved in the case. It is interesting to note that despite the establishment of certain statutory institutions at various levels for the given purpose, the cases are seldom brought to the notice of such institutions.

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<sup>38</sup> Mithun is a bull like animal which have very high economic and cultural value in the entire state. It is also states' animal(local bovine species),scientifically known as *Bos frontalis*.

<sup>39</sup> Personal findings at market place.

<sup>40</sup> As told by one of the interviewer, Mr. Taka.

There is a high transaction cost involved in implementing the statutory laws in the remote corner state like Arunachal Pradesh. When it is about regulation of natural resource such as forest, it becomes imperative to compare the cost involved in it to sanction its rules and regulations. There are certain indirect indicators to measure the transaction costs involved in the governmental regulation of resource management. The number of forest department offices located near the resource site and the distance of the head quarter of forest department are two such important proxy indicators. Along with a high transaction cost involved in the process, a considerable distance of the headquarters from the forest departments also creates predicaments for effective monitoring by the concerned authorities. It causes serious problems such as leakage of the laws and the resultant failure to protect the resources from ruin or degradation. The absence of cadastral surveys in the concerned area creates further difficulties for the government to manage resources that fall within the unclassified category of forests. The table A-1 in the appendix, indicates that Apatani plateau which comes under Lower Subansiri district falls in the forest circle jurisdiction of Central Circle (Passighat). There are no account beat or non-account beat offices of the forest department in this district. It is costly to manage the affairs from the township of Passighat under which the jurisdiction of the plateau falls. It has also been observed that, the government forest officials, usually belonging to other parts of India or the state itself, exhibit less interest and commitment towards managing the resources efficiently than their local counterparts. Besides these, the local forest beat office do not have any maps or chart which shows demarcation of government reserved forest. Moreover, at every place of forest fencing is not possible. The local norms often considers rivulets, terrain and other such natural division as boundary for classification.

This clearly indicates the redundancy of these institutions, and lack of interest on the part of government to find solutions to such quagmires. The effectiveness of the customary laws, in devising various mechanisms to solve problems, provide sufficient reasons for the Apatanis to rely on them, than approach the governmental institutions for redressal of the intermittent conflicts.

Any violation of the customary law first goes to the village council. It has been found that any violations and disputes are settled at this level. If this does not happen and if the dissatisfied party wants to approach the Deputy Commissioner<sup>41</sup>(DC), the DC decides the matter with the help of the Political Interpreter who helps the DC in interpreting the customary laws and their social practices. If the disputants approach the DC directly, he normally sends them back to the village council. Sometimes the DC calls the members of the village council to decide the matter in his presence. These cases are usually settled outside the formal courts and written note of the final decision is sent to the DC's office<sup>42</sup>.

The customary practices that have the sanction of the society also serve the function of conflict prevention in the society. There is a saying among the Apatani tribesmen that reinforces this belief. It says that it is better to forego a strip of land (measuring a span of hand) if under conflicting ownership, rather than wasting time and wealth over it. This shows the peaceful character of the community and it is well reflected in their strict adherence to rules guiding their social behaviour. '*Dapo*' is one of the social practices commanding control in the Apatani society and described as under.

The term '*Dapo*' has been interpreted differently at different times depending upon the need of the community. *Dapo* is infact a sort of a peace treaty which began at earlier time when the Apatani began to settle here in this plateau. As they are surrounded by other tribe namely, Nishi, so in earlier time the valley witnessed some conflicts between them. *Dapo* is their local mechanism which minimizes the disputes to minimum. It has been found that Apatanis belief that formal treaties of friendship between the villages formed a fundamental part of their political system and assured peace<sup>43</sup>. An element of warning has been added to this treaty now a days (Pant,2002). Usually three poles of bamboo about 3-4 feet long are erected in a vertical criss-cross manner. In order to

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<sup>41</sup> It is to be noted here that in Arunachal Pradesh it is single line administration i.e. both judicial and administrative power is vested with the district head, Deputy Commissioner.

<sup>42</sup> R. Pant, *Customs and Conservation*, p.68.

<sup>43</sup> F. Haimendorf, *A Himalayan Tribe: From Cattle to Cash*,pp.41,82..

minimize tension or disputes in any type of forest land where there is high likelihood of a dispute arising, a structure depicting *Dapo* is erected at the boundary of such areas to emphasize the message. Even now a days written warning is also seen on the wooden plaque that mentions the sanctions or fines whatever as per their customs in the event of violation.

The next section deals with the management of water for irrigation purpose by the community.

Water:

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Water being a public good is a shared resource. Management plays a pivotal role in the optimal use of the existing resources. This implies that how far management is able to maximize the returns from the existing scarce inputs. Cooperation is key to the protection and equitable distribution of the water resources. Watershed management must take into account the needs of all those who depend on mountain water, including those who have the greatest stake in preserving healthy mountain ecosystems- the mountain people themselves.

Management of water:

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Water is a critical input to agriculture, especially in areas where traditional agriculture is practiced. The field survey conducted in the area of investigation, reveals that the entire process of irrigation is managed by the local people. The nature of management of water resources in farming is unique in its own way.

Irrigation farming such as wet cultivation of rice require communal work to maintain it, and to improve the water delivery system. In the absence of a disciplined schedule and scale of water distribution among the beneficiaries, very often economic returns could decline drastically.

The Apatani tribal people have also developed an efficient system of water management for paddy and fish culture that has remained sustainable for centuries. The system involves people's participation for common works and the available water of natural

streams is used judiciously in a planned manner for crop production. All streams coming out of surrounding hills are tapped at the beginning of the valley; channelised and diverted through a network of primary, secondary and tertiary channels to paddy fields. At a short distance above the terraces, some water is allowed to flow in the first feeder channel through a diversion, while the stream continues on its course. The feeder channel branches off at angles to lead water to any terraced paddy field which can be flooded or drained as per need by blocking or opening of connecting ducts locally known as *Huburs*. The cross section of the main and sub-channels vary in depth and width as per the load of water. These channels are pitched with locally available stones and boulders especially at the entry point for checking erosion due to flow of water. By adjusting the height of the outlet pipes, the water level in the rice field is maintained. A 10 cm water table is maintained in the plot by adjusting the height of outlet bamboo pipes. The excess water from the fields is drained into the Kale river, which flows through the middle of the valley. The channel for irrigation also carries a lot of natural fertilizers of rotten leaves from the wooded land to the fields.

Rice is supplemented with millet cultivated on elevated partition bound between rice plots. Pisciculture is done along with late variety of rice because of assured water supply and this provides additional income to the farmers. With a production of about 50 kg of fish equivalent to about 400-500 kg of additional rice in terms of monetary benefits, which compares favourably with similar systems in Java and Madagascar. With human labor, efficient management of water canal system as a major input and with very little organic manure, the Apatanis obtain a high energy output from paddy – cum-fish farming. The efficiency of the system is exceptionally high for rice cultivation 60 to 80 units per unit input. This wet rice cultivation with unique water management practices of the Apatanis, therefore is one of the most efficient agricultural systems, with an energy output/input ratio of upto 60-70 compared to about 9 for traditional agriculture(Mitchell,1979) and less than one for modern western agricultural system(Steinhart and Steinhart,1974).

According to Ramakrishnan and Kumar(1997), the yield of rice varies from 3.5 to 4.1 tonnes/hectares for both the varieties where as for Punjab its3.46tonnes/hectares<sup>44</sup>. Due to lack of data on apatani tribe a time series analysis cannot be done.

With 27-35 MJ units of energy output per labor hour, this system compares favourably with similar systems of China(32.8 MJ) (Dazhong and Pimentel,1984) and more modern agriculture of industrialised societies (Leach, 1976), such as United Kingdom, with an output of 40MJ units.

On my investigation in the field survey in one of the focus group discussion, the villagers of type 1 as well as type 2 villages explains about the mechanism of management of water as,

We manages the water right from its source till the field where our paddy are cultivated. Our entire water route is fenced by bamboos which we grow at our private forest land. Each one of us contribute the bamboos as per our bamboo productivity. We change these bamboos when it got rotten or whenever the fence got destroyed either by some animals or may be due to excessive rain in the valley. This is done by all the village members. Even our children help us indirectly by helping our hands such as picking piece of bamboos, tie the rope and making red tea etc. when we are engaged in erecting the bamboo walls to fence the water cannel. Almost all the villagers you will find engaged in this work in one form or another. Our women apart from helping in it, prepares apong for us which provide energy for further work<sup>45</sup>.

This shows that the entire community cares about the management of common resources like water and participate enthusiastically especially when the work of fencing of water takes place. Water is shared by all the members of the community. Some of the water is even diverted to a reservoir and is used when water scarcity occurs. No one has to pay any premium in cash to council in lieu of water they share. However, it is binding that every family member(15 years onwards) should help while erection of bamboo wall takes place. There appears to be hardly any cases where a household has not contributed in any form in the management of the water resources to the field.

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<sup>44</sup> Only 1997-98 data was available for the valley . that is why only this is taken as proxy for measurement. However , field survey reveals that approximately this remains the trends for the valley.

<sup>45</sup> Documentated in the Focus Group Discussion in the Hong village of the Apatani plateau in March, 2006. The group comprises of about 50 people who were participated from both types of villages. I took help of local interpreter as some of old people cannot speak either Hindi, Assamese or English.

When the water channel reaches near the paddy field, then the actual division of the resources take place. Since most of the cultivable lands of the people are found in a cluster at one place, as such there is need of immense cooperation and solidarity so that none can be deprived due to lack or scarcity of water. The water from the channel is distributed among the users in such a way that even the last, far-off field can also be irrigated fully. So far as sharing of water for irrigation among the users is concern, there is no major case of dispute that came to my notice during field survey. Their feeling of brotherhood can be described by the fact that without having any incentive from the downstream user of resources, the up stream user continues to supply sufficient share of water to other downstream users. As one of the respondent, Mr. Habung (53,m), narrates,

I did not come across any such incident of water dispute in my life in any villages especially which is near to my village. Even my neighbors does not seem to have experienced any such problems so far I know. You know it's a joint effort of the entire village and we find it very enjoying when almost everyone from the village participate with full vigor and spirit...

There is yet another kind of team effort which came to notice in field survey. It was revealed by one of the respondent, Mrs. Yaki <sup>46</sup>(43,f), who explains me,

The boys and girls of the same age group form themselves into a kind of communal labor gang known as patang. These members are always ready to assist in each other's fields and dams according to the principle of reciprocation...

It has been found that the apatanis make extensive use of irrigation channels to keep their lands under different states of submersion. In the words of Haimendorf: "Everyone of the larger streams rising on the wooded heights that ring Apatani country is tapped soon after it emerges from the forest"<sup>47</sup>.

The Apatani tribal people have also developed an efficient system of water management for paddy and fish culture that has remained sustainable for centuries. The system involves people's participation for common works and the available water of natural streams is used judiciously in a planned manner for crop production. All streams coming out of surrounding hills are tapped at the beginning of the valley; channelised

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<sup>46</sup> Mrs. Yaki, a Apatani Itanagar based school teacher, originally hails from Hong village. She gave me the detail insight of their tribe while my stay at Itanagar and accompany me in the field survey at villages near by Ziro.

<sup>47</sup> As cited in *Arunachal Panorama, The people of Arunachal Pradesh*, p.128.



and diverted through a network of primary, secondary and tertiary channels to paddy fields. At a short distance above the terraces, some water is allowed to flow in the first feeder channel through a diversion, while the stream continues on its course. The feeder channel branches off at angles to lead water to any terraced paddy field which can be flooded or drained as per need by blocking or opening of connecting ducts locally known as *Huburs*. The cross section of the main and sub-channels vary in depth and width as per the load of water. These channels are pitched with locally available stones and boulders especially at the entry point for checking erosion due to flow of water. By adjusting the height of the outlet pipes, the water level in the rice field is maintained. A 10 cm water table is maintained in the plot by adjusting the height of outlet bamboo pipes. The excess water from the fields is drained into the Kale river, which flows through the middle of the valley. The channel for irrigation also carries a lot of natural fertilizers of rotten leaves from the wooded land to the fields. The Apatnais with water use along with nutrient use in their paddy field.

Apatanis have evolved sedentary agriculture, chiefly in the form of wet rice cultivation in their extensive valley lands, using indigenous techniques. Their system of *Aji*<sup>48</sup> cultivation, using a combination of paddy and fish together with millet on the bunds separating each plot, is thought to be one of the most productive and efficient agricultural systems of the region<sup>49</sup>. In this system, a small pit is dug in each terrace in a series of terraces where paddy is grown. Fingerlings<sup>50</sup> are put in water in these pits. When water supply is sufficient in monsoon season, the whole paddy field is kept under shallow submergence of 5 to 10 cm and fishes come out of the pits and move around the whole submerged area of the terrace field. During water scarcity period, when water remains only in the pits, fishes run back to the pits and grow. In this system, fishes get better nutrition due to manuring of paddy fields and their growth is better due to availability larger surface area during full submergence of paddy fields. Thus, both paddy and fishes are produced together by proper management of rainwater.

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<sup>48</sup> In local language it means Rice Field.

<sup>49</sup> R A Singh and R C Gupta, *Traditional land and water management systems of North East hill region*, Indian Journal of Traditional Knowledge, 1 (2002) 32.

<sup>50</sup> Small fish.

As a result of prudent management of water resources for irrigation purposes, the requirement of fertilizers is not felt. It is well recognized that the use of fertilizers are harmful for the survival of fishes in the paddy fields. These practices reflect the norm of collective action. The Apatanis with cooperative effort under the overall supervision of the village headman, have optimized water use along with nutrient use in their rice field<sup>51</sup>.

#### Economic Value:

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The efficiency of well managed irrigation system can be examine by taking proxy indicator. Here the economic value generated by the paddy-cum-fish<sup>52</sup> farming is the returns to well managed irrigation system by the community.

The efficiency of the farming methods employed by the Apatani farmers is well reflected by the fact that their paddy-cum-fish agro-ecosystem are highly productive (400-500 kg / ha). It has been estimated that the given figure values 3 to 4 times the average yield of the paddy produced in the state. A heavy reliance on organic substances for the manuring of crops make the agrarian practices economically viable. Such conventional methods of farming reduces the cost of cultivation and eschew dependence on external inputs such as chemicals and fertilizers.

The economic and energy efficiencies and the input/output ratio for individual crops are given in table no A-5(Appendix). Here the inputs include only labor, organic manure and seeds; draft animal power is not used as an input. The output from the system and the net return to the farmer was higher under paddy, millet and fish combination than paddy alone or with paddy and millet. The input/output ratios are also high in case of paddy, millet and fish combined together than other two systems. It appears that widening plots by digging adjacent higher ground down to an irrigable stage is a successful in view of mounting population and evolution of new market opportunities. According to study by Rai, the net per capita monetary return through agriculture is

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<sup>51</sup> PS Ramakrishnan, Apatani Wet Rice Cultivation.

<sup>52</sup> It is to be noted here besides paddy and fish, millets are also grown up in the same plot by the Apatanis.

high. They sold as much as 40% of the rice produced to their neighboring tribes namely *Nishis* and the *Hill Miris* (Rai, 2005).

Irrigation management by the state:

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The P.W.D<sup>53</sup>. of the government now a days builds cement-walled canals along the banks of the rivulet that flows through the valley. During my visit to field trip I asked one of my respondent, Mr. Bukur, that building up of such cement walls by the government is a boon for the community in general and village in particular. Mr. Bukur answer was bit a pessimistic about it. Seeing my quest about the same he finally expressed that, “the cement begins to crack within a couple of years and leaves behind chunks of hard stone and mortar structure, debris which ultimately ruin the aquatic life as well as their canals”. As it is difficult for them to rebuild it , ultimately the canal dies; this is a one of the most desperate situation the valley is facing. In my visit to field I found the debris of such mortar which even diverted the route of water flow to undesired direction which lead to more serious environmental repercussions. Mr. Bukur sadly state that his village had already faced such degradation.

Inferences:

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During field survey it has been found that the Apatanis have strong networking among their community. This is reflected by the fact that they built their houses in cluster, leaving no space between the two houses. Conflicts on account of being so close to each other were not evident in my interviews with several village persons as well as in the direct discussions with the council member. The presence of houses in the close ‘cluster’ helps in faster dissemination of information and to judge about the character of reciprocity of each other. In this way, the houses built in such a manner helps indirectly in minimizing the transaction cost in terms of free and speedier information shared among themselves. Besides these, the close ‘cluster’ like a house give room to the people to know more about their character informally and denounced any such person whose activity level create a threat to their social customs and solidarity.

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<sup>53</sup> PWD means Public Works Department of Govt. of Arunachal Pradesh.

It has been revealed in the field survey that council meetings to resolve disputes are not so common. On an average, the meetings take place for 50 to 60 days in a year<sup>54</sup>. This indicates that disputes among the Apatanis are comparatively lesser than other adjoining tribes. This also shows the cooperative nature of the tribe.

The sense of strong bonding becomes more apparent especially during their festivals. Here the festivals have a strong bearing with their socio-economic life. The performance of *Mioko*, one of the main festivals of Apatanis, apart from being ritualistic, also arrogates the nature of a social obligation, following a fixed pattern of observance ascertained from time immemorial. Their symbols of unity and cohesion are also envisioned in their seasonal observances to which they look ahead with anticipative yearnings. The celebration of *Mioko* is also the juncture for visits of friends from other villages to the performing village<sup>55</sup>. Haimendorf has pointed out that whatever is lackadaisical in central authority in the Apatani social organization is more than compensated by the ceremonial bonds which unite them into a system of secure social dependence<sup>56</sup>. Further the disputes, which turn out between villages from time to time, are easily adjudicated within a secured pattern of social demeanour, and move, in course of their resolution, along the same channels of social explication as in the case of ceremonial gifts<sup>57</sup>. It has been found in the survey that in order to keep track with changing time, the norms of the council are also changed with the overall consent of the community. It is found that the presence of all village members is almost mandatory during this festival. Though there is a time cost involved in terms of opportunity cost in attending the rituals and also proceedings of some important meetings of the council, but it seems that societal returns to it counterbalance the cost of involvement in the rituals and meetings. This is so because the group participation often led to revelation of information about the personal traits which is very much important to beget the notion of 'trust' and 'reciprocity'- which are the qualifications of competent cooperative department.

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<sup>54</sup> It was asked indirectly in questionnaires, and also from the council members directly.

<sup>55</sup> As *Mioko* is celebrated in rotation wise.

<sup>56</sup> As cited in *Arunachal Panorama, The people of Arunachal Pradesh*, p.123.

<sup>57</sup> J.N. Chowdhury,.....*The People of Arunachal Pradesh*, pp.123-124.

As they have keener moral obligations to follow their norms as defection is treated very severely and as such repudiation is costly for defaulters in the long run. As such they need not enjoin enough monitoring or any kind of such activity. That is why when the State Government has been trying to prepare the land records, there has been resistance against extending its scope to the villages. The villagers argue that everyone knows every inch of land and no one violates any other person's right to use his land. Hence there is no need for maps and records or bringing the land record staff, to show the plot which people know from generation to generation<sup>58</sup>. As Ellickson describes in 'Order without law' to Shasta County, informal groups are not hierarchies, they do not have official sets of records. Despite lack of records, members mostly circulate relevant historical information by word of mouth and store it in their memories<sup>59</sup>. The essence of argument here is that *ex post* transaction cost is much lower as compared to other forms of regulation; such as one by the forest department of the state to regulate the forest resources where it involves a major chunk of cost in supervising in form of staffing, procuring information etc<sup>60</sup>. Another problem with the state regulation is noticed here is that of disseminating the information about the nature of statutory laws which are codified in English only. This brings disincentives on the part of local people to take an effort to know about it. In other words, in the terminology of economics, there is a high information cost involved in using statutory laws to govern local people. A close-knit group's members regard their norms superior to statutory laws, as distant lawmakers may be less informed than the local norm-makers. As such a close-knit group renders a relatively reliable and cheap system of informal social control. In the words of Acheson,

Fishermen feel strongly that the law should be kept at bay and that people should handle their own problems. Any fisherman who goes to the police about trap cutting not only looks ineffectual and ridiculous but is somewhat of a threat. When a man's traps are missing, taking the law into his own hands is not only more effective but also maintains his standing among fellow fishermen<sup>61</sup>.

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<sup>58</sup> J.N.Das(edited by P.M.Bakshi & Kusum), *Land System of Arunachal Pradesh*, p.35.

<sup>59</sup> Ellickson, *Law Without Order*.

<sup>60</sup> As discussed in our chapter 2 about the various inefficiencies related with the state regulation.

<sup>61</sup> As cited in Ellickson's, *Law without ...*, (Acheson, *The Lobster Gangs of Maine*), p.251.

Their very art of prudently managing the water for their field has led to self reliance in the field of agricultural production. Infact, a proportion of the augmented yield has been diverted towards the market. In the market they sell it in two forms- one by directly selling as rice, and another in its processed form of rice beer(*Apong*). Besides these, the activity of fish rearing in the same field is an additional source of income for them.

Thus the entire discussions show that the people residing in the plateau transgress the narrow limitations of self-interestedness and exhibit a greater sense of social and collective responsibility towards the utilization of natural resources.

### Challenges

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A few decades back like entire Arunachal Pradesh, this valley of Apatanis was isolated from the rest of the world. In order to safeguard their rich tribal indigenous culture the then British government enacted a new provision of Inner line Regulation in 1873 under the aegis of the Bengal Eastern Frontier Regulation Act 1873 which continues till date, according to which the non-locals were to obtain written permission from the designated authorities before entering the frontier tract. The intention behind this was to prohibit the poachers, money lenders, wood cutters, traders, missionaries, etc from exploiting the simple tribal folk and denying settlements of the non-tribes in the tribal areas.

Since then life in the said valley has changed gradually but drastically. It has been found that youth of this valley now optimistically want to join the new lucrative tertiary sector- mainly in the government jobs. Infact data of the state itself speaks of a jump in the growth of service sector. Right from the Sixth Plan onwards the sectoral allocation of fund is found highest in case of service sector. Though in the Sixth Plan major emphasis of fund allocation was given to agriculture sector but service sector in that period was just next to it<sup>62</sup>. Subsequent to this period, there is a decreasing trend in the allocation of fund in agriculture sector. Even the sectoral growth reveals the skewed

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<sup>62</sup> Refer Appendix Table No. A-4(1)

picture towards the tertiary sector in the later decades<sup>63</sup>. As such this valley also has not been untouched with this changing signals. The youth are now more prone towards joining in white collar jobs.

The changing pattern can be seen in the visual changes that are taking place. Now a days the roofs of the houses of people which were previously made up of bamboo and thatches are now gradually replaced by corrugated tin sheets being subsidized supplied by the government specially when village burns down. Another attempt of the government to introduced the grass carp three years back was not in tune with the sustainability. The fish replaced the common carp bred in the wet rice pound. The grass carp, once it ate up all the nutrients in the winter, ate up the paddy roots as well. As such people reverted to the common carp next year.

Another challenge to sustainability comes in the form of migration of young people to other places in the hope of joining the service sector in different parts of the state. This has lead to left the field untended<sup>64</sup>. Mr. Bukur expressed the view that if this trend were to continue, their indigenous system would be under stress. He even expressed his anguish against the opting of horticulture by clearing forest. He said, “ People do not realize that if they clear forests for horticulture the run off from the mountains will decrease and the nutrient flow to the fields will reduce. Our agriculture shall suffer”<sup>65</sup>.

Another point of concern is the conversion of area of Talle Valley into sanctuary by the government without taking any concern of the local community. This was the site (traditional communal hunting ground) where the local people used to grow *Taxus bacatta*<sup>66</sup>. Now nothing has been left of the plant, as it has been extracted for use of cancer treatment abroad. However, the local people are found trying their best to revive its plantation in their own lands.

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<sup>63</sup> Refer Appendix Table No. A - 4.

<sup>64</sup> As interviewed given by Bukur in my field investigation during March, 2006.

<sup>65</sup> As cited in *Down to Earth*, Article by Nitin Sethi, August 15, 2005, p.32.

<sup>66</sup> It is a medicinal herbs grown in this area.

## **CHAPTER V**

**CONCLUSION.**



This study has presented an overview of property rights regimes; their structure; and their functions depicting possible linkages between the local tribal inhabitants and their environment. It begins with a discussion of the ongoing debates centered around the pressing concern, namely, 'Tragedy of Commons'. Hardin has prescribed certain remedies to avert the tragedy of commons. Later, other scholars holding a similar view as Hardin, maintained that institutional arrangement is a key to overcome such contingences which Hardin had traced. There seems to be a convergence of ideas amongst scholars regarding the role of institutions in averting the said tragedy.

Different types of institutional arrangements have been prescribed by a range of scholars to overcome the problem of open access. The types of property rights regimes fall along a spectrum with open access and private property at its opposite ends. Property rights regimes are a necessary but not sufficient condition for the efficient use of environmental resources. Without clearly specified property rights, environmental resources cannot be sustained over time, but property rights alone cannot ensure levels that reflect social objectives. Property rights regime must meet certain design principles and perform critical functions of coordination and linkage between humans and their living environment.

Property rights structures are analysed in terms of externalities and transaction costs, and the main idea is that property rights lower transaction costs to the effect that cooperation between rights holders and duty bearers are facilitated, enabling the internalisation of externalities. The relative effectiveness of property rights structures in lowering transaction costs determines which structure is the most appropriate in a given resource use situation.

The theoretical understanding on common property resources in the preceding chapters indicated that there are alternative arguments provided by each school of thought. However, each explanation is laden with a myriad of merits and demerits. One of the most striking feature of various institutional arrangements proposed in these theories is that- compatibility of any particular property regime is specific to time and space. For example, as Olson stated that in case of heterogeneous groups, the norms of cooperation are difficult to follow because of diverse rationalities across groups. In such a case there is a need of Hobbesian leviathan to administer

the quagmire. To state another example, when exclusion becomes costly its always better to search for an alternative institutional arrangement rather than rely on the privatization *per se*. Similarly, state regulated institution has its own advantages and pitfalls.

The research project conducts an ethnographic study of a traditional village council(*Buliangs*) of Apatanis and delves into various modes of natural resource management, best suited to the demands of its local population. It attempts to provide deeper insights into the norms of cooperative action employed by the local people. The moot question here is to address the mechanism of organizing community-based property rights over natural resources such as forest and water. It has been found that Apatanis have different types of property arrangements ranging from private property domain to community forest grazing land. As indicated in the introductory chapter, the primary focus of the study is on community forest. The sample shows that in type 1 villages, the availability of communal land per person has declined over a period of time. A probable factor that explains this development is- greater proximity of the type 1 village to the urban centre. As a result of this, the pressure of urbanization on the communal forests has increased many folds. It is to be noted here that, this result could not be supplemented by statistical figure<sup>1</sup>.

*Mithun* is the most common grazing animal found on this type of land. The animal exhibits high economic value which can be gauged by its market value. The implication here is that any degradation of these pastures may be in the form of increasing pressure due to population, has its adverse affect on the livelihood of local people especially the poor. The local poor are more affected with this change due to the fact that they do not have much of forest land at their disposal. This in turn affects rearing of animals, especially the one (*Mithun*) which have high economic value. It is interesting to note here that almost every household has this animal, no matter how poor they are. One reason behind this might be in the earlier time this animal were good in number as compared to human population; as such every one anyhow able to have some access to this animal in past which is still in their disposal, though not in that quantity. This

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<sup>1</sup>This is due to unavailability of land records village-wise either with the government or the village council. However, such developments could be traced by employing other qualitative methods during the field survey such as during the mobile interviews with different individual members of the forest.

clearly establishes the fact that if this trend of pressure on community land tends to continue then it has adverse affect on the livelihood of those marginalized section of villagers. It has also been revealed from the survey that their local council is taking stock of this problem and engaged in designing some new framework to tackle this problem. However , it is not found out what type of mechanism exactly they will follow within their jurisdiction to avert this crisis.

A major chunk of the dependence of the villagers on this type of forest is in the form of fuelwood. Normally the village council permits one full truck of woods for this purpose. It has been came to notice that there were some cases of illegal falling of trees, though they were caught and penalized as per their norms, but the question here which must be addressed is that, when the population will increase or due to any such external socks how far their local village management is able to mitigate these eventualities. So far it seems that there village council is competent to tackle with the present generation. This is so because the notion of trust and reciprocity is found still very strong here. The sense of cooperation behavior is very much prevalent.

Regarding type 1 village, the surveyed data shows that there is a shift on the dependence on energy pattern for cooking purposes. This might be due to its proximity to better infrastructure which enables the villagers to access to other sources of energy for cooking. This pattern changes on energy dependence can led to lesser dependence on the forest for fuelwood collection. But again the question is that, the infrastructural development often led to population pressure which might be a threat for the sustainability of these natural resources. This is so because the accelerative population pressure will demand for additional care and monitoring of the resources and as a result, it will amplify the transaction cost. Besides this, the population pressure might led to the collapse of mutual trust and reciprocity and hence the crumble of cooperation behavior. This is so because the information cost involved in scanning of one's behavior, which is the core of the theory of cooperation, become costly and time taking.

Thus, it can be said that whenever there is a stress of population on the common property resources, it has negative affect on the cooperation behavior, *ceteris paribus*.

However, presently the villages of this tribe are enjoying the benefits of cooperation and successfully managing their affairs within the jurisdiction of village council as it has been explained in the last chapter that there is reluctance among the people to take up their conflicts either to sub-divisional or district court. The tribal communities are unaware of the different statutory forums available for redress of their problems. Whatever little exposure these communities have had to the modern system of judiciary is generally not very amenable, hence these people prefer not to go the formal courts. The people find easier and speedier redressed of their disputes and any conflicts within the jurisdiction of village council. The inherent beliefs and lesser transaction cost involved in the local adjudication of cases helps further in cementing their social bonding and immense faith on their village council.

It has come out as a one of the finding that, the traditional institutions have an advantage over the formal legal institutions. This is essentially due to two reasons: first, the indigenous people are cognizant about their social systems, norms, values etc and second, the members of the council are a part of the same society and hence would not normally delay in the settlement of disputes. On the other hand, the members of formal institutions who belongs to other society considers the locals as strange and alien. Moreover, rules contrived by the society and implemented through the traditional institution elicit ameliorate compliance .

One important thing is noticed that monetization of the economy has also led to change in the nature of fines i.e. previously fine and penalty was to be paid in terms of kind, but now it has been gradually replacing by cash as we have seen in one of the case in the last chapter.

From the law and economics perspectives, the nature of liability rule which this council exhibits also in a sense calls for a group effort responsibility. For example, we have noticed in one particular nature of norms of the council when any livestock infringes others boundary in the cultivated field and the same has been noticed by the owner of the field and let the animal enter deliberately, the council in such a case give its verdict which is in tune with the logic of liability rule of “comparative negligence” which rests on the logic of bilateral precaution unlike the rule of “strict liability” which the statutory law often follows in such cases.

If we compare the efficiency of forest department, then it seems that due to high *ex post* transaction cost involved in managing the forest, it becomes not only costly but also some times rather impossible to monitor the resources. Besides this, other impediments of state regulation which are stated in chapter two often led to mismanagement of resources in large. Moreover, the local state forest officials find hardly any incentive to take an effort honestly to safeguard the forests.

Regarding managing of water for irrigation, the field findings hardly reflects any considerable disputes. The manifestation of collective action of irrigation can be best examined through output of agriculture. Though there is lack of consistent year-wise data, but some previous study done by scholars had statistically claimed the fact that per hectare yield of paddy is almost four to five times than other part of the state and it is also comparable with the green revolution areas. Further, due to judicious management of water through their cooperative behavior, they are able to have an unique paddy-cum- fishery farming. This has additionally supporting their livelihood patterns. This finding supports our hypothesis that being land is a scarcer factor for the Apatanis, but with collective sharing and efficient managing of the water, the agricultural output of this plateau (Apatani Plateau) seems enough to support the livelihood of the local people. Furthermore, a part of the increased output has find its way to the market<sup>2</sup>.

Apatanis exhibits both capitalistic trend as well as communal cooperation. On the one hand they recognizes private possession of land and, on the other, group alliance involving communal cooperation, ruled by traditionalism. The spirit of co-operation is bound to spill over to other sphere as well.

But its very difficult to make a generalization of this statement. This depends upto large extent on the networking, group behavior, mutual cooperation of the society in general- *social capital*. As we have seen in the case of Putnam's empirical finding about the social capital of northern and southern Italy, where it was found that, horizontal type of social bondage led to more equitable society and thus there will be cooperation amongst the people.

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<sup>2</sup> Field survey indicates that they have marketable surplus.

The real problems which the council faces in the light of advancement of many different stake holders at the same domain. For example, the emergence of joint forest management, Panchayati Raj institutions etc.- people hold pessimistic view about these upcoming institutions as they regard these changes would led to dilapidation of their local norms and customs.

The need is to sustain this indigenous institution for the better well being of the local people in particular. Here there is a role for the government to play . The state can act as a facilitator to support resource users to behave in a desirable way and impart necessary training for scientific management of resources. The state and other NGOs can provide information and help the locals to ensure individual incentives are compatible with the collective interest.

Another recommendation which stems out from the research suggests that, there is a need for the proper documentation of their indigenous law primarily pertaining to natural resource management. The documentation must be undertaken with utmost care so that it can ensure the wider participation of the local people in it. Further, there is a need of a mechanism to developed which can bridge the gap in the provisions of the statutory and customary laws vis-à-vis natural resource management of the tribal in general and Apatanis in particular.

It has also been noticed that, there is erosion of customary practices among the younger generation. There is a need to inculcate the vitality of customary laws among the younger generation so that this time immemorial customs and traditions of the Apatanis which is so far prudently managing the natural resources should be transmitted to coming generation.

Future research is require to strive to gain an ameliorate understanding of the evolution of resource management and other rural institutions, and the ways in which policy can affect outcomes. There is a need of multidisciplinary approach in order to understand these indigenous institutions.

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## APPENDIX

<b>Table: A-1 District-wise Number of Forest Circle, Division, Range and Beat Offices in Arunachal Pradesh</b>						
(As on 31.03.2000)						
Districts	Forest Circles Covering the District	No. of Forest Division		No. of Ranges	No. of Beat Offices	
		Territo rial	Survey/  WP/ SF Research & Wildlife		Accounts Beat	Non- Accounts Beat
Tawang	Western Circle (Banderdewa)	1	-	4	-	4
West Kameng	Western Circle (Banderdewa)	3	2	21	8	19
East Kameng	Western Circle (Banderdewa)	1	-	4	1	6
Papumpare	Western Circle (Banderdewa)	2	6	21	5	19
<b>Lower Subansiri</b>	<b>Central Circle (Pasighat)</b>	<b>1</b>	<b>-</b>	<b>8</b>	<b>-</b>	<b>-</b>
Upper Subansiri	Central Circle (Pasighat)	1	-	3	-	8
West Siang	Central Circle (Pasighat)	1	-	7	-	13
East Siang	Central Circle (Pasighat)	1	1	7	1	16
Upper Siang	Central Circle (Pasighat)	1	1	6	1	8
Dibang Valley	Eastern Circle (Tezu)	2	2	9	2	9
Lohit	Eastern Circle (Tezu)	2	2	15	3	9
Changlang	Southern Circle (Deomali)	2	1	10	2	5
Tirap	Southern Circle (Deomali)	2	1	10		7
<b>Arunachal Pradesh</b>	<b>4</b>	<b>20</b>	<b>16</b>	<b>125</b>	<b>23</b>	<b>122</b>

Source: Statistical Abstract of Arunachal Pradesh 2000, Directorate of Economics and Statistics, Govt. of Arunachal Pradesh, Itanagar.

## APPENDIX

Table: A-2 District wise Forest Cover Areas in Arunachal Pradesh  
( in percent) (as on 12.03.2001)

Districts	Percentage Forest Cover
Tawang	56.9
Dibang Valley	70.6
Lohit	74.8
East Siang	82
Upper Siang	83.8
Changlang	84.8
Upper Subansiri	85.7
West Kameng	86.2
West Siang	87.3
Tirap	88.3
<b>Lower Subansiri</b>	<b>90.3</b>
East Kameng	91.8
Papum Pare	93.5

(Source: www.indiastats.com)

**Table A-3: Common village land (ha) per household by population size-class of villages in different states**

State / UT	(Census' 91) population size-class of villages							All
	Less than 100	101 - 200	201- 600	601 - 1200	1201 - 2000	2001 - 5000	more than 5000	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Andhra Pradesh	0.84	-	0.26	0.33	0.18	0.18	0.09	0.17
<b>Arunachal Pradesh</b>	<b>2.93</b>	<b>2.23</b>	<b>0.53</b>	<b>1.57</b>	<b>0.25</b>	<b>0.08</b>	<b>0.31</b>	<b>1.15</b>
Assam	0.18	0.05	0.08	0.06	0.03	0.02	0.01	0.05
Bihar	0.28	0.49	0.28	0.09	0.08	0.03	0.03	0.08
Gujarat	75.84	-	2.06	1.38	0.57	0.51	0.21	0.72
Haryana	0.47	-	0.08	0.07	0.08	0.04	0.03	0.05
Himachal Pradesh	1.7	0.23	0.19	0.26	0.04	0.39	0.07	0.33
Jammu & Kashmir	0.32	0.71	0.19	0.14	0.1	0.05	0.04	0.14
Karnataka	0.08	1.24	0.39	0.32	0.18	0.22	0.15	0.25
Kerala	-	-	-	-	0.21	0.1	-	0.12
Madhya Pradesh	9.03	0.48	1.16	0.57	0.48	0.26	0.23	0.74
Maharashtra	10.8	-	1.16	0.28	0.19	0.21	0.1	0.3
Manipur	2.21	0.19	0.46	0.14	0.06	0.03	0.01	0.17
Meghalaya	0.94	0.64	0.93	0.4	0.07	0.22	-	0.72
Mizoram	2.87	14.97	4.29	5.37	2.85	0.85	0.13	4.37
Nagaland	-	0.04	0.81	0.82	0.58	2.65	0.64	1.49
Orissa	2.63	0.31	0.27	0.25	0.12	0.08	0.09	0.28
Punjab	0.1	-	0.05	0.03	0.02	0	0	0.02
Rajasthan	1027.34	0.34	0.83	0.63	0.81	0.67	0.74	2.04
Sikkim	0.65	0.36	0.64	0.27	0.21	0.04	0.07	0.25
Tamil Nadu	0.3	-	0.78	0.29	0.17	0.12	0.06	0.16
Tripura	-	-	-	-	0.04	0.02	0	0.01
Uttar Pradesh	0.83	0.67	0.2	0.15	0.06	0.07	0.04	0.14
West Bengal	0.22	0.82	0.12	0.02	0.02	0.01	0.01	0.03
A. & N. Islands	-	-	0.04	0.22	0.2	0.02	-	0.13
India	6.28	0.56	0.55	0.31	0.19	0.15	0.09	0.31

Source: Report No. 452: Common Property Resources in India, Jan - June 1998, NSS 54<sup>th</sup> Round

**Table A-4: Changes in Sectoral Composition of Income in Arunachal Pradesh  
(in percent)**

Sector	1970-71	1980-81	1990-91	2000-01
Primary	59.19	47.28	46.19	34.67
Secondary	20.33	22.21	21.56	23.65
Tertiary	20.48	30.51	32.25	41.68

Sources: Extracted from Estimates of Domestic Product,  
Directorate of Economics and Statistics,  
Government of Arunachal Pradesh Itanagar.

**Table A-4(i) :Sectoral Plan Outlay in Arunachal Pradesh  
since Sixth Five Year Plan (Rs. in Crores)**

Plan Period	Agriculture & Allied Activity	Industry & Minerals	Transpo rt & Commu nication	Energy	Services	Total
Sixth (1980-85)	78.52 (37.04)	10.26 (4.84)	56.10 (26.46)	-	67.12 (31.66)	212.00 (100)
Seventh (1985-90)	118.05 (29.51)	9.50 (2.38)	127.15 (31.79)	36.90 (9.22)	108.40 (27.10)	400.00 (100)
Eighth (1992-97)	264.38 (22.89)	24.49 (2.12)	343.93 (29.78)	151.96 (13.16)	370.24 (32.05)	1155.00 (100)
Ninth (1997-2002)	749.69 (21.00)	46.10 (1.29)	929.51 (26.04)	467.13 (13.09)	1377.46 (38.58)	3569.89 (100)
Tenth Draft (2002-2007)	1100.79 (23.79)	82.57 (1.79)	1161.56 (25.10)	595.38 (12.87)	1686.70 (36.45)	4627.00 (100)

(Note: Figures in bracket indicates percent.)

Source: Directorate of Planning and Development, Government of Arunachal Pradesh,  
Itanagar.

**Table A-5: Input / Output pattern of Paddy-cum-Fish Agro-Ecosystem of the Apatanis of Lower Subansiri District of Arunachal Pradesh**

Production Measures	Agro-Ecosystems	
	Energy(MJ/ha/ year)	Monetary (Rs/ha/ year)
<b>Input Total</b>		
Paddy	875.5	2579
Paddy + Millet	908.1	2675
Paddy + Millet + Fish	906.6	2753
<b>Labor</b>		
Paddy	741	2250
Millet	31.5	91.5
Fish	36	102
Organic Manure	125	250
<b>Seed</b>		
Paddy	9.5	79
Millet	1.1	4
Fish	0.4	100
<b>Output Total</b>		
Paddy	61325.5	8272
Paddy + Millet	63218	8460
Paddy + Millet + Fish	68182	10062
<b>Input: Output</b>		
Paddy	70.05	3.2
Paddy + Millet	69.62	3.16
Paddy + Millet + Fish	75.21	3.65

Source: P.S. Ramakrishnan, The science behind rotational bush fallow agriculture systems Proceeding of the Indian Academy of Sciences (Plant Sciences), 93 (1984) 379. (Cited from S.C. Rai's, article Apatani paddy-cum-fish cultivation: An indigenous hill farming system North East India)

