Community Involvement in Conservation: An Assessment of Impacts and Implications in the Annapurna Conservation Area, Nepal

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DECLARATION

This work, presented for the degree of Doctor of Philosophy, conforms to the University of Edinburgh's current research degree regulations. I am responsible for composing this thesis. It represents my own work and where the work of others has been used it is duly acknowledged.

ABSTRACT

Nepal has established an extensive network of protected areas to conserve biodiversity. Several problems relating to management of these protected areas have emerged, such as wildlife poaching and park-people conflicts. To address these problems, local communities have been given more responsibilities in protected area management by creating new categories of protected areas. This research investigates the success of such an approach from the perspectives both of biodiversity conservation and the livelihoods of local communities.

The perceived success of a community-based protected area management was examined in the Annapurna region, Nepal. An integrated biophysical and social survey was designed and carried out for a stratified sample village communities. A field site sampling strategy was designed to examine the effect of two factors: conservation legislation, referring explicitly to establishment of the protected area, and tourism. To evaluate the impact of legislation, areas both inside and outside the protected area were compared. In addition, areas with and without tourism within the protected area were analysed. A biophysical survey was conducted to assess the present status of wildlife and forest resources, and current pressures on forest resources. This was achieved by assessing the intensity of anthropogenic disturbance in forest stands.

A complementary social survey using various tools such as PRA, structured interviews, semi-structured interviews and questionnaire surveys was conducted in 14 village settlements. The questionnaire survey measured the economic losses due to crop damage and livestock depredation by wildlife. The structured interviews gathered information on conservation awareness, local attitudes toward conservation, resource use patterns, effectiveness of the conservation area regulation, relationships between people and the protected area and perceived benefits of conservation. Various participatory tools such as social mapping, seasonal calendars, and matrices were also used to gain further insights into biodiversity conservation.

The results indicate that significant differences, particularly in forest structure, exist between the protected area and areas lying outside. Higher basal area, higher species diversity, higher species richness and low cut stumps number indicate improvement in forest conditions. Local communities have effectively controlled hunting. Therefore, it is evident that wildlife populations are stable, if not on the increase. The results suggest that there has been significant reduction in use of fuelwood. The involvement of local communities in conservation tends to reduce poaching and indiscriminate use of resources, particularly fuelwood. The results also demonstrate that, at present, there has been no significant negative impact of tourism on forest resources and wildlife populations in ACA.

The community-based approach was successful in involving an overwhelming majority of local communities in conservation. The observed differences with local attitudes towards conservation are found to be significant. It is evident that local communities have perceived positive changes in their village settlements. There is a promising collaborative relationship between local communities and conservation authorities. As a result, there is a significant development in local institutions. The conservation regulation has devolved enough management authority. It is evident that awareness of and compliance with the regulation should be increased. Examination of the costs and benefits of conservation suggests that although benefits at the community level are high, costs due to crop damage by wildlife at the individual household level are found to be critical. Tourism is found to be an opportunity for conservation of the area. In the light of these findings, this research concludes that community-based protected area management approaches could be a good alternative to a conventional people exclusive park formation in many situations, particularly in developing countries.

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ABBREVIATIONS

ACA	Annapurna Conservation Area
ACAP	Annapurna Conservation Area Project
ACAMC	Annapurna Conservation Area Management Committee
ADB	Asian Development Bank
ADMADE	Administrative Management Design
ANOVA	Analysis of Variance
CAMC	Conservation Area Management Committee
CAMG	Conservation Area Management Guidelines
CAMPFIR	Communal Areas Management Programme for Indigenous Resources
CAMR	Conservation Area Management Regulation
CBD	Convention on Biological Diversity
CBS	Central Bureau of Statistics
CITES	Convention on International Trade in Endangered Species
DCAMC	District Conservation Area Management Committee
DFID	Department for International Development
DFO	District Forest Office
DNPWC	Department of National Parks and Wildlife Conservation
FAO	Food and Agriculture Organization of the United Nations
FINNIDA	Finnish International Development Agency
FUG	Forest Users' Group
GDP	Gross Domestic Product
HELVETAS	Swiss Association for International Cooperation
HMG	His Majesty's Government
HMGN	His Majesty's Government of Nepal
ICDP	Integrated Conservation and Development Project
IUCN	The World Conservation Union
JICA	Japan International Cooperation Agency
JOVC	Japan Overseas Cooperation Volunteers
KMTNC	King Mahendra Trust for Nature Conservation
LGA	Local Self-Governance Act
LPG	Liquid Petroleum Gas
LIRDP	Luangwa Integrated Resource Development Project
LSU	Livestock Unit
PA	Protected Area
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal
SAARC	South Asian Association for Regional Cooperation
SE	Standard Error
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

VDC	Village Development Committee
WCMC	World Conservation Monitoring Centre
WNPC	World National Parks Congress
WWF	World Wildlife Fund

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CHAPTER I

INTRODUCTION

1.1 RESEARCH CONTEXT AND RATIONALE

Biodiversity conservation has been recognised as an issue of global importance (El-Ashry 1995). Protected areas have the key role in biodiversity conservation. Protected area management has become one of the major elements of national development planning in many countries because protected areas are seen as central instruments for the conservation of biodiversity (Pimbert & Pretty 1997). Nevertheless, most protected areas in the past were established by either displacing local communities or without giving sufficient consideration to their livelihood alternatives. Conservationists often worked in isolation from the surrounding communities and dissociated themselves from local livelihood needs (Ghimire & Pimbert 1997). It has also been suggested that the western concept of protected areas has focused on the vision of protected areas as being untouched and pristine wilderness (Suri 1996). Many protected area management programmes have overlooked the importance of locally developed ways of meeting needs for food, health, shelter, energy and other fundamental human needs (Pimbert & Pretty 1997). The dominant conservation ideology has erroneously held that human activities are necessarily damaging to natural ecosystems, and therefore they should not be involved in protected area management (Suri 1996).

The lessons learned and experienced gained over the last few decades have shown that for effective park management, local people should be involved in the management of a protected area (Brandon & Wells 1992; DNPWC 1996; Rao et al. 2002b; Wells & Brandon 1992). This indicates that the success or failure of conservation programmes is often primarily determined by social factors (Mascia et al. 2003). This shift in conservation philosophy has resulted in an increasing emphasis on involving local communities in conservation and linking conservation with development (Brandon & Wells 1992; Dudley et al. 1999a; IUCN 1998; Lehmkuhl et al. 1988; Mishra 1982a; Sherpa et al. 1986; Stolton & Dudley 1999; Wells & Brandon 1992). The 'Community-based Conservation Approach' is one of the approaches developed with the aim of involving local communities in biodiversity conservation. However, there is not enough evidence yet to indicate whether the approach is successful in meeting the needs both of local people and biodiversity conservation. It has been argued, for example, that this approach has not reduced the pressure on biodiversity (Schaik & Rijksen 2002). Despite the lack of scientific evidence of success, the approach has been widely promoted in Nepal, predominantly based on anecdotal experience rather than firm evidence of success. This potential weakness has stimulated the present research.

1.2 INTRODUCING THE RESEARCH TOPIC AND APPROACHES

The present research evaluates the success of the first community-based conservation programme in Nepal, which is designated as a conservation area, in protecting and improving local livelihoods and ecological conditions in the Annapurna region. The conservation area approach is designed to achieve long-term national biodiversity conservation goals and improvement of local livelihoods (Brandon & Wells 1992; Gurung & DeCoursey 2000; KMTNC-ACAP 1997; Nepal 2002a). Success of a conservation programme very much depends on careful integration of conservation and improvement of local livelihoods in Nepal. A vast majority of the rural people in Nepal still depend on depleted forest resources for subsistence use of fuel, fodder, timber and medicine (Hough & Sherpa 1989). Firewood supplies about 75 per cent of the total energy demand in the country (Sharma 1991); however in Annapurna it has been reported that fuelwood meets more than 97% of the total energy needs (Hough & Sherpa 1989). In addition to local needs, the area has had to fulfil the demands of increasing tourism. Therefore, the concept of a conservation area was crafted to address biodiversity conservation needs, local socio-economic development and tourism management, in an integrated manner.

The Annapurna Conservation Area (ACA) is the first conservation area and the largest protected area in Nepal where biodiversity conservation concerns are integrated with local livelihood concerns. ACA aimed to reverse past environmental degradation, to move towards sustainable utilisation, and to conserve species and ecosystems by empowering local people (Hough & Sherpa 1989). This is also one of the most cited examples of community-based conservation in Asia. However it has been reported that the critical link between development and conservation is obscured in ACA (Wells & Brandon 1992). On the other hand, the ACA management has been referred as a win-win-win scenario where local communities, tourists and environment are benefiting (Nepal 2000b). Either way, there is very limited scientific evidence to measure and quantify the level of success in ACA. Therefore, an integrated biophysical and social survey was carried out to analyse ecological and social effectiveness, local institutional capacity, and legal status of the conservation area.

1.3 Aim

The aim of this study is to assess the impact and implications of community-based conservation in the Annapurna Conservation Area, Nepal. The study uses comparative analysis of biophysical and social information inside the designated protected area and outside the protected area in the neighbouring villages. Four groups of fourteen villages were selected in order to achieve this aim. The research investigates three principal hypotheses: -

Hypothesis 1: That community involvement results in quantifiable conservation benefits in protected areas.

This hypothesis is tested by exploring the following questions:

1. Has the involvement of local communities in protected area management had any influence on the pattern of forest use and its impact on forest resources?
2. Have any changes in wildlife populations occurred as a result of community participation in protected area management?
3. Has the community involvement changed attitude, awareness and behaviour of local communities towards conservation and protected area management?

Hypothesis 2: That local communities receive significant benefits from community-based conservation.

This is tested by exploring the following questions:

1. What are the crucial elements that encourage local people to become involved in conservation initiatives of a protected area?
2. What are the costs and benefits of conservation to a local community within a protected area?
3. Do the present policies offer enough incentive for the involvement of local people in the planning and management of protected area?

Hypothesis 3: That tourism has a net positive impact on the ecological situation in protected areas.

This is tested by exploring the following questions:

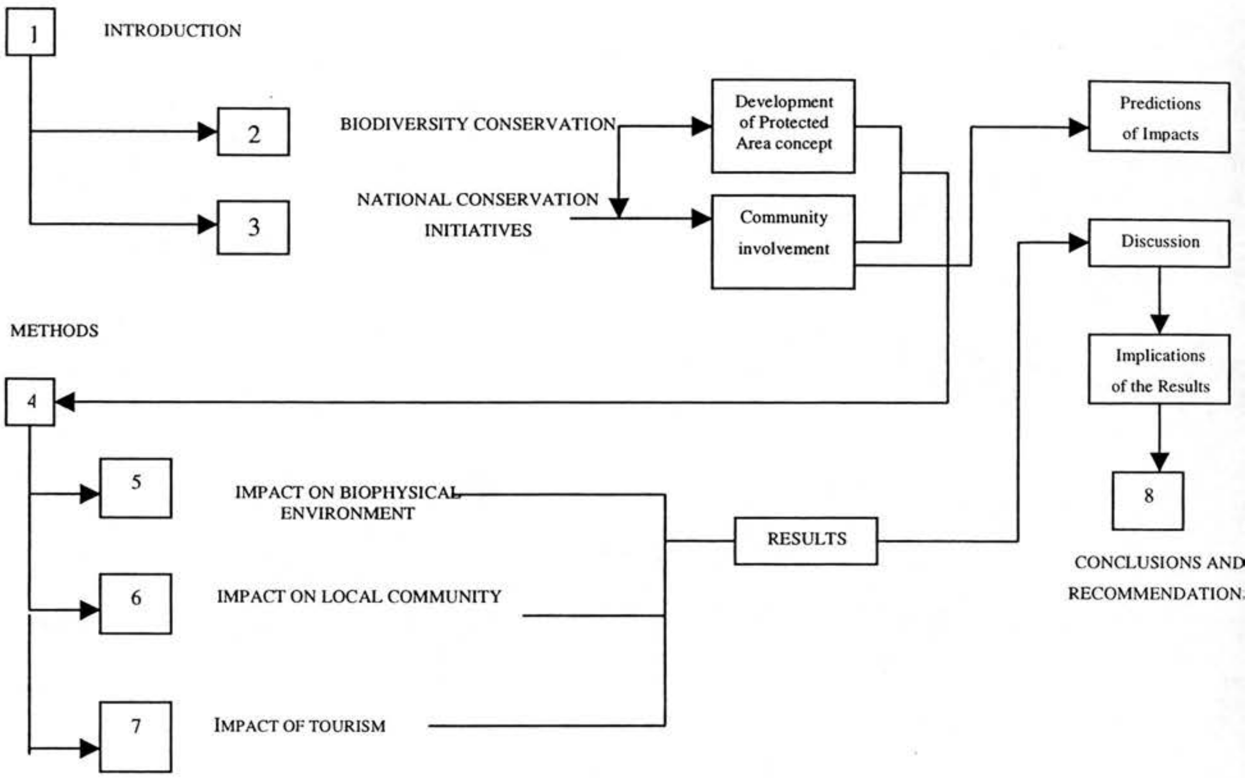
1. Is tourism an incentive for conservation?
2. Has tourism accelerated the degradation of forest resources, wildlife and other resources?
3. Is tourism an incentive for local communities involvement in conservation?

1.4 THESIS OUTLINE

This thesis is divided into eight chapters as outlined in figure 1.1. The present chapter provides a general context for the research aims and explains briefly the rationale behind the study. Chapters 2 and 3 review the issues in more details. The emergence of a protected area system, benefits and issues of protected areas, and realisation of community involvement in conservation are discussed with an assessment of relevant literature in Chapter 2. Biodiversity conservation in Nepal, the development of protected area system in the country, legal steps to involve local communities in conservation and a detailed background to the study area are covered in Chapter 3.

In Chapter 4, the methodology and techniques used in this study are outlined. The importance of integrating biophysical and social survey techniques is explained. The results obtained are presented in Chapters 5, 6 and 7. The impacts of community-based conservation on the protected area management are analysed and discussed in Chapter 5. Costs and benefits of community-based conservation to local communities are assessed and discussed in Chapter 6. The impacts of tourism in the community-based conservation are analysed and discussed in Chapter 7. Chapter 8 summarises the conclusions drawn from this study and considers the implications that the results have for the improvement in the community-based conservation approach in Nepal and elsewhere in the world.

Figure 1. 1 A schematic view of the research structure



This figure shows the research structure by chapter indicated by numbered boxes. They are arranged to highlight the linkages between them and to illustrate the development of the arguments.

CHAPTER II

BIODIVERSITY CONSERVATION, PROTECTED AREAS AND LOCAL COMMUNITIES

2.1 BACKGROUND

Conservation of biological diversity or biodiversity has received significant attention over the past few decades worldwide. Article two of the Convention on Biological Diversity defined the term as "*the variability among living organisms from all sources including, inter alias, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystem*" (CBD 1994). Biodiversity may be addressed at many levels, from genes to ecosystems, but for most practical purposes the diversity of organisms is central, and species diversity is the most useful general measure (Groombridge & Jenkins 2000).

Species have value as commodities and as amenities and they can also have moral or ethical values (Norton 1988). Species have *moral value* even if that moral value depends on us. Economists also calculate an *optional value* for species of unknown worth i.e., the value we should place on the possibility that a future discovery will make a species useful that we currently consider useless (Fisher and Hanemann cited in Norton 1988). A temperate tree species (a Yew plant *Taxus baccata*) generally used for firewood in the mountain regions of Nepal provides a good example. This plant was discovered to possess many chemical compounds (such as Taxol) of potential benefit as a cure for cancer. This suddenly increased its economic value in the market thereby encouraging the villagers to save the species on one hand and increasing demand from outside on the other.

According to various estimates, species are becoming extinct at an ever-increasing rate, resulting in a predicted loss of species at unprecedented rate during the next two decades (Norton 1988; Wilson 2001). Lack of knowledge about total numbers of species and their global or regional distributions, however, make extinction rates difficult to quantify precisely (Ceballos & Ehrlich 2000). The global loss of biodiversity has been described as a product of two phenomena (Norgaard 1988). First, human population levels have forced the transformation of relatively undisturbed areas into lands for agriculture. Second, both industrial and agricultural pollutants have applied a new and narrowly uniform selective pressure on species (Norgaard 1988). Forest became an integral component of the global economy (Wilson et al. 1999). People increasingly drew their supplies not from any one local ecosystem but from the entire world capital of living resources. Habitat modification or loss is now generally considered to be the most important factor acting to increase species extinction (Groombridge & Jenkins 2000; Myers 1997). The current estimates of extinction rates attributed to habitat destruction generally rely on species-area relationships (Kinzig & Harte 2000). Many of the predictions based on species-area relationships appear to overestimate the extent of current species extinction (May et al. 1995). Conservation efforts have necessarily focused on saving as many threatened species as possible and preferably by protecting habitats and entire ecosystems.

This accelerated world-wide loss of natural resources has forced a few individuals to think about some of the dangers inherent in man's increasing impact on nature and its potential consequences for the earth's ecological functions and the fulfilment of basic human development needs. Some researches have promoted the concept of a *purposeful responsibility* for ensuring survival of at least representative areas of natural ecosystems. One mechanism of conserving many species and ecosystem is the establishment of protected areas (McNeely 1982b).

Protected areas have been established for a level of protection of ecosystems, biological processes and species (Berger 2003). The level to which protection can extend beyond protected borders has never been explicitly clear (Berger 2003). Early attempts to manage entire landscapes for conservation failed because of misidentification of so called keystone species (Goldstein 1999). It was hoped that managing one or a few obvious species, such as top carnivores would somehow safeguard the broadest possible community (Goldstein 1999). However, protected areas have all lost species as a result of management decisions that failed to protect park integrity (Janzen 1983 cited in Berger 2003). Such conservation efforts need to protect biodiversity, beyond just saving keystone species. This means, reserves alone are not adequate for nature conservation but they are cornerstone on which regional strategies are built (Johns 1992; Margules & Pressey 2000).

The species centred conservation approach is not effective to protect all species under threat (Myers et al. 2000). As a result an *ecosystems approach* to conservation was developed with a concern about species centred approach not working very well (Goldstein 1999). The approach emphasises on ecological systems and to maximise ecological integrity (Yaffee 1999). The biotic focus of management includes both species and ecosystems and adds ecosystem function to species composition and structure as important management considerations (Yaffee 1999). As a result, restoration or maintenance of ecological processes such as nutrient cycling, disturbance regimes, or hydrological flow, becomes important for species composition and diversity (Sparks 1995 cited in Yaffee 1999). However, there has been a growing dichotomy between preservation of single species and an ecosystem based approach to conservation (Seriogo et al. 2003). An ecosystem-based conservation approach is likely to help to protect the ecological integrity of protected areas. Hence, the focus is shifting to ecosystem-level conservation (Richter 1993).

The continuing rapid loss of biodiversity is leading conservationists to broadening their priorities to ensure the survival of as many species as possible (Brummitt & Lughadha

2003). One of the approaches is the identification of '*biological hotspots*'. These are areas with extraordinary concentration of species and high number of endemic species facing a high level of threat (Myers et al. 2000). However it has been claimed that even if we succeed in saving all the priority hotspots, we will still face loss of representation in most countries and ecoregions (Ginsberg 1999). Furthermore, the huge size of some hotspots makes effective conservation action impractical (Brummitt & Lughadha 2003).

An '*ecoregional approach*' has recently been developed by World Wildlife Fund – USA. The ecoregion approach seeks to advance biodiversity conservation planning beyond previous approaches such as hotspots to achieve representation of habitat types at global scale (Olson and Dinerstein 1998 cited in Jepson & Whittaker 2002). However, there is a lack of information regarding at which level most practical conservation actions are determined, and for a spatial resolution at which practical conservation planning takes place (Chown et al. 2003). Therefore, unless we find ways to protect ecosystem function and ensure the long-term stability of the global environment, priority-setting exercises will merely serve as historical documents showing us the patterns of diversity we have lost (Ginsberg 1999).

2.2 DEFINITION AND CATEGORISATIONS OF PROTECTED AREAS

Protected areas such as national parks and reserves represent today one of the most important methods of conserving biological diversity worldwide (Wells & Brandon 1992). These protected areas are designed to conserve many of the world's habitats and species (Brandon & Wells 1992). The first protected area, the Yellowstone National Park was created in north-western Wyoming, USA in 1872 (Pimbert & Pretty 1997). The Royal National Park in 1875 and Canada's Banff National Park in 1885 followed this. By the turn of the century, 20 national parks and similar reserves had been established in various countries. With this, the protected area movement grew steadily and has now spread over the entire globe. The world's protected areas are the greatest legacy we can leave to future generations - to ensure that our descendants have access to nature and all the material and spiritual wealth that it represents (IUCN 1994). The International Union for Conservation of Nature and Natural Resources (IUCN) proposed an "official" definition of a "national park". IUCN – the World Conservation Union, defines a protected area as:

"*An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means*" (IUCN 1994).

IUCN has defined a series of six protected area management categories, based on primary management objective (IUCN 1994). These are summarised in table 2.1.

2.3 GROWTH AND DEVELOPMENT OF PROTECTED AREAS

Protected areas were established in response to the clear recognition of the need to control human activities to avoid harmful impact on biodiversity. Growth of protected areas was slow in the early years, but began to increase in the 1920's and 1930's, before being brought almost to a halt by World War II (Harrison et al. 1982). By the early 1950s, momentum had begun to gather again and the decade from 1970 saw about twice as many new areas created as had existed in 1969 (Harrison et al. 1982).

The 1972 World National Parks Conference gave additional momentum in the establishment of protected areas. During this decade, the total number of protected areas rose from 1,823 to 2,671, and the area protected increased from 217 million ha to 396 million ha. Today, the world's network of 30,350 protected areas extends over a total area of 13,232,275 km^2, which represents 8.83 per cent of total land area (Green & Paine 1999). Out of this, 17,892 (59 per cent) of protected areas are less than 1000 ha in size

Table 2.1 IUCN protected area management categories and definitions

CATEGORY Ia	***Strict Nature Reserve: protected area managed mainly for science*** Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.
CATEGORY Ib	Wilderness Area: protected area managed mainly for wilderness protection Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.
CATEGORY II	National Park: protected area managed mainly for ecosystem protection and recreation Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
CATEGORY III	Natural Monument: protected area managed mainly for conservation of specific natural features Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.
CATEGORY IV	Habitat/Species Management Area: protected area managed mainly for conservation through management intervention Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.
CATEGORY V	Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.
CATEGORY VI	Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

Source: IUCN (1994)

and they account for a total of 28,713 km^2, which is only 0.2 per cent of the global protected areas network. Just 1673 (6 per cent) of protected areas exceed 1000 km^2, but they comprise 11.56 million km^2 or 87 per cent of the global network (Green & Paine

1999). A much smaller proportion of the world's seas (barely 1 per cent) are protected (IUCN 1994). The 2003 United Nations List of Protected Areas released at the Vth IUCN World Park Congress in Durban, South Africa reported more than 100,000 protected areas that include World Heritage Sites, Biosphere Reserves and other protected areas (IUCN 2003a).

Efforts are underway to step from the art of protected area management to science and technology of managing resources for various and usually integrated purposes (Miller 1982). The creation of large protected areas, going beyond national political boundaries, is underway. The Great Limpop Trans-frontier Park with 35,000 km^2 is one of the examples. The park unites the Kruger National Park in South Africa with national parks in Mozambique and Zimbabwe giving free wandering spaces to hundreds of species including elephants, rhinoceroses and giraffes (New-Scientist 2002). But there are still many gaps in the extent of protected areas at the national level. The majority of protected area systems (66 per cent) cover less than 10 per cent of the total land area. A few countries such as Syria, Yemen and the Maldives have yet to establish protected area systems (Green & Paine 1999).

At the turn of the millennium, the world's 30,350 protected areas represent a tremendous investment by countries of the world to protect their biological diversity for future generations (IUCN 1994). The present network of protected areas in the different categories for the world is summarised below (Table 2. 2). It indicates that a higher number of protected areas with IUCN categories IV – VI has been established both in terms of number and area coverage. Looking at the changes in the IUCN categories over time, it appears that there is a trend of global shift in protected area management towards community involvement.

Table 2.2 Global protected area network classified by IUCN Management Category

S. No.	Categories	Number	Per cent	Extent (km^2)	Per cent
1	I	5198	17%	1,919,058	14%
2	II	3384	11%	4,001,605	30%
3	III	2122	7%	193,021	1%
4	IV	11,171	37%	2,459,703	19%
5	V	5578	18%	1,057,448	8%
6	VI	2897	10%	3,601,440	27%
7	Total	30,350	100%	13,232,275	99%

Source: Green and Paine (1999)

2.3.1 Benefits of protected areas

Establishment of a protected area has costs and benefits at community, national and regional levels (McNeely 1988). Parks and reserves have proved a key means of protecting genetic diversity, and protecting species from extinction (Lucas 1982). Such areas safeguard outstanding landscapes and seascapes; maintain biodiversity; protect water catchments; minimise erosion; act as catalysts for environment education; stimulate tourism; support sustainable utilisation; and provide for wide range of recreational uses (Thorsell 1990). Many of these areas are important to local communities for their cultural values and sustainable supply of resources on which they depend for their survival (Lucas 1982). They are important also for research and education, and contribute significantly to local and regional economies, most obviously from tourism.

Importance of sustainable use benefits of resources with conservation was recognised in 1980s. The *World Conservation Strategy* prepared by IUCN together with UNEP, WWF, UNESCO and FAO in 1980 provided an important focus to conservation. The strategy defines conservation as "*the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations*" (Talbot 1982). The three specific objectives of conservation as presented in the strategy were to maintain essential ecological processes and life support systems; to preserve genetic diversity and to ensure the sustainable utilisation of species and ecosystems (IUCN/UNEP/WWF 1980)

The *Convention on Biological Diversity* (CBD) provided a new thrust for collective and responsible action related to protected areas (Krattiger et al. 1994). Article One of the CBD defines the objectives of this Convention. These are the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits derived from the use of genetic resources (Burhenne-Guilmin & Glowka 1994). The importance of protected areas is explicitly recognised in the Convention on Biological Diversity Article VII (IUCN 1994).

These are the clear biophysical contributions of parks and protected areas to the objectives these international environmental Strategy and Convention. However, to be effective in terms of the strategy, the establishment and management of protected areas must be set within the social and economic development of the countries involved. A major problem of the past is that these areas were all too often seen to be in opposition to development, or at best, not to contribute to them. To protect rare and endangered flora and fauna, there is clearly a need for the traditional parks. Indeed, there is need for vastly more such strictly protected areas worldwide. But there is also a need for many additional kinds of protected areas, managed with different objectives for producing the benefits more closely associated with society (Talbot 1982).

The recent Vth IUCN World Park Congress held in Durban, South Africa renewed emphasis on the importance and value of protected areas to society as a whole and sets agenda for next decade. The Congress started with the theme 'Benefits Beyond Boundaries'. The Durban Action Plan produced by the Congress stressed that protected areas cannot remain in isolation from surrounding areas of land and sea, and from the communities and the economic activities in and around protected areas (IUCN 2003a). The Congress calls to fulfil protected areas' critical role in global biodiversity conservation and to implement protected areas' fundamental role in sustainable development (IUCN 2003a).

2.3.2 Costs of protected areas

Protected areas such as national parks and wildlife reserves have been recognised as playing a crucial role in conserving biodiversity (Wells & Brandon 1992). In spite of this recognition of protected areas, many of these areas are becoming more difficult to keep preserved areas intact and undisturbed because of the hardship they impose on local communities (Wells & Brandon 1992). Poaching of supposedly protected species such as rhinoceros, tiger, elephant is frequently reported. Furthermore, protected areas are facing many challenges such as external threats associated with pollution and climate change, irresponsible tourism, infrastructure development and ever-increasing demands for land and water resources. The increasing demand for wild animals and plants, and their products is threatening the existence of rare and endangered species in protected areas (IUCN 2003b). Moreover, many protected areas lack serious political support and have inadequate financial and other resources (IUCN 1994).

In general, the main objective in establishing protected areas has been protection of nature, relying on guard patrols and penalties to exclude local people (Wells & Brandon 1992). This follows the conventional concept of establishing protected areas in developed countries (Carew-Reid 1990). Local communities and other civil society interest groups are not sufficiently engaged in identification and management of protected areas (IUCN 2003b). Most countries that have set up protected areas have created nature or wildlife reserves with no provision for traditional practices. This indicates that protected areas are governed in the absence of a system of shared objectives, value and principles (IUCN 2003b). Therefore, the phenomenon of "*paper parks*", where protected areas are designated but have not been implemented in any serious ways, is increasingly recognised (Dudley et al. 1999a; IUCN 2003b; Terborgh & Schaik 2002). That means, the creation of national parks and reserves has been less an act than a process; many paper parks are being degraded by illegal activities (Terborgh & Schaik 2002). Many countries have ambitious programme of protected areas, but only few of these are considered priority units, with established management plans for their protection. It has been reported that Brazil has more 'paper parks' than guards in the Amazon (Terborgh & Schaik 2002). There are, therefore, no direct protective activities in such parks (Bernhardson 1986).

A number of protected areas suffer from poaching, logging, agricultural encroachment or other forms of degradation (Wells & Brandon 1992). Poaching of wildlife has been considered a universal phenomenon in a large majority of tropical parks (Terborgh & Schaik 2002) A study based on over 15 years of wildlife surveys in Thailand has made it abundantly clear, that there is virtually no protected area in the country that is free from serious poaching problems (Brockelamn & Dearden 1990). Poachers can roam unimpeded in areas that are remote from park administration. Lack of regular patrolling by guards in remote areas is the main factor responsible for the high level of poaching. A study carried out by Bruner et al. (2001) has shown that higher density of guards in a park has increased its effectiveness. However, more radical law–enforcement methods such as shooting at poachers by guards have also proven not to be viable strategies. Most officials and experts now agree that more frequent patrolling by guards and improvement of relations with local villagers through extension work are keys to improved protection (Brockelamn & Dearden 1990; Castro et al. 2001). Thus, effectively engaging local people in management and decision-making is an important dimension that needs to be addressed (Castro et al. 2001).

On the other hand, imposing protected areas on rural communities has had a number of negative consequences such as the restriction of access to traditionally used resources (Mishra 1982b); the game laws which allowed hunting by permit only made their normal subsistence hunting illegal (Lusigi 1982); the disruption of local cultures and economies by tourists (Hough 1988); increased depredation on crops and livestock by wild animals (Mishra 1982b) and displacement of people from their traditional lands leading to social and cultural disruption, enforced poverty, anomaly shown by symptoms of hopelessness, and even death (Calhour 1972 and Lusigi 1984 cited in Hough 1988). These adverse effects have generated resentment and hostility that has led to vandalism, such as the setting of fires and the damage or destruction of park property, the refusal of local people to sell food to park staff, and, in extreme cases, the murder of park employees. On the other hand local human populations are apt to violate park boundaries and regulations by hunting animals, cutting down trees, and grazing their stock inside the park (Hough 1988). The present protected areas are therefore surrounded by populations that have often little sympathy for the park system or for conservation efforts in general (Lusigi 1982). The situation indicates that protected areas will not survive for long whenever local people remain impoverished and are denied access to needed resources inside protected areas (Brechin et al. 1991; Brown & Kothari 2002).

In many areas there are wildlife conservation laws in place but the enforcement of laws is either very weak or not seriously considered by protected area managers. Hunting is banned and is therefore illegal in most countries, yet it is widely practised in the absence of effective law enforcement (Brockelamn & Dearden 1990; Nepal 2002b; Newby 1982). Hunting of wildlife may form part of long-standing traditions that is difficult to change. However, with the exception of particularly rare species, it has been argued that traditional hunting is still largely insignificant to wildlife numbers (Newby 1982). Throughout Africa and Asia, protected areas are protected from illegal incursion (encroachment) and exploitation (poaching) by teams of guards. The steep decline in the numbers of elephants and rhinos in African parks during 1980's, however, demonstrates that these law enforcement efforts are not fully effective. Although the parks were established in the mid-1950's, limited resources precluded the effective management of these conservation areas (Hough 1994). Similarly, reports from various Asian countries such as Thailand, Myanmar, India, Nepal, and Indonesia reveal that protected areas in these countries have also greatly suffered from illegal poaching, hunting, fishing, and livestock grazing thereby threatening wild flora and fauna despite good wildlife laws in place (Brockelamn & Dearden 1990; Fox et al. 1996; Kothari 1994; Mishra 1997; Nepal

2002a; Nepal 2002b; Nepal et al. 2002; Rao et al. 2002b; Sekhar 1998; Wardojo 1994). Some of the poaching reports are very alarming. For example, poachers in Nepal killed 25 rhinoceroses in seven months in 2002 (Gajurel 2002; Ghimire 2002). The government organised 'Nepal Rhino Count 2000' reported 612 rhinoceroses remaining in the wild (DNPWC 2000).

Local communities' dependence on park resources is still very high in many countries. A recent study in the Serengeti National Park, Tanzania has shown that a large proportion of the meat consumed by the local communities close to the park was bush meat obtained illegally from the National Park or associated protected areas (Loibooki et al. 2002). Thousands of domestic livestock, particularly domestic water buffaloes were reported to graze inside the Koshi Tappu Wildlife Reserve, Nepal (Chapagain 2003). The grazing pressure in this wildlife reserve indicates the level of dependency of local people for their subsistence on park resources. The people have not accepted conservation plans implemented in these parks mostly because of lack of other livelihood opportunities. In many cases, there has simply been no assessment of human needs. Planning still tacitly assumes that these countries will develop in the same way as Western countries and that these ideas can be transplanted without modification (Lusigi 1982). Wildlife in Africa, in particular gorilla populations, is so heavily exploited that it seems the only solution for its protection is the creation of national parks and reserves under strict control and with a certain amount of international supervision. Though the gorilla is totally protected by legislation, it is inferred that actual protection does not exist (Ayensu 1982). There are a number of comparable dilemmas in other African states. A similar situation prevails in Asia. Many of the former hunting and forest preserves have been converted to today's national parks and wildlife sanctuaries (Mishra 1991). Most countries of the region are heavily dependent on direct harvesting from nature (MacKinnon 1994). Growing economic activities such as agriculture, fisheries, timber logging, irrigation and electricity generation have weakened traditional conservation practices.

The declaration of the park, and the resulting restrictions on traditional practices such as cattle grazing and collection of forest products have caused widespread resentment among the local people. Conflicts between park authorities and local communities have been reported in almost all national parks in Nepal (Nepal 2002a). It was recently reported that the park authority killed 88 domestic buffaloes grazing inside the Koshi Tappu Wildlife Reserve in Nepal to protect 150 endangered wild water buffaloes (Chapagain 2003). Ives et al. (1989) reported that several hundred high-altitude local communities were forcibly expelled from their traditional homeland and abandoned without compensation during the development of the Lake Rara National Park in western Nepal. These actions are often difficult to justify from a point of view of local communities who were there from generation to generation.

Therefore, improving law enforcement is likely to increase local hostility and social isolation, and hence serve as a disincentive for effective conservation work (Hough 1994). The conventional approach to protected area management often known as 'fences-and-fines', in general, has failed in many countries mainly because of its top down nature, and it also failed to take into account economic and other interests of local communities, or to involve them in making conservation related decisions (Songorwa et al. 2000). However, protected area authorities in many parts of the developing world have still not abandoned their policies to exclude local community involvement in park management and continuation of traditional livelihood strategies (Nepal 2002b).

There is a considerable body of literature that has analysed the major constraints to biodiversity conservation and ultimately the effective management of protected areas (Ajai 1994; Bruner et al. 2001; Cole 1994; Kamara 1994; Kothari 1994; Murphree 1994; Pauchard & Villarroel 2002; Ranjitsinh 1982; Sriwatanapongse 1994; Wardojo 1994). These are summarised in the following table 2.3.

Table 2.3 Summary of some of the major constraints to biodiversity conservation and the effective management of protected areas around the world as reported in literatures

No.	Some constraints to biodiversity conservation
1.	Protected area coverage is not representative of major ecosystems. Generally, biodiversity outside protected areas has not yet been taken into account. Conservation attempts are often oriented towards high profile activities such as tiger or rhinoceros conservation.
2.	Many protected areas in developing countries are too small and too isolated given the destruction of suitable habitats in surrounding areas. The breakdown of habitat corridors and the resultant isolation of populations have had the most impact on large mammals.
3.	Research and training facilities for biodiversity protection and management are very limited. Applied research, which could be utilised for practical managerial purposes in protected areas, is still in a nascent stage in many parts of the world. This means that there is limited scientific information to support comprehensive management programmes of a protected area.
4.	Lack of finances and the consequent lack of protective personnel is an almost universal major drawback.
5.	The physical boundaries around protected areas have not been established on the basis of ecological and scientific criteria.
6.	Inadequate enforcement of legislation, inadequacy of the laws to assist appropriate management and protection, and the leniency of the law courts in dealing with the offenders.
7.	Threat of mega-development works such as hydroelectricity, irrigation and roads.
8.	Inadequate government initiatives to conserve biodiversity.
9.	Lack of adequate willingness among protected area managers to listen and talk openly with local community on a topic about which they felt strongly.
10.	Institutional and policy reforms are often not developed in response to real need. They are largely driven by availability of donor funding for the sector thus leaving the question of what will happen when a donor terminates funding for a particular project.
11.	Not enough initiatives to involve local communities, private sector and NGO partners in protected area management.

This indicates that for the successful conservation of biodiversity through a protected area management system, there needs to be major reform particularly in developing countries. More effort needs to be devoted to carefully addressing the constraints indicated above. Nevertheless, a study carried out on effectiveness of parks in protecting tropical biodiversity has claimed significantly better conditions inside the parks than in their surrounding area (Bruner et al. 2001). This study also mentioned that park effectiveness was correlated most strongly with density of guards. This suggests that there are proven ways to manage protected areas effectively but they demand the provision of adequate financial, institutional and human resources input (Castro et al. 2001). Even then, many protected areas may not gain the support of local communities, which is also shown to be essential for success. Therefore, the Durban Action Plan has called for implementation of protected areas' fundamental role in sustainable development (IUCN 2003b). The Congress has also emphasised on the rights of local communities in relation to natural resources and biodiversity conservation (IUCN 2003b).

2.3.3 The search for ways of resolving the conservation dilemma

It has been recognised that protected areas are difficult to implement in countries where boundaries were not enforceable due to inadequate government resources, weak management capacities, remote sites, and ineffective legal systems (Salafsky & Margoluis 2002). Most protected areas were originally established with little or no regards for local people (Wells & Brandon 1992). In response to these limitations, there is growing recognition of the need to respect traditional activities of the people who for generations have lived, hunted and fished there (Wells & Brandon 1992). Indeed many in the conservation community believe that the future of biodiversity conservation and protected areas in developing countries is unpromising unless local communities become an integral part of conservation efforts and benefit economically from these efforts (MacKinnon 2001). It seems evident that an increasingly constructive compromise will need to be sought with mechanisms that will see protected areas established with the co-operation of local communities and landowners and with management arrangements which meet the needs of communities and owners but are compatible with an acceptable level of preservation of natural and landscape values (Lucas 1982). The Vth IUCN World

Parks Congress recognised that protected areas cannot remain in isolation from the communities and the economic activities in and around them (IUCN 2003b).

Therefore, protected areas have strategic reasons for initiating the search for solutions to these conflicts as, in the long term, their survival is dependent on political support (Hough 1988). Protected areas are an integral part of a global shift towards the concept of sustainable development as articulated in the moves towards greater environmental responsibility since the second world war; notably the World Commission on Environment and Development, Brundtland Report also know as "Our Common Future" (WECD 1987). In addition Agenda 21 of the Rio Earth Summit clearly articulates international recognition that community empowerment is necessary for sustainable development (Robinson 1993 cited in Nepal 2002b). However, despite the fact that the formal idea of national parks has been in existence since the 1872 creation of Yellowstone National Park in the USA, such areas seem to be increasingly unable to protect many features that they were established to protect because, unlike the original national park model, they suffer from population pressure in areas of resource deprivation. The reason for this is not related to the design and management of protected areas themselves, although this may be important in some cases, but more to what is happening outside the reserves. Protected areas have become islands in a sea of change in aspects such as climate, hydrology, vegetation, fauna and aesthetic values in parks as a result of outside influence (Brockelamn & Dearden 1990).

With the change in perspectives with regard to protected area planning and management, the National Parks in 'developing countries' have tended to deviate from the western model of strict protection in order to include economic development of local people in their park management philosophy. This frequently builds on long established traditions of local involvement. For example, the Royal Chitwan National Park, Nepal has been managed in such a way as to allow for the limited collection of grassland products to meet vital needs of local people for structural material (Lehmkuhl et al. 1988). It has been increasingly accepted that park management policies in some countries should allow limited access to park resources by the local people to meet their subsistence and cultural needs. Too much access to the natural resources of a park may however simply cause people to rely on the park resources and manage their own land less intensively than hitherto (Sharma & Shaw 1993). Nevertheless, a recent study in the Royal Chitwan National Park provided an alarming picture of the sustainability of nature conservation and park-people relations in the park (Straede & Helles 2000). Research should be seen as a legitimate and essential, indeed routine, activity in most protected areas, particularly in the biologically rich reserves in the tropical countries. A recent study indicated that protected area management authorities must have a clear policy of what research they will actively encourage and how to ensure that the results are manageable (Thorsell 1990).

As a result of these pressures the conservation approach shifted to involve local communities to promote economic development in conjunction with protected areas (Salafsky & Margoluis 2002; Wells & Brandon 1992). However, meeting the challenge of economic, social, cultural, ecological and political will requires some basic changes in philosophy, both on part of some conservationists and of some developers (Talbot 1982). One such change involves a shift from the approach that a park is being protected "against" people, to the approach that is being protected "for" people. This does not mean that the park is open to logging or hunting but that it recognises that by protecting the area it is making a real contribution to human welfare (Talbot 1982). The physical management of the area may not change, but the political, financial and general public support will change, and the chances that the park will remain a park will be greatly improved (Talbot 1982). As protected areas are seen in the context of a changing world, the 1982 National Park Congress, in Bali widely addressed the need to look at how the concept of protected areas may evolve to meet society's changing needs. One of the major concerns of the conservationists and protected area managers during the Bali Congress was that the successful management of a protected area must include the co-operation and support of local people. This congress called for increased support for communities next to parks through such measures as education, revenue sharing, participation in decisions, appropriate development schemes near protected areas and where compatible with the protected areas objectives access to resources (McNeely & Miller 1982). Thus, the park managers and planners started *searching for the ways* to balance between the values of conserving the world's biodiversity and local needs of the people living within or in the vicinity of protected areas. These people are a particularly important group that is affected by conservation measures (Brandon & Wells 1992). Because of their geographic proximity, cultural and historical associations, and the likelihood that they will continue to live in the area, local people are closely linked to protected areas in both time and space. Most often, those people are directly dependent on park resources for their livelihood (Fox et al. 1996; Lehmkuhl et al. 1988; Mishra 1982a).

There has been a broadening of perspectives with regard to protected areas planning and management over the last 20 years. Some of the key indicators of what may accurately be discussed as a `paradigm shift' include the following (Dudley et al. 1999b):

1. A change in emphasis from government to civil society, with protected area planning and management moving from centralised to decentralised models.
2. Recognition of the importance of the connections between protected areas.
3. An increase in the range of values that protected areas is expected to fulfil.
4. A growth in availability of expertise and methodologies to improve selection and management.
5. Development of a more dynamic approach to protected area planning.
6. Greater emphasis on bottom-up approaches.
7. The emergence of social science as an important contributor to protected area planning and management.
8. A changing role for protected area managers, with the emphasis shifting from direction to facilitation.
9. A rapid growth in knowledge about and interest in restoration with protected area networks.

With global changes in perspectives with regard to protected area planning and management, Nepal has also made changes in the protected area management strategies.

2.4 INTERNATIONAL POLICY REVISION

There has been a constant evolution in the global perception of protected areas. The third World Congress on National Park and Protected Areas held in 1982 in Bali, Indonesia recognised that successful management of protected areas ultimately depends on the co-operation and support of local people. The Bali Congress was of particular interest because it was directed specifically at defining the role of protected areas in supporting social and economic development. The Bali declaration provides the broad policy framework to guide future action, based on the conviction that protected areas, when designed and managed appropriately, can bring major sustainable benefits to society (WNPC 1982). It was also realised that national parks must be as carefully protected as ever, but a range of other categories of protected areas must supplement them in order to meet the social and economic development need (McNeely 1982a). Indeed, protected areas can play a central role in the social and economic development of the rural environment, and can contribute to the economic well being of urban centres and the quality of life of their inhabitants (McNeely & Miller 1983).

The IV World Congress on National Parks and Protected Areas meeting in Caracas, Venezuela (in February 1992) emphasised the challenge, which the conservation community is facing, and the need for protected areas to attract public and political support (Censario 1996). The Caracas congress concluded that more and better-managed protected areas were urgently required. It was also emphasised that protected areas are about meeting peoples' needs: that protected areas should not be islands in a sea of development but be part of every country's strategy for sustainable management and the wise use of its natural resources (IUCN 1994). The Caracas Congress came up with a new approach which puts protected areas at the centre of strategies for sustainable development, concentrates on the linkages between protected areas and the areas around, and focuses on the economic benefits that such areas can bring.

This signifies that the emphasis has moved from complete protection of isolated areas or hotspots to a more comprehensive and dynamic concepts of conservation and management of *working landscapes*. A review of the 1994 IUCN guidelines for protected areas management categories reveals that the system offers considerable scope to incorporate people's interest and concerns. The revised categories have identified six distinct categories of protected areas. The current system of IUCN categories present greater flexibility (Oviedo & Brown 1999). The revised IUCN categories imply a gradient of human intervention ranging from effectively none at all in the case of some Category I areas to quite high levels of intervention in Categories V and VI (Phillips & Harrison 1999). This revision shows the commitment and concern of IUCN to match global protection priorities more closely with human needs and aspirations.

The Category V (*protected landscape and seascape*) and Category VI *(managed resource protected area*) groups emphasise the concept of community involvement in management. Category V stresses the value of the interactions between people and nature over time, which is particularly appropriate to the characteristics of indigenous lands and territories. The IUCN definition notes that `safeguarding the integrity of this traditional interaction is vital to the protection, maintenance, and evolution of such an areas'. The Category V designation builds on existing institutional responsibilities, and therefore offers possibilities to develop collaborative management agreements and other flexible arrangements for management of natural and cultural resources. It has important specific objectives related to the conservation of cultural heritage, and seeks to bring benefits to local communities and contribute to their well being through the provision of environmental goods and services (Oviedo & Brown 1999).

Category VI *(managed resource protected area)* aims basically to ensure the sustainable use of natural ecosystems to meet community needs, while ensuring long-term protection and maintenance of biological diversity. This category embraces the concept of an `area of multiple use'. It also permits private and communal ownership of land and considers specifically the option of management by local institutions, as well as collaborative management between public entities and local communities. Under this category, a protected indigenous territory must comply with criteria specified in the guidelines which include: the area should be managed for the long-term protection and maintenance of its biodiversity; at least two thirds of the area should remain in its natural state; it must be large enough to absorb sustainable resource uses without detriment to its overall long-term natural values; it should contain predominately unmodified natural systems, whereas the management of the remaining area must not be in conflict with that primary purpose (Oviedo & Brown 1999).

Table 2.4 Matrix of management objectives and IUCN protected area management categories

No.	Management Objectives	Protected Area Categories					
		I	II	III	IV	V	VI
1.	Scientific Research	1	2	2	2	2	3
2.	Wilderness protection	2	2	3	3	-	2
3.	Preservation of species and genetic diversity	1	1	1	1	2	1
4.	Maintenance of environmental services	2	1	-	1	2	1
5.	Protection of specific natural/cultural features	-	2	1	3	1	3
6.	Tourism and recreation	-	1	1	3	1	3
7.	Education	-	2	2	2	2	3
8.	Sustainable use of resources from natural system	-	3	-	2	2	1
9.	Maintenance of cultural/traditional attributes	-	-	-	-	1	2

Key: 1. Primary objective
2. Secondary objective
3. Potentially applicable objective
-. Not applicable

Source: IUCN (1994)

The matrix given above provides a summary of protected areas' management objectives and their categories (Table 2.4). The IUCN categories I-III aimed at strict protection approach by excluding extractive use activity and most human habitation (Hutton & Leader-Williams 2003). In direct contrast, the categories IV-VI include human habitation and activity, and extractive resource use is either a primary or a secondary objective (Hutton & Leader-Williams 2003). This implies that human needs and aspirations have been given priority in the protected area management.

2.5 COMMUNITY INVOLVEMENT IN CONSERVATION

The above discussion clearly indicates that there is a global priority to involve local communities in conservation. The IUCN categories IV – VI have clearly allowed certain degrees of community involvement in protected area management. A community is defined here as a group of individuals or households sharing a common location. The group is potentially capable of acting together for preservation of natural resources, development of the village infrastructure, the maintenance of public peace and harmony, and for the performance of ritual activities essential to the material and spiritual well being of the village as a whole (Furer-Haimendorf 1964).

2.5.1 Community-based conservation

It has been increasingly recognised over the past twenty years that the successful management of protected areas must include co-operation and support of local communities (Brandon & Wells 1992; Wells & Brandon 1992). Building a good relationship between local communities and protected areas is therefore a critical importance to the success of any conservation programme. This trend has encouraged the development of a new conservation paradigm of 'Community-based Conservation' (Mehta & Kellert 1998). Community-based conservation is defined as those principles and practices that argue that conservation goals should be pursued by strategies that emphasize the role of local communities in decision-making about natural resource (Adams & Hulme 1998). This includes community-based conservation, community wildlife management, collaborative management, community-based natural resources management, neighbours as partners, and integrated conservation and development programmes (Adams & Hulme 1998). By definition, the conservation must be of, by and for communities (Murphree 1994). In general, community-based conservation programmes, particularly in Africa, are assumed to achieve their goals in three ways: (1) allowing people living in and around protected areas to participate in land-use policy and management decisions; (2) giving people proprietorship or ownership over wildlife resources; and (3) providing local people with economic benefits from wildlife conservation (Hackel 1998). However, the community-based conservation approaches in Asia have given less emphasis on direct economic benefits to local community from wildlife safari hunting. Instead, a greater focus has been placed on provision of incentives for participation in conservation through tourism, training, utilization of wild plant resources and support in development. This involves new approaches, new skills and in some cases also a major change in attitudes (Stolton & Dudley 1999). The guiding principles of the IUCN Task Force on Local Communities and Protected Areas also emphasized on rights and responsibilities of local communities (Table 2. 5).

This 'new paradigm' in protected area management recognises that the prevailing protected area model cannot be imposed at the expense of local people's rights and cultural traditions, but must be adapted in ways that respect their rights and cultures. There is a shift in management approach of protected areas from an *exclusive* to an *inclusive* approach, which allows for a high degree of local community participation. This thinking has developed in the current context of global change related to expanding democratisation, the restructuring of nation states, and growing integration of biodiversity conservation with planning for sustainable development. Responding to demands by people all over the world for greater control of decisions affecting their lives, there is a global trend towards devolution of power to the local people and decentralisation of authority (Oviedo & Brown 1999).

Table 2.5 Guiding principles of the IUCN task force on local communities and protected areas

Main guiding principles
1. Local communities are to be recognised as rightful, equal partners in the development and implementation of conservation strategies that affect their lands, waters and other resources, and particularly in the establishment and management of protected areas. This should apply to all IUCN categories of PAs, where local communities are present.
2. The livelihood security of local communities living within or around protected areas and dependent upon the resource base within such areas needs to be protected and enhanced while ensuring the ecological integrity of the area.
3. Since many local communities have a close link with natural resources, their traditional knowledge in conserving and sustainable management of their resources and their own ways of valuing biodiversity, need to be respected and utilised in conservation measures.
4. Tenurial security of local communities over land, water and other resources, accompanied by appropriate responsibilities, is essential in creating and maintaining a stake in natural resources and biodiversity conservation.
5. Alternative and modified resource use practices need to be evolved, by and in association with local communities, to tackle unsustainable practices of resource use.
6. The principal benefits from conservation strategies and measures should go into further conservation measures and to local communities.
7. Forced displacement of local communities that have traditional and customary rights to use of resources, in and around PAs, is unacceptable.

Source: Eagles et al. (2002)

The term 'community-based conservation' includes, at one extreme, buffer zone protection of parks and reserves and, on the other, natural resources use and biodiversity conservation in rural areas (Murphree 1994). There are different levels and forms of community involvement from just consultation to active involvement in park management. Public relation campaigns about the park and wildlife conservation by park authorities to minimise the antagonistic attitudes of the local people are one form of initial involvement. But this approach has limited success (Mishra 1982a) simply because the local people view the park staff as watch dogs who keep them away from the resources they had been using in the past. The programme to provide the local villagers with renewable resources from the park as a form of compensation for losses and difficulties due to park establishment such as in the Royal Chitwan National Park, Nepal is widely acclaimed as a step in mobilising local community towards park management.

Buffer zone management, which focuses on the surrounding local community needs is regarded as one of the suitable strategies for resolving any existing or potential conflicts caused by firewood, fodder and grazing, pressures. A buffer zone is an area delineated around park boundaries as sites for integrated conservation and development related activities. A buffer zone separates a protected area from direct human or other pressure and provides valued benefits to neighbouring rural communities (MacKinnon et al. 1986; Wells & Brandon 1993). Although an integrated approach to buffer zone is another concept of integrating certain local needs, yet it does not involve local communities in management of a protected area.

The community-based conservation approach aims to empower and actively involve local communities in the whole process of the park management - from problem identification to evaluation of a programme. Beyond just "consulting" local people, this new approach to protected area management supports local communities to revive, strengthen or develop local institutions, formalises benefit sharing arrangements, builds on community knowledge, develops capacity of local communities and even formally shares some form of authority and responsibility in management (IUCN 1998). Thus, involvement of local people is a new approach to management of protected area reflecting greater participation of local people in conservation and development (Wells & Brandon 1993). The main aim of community involvement is to achieve an acceptable balance between local people's basic needs and global biodiversity conservation needs. Thus, the status of the local communities in this approach should be an active conservation partner in park management (Songorwa et al. 2000).

2.5.2 Local knowledge system and institutions

Traditional communities have always met their immediate needs from biological and other natural elements, in most cases from ecosystems immediately surroundings them (Poffenberger 1997). For thousands of years communities around the world have experimented with technologies, social systems, beliefs and values, which allowed them to sustain themselves in an immense range of ecosystems (Poffenberger 1997). Local communities often have a rich and detailed knowledge of local plants, animals and ecological relationships, sometimes called traditional ecological knowledge (Ostrom 1997). Communal roles often regulate the harvest of particularly valuable wild resources. There are communal labour obligations for maintaining wild resources (Ostrom 1997). Local rules that restrict who uses how much of biological resources require effective local social institutions, accepted rights and obligations, and a shared vision for interpretation and action (Ostrom 1997).

Generally, local institutions include rules and a common understanding about how problems are to be addressed and solved in a particular community (Ostrom 1997). These institutions could be formal or informal but still manage to regulate the use of resource systems over long periods of time (Ostrom 1997). However, many conservation initiatives have superseded existing formal or informal institutions (Pimbert & Pretty 1997). As a result, local systems of decision making and resource management are eroded and local institutions are replaced by the bureaucracy and professional bodies (Pimbert & Pretty 1997).

For communities to act as effective agents of conservation, they must be structured so as to accommodate internal differences for collective goals (Murphree 1994). The concept of community-based conservation implies that 'the community' has an adequate institutional base for management, and this in turn implies that it has a sanctioned authority that implements it responsibilities (Murphree 1994). Local institutions enforce rules, incentives and penalties for eliciting behaviour conducive to rational and effective resource conservation and use (Pimbert & Pretty 1997). As an example, historically the Sherpa community from high mountain areas of Nepal have developed a strong sense of community stewardship, as the whole community took responsibility for protecting common properties such as forests and grasslands, managed through a traditional institution called the *shiingi nawa* (Nepal 2002b). Therefore, local institutions are resources to be strengthened, changed and developed, not ignored and suppressed (Pimbert & Pretty 1997) for successful operation of a community-based conservation initiative.

2.5.3 An examination of community-based conservation approach

There has been an increase in projects attempting to link the conservation of biodiversity with local social and economic development. In late 1980's and early 1990's, many community-based conservation initiatives were launched throughout the world such as Mimaraua Sustainable Development Reserve in Brazil, La Amistad Biosphere Reserve in Costa Rica, CAMPFIRE (Communal Areas Management Programme for Indigenous Resources) in Zimbabwe, ADMADE (Administrative Management Design) and LIRDP (Luangwa Integrated Resource Development Project) both in Zambia, the Cuna Comerca in Panama, ACA (Annapurna Conservation Area) in Nepal, the Great Barrier Reef Marine Park in Australia and Michuri Mountain Conservation Area in Malawai.

The major focus of community-based conservation has been on integration of wildlife management and utilisation to support rural economies. There are a number of notable examples of community-based conservation approaches in Africa, such as CAMPFIRE, ADMADE and LIRDP. These initiatives have reported decreases in poaching, improved conservation through an increase in wildlife game scouts, direct economic benefits from trophy hunting and some development schemes (Lewis & Alpert 1997; Metcalfe 1994; Wainwright & Wehrmeyer 1998). Experience from these schemes has shown a certain degree of success where there are big game animals (Hackel 1998). However, there are growing concerns that these schemes succeeded in protecting some of the larger mammals not by their ability to distribute socio-economic benefits but by virtue of their increased enforcement levels (Gibson & Marks 1995). Information on the effectiveness of this approach to protect Africa's remaining wildlife is often lacking (Hackel 1998). It is often argued that the management approach misunderstood some of the economic, political and social benefits of local hunting (Gibson & Marks 1995). It has also been reported that there has been no decrease in wildlife poaching rate compared to the situation before the programmes, although the poachers have shifted their tactics and prey selection (Gibson & Marks 1995). Therefore, advocates of protectionist approach argue that the new conservation paradigm promoted a utilitarian, economic approach at the expenses of scientific and aesthetic considerations (Schaik & Rijksen 2002).

The involvement of local communities in conservation is another major aspect of the approach. Murphree (1994) emphasized that proprietorship is required to make the concept of community involvement viable. However, proprietorship is often a promise by an external agency rather that a reality in many cases (Metcalfe 1994). Therefore, communities are often not actively participating in planning and management (Metcalfe 1994; Songorwa et al. 2000; Wainwright & Wehrmeyer 1998). Local level institutions are also sometimes lacking, thereby the management decisions are controlled by district or state owned institutions (Metcalfe 1994). As a result, controls of poaching are not often initiated by local communities; but instead they are externally enforced (Metcalfe 1994). This leads on to the situation where *illegal actions* such as poaching and illegal settlement are undertaken by the communities themselves (Metcalfe 1994). There is evidence also of possible conflicts between rural peoples' economic needs and the implementation of community-based conservation (Hackel 1998). Such evidence shows that the community-based approach has not yet always proved successful in enabling local communities to regain control over their resources and decision-making capabilities.

Community-based conservation programmes attempt to influence thinking and attitudes of local communities in the belief that this will lead to changes in behaviour (Infield &

Namara 2001). Various lines of evidence have indicated that communities have developed positive attitudes and perceptions towards conservation (Infield & Namara 2001; Mehta & Kellert 1998; Metcalfe 1994). However, the attitudes of communities are often based on support to social development or direct benefits from wildlife utilization (Infield & Namara 2001; Mehta & Kellert 1998). If rural communities accept this management approach because of its economic benefits, they may reject it at some point in the future if a better economic alternative is presented (Hackel 1998). Despite growing support for conservation measures in and around protected areas, support for conservation institutions involved in the practical implementation of conservation measures is still limited (Gillingham & Lee 1999; Infield & Namara 2001; Ite 1996; Newmark et al. 1993). Therefore, there is a strong requirement for effective conservation education and awareness programmes to bring about changes in behaviour and actions of both local communities and conservation authorities.

2.6 Some unanswered questions

Community-based conservation is an obvious advance over conventional conservation practices because of its inclusive approach (Hackel 1998). Kothari et al. (2000) have reported that the approach in Nepal offers substantial ecological, economic and social benefits. Local people have been gradually accepted as 'partners' in wider efforts towards sustainable management (Dudley et al. 1999a). On top of that, the wider definitions of protected areas have given good opportunities to integrate conservation and development. However, unambiguously successful and convincing examples where the development needs of local people have been effectively reconciled with biodiversity conservation, remain difficult to find (Wells 1995). Evidence that community-based conservation has benefited conservation is often indirect at best (Lewis & Alpert 1997). Hackel (1998) has suggested that the role of protectionism in community-based conservation must be carefully considered during the initial stages of programme design. Appropriate laws or policies are also often lacking to legitimise community-based conservation approaches (Songorwa et al. 2000). This means that governments are often not prepared to devolve authority and responsibility for management of wildlife to local communities (Songorwa et al. 2000). Therefore, the question about whether this new approach provides a new paradigm for protected area management or whether it is just another fashionable trend in protected area management is still to be answered.

It has not been easy to link the needs of local communities and global biodiversity conservation goals. It is therefore easier to advocate community-based approach than to implement it on the ground (Hackel 1998). The protectionist argument is that conservation programmes have been diluted by strategies that promote community development and greater local involvement in decision making (also see Wilshusen et al. 2002). Wilshusen et al. (2002) have summarised the argument into five interrelated themes: the central importance of protected area; the moral imperative of nature protection; the ineffectiveness of conservation linked to development; the mythical status of harmonious, ecologically friendly local people; and the immediate need for strictly enforced protection measures. Therefore, these concerns need to be adequately addressed by community-based conservation programme.

The mixed experience with community-based approaches achieved to date suggests that there are many flaws in management and implementation of this approach, just as in alternative protectionist approaches. Nevertheless, conservationists should not overlook the importance of locally specific ways of meeting needs for food, health, shelter, energy and other fundamental human needs (Pimbert & Pretty 1997). On the other hand, community-based approaches should not also 'dilute' conservation programme by over emphasising social issues. As mentioned by Adams and Hulme (1998), effective conservation demands dynamic mixes of both state action and action by societies, not dismissal of one of these actor groups to the sidelines. What is required is a rigorous assessment and evaluation of community-based approaches on scientific grounds in order to analyse causes of failure and success, to assist in the development of future programmes employing this approach. This should include analysis of institutional capacity; biological effectiveness; social effectiveness (benefits obtained or social systems involved); financial sustainability and legal status (Dudley et al. 1999c). Although the community-based conservation approach has been widely promoted in Nepal and elsewhere, it has not been investigated to any depth, particularly in Nepal. This potential concern has encouraged an assessment of the first community-based conservation programme in Nepal.

2.7 SUMMARY

Protected area establishment and management is one of the most important methods of conserving biodiversity worldwide. These areas were established in response to the clear recognition of the need to control human activities to avoid harmful impacts on biodiversity. This approach to protection provides a multiple flow of benefits to society but sometimes only one sector of society. It has been realised that protected area alone are not adequate for nature conservation. Furthermore protected areas are facing many challenges. The national parks, nature reserves and other protected areas of the world have most commonly been established without either the advice or consent of the people most likely to be directly affected by their establishment. Without this support, or at least acceptance by the local people, the future of any protected area cannot be considered secure. Furthermore, the prospect for extending any system of protected areas to take in new lands or waters becomes increasingly uncertain where popular support for protection of nature is lacking (Dasmann 1982). Therefore, the future of the national parks and protected areas is uncertain unless urgent measures are taken to implement realistic policies that will be acceptable to the local people.

Past conservation efforts have at least been successful in demarcating a system of protected areas whose perpetuation must now be ensured by realistic policies and plans. However it has been demonstrated, as Lusigi (1982) has commented, that a realistic conservation can only be achieved by the local people, and indeed mainly by the rural population. Experience over the past 15 years or so has also shown that the protected areas cannot be isolated from the people living in and around the protected areas. The Bali Congress recognised the importance of cooperation and support of local people. This recognition has encouraged to the development of a new conservation paradigm, 'community-based conservation'. Substantial knowledge and experiences of the community-based conservation model have been gained over a decade period. However, many in the conservation community have not been convinced that this is an effective and appropriate model of protected area management. On the other hand, it has been realised that there is a need for changes in behaviour and actions of both local communities and conservation authorities for an effective management of community based protected areas. A critical analysis of community-based conservation would be valuable and arguably necessary to define its strengths and weaknesses.

Nepal is one of the countries, which pioneered the approach of 'community-based protected area management'. The conservation policy and programme of Nepal have successfully addressed the needs of local communities staying inside and outside a park. However, as argued by MacKinnon (2001), many conservationists in Nepal are concerned that the social agenda is dominating conservation initiatives, yet often these initiatives have attained neither conservation nor rural development objectives. Therefore, in-depth review of biodiversity conservation through a protected area management system in the country is made in the next chapter.

CHAPTER III

BIODIVERSITY CONSERVATION IN NEPAL: BACKGROUND AND STUDY SITES

3.1 INTRODUCTION

The aim of this chapter is to provide a description of the environmental and ecological context of Nepal and particularly of the Annapurna Conservation Area (ACA). The initial sections deal with the national situation and lead into a more detailed account of biodiversity and conservation measures in Nepal. A brief account of political development of the country is given because this has a direct impact on the ecology and environment of the country. This furnishes the background to an understanding of the Annapurna Conservation Area and the nature of the study area.

3.1.1 The physical environment

Nepal, a land-locked country covering an area of 147,181 sq km., is situated between India and China. This Himalayan country, which never came under direct colonial rule, is located between the latitudes 26^0 22' and 30^0 27'N and the longitudes 80^0 40' and 88^0 12'E. The average length of the country is 885 km from east to west and width varies from 145-241 km with a mean of 193 km north-south. Nepal is centrally located in the Himalayas. Out of the 24 high peaks above eight thousand meters in the Himalayas, 17 are located in Nepal. For administrative purposes, the country is divided into 75 districts, 3,912 village development committees and 58 municipalities (CBS 2001). Districts are further divided into a number of Village Development Committees (VDC) and Municipalities as local units. There are 9 wards in each VDC and the number of wards in a municipality ranges from 10 to 35 (CBS 2001). According to the national census of 2001, the total population of Nepal was 23,151,423. The country has a large number of diverse ethnic groups distributed throughout the country. With a few exceptions, these ethnic groups live in well-defined geographic areas (Bista 2000). For example, the Tibetan speaking Mongoloid people live in high Himalayan regions whereas Tibeto-Burman and Indo-Aryan speaking groups live in hill and valleys. The annual population growth rate for 1991 to 2001 was 2.24% per annum (CBS 2002). Nepal is categorised as one of the least developed countries of the world with the estimated per capita GDP of US$ 244 for the year 1999/2000 (CBS 2001).

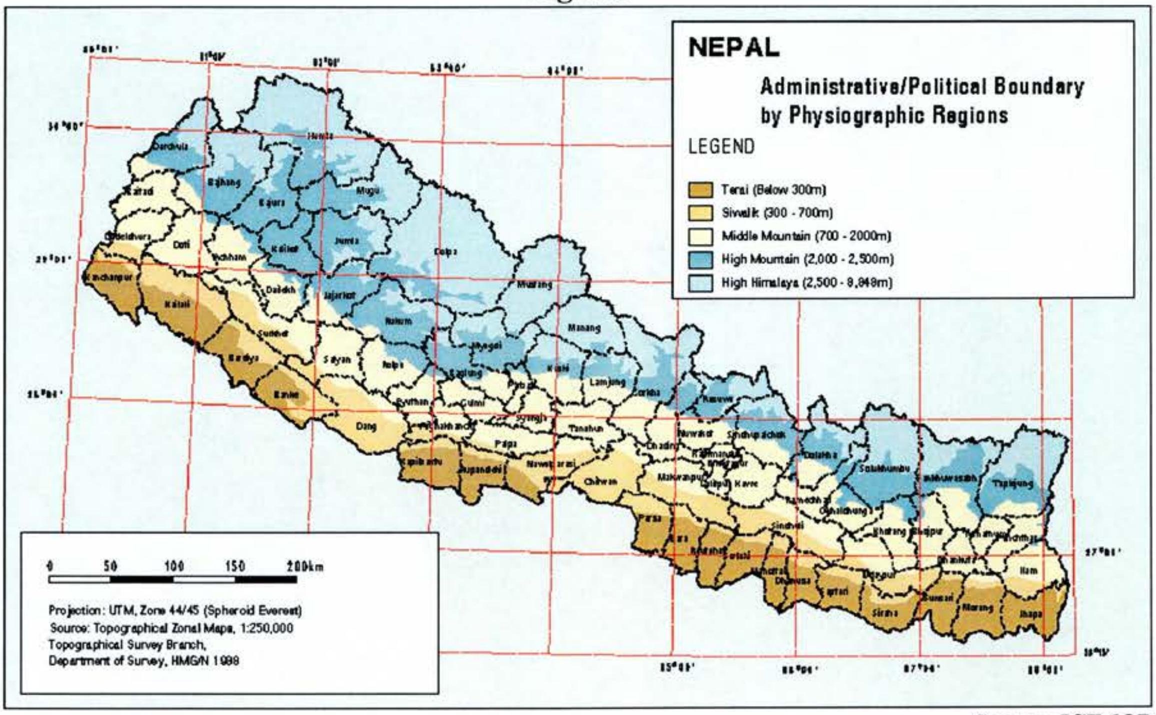
Plate 3.1 Map of Nepal bordered with China in north and India in south, east and west

Source: Magelan Geographix

3.1.2 Physiography

The country is classified into five physiographic zones based on the Land Resources Mapping Project 1986: Terai (14%); Siwaliks (13%) Middle Mountains (30%); High Mountains (20%); and High Himalayas (23%). CBS (2001) has divided the country into three regions. They are Mountain, Hill and Terai. These ranges lie within the 200 km width of Nepal. Thus, a north-south cross section of Nepal reveals a range of altitudinal variation from over 7,000 m towards the north to less than 1,000 m towards the south.

Plate 3.2 Map of Nepal with administrative/political boundary with physiographic regions



Source: ICIMOD

(a) The Terai belt is composed of flat and valuable agricultural land in southern Nepal, and forms a northern extension of the alluvial Gangetic plain. It lies at an altitude of <300 m and comprises 23 per cent of the land area of the country. According to the 2001 population census, the Terai region is one of the most densely populated areas within Nepal. It is inhabited by 48.4 per cent of the total population (CBS 2002).

(b) The Hill region encompasses two ranges, the Siwalik and the Mahabharat and forms the central part of Nepal. The Siwalik range comprises the southernmost hill region of Nepal. The Siwalik range is mainly composed of sedimentary rocks and is also comprised of boulders. The Mahabharat range, also known as *inner Himalayan range,* falls between the Siwaliks and Middle Hills. It is composed of hard rocks like granite or quartzite and limestone. The elevation of Mahabharat range is from 1,500 to 2,700 m. The Middle Hills lie north of the Mahabharat and occupy the central region of the country. It is rich in schites and quartz rocks. The Hill region is settled by 44.3 per cent of the total population of the country (CBS 2002).

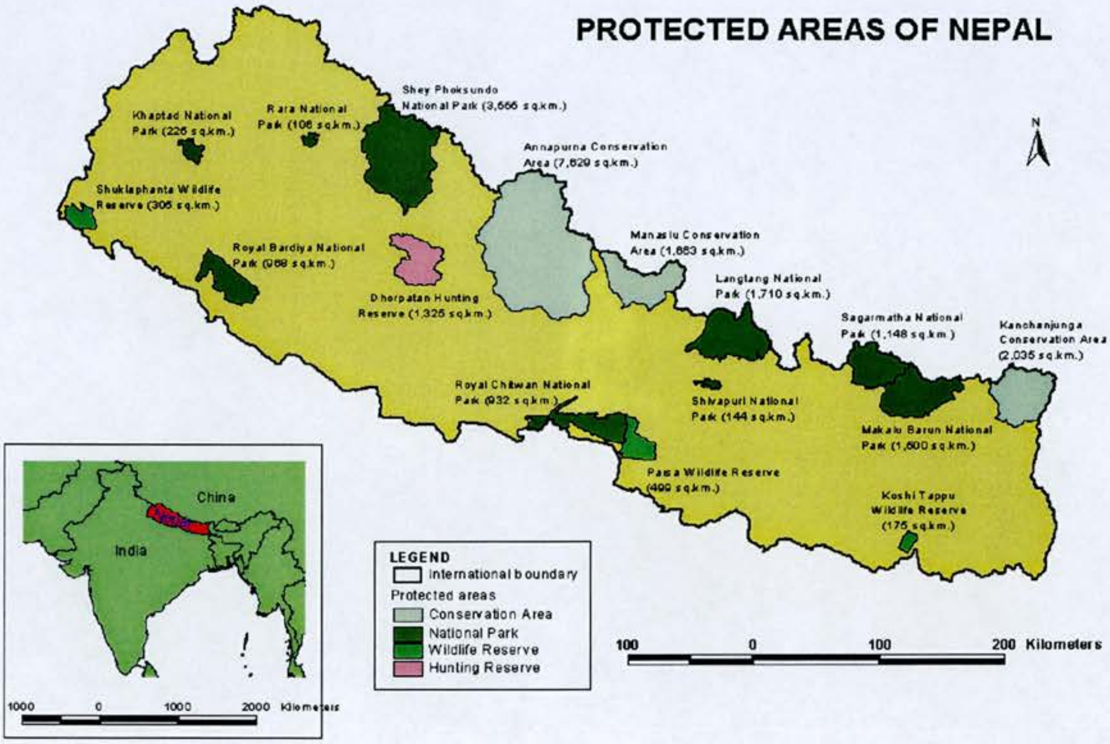
(c) The Mountain region lies in the northern part of the country above 4, 877 m and stretches from the east to west of Nepal. This region comprises sub-alpine and alpine zones. This region covers one third (35%) of the land area of the country but only about 2 per cent of its land area is suitable for cultivation. Only 7.3 per cent of the total population of the country resides in this region (CBS 2002). The Himalayas form the highest and one of the youngest mountain systems in the world (Inskipp & Inskipp 2001). Geologically speaking, the Himalayas are still growing, having been created out of the collision of tectonic plates of the earth's crust less than 60 million years ago (Muthoo, M. 2000). This is why soils of marine origin and substrata, including seashells, are found on the upper Kali-Gandaki Valley.

Table 3.1 Area coverage and population distribution in different zones in Nepal

Ecological Regions	Area		Population in 2001 (million)	
	Km^2	%	Size	%
Mountains	51,817	35.2	1.68	7.3
Hills	61,345	41.2	10.25	44.3
Terai	34,019	23.1	11.21	48.4
Total	147,181	100	23.14	100

Source: (CBS 2002; UNEP 2001)

Plate 3.3 Individual protected areas of Nepal that constitute one of the most successful protected area management systems in the Southeast Asia. The light green colours indicate protected areas that were gazetted as Conservation Areas. Conservation areas in Nepal promote community-based protected area management.



Source: KMTNC-ACAP

The Annapurna Conservation Area (ACA) is located in the Hill and Mountain regions of the west-central Nepal at latitude of 28°50'N and longitude of 83°57'E and covers 55 village development committees (VDC) of five districts. ACA covering 762,900 ha is managed as the Annapurna Conservation Area Project (ACAP) by the King Mahendra Trust for Nature Conservation (KMTNC) (appendix 3.1) (KMTNC-ACAP 1997).

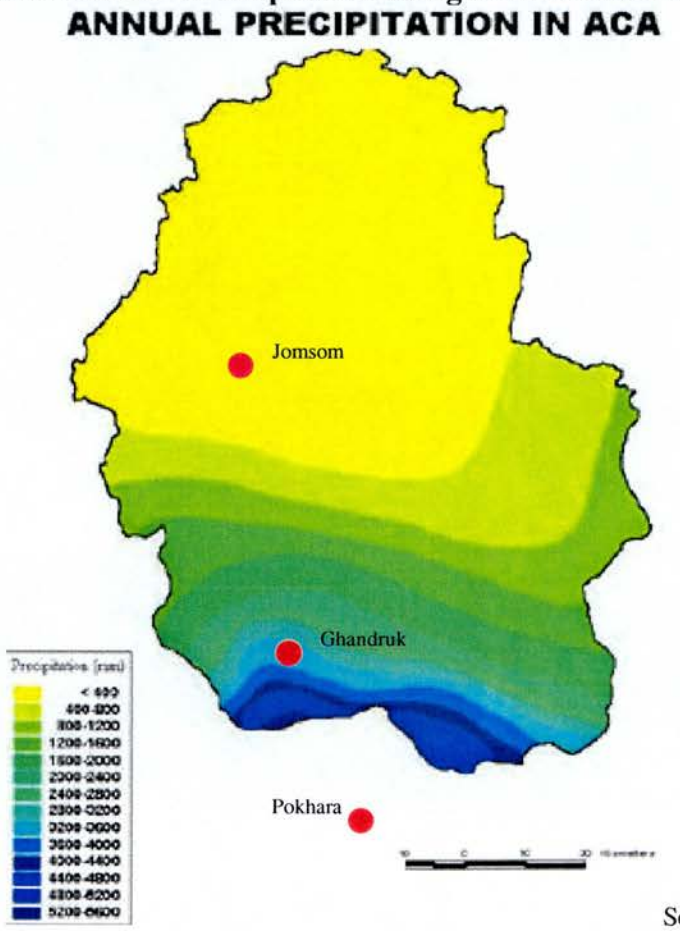
ACA is well known internationally and in Nepal for its beautiful mountains and a unique ecology. The area is bounded to the north by the dry alpine deserts of Dolpo and Tibet, to the west by the Dhaulagiri Himal, to the east by the Marshyangdi Valley and to the south by valleys and foothills surrounding Pokhara (Mahat 1985). Some of the world's highest snow peaks over 8,000 m and the world's deepest valley of the Kali Gandaki river are in ACA. These extreme diversities have made it Nepal's most popular trekking destination with over 70,000 trekking tourists in the year 2000, which is over 62 per cent of the total trekking tourists visiting Nepal (Bajracharya 2002).

3.1.3 Climate

Nepal has a great deal of variation in climate. It ranges from tropical to arctic depending upon the altitude and aspect. The remarkable differences in climate conditions are primarily related to the range of altitude such as the short north-south distance. The presence of east-west trending Himalayan massifs to the north and monsoonal alteration of wet and dry seasons also greatly contribute to local variation. The climates of Nepal have been classified into five major global types (Shrestha 1999). These are (i) cold (Arctic/Nival), (ii) cold temperate, (iii) warm temperate, (iv) subtropical, and (v) tropical. Biologists in general, have recognised four major bio-climatic zones (Shrestha 1999). These are tropical, temperate, alpine and arctic, with further sub-divisions. The climate of ACA is also extremely varied due to different topographic gradients ranging from subtropical to alpine. Topographical and climatic variation has resulted in diverse habitat and biological diversity within the country (UNEP 2001).

Rainfall influences the composition of flora and fauna in Nepal (HMG/UNDP 2000). Eighty per cent of the total annual precipitation in the country occurs in the form of summer monsoon rain prevailing from June to September. The average annual rainfall in Nepal is about 1600 mm but the actual amount differs in different bio-climatic zones (HMG/UNDP 2000). There are three broad but distinct seasons according to the monsoon rainfall pattern (UNEP 2001). The first is the hot and rainy monsoon, prevailing from June to September. The second is the post monsoon season lasting roughly from October through January. The third type is the pre-monsoon season, extending roughly from February to May.

Plate 3.4 Distribution of annual rainfall pattern in the Annapurna Conservation Area. The blue colour in the map indicates high rainfall zone within the protected area.



Source: KMTNC-ACAP

The distribution of rainfall over the country is spatially varied and generally decreases from east to west with a few exceptional wetter cases in the west. As the Himalayas act as a barrier against the direction of the monsoon wind flow, the southern slope receives most of the rain from this wind, while the northern part of the Himalayan range is a rain shadow region with little or no rain (UNEP 2001). According to the annual rainfall pattern, ACA has two distinct climate regions. The southern slopes of the Annapurna range receive some of the heaviest rainfall with over 5,000 mm per annum (Jackson

1987) while the northern slopes of the range being in the trans-Himalaya region receive a minimal precipitation of 250-500 mm annually (KMTNC 1997).

Temperature in Nepal generally decreases from the south to north with increasing altitude (UNEP 2001). The Terai region is warmer with summer temperature exceeding 37° C. In the middle Hills of the Himalayas, temperature lies between 12-16° C. Air temperature on average decreases by 6.5° C for every 1000 m increase in altitude in mountains (UNEP-WCMC 2002). The hottest months, generally, are May and June while coldest month is January. Average annual temperature in the southern slope of ACA is 16.3° C as recorded in Ghandruk (KMTNC-ACAP 2002a) while the average annual temperature of the northern slopes in ACA are 12.2° C and 5.8° C as recorded in Jomsom and Lomanthang respectively (Jackson 1987). Thus, geology, physiography and climate all vary across ACA providing distinctive habitat characteristics within the area.

3.1.4 Political development in the country

Biodiversity conservation in Nepal, in the past, was initiated by political and economic interests rather than ecological considerations (Chaudhary 2000). Therefore, loss in biodiversity especially forest and wildlife was very much correlated with the political situation of the country. Nepal was politically unified by Prithvi Narayan Shah, the king of Gorkha, defeating the smaller warring kingdoms in the middle of the eighteenth century. The unification, however, did not have much effect on social, cultural and economic systems until recently. The country was under rule of the hereditary prime ministers since 1846 led by Jung Bahadur Rana for just over a century. During the Rana Regime, the wildlife and their habitats were relatively undisturbed due to low human pressure, malaria infestation in the Terai forests and the Ruler's interest in big game hunting (Sharma 1998b). Game and trophy hunting of big mammal species such as tiger, rhino and deer by the Rulers flourished during this period. Even viceroys and governors-general from the British government in India at the invitations of the Rana Prime Ministers frequently hunted in the Terai region of Nepal (Shaha & Mitchell 2001). The

Ranas were overthrown in 1951 by a popular revolt led by King Tribhuvan, the grandfather of the present king.

The period 1951-1959 was marked by a rapid succession of governments and political instability. An election was held under a parliamentary constitution in 1959 which brought the elected government to power, but this was dissolved in December 1962 by the King Mahendra, who had succeeded his father King Tribhuvan (UNDP 1994). The King introduced the party-less Panchayat system named after the traditional village councils. The Panchayat period was considered advantageous from the point of wildlife conservation (Sharma 2002). The active interest of the Royal family and their leadership led the government to adopt several important policy decisions (Sharma 2002) including establishment of the King Mahendra Trust for Nature Conservation in 1982 by a Legislative Act and initiation of the Annapurna Conservation Area Project in 1986. The Panchayat system lasted until April 1990, when a popular pro-democracy movement swept the nation. In response to the people's will, King Birendra lifted the thirty-year ban on political parties in 1990 (UNDP 1994).

A new constitution came into effect incorporating elements of constitutional monarchy and multiparty democracy (UNDP 1994). The constitution calls for a two-tiered legislature, the National Council (Upper House) consisting of 60 members and the House of Representatives (Lower House) with 205 members. Members of the House of Representatives will be elected every five years through national elections. The King is the Head of State. The day-to-day administration is the responsibility of the Council of Ministers headed by the Prime Minister.

The period from 1990 – 2002 of democracy was not as effective as was expected by the general public. The history of a rapid succession of governments and political instability kept on repeating. Corruption, delay in execution of projects and ineffective performances of the development projects were significant. The agenda of poverty reduction and good governance was limited only to the national documents. Nepal is a low-income country ranked by the United Nations as among the 49 'least developed countries' and has among the lowest scores in the United Nation Development Programme's Human Development Index (UNDP 2003). A recent nationwide survey estimates that 42 per cent of Nepal's population – about nine million people – still live in poverty, particularly in the rural areas (UNDP 2002b). However, the biodiversity conservation effort through a protected area system further developed during this period because of the active interest of the Royal family and governments' commitment to conserve resources.

On the other hand, the country has also been facing a severe security problem due to the Maoist insurgency. The Maoist insurgency started six years ago from remote villages of four districts in Mid-western Nepal. Today it has spread throughout the country and over 40 districts have been highly affected (HMG/Nepal 2002). Development activities have been severely affected due to the poor security situation and deteriorating law and order. The Maoists were declared as terrorists by the government because they have destroyed important infrastructure such as communication, water supplies and the road network. The king also declared a "state of emergency" in the country according to the constitution-1990 and mobilised security forces to combat the Maoist insurgency (Staff-Reporter 2001). Nevertheless, the state of emergency did not significantly reduce the problem of insecurity and failed to maintain law and order in the country. At the same time, this period experienced a significant increase in encroachment on protected areas by people and poaching of flagship species such as tiger and rhinoceros (Editor 2003; Ghimire 2002; Post-Reporter 2001a). This suggests that conservation planning in developing countries must take account of possible and potential impact of serious political instability (Oates 1999).

At the juncture of the political and economic crisis, there were a series of other developments that did not provide a favourable atmosphere to progress in the country. The Royal Massacre at the Palace in Kathmandu on June 1, 2001, which killed the King, Queen and other family members (Post-Reporter 2001c), added a state of deep confusion, mistrust and shock among people in the country. With the demise of His Majesty King Birendra, His Royal Highness Prince Gyanendra was declared King in accordance with the Constitution of the Kingdom of Nepal-1990. The present king is the immediate younger brother of the late King. The present king is the former chairman and at present, the patron of the King Mahendra Trust for Nature Conservation (KMTNC).

There has also been a relatively rapid turnover of governments, which has hampered efforts at reform. The government dissolved the Parliament on May 2002 and announced national elections in November 2002 (Staff-Reporter 2002a). His Majesty the King relieved the Prime Minister and his Council of Ministers of their office on the grounds of incompetence to hold the general election as scheduled and assumed executive powers until a new government is formed (Staff-Reporter 2002b). Therefore, the election was postponed. This clearly indicates that a fully effective system for the rule of law has not yet been developed in Nepal. There are also significant implications to the biodiversity conservation due to this political problem in the country. The secretary at the Ministry of Forest and Soil Conservation also admitted the fact that the forest and wildlife faced a worsening situation of insecurity in the fiscal year 2001-02 (Post Report 2002: Kathmandu Post Vol. X No. 178). The study area was one of the seriously affected areas among the protected areas. The field offices in the southern slopes of Annapurna ranges of the Annapurna Conservation Area Project including the headquarters at Pokhara were either forced to close or damaged by blasting the properties during the study period. Despite these problems, the protected area system remains the key to biodiversity conservation in the country and the close involvement of local communities is seem to be crucial to its success.

3. 2 BIODIVERSITY AND NATIONAL CONSERVATION INITIATIVES

3.2.1 Biodiversity in Nepal

Biodiversity is the total variety of life on the Earth ((HMG/UNDP 2000). In other words, it encompasses the total number, variety and variability of life forms, levels and combinations existing within the living world. It represents variability within and among them (HMG/UNDP 2000). The definition of Biodiversity in Nepal follows the definition outlined by the Convention on Biological Diversity (CBD). Nepal provides a unique habitat for diverse flora and fauna as a result of the wide range of environmental conditions especially physiographic and climatic conditions. Over 5,160 species of flowering plants have been reported from the country out of which 246 species of flowering plants are endemic to Nepal (Shrestha 1999). Nepal is also diverse in animal species. Approximately 181 species of mammals, 844 species of birds, 143 species of reptiles and amphibians (Shrestha 1999) and 643 species of butterflies (Smith 1994) have been recorded in Nepal. Some of the endangered mammals include the one-horned Indian rhinoceros (*Rhinoceros unicornis*), the Bengal tiger (*Panthera tigris*), the red panda (*Ailurus fulgens*), the snow leopard (*Panthera uncia*), and the musk deer (*Moschus chrysogaster*) (Shrestha 1999).

Nepal has a very diverse flora with 35 forest types which are categorised into ten major groups (HMG/UNDP 2000; Jackson 1987). These are:

a. Tropical forest (below 1,000 m): This forest is predominantly composed of *Shorea robusta* in the southern part of Nepal. *Acacia catechu – Dalbergia sisoo* forest replaces *Shorea robusta* along streams and rivers.
b. Sub-tropical broad-leaved forest (1,000 – 2,000 m): *Schima wallichii – Castanopsis indica* forests are found in the central and the eastern Nepal. Riverine forest occurs along large rivers. *Alnus nepalensis* forest is wide spread along streams and moist places.

c. Subtropical Pine forest (1,000 – 2,200 m): *Pinus roxburghii* forest occurs particularly on the south facing slopes of mid-hills and Siwaliks in western and central Nepal.
d. Lower Temperate broad-leaved forest: This forest occurs in between 2,000 – 2,700 m in the west and 1,700 – 2,400 m in the east Nepal. *Alnus sps., Castanopsis sps.,* and several species of *Quercus* thrive in mid-hills. *Quercus lamellosa* forest is widespread in central and eastern Nepal.
e. Lower Temperate mixed broad-leaved forest (1,700 – 2,200 m): This type of forest is confined to the north and west facing slopes. In many places, prominent tree species of this forest belong to family Lauraceae.
f. Upper temperate broad-leaved forest (2,200 – 3,000 m): *Quercus semecarpifolia* forest is widespread in central and eastern Nepal on south facing slopes but is absent in heavy rainfall areas such as hills lying north of Pokhara.
g. Upper temperate mixed broad-leaved forest (2,500 – 3,500 m): The forest occurs in central and eastern Nepal mainly on north and west facing slopes. *Acer* and *Rhododendron* species are prominent throughout this altitudinal range.
h. Temperate conifer forest (2,000 – 3,000 m): *Pinus wallichiana* forest, *Cedrus deodara* forest, *Cupressus torulosa* forest, *Tsuga dumosa* forest, *Abies pindrow* forest are characterised in this type of forest. However, many of the above species extend above 3, 000 m.
i. Sub-alpine forest (3,000 – 4,100 m): *Abies spectabilis, Betula utilis,* and *Rhododendron* forests occur in sub-alpine forest.
j. Alpine scrub (above 4,100 m): This is found in the dry inner valleys of the Langtang, Mustang and Dolpo areas. Juniper-Rhododendron association include *Juniperus recurva, J. indica, J. communis, Rhododendron anthopogon, R. lepidotum* associated with *Ephedra gerardiana, Hippophae tibetana* in inner valleys. *Caragana versicolor, Lnicera spinosa, Rosa sericea, Sophora moocroftiana* occur in the north of Annapurna massif.

ACA is one of the important reserves for mountain biodiversity in Nepal. Topographical heterogeneity and the compression of climatic zones (Körner, Spehn and Messerli, 2001 referred in Muthoo 2002), together with other factors such as strong sun, desiccating wind or atmospheric moisture have created a multitude of mountain habitats (Muthoo 2002). Steepness of slope and aspect are among other critical geo-morphological factors that influence the rock weathering process, soil formation, vegetation types, wildlife and human habitations (Muthoo 2002). Although richness declines with altitude, lower elevation slopes often hold a wide range of habitat types within a relatively short distance (UNEP-WCMC 2002).

Different forest types from sub-tropical broadleaved forest to alpine scrub of rhododendron and junipers have been recorded in ACA. At the lowest levels (above 1000 m), there are subtropical forests of broadleaved *Schima wallichii, Castonopsis indica* on moist slopes whereas *Pinus ruxburghii* forest is confined to dry slopes (Gurung 2000; Inskipp & Inskipp 2001). These are replaced by temperate forests of mixed broadleaves including the oaks (*Quercus lamellose* and *Q. semecarpifolia)* with rhododendron species at 1900 m to 3000 m. Coniferous forests mainly of fir (*Abies spectabilis*), blue pine (*Pinus wallichiana*), and hemlock (*Tsuga dumosa*) grow on the dry ridges and slopes (Inskipp & Inskipp 2001). The sub-alpine forests are dominated by birch (*Betula utilis*), blue pine and junipers. Rhododendron and juniper scrub grow in the alpine zone. ACA links eastern Himalayan flora with that of the western Himalayas (Shrestha 1999).

ACA is the transitional zone between the east and west Himalayas. The Kali Gandaki valley, which runs north to south through ACA, is the dividing line (Inskipp & Inskipp 2001). Therefore, the conservation area supports species typical of both the eastern and western Himalayas. It is suggested that occurrence of more than 472 birds species from the area is the result of this transition (Inskipp & Inskipp 2001). Other faunal richness includes 21 species of amphibians, 32 species of reptiles and more than 101 species of mammals (appendix 3.2) (KMTNC 1997). The area has provided habitat for many rare and endangered species of birds and mammals such as all six species of Himalayan Pheasant found in Nepal, snow leopard, musk deer, Himalayan tahr (appendix 3.2). Even exploratory biodiversity research in the area is as yet very limited.

Whilst Nepal is bestowed with rich biodiversity, it is equally threatened by severe ecological problems. Out of the population of 23 million with a growth rate of 2.24 per cent per annum (CBS 2002), 90 per cent are subsistence farmers and 42 per cent of them live in poverty (UNDP 2002b). These people depend on the depleted forest resources for fuel, fodder, timber and medicine. Traditional energy sources, notably fuelwood and agricultural residues, respectively supply about 75 per cent and 20 per cent of the total energy demand in the country (Sharma 1991). The domestic sector accounts for 95 per cent of the total energy use. This sector consumes almost all of the fuelwood and part of the commercial energy (Sharma 1991). Per capita fuelwood consumption in the hills is estimated to be 640 kg per person per year (UNEP 2001). Therefore, a lack of alternatives to fuelwood is one of the major problems in conservation and management strategy of the country.

Plate 3.5 A temperate forest of mixed broad leave in Chhomrong, ACA

Poverty and high dependence on fuelwood as the source of energy for cooking and heating has caused deterioration in the quality and quantity of forest cover and often contributed to soil degradation, erosion, landslides and flooding (UNEP-WCMC 2002). Tourism in many mountain villages of the country has also contributed additional pressure in an environment, which has just enough food and fuel to provide a bare subsistence for the local people (Mc Neely 1985). It was reported that the continuing use of fuelwood by tourist lodges in Sagarmatha National Park has contributed to the thinning of forests in some parts of the national park and to depletion of shrub juniper in most heavily visited alpine region (Stevens 2003). However, tourism is also creating some direct and indirect benefits to villages. The annual deforestation rate in Nepal is estimated to be 1.8 per cent and about 27.3 per cent of the total area, at present, is under forest cover (FAO 2001). The rate of population growth and lack of livelihood options in villages are two of the factors underlying pressure on forest resources (UNEP-WCMC 2002).

3.2.2 National conservation initiatives

Attempts at conservation and conservation policy date back many centuries in Nepalese society. The protection of patches of forest adjacent to places of worship or important sources of water as sacred groves is part of the traditional conservation ethos of people in the country. Various traditional system of resource administration notably forest administration such as *shing-i-nawa*, *taluksari* and *kipat* have evolved (Hobley & Malla 1996; Mc Neely 1985; UNEP-WCMC 2003). These traditional forms of resource conservation disappeared with the handing over of private forests to the state in 1957 under the Forest Nationalisation Act. Historically, administration and protection of forest was effective wherever local control existed; forest degradation was largely related to outside influence (Mahat 1985). But the 1957 Act gave no recognition to traditional systems of forest management by local people for their own needs (Blaikie & Sadeque 2000).

The National Conservation Strategy 1988 and Master Plan for Forestry Sector 1988 gave concrete direction to conservation initiatives of the country. The salient features outlined in the objectives of the National Conservation Strategy are to (i) satisfy the basic material, spiritual and cultural needs of the Nepalese people, both present and future generations; (ii) ensure the sustainable use of Nepal's land and renewable resources; (iii) preserve biological diversity; and maintain essential ecological and life support systems (HMGN/ADB/FINNIDA 1988 as referred in HMG/UNDP 2000). The Master Plan for Forestry Sector was the outcome of the realisation for a need of a comprehensive long-term plan to meet the basic needs of the people by sustainably managing forest resources in the country. Some of the strategies identified by the Master Plan include (i) to reduce consumption of forest products; (ii) increase production of fuelwood, fodder and timber by promoting community forestry, private forestry, leasehold forestry and initiating management of national forests ((HMG/UNDP 2000). The 20-year Master Plan placed greater emphasis on community forestry (Hobley & Malla 1996; New-ERA 2001). Shrestha (1999) pointed out that the inherent problem of Nepal is failing to implement master plans and strategies, which are based upon expectations of foreign support. Hence, a number of management plans, action plans, and strategies have already become outdated in Nepal.

Community forestry, a major component of the Master Plan for the Forestry Sector, aims to protect, manage and use the forest through local forest user groups (HMG/Nepal 2002). This approach advocates local participation, bottom-up planning and sustainable use of forest resources. At present, community forestry has a wide coverage with over 8,314 forest user groups (FUGs) in all part of the country predominantly in the hill areas (HMG/Nepal 2002). The Department of Forest staff role is visualised as a facilitator in the overall process (Baral 2002). Nevertheless, lack of social science knowledge and regular monitoring capability among the staff have limited its success. On the other hand, the need to fulfil the immediate interest of the users has narrowed holistic development possibilities of forest resources in most of the community forestry.

The country has also entered a number of obligatory and co-operative agreements related to biodiversity conservation. It is a signatory to the Convention on Biological Diversity. Nepal is also the signatory of other major international treaties such as (i) Convention on International Trade in Endangered Species of Wild Fauna and Floras (CITES); (ii) Ramasar Convention (Wetlands Convention); and (iii) World Heritage Convention (HMG/Nepal 2002; Shrestha 1999). The above discussion indicates that Nepal has developed conservation strategies, master plans and also entered in a number of international conservation agreements. However, there is still lack of effective implementation of these strategies and plans. This also emphasises that there is a need for assessment of effectiveness of these strategies and plans on the ground.

3.3 Development of a Protected Area System

The protection of biological diversity in the country started with the enactment of the Wildlife Conservation Act of 1958. This Act provided legal protection to the rhinoceros and its habitat in Chitwan by establishment of a rhino sanctuary (Maskey 1997). However, more formal protection initiatives came after the approval of the National Parks and Wildlife Conservation Act, 2029 (1973) (Maskey 1997; Sharma 1998b). The Department of National Parks and Wildlife Conservation within the Ministry of Forests and Soil Conservation is the main national institution responsible for the protected areas management and biodiversity conservation. The National Parks and Wildlife Conservation Act 1973 is administered by this Department. This Act is the major commitment of Nepal in the development of the Protected Area System. The conservation of ecologically valuable areas and wildlife is provided for by this Act. The Act of 1973 prohibits the following in protected areas (Belbase 1999): (i) hunting of any animals or birds; (ii) building of any house, hut or other structure; (iii) clearing or cultivating of any part of the land, or the harvesting of any crops; (iv) grazing of any domestic animals; and (v) mining within the protected areas. However, the legislation was highly biased towards ecology and, thus, did not consider socio-economic need of local communities living within or in periphery of a protected area.

3.3.1 Categories of protected area

The Royal Chitwan National Park was established as the first protected area in 1973. The main aim of this national park establishment was to protect the remaining population of one horned rhinoceros, Bengal tiger, and other large mammals such as the sloth bear, the Asian elephant, the gaur bison and certain other species. A strict protection approach was followed with the armed forces to control any illegal activities (Maskey 1997). Declaring national parks and other protected areas offered the best possible opportunity to save at least some representative samples of those ecosystems (Upreti 1985). Within two decades after establishment of the first national park in the country, different IUCN categories of protected areas were established. At present, five such models of protected areas are operative in Nepal (Shrestha 1999). These are given in the table 3.2.

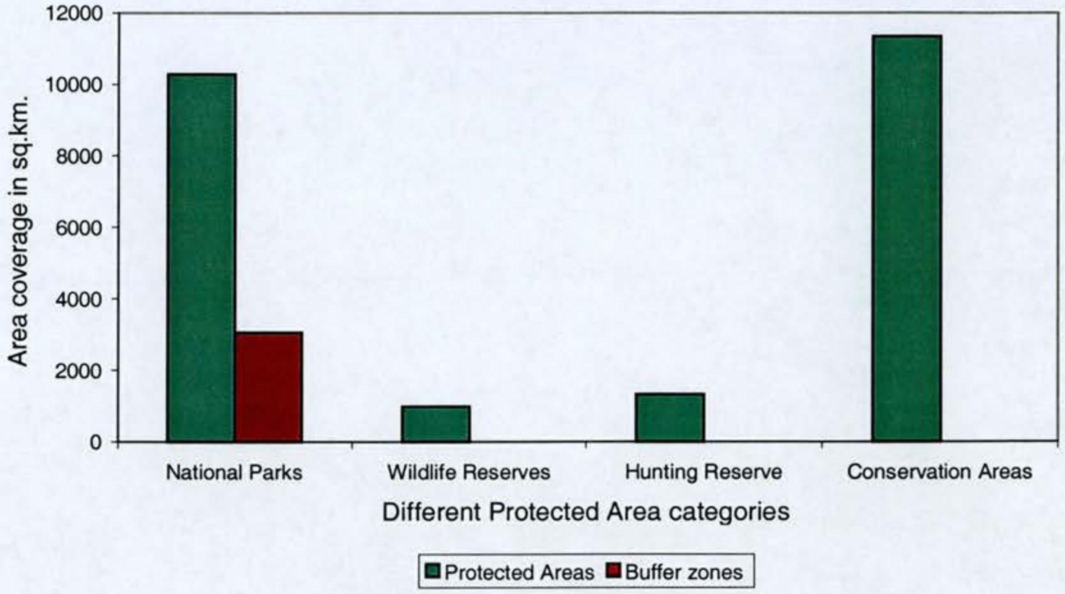
Nepal, at present, has a fairly extensive network of protected areas that cover 18.11% (including buffer zone) of its total land area, which includes nine national parks, four wildlife reserves, three conservation areas and one hunting reserve (appendix 3.3). Within the protected area system, conservation areas cover more than 45% of the total protected area coverage (Figure 3.1). The management model of these protected areas consists of various mixes of IUCN categories based upon different socio-economic settings. However, the middle hill of Nepal lying between the Himalayan region in the north and the Terai/Siwalik region in the south are poorly represented in the protected area system (Shrestha 1999).

Table 3.2 Summary of a network of protected areas in Nepal with special features of different categories

S. No.	Protected Area	Description
1.	National Parks	• An area set aside for conservation management and utilisation of animals, birds, vegetation or landscapes together with the natural environment. • Entry is restricted without permit. • Guarded by the army. • Managed by Department of National Parks. • IUCN Category II • 9 National Parks
2.	Wildlife Reserves	• An area set aside for conservation and management of animal and bird resources and their habitats. • Entry is restricted without permit. • Guarded by the army. • Managed by Department of National Parks. • IUCN Category IV • 3 Wildlife Reserves
3.	Hunting Reserves	• An area set aside for the management of animal and bird resources for the purpose of sport hunting. • Entry is restricted without permit. • Guarded by the army. • Managed by Department of National Parks. • IUCN Category IV • 1 Hunting Reserve
4.	Conservation Areas	• An area managed with an integrated plan for the conservation of the natural environment and the sustainable use of natural resources • No entry restriction to local people. • Entry is restricted to visitors without permit. • No army guard. • Local communities live within the area. • Managed by Department of National Parks and KMTNC, a non- governmental agency. • IUCN Category VI • 3 Conservation Areas

(Adapted from Shrestha 1999)

Figure 3.1 Comparison in area coverage by different categories of protected areas in Nepal. Conservation areas are the new designated category of protected area, which promotes community-based protected area management. The conservation areas are without any army staff and local community are given more responsibility in management.



The country has successfully developed an impressive network of protected areas by effectively and timely amendments of the Wildlife Act based on management priorities. As a result, the country has set an exemplary account of conventional wildlife management as well as a model of community-based protected area management (Maskey 2001). In the initial stage, most of the protected areas followed a strict protection approach for conservation of wildlife species. The National Park and Wildlife Conservation Act 1973 emphasised removing the people away from the area and protect the area by posting Royal Nepalese Army staff to enforce park regulations. The army has played a critical role in preserving the mega-fauna in protected areas. Their role has been particularly significant during the transfer of political power from one system to another. The Royal Chitwan National Park was literally saved by the army from being engulfed by illegal settlers from elsewhere (Shrestha 1999). However, the role of army has remained somewhat questionable in sustainable management of the protected areas of the mountain regions where local communities could have fulfilled the role, potentially.

The army, by and large, contributes to protected area management by protecting national parks and wildlife reserves from timber smugglers, poachers, livestock grazing, forest fires and public encroachments (Shrestha 1999). Poaching of endangered wildlife species such as one horned rhinoceros has escalated after the withdrawal of some security posts from Terai parks in the aftermath of emergency in the country (Chapagain 2002; Ghimire 2002; Himalayan-News-Service 2002). In addition, the cost of army protection is high, taking up about three quarters of the park's total annual budget (Shrestha 1999). This has brought up the question of effectiveness and a long-term viability of protected area management based on army guards in recent years.

On the other hand, the government has also effectively introduced another model of protected area at least in the Himalayan region without any army staff and local community were given more responsibility in management. Conservation areas, based on an integrated conservation and development concept, has provided a successful example that community-based conservation programmes can be complementary to local development efforts. Unlike the past policies, which concentrated protected area management on a local community exclusion approach, the new policy emphasis on integrated management of a protected area with inclusion of the local community. The government has recently realised that protected areas are inadequate to ensure the long-term conservation of globally significant biodiversity. Therefore, the landscape approach to biodiversity conservation is envisaged (UNDP 2002a). The approach aims to extend biodiversity conservation strategies into the surrounding productive landscape comprising national forests, agriculture land, riparian stripes, and wetlands. From this we can deduce that Nepal is proactively adopting various new and appropriate policies to conserve remaining biodiversity of the country. Despite this, there is serious lack of effective monitoring of these policies.

3.3.2 Problems and challenges in protected area management

Despite the wide coverage of the protected area system and success achieved in protection of certain flagship species such as one-horned rhinoceros and Bengal tiger, several problems relating to management have emerged. Reports of human wildlife conflicts including poaching of protected species like one-horned rhinoceros, Bengal tiger, Asian elephant are regular news excerpts in the country (Baduwal 2002; Chapagain 2002; Ghimire 2002; Post-Reporter 2001a, b). Besides, these protected areas also face many challenges, such as external threats associated with pollution and climate change, irresponsible tourism, infrastructure development and ever-increasing demands for land and water resources. Moreover, many protected areas lack political support and have inadequate financial and other resources (IUCN 1994).

Declaring biodiversity-rich areas as 'internationally important' conservation sites is meaningless for local communities in Nepal as long as the issues that emerge out of such declarations have not been discussed and resolved to the satisfaction of local communities (Ghimire & Pimbert 1997). The following example from Nepal illustrates the ineffectiveness of such declaration. The survival of the wild water buffalo (*Bubalus bubalis*) in the Koshi Tappu Wildlife Reserve, the first Ramsar site in the country, is at stake due to habitat destruction from encroachment by the people and cattle, and their crossbreeding with the domestic buffalo (Budhathoki 2003). This wildlife reserve of international importance has become a grazing area for thousands of domestic buffaloes despite strong rules and regulations at place. The failure to rehabilitate the families displaced from the reserve area, when it was created, is the prime cause of the problem of human encroachment (Editor 2003). From this we can conclude that conservation programmes are only valid and sustainable when they have the dual objectives of protecting and improving local livelihoods and ecological conditions (Ghimire & Pimbert 1997).

As in other countries, protected areas established before 1980s in Nepal were without or with very limited provision for traditional practices. Therefore, the restriction or denial of access to parks and reserves has in some cases resulted in economic and social hardship by local communities. For example, some villagers neighbouring the Parsa Wildlife Reserve were forced to migrate because of the lack of access to resources; escalating damage by wildlife; and even misbehaviour by the soldiers and park staff (Post-Reporter 2001b). The park authority in the Koshi Tappu Wildlife Reserve shot dead around 88 buffaloes recently to discourage cattle grazing inside the park (Acharya 2003). These adverse effects have generated resentment and hostility that has often led to vandalism, such as the setting of fires and the damage or destruction of park property. On the other hand, local human populations are apt to violate park boundaries and regulations by hunting animals, cutting down trees, and grazing their stock inside the park (Hough 1988). This has led to a situation where populations that have little sympathy for the park system or for conservation efforts in general surround the protected areas. As argued by Lusigi (1982) and valid for Nepal in many cases that there was simply no assessment of human needs, and planning still assumes that these countries will develop in the same way as Western countries and that these ideas can be transplanted without modification.

Experience worldwide and especially in Nepal for over the past 15 years or so has shown that the protected areas cannot be isolated from the people living in and around the protected areas. The sustainable use of local resources, particularly forest, remains the integral both to the livelihoods of the local communities and to the conservation of biodiversity and fragile environments. Furthermore, traditional management of the present network of protected areas with Royal Nepalese Army is too expensive for conservation of a significant portion of biodiversity-rich landscapes. There has been worldwide recognition that local communities must be actively involved, and their needs and aspiration considered, if biodiversity is to be conserved and sustained. Nepal, a leader among developing nations with regards to conservation legislation and programmes, made amendments to the 1973 Act in 1989 and 1993. The amendments permitted greater rights and responsibilities to local communities with designation of conservation areas and buffer zones around protected areas (HMG 1996; KMTNC 1996).

3.4 LEGAL STEPS TO INVOLVE LOCAL COMMUNITIES IN CONSERVATION

The Annapurna Conservation Area (ACA) was the first conservation area declared with amendments in the 1973 Act to involve the local community in conservation. Eight years after successful trial of the conservation area approach in ACA, the government endorsed the Conservation Area Regulations 1996, which legalised and formalised protection activities with local communities in conservation areas. The 1985 international workshop on the management of national parks and protected areas in the Hindu Kush-Himalayas was most the important gathering in the country, which laid great emphasis on the need for involvement of local people in protected area management and integration of conservation with development (McNeely et al. 1985). Consequently, a team of high-level government officials approved the operational plan for the Annapurna Conservation Area in July 1986 (Gurung 1989), which emphasised the involvement of local communities in conservation and integration of conservation with development. The government also amended the National Parks and Wildlife Act in 1989 (third amendment) and 1993 (fourth amendment) to provide a legal basis for the establishment of multiple-use Conservation Areas and buffer zones respectively through involvement of local community. These are major shifts in the protected area management paradigm in Nepal.

The 1989 amendment included the conservation area designation in the protected area categories. Under the amended status, "*conservation areas*" are defined as "*areas to be managed according to the integrated plan for the conservation of the natural environment and the balanced use of the natural resources*" (HMG 1992). A conservation area provides for a flexible system of resource management through involvement of the local community. The amendment also enables the government to contract out the management of conservation areas to any "*institution established with the objective of conservation of nature and natural wealth*" (HMG 1992). With these two provisions, Nepal significantly expanded its legal approach to land protection. It sanctioned multiple–use-management in designated conservation areas, and it authorised non-governmental organisations (NGOs) to assume management responsibility (Keiter 1995).

The fourth amendment in 1993 authorised the Department of National Parks and Wildlife Conservation to establish and manage buffer zones outside the park boundaries. It defined the buffer zone as the area surrounding a national park or reserve to provide for the use of forest resources on a regular and beneficial basis for the local people (HMG 1992). The amendment incorporates the principles of local participation and sustainable development to promote responsible management of adjacent forests. The amendment provides the park warden with the authority and the tools needed for a more collaborative management approach. The amendment also provides that 30 to 40 per cent of the funds generated from park revenues may be expended for local community development (HMG 1992). The buffer zone management is a further shift away from a regulatory model that previously characterised national park management in Nepal (Keiter 1995). This reflected the government's commitment to involve local community in conservation.

The Conservation Area Management Regulations 2053 (CAMR1996) and the Conservation Area Management Guidelines 2056 (CAMG 1999) published by the government under rights provided by the National Parks and Wildlife Conservation Act, 2029 (1972) devolved management authority to local communities of ACA (KMTNC 1996). Approval of these two important documents suggests that the government is committed to devolve ownership rights and control to ACA communities. CAMR and CAMG have emphasized delegation of management authorities to the local communities by entitling the Conservation Area Management Committee (CAMC) as a main local institution. CAMR also authorised CAMCs to constitute sub-committees to conduct conservation and development work systematically (KMTNC 1996). These documents also outlines the functions, duties and authorities of CAMCs and sub-committees. CAMR supplemented by CAMG also provides authority and responsibility to manage funds by the CAMCs, which are earned from user fees for grazing and forest product utilisation (KMTNC 1996, 1999). The local community's role as a partner in the management of a conservation area through a Conservation Area Management Committee has been explicitly reflected in the regulations. The regulations authorise Conservation Area Management Committees to issue permits and collect revenues from the local community for allowing fishing, forest resource utilisation, grazing and other resources utilisation (KMTNC 1996).

The success of the ACA approach to protected area management influenced and encouraged the government to declare new protected areas with a conservation area designation rather than a national park or wildlife reserves. To date, four conservation areas have been declared in the Himalayan region of the country. However, the conservation area status of the Makalu-Barun Conservation Area has been changed to buffer zone of the Makalu-Barun National Park (DNPWC 1999). Amalgamation of the national park and conservation area was attempted only in this protected area perhaps because of the interest of the supporting donor, the Mountain Institute, a USA based conservation INGO. This indicates the adaptive nature of protected area management policy and the influence of the donor community in conservation policies in Nepal. Adaptive management enables ongoing improvement of management policies and practices based on lessons learned from operation activities (Dallmeier et al. 2002). According to a senior officer in DNPWC, the change in conservation area status was to bring uniformity among the protected areas within the country (Bajimaya, personal communication). He also explained that national parks and conservation areas have clearly two different identities within the Nepalese protected area management system. The amalgamation was tried when there was no provision of buffer zones. Nevertheless, declaration of a new conservation area or changing the conservation area status to a buffer zone is an experienced-based rather than evidence-base. Most often decisions regarding conservation issues are taken without monitoring or evaluation of effectiveness (Pullin & Knight 2001).

The conservation history of Nepal shows progressive development of nature conservation policies with careful consideration of the social, economic and political climate in which it occurs (Heinen & Kattel 1992; Keiter 1995). With this legal amendment to involve communities, Nepal became one of the pioneer countries in the world to initiate the community-based protected area management. Active initiatives have been taken to develop legal and policy-frame works to involve communities by endorsement of Conservation Area Regulations 1996 and Buffer Zone Management Regulations 1996 (HMG 1996; KMTNC 1996). The new laws underlie the philosophy of community-based conservation by incorporating public participation in management (Heinen & Mehta 1999). However, certain new policies are conflicting with community-based protected area management. In particular, the Local Self Governance Act (LSGA) 2056 (2000) brought in by the Ministry of Local Development overlaps with the Conservation Area Management and Buffer Zone Management regulations. LSGA stipulates that natural heritage is the property of the VDC. Hence members of local government believe that all the resources within their political boundary of VDC or District Development Committee (DDC) are property of that VDC or DDC (Belbase & Regmi 2002). The regulations also stipulate that any proceeds accrued from the sale of resources including bone, horn, feather and skin of any wildlife which is not prohibited by prevailing Nepali laws, go into the DDC fund (Belbase & Regmi 2002). These and similar other issues contradict with the present Conservation Area Management Regulations and other conservation legislations of Nepal. Therefore reconciliation of these Acts needs greater emphasis for successful implementation of both regulations.

3. 5 DEVELOPMENT OF ANNAPURNA CONSERVATION AREA

Annapurna region's popularity as a tourist destination expanded in the 1950's when the country was opened to foreign visitors. The large and growing numbers of tourist visiting Annapurna have had significant environmental, socio-economic and cultural impacts (Nepal et al. 2002; Wells 1994b). Large areas of forested land were cleared to provide cooking, heating and lodging services to visitors. On the other hand, expanding agriculture, water pollution, poor sanitation, non-biodegradable waste and littering of trails have accelerated. These trends threatened the area's economic and cultural systems as well as its biological diversity (Wells 1994b).

As a result, the first field reconnaissance in the Annapurna area to determine the potential for a National Park was made by T. S. Choate in 1971 and was followed by a FAO consultant J. Bower in 1974 (Sherpa et al. 1986). A proposal to establish a multi-use recreational area by Mr. Karna Shakya was proposed in 1980 (Mahat 1985; Sherpa et al. 1986). The proposal emphasised sustainable utilisation of resources; optimisation of tourism potential; protection of the ethnological and cultural heritage; and developing local economy through tourism ancillary industries such as horticulture and poultry. The recommendations and proposals put forwarded by these experts were the beginning of the early conservation history of the Annapurna region (appendix 3.4).

At the national level concern regarding the conservation status of the area came after the directives from the late King Birendra during his unofficial visit to the region in 1985. The King stated that conservation be executed in the region alongside careful tourism development using existing resources to their fullest (Sherpa et al. 1986). In response to this, a formal plan "A Nepal Plan" was put forwarded by B. Bunting and M. R. Wright from the World Wildlife Fund in 1985 which proposed a concept and initial development strategy (Mahat 1985; Sherpa et al. 1986). A study was carried out in June 1985 to recommend designation, boundaries, management priorities and specific strategies for involving local residents in the management and administration of a protected area (Sherpa et al. 1986). The study team recommended a 'Conservation Area' designation, which advocated a new concept in protected area management. The Operational Plan produced by the study team stressed a less restrictive and more flexible programme that involves the local people in resource conservation and allows them to reside in the area and maintain their rights and access in the use of the natural resources (Sherpa et al. 1986). It was clear that designation of a national park would lead to rapid international recognition while also permitting the application of existing legislation. However, it was feared that the restrictive management required by law in a national park would generate same negative local responses as seen elsewhere in Nepal (Sharma & Wells 1996; Sherpa et al. 1986).

The King Mahendra Trust for Nature Conservation (KMTNC), a national environmental non-governmental agency, launched the Annapurna Conservation Area Project (ACAP) after receiving a mandate from the parliament (KMTNC-ACAP 1997). KMTNC established in 1982 by the Legislative Act, mandated as an autonomous, non-profit and non-governmental organisation, to work in the field of nature conservation in Nepal. On July 20, 1992, ACAP received official gazette from His Majesty's Government of Nepal (HMG/N), which endorses the 'conservation area' designation. The authority to manage the designated conservation area was handed over to KMTNC for a period of ten years (KMTNC-ACAP 1997). Subsequently, the government approved the Conservation Area Management Regulations and its Guidelines, which provide a legal framework for the management of conservation areas (appendix 3.5). The regulations authorise KMTNC-ACAP to collect and utilise the entry fee levied to every trekker visiting ACA for the purpose conservation and development in the area. At present, the ACA approach to conservation and development is considered as a successful example in community-based protected area management (Bajracharya 2002; HMG/UNDP 2000; Sharma 1998b; Wells 1994b).

3.6 LOCAL PEOPLE AND THEIR DEPENDENCE ON NATURE

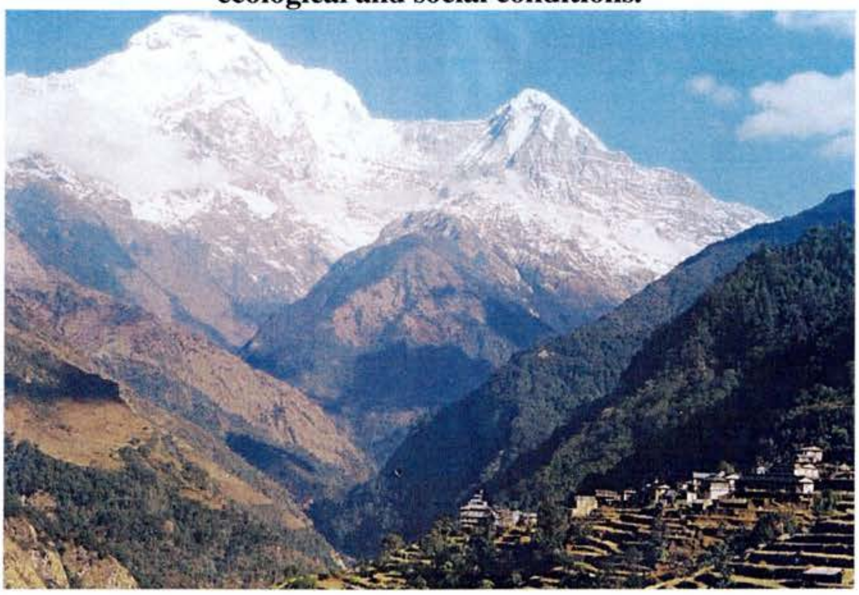
The area is settled by very diverse ethnic groups of people. Approximately 120,000 people from five major ethnic such as Gurungs, Magars, Thakali, Manang Gurung and Bahun, and other tribal groups live in ACA (Bajracharya 2002) Gurungs, Tibeto-Mongol ethnic group, are the dominant group in the southern slopes (appendix 3.6). The traditional economy was herding, hunting and swidden (slash and burn) agriculture adapted to rugged highlands and high forests (Messerschmidt 1976). Today, they grow rice, wheat, maize, millet and potatoes in their terraced fields, and have recently been active in tourism. A great majority of Gurungs traditionally join the Gurkha regiments in Britain and India (Bista 2000; Macfarlane 1976). A majority of Gurungs follow a mixture of Buddhism, Hinduism and Animism religions. The earlier religion they followed was Animistic and Shamanic, akin to the pre-Buddhist Bon religion of Tibet (Messerschmidt 1976).

Traditionally, the people of the region are highly dependent on natural resources. Hunting and swidden practices were formerly important economic activities (Messerschmidt 1976; Sherpa et al. 1986). A minority of the villagers continue these practices at present. Nevertheless, the majority of the people are still dependent on natural resources for fuel wood, fodder, timber and for other non-timber forest products such as *nigalo* bamboo, varieties of vegetables and fruits, and some medicinal plants. Wood is the primary source of energy for cooking and heating. Bamboo is used to weave baskets and other agricultural implements.

For this reason, the interests of the local people are clearly tied to forest resources of their area. Many studies have shown that the local people have deep understanding of forest resources, and have practical experience and interest in the management of these forests (Mahat 1985; Sherpa et al. 1986). On the other hand, forest degradation has been a concern, which is mainly caused by factors such as population growth, changes in government policies regarding forest management and tourism.

Trekking tourism has become a dominant feature in certain parts of ACA. The attractions of the area are both spectacular and reasonably accessible (Wells 1994b). The average annual flow of visitors is more than 50,000 although there has been a dramatic decline in number of visitors in recent years due to the recent political problems in the country. A recent tourism facility survey in the area reported 921 lodges, campsites and teashops with a significant increase in these facilities over a five-year period (KMTNC-ACAP 2001a).

Plate 3.6 General terrain of southern slopes of Annapurna Conservation Area with spectacular view of Annapurna South with Landruk village. Farming is carried out in terraced slopes. The present research was carried out in villages with similar ecological and social conditions.



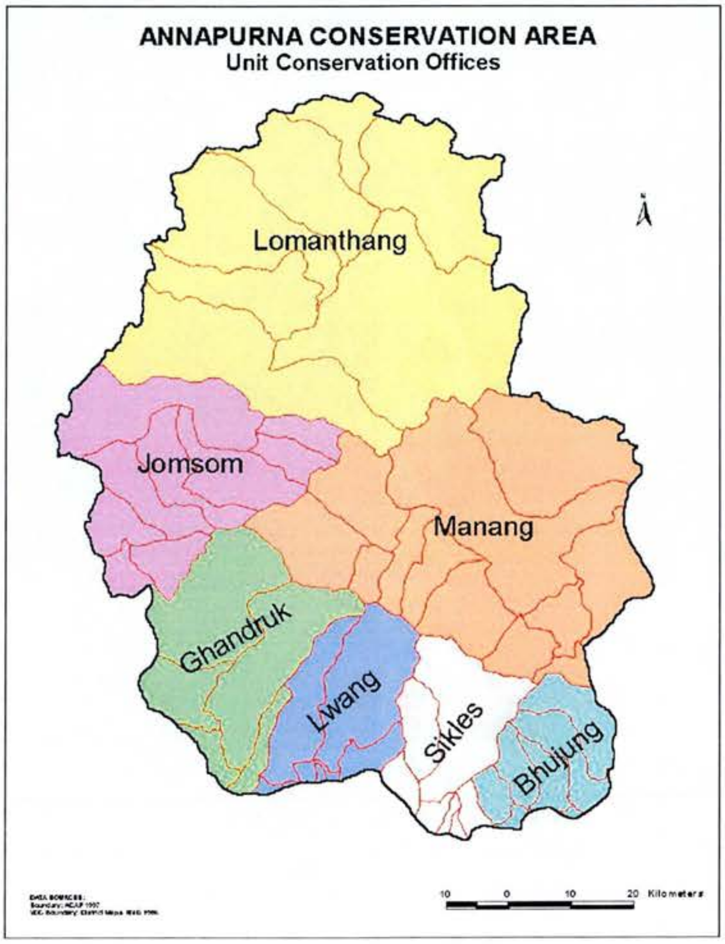
Therefore, tourism has become one of the prime economic activities in the area but uneven distribution of income in and between villages has developed economic disparity. There is considerable evidence that tourism widened the gap between the rich and poor within tourist regions (Nepal et al. 2002). However, tourism has been one of the major driving forces in the conservation and development of the area. A user's fee (about £16) is levied on all non-national visitors (different fees apply for the visitors from the SAARC countries) to ACA. Unlike most national park fees, these user fees do not go to the government treasury but are recycled back to the protected area by KMTNC, which oversees 762,900 ha of the area with over 250 staff without any financial burden to the national government.

3.7 MANAGEMENT OF ACA

The management of ACA is based on the participatory multi-land use protected area concept. The Operational Plan prepared in 1986 outlined five management zones which are (i) Special management zone, which includes areas with scenic beauty that have less than 100 years of settlement history; (ii) the Wilderness zone, includes areas roughly above, 4,750 metres altitude; (iii) the Protected Forest lies between the Wilderness zone and the Intensive management zone; (iv) the Intensive Management zone includes areas under intensive agriculture and human activities; and (v) the Biotic/Anthropological Zone includes areas where the influence of technology and modern man has not significantly affected the life of the inhabitants (Sherpa et al. 1986). A Management Plan was prepared in 1997 based on wider implementation experiences of the operation plan. However, the Management Plan does not mention the different management zones. Implementation and monitoring of conservation policies could be less effective without the management zones.

The Management Plan was based on eight management goals, with objectives, priority programmes and policies (KMTNC 1997). These management goals were: i) to build and strengthen the institutional capacity of ACAP through human resource development; ii) to develop a long term framework for conservation of the natural resources in ACA; iii) to promote nature conservation through sustainable development of tourism; iv) to enhance the status of women by according an equal role to them in decision making processes in conservation and sustainable development; v) reduce stress on critical resources primarily forests through wider use of micro hydro electricity and other alternative programmes; vi) to promote community infrastructure development; vii) to promote cultural heritage conservation; and to carry out essential multi-disciplinary management research to support conservation and development initiatives (KMTNC 1997).

Plate 3.7 Map of the Annapurna Conservation Area (ACA). ACA is divided into 7 management units. A Unit Conservation Office administers each unit with several villages. The Headquarters based in Pokhara supports these unit offices.



Source: KMTNC-ACAP

Conservation programmes' in ACA were executed in a stage-wise manner enabling ACAP to gain experience and gradually expand its working area. After successfully testing its concept in one VDC, subsequently it expanded to 762,900 ha (7,629 sq. km) in two stages. To manage programmes and activities in these rugged areas, the ACA Headquarters in Pokhara coordinates through its seven unit conservation offices in field bases. The Conservation Area Management Committee (CAMC) is the main executive body constituted by the ACAP to manage the conservation area. The villagers of every ward nominate nine of the 15 members. Committees exist in all the 55 Village Development Committees of ACA and under these committees are several grassroots institutions such as the forest management committees, mother's group, tourism management committees, electricity management committee, etc. All these institutions are responsible for executing and linking their specific activities with the conservation of natural resources.

To address the integrated nature of the programme, KMTNC's ACAP has a team of staff in ACA from different disciplines such as agriculture, tourism, engineering, economics and rural development besides forestry and biology. A considerable percentage of staff is from the region. The director of the conservation area during this research was a person from the area. ACA also provided indirect employment opportunities to the local people inside and neighbouring the area through tourism and other skill-development training such as trekking guide, hotel management, agriculture development, poultry and electrician.

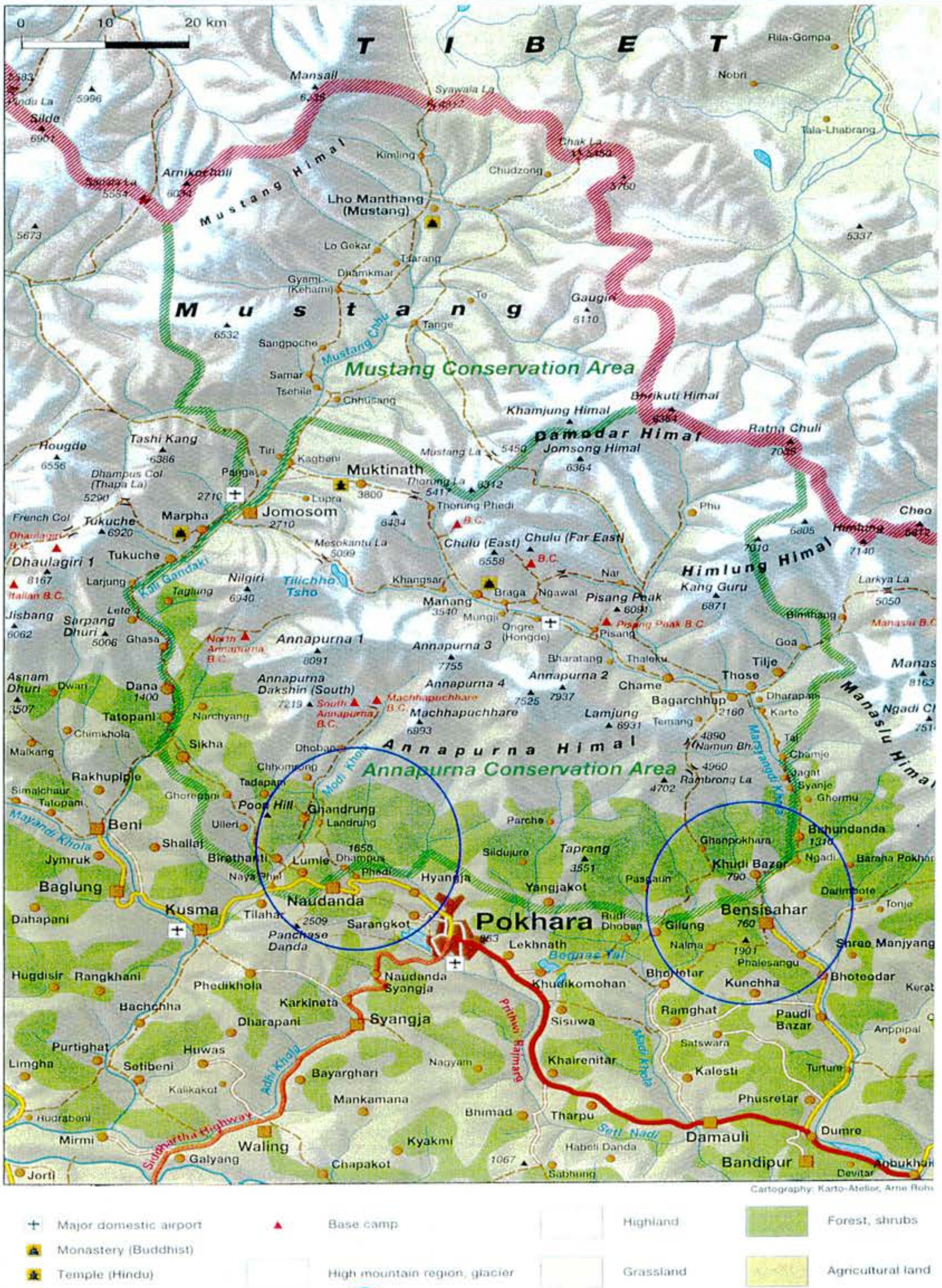
3.8 Management of resources outside ACA

Management of forest resources outside ACA is generally controlled and managed by the national government through District Forest Offices. The Forest Act of 1961 provided legislation for state administration of the forests (Palit 1996). The act, however, had little impact on forests situated in distance and inaccessible areas where people continued to use the forests for subsistence needs. With the realisation of need of local involvement in forest management, the government took a significant step to involve people through a community forestry approach. The forest legislation of 1993 has five categories of national forests and these are: community forests, leasehold forests, religious forests, government-managed forests and protected forests (Belbase & Regmi 2002; Kanel 1993). The community forest development is the present priority of the government. The main focus of the approach is the handing-over of control and responsibility for the management of forests to local people (Adhikari 1990). Thus, the community forestry relies on local users for protection, management and utilisation of any part of a national forest (Shrestha 1995). Most of the forest sites surveyed outside ACA were under some form of the community forestry approach except the forest sites in Mauja village. Therefore, the government has handed over these forests to local forest users' group (FUG) for management and sustainable utilisation of the resources. FUG works under the supervision of the district forest office. However, the aim of community forestry is more inclined towards utilisation for collective benefits and, therefore, biodiversity conservation within these forests are generally not in the priority of local forest users' group. On the other hand, the community forest has not been linked with other national forests managed by the government thereby increasing illegal pressure in nearby national forests (Sharma 1993). Various overseas donors assisted the community forestry programme in Nepal (Shrestha 1993).

3.9 THE STUDY AREA

The study area is located on the southern slopes of the Annapurna range in Central Nepal. The study sites are located in the villages within Kaski District (between 28°14' to 28°25'N and 83°44 to 84°03'E) and Lamjung District (between 28°12' to 28°18'N and 84°15' to 84°22'E) in the Annapurna Conservation Area and in its periphery. The villages of the study sites lie above 1300 m from sea level except two villages in Lamjung District (appendix 3.7). Most of these areas, particularly in ACA are well known for high natural resources; however population growths, expansion of agriculture land, tourism development and a lack of alternative energy sources have degraded resources.

Owing to the differences in topography, climate, biodiversity and other factors such as different ethnic groups and cultural practices between southern slopes and northern slopes of the Annapurna range, the present research was focused in the southern slopes.



Source: Nepal et al. (2002) Study sites

Plate 3.8 Map of ACA showing study sites inside and outside ACA

It is also the case that the conservation programme was initiated more than five years later in northern slopes than in most of the southern slopes. However, high dependency on wild resources use, prevalence of traditional system of resource management in the past, an increasing influence of tourism and a similar approach of conservation intervention make the study area and northern slopes very similar. Therefore, the study sites selected were also representative of ACA including both villages with and without tourism. The present study sites are also most affected by conservation and development programmes implemented through ACAP and through the government and/or international donor communities such as DFID (the UK government), British Gurkha Welfare Office, HELVETAS (the Swiss government) and JICA/JOVC (the Japanese government). This means that the sites also provide models of positive and negative processes of conservation and development affecting the region. However, to get a more realistic picture, villages with tourism and without tourism were selected within the conservation area. Peripheral villages with and without tourism that are not covered by the conservation area regulations, i.e. outside ACA, were also selected to compare the effectiveness of the conservation area. Fourteen study sites were located within relatively homogenous villages (climate, altitude, vegetation type, ethnic composition, resource use pattern, farming system), characteristics of the southern slopes of the Annapurna ranges. These were:

Table 3.3 Distribution of different study villages according with and without tourism, and abiding by and do not abiding by the conservation area regulations

	Villages with tourism	Villages without tourism
Villages inside ACA	1. Chhomrong (Kaski)	1. Bhujung (Lamjung)
	2. Ghandrung (Kaski)	2. Baghum (Lamjung)
	3. Landrung (Kaski)	3. Sabet (Kaski)
		4. Dangsing (Kaski)
Villages outside ACA	1. Sarangkot (Kaski)	1. Aantighar (Kaski)
	2. Bhulbhule (Lamjung)	2. Mauja (Kaski)
	3. Ngadi (Lamjung)	3. Maling (Lamjung)
		4. Taksar (Lamjung)

Site identification was done by consultation of maps and information, previous experience of the researcher, consultation with conservation area staff, conservation area management committee members and district development committee members. Considerable care was taken to select study communities which were characteristics of ACA. Preliminary field visits were also made to identify the sites outside the conservation areas. Ethnic composition, resource use pattern, topography and accessibility to the site were main criteria used to identify the sites. All the study sites are in the middle hill area of western Nepal. Gurungs and other hill tribes such as Magar, Brahman, Chhetri are the major ethnic groups in all these study sites. A majority of these village communities were dependent on wild resource for their subsistence. Agriculture farming is carried out in terraced hill slopes. Main crops grown are Maize, Millet and Rice. Livestock farming is a part of agriculture system in all the villages. All the study sites were within 8 hours walking distance from the nearest road. Therefore, the villages selected for the study, in general, were homogenous in these characteristics. However, certain compromise was needed during the site identification due to a severe security situation in the country. Certain villages were purposely avoided because of higher Maoist activities in these villages.

This chapter provided an overview of conservation issues of Nepal. The study sites were also introduced in the chapter. The following chapter will deal with research approach and methodology applied in the study.

CHAPTER IV

MEASURING IMPACTS OF COMMUNITY INVOLVEMENT IN CONSERVATION: RESEARCH APPROACH AND METHODOLOGY

4.1 INTRODUCTION

This chapter will describe the methods used in the study. In the light of the growing importance of the community's role in conservation, there is now a considerable body of research, which suggests that integration of biophysical and social issues are central to protected area management research (Kremen et al. 1994). On the other hand, the previous researches within protected areas had inclined more often towards ecological or biological aspects. The present chapter describes biophysical and social methods, which have been selected as the principal methods in the research. It presents an overview of existing methods and expands upon the techniques used. This chapter is divided into the following sections: field research in context; an overview of impact assessment of protected area management; sampling design; field research and data analysis.

4.1.1 Field research in context

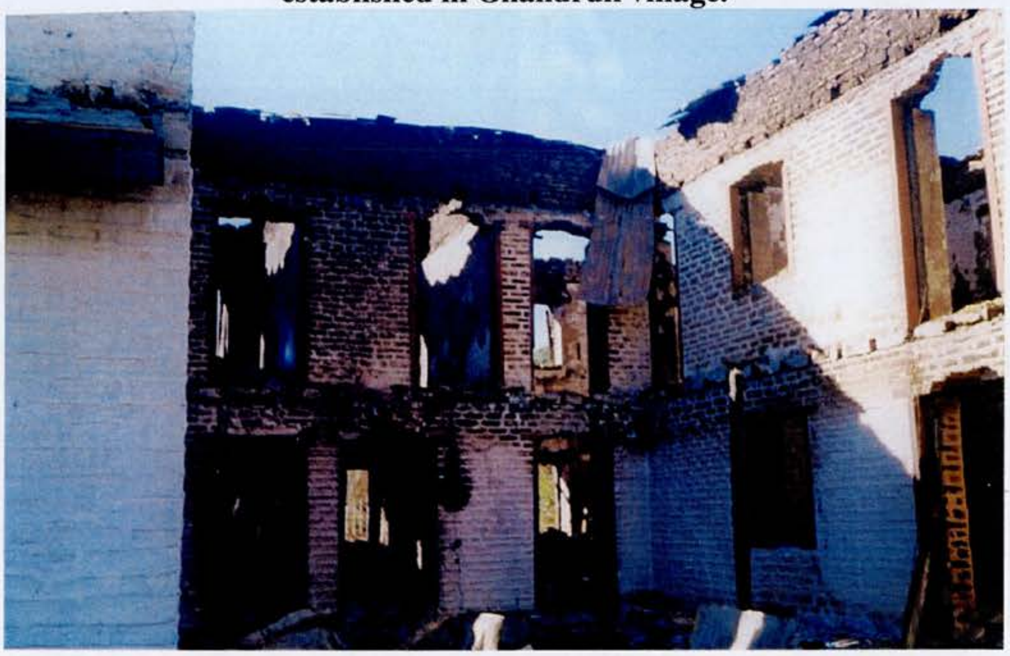
Until the year 2000, I was involved in the management of the Annapurna Conservation Area (ACA). With more than 12 years of experience working with the local communities in ACA, I was directly involved in various conservation and development activities from field to policy development. This provided a basis for using intuitive and field experience during the present research. Previous knowledge on the area, of people and their culture, together with experience of conservation intervention greatly facilitated the research. Most of the communities in ACA were aware of the purpose of frequent visits to their villages. The formality of introducing the work to the local people, securing permission for research and explaining the purpose of visits were rarely felt necessary in ACA during the field research because of previous experience and the relationship built-up over many years. Community leaders and women's group leaders were often happy and proud to see me in their village as a researcher because most of the time they have encountered researchers who have neither any previous knowledge of the area nor any long-term commitment to the future of the area.

Nevertheless, there were impediments to the field research due to my association with the area. During the initial stage of the PRA exercises, the local community leaders in ACA were not serious in sharing information; especially on changes in resources because they thought that I would have better information and knowledge on these issues. This required persuasion on the importance of sharing information and knowledge. The PRA exercises, structured interviews and wildlife damage questionnaire survey went well, once the local people realised the importance of sharing information for the research work. A team of two to three villagers who have good knowledge of the forest and wildlife always accompanied me during the forest surveys.

The research was initiated when the country was facing a severe security problem due to the Maoist insurgency. The government also declared a "state of emergency" in the country and mobilised security forces to combat the Maoist insurgency during the research period. Nevertheless, the state of emergency did not significantly reduce the problem of insecurity. There was no visible improvement in the law and order situation in the country during the research period. The heavy presence of security personnel, mainly in the urban areas, and increases in activities of the Maoist's groups in the rural areas particularly in forest, made travel to the field sites very difficult and hazardous. I have also noticed an increased mistrust among the villagers. There was a tendency to avoid contact with unknown people in villages that are very unusual. A further serious development was the reaction of local people on seeing unknown people. They simply identified the outsiders as a rebel group. As an example, once we were returning to the

Mauja village, Dangsing VDC following a long day of forest survey work. It was already dusk and therefore the villagers could not recognize us and we were regarded as a group of rebels. This fear among the villagers is understandable because there were frequent movements of rebel groups throughout the area. The rebel groups shelter in forests during the day and come to villages in the evening. The frequent damage to the field offices of ACA over the year was also an indicator of their presence in villages.

Plate 4.1 ACA is the most severely affected by the Maoist insurgency among the protected areas in Nepal. The picture shows the level of damage created by rebels in the ACA field offices. This building was the first headquarters of ACA established in Ghandruk village.



One of the PRA exercises was also carried out in the presence of armed rebels. When our team was conducting the PRA exercises in a village in Lamjung, an armed rebel group joined the PRA group. They observed our PRA exercises but did not participate or interfere during the exercise. However, we were requested to clarify the purpose of the exercise to them. This state of confusion made our work relatively difficult. The forest survey work in the villages of Lamjung area could not be completed because of the continuous presence of the rebel groups in and around the forest. Several attempts were made to achieve this work but unfortunately without any success.

4.2 IMPACT ASSESSMENT OF PROTECTED AREA MANAGEMENT: AN OVERVIEW

The interests and expectations of the local community for participating in conservation are changing. These changes have led to emergence of a new approach to protected area management. Community-based conservation has emerged as a new paradigm in protected area management in recent decades. The effort to involve a local community as a partner in a protected area management is referred to here as community-based conservation. It is a process of ecosystem conservation where communities have a key or significant role in the decision-making process (Kothari et al. 2000). Community-based conservation currently dominates the global discourse on conservation policy (Adams & Hulme 1998). Traditional, near-exclusive reliance on biological science and expert decision-making is being replaced by multidisciplinary integration and stakeholder participation as two key precepts of biodiversity conservation (Riley et al. 2002). Community-based conservation is intended to be inclusive rather than exclusive of local communities (Infield and Adams, 1999 cited in Infield & Namara 2001). As the community-based conservation approach is about people and about species or ecosystems, application of both biological and social sciences is important. A success of a community-based conservation, therefore, needs to examine the ecological and social effectiveness of the approach. With this shift in protected area management, managers are increasingly making complementary use of biological and social science while seeking more extensive input and involvement from the local community (Riley et al. 2002).

The social and economic vitality of neighbouring communities is increasingly considered essential for the success of parks and conservation objectives (Lusigi 1982; West & Brechin 1991). Current research on protected areas and the conservation of biodiversity has begun to broaden its focus away from the biological elements of conservation, such as the numbers of species, home range of a mammal species, and elements of biophysical environment (Abbot & Guijt 1998). It is often argued that information provided by ecologists is not always sufficient or appropriate, and that their methods can be too costly and time-consuming to be useful for many situations in which environmental information is required (Abbot & Guijt 1998). It is also important to note that conservation problems have scientific, economic and social dimensions, although the particular mix will vary according to circumstances (Mangel et al. 1996). It is also argued that biodiversity assessment, particularly in a community-based conservation, is value-laden (Lawrence 2002; Lawrence & Elphick 2002). Local people value biodiversity for its aesthetic, cultural and spiritual values besides its utilitarian values. Therefore, different stakeholders may hold apparently different values to biodiversity (Lawrence & Elphick 2002). This indicates that biodiversity assessment is not simply a matter of gathering scientific evidence about biophysical process but rather it involves subjective judgement based on values of biodiversity (also see Lawrence 2002).

The disconnect in between our biological knowledge and conservation success has also led to a growing sense among scientists and conservation practitioners that social factors are often the primary determinants of success and failure of a protected area (Mascia et al. 2003). With the changes in conservation approach, therefore, there is a growing inclination towards an integration of biological, social and participatory research. But the balance between the uses of methods will depend on the research objectives.

The subsistence harvesting of wild resources such as fuel wood, timber, fodder and non-timber forest products is important in many rural communities (Scoones et al. 1992 as cited in Abbot & Mace 1999), which is generally allowed in many community-based conservation initiatives. The community-based conservation approach addresses both ecological and social concerns of a protected area. The managers therefore need to understand the impact of the conservation intervention at both levels. This is further strengthening of the case for integration of biological and social research probably based on participatory approaches in an assessment of a community-based conservation (Kremen et al. 1994; Lawrence 2002; West & Brechin 1991).

So far, little research evidence has been published on impacts of community-based protected area management on both conservation and the local community. There is, however, a great need of such research because there is a global trend towards community-based conservation (Adams & Hulme 1998; Brandon & Wells 1992; Dudley et al. 1999a; Maskey 1997; Mehta & Kellert 1998; Songorwa et al. 2000; Stolton & Dudley 1999).

4.3 SAMPLING DESIGN

This study was conducted in the Annapurna Conservation Area in Nepal where local communities have been involved in conservation for more than a decade. While the state of the biophysical resources and social conditions have improved after the conservation intervention in ACA (Kothari et al. 2000), the measurement of its impact is difficult because of lack of any baseline information. In order to assess the impact of community involvement in the protected area management a comparative approach to research was therefore adopted, involving assessments of sites within the Conservation Area and outside where the community-based protected area management policies and regulations have not been obligatory.

Sampling was necessary to measure defined variables in order to represent the entire population inside and outside the Conservation Area, which would have been too large and too expensive to measure completely. Sampling designs are ways of selecting parts of the population for measurement (Scott 1998). The sampling was replicated to increase the reliability and general applicability of the results. Replication also reduces bias in the sampling. This study used both stratified random sampling and systematic sampling. Random sampling is when every member of the whole population has an equal and independent chance of being in the sample (Underwood 1997). Randomisation of the sampling allows a wider representation of the true population. Random samples are not, however, necessarily representative in any one particular case (Underwood 1997). Sampling at precise random locations is however time-consuming (Sutherland 2000). The social research was conducted using stratified random sampling while taking the above issues into consideration. In order to ensure that the sampling was representative of the populations, the samples in the social research were divided into specific *strata* such as caste groups, gender and village activity. The subdivision of the population into strata aims to derive parts each of which are more homogenous than the whole population i.e. the within-stratum variance is relatively small (Philip 1994).

In a systematic sampling, sampling units are selected by a systematic routine or spatial pattern (Philip 1994). Systematic sampling is easier to perform in the field and hence is less subject to selection errors than are either simple random sample or stratified random samples (Cochran 1963; Scheaffer et al. 1990). It can provide greater information per unit cost than simple random sampling can provide. A systematic sample is generally spread more uniformly over the entire population and thus may provide more information about the population than an equivalent amount of data contained in a simple random sample (Cochran 1963; Scheaffer et al. 1990). The difference between two sampling approaches is that with systematic sampling the units occur at the same relative position in the stratum, whereas with the stratified random sample the position in the stratum is determined separately by randomisation within each stratum (Cochran 1963). Taking these issues into consideration, the forest survey was carried out using a systematic sample approach to estimate the proportion of human impacts at different distances from a village edge.

The sampling programme was designed to examine the effects of two factors: conservation legislation, referring explicitly to the protected area; and tourism. To evaluate the impact of these factors, areas both inside and outside the protected area were compared. In addition, areas with and without tourism were surveyed, both within and outside the protected area. There were, therefore, four different combinations of factors as follows:

Table 4.1 Sampling Strategy

	Within ACA	Outside ACA
Area with tourism	3 villages	3 villages
Area without tourism	4 villages	4 villages

In each combination, three villages with tourism and four villages without tourism were surveyed. In order to ensure that replicates were independent, a distance of approximately 1 kilometre between villages was adopted. Painter (1991) described the village or 'territory' as a land area, which is habitually used by members of an agrarian community for their livelihoods, with boundaries that are recognised by members of the spatial unit and by those residing outside the territory (cited in Freudenberger 1994).

4.4 FIELD RESEARCH

Two main techniques were used to assess the impact and extent of the community-based protected area management (Fortin & Gagnon 1999; Kontogianni et al. 2001). First, a biophysical survey was conducted to analyse current risks and pressures on the forests. Secondly, a social survey based on selection of different approaches was carried out in the area to examine effectiveness of the community-based protected area management at a village level. Description of the methods used is elaborated in the following section (Figure 4.1).

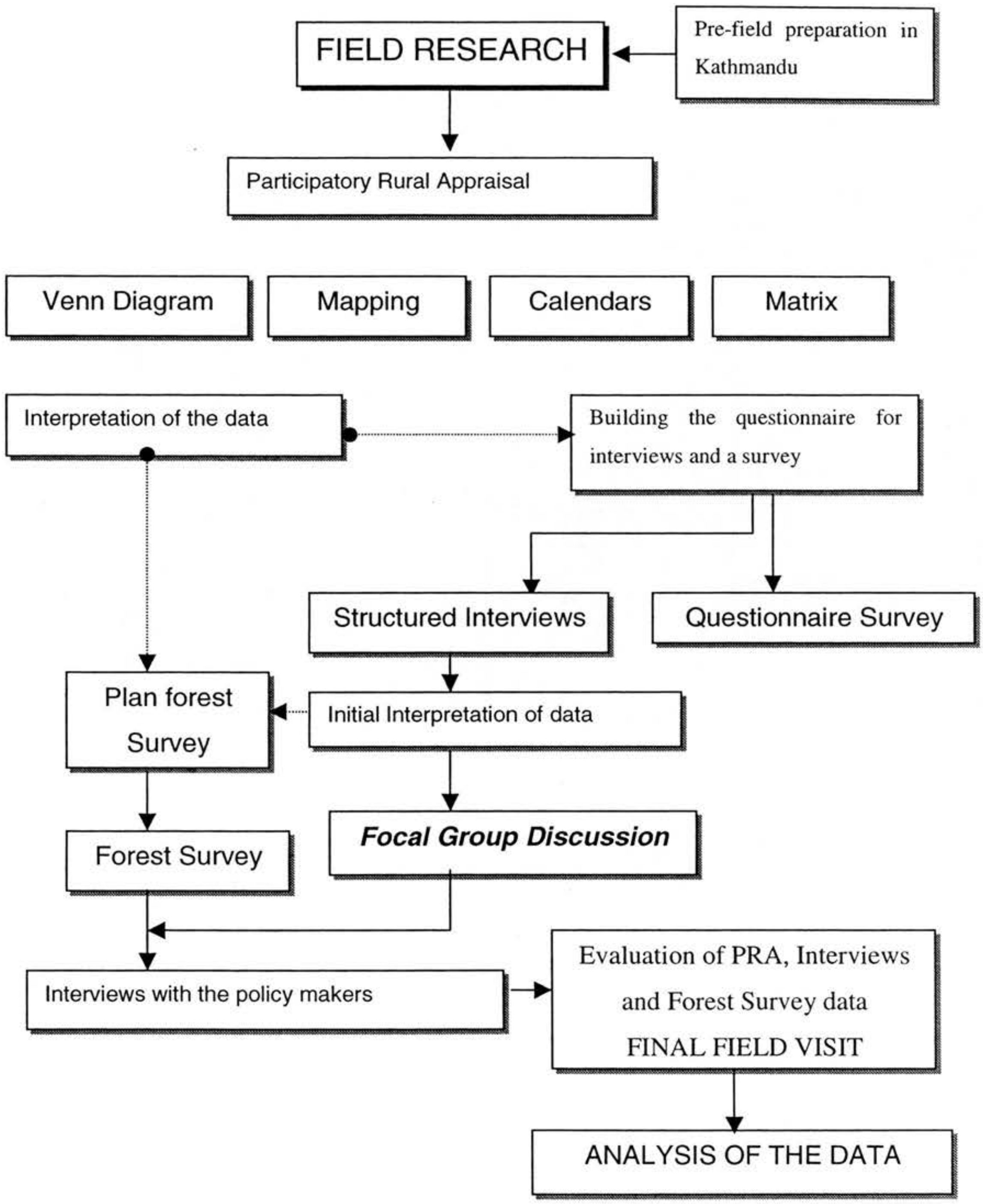
4.4.1 Biophysical methods

Forest inventory

Forest inventory is a procedure used for the quantitative description of a forest or stand. In the simplest terms, a forest inventory is an attempt to describe the quantity and quality of forest trees and many of the characteristics of the land area upon which the trees are growing (Husch 1963). Forest areas at different levels of human impact, specifically due to harvesting of fuel wood, fodder and timber, were identified based on a distance-in-time from human settlements. A systematic sampling approach was used to extract information on plant species composition and richness. In systematic sampling, sampling units are selected by a systematic routine or spatial pattern (Philip 1994). The forest survey was carried out using a systematic sample approach to estimate the proportion of human impacts at different distances from the village edge. It was hypothesized that forests close to the edge of village would have relatively high anthropogenic influences compared to the forests further away.

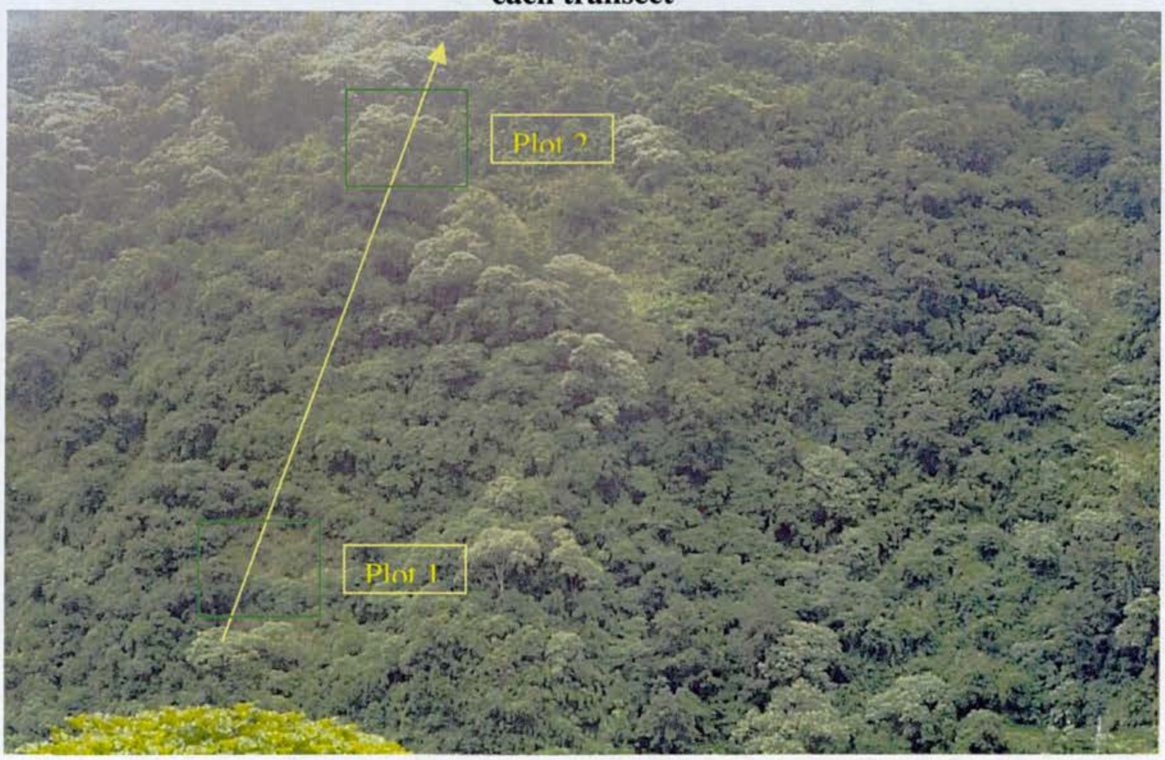
The forest samples were sited at intervals of 45 minutes and generally, uphill walking distance from the edge of the village, providing a time series and believed to be more realistic and meaningful than distance in high mountain terrain. The forest sites were identified through the participatory resource mapping exercises. The forest survey within ACA was carried out only in the intensive use zone and lower part of protected forest because these areas are of greatest likely areas with anthropogenic impact. According to the Operational Plan of ACA, the intensive use zone is the area where villagers are allowed to collect wild resources for subsistence purposes and protected forest zone is zone with restricted collection of wild resources (Sherpa et al. 1986). Similarly, survey outside ACA was carried out in the areas assumed to be used by local communities for wild resources. The forest survey was carried out only in five villages inside ACA and three villages outside because of insecurity due to Maoist activities in forests of other study villages.

Figure 4.1 Flow diagram showing the processes of the field investigation



A transect was drawn generally in vertical direction from each sampled village in order to assess the structure of the forest with respect to distance from a human settlement, making the assumption that anthropogenic disturbances to forest decreases with the increase in distance from the nearest settlement area. However, two transects were drawn in Landruk village because both these sites were equally used by the villagers. The main purpose in using transects in these situation was to describe the maximum variation over the shortest distance in the minimum time (Kent & Coker 1992). Transects were used to survey changes in vegetation and commensurate changes in the level of human impact along an environmental gradient or through different habitats (Bullock 1996). A minimum of four or five quadrats of 10 m x 10 m was laid out at an interval of 45 minutes uphill walking distance along the transect line. Quadrats are used to define sample areas within the study area (Bullock 1996).

Plate 4.2 A transect drawn towards outward direction from each sampled village in order to assess the structure of forest. Generally, four plots were established in each transect



Within each major quadrat, a sub-quadrat of 5 m x 5 m and 2 m x 2m each for sapling and seedling respectively were also placed randomly. Within each quadrat, tree diameters at breast height (dbh), sapling and seedling numbers and crown cover of trees were measured.

Plant definitions such as tree, sapling and seedling were used similar to the ones used by other investigators (Pipoly III & Madulid 1998; Wales 1972). Trees were defined as plants with a stem equal to or greater than 10 cm dbh (Blanc et al. 2000). In each of the 10 m x 10 m quadrats the number of stems of each species, their diameter at breast height (dbh) and origin were determined. Diameter at breast height (dbh) was measured with a diameter tape for later conversion to basal area. Origin refers to the presence of stump sprouts (Wales 1972). Only those stump sprouts obviously originating from the roots of a living or dead standing tree were recorded as a separate single stem (appendix 4.1).

Each individual tree was identified to species by its local name and by reference to standard taxonomic works such as Flowers of the Himalaya (Polunin & Stainton 1984), Dictionary of Nepalese Plant Names (Shrestha 1998), Discovering Trees in Nepal and the Himalayas (Storrs & Storrs 1984), and the Biodiversity Conservation Data Project (KMTNC 1994). Other relevant works in the area such as a Floristic Study of Southern Annapurna Region (Kayastha 1989), Tree Species Utilized in Ghandruk Village as Firewood (Saito 1990), Notes on Local and Scientific Name of Important Tree Species of Ghandrung (Gurung 1992) were also extensively referred. About 10% of trees could not be identified at the field or using standard references. These specimens were collected for identification. However, due to political unrest, time limitation and other reasons, these specimens could not be taken to the National Herbarium and Plant Laboratory, Plant Research Division, Godavari, Kathmandu for identification.

A sapling quadrat of 5 m x 5 m was randomly established in each 10 m x 10 m quadrat. Saplings were defined as stems less than 10 cm dbh and equal or greater than 30 cm in height to the terminal bud (Blanc et al. 2000; Wales 1972). In each sapling quadrat, the number of stems of each species and origin of the stems were determined. A seedling quadrat of 2 m x 2 m was established within each sapling quadrat. Seedlings were defined as stems less than 30 cm in height. In each seedling quadrat, the number of stems of each species was determined (appendix 4.1).

Forest site characterization using environmental variables and human disturbances

The balance between pristine natural areas and anthropogenically disturbed areas influences all manner of ecological phenomena, including fragmentation and edge effects, invasion of natural areas by non-native species, regeneration of natural communities, and ecosystem processes, such as nutrient and water cycling, energy flows, and soil production and stability (Kremen et al. 1994). Therefore, the environmental conditions and the level of anthropogenic disturbances in the sampled forest were measured by taking records of variety of ecological and anthropogenic variables (appendix 4.2).

Ecological variables

Slope, Aspect and Elevation

Topographic features such as slope, aspect and elevation together with Geographic Positioning System coordinates were measured in each plot because these features influence form and functions of forests. An Abney level was used to measure degree of slope of each plot. A Suunto lightweight mirror compass was used to measure aspect. A simple altimeter with $\pm$ 10 m error was used to measure elevation at each plot.

Evidence of wildlife

Direct (e.g. Visual) and indirect (e.g. pellets and tracks) evidence of wild animals was recorded along the transect route. Counting pellets is a very good method for detecting the presence of animal species, if it is possible to identify the species (Sutherland

1996b). Hence, pellets of wild animals were detected and counted along each transect. Efforts to identify species based on these pellets were made with the help of a local expert. Looking for footprints of mammals in areas of soft ground such as near water is another useful way of detecting the presence of species and counting the density gives a crude but a quick indication of abundance (Sutherland 1996a). Therefore, footprints were carefully observed along each transect. Wild animal species were identified with the help of an experienced local forest guide.

Anthropogenic variables

Grazing livestock

Livestock is a vital part of the economy and tradition of rural communities in the study areas. Livestock, especially buffaloes, are kept for milk, meat and manure whereas cows are kept for milk, manure and for cultural value. The oxen are mainly kept for draught power. Buffaloes are the predominant livestock in the study areas. According to Jackson (undated) livestock grazing can exert strong influences on grassland vegetation, forest structure and wildlife activity. Unregulated grazing can lead to increased soil erosion, runoff, land sliding, disturbance to plant succession and the competitive exclusion of many wildlife species. The regeneration of many tree and shrub species may be adversely affected, thus leading to imbalanced forest stands (Jackson undated). Therefore, evidence of livestock grazing in each sampled plot was recorded by counting grazing animals and/or dung of the animals.

Sign of fodder and/or fuel wood collection

Subsistence harvest of wild resources including fuelwood, fodder, timber and non-timber forest products is important in many rural societies. Fodder and fuel are the most important products in the middle hills forest of Nepal (Houghton & Mendelsohn 1996). Such kinds of anthropogenic activities can potentially affect the plant species diversity and composition. Therefore, evidence of visible human disturbances such as cut stumps and logs were counted and recorded in each plot. To verify the fuelwood species harvested, a sample survey of fuelwood species in a stack of wood collected by a household was also carried out. Major species with highest quantity in a wood stack were recorded.

Other resource collection signs

Other evidences of human disturbance such as presence of quarrying and burning were also detected and recorded in each plot.

4.4.2 Social Methods

It has been argued that the social sciences must become central to conservation science and practices to preserve the earth's natural heritage (Mascia et al. 2003). There are various methods to collect information in social research. Methods were designed to assess the effectiveness of a community-based protected area management initiative from a social dimension. Hough (1991b) defined social impact assessment as a tool for predicting the human consequences of a particular project or activity in the same way that an environmental impact assessment tries to predict environmental consequences. Social impact assessment involves the systematic gathering and analysis of social data through techniques such as direct observation, interviewing local residents and leaders, surveys and questionnaires and collecting demographic and economic statistics (Hough 1991b). The present research methods involved a combination of participatory research methods followed by a questionnaire survey and structured interviews of a sample village from each site. The aim was to acquire a range of qualitative and quantitative data to understand both ecological and social consequences of the conservation initiative.

There are numerous participatory methods that have been developed in order to understand social systems and social consequences. The aim of such participatory methods is to gather information in partnerships of multiple stakeholders for efficient, effective and socially inclusive research. These methods also help to share valuable traditional knowledge though it should not be at the expense of local communities.

There is a moral imperative to ensure that this objective is achieved through mutually supportive relationships with local people (Baines 1989). These concerns also help the search for more participatory approaches.

There are different types of participatory research methods and approaches such as focus group interviews, semi-structured interviews, photo appraisal, observational walks, historical mapping, rapid rural appraisal (RRA) and participatory rural appraisal (PRA). These methods are complementary. They are, hence, often used in combination. Participatory approaches such as PRA and RRA are increasingly being used in biodiversity and protected area management research. Rapid rural appraisal (RRA) uses a range of interactive methods to gain insight and knowledge from local people (Sutherland 2000). It is useful to distinguish between PRA and RRA. In PRA, local people undertake data collection and analysis, with researchers facilitating rather than controlling. PRA is an approach of shared learning between local people and researchers (Chambers 1997).

Participatory rural appraisal (PRA)

PRA approaches and methods present alternatives to questionnaire surveys in appraisal and research and generate insights of policy relevance (Chambers 1997). The aim of PRA and other participatory research therefore is to work together with the local community to try and reach a result, which has benefits for both. The main reasons for promoting this approach and methods are saving time, lower costs, quality of information and local community involvement. If the process is conducted in a gender sensitive way, it will enable local people especially women, to feel safe enough to express their own opinions in the group or community (Butcher & Kievelitz 1997).

PRA ensures that the voices of the local communities are heard directly. Nevertheless, many PRA exercises consist of researchers collecting indigenous knowledge and ideas, and then proposing development possibilities to the local people (Waters-Bayer et al.

1995). However, some individuals and groups have the skill or authority to present personal interests in more generally valid terms, others do not (Mosse 2001). Therefore, the behaviour and attitudes of the facilitator matter as much if not more than methods in PRA. The validity and reliability of the information generated through this method is highly influenced by the skill of the facilitator. The facilitator must have good communication skills, listening skills and the ability to ask relevant questions. The facilitator has to play a neutral role and make sure that all matters are discussed openly and without bad feeling. They have to concentrate on the process that ensure that the *voiceless* are heard, that other norms are followed, that learning occurs, and practical results are produced (World-Bank 1996).

While the methodology itself clearly has great potential in planning around specific issues such as health, forestry and agriculture, there are, nevertheless, certain limitations. PRA cannot adequately provide information of social relationships such as patterns of dominance and dependence, political influence and patronage (Mosse 1998). This is mainly a result of social context of many PRA. Some of the tools such as land use mapping and transect walks can be quite long and complex, which might reduce the interest of the local people. Sensitive issues related to resource utilisation, water rights, village boundaries may be raised during the discussion. This may lead to conflicts in the community. On the other hand, such as technique has the ability to bring potential conflicting issues into the open. This may elucidate the power distribution within the community. Participation in PRA and the consensus outputs they produce are often determined by local social relations, which may give privilege and authority to certain opinions, priorities and perspectives while muting others (Mosse 1998).

A good knowledge of the multiple actors within the community, as well as those who work within and between communities (Rocheleau & Slocum 1995) and understanding of local configurations of power such as local leadership styles, factions and alliances and gender relations is a prerequisite for organisation of community-based PRA, and for the interpretation of its outputs (Mosse 1998). There can be significant differences between the values, scores and ranks of women and men, and of different groups. Chambers (1997) claims that these are not weaknesses of the method but the expressions of different realities. Although the approach and tools used are simple and accessible, the skills needed to analyse the information are more complex and demanding (Butcher & Kievelitz 1997). However, in the present research the experience, local knowledge and understanding of local configurations of power of the researcher and his team over many years helped to overcome this problem. Information from PRA exercises was immediately analysed and documented to obtain most out of it.

The outcomes and accuracy of the information generated from this approach, therefore, depend on objectives, power relations in the community, the nature of specific institutions and the method of facilitation. The implication of this potential weakness is that not all the information recorded in PRA may be accurate information (Mosse 2001). The scientific rigour and validity of this approach depends on the concept of triangulation, with data collected from one source being validated or rejected by checking it with data from different sources and using different methods. A comparison of results using PRA and conventional sample surveys has shown that PRA are valid and the approach is reliable (Temu & Due 2000). The methods could be complementary to each other. The results of participatory tools have also indicated that these tools can be used as a source of information about trends in biodiversity, including both changes in abundance of particular species and dynamics of different vegetation types (Hellier et al. 1999). The values of such information depend on its accuracy. Hellier et al. (1999) claim that the results from different participatory tools were generally consistent, lending support to the overall finding.

Considering the above arguments, various participatory tools such as resource mapping, calendars, matrixes, Venn diagram and focus group discussion were used to obtain insights and discover resource use patterns, changes in wildlife populations, causes and effects of conservation and institutional development (appendix 4.3). It is important to note that in reality there were a lot of overlaps in the information obtained using different tools. Therefore, the information was verified during the process of collecting information using these participatory tools. The information was crosschecked during interviews, a questionnaire survey and forest surveys. The PRA exercises took about three to four hours in a group of five to eight people.

Different locally available materials such as grains, leaves and stones were extensively used to facilitate various participatory tools. Discussion on wildlife related issues were facilitated by the use of wildlife photographs printed in an A4 paper. For example, relevant photographs of wildlife species were used to discuss changes in the wildlife population over certain period of time. Use of photographs and grains always grabbed a very good attention of the participants. Pens and papers were also used when it was relevant.

Plate 4.3 Locally available materials were used to facilitate participatory discussion. The photo shows the use of grains and beans in a matrix scoring regarding perceived changes in conservation awareness, hunting and fuelwood collection.

Interviews

The role of social research in society is to understand and explain social phenomena, to focus attention on particular issues and to challenge conventionally held beliefs about the social and natural world. Interviewing is one of the main methods used in the social research (Punch 1998). The methods of maintaining and generating conversations with people on a specific topic or range of topics, and interpretations which social researchers make of the resultant data, constitute the fundamentals of interviews and interviewing (May 1997). Interview is a very good way of accessing people's experiences, perceptions, aspirations, attitudes and feelings (May 1997; Punch 1998). It is a data collection tool of great flexibility, which can be adapted to suit a wide variety of research situations (Punch 1998). There are many types of interview used in social research such as the structured interview; semi-structured interview; the unstructured or focused interview and the group interview. They differ from the each other in structure; purpose; role of the interviewer; number of respondents involved in each interview; and form and frequency of administration (Sarantakos 1998).

A structured interview was applied to gather data on conservation awareness, attitude, resources use pattern, conservation regulation, relationship with park staff and benefits from conservation. In structured interviews, respondents are asked a series of pre-established questions with pre-set response categories (Punch 1998). A general draw-back of structured interviews is that many people may not reply truthfully in response to questions asked by a third party if they fear actions against their interests (Mehta & Kellert 1998; Sah & Heinen 2001). The structured interviews were conducted in November 2001 to February 2002 based on a pre-designed structured questionnaire (appendix 4.4). The questions were presented in an informal way to establish greater trust and dialogue, and increase opportunities for other information to emerge. The interview team consisted of three persons who have good knowledge of questionnaire survey techniques and good ability to develop proper rapport with people particularly with the respondents (Casley & Lury 1987). The questions were expressed as simply and clearly as they can be. They were elaborated in local Gurung dialect whenever it was felt necessary. Prompts and probes, as in semi-structured interview, were used to help respondents to offer accurate information and/or refine and complete their answers. Probing generally helped to encourage the respondent to talk and to direct the discussion towards the objectives of the study without causing bias or distortion. For this reason, probes are neutral statements that do not affect the respondent's direction of thinking (Sarantakos 1998). The research team was freer to probe beyond the answers to acquire more in-depth knowledge and also to create a good environment for motivation and discussion. The interviews were recorded in structured questionnaire forms by one of the research team members during the interviews to ensure that the answers to the set of questions were recorded and coded for computer entry.

The structured questionnaire forms included both fixed-response and open-ended questions (Mehta & Kellert 1998; Sah & Heinen 2001). The questions were written in the Nepali language. Each questionnaire was divided into five main categories. These were (1) reasons for involvement in conservation; (2) authority and ownership on resources; (3) benefits and costs of conservation; (4) effectiveness of conservation policy and regulations and (5) relationship between park authority and local community. To depict preferences, images, perceptions, attitudes or judgements in the form of rankings, ratings or some other set of response alternative, scale dimensions such as the Likert scale, the verbal frequency scale and a numerical scale were also used in the questionnaire (Alreck & Settle 1995).

Local communities generally include a variety of groups or stakeholders. The differences of ethnic origin, caste, age, gender, profession and economic and social status can create profound differences in interests, capacities and willingness to invest for the management of local resources (Borrini-Feyerbend 1997). Benefits to one group and meets conservation objectives may harm another group (Borrini-Feyerbend 1997). ACA is extremely diverse with different ethnic groups (such as Gurung, Bahum, Magar, Damai, Kami and Sarki), professions (such as agriculture, tourism, army), land ownership (such as rich farmer, middle class and landless) and local traditional authorities. Hence, stratified sampling was carried out at the household level as mentioned by Gillingham and Lee (1999), on the grounds that the household (defined in Casley & Lury 1987, p. 188) constitutes the basic unit of shared economic production and resources utilisation in the village. Household interviews also took account of different gender responses and ethnic division into the main Gurung group and the 'Occupational caste group' (appendix 3.6). A list of households with stratification into different groups such as conservation leaders, elected leaders, tourism entrepreneurs, women and occupational groups was obtained from the park office and Village Development Committee (VDC) office. Households in each stratum were then selected randomly by lottery from each village such that 15% of the total households were interviewed (Sah & Heinen 2001). In each survey village, interviews purposely included at least two chairpersons from among various functional local institutions such as village development committee (local village government), conservation area management committee, mother's group, tourism management group and youth group identified during the PRA exercises. However, this stratification approach excluded the population below the age of 20. The average age group of respondents was 49 ± 13 standard deviation. An interview took between 45 minutes to an hour to complete.

Wildlife damage questionnaire survey

Wildlife often damages crops and livestock causing economic losses to local communities and those people affected often hold less favourable attitude towards wildlife protection (Bruggers et al. 2002; Conover 1998; Lehmkuhl et al. 1988; Mehta & Heinen 2001; Rao et al. 2002a; Sekhar 1998). Since the social and economic vitality of the communities are recognised in community-based protected area management, an assessment of impact of wildlife conservation on communities was conducted to assess the negative impact of conservation on the local socio-economy. Household interviews were carried out in the sampled villages. A structured questionnaire was posed orally to the key person in 150 households selected by stratified random sampling (appendix 4.5).

Stratified sampling was used to ensure representative proportions households from different distances to the edge of the forest and the major ethnics groups in the study areas. The survey covered 10% of all households residing in the sampled villages. The average age group of respondents was 45 ± 16 standard deviation. Information was collected on various socio-economic issues such as crops grown and yields; livestock ownership; damage caused by wildlife on each major crops and livestock; species causing damage; percentage losses and protection measures adopted and attitudes toward wildlife conservation.

Interview with policy and decision makers

Semi-structured interview is an informal and open-ended interview. In the semi-structured interviews, interview questions are not pre-planned and standardised, but instead there are interview guide to get the interview going (Punch 1998). It is also called 'guided conversations' (McNeill 1989). The semi-structured interviews is a powerful research tool, widely used in social research and other fields, and capable of producing rich and valuable data (Punch 1998).

The semi-structured interview was conducted with park staff and policy levels personnel to obtain additional information on present conservation practices and future conservation plans. It was conducted in the Nepali language and was recorded by agreement with the respondents in a portable audiocassette recorder. Information on park management, community-based conservation, local empowerment and the future of community-based protected area management were acquired through semi-structured interviews conducted in July – August 2002 (appendix 4.6). A total of 10 key persons were interviewed representing the majority of all the conservation institutions such as the Department of National Parks and Wildlife Conservation, the World Wildlife Fund-Nepal (WWF), King Mahendra Trust for Nature Conservation (KMTNC) and other prominent conservationists involved in biodiversity conservation and protected area management in Nepal.

Focal group discussion

The focus group interview is organised to accomplish a specific purpose through a defined process. The purpose is to obtain information of a qualitative nature from a predetermined and limited number of people. Focus group discussion involves between 4 to 12 peoples (with six to eight people the preferred norm) discussing the topic of the concern with the guidance of a researcher or a moderator.

Plate 4.4 A focus group discussion was carried out to discuss effectiveness of the protected area management in general and the Conservation Area Management Regulation in particular with the village leaders, and Conservation Area Management Committee chairpersons and members

The hallmark of focus groups is their explicit use of group interaction to produce data and insights that would be less accessible without the interaction found in a group (Morgan 1997). Although the depth of information about individual motivations and views may be shallower than in structured or semi-structured interviews, focus group discussions can yield additional information as people react to views they disagree with. The group situation can also stimulate people in making explicit their views, perceptions, motives and reasons (Punch 1998). The focus group interview has been perceived as `conversation with a purpose'. Usually this kind of conversation provides rich detailed data that could be used alongside other materials (Burgess 1984). The focus group interview is directed by questions or topics supplied by the researcher. Therefore, the group interview cannot be started without detailed knowledge and preparation.

A focus group discussion was organised to discuss on effectiveness of the Conservation Area Management Regulation -1995 (CAMR). Eight chairpersons and members of Conservation Area Management Committees (CAMC) and Village Development Committees (VDC), and three senior ACAP management staffs were present in the discussion. The focus group discussion presented a more natural environment than that of an individual interview because participants were influencing and influenced by others. The natural resources conservation officer of ACA facilitated and coordinated the discussion. The focus group discussion was directed towards applicability of CAMR, various constraints in the application, impact of the regulations and shortcomings of the regulations. Most of the participants reflected their views very clearly. There were good interactions among the participants and with ACAP staff. Questions and clarification on confusing statements were asked. Even the ACAP Director and legal unit staff participated in the middle of the discussion on the request of the participants. Their participation helped to clarify the issues raised in the discussion.

4.5 Data Analysis

Analysis of data was divided into ecological and social parts for ease of analysis. The results of these data were linked carefully during the interpretation. MINITAB Release 13.1 (Minitab Inc. State College, PA 16801-3008, U.S.A. www.minitab.com) was used for the ecological data analysis and the SPSS ver. 10.0 (Statistical Package for the Social Sciences, SPSS Inc., Chicago, IL 60606, USA. www.spss.com) was used for the social data analysis. The focus of the data analysis was to ensure that the research questions are properly answered.

4.5.1 Ecological data analysis

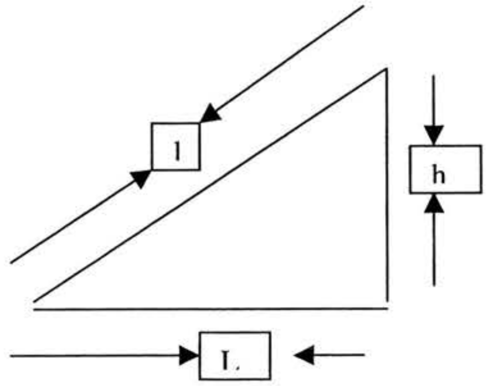
The ecological data analysis concentrated on forest structure and anthropogenic effects on the forest, which included various tree density and diversity indices. Any distance measured on a slope was corrected for slopes.

Slope Correction

To determine exact plot and stand area, the slope correction was made in all the forest survey plots because the survey was carried out in mountainous terrain with varying degrees of slope (11° to 66°). The true length was derived by measured length plus the correction. The following slope correction method was used for correcting slopes (appendix 4.7). Source: www.suske.its.unimelb.edu.au .

Reduction by slope angle, where L is true length, l is slope distance and α is the elevation of the line as shown in the figure below.

$$L = l\cos\alpha$$



Ecological variables

Density denotes the mean number of individuals of a given species out of the total of sample examined in a study area. Stand density is a quantitative measurement of a stand in terms of number of trees per hectare (Husch 1963). Density of trees, seedlings, saplings and cut stumps were calculated by:

$$\text{Density(ha)}=\frac{Total\ number\ of\ plants\ of\ individual\ species}{Area\ of\ quadrats}\times 10{,}000\, sq.m.$$

Tree basal area (BA) is the cross-sectional area (over the bark) at breast height (1.3 meters above the ground) measured in metres squared (m2). BA can be used to estimate tree volumes and stand competition. Tree Basal Area was simply measured by measuring the diameter at breast height in centimetres and the basal area (m2) was calculated using an equation based on the formula for the area of a circle (area = πr2 where r = radius and πp = 3.142) and the formula for radius (r = diameter/2 = DBH/2). Therefore,

$$\text{Tree Basal Area (TBA) } (m^2) = \pi\, r^2$$

$$= 3.142 \text{ x } (dbh/200)^2$$

Where dbh is the Diameter at Breast Height in centimetres. This formula also converts the diameter in centimetres to the basal area in square metres.

Stand basal area (SBA) is simply the sum of the basal area of all (living) trees in a plot, expressed in per hectare of forest (m^2 ha^{-1}) and denoted by G. Stand Basal Area is directly related to stand volume and is a good measure of stand density (Hutch et al. 1982). It can be calculated from measurements of the diameter (dbh in cm) of all trees in a known area (a = area in ha) (Brack 1999):

$$G = \frac{\pi}{40000} * \frac{\sum dbh^2}{a} = 0.0000785398 * \frac{\sum dbh^2}{a}$$

Species richness is a count of number of species present in a stand (Magurran 1988) and is easily conceptualised and can be compared across different habitats.

Species diversity index: The diversity of community needs to account for both species richness and the evenness with which individuals are distributed among species. There are many indices of species richness and diversity (Spellerberg cited in Spellerberg 1992). The Shannon-Wiener Index, the most commonly used measure of heterogeneity (Krebs 2001), was used for calculating the diversity index. The Shannon-Wiener Index assumes that all species present are represented in a sample and that the sample was obtained randomly. This index was measured by:

$$\mathrm{H} = \sum_{i=1}^{s} (pi)(\log_2 pi)$$

Where H is index of species diversity, s is number of species; p_i is the proportion of individuals found in the *ith* species. In a sample the true value of pi is estimated by n_i/N (Magurran 1988). The natural logarithm ($\log_2$) was used in the calculation. The selection of a logarithmic base is unimportant as long as calculation is consistent (Magurran 1988). Two components of diversity are combined in the Shannon-Wiener Index, number of species and equitability or evenness of allotment of individuals among the species (Krebs 2001). Therefore, both the number of species and their equitability or evenness affects the index. A greater number of species and a more even distribution both increase diversity as measured by H.

Species evenness or equitability shows how equally abundant the species are. The ratio of observed diversity to maximum diversity is therefore taken as a measure of evenness (E) (Pileio 1969 as referred in Magurran 1988). Species evenness was measured by

$$E = \frac{H}{H\max} = \frac{H}{\ln S}$$

where, H_{max} represents the maximum possible diversity and S is the total number of species.

Statistical tests

Both descriptive and inferential statistics were used for interpretation of the results. Descriptive statistics were used to organise, summarize, and describe measures of a sample (Fowler et al. 1998). However, no predictions or inferences were made regarding population parameters. On the other hand, inferential (or deductive) statistics were used to predict population parameters from sample measures (Fowler et al. 1998).

A t-test was used to compare more than one set of means (Fowler et al. 1998). If the observations were not approximately normally distributed then t-test were performed upon transformed observations or by a suitable non-parametric alternative such as Mann-Whitney U-test. The t-test and other parametric tests assume that samples have been drawn from populations which are normally distributed (Fowler et al. 1998).

Normality of the data was generally tested using the dot plot graphic method. A normal distribution is symmetric and bell shaped (Minitab 2000). However, the notion of a normal distribution only applies to continuous variables. The dot plot is a method that gives a rough but rapid visual appreciation of the way in which data are distributed (Fowler et al. 1998). The Anderson-Darling Normality test was also used to confirm whether the data follow a normal distribution. In the Anderson-Darling Normality test, the smaller the p-value is, the less likely the sample came from a normal distribution. In other words, if the p-value is equal or greater than 0.05, then the sample is most likely came from a normal distribution (Minitab 2000). If the data were not normal, then the data were normalised by a log transformation (de Vause 2002) or the arcsinh transformation (Fowler et al. 1998). Nonparametric equivalent tests were used if the data were not normal even after transformation.

The Mann-Whitney U-test was used as alternative to the two-sample t-test (de Vause 2002). It is a non-parametric test that performs a hypothesis test of equality of two-population median and calculates the confidence interval. An advantage of nonparametric tests is that the test results are more robust against violation of the assumptions (Fowler et al. 1998). Therefore, if the data were not normal even after transformation, then the Mann-Whitney U-test was used.

4.5.2 Social data analysis

Social information was generated from the participatory rural appraisal, structured interviews, questionnaire survey, focal group discussion and key informant interviews. The information generated from PRA was validated during other surveys. The PRA information was analysed and interpreted together with the participants. Elaboration of the information generated from these exercises was immediately carried out. The information were extracted and summarised in relevant result chapters.

The structured interviews data and the questionnaire survey data were coded. The coding is a method of representing categories and values of a variable so that responses are converted to a form of suited to statistical analysis and data become more manageable (de Vause 2002). All the variables were coded in the same direction. Since a high score on the final scale was meant to reflect a pro-conservation position, each of the items must reflect this. Therefore, those coded in the wrong direction were reverse coded by using SPSS software package. The statements with agree and strongly agree were coded

4 and 5 respectively. Whereas neural, disagree and strongly disagree were coded 3, 2 and 1. 'Don't know' responses were scored as neutral and coded 3. Different groups in a community or stakeholders may have a different stake or conflicting issues regarding the conservation intervention. Ideally therefore, a cross section of a community should be assessed covering each of the main stakeholders as illustrated in page 99. However, in the present research, responses of different groups or stakeholders (such as caste groups, gender, tourism) within the study communities were analysed in the relevant sections.

Attitude and perception data were examined using 5-point scale statements which respondents were asked to agree or disagree. To obtain an overall score for all respondents on some of the attitude scale, responses to each of the statements were added and average score was estimated. The mean score ranged from 1 to 5 where 5 indicates strong agreement and 1 with strong disagreement. In some cases, responses to each statement were reverse coded to facilitate in producing a scale or an index. A scale adds together a person's score on a number of different variables to arrive at an overall score on a broader concept (de Vause 2002). *Cronbach's alpha* was used to test reliability of a scale on items with multiple response categories. To be reliable, a scale should have an alpha coefficient of at least 0.7 (de Vause 2002). The strength of alpha is that it provides the analysis of patterns of internal consistency. The alpha examines how groups of variables are related to groups of other variables.

Both descriptive and inferential statistics were used for interpretation of the results. A χ^2 test was used to analyse frequencies. Mann-Whitney U-test was mainly performed to a hypothesis test of equality of two-population median and calculates the confidence interval.

CHAPTER V

THE EFFECTIVENESS OF COMMUNITY INVOLVEMENT IN DELIVERING CONSERVATION BENEFITS TO THE PROTECTED AREA

5.1 INTRODUCTION

A major objective of protected area systems throughout the world is the maintenance of the diversity of species and ecosystems (Harrison et al. 1982). It is claimed that the establishment of protected areas has proved a key means of conserving biodiversity (Lucas 1982). The protected area approach was initiated with the promotion of the national park concept with the inception of Yellowstone National Park in 1872. With subsequent progress in social and economic development, it has been increasingly realised that national parks must be supplemented by a range of other categories of protected areas in order to meet the needs of modern society (McNeely 1982a). In Nepal, national parks have been re-conceptualised to include resident peoples. Therefore, other kinds of protected areas have been introduced of which the Annapurna Conservation Area is exemplary.

Establishment of a protected area does not in itself ensure that the biodiversity within the area will be adequately protected (Harrison et al. 1982). There is very little knowledge about the status of many protected areas (Hocking et al. 2000) and critics claim that in the context of growing human pressures and development needs, many protected areas fail to deliver their stated aims (Terborgh 1999). Therefore, assessing the effectiveness of protected areas in delivering the stated objectives has been recognised as an essential part of a protected area management.

There is currently a shift in the management of protected areas from an *exclusive* to an *inclusive* approach, which allows for a high degree of local community involvement. This shift in approach is the result of increasing recognition over the past few decades that the successful management of protected areas must include the cooperation and support of local people (Brandon & Wells 1992) (also see Chapter II). A number of projects have been launched in developing countries with the goal of linking biodiversity conservation with improvements in human welfare (Wells 1995). Many international conservation and development funding agencies, including the World Bank, have stressed approaches to management of protected areas that incorporate local people into protection, benefit sharing and planning (Wells 1995).

The effectiveness of community involvement in conservation remains unproven. Only a few conservation projects have so far been able to demonstrate significant improvements in biodiversity conservation which are attributable to, or even connected with, improved local economic opportunities (Wells & Brandon 1992; Wells 1995). Therefore, some critics of the approach have concluded that biodiversity conservation initiatives should place renewed emphasis on authoritarian protection of national parks and other protected areas to safeguard critically threatened habitats worldwide (Terborgh 1999; Wilshusen et al. 2002). However, a purely preservationist view is not viable in much of the world (Kremen et al. 1994); hence the goal of retaining all existing biodiversity and restoring ecosystems to their original pristine conditions is unrealistic (Kremen et al. 1994).

Conservation areas in Nepal, which promote community-based protected area management, have also been criticized for not being able to deliver biodiversity conservation objectives (Heinen & Mehta 1999; Kellert et al. 2000; Nepal 2002a). Yet, there have been relatively few research projects that provide evidence one way or the other. The declaration of a new conservation area, the modification of conservation area status or the establishment of buffer zones in Nepal are usually experience-based and are often without any evaluation. Most often decisions regarding conservation issues are taken without monitoring or rigorous evaluation of effectiveness (Pullin & Knight

2001). It is this weakness that has led to increasing realisation of the need for scientific research to quantify the degree of conservation success. However, biodiversity assessment is not just a matter of gathering scientific evidence about biophysical process but rather it involves subjective judgement based on values of biodiversity. Generally, different stakeholders in a community may hold apparently different values (Lawrence 2002).

This chapter assesses the effectiveness of community involvement in delivering conservation benefits to the Annapurna Conservation Area (ACA). Various biophysical and social indicators have been analysed, and the implications of the results for management have been considered. This chapter is divided into six different sections. The current section provides a general context. The second section summarises the results of an assessment of forest structure, tree species and human disturbances. Both social and ecological information relating to evidence of changes in wildlife populations are presented in section three. Active involvement of local communities in conservation depends on their attitude towards conservation activities. Therefore, conservation attitudes and awareness of conservation issues among the local communities are dealt with in the fourth section. This section also covers the relationship between the park and the people. The effectiveness of community-based protected area in delivering conservation benefits is discussed in the fifth section. The final section of this chapter summarises the conclusions drawn from this study and considers the implications of the results for improvement of community-based protected area management approaches in Nepal and elsewhere in the world. The effect of tourism and other variables on conservation and behaviour of local communities in ACA will be dealt in the Chapter VII.

5. 2 FOREST STRUCTURE, TREE SPECIES AND HUMAN DISTURBANCES

Ensuring the ecological integrity of forests during sustainable harvesting is one of the focuses of the community-based protected area management approach in the Annapurna

Conservation Area (ACA). The definition of ecological integrity has been given as *maintaining and even restoring native biological diversity* (Seymour & Hunter 1999). Trees are considered the key components of a forest. Trees affect forest biota through the resources they produce (e.g. food) or regulate (e.g. light and rainfall) and through the physical structure they provide (Seymour & Hunter 1999). Trees also influence other taxa through their effects on ecosystem processes such as nutrient cycles, disturbances and under-storey productivity (Seymour & Hunter 1999). Therefore, various tree indicators and the anthropogenic utilisation of the forest were studied to give a measure of human disturbance and its ecological impact. A transect was drawn generally towards outward direction from each sampled village in order to assess the structure of the forest. A minimum of four plots of 10 m x 10 m was laid out at an interval of 45 minutes uphill walking distance along the transect line. The forest survey was carried out only in five villages inside ACA and three villages outside because of insecurity due to Maoist activities in forests of other study villages (also see chapter 4).

5.2.1 Forest structure

Forest structure was characterised in term of tree density, basal area and species diversity. A total of 43 tree species were recorded at the study sites inside ACA and 23 outside. Density of the trees $\geq$ 10 cm dbh and basal area figures are given in Table 5.1. The mean density $\pm$ SE of the trees in ACA was 1830 $\pm$ 256 trees ha^{-1}; outside ACA the mean value recorded was 1561 $\pm$ 165 trees ha^{-1}. The Mann-Whitney test of tree density showed that there was no significant difference ($P > 0.87$) in the tree density within ACA and outside.

Basal area is a very useful variable for quantifying the structure of a forest plot. The basal area per hectare is a standard measure of the size-density relationship of forest plots (Larsen 1999). The mean basal area ($\pm$ SE) inside ACA was 114.6 $\pm$ 15.5 m^2 ha^{-1} whereas the value outside was 50 $\pm$ 16.8 m^2 ha^{-1}. There was a significant statistical difference between inside and outside ACA (Mann-Whitney test, W= 574 and P =

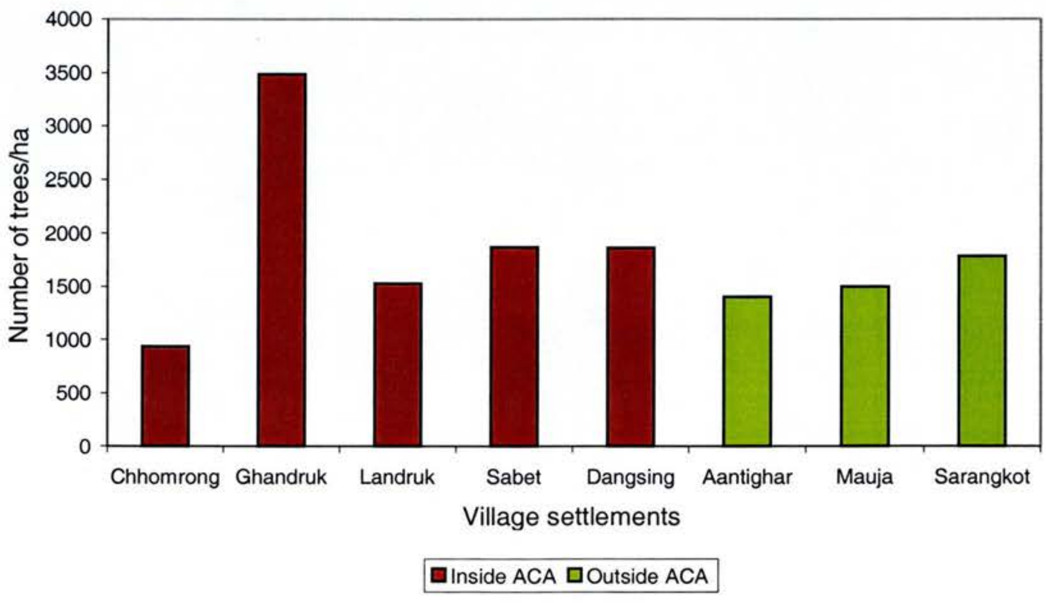
0.001) with significantly higher basal area recorded inside ACA. The basal area is found to be lower in plots closer to a village indicating higher human pressure (Figure 5.2).

Table 5.1 Density, basal area, species diversity and species evenness of all the trees $\geq$ 10 cm dbh in the twenty-five plots within ACA and twelve plots outside ACA

	Inside ACA	Outside ACA
Density (trees ha^{-1})	1830 ± 256	1561 ± 165
Basal area (m^2 ha^{-1})	114.6 ± 15.5	50 ± 16.8
Shannon-Weiner Index	1.28 ± 0.9	0.91 ± 0.11
Species evenness	0.80 ± 0.04	0.74 ± .05
Species richness	43	23

- Each village was surveyed by one transect except for Landruk village. Four plots were established in each transect.

Figure 5.1 Comparison of mean tree densities per hectare for different villages both inside and outside ACA



Species diversity was found to be higher inside ACA. The mean Shannon index of diversity (± SE) was 1.28 ± 0.9 in ACA and 0.91 ± 0.11 outside ACA. The Mann-Whitney test of the diversity index illustrated a significant difference inside and outside

Figure 5.2 Comparison of mean basal areas for different plots of transect both within and outside of ACA

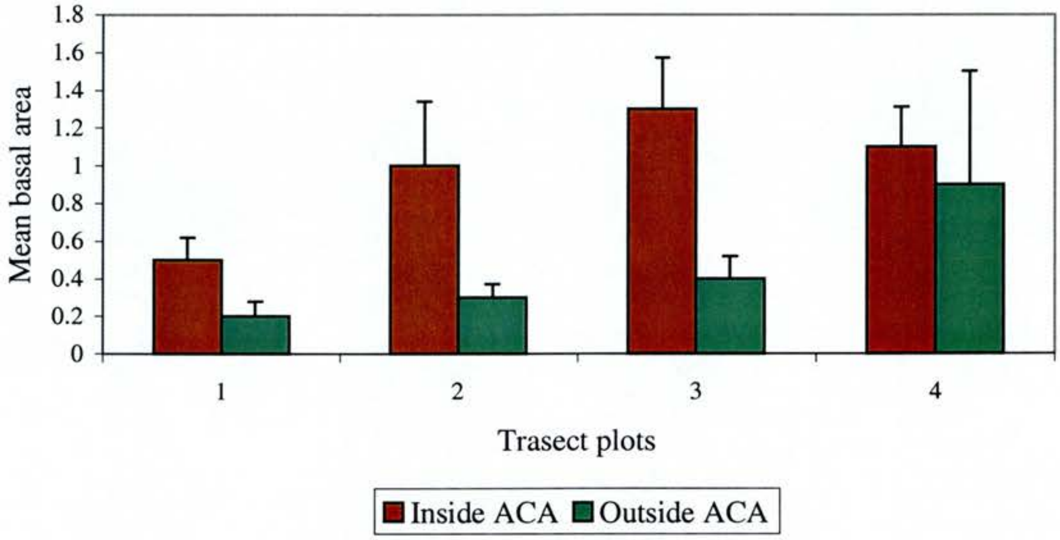
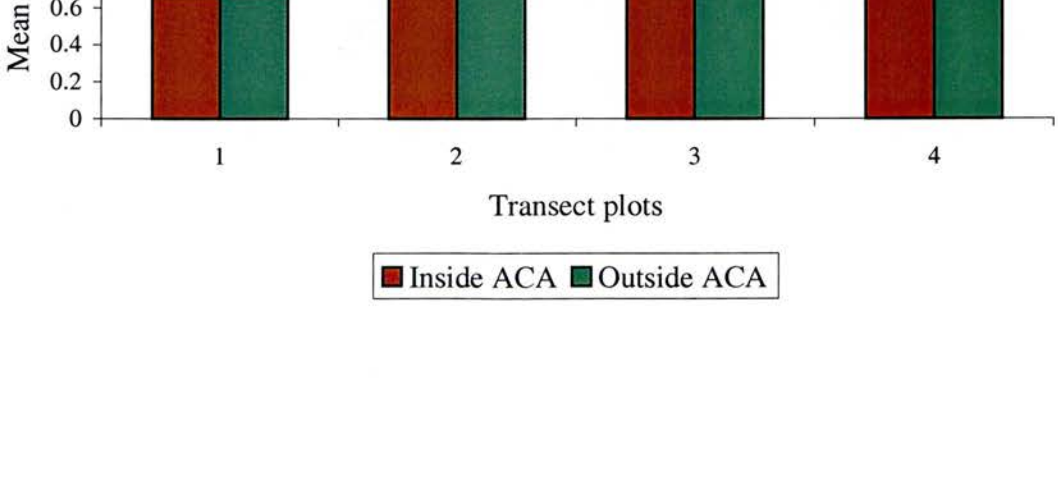


Figure 5.3 Comparison of mean species diversity for different plots of transect both within and outside of ACA



ACA (Mann-Whitney test, W= 550, $P < 0.01$). The species diversity was found to be varying within different plots with relatively higher variation inside ACA transects (Figure 5.3). However, the species evenness or relative diversity was found to be very similar between these areas. The evenness (mean $\pm$ SE) was 0.79 ± 0.04 for ACA forest and 0.73 ± 0.05 outside. There was no statistical difference in the species evenness inside and outside ACA (Mann-Whitney test, $W = 517$, $P > 0.17$).

5.2.2 Natural regeneration

Sapling (>= 30cm high and <10 cm dbh) and seedling (< 30 cm) densities were estimated from the sub-quadrats sampled in each plot. These density results showed a similar pattern as for the mature tree densities with dbh $\geq$ 10 cm. The mean density ($\pm$ SE) of the saplings in ACA was 5476 ± 1287 saplings ha^{-1} and the value outside was 5984 ± 983 trees ha^{-1}. A t-test of the log-transformed sapling density showed that there was no significant difference ($P > 0.12$) in these densities within ACA and outside. The variation of mean number of saplings between plots was found to be higher inside ACA (Figure 5.4). The mean seedling density ($\pm$ SE) in ACA was 19108 ± 3498 seedlings ha^{-1} and the value outside was 15548 ± 4419 seedlings ha^{-1}. The Mann-Whitney test for the seedling density showed no significant difference between these areas ($W = 484.5$, $P > 0.77$). The mean number of seedlings was found to be decreasing in the plots further away from villages (Figure 5.5) indicating that number of seedlings is higher in human disturbed area.

Figure 5.4 Comparison of mean number of sapling for different plots of transect both within and outside of ACA

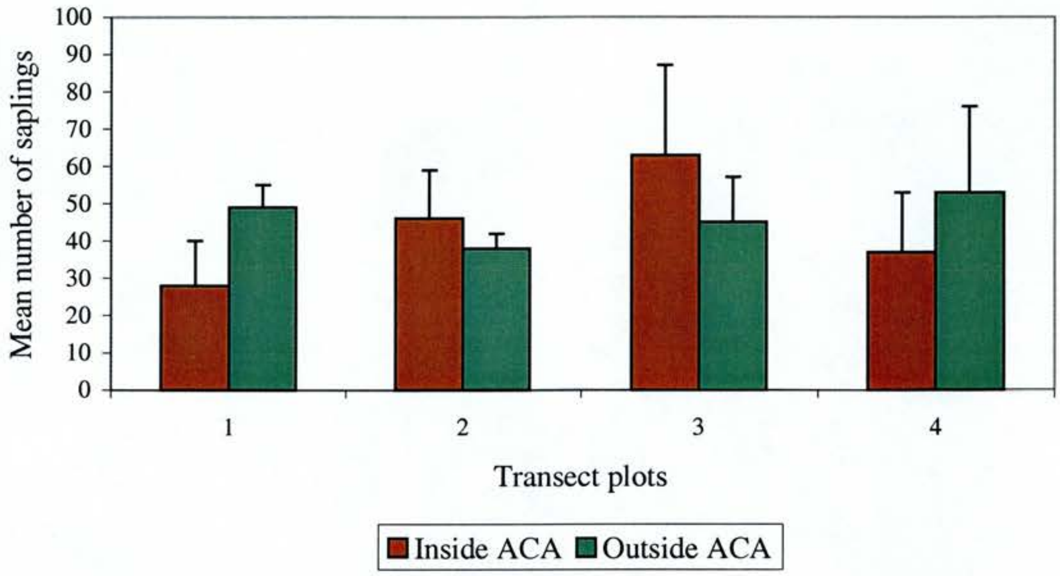
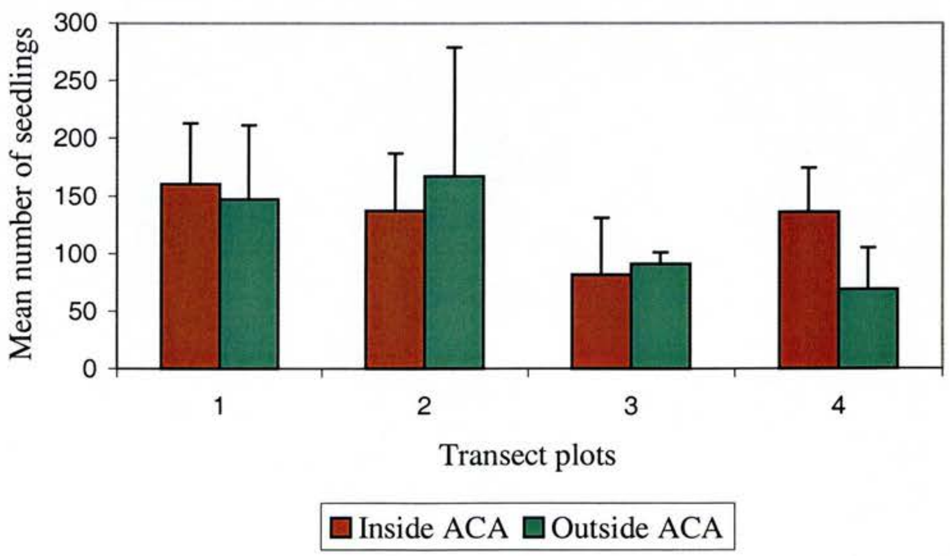


Figure 5.5 Comparison of mean number of seedling for different plots of transect both within and outside of ACA



5.2.3 Human disturbance

Disturbance can be defined from an ecological perspective as an interruption in the condition of a biological system by a discrete event (Pidwirny 2001). Disturbance can occur at a variety of different spatial and temporal scales. Many disturbances in the biosphere arise from purely natural events such as forest fires, flooding or wind damage, or climatic events such as hurricanes and drought. Disturbances as a result of the action of humans are generally considered to be artificial although some are exacerbations of natural process. The number of human-mediated disturbances on biological systems has been increasing over time because of population growth (Pidwirny 2001).

The cutting of trees for timber and fuelwood and grazing of domestic animals are the two major disturbances to the forest in the study areas. Therefore, the number of cut-stumps of trees was estimated from the quadrats sampled in each plot. The mean value was significantly lower in ACA compared to outside ACA (Figure 5.6). The mean cut-stump density ($\pm$ SE) in ACA was significantly lower (716 $\pm$ 170 cut-stumps ha^{-1}) than outside (1785 $\pm$ 275 cut-stumps ha^{-1}) as well. The Mann-Whitney test for the cut-stump density showed a highly significant difference between these values ($W = 376.5$, $P < 0.001$). Generally the mean number of cut stumps was found to be decreasing in the plots further away from villages. The variation of mean number of cut stumps between plots was found to be higher inside ACA (Figure 5.7).

Grazing of domestic animals was estimated by counting dung and grazing animals observed in the quadrats sampled in each plot. The mean number of grazing animals and dung (+ SE) in ACA was 35.8 $\pm$ 19.3 grazing animals ha^{-1} and 127.3 $\pm$ 44 dung ha^{-1} and the values outside were 16.7 $\pm$ 16.7 grazing animals ha^{-1} and 59.3 $\pm$ 50 dung ha^{-1}. The Mann-Whitney test for the number of grazing animals and dung densities showed no statistical differences between these areas ($P > 0.72$ and $P = 0.33$ respectively).

Fig 5.6 Comparison of mean cut-stumps per hectare for different villages within and outside ACA

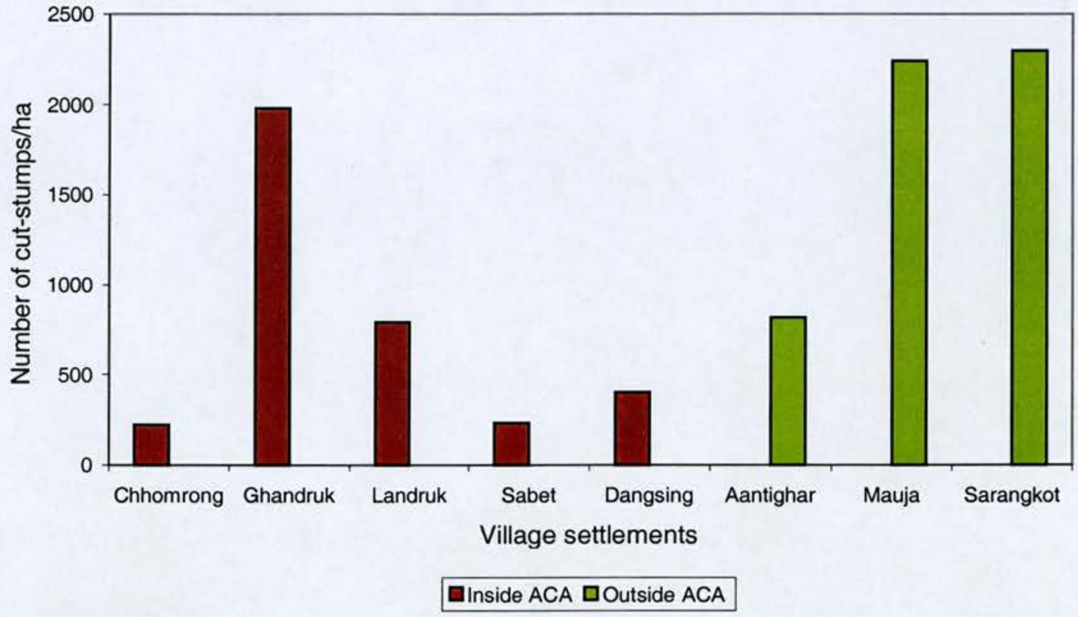
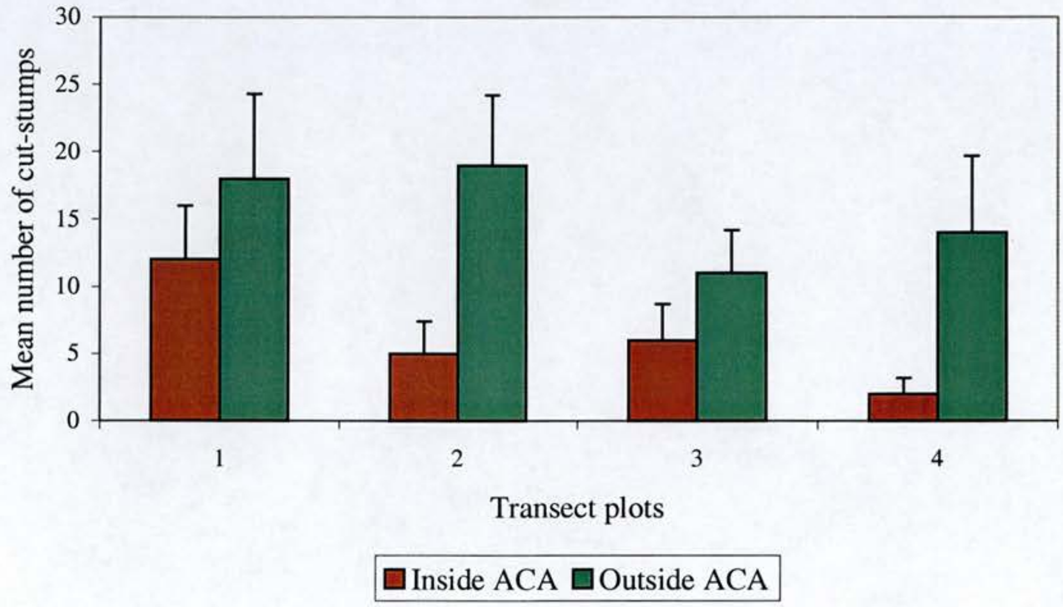


Figure 5.7 Comparison of mean number of cut stumps between each plots of transect both within and outside of ACA



5.2.4 Pattern of forest use

Changes in attitude, an increase in conservation awareness and increasing realization of conservation benefits generally encourage local community members to change patterns of resource use behaviour. Matrix ranking of the preference to use wood, kerosene, liquid petroleum gas (LPG) or electricity as sources of fuel for cooking and heating by the local community members in ACA indicated greater preferences to use electricity and LPG as the main fuel. They had perceived that use of wood as only the source of fuel has detrimental effects on their forest resources. It was also reported during the PRA exercises that the fuelwood collections from the forest have been reduced by half compared to a decade earlier. Various reasons were given for the reductions in collection of fuelwood. These were: conservation awareness, efficient use of fuelwood through introduced technologies and behavioural changes, use of fire only on when needed, collection of only dry and dead wood, plantation of fuelwood species on farm, and harvesting of wood from the private woodlots. For example, the system of keeping a fire on a hearth throughout a day and night does not exist any more. Similarly, felling big trees and stocking up huge stacks of wood within the forest by the villagers has been abolished from ACA villages.

A sample survey of species in a stack of fuel wood in the selected villages inside ACA found 29 species used for fuelwood in total. Out of total 41 households surveyed, the wood from the Uttis tree (*Alnus nepalensis*) was the dominant wood species in terms of quantity in a stack of fuelwood. This species was noticed as the dominant wood in a stack in 77% (n = 41) of the surveyed households. Bilaune (*Maesa chisia*), Chutro (*Berberis aristata*), Jhyanu (*Euria acuminata*) and Dab dabe (*Symplocus ramosissima*) were other minor species in stacks of fuelwood. Falant (*Quercus lamellose*), which emerged as a highly preferred fuelwood species in the PRA exercises, was reported from only 7.3% (n = 41) of the surveyed households as a minor species.

The participants in the PRA exercises also reported a decrease in collection of other products such as fodder and non-timber forest products over a decade period. They suggested that fodder collection has been reduced by half in comparison to a decade earlier. Some of the main reasons given were an increase in use of farm fodder, a reduction in the number of livestock and increasing conservation awareness. Collection of two major non-timber forest products, particularly some *nigalo* (*Arudinaria* spps.), and nettle fibre plants (*Girardinia diversifolia*) had also decreased. *Arudinaria* spps., which were widely used for construction of agricultural implements, particularly bamboo carrying baskets, grain storage and mats for drying grains have been gradually replaced by items made of plastic. Similarly, imported clothes have replaced the nettle fibre products, which were used for weaving traditional clothes. The residents have shifted towards market-based products simply because these are easily available, and on the other hand, production of traditional woven clothes and mats was labour intensive. However, there was disparity in income between inside and outside ACA, within ACA and within villages with tourism thereby limiting their capacity to use market-based products.

5.3 Evidence for changes in wild animal population

Changes in wildlife populations were mainly estimated through the social surveys. However, some evidence of wild animal populations was recorded during the forest survey. Track counts, pellets counts and direct observations in the quadrats were used to estimate species richness and abundance.

5.3.1 Trends of wild animal populations

A participatory wildlife matrix scoring, based on the social surveys, indicated an increasing number of key wild animal species, both mammals and birds, inside ACA. The participants scored twelve key animal species based on a 5-point scoring scale (1 is low and 5 is high) for different time periods. The participants identified the key animal species for scoring. The mean scores for the wild animal in 1971 and 2001 were 2.0 and 4.24 in ACA whereas the average scores were 2.48 and 2.80 respectively outside. The matrix scoring indicated that wild animals populations inside ACA have increased following conservation intervention. The participants also reported increase in the population of musk deer, which was once thought to be locally extinct due to commercial hunting.

Table 5.2 Perceived changes in wildlife population based on the participatory wildlife matrix scoring

Wildlife Matrix Scoring for different years	Average Matrix Score			
	1971	1981	1991	2001
Inside ACA	2.00	2.30	3.10	4.26
Outside ACA	2.25	2.25	2.75	2.80

Matrix scoring 1 to 5, 1 is low and 5 is high.

Structured interviews with the members of local communities also showed similar results. A majority of the respondents (80%, n = 114) in ACA believed that wild animals have significantly increased whereas only a quarter of the respondents (25%, n = 85) outside the area expressed the same view.

5.3.2 Evidence of wildlife in the forest

Track counts, pellets counts and direct observations in the quadrats also indicated significant differences in the wildlife populations between inside ACA and outside the area. The mean sighting ($\pm$ SE) of herbivore mammals such as barking deer (*Muntiacus muntjak*) and Himalayan tahr (*Hemitragus jemlahicus*) during forest surveys in 25 plots within ACA were 0.56 $\pm$ 0.26 sightings plot^{-1}. No sightings occurred outside ACA. Average pellet groups found also significantly differed between the two areas. The mean pellet group count ($\pm$ SE) was significantly higher inside ACA (156 $\pm$ 68.3 pellet groups hectare^{-1}) than outside (none outside). The Mann-Whitney test showed a significant difference between these values ($P = 0.03$). However, these results should be viewed with caution, as these observations were limited to a small sample size and to only one season.

Plate 5.1 Pellets are one of the major evidence of presence of animal in a forest. A group of barking deer pellets observed in a study site.

5.3.3 Perceived changes in wildlife population

Perceptions of wildlife population changes and hunting behaviour were different between the two study areas (Table 5.3 and 5.4). Mean scores for individual perception statements ranged from 4.02 to 4.7 inside ACA and 2.03 to 4.21 outside ACA on a 5-point scale. Respondents in ACA strongly perceived changes in wildlife populations over the period of a decade. Respondents reported frequent sightings of wildlife inside the forest with a mean score of 4.11 inside ACA and 2.75 outside.

Table 5.3 Perception of respondents towards wildlife conservation as indicated in a questionnaire survey with community members within ACA

Perception Statements	Responses (%)					Mean	± SD
	SA	A	N	D	SD		
1. Protection of forest increased wildlife.	80	15	3	2	0	4.7	0.6
2. Wildlife is frequently encountered in the forest.	53	29	8	2	8	4.2	1.1
3. Villagers still do hunting.	2	7	3	5	83	1.4	0.9
4. Pest wildlife should be killed.	61	12	10	7	10	4.0	1.3

N = 89, SA, strongly agree; A, agree; N, neutral; D, disagree and SD, strongly disagree. Respondents assigned a score of 5 for SA, 4 for A, 3 for N, 2 for D, and 1 for SD.

A Mann-Whitney test performed on the scale scores showed that ACA residents perceived larger changes in wildlife populations and hunting behaviour compared to the area outside ($P \leq 0.01$). A majority of respondents both in ACA and outside (83%, n = 89 and 66%, n = 61 respectively) strongly disagreed with continued hunting. However, a majority of the residents inside ACA (73%, n = 89) compared to about half outside the area (57%, n = 61) perceived the need to control pest wildlife species.

Table 5.4 Perception of respondents towards wildlife conservation as indicated in a questionnaire survey with community members outside ACA

Perception Statements	Responses (%)					Mean	± SD
	SA	A	N	D	SD		
1. Protection of forest increased wildlife.	49	30	18	2	1	4.2	1.5
2. Wildlife is frequently encountered in the forest.	15	21	23	10	31	2.8	0.9
3. Villagers still do hunting.	15	10	2	8	65	2.0	1.6
4. Pest wildlife should be killed.	33	24	10	3	30	3.3	1.6

N = 61, SA, strongly agree; A, agree; N, neutral; D, disagree and SD, strongly disagree. Respondents were assigned a score of 5 for SA, 4 for A, 3 for N, 2 for D, and 1 for SD.

5.4 CONSERVATION AWARENESS AND ATTITUDES AMONG LOCAL COMMUNITIES

Local communities residing inside a protected area and neighbouring villages may show a negative attitude towards conservation even though they receive benefits from it

(Akama et al. 1995; Heinen 1993). Negative attitudes are generally caused by wildlife damage to crops, losses of livestock by wildlife, loss of land to conservation, lack of control over resources and conflicts between local communities and the park staff (Fiallo & Jacobson 1995; Parry & Campbell 1992). The attitudes of local communities to conservation were therefore surveyed as part of this study.

5.4.1 Involvement in conservation

Conservation was generally understood as the protection of forests and wildlife in the study area. Among the three key definitions that emerged out of the participatory discussions with the local communities, a high proportion of the respondents (73.7% in ACA, n = 114 and 77.6% outside the area, n = 85) understood conservation as protection of forest and wildlife (Table 5.5).

Table 5.5 Local communities' understanding of conservation as indicated in structured interviews with local communities within and outside ACA

Conservation Definitions	Inside PA (%) (n = 114)	Outside the P A (%) (n = 85)
1. Forest and wildlife protection	73.7	77.6
2. Control on hunting and illegal resource collection	1.8	0
3. Sustainable management of biodiversity	23.7	8.2
4. Any others	0.9	14.1

The overwhelming majority of respondents inside (98.2%, n = 114) and outside ACA (77.6%, n = 85) believed that they were involved in conservation initiatives. However, the proportion of people involved in different conservation activities differed between inside ACA and outside. Some of the key conservation activities in which the residents of ACA were involved are tree seedling plantation on community and private farmland (68.4%, n = 114), active involvement in conservation decisions through various local institutions (70.2%, n = 114), initiatives to control illegal poaching activities (34.2%, n = 114), abiding by conservation decisions (34.2%, n = 114) and other conservation activities such as regular village clean-ups (53.5%, n = 114). Involvement of the residents outside ACA in these conservation activities was relatively low (Table 5.6)

Table 5.6 Perceived involvement in various conservation activities based on structured interviews with local communities within and outside ACA

Conservation Activities	Inside ACA (%) (n = 114)	Outside ACA (%) (n = 85)
1. Plantation of tree seedlings	68.4	32.9
2. Active involvement in conservation decisions	70.2	29.4
3. Initiatives to control illegal activities	34.2	15.3
4. Abiding by the conservation decisions	34.2	24.7
5. Any other activities such as village clean-up	53.5	9.4

5.4.2 Attitudes towards present conservation and development

The results indicated that the great majority of respondents in ACA in comparison to those outside held a positive attitude towards conservation and development efforts (Tables 5.7 and 5.8). A remarkably high proportion of respondents in ACA (98.3%, n = 114) in comparison to outside (56.4%, n = 85) either strongly agreed or agreed to the statement regarding the success of conservation efforts. An overwhelming proportion of respondents in ACA (93.8%, n = 114) either strongly agreed or agreed with the attitude statement regarding satisfaction of village development activities. However, a higher proportion of respondents outside (75.3%, n = 85) in general agreed with this statement rather than strongly agreed (2.4%, n = 85). The average scores in ACA were 4.44 and 4.26 for these individual statements while corresponding values were 3.57 and 3.62 outside, on a 5-point scale. The Mann-Whitney test performed on the scale scores of both areas showed that the residents in ACA had a significantly better attitude towards conservation and development initiatives than residents outside ($P < 0.0001$).

All the respondents in ACA (100%) and outside ACA (94.1%) reported positive changes in their village over a decade period (Table 5.9). Increases in greenery and wildlife, and improvements in village sanitation and infrastructure development were the major perceived changes.

Table 5.7 Attitude of respondents towards overall conservation and development based on structured interviews with local communities within ACA

Attitude Statements	Responses (%)					Mean	± SD
	SA	A	N	D	SD		
1. I regard the present conservation initiative in my village as successful.	46.5	51.8	1.8	0	0	4.44	0.53
2. I am very satisfied with the present village development activities.	36.8	57.0	1.8	4.4	0	4.26	0.70

n = 114, SA, strongly agree; A, agree; N, neutral; D, disagree and SD, strongly disagree.
Respondents assigned a score of 5 for SA, 4 for A, 3 for N, 2 for D, and 1 for SD.

Table 5.8 Attitude of respondents towards overall conservation and development based on structured interviews with local communities outside ACA

Attitude statements	**Responses (%)**					**Mean**	**± SD**
	SA	A	N	D	SD		
1. I regard the present conservation initiative in my village as successful.	3.5	52.9	41.2	2.4	0	3.57	0.60
2. I am very satisfied with the present village development activities.	2.4	75.3	7.1	12.9	2.4	3.62	0.83

n = 85, SA, strongly agree; A, agree; N, neutral; D, disagree and SD, strongly disagree.

Respondents were assigned a score of 5 for SA, 4 for A, 3 for N, 2 for D, and 1 for SD. The respondents were asked about perceived challenges if the community members in the future have to manage the community-based protected area with minimal support from external institutions (Table 5.10). A regular source of finance (68%, n = 114), commitment of the ACA management authority (31%, n = 114), cohesiveness among village community (47%, n = 114) and capacity of local community members in the management (70%, n = 114) were some of the key perceived challenges identified by the respondents. Perceived problems outside the protected were similar but with a relatively low proportion of respondents. This could be due to a lack of sufficient experience among the respondents outside ACA in community-based conservation approach.

Table 5.9 Perceived changes in the village within and outside ACA over a decade period

Perceived Changes	Inside ACA (%) (n = 114)	Outside ACA (%) (n = 85)
1. Noticed any positive changes	100	94.1
2. Greenery in the village increased	92.1	51.8
3. Wildlife population increased	79.8	24.7
4. Village sanitation improved	77.2	70.6
5. Village infrastructure developed	89.5	58.8

Source: Structured interviews

Table 5.10 Perceived challenges for the success of community-based conservation as indicated in structured interviews with community members within and outside ACA

Challenges for success	Inside ACA (%) (n=114)	Outside ACA (%) (n=85)
1. A regular source of finance	68	61
2. Political support for conservation	18	10
3. Development of uncontrolled tourism	2	1
4. Contradictory government policies	5	2
5. Commitment of the concerned conservation authority	31	37
6.Cohesiveness among village community	47	30
7. Capacity of local community in the management	70	39

5.4.3 Attitudes of people towards the park authority

The lack of cooperation between local community members and the park authority has been considered as one of the reasons for the development of negative attitudes among residents in and around protected areas (De Boer & Baqete 1998; Fiallo & Jacobson 1995; Ite 1996; Newmark et al. 1993) thereby threatening their effectiveness. The results of the surveys of attitude towards the park-people relationship in ACA indicated a highly positive relationship. The mean score of individual perception ranged from 4.46 to 4.79 in ACA and 2.30 to 4.07 outside ACA on a 6-point scale (Table 5.11 and 5.12).

ACA, with its strategically located field offices and its team of field-based staff, regular conservation education and awareness activities and a system of regular discussion with local institutions and local community members through various meetings, workshops and training activities have built a strong relationship with the local community members in comparison with the situation outside ACA. A Mann-Whitney test carried out on the scale scores of these areas demonstrated that ACA community members had a significantly better affinity to conservation authority than the community members outside ACA (P<0.0001).

Table 5.11 Perception of respondents towards the park-people relationship as indicated in structured interviews with local communities within ACA

Statements	Responses (%)						Mean	± SD
	A	O	S	R	N	DK		
1. The park authority is in regular touch with the local institutions.	83.3	13.2	3.5	0	0	0	4.79	0.48
2. The park authority is in regular touch with the local communities members.	74.6	20.2	5.3	0	0	0	4.69	0.56
3. The local institutions are consulted, informed and listened to in appropriate ways.	66.7	21.1	7.9	2.6	0	1.8	4.46	0.96
4. The community members' interests in conservation are compatible with the park authority.	80.7	16.7	0	1.8	0	0.9	4.73	0.69
5. The local community members are involved in planning and designing of new projects.	88.6	5.3	0.9	0	2.6	2.6	4.69	1.04

N = 114, A, always; O, often; S, sometimes; R, Rarely, N, never and DK, do not know.
Respondents assigned a score of 5 for A, 4 for O, 3 for S, 2 for R, 1 for N and O for DK.

An overwhelming majority of respondents in ACA had accepted the park authority as a conservation facilitator (56.1%, n = 114) or a development agency (22.8%, n = 114) rather than a conservation decision maker (Table 5.15). None of the respondents in ACA saw the role of the park authority as a conservation decision maker.

Table 5.12 Perception of respondents towards the conservation authority-people relationship as indicated in structured interviews with local communities outside ACA

Statements	Responses (%)						Mean	± SD
	A	O	S	R	N	DK		
1. The concerned authority is in regular touch with the local institutions.	14.1	20.0	21.2	12.9	30.6	1.2	2.70	1.47
2. The concerned authority is in regular touch with the local communities members.	0	27.1	16.5	17.6	37.6	1.2	2.30	1.26
3. The local institutions are consulted, informed and listened to in appropriate ways.	3.5	25.9	9.4	21.2	38.8	1.2	2.30	1.34
4. The community members' interests in conservation are compatible with the concerned authority.	9.4	35.3	20.0	7.1	11.8	16.5	2.74	1.64
5. The local community members are involved in planning and designing of new projects.	48.2	29.4	9.4	7.1	3.5	2.4	4.07	1.02

N = 85, A, always; O, often; S, sometimes; R, Rarely, N, never and DK, do not know.
Respondents assigned a score of 5 for A, 4 for O, 3 for S, 2 for R, 1 for N and O for DK.

Table 5.13 Perceived role of conservation agencies in the villages both within and outside ACA

Conservation Roles	Respondents within ACA (%) (n = 114)	Respondents outside ACA (%) (n = 85)
1. Conservation decision maker	0	1.2
2. Conservation planner	1.8	29.4
3. Conservation facilitator or catalyst	56.1	22.4
4. Development agency	22.8	3.5
5. Funding agency	3.5	0
6. All Above	15.8	0
7. None	0	43.5
Total	100	100

Source: Structured interviews

However, a majority of the respondents (43.5%, n = 85) outside ACA indicated that there is no role of the conservation authority[1] in decision making, planning, facilitating and funding of conservation activities in their village. A proportion of the respondents

[1] Conservation authority outside is mainly the government's District Forest Office (also see Chapter 3).

outside ACA were aware of the role of the conservation authority in planning (29.4%, n = 85) and facilitating (22.4%, n = 85) conservation activities in their villages (Table 5.13).

5.4.4 Institutional Development

The social survey of institutional development before and after conservation intervention in the study area illustrates a very encouraging trend. The Conservation Area Management Committee (CAMC), a legitimate local conservation and development institution (see Chapter 6), has been established as a major local institution in all the study Village Development Committee Areas in ACA. A very high proportion of residents in ACA were aware of the role and responsibilities of this local institution. The majority of the respondents in ACA (85.1%, n = 114) understood that conservation planning for their villages is prepared by CAMC. Only 14.9% (n = 114) of the respondents believed that the Annapurna Conservation Area Project (ACAP), ACA authority, prepares the plan. There was a similar trend outside ACA. The Forest Users' Group (FUG), a legitimate local forest management committee, had been observed as a promising local institution. However, slightly less than half of the respondents (45.9%, n = 85) outside ACA believed that a FUG does not have any role in conservation planning in their villages. Among these respondents outside ACA, 18.9% (n = 85) were unaware of the role of various local institutions in conservation planning (Fig 5.3).

Table 5.14 Various institutions role in conservation expressed by respondents within ACA during structured interviews

Institutions	Planning (%)*	Policy (%)*	Ownership (%)*
1. Conservation Area Management Committee	85.1	95.6	91.2
2. Annapurna Conservation Area Project	14.9	3.5	5.3
3. His Majesty's Government (HMG)	-	-	3.5
4. Village Development Committee (VDC)		0.9	-
Total	100	100	100

* Respondents in percentage; n = 114

Table 5.15 Various institutions role in conservation expressed by respondents outside ACA during structured interviews

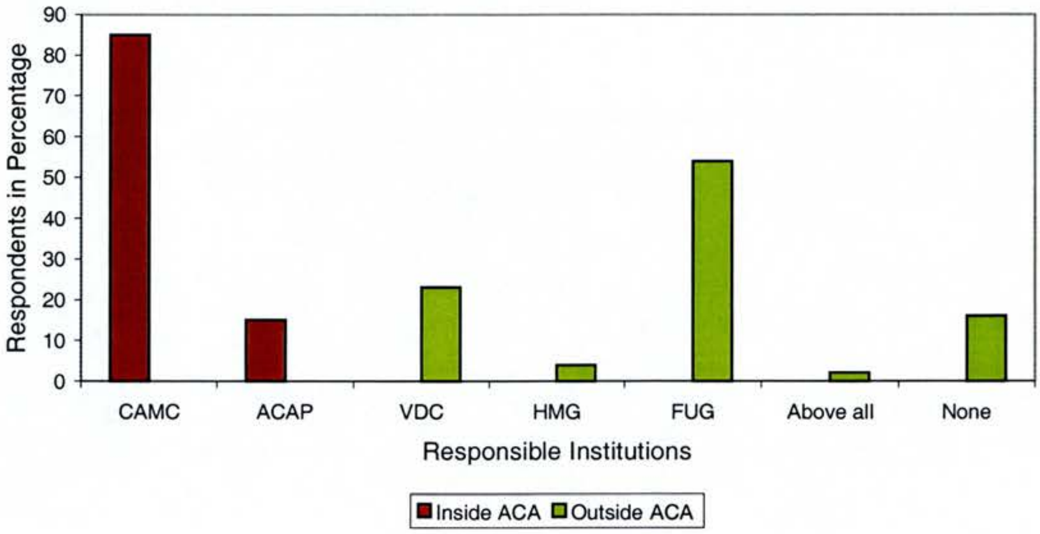
Institutions	Planning (%)*	Policy (%)*	Ownership (%)*
1. Village Ward Committee	23.5	24.5	22.4
2. Forest Users' group (FUG)	54.1	44.7	48.2
3. His Majesty's Government (HMG)	3.5	12.9	15.3
4. Local Individuals in the village	-	-	11.8
5. All the above	2.4	-	-
6. None	16.5	17.6	2.4
Total	100	100	100

* Respondents in percentage; n = 85

The Conservation Area Management Committee (CAMC) holds responsibility for the formulation of village level conservation policy and ownership of forests. An overwhelming majority of the respondents (> 90%, n = 114) inside ACA indicated that the CAMC formulates village level conservation policy. They also believed that ownership of forest lies with CAMC (Table 5.14). Respondents outside ACA considered the Forest Users' group responsible for conservation policy formulation and ownership of the forest. Comparing these two areas, community involvement is associated in ACA with a strong role of CAMC in overall conservation. The FUG has been seen as having a role in conservation activities outside, but other institutions such as the local ward committee (sub unit of village development committee), HMG and local individuals from the village have also played an equal role. A significant proportion of the respondents outside ACA (17.6%, n = 85) do not see any one institution playing a key role in conservation (Table 5.12).

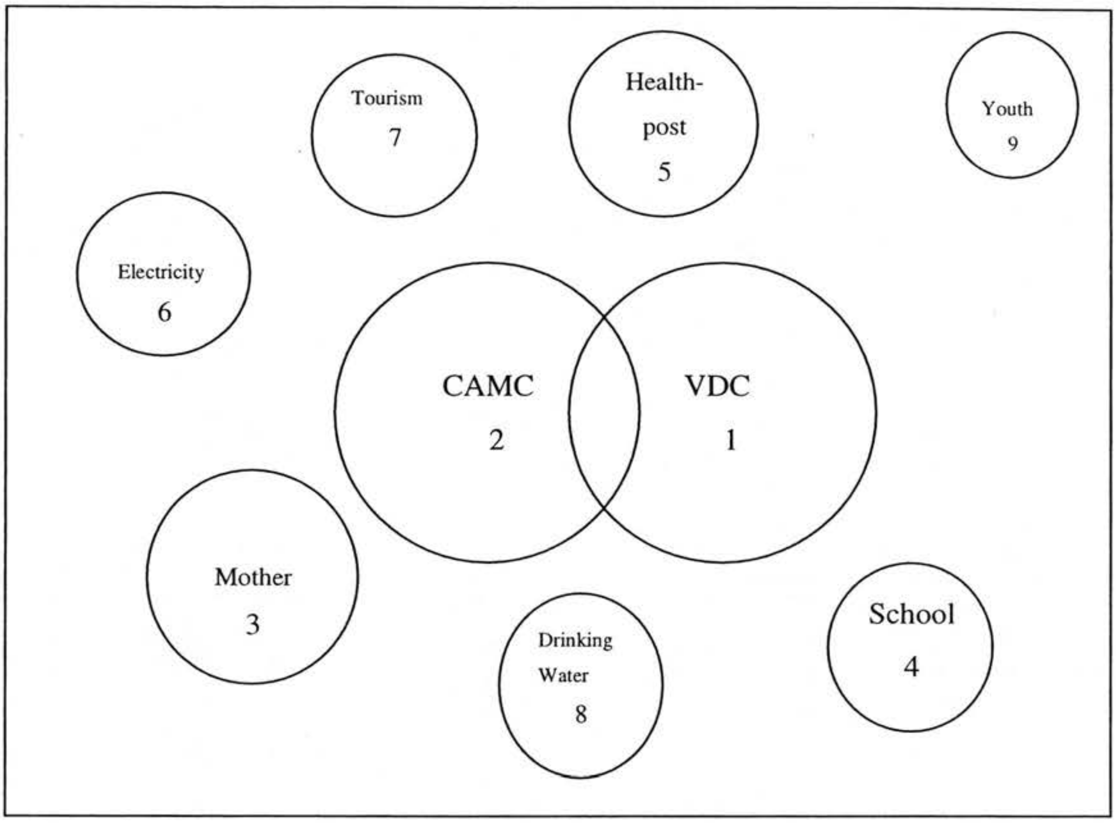
The institutional analysis using PRA methods, the Venn diagrams, also reflected considerable institutional development in the form of functional committees in ACA (Figure 5.9). The Conservation Area Management Committee, Mother's group (Women's Group), Tourism Management Committee, School Management Committee, Health-post Management Committee and Drinking Water Management Committee are some of the main functional committees. The Village Development Committee (VDC), which is an elected village council, exists throughout ACA. The majority of the residents regarded the VDC, CAMC and Mothers' Group as the most important and powerful institutions in the village.

Figure 5.8 Comparison of role of various local institutions in conservation planning as expressed by local communities during structured interviews



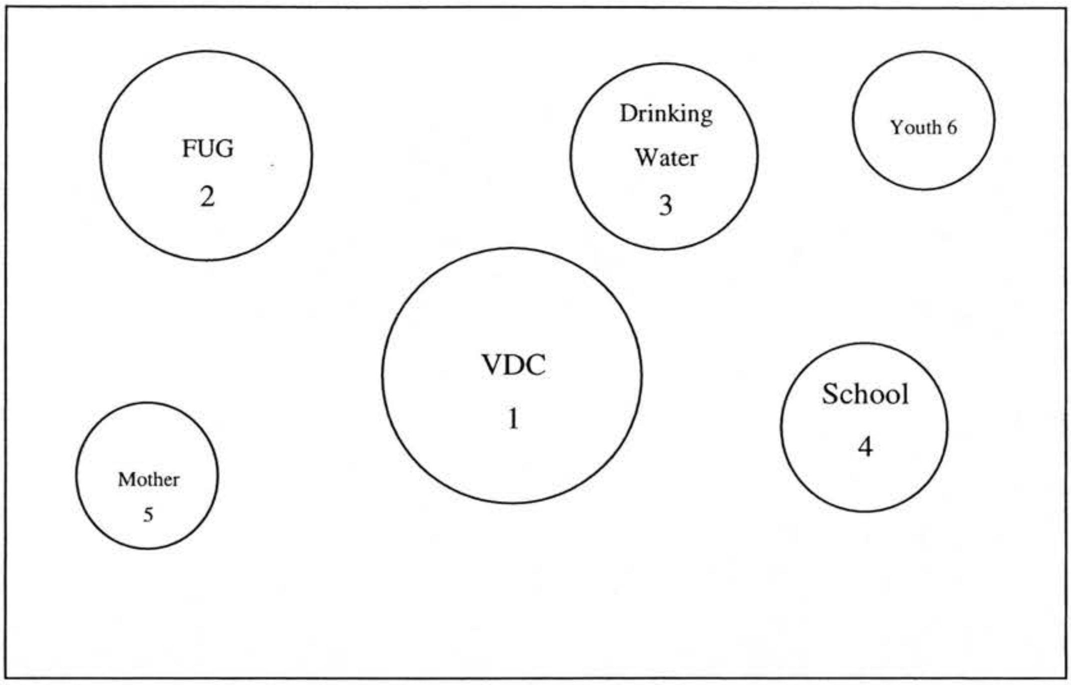
The mean number of local institutions (± SE) was 3.4 ± 0.32 local institutions per village before ACA and the value was 9.3 ± 1.15 local institutions per village at present. The t-test of mean difference before and after conservation intervention showed a significant increase in the number of local institutions following conservation intervention ($P = 0.002$). The mean number of local institutions following the conservation intervention was also significantly higher inside ACA (9.3 ± 1.15 local institutions per village) than outside ACA (6.0 ± 0.26 local institutions per village and Mann-Whitney test ($W=70.5$, $P = 0.04$).

Figure 5.9 Major local institutions in ACA as identified by local communities using the Venn diagram during participatory exercises (number and size indicate the order of importance)



A trend of the development of local institutions was also observed outside ACA (Figure 5.10). The mean number of local institutions (± SE) per village a decade earlier was 2.6 ± 0.49 local institutions per village whereas the value was 6.0 ± 0.26 local institutions per village recorded in this study, indicating significant development during the past 10 years (t-value= -5.67, P=0.005). The Forest Users' Group, Drinking Water Management Committee and Mother's Group were recently developed local institutions outside ACA. The elected village council, VDC, was considered to be the most important and powerful institution outside.

Figure 5.10 Major local institutions outside ACA as identified by local communities using the Venn diagram during participatory exercises (number and size indicate the order of importance)



5.5 Discussion

5.5.1 Forest structure, tree species and human disturbance

Forest structure is the physical and temporal distribution of trees and other plants in a plot (Oliver & Larson 1996). It is an important factor in determining habitat and species diversity. An increase in the heterogeneity of horizontal and vertical structure is linked to the presence of a higher number of species and plots with greater ecological stability (Pommering 2002). An indication of ecological effectiveness of a protected area can therefore be assessed through analysis of forest structure. In community-based protected area, the communities are presumed to have an incentive to conserve biodiversity because they are given opportunities to benefit directly from it (Salafsky & Wollenberg 2000). The present study recorded high basal area of trees and higher tree species diversity inside ACA compared outside ACA. The data also clearly demonstrates that forest study plots close to villages have higher human influences indicated by higher mean cut stump, lower mean basal area and higher mean number of seedlings. The lower mean cut stump, higher basal area and lower mean number of seedlings in study plots away from villages indicated lower human disturbances.

A comparative study of the conditions inside selected protected areas and the surrounding areas in different countries has shown that in general, protected areas were in significantly better condition than their surrounding areas (Bruner et al. 2001). A similar study carried out in some protected areas in the Terai and surrounding forest areas in Nepal indicated no difference in the basal area of trees (Joshi 2000). However, more tree saplings were reported to encounter in the unprotected forests than in the protected areas. This might be expected in areas with greater disturbances. A study in Zimbabwe showed that a forest in a protected area supported a higher basal area than the woodlands of the communal area (Vermeulen 1996), a finding consistent with the results of the present study. Basal area and tree density values reported elsewhere in the literature for temperate forest typically ranged 15 – 85 $m^2 ha^{-1}$ and 320 – 2080 trees ha^{-1} respectively (Busing 1998; Saxena & Singh 1988; Sundriyal & Sharma 1996). Comparing these values with those obtained by the present study showed that the basal area was relatively high in ACA but tree density in ACA was comparable with other temperate forests. The high increase in basal area inside the protected area can be explained by the low levels of disturbance (Bauhus et al. 2002; Smiet 1992).

The incidence of tree cutting was expressed by cut-stump density in the forest, which was clearly and directly related to human actions. An important and positive factor supporting conservation through involvement of the communities was indicated by the significantly lower number of cut-stumps in ACA compared to that of outside ACA. Collection of only deadwood, the introduction of various alternative form of energy technologies such as kerosene, micro-hydro electricity and improved fuel wood stoves, conservation education and awareness and availability of fuelwood on private woodlots have cumulatively contributed to reduce pressure on forests. Above all the alternative form of energy or efforts to build awareness to reduce the quantity of fuelwood is not observed outside ACA. However, the discussions with the communities indicate that the local communities outside ACA have interest to adopt either fuelwood saving technology or alternative form of energy to reduce present fuelwood demand. Possibilities of effective initiatives to establish community or private woodlots as in ACA villages to reduce pressure in natural forests were also observed outside ACA.

Evidence from earlier research on fuelwood use by the local communities and tourist lodges also indicated decrease in fuelwood use. The first report of the KMTNC-Annapurna Conservation Area Project (1987) reported the use of 25 kg day^{-1} of fuelwood by a household, 250 kg day^{-1} by a tourist lodge and 100 kg day^{-1} by an organised trekking group. A study of fuelwood use in the 1990's estimated that a household use of 10 to 15 kg day^{-1} while a tourist lodge uses 100 kg day^{-1} (Saito 1990). Various recent studies of fuelwood use have shown a recent dramatic decrease in fuelwood use, particularly in tourist lodges and by organised trekking groups. The estimated daily fuelwood use among the lodges was reported to vary from 9 to 11 kg per tourist lodge whereas at household level it was 8 kg day^{-1} (Banskota & Sharma 1996; KMTNC-ACAP 2000b). The use of fuelwood by organised trekking groups has been restricted from using in ACA since establishment of ACA. This was also supported by the increasing trend of adoption of various alternative energy devices (KMTNC-ACAP 2001a).

Plantation records of various indigenous fast-growing fuelwood and fodder tree seedlings on the southern slopes of ACA also substantiate the reduced use for the forest for the purpose of fuelwood harvesting. Official records showed that more than 1,666,000 tree seedlings were planted on communal lands and private farm lands in all of ACA by the local communities during 1986 to 2000 out of which two-thirds were planted on private farmlands (KMTNC-ACAP 1997, 1999, 2001b).

Plate 5.2 A stack of fuelwood recently harvested from a private woodlot in Chhomrong village

A respondent from Ghandruk village informed us that '*the majority of the villagers are now self-sufficient in their farm fuelwood. Therefore even those who do not have farm trees, have easy access to wood in the forest*'. These kinds of conservation activities were either non-existent or less effective outside ACA. Despite efforts by the government and other supporting agencies, successful plantation in the community owned lands or on private farmlands was not observed outside ACA.

A comparison of tree species utilized in 1990 and currently existing in some villages within ACA showed considerable differences. Research conducted by Saito (1990) reported use of more than 90 species for fuelwood. Uttis (*Alnus nepalensis*), Kali kath (*Myrsine sps.*) and Angeri (*Lyonia ovalifolia*) were reported as occupying about half of the whole stack of fuel wood (Saito 1990). This study found that only 29 species of fuelwood were used in total. This implies that use of a wide variety of fuelwood species from forests has been reduced significantly.

Plate 5.3 A private woodlot with fodder trees planted on farm all around a local house. Forests seen further away are either private woodlots or community woodlots around village settlement in Ghandruk

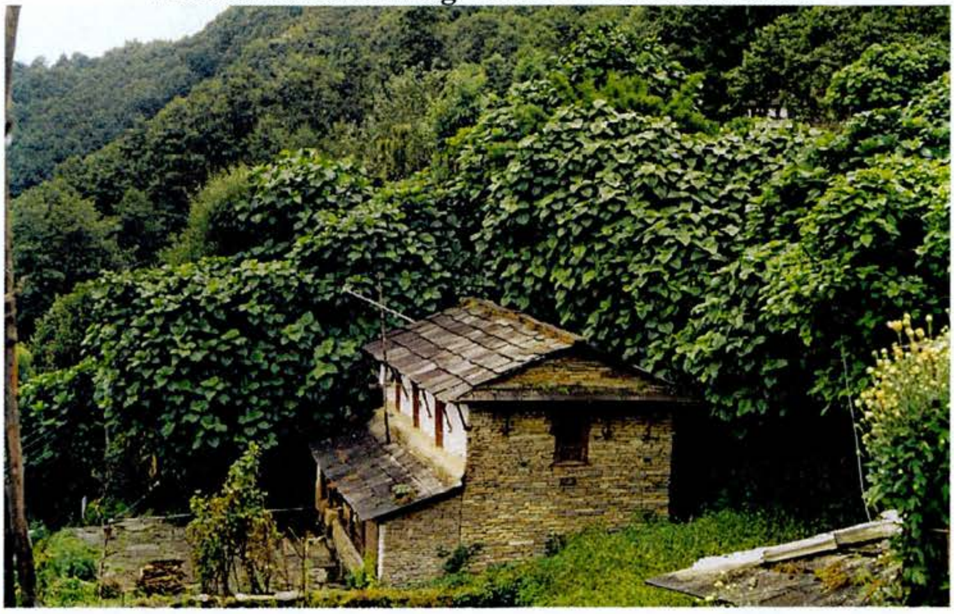
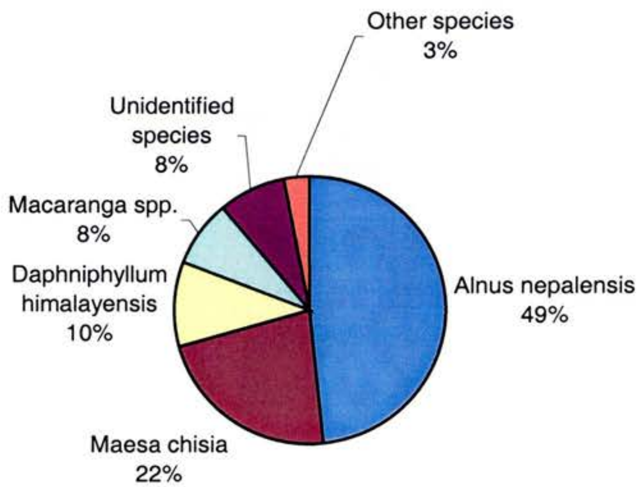


Figure 5.11 General proportions of different tree species in a stack of fuelwood stored at household level in a village in ACA



Source: ACAP (2000)

The majority of the households in the study area villages within ACA were found to use the Uttis tree (*Alnus nepalensis*) as a main fuelwood species. A fuelwood consumption survey in a village in ACA also supported this result (KMTNC-ACAP 2000b). The study reported that almost half of the total fuelwood in a stack was found to be from the Uttis tree (Fig. 5.11). The main reason for high use of this species as fuelwood was availability from private woodlots as this is the most widely promoted tree species for establishment of private woodlots within ACA. The local people could harvest the fuelwood from this species within 6 – 8 years after planting under suitable conditions. A high use of this species also suggested that the local communities are now dependent on the wood from private woodlots rather than from natural forests, thereby indicating reduced pressure on them. The results of PRA exercises also supported the above argument. The majority of the participants in the PRA exercises revealed that fuelwood collections from the forest have been reduced by half compared to a decade earlier. It clearly indicated that providing alternatives directly linked to the objectives of reducing unsustainable use could be an effective means of addressing the subsistence needs of local people (Rao et al. 2002b).

The number of grazing animals and dung in the forests indicated that there were no difference in livestock grazing pressure in forests between within and outside ACA. The study showed that there was a mean of 36 grazing animals (cattle and buffalo) on average per hectare of forest areas within ACA. The available statistics suggest that the livestock population in Nepal and its pressure on forest habitat is considerable, and perhaps the excessive drain on natural resources will lead to an ecological and environmental imbalance (Joshi 1992). Although there is no difference in livestock pressure at the moment, yet livestock grazing might be one of the noticeable sources of anthropogenic disturbances to natural habitats in ACA.

Livestock, particularly cattle and buffalo, play a vital role in the whole agricultural system in Nepal and so have a large influence on the rural economy (Joshi 1992).

However, discussions with local communities during participatory surveys indicated that considerable changes have taken place in livestock population, structure and management systems in ACA over the last few decades (about 35 years earlier). The big herds of cattle and buffaloes with 45 – 60 animals have been replaced by animal numbers of 10 – 12 maximum. However, these changes have taken place gradually over decades. Households with sheep flocks have also reduced. Labour shortages, a decreasing interest of young people in traditional livestock farming and increased involvement in tourism-related businesses had contributed to the reduction in livestock numbers. This observation was also supported by the findings of Shrestha and Ale (2001). More than 65% of buffaloes in ACA was stall-fed indicating that the local people have also started to adopt a stall-fed system instead of free grazing in forests. Similar findings were reported on a study on livestock population trends in the Hindu Kush Himalayas (Tulachan & Maki-Hokkonen 2002). The establishment of private woodlots with fodder trees in the study area villages within ACA also indicated the shift in livestock farming system (see plate 5.3).

This evidence implies that although there is a certain level of grazing pressure in forests, the level of pressure has been reduced over the last few decades. The relative prolific regeneration in forests also indicated a low level of anthropogenic disturbance. It was reported that due to a reduction in fuelwood use and other measures, there has been significant regeneration of forests (Kothari et al. 2000). The current results are consistent with this suggestion.

5.5.2 Changes in wild animal populations

The tree species composition of a forest is very important, at least indirectly, to virtually all the wild animal populations living there (Hunter 1990). Previous studies have shown that a greater species diversity of trees supports a relatively high diversity of bird species (Hunter 1990). It can be postulated that maintaining the natural species composition of a forest is very important for a biodiversity conservation point of view. The aim of protected area management, as mentioned earlier, is the maintenance of the diversity of species and ecosystems. The evidence of higher tree species diversity and basal area together with relatively low human disturbance in terms of fuelwood collection suggested that the quality of habitat for wildlife is relatively high inside ACA.

It was reported that unmanaged hunting depletes large game populations (Bodmer et al. 1997), which greatly diminish the conservation value of these forests. However, a great majority of the residents in ACA reported an increasing trend of the abundance of key wild animal species compared to the respondents outside ACA. The major reason for an increase in wild animal populations in the area is the highly effective implementation of policies aimed at controlling wildlife hunting by the local communities through their functional local committees. The majority of local communities in ACA have abandoned hunting of wild animals such as barking deer (*Muntiacus muntjak*), Common Goral (*Naemorhedus goral*), Himalayan Thar (*Hemitragus jemlahicus*) and Kalij Pheasant (*Lophura leucomelana*), which were previously sought-after game animals hunted by the local communities of the area. Generally, such hunting was not for subsistence purposes (Sherpa et al. 1986). The local communities were also able to control recreational hunters from urban centres and peripheral villages.

In contrast, it was reported that hunting pressure is high in almost all tropical forest parks in West Africa (Oates 2002). The strong disagreement of more than three quarters (83%, n = 89) of respondents in ACA to the wildlife questionnaire regarding local communities continuing hunting indicated strong support for the abandonment of hunting. As reported elsewhere (see Infield & Namara 2001), some of the respondents of the questionnaire survey and participants of the participatory discussion reported occasional killing of some pest animal species. Therefore, the key concern of the local communities regarding controlling pest animal species such as Rhesus Macaque (*Macaca mulatta*), Indian Porcupine (*Hystrix indica*) and barking deer (also see Chapter VI) indicated that local support for wild animal conservation did not extend to the situations where the local communities felt that their livelihoods were under threat from the wildlife. A recent study in a Tanzanian Game Reserve also has shown a similar pattern of response from the local communities (Gillingham & Lee 1999).

The local communities were encouraged to conserve wildlife because the benefits from conservation were perceived to exceed costs (Metcalfe 1994). However, it was reported by the local communities that control of some of the wild animal species with high commercial value such as Himalayan musk deer (*Moschus chrysogaster*) have not yet been as effective as was anticipated. Evidence of some hunting records in ACA and discussions with the CAMC members indicated that people from other districts carried out most of these hunting activities (KMTNC-ACAP 2002b) and they were often linked to a commercial hunting network. These occasional hunting occur primarily because of external demand for wildlife products such as musk and is often well-organised activity. Similar problems of commercial illegal hunting were reported from protected areas in Myanmar (Rao et al. 2002b).

The ACA's records of legal actions for over a five-year period from 1998 to 2002 showed that there were only seven illegal hunting cases filed (KMTNC-ACAP 2002b). Compared to reported cases from the army guarded national parks and other wildlife reserves of Nepal (DNPWC 1993, 1995; Phuyal 2003; Post-Reporter 2001a), illegal hunting in this protected area was thus relatively very low. However, there have been criticisms that conservation areas do not necessarily protect wildlife and there have also been reports that the incidence of wildlife poaching is far greater in conservation areas than in national parks or wildlife reserves (Thakali, 1995 cited in Heinen & Mehta 1999). The present evidence indicated that these reports might be erroneous at least from the present study villages within ACA. Nevertheless, the Maoist insurgency that has been affecting many rural areas of Nepal for some years, has created a situation of lawlessness, and is thought to have influenced the level of poaching in ACA over recent years. A majority of CAMCs on the southern slopes of the Annapurna region have not been effectively functioning during the study period due to Maoist activities. It was reported that the uprising has exiled 9 chairpersons and 39 members of CAMCs asking them to abandon their homes and villages (Yonzon 2002). Therefore, the insurgency, on one hand, has forced local community leaders to abandon their villages and on the other hand, has sharply reduced visits of conservation officials to different field sites. Among the protected areas of Nepal, the highest insurgency damage has occurred in ACA (Yonzon 2002). Similar problems in park management due to insurgency have been reported from elsewhere in other countries (Hart 2002; Oates 2002).

Compared to respondents in the villages outside ACA, a relatively high proportion of the people reported frequent encounters with wild animals in ACA forest. Evidence of relatively higher sighting of wild animals and pellet count data in ACA strongly support suggestion that populations of wild animals in the area have increased. However, these results should be viewed with caution, as these observations were limited to a small sample size and to only one season.

A study of the Himalayan Tahr populations indicated that there is a sizeable population of the animal in the area (Gurung 1995). A recent study in the area reported a 20% increase in the population of the Tahr over a five-year period (Shrestha & Ale 2001) indicating that a healthy population is increasing. A similar study monitoring the Koklass pheasant (*Pucrasia macrolopha*) and Satyr Tragopans (*Tragopan satyra*) for 20 years by the World Pheasant Association in one of the areas of ACA reported stable populations, whereas most Himalayan pheasant species are thought to be declining elsewhere (Kaul & Shakya 1998). Other species such as hill-partridge (*Arborophila torqueola*) have been reported relatively in large numbers. This evidence implies that wild animal populations in the area are stable if not on the increase compared with the areas outside and elsewhere. It is important to mention here that conservation of fresh water ecology particularly fish, however, has not been effective in ACA. Discussion with ACA staff and CAMC members during the focus group reported uncontrolled use of electric rod fishing and poisoning in major rivers.

5.5.3 Local community attitudes towards conservation

The success of community-based protected area depends on the local communities having a positive attitude towards conservation, and of park authorities towards the communities. A positive attitude has a very strong influence on the mentality and motivation necessary for involvement in conservation initiatives. However, the attitudes of individuals are not always closely linked to their behaviour. The community-based protected area management approach thus attempts to influence thinking and attitudes in the belief that this will lead to changes in behaviour (Infield & Namara 2001). The results of the current research suggest that conservation intervention in ACA does seem to have significantly influenced attitudes of the local communities leading to changes in their behaviour. A strong traditional system of resource management either through *Ban Samiti* (Forest Management Committee) or other traditional local management committees; culture of working together and helping each other; and good leadership within the ACA villages have catalysed these changes.

A majority of the people perceived 'conservation' as the protection of forest and wildlife (biodiversity) in ACA. An evaluation of a previous pilot programme in ACA reported that different people have understood 'conservation' in different ways (Sherpa et al. 1989). This suggests that there has been a substantial increase in the level of awareness among local communities regarding the main objective of 'conservation' in the area.

Unlike other areas where residents have complained about not being involved (Alexander 2000), ACA appears to have been successful in involving an overwhelming majority of residents in the area. In addition to planting tree seedlings and regular cleaning-ups of the village, almost three quarters of the respondents in ACA indicated that they were involved in conservation decisions through various local institutions. This clearly suggests that local communities in ACA have been empowered by giving them legal responsibility and authority in decision making over the management of previously strictly government controlled resources. The Conservation Area Management

Regulations (CAMR) has provided power to control and manage local resources by local communities. In contrast, it was reported that before the conservation intervention local communities in ACA were aware of the problems that they had no power to control and regulate use of their resources (Hough & Sherpa 1989). The local communities' involvement in ACA could be referred to that categorized by Pretty (1994) as cited in Pimbert and Pretty (1995) as *interactive participation,* where local communities participate in joint analysis that leads to action plans and the formation of new local institutions or the strengthening of existing ones. These institutions take control over local decisions, and so that the local communities have a concern in maintaining structures and practices. At the beginning the local communities were highly sceptical about ACAP actions expressing a concern that this strategy would slowly transform the area into a national park (KMTNC-ACAP 1987). However, the present evidence confirms that substantial achievements have been made in a 15-year period with respect to involvement of the local communities in conservation planning, management and decision-making. This was achievable due to various reasons. ACA is managed by KMTNC, which has a relatively less bureaucratic and committed team than the government agencies. In addition, ACA has support from overseas donors, substantial tourism revenues, and good expertises to work with local communities that considerably helped to make this achievement (also see Chapter 7 & 8).

Despite the fact that a very high proportion of respondents is involved in conservation, a surprisingly low proportion of the local communities reported that they were involved in the initiatives to control illegal activities and adhering to conservation decisions. There could be a number of reasons for this. One of the prominent conservation leaders in Ghandruk mentioned that '*everyone in the village is working as a conservation watchdog. Therefore, no one can hide any of their illegal conservation actions in the village*'. This statement reflected that generally there is no need for additional initiatives to control illegal activities within the village. As the majority of the villagers perceived themselves to be involved in making conservation decisions, they are of the opinion that following conservation decisions is obvious. This suggests that residents feel they were part of the conservation process.

A high proportion of respondents outside ACA also claimed to be involved in conservation activities. However, only a very small proportion of the respondents outside ACA reported involvement in the planting of trees, conservation decision-making, initiatives to control hunting and adhering to the conservation decisions. The evidence shows that the local community involvement in the villages outside ACA could be categorized as *'participation for material incentives'* as proposed by Pretty (1994) as cited in Pimbert and Pretty (1995). This includes for material incentives such as receipt of a fuelwood and fodder quota, and participation in activities such as Forest Users' Group (FUG) meetings and/or elected Village Ward Committee meetings, rather than active participation in decision-making for resource management in their village. Similar kinds of participation have been reported elsewhere in other countries (Gillingham & Lee 1999). Compared to other categories of forest management in Nepal, the community forestry programme has been considered to have a positive impact (Dongol et al. 2002; Timisina 2003). However, overall assessment of social and ecological impacts of the community forestry is still lacking.

A higher majority of respondents (98.3%, n = 114) in ACA displayed positive attitudes towards conservation and development activities within ACA compared to the outside (56.4%, n = 85). This is not a surprising result because ACA has made major efforts to improve conservation education and awareness through formal and non-formal education programmes, whereas such activities do not exist outside ACA (see also Mehta & Heinen 2001). However, elsewhere in Nepal and in other countries, local communities residing inside or on the periphery of protected areas have often been reported to have negative attitudes towards conservation despite receiving the direct and indirect benefits (Gillingham & Lee 1999; Heinen 1993). Interestingly, respondents in ACA unanimously perceived positive changes in the village over the period of a decade in both conservation and development. The explanation could be that the changes such as improvement in village sanitation, infrastructure development, woodlots around villages and improvement in forest conditions in villages are generally very visible and comparatively better than neighbouring villages. The positive conservation attitudes expressed by local communities in ACA were broadly consistent with the findings of previous surveys (Banskota & Sharma 1995b; Mehta & Heinen 2001). Therefore, the response is found to be well acceptable. The data collected here (see Table 5.9) suggests that over three-quarters of the respondents were aware of the conservation impact that ACA is making.

However, a large majority of respondents outside ACA (94.1%) had also perceived positive changes in their village. They reported improvements in forest conditions, village sanitation and infrastructure over the last decade. One of the possible explanations of the perceived changes outside ACA could be that various government and donor agencies such as the British Gurkha Welfare Office, Lumle Agriculture Research Centre, German Technical Cooperation (GTZ) and Japan International Cooperation Agency (JICA) have implemented various short-term conservation and development programmes in these villages. However, the integration and continuity of conservation and infrastructure development programmes were found to be lacking outside ACA.

Increases in conservation awareness and positive attitudes towards conservation were also reflected by the suggested future of community-based protected area. When asked to consider if the community members in the future had to manage the conservation area with minimal support from external agencies, almost three-quarters of the respondents (70%) in ACA reported that their lack of management capacity would be the major challenge. As expected, the respondents also placed substantial importance on a regular source of financial support. They considered that cohesiveness among the village communities could also be a threat. However, they did not consider growth of uncontrolled tourism and contradictory government policies as barriers for the future management of the conservation area. This evidence suggests that the local communities in ACA are still not confident enough to handle the conservation area management independently, probably because of the direct involvement of ACA authority. A workshop organised in the year 2000 for conservation leaders of ACA also strongly emphasised on the need for building management capacity of the local communities (KMTNC-ACAP 2000a). Similar issues were perceived by the respondents outside ACA but with a relatively low proportion of respondents, indicating that they lacked active involvement in conservation.

5.5.4 Attitudes of people towards the park authority

The effectiveness of community involvement in conservation is illustrated by the changes in attitudes of people towards ACA authority. The results of the interviews indicated a highly positive relationship between the local communities and ACA staff and authority. In contrast to other countries where a lack of communication with local communities was a key issue (Alexander 2000); more than three quarters of respondents agreed that ACA staff and authority were in regular communication with local institutions, and local communities and they were consulted, informed and listened to properly. ACA's emphasis on local capacity building through home visits, conservation awareness, adult literacy, conservation workshops, trainings and exposure trips and other interactive programmes with the local communities (KMTNC-ACAP 1997, 1999, 2001b) may therefore have had impact on attitude. This could be considered as a positive indicator of the development of strong partnerships with mutual trust between the local communities and ACA authority to support conservation action in the area.

In contrast, elsewhere in the world, local communities have often been found to hold more negative opinions of park staff and authorities than conservation activities themselves (Gillingham & Lee 1999; Infield & Namara 2001; Newmark et al. 1993; Parry & Campbell 1992). There have been reported cases of harassment to the local communities residing in and around parks by park staff and army guards that is often referred to as the enforcement of park by-laws by the staff (Infield & Namara 2001). For example, park staff and army guards recently killed more than 30 domestic buffaloes grazing in the Koshi Tappu Wildlife Reserve in Nepal (Post-Report 2003). These water buffaloes were the only means of income for most of the people residing around this park and therefore their livelihood were imperilled by this action.

The interactions between the local communities outside ACA and the conservation authority (generally, the district forest office, DFO) were found to be insignificant in compared within ACA, which is unsurprising. A little more than a quarter of the respondents outside ACA reported being in regular contact with the conservation authority. This low proportion reflects a lack of extension capability (Baral 1994) and a lack of confidence of forest office staff to communicate with local communities. However, modifying the behaviour of park or forest office staff towards local communities has not proved easy (Infield & Namara 2001). The lack of a good working relationship between the district forest office staff and local communities and particularly the forest users' groups (FUGs) was also indicated in a study report by the New Era, a non-profit and non-governmental organization (New-ERA 1996). However, a high proportion of respondents (48.2%) believed that local community members were involved in planning and designing of new projects.

The ACA authority's claim as *lami* or conservation facilitator rather than conservation decision maker (Gurung 1989; KMTNC 1997; KMTNC-ACAP 1997; Pye-Smith et al. 1994) was supported by more than half of the respondents. This again emphasizes the fact that the local communities were aware of their role and the ACA authority's role in conservation. However, the evidence indicates that a considerable proportion of the people still see the role of the ACA authority as a development agency, funding agency or responsible for all, emphasizing either the need for a greater focus on decentralization or more focus on raising awareness on the role of local institutions and communities in conservation. Another explanation for this could be that a certain proportion of the local communities have not yet changed their perception of external agencies as law enforcement agencies and decision makers.

The government forest office's changing role from a law enforcement approach to a community forestry approach with major responsibilities transferred to user communities, was reflected by the responses obtained outside ACA. An unexpectedly low proportion of the respondents (1.2%) identified a role of the forest office in conservation decision-making. This implies that the forest office has either decentralized the conservation decision-making process or the office has little influence in conservation decision-making. About half of the respondents perceived the role of forest office as a conservation facilitator and planner. Growing local community support for changing the government's role in the forestry programme was demonstrated from these responses. However, about half of the respondents interviewed did not recognise any role of the government forest office in conservation. This could be explained by the fact that, despite the government's interest in involving the local user communities in forest management, they are often not willing to participate because government staff lack extension capability, and lack incentives and confidence to work together with local communities (see also Baral 1994). Whereas in ACA major focus has been given on conservation education, awareness and extension, and major proportion of staff are based at the field. That gave more opportunities to interact and develop confidence to work together.

5.5.5 Local institutional development

Community involvement is believed to provide a number of benefits including the incorporation of local knowledge in planning and decision-making, generation of greater support for and sustainability of local actions and being consistent with democratic values (Pelletier et al. 2003). The success of community-based protected area often depends on the real empowerment of local resource users and attention given to legitimacy in local institutions (Kull 2002). Local institutions provide leaders, stewards and rules for social regulation (Berkes et al. 2000), making community-based protected area management effective and sustainable. They also help to maintain community solidarity and negotiating power in relation to threats (Chambers 1997). A main indicator of success of conservation efforts is the development and strengthening of local institutions, which can represent local communities' interests and concerns (Martin 1997).

There is evidence of the development of local institutions in ACA. The Conservation Area Management Committee (CAMC) has been established as a main local institution for planning, designing, implementation of conservation and development plans and programmes in ACA villages. It is notable that a large majority of the respondents of the interviews considered that CAMC has an important role in conservation planning, policy formulation and ownership of the forest resources. A low proportion of respondents indicated the role of ACA authority in planning and policy formulation. The respondents did not report any role of government agencies in the area, however a few respondents reported that forest ownership lies with the government. The results indicate that CAMC has the responsibility and authority to manage and use resources. The awareness among the respondents regarding the role and functions of CAMC emphasises the importance of this institution within the villages. This can be further explained by the fact that CAMC plays a key role in conservation and development in the villages. Enforcement of conservation rules, and decisions on time, place and amount of harvestable forest resources for non-commercial use, identifying and organising tree seedling planting, listening to the communities' concerns and demands, and prioritisation and coordination of infrastructure development needs in the villages are some of the important tasks they are performing.

Some encouraging trends were noted outside ACA. The Forest Users' Group (FUG) was considered as an important conservation institution with a role in conservation planning, policy formulation and forest ownership. However, more than a quarter of the respondents reported that other actor groups such as the Village Ward Committee and the government agencies are involved in these conservation activities. It is important to note that around 16% of the respondents mentioned that none of these institutions have any role in their village settlement. Discussions during PRA exercises indicated that although the FUG has emerged as an active conservation institution, there has been a serious lack of support from government agencies, a lack of regular meetings except during harvesting of wood for fuelwood and a lack of capacity development of FUG executive members leading to their limited performance. The responsibility, authority and scope of a FUG's work also differed between studied villages. In contrast, a few powerful people in the villages outside ACA controlled the ownership of forest and forest management decisions where the community forestry approach has not yet been implemented. This emphasises a need for implementation of community forestry policy uniformly within the country.

For communities to act as effective agents of conservation and development, they must be structured so as to accommodate internal differences for collective action (Murphree 1994). CAMC is the main legitimate conservation authority in the villages of ACA. During the initial stages of conservation intervention, the legitimacy of CMACs was based on a shared value system and collective cohesiveness as in a traditional authority structure (also see Murphree 1994). The conservation area regulation endorsed by the government in 1996 under rights provided by the 1973 National Parks and Wildlife Conservation Act (KMTNC 1996) gave a legal designation and role to CAMCs.

The regulation placed CAMC in a key position in conservation through a decentralised approach. The CAMCs have the authority and responsibility to capture and fine persons breaking the regulations. As foreseen in the ACA Operational Plan prepared in 1986 (Sherpa et al. 1986), income from fines and issuing permits for resource harvesting (e.g., timber) is deposited into a distinct CAMC account and used for incentives and local development.

The main duties of CAMC outlined in the regulation include the preparation of a management action plan for conserving the environment and sustainable management of resources (KMTNC 1996). The management based on a CAMC plan was intended to demonstrate a systematic approach to managing community-based protected area at the ground level. However, an approved CAMC management action plans were not in place in the areas investigated during this study, and instead an ad hoc system of resource management prevailed in ACA. All the CAMCs, with the guidance and support of ACA staff, had prepared and submitted plans to the ACA authority. Discussion with the concerned authority emphasised the importance of the CAMC management action plans but could not make any commitment regarding when and how to implement the plans. On the one hand, the ACA authorities were not confident about the accuracy of information presented on plans and on the other, they still doubt on effectiveness of these plans. However, if the ACA authorities are committed to manage ACA based on the CAMR, there is a need of the management action plan for each CAMC.

The evolution of various local institutions including CAMC over the past decade in ACA is shown to be another significant development. This could be attributed to changes in awareness and attitudes towards participation in various community programmes and realisation of the importance of collective actions and the shared value systems among the local communities. The local institutions in ACA could be categorized based on Murphree (1994) into local governance structure (e.g., VDC, CAMC), specific-interest organisations (e.g., mother's groups, forest management committees, youth groups, drinking water sub-committees, school management committees, electricity management sub-committees), service organisations (e.g., '*Ghantu*' culture conservation sub-committees) and private entrepreneurial organisations (e.g., tourism management sub-committees). Most of the sub-committees perform their activities under the umbrella of either CAMC or VDC or both. Local institution formation does happen outside ACA. But these institutions were not generally active to develop a system of collective actions because there is a lack of effort to develop awareness, motivation and appreciation of their contributions. The local communities also reported a lack of capacity enhancement training during participatory discussions.

Communities living in difficult circumstances seldom survive without a strong spirit of cooperation (Pye-Smith et al. 1994). The underlying assumption is that traditionally local people get organized to work together if they live in close proximity and share common interest for conservation and development of their village (Bajracharya 2002). The local communities within ACA and outside have their own traditional system of working together for example in building trails, managing their forest, setting up irrigation systems, collecting fuelwood, and planting and harvesting of crops. The *jhara* system, which determines the division of labour and *huri* where the village provides labour service to a family in a village as part of mutual exchange of labour have been encouraged in ACA (Bajracharya 2002; Pye-Smith et al. 1994). This indicates that the ACA approach has been found to be successful in capturing this opportunity to develop local institutions in the area. An increase in the number of local institutions, particularly specific-interest organisations, observed in ACA is therefore not surprising. Discussions with the local communities indicated that local institutions give equal opportunities to the community leaders to show their performance and capability through these institutions. There was competition between the institutions to perform better, resulting in effective and efficient outcomes. The nature of the work of these institutions is very diverse, ranging from village sanitation improvement to community-owned micro hydro management, tourism management to forest management, drinking water to kerosene depot management (KMTNC-ACAP 1997, 1999, 2001b). However, efforts to develop local institutions based on traditional system is lacking outside ACA.

There were a few reported cases of ineffective performances of certain local institutions. As an example, the chairperson of a forest management committee in a village in ACA (Lumle VDC) misused Rs. 40,000.00 (£325.00) from the sub-committee fund. The CAMC of the village immediately took action against him but it was not effective, thus damaging the reputation and faith of the communities in that particular institution in the village. As mentioned by Murphree (1994), an organisation, regardless of how appropriate its structure is, is only as good as the people who operate it. This leads to the point that leadership both in local institutions and ACA management is crucial for the success of the initiatives.

Although comparatively low, a trend of evolution of local institutions was also observed outside ACA during this survey. Some effect of ACA was observed on evolution of local institutions outside ACA. Observation of how local communities were being organised in ACA encouraged the communities outside ACA to form local institutions such as a mothers' group and a tourism management committee. However, most of the institutions evolved recently outside ACA were specific objective organisations such as drinking water committees, FUGs, mother's groups, youth groups and school management committees. Unlike in ACA, most of these institutions if they exist, perform their activities independently from each other.

5.6 Conclusion

This chapter has examined the effectiveness of community involvement in conservation as it delivers conservation benefits to the protected area. Results indicate that ACA has demonstrated improvements in ecological and social issues in the villages of ACA over the past decade. ACA has maintained a superior forest structure with higher basal area and species diversity. Evidence suggests that poaching of wildlife has decreased and wildlife populations are stable if not increasing. Therefore the ecological effectiveness of the community-based protected area management approach in ACA is confirmed. It can be emphasized that if halting and slowing deforestation and poaching are reasonable environmental goals to protect biodiversity (Schwartzman et al. 2000), then the community-based protected area management approach promoted in ACA is undoubtedly delivering conservation benefits to the protected area that is comparable to other protected areas in Nepal which have a strict protectionist approach.

The results also indicated importance of an integrated management approach to minimize anthropogenic impacts on forests. The integration of activities designed to increase conservation awareness, plantation of fuelwood species in community and private farms and the provision of alternative energy sources has contributed to reductions in fuelwood collection from forest. Decreases in the quantity of fuelwood use by households and lodges were substantiated by evidence of significantly lower densities of cut stumps in ACA than outside. Evidence of tree regeneration also indicates a relatively low level of disturbance. However, further assessments of damage by grazing livestock in forest areas are necessary for enhancement of management procedure within ACA.

Among social issues, the attitudes of the local communities towards the conservation and conservation authority were generally found to be very positive. This was reflected by changes in the behaviour and actions of local communities in conservation. A majority of ACA residents perceived positive changes in conservation and development in their villages. The role of ACA as a facilitator or *lami* has been found to be successful in building effective partnerships between the authority and the local communities. However, it is important to note here that the achievements of conservation awareness are fragile, and easily lost (Infield & Namara 2001). Therefore, the role of individual ACA staff and the authority as a whole have an immense effect on local attitudes and the development of effective partnerships. A deep understanding of and continuing commitment to community involvement among ACA staff and authority is critical importance. The growing bureaucracy and slow process of decision-making (Ale, personal communication) which may have been caused by political instability in the country, must be corrected for better performance.

Development of CAMC as a local conservation institution has contributed in conservation of resources in the area by the local communities. Sustainability of the approach has been demonstrated by the possibility of improving the capacity of local institutions such as CAMC; in fact, CAMC has been addressing a comprehensive range of conservation problems and issues. Delegation of proprietorship rights on natural resource management to CAMC by the government through ACA management has strengthened the local institution to a certain level. Awareness among local communities has enhanced the role of CAMC in conservation planning, policy and ownership of forest; thus helping to established CAMC as an important institution within the area. However, difficulties were reported in the approval and implementation of CAMC operational plans by the concerned conservation authorities. A lack of proper management action plan at the CAMC level might make the management ineffective in the future. With examining the effectiveness of community involvement in delivering benefits to the protected area in this chapter, the following chapter analyses the effectiveness of the approach in delivering benefits to the local communities in ACA.

CHAPTER VI

THE EFFECTIVENESS OF COMMUNITY INVOLVEMENT IN DELIVERING BENEFITS TO THE COMMUNITIES

6.1 INTRODUCTION

The recent trend towards matching protection priorities more closely with human needs and aspirations is becoming increasingly accepted as an important element in protected area management strategies (Adams & Hulme 1998; Brandon & Wells 1992; Dudley et al. 1999a; IUCN 1998; Lehmkuhl et al. 1988; Mishra 1982a; Sherpa et al. 1986; Stolton & Dudley 1999; Wells & Brandon 1992). The main argument is that the 'fences and fines' approach can have adverse impacts on the living conditions of local communities (Adams & Hulme 1998). The lessons learned and experience gained in recent decades suggest that in the future, protected areas should be linked more effectively to a form of sustainable development that protects the aspirations and needs of local people. Consequently, local people are being accepted as `partners' in wider efforts towards sustainable management (Dudley et al. 1999a), which is generally termed as 'Community-based conservation'.

Community-based conservation aims to link biodiversity conservation with improvements in human welfare. The key feature of the approach involves developing a dependent relationship between biodiversity and local communities (Salafsky & Wollenberg 2000). It is often argued that if local communities are given opportunities to benefit directly from biodiversity, they will have an incentive to conserve biodiversity (Salafsky & Wollenberg 2000). Although local communities may receive tangible benefits in various ways such as revenue sharing, employment, natural resource use, support for community projects and capacity building (McNeely 1988; Wells 1996), it should be accepted that some groups within a community may benefits overall while others may lose out. It has been reported that community-based conservation has not often improved the standard of living of local communities (Wainwright & Wehrmeyer 1998).

Although community-based conservation has been the focus of increasing research effort, there has been little in-depth research on the benefits of the approach to local communities. Hence this Chapter is aimed at analysing the key elements that encourage local people to become involved in conservation and the costs and benefits of conservation to the local communities. The costs and benefits were based on structured interviews and a questionnaire survey with local communities and are thus based on more than strictly economic criteria. The Chapter also considered the level of devolution of power to local communities by analysing the present conservation area management regulations.

6.2 COSTS AND BENEFITS OF INVOLVEMENT IN CONSERVATION

Community-based conservation attempts to provide a means of harmonising the needs of local communities with those of ecosystems (Metcalfe 1994). The approach emphasizes the involvement of local communities in and around protected areas in the management of conservation resources (Adams & Hulme 1998; Wainwright & Wehrmeyer 1998). In contrast to conventional protected area management, the approach promotes economic and social development of local communities. However, studies have indicated that costs associated with conservation, such as damage of crops by wildlife, can have negative effects on local attitudes, whilst benefits such as game meat may have some positive effects (Gillingham & Lee 1999; Heinen 1993; Infield & Namara 2001; Ite 1996; Mehta & Kellert 1998; Nepal & Weber 1995b). A positive attitude has a strong influence on the mentality and motivation necessary for involvement of local people in conservation.

6.2.1 Rationale for involvement in conservation

Communities are involved in conservation because they receive support for social development or direct benefits from access to wild resources (Hackel 1998; Infield & Namara 2001; Mehta & Kellert 1998). The structured interviews indicated that the main *raisons d'être* given by the respondents in ACA for their involvement in conservation were sustainable use of wild resources (72%, n = 114), conservation education and awareness (65%, n = 114), integration of local needs (50%, n = 114) and infrastructure development (42.1%, n = 114). The reasons given for involvement in conservation were found to be similar among different groups such as man, women and occupational group. However, integration of local needs was considered important only by slightly more than a quarter of women respondents (29%, n = 24). Although the respondents outside ACA indicated a similar rationale for involvement in conservation, the comparison of the results between within ACA and outside using the χ^2- test showed significant differences (Table 6.1). Respondents outside ACA also reported that infrastructure development was not an incentive to them for involvement in conservation.

Table 6.1 Perceived rationale for involvement in conservation as indicated with community members within and outside ACA

Incentives	Inside ACA* (%) (n = 114)	Outside ACA* (%) (n = 85)	χ^2	P - Value
1. Sustainable use of resources	71.9	52.9	7.6	= 0.006
2. Community ownership	22.8	15.3	1.74	> 0.18
3. Local empowerment	14.9	2.4	8.89	= 0.003
4. Management authority	27.2	2.4	21.61	< 0.0001
5. Integration of local needs	50.0	25.9	11.83	= 0.001
6. Involvement of women	23.7	5.9	11.43	= 0.001
7. Conservation awareness	64.9	35.3	17.12	< 0.0001
8. Infrastructure development	42.1	0	47.16	< 0.0001
9. Tourism Income	14.9	1.2	11.16	= 0.001
10. Conservation Regulation	0.9	4.7	2.91	> 0.8

* The total in each column is more than 100% because it is a multiple answer question.
Source: Structured interviews

Devolution of management authority to the local communities (27.2, n = 114), involvement of women in conservation and development (23.7%, n = 114) and community ownership of resources (22.8%, n = 114) were also considered to be important elements of the ACA conservation programme for the communities to be involved in conservation. A significantly higher proportion of the respondents in ACA in compared to outside also considered income from tourism as an incentive to be involved in conservation ($\chi^2 = 11.16$, $P = 0.001$). However, the Conservation Area Management Regulation (CAMR) was not an incentive to the local communities of ACA for their involvement in conservation. A high proportion of respondents in ACA (72.8%, n = 114) were unfamiliar with CAMR.

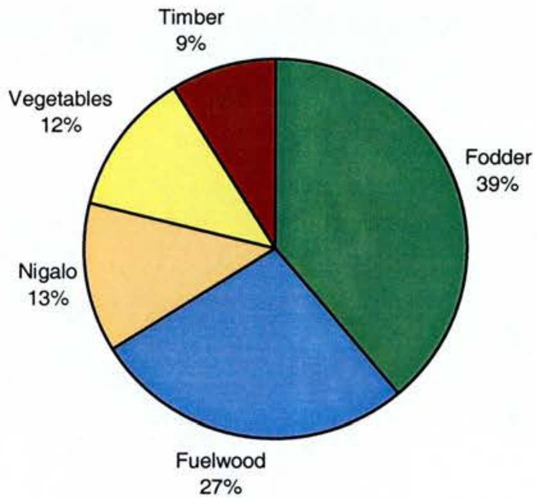
6.2.2 Benefits of conservation

Local communities deserve to have access to the resources required to meet their basic needs, economic safety and, where possible, social development (Ghimire & Pimbert 1997). The community-based conservation approach was built on this philosophy and gives substantial emphasis to enhancing existing livelihood opportunities. It is also assumed that local communities will be involved in conservation when benefits of conservation are perceived to exceed costs (Metcalfe 1994). An increase in fodder and fuelwood trees on private farms, regeneration of trees on degraded land, local institutional development, an increase in forest cover, easier availability of fodder and fuelwood in the forest, improved water resources, an increase in wildlife populations, infrastructure development, and improvements in health and sanitation were reported as the benefits of conservation by the PRA participants.

Access to resources

Fuelwood, fodder for livestock and timber for construction are basic subsistence needs of local communities in the Annapurna area, as elsewhere in the country (Hough & Sherpa 1989). In general, local communities in ACA were found to collect 39% of fodder, 27% fuelwood, 13% *'Nigalo'* (*Arudinaria* spp), 12% wild vegetables and 9% of timber annually out of total resources collected from forests (Figure 6.1). This indicates that fuelwood and fodder are the major resources harvested from a forest by the local communities.

Figure 6. 1 General pattern of annual resource uses from forests in the ACA villages as indicated by respondents in the PRA exercises



A majority of the respondents believed that access to major resources such as fuelwood and fodder has improved since involvement in ACAP. More than three quarters of the respondents in ACA (89.5%, n = 114) with compared to outside ACA (36.5%, n = 85) strongly agreed with the statement that they have easy access to fuelwood and fodder. Interesting, a majority of respondents among occupational group strongly agreed to the statement. Similarly, most of the respondents in ACA (98.2%, n = 114) also reported that they have easy access to different varieties of fodder and fuelwood tree seedlings from forest nurseries for plantation, compared to only 32.9% of the respondents outside

ACA (n = 85). These results indicate that improved access to fodder and fuelwood in forests has represented one of the successes of ACA compared to the area outside.

Social Services

Support for social services through improvement in infrastructures in the villages was one of the perceived benefits for involvement in conservation. The overwhelming majority of respondents in ACA (94%, n = 114) either strongly agreed or agreed with the statement regarding satisfaction of village development activities. More than three quarters of the respondents (78%, n = 114) in ACA reported that basic infrastructure such as drinking water, trails, bridges and health facilities had improved following the conservation intervention. No differences were found among different groups of people (man, women and occupational groups) within the ACA community regarding village infrastructure improvement.

Similarly, respondents outside ACA also reported that they have received support for infrastructure development through various government agencies and other sources (Table 6.2). χ^2 tests indicated that the ACA respondents perceived significantly more benefits compared to those outside ACA with respect to improvement of access to village ($\chi^2 = 14.3$, $P < 0.0001$); bridge improvement ($\chi^2 = 44.3$, $P < 0.0001$), village sanitation improvement ($\chi^2 = 28.11$, $P < 0.0001$); and electricity provision ($\chi^2 = 21.67$, $P < 0.0001$). However, no significant differences were found with respect to drinking water improvement ($\chi^2 = 0.53$, $P = 0.47$); health facilities ($\chi^2 = 0.44$, $P = 0.51$) and support for schools improvements ($\chi^2 = 2.20$, $P = 0.14$). The respondents outside ACA perceived significant support for irrigation facility improvements compared to within ACA. These results suggest that in general the local communities in ACA were receiving visible and recognised support for infrastructure development in villages. The results also indicate that further support for basic needs such as access roads, bridge improvements and electricity provisions is required outside ACA. However the survey also implies that villages outside ACA are not devoid of development benefits.

Table 6.2 Distribution of responses on support to infrastructure development within and outside ACA

Basic Infrastructure	Inside ACA (%) (n = 114)	Outside ACA (%) (n = 85)
1. Drinking water facilities	86.0	89.4
2. Bridge improvement	86.0	41.2
3. Village access improvement	91.2	70.6
4. Health facility	71.1	75.3
5. Support for school	87.7	80.0
6. Irrigation improvement	7.0	20.0
7. Support for electricity	80.7	49.4
8. Village sanitation improvement	99.1	75.3

Source: Structured interviews

A higher proportion of the respondents within ACA compared to outside also reported that they received support for various forms of technical training (χ^2 = 175.4, P < 0.0001), which provided them with economic opportunities as well as helping to develop their capacity in different fields such as tourism and agriculture. However, observation during the study and discussions with local people indicated that impact of training, particularly agriculture, was limited to improvement in subsistence agriculture.

Agriculture is the major economic activity in the area. More than half of the respondents (66.7%, n = 114) in ACA reported that they had received support for agricultural development such as training in sustainable farming, access to vegetable seeds and seedlings, and technical help establish a vegetable nursery. Only slightly more than a quarter of respondents outside ACA (36.5%, n = 85) reported the same. More respondents in ACA reported that they received support than respondents outside ACA (χ^2 = 17.86, P < 0.0001). Of the total respondents (n = 114) in ACA, 13.2% reported that they received improved varieties of cereal crop seeds and 38.6% received support for seasonal vegetable seeds and seedlings. Among women respondents, only 8% (n = 24) reported that they have received improved variety of cereal crop seeds. However, no difference was found among man, women and occupational groups regarding support available for seasonal vegetables seeds and seedlings. Training and study tours related to sustainable agricultural development were obtained by 16.7% of the total respondents in ACA. However, a majority of respondents from the occupational group reported that they have not received such opportunity (94%, n = 17). Of the total respondents in ACA (n = 114), 3.5% and 19.3% respectively reported that they received support for cash crop development and improved livestock management. These results suggest that support for agriculture and livestock development in ACA is apparent but not yet prominent, although these are the major economic activities in the area.

There were indications of a few other economic opportunities in the villages in ACA, which developed together with the conservation intervention. Of the total respondents in ACA (n = 114), 81.6% reported that the number of economic opportunities in villages has increased. In contrast, only 34.3% outside ACA (n = 85%) reported this. ACA has also provided direct employment opportunities. Among 242 ACA staff, almost half of them (49.6%) were local staff from the area. Income from tourism is another economic opportunity within ACA while it is less well supported outside ACA.

6.2.3 Costs of conservation

The cost and benefit analysis undertaken during the participatory research revealed that the major costs of conservation were an increase in crop damage by wildlife, a decrease in fodder grass species in forests, a decrease in wild mushroom availability in forest and a decrease in crop production as a result of shading by the on-farm plantations of trees.

Difficulties caused by conservation

More than a quarter of respondents (28.9% n = 114) in ACA reported that they encountered difficulties after the establishment of ACA. However, a χ^2 test revealed that this value was significantly lower compared to outside ACA (P = 0.005). Almost a half of the respondents outside ACA (48.2% n = 85) reported that they have encountered difficulties as a result of the Government's forest conservation programme. Among women respondents in ACA, less than a quarter reported difficulties after the conservation intervention (13%, n = 24). Restriction of forest utilization and a lack of grazing land were the main difficulties reported by the respondents outside ACA (Table 6.3). Notably, these two issues were also a main concern among a small proportion of the respondents from the occupational group within ACA (18% & 12%, n = 17).

Table 6.3 Potential difficulties experienced by local communities following introduction of conservation measures

Difficulties	Inside ACA (%) (n = 114)	Outside ACA (%) (n = 85)	χ^2	P - Value
1. Restriction of forest utilization	10.5	32.9	15.23	< 0.0001
2. Control of hunting	7.0	10.6	0.80	= 0.375
3. Lack of grazing land	3.5	27.1	23.03	< 0.0001
4. Restriction of commercial harvesting	3.5	4.7	0.18	= 0.671
5. Frequent intervention by conservation authorities	0.9	0	0.75	= 0.387
6. Decrease in forest-based small-scale industry	0.9	3.5	1.74	= 0.187
7. Crop damage and livestock depredation	15.8	12.9	0.317	= 0.573

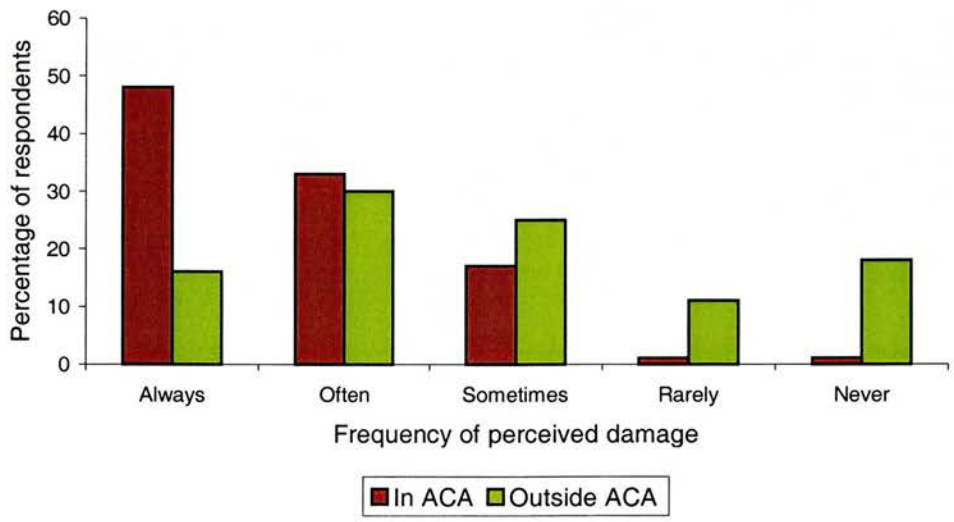
Source: Structured interviews

In comparison to outside ACA, these difficulties were perceived to be significantly less of a problem within ACA (P <0.0001). However, crop damage and livestock depredation were the main issues among the list of difficulties reported by the respondents of structured interviews in ACA (15.8%, n = 114). Surprisingly, in comparison with man and occupational group, the women respondents perceived these difficulties less of a problem.

Crop damage by wildlife

Crop damage by wildlife has been reported from the majority of protected areas in developing countries (Jackson undated; Madhusudan 2003; Maih et al. 2001; Naughton-Treves 1997; Rao et al. 2002a; Sekhar 1998; Weladji & Tchamba 2003). The questionnaire survey of wildlife damage to crops showed that the problem is a reality within ACA. A major proportion of respondents (84%, n = 89) reported that they were either experiencing problems of crop damage by wildlife such as monkeys, deer etc. permanently or frequently. Among them, slightly more than a quarter of respondents from the occupational group reported the problem of crop damage (27%, n = 22), while more than half of respondents of other ethnic group including Gurung reported the same. This indicates that the occupational group perceived crop damage less of a problem. There were no differences in responses among man and women from ACA respondents. Generally, perception on crop losses by wildlife varied considerably among study villages (Figure 6.3). However, respondents from villages with tourism within ACA have perceived higher crop losses. Crop damage outside ACA was relatively low and was reported by only 16% (n = 61). About a quarter of the respondents outside ACA (28% n = 61) reported that crop damage by wildlife was either rare or never experienced (Figure 6.2). The evidence suggests that crop damage by wildlife within ACA is prevalent and serious.

Figure 6.2 Frequency of perceived damage of crops by wildlife



Millet (*Sorghum* spp.), paddy rice (*Oryza sativa*), maize (*Zea mays*), and potato (*Solanum tubersum*) were the key crops damaged by wildlife, which are the main crops grown in ACA. Among the respondents in ACA, more than 97% (n = 89) reported that they cultivated maize and millet, and 51% (n = 89) cultivated potatoes. Of the total respondents (n = 89), almost three quarters (74%) reported loss of maize by wild animals. No differences were found among man, women and occupational group regarding loss of maize. Similarly, 38% and 42% (n = 89) of the respondents reported loss of rice and millet respectively by wildlife. However, only 18% of the occupational group respondents (n = 22) reported loss of rice by wildlife. Whereas, the same value was 31% (n = 54) for the male respondents and 48% (n = 35) for the women respondents. The proportion of losses of crops as a result of wild animals was found to be significantly higher within ACA as compared to outside. The estimates of crop damage were based on the difference between reported yield and possible yield in the absence of crop damage on individual plots as reported by the respondents (Studsrod & Wegge 1995). Generally, crop losses varied considerably from place to place. However, it was found that the mean loss of maize within ACA was 23.6 ± 3% loss of total production per household.

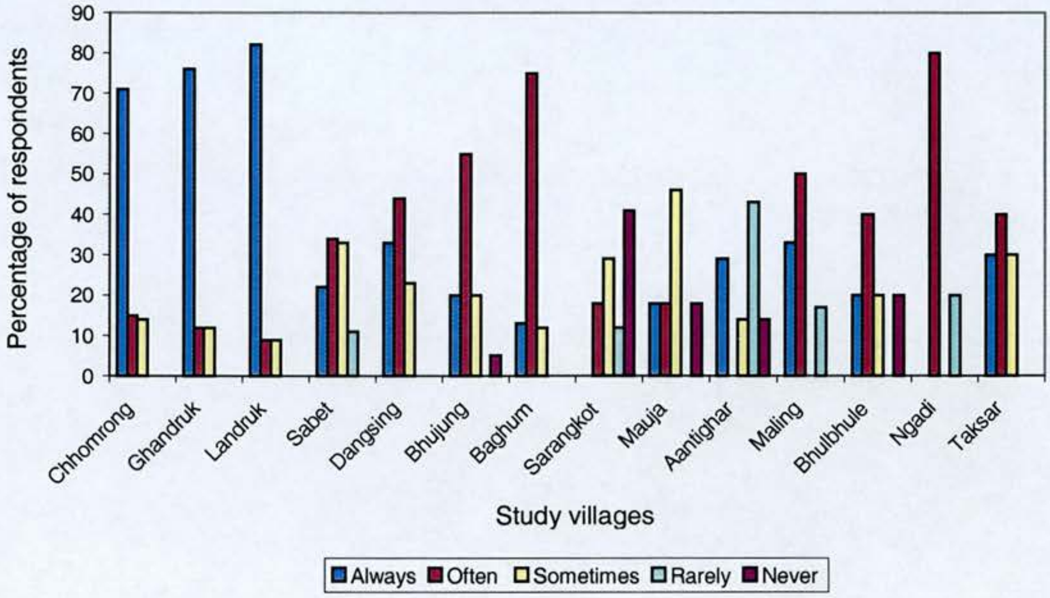
Table 6.4 Estimated mean (± SE) proportion of crop losses (loss per household as a percentage of total production)

Crops	Inside ACA	Outside ACA	Mann-Whitney U Test	P - Value
Rice	6.4 ± 1.4	2.7 ± 0.9	2523.0	0.39
Wheat	6.7 ± 2.1	4.6 ± 2.0	2564.0	0.33
Maize	23.6 ± 3.0	9.2 ± 1.6	1786.5	0.001
Millet	11.4 ± 2.0	2.9 ± 1.0	2001.0	0.001
Potatoes	6.2 ± 1.7	1.0 ± 1.0	2307.0	0.004

Source: A questionnaire survey

Similarly, average millet and potato losses within ACA were 11.4 ± 2.0% and 6.2 ± 1.7% loss of total production per household respectively (Table 6.4). However, it was reported in a study in India that crop damage actually observed in quadrat sampling was approximately 35% less than estimates based on a questionnaire survey (Sekhar 1998). The present evidence indicates that the annual loss of crops, particularly maize, is very high in ACA but respondents might have estimated higher than the actual annual loss.

Figure 6.3 Frequency of perceived damage of crops by wildlife in each study villages



The Rhesus macaque (87%, n = 89) and porcupine (72%, n = 89) were reported as the most damaging animal species by a majority of respondents within ACA. No differences were found among different groups of respondents (man, women and occupational group). These animals were reported to damage crops frequently; they are difficult to drive away and often damaged substantial quantities of crops. The barking deer (36%, n = 89) and Himalayan black bear (20%, n = 89) were other crop-damaging animal species reported by respondents. Rhesus macaque, porcupine and Himalayan black bear were reported as the main crop-damaging wildlife outside ACA. However, barking deer was not considered as a pest outside ACA (Table 6.5).

Figure 6.4 Estimated mean crop losses by each household in the study area based on a questionnaire survey

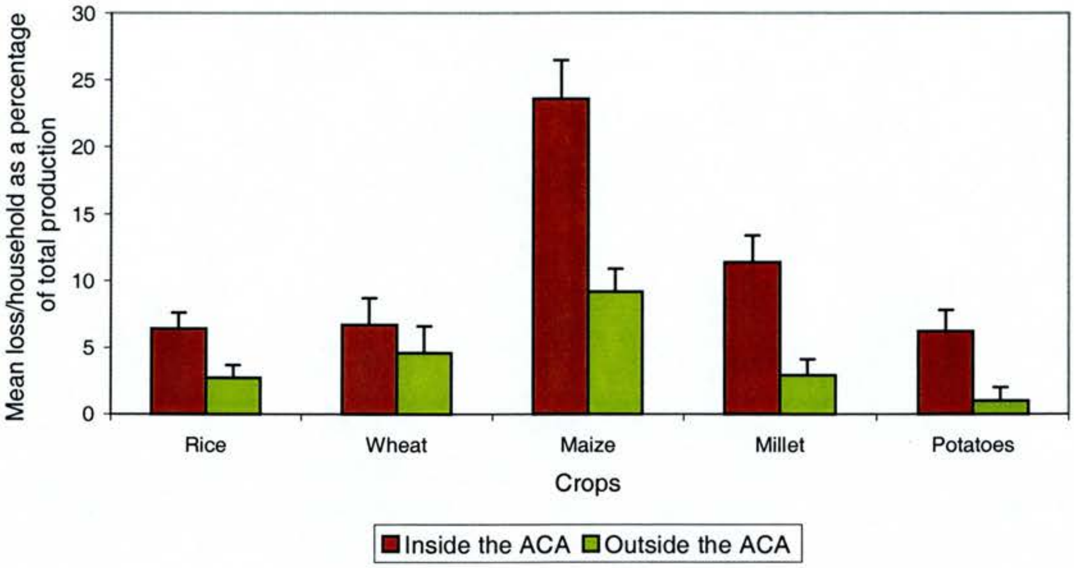


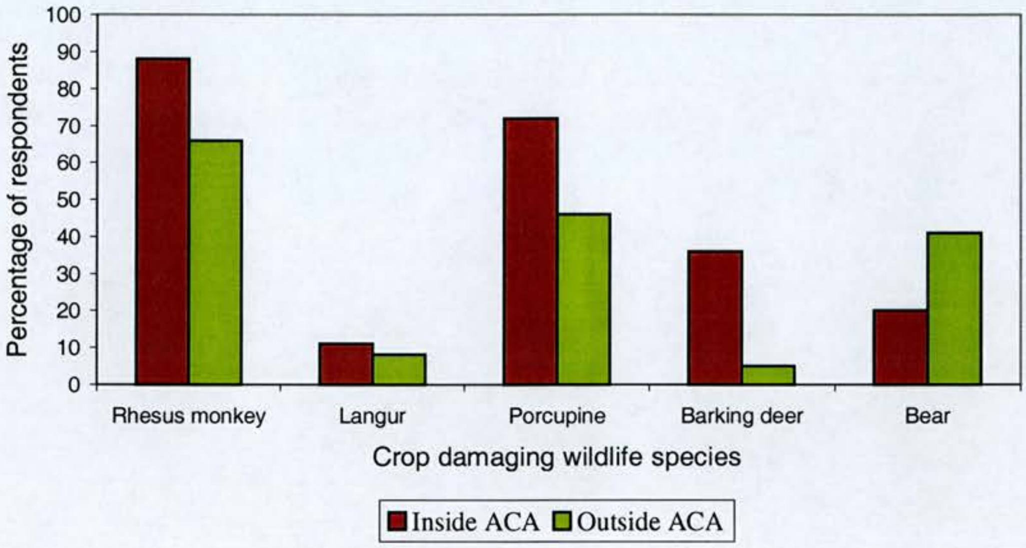
Table 6.5 Listing of major crop damaging wildlife species

Pest wildlife species	Scientific names	Inside ACA (%) (n = 89)	Outside ACA (%) (n = 61)
Rhesus monkey	*Macaca mulatta*	88	66
Common langur	*Semnopithecus entellus*	11	8
Porcupine	*Hystrix indica*	72	46
Barking deer	*Muntiacus muntjak*	36	5
Bear	*Ursus thibetanus*	20	41

Source: A questionnaire survey

Almost three quarters of the respondents (n = 89) within ACA either strongly agreed or agreed with the statement that pest wildlife species, especially the rhesus monkey and porcupine should be culled, while more than half of the total respondents (n = 61) outside ACA either strongly agreed or agreed with this statement. A Mann-Whitney U test showed that the proportion that agreed was significantly higher in ACA ($U = 1904.5$, $P = 0.001$). The results show that there is a clear perception of wildlife damage within ACA and that this view is substantiated by physical evidence of crop loss, forming a significant part of income. The situation is significantly worse within ACA than outside, and this is presumed to be as a result of conservation measures. The issue needs to be addressed promptly and probably with development of appropriate policies.

Figure 6.5 Respondent's ranking of the major crop damaging wildlife species as indicated in a questionnaire survey

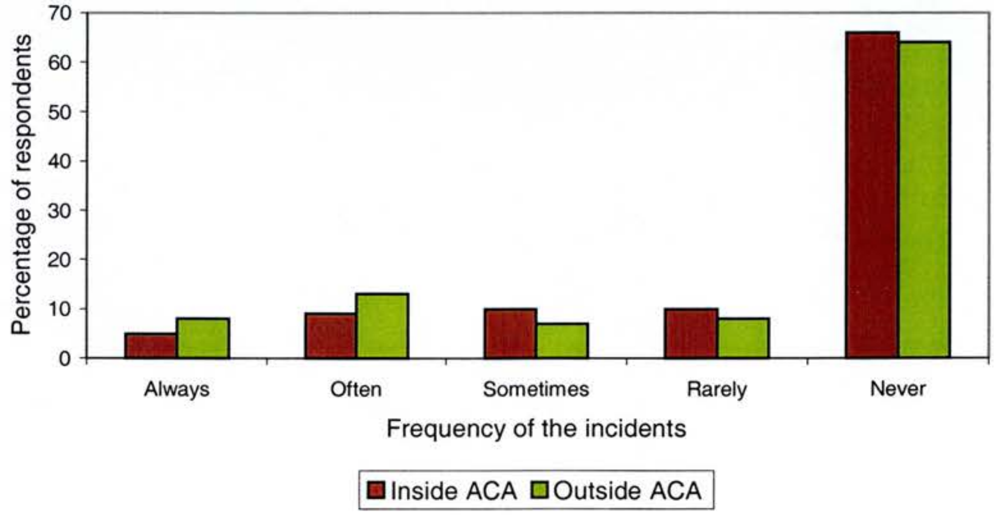


Livestock depredation by wildlife

Depredation of livestock by wild predators is an issue of great concern in many countries including those within the Himalayan region (Jackson undated; Mishra 1997; Weladji & Tchamba 2003). Evidence has shown that the problem of livestock depredation exists in ACA but was not serious as perceived by respondents. Of the total respondents within the conservation area (n = 89), 34% reported livestock depredation. Similar incidents were reported by 36% of the respondents outside ACA (n = 61). During discussions forming part of the PRA exercises within ACA, participants reflected that livestock depredation had decreased over the past two decades. Of the total respondents within ACA (n = 89), only 4.5% reported that they always had experienced problems of livestock depredation (Figure 6.6). None of the respondents from the occupational group in ACA reported the problem of livestock depredation. However, among all the respondents of the wildlife damage survey, women respondents perceived relatively higher proportion of the damage (9%, n = 35) in comparison to man (2%, n = 54).

The majority of respondents both inside (94.4%, n = 89) and outside ACA (97%, n = 61) indicated that they raised livestock. Buffaloes were the main animals in both within and outside ACA. The average livestock unit (LSU), which is calculated as a buffalo = 1.5 LSU; cattle = 1 LSU and goat and sheep = 0.20 LSU (Source: Sekhar 1998), was 6.5 ± 1.0 and 4.1 ± 0.42 LSU per household within and outside ACA respectively. There was no significant difference in livestock-holding such as buffaloes, cattle, sheep and goats per household between inside and outside ACA.

Figure 6.6 Frequency of livestock depredation by wild predators perceived by local communities as indicated in a questionnaire survey



Despite buffaloes being the main livestock in the study area, none of the respondents either within or outside ACA reported killings by wild animals in the past three years. However, respondents in both areas reported occasional killing of cattle, goats and sheep. The results suggest that although buffaloes are the main livestock in ACA, depredation of buffaloes by wild animals was not significant. More importantly the establishment of the conservation area has not impacted on wildlife-livestock conflict. The mean number cattle, goats and sheep killed by wild animals was found to be low both within and outside ACA (Table 6.6). A Mann-Whitney test indicated that there was no statistical difference in the number of livestock killed within and outside ACA ($p= 0.85$).

Table 6.6 Estimated livestock killing by wildlife over a three-year period (1999 – 2001)

Households	Inside ACA (n = 89)	Outside ACA (n = 61)
Average Livestock Unit (LSU)	6.5	4.1
Livestock killed		
Buffaloes	0	0
Cattle	9	2
Goats and sheep	30	24
Total kills	39	26
Total kill in LSU	15	6.8
Average LSU loss (mean ± SE)	0.16 ± 0.04	0.12 ± 0.04

Source: A questionnaire survey
Livestock Unit (LSU) is calculated as a buffalo = 1.5 LSU; cattle = 1 LSU and Goats and sheep = 0.20 LSU (Source: Sekhar 1998)

On average, a household within ACA lost total animals valued at the equivalent of £3.89 (Rs. 479.70) each year. Similarly, a household outside ACA lost the equivalent of £3.59 (Rs. 442.80) each year. These estimates are based on prices provided by the respondents and the ACA Natural Resources Conservation section (Buffalo = £130.88; Cow = £12.18; Ox = £64.89; Goat = £24.36 and Sheep = £28.45; and 1 pound = Rs. 123.20). The common forest leopard (*Panthera pardus*) is the only carnivore species held responsible for killing of livestock in the area. Livestock depredation by wildlife in ACA is negligible thus suggesting that the prey-predator balance in ACA has altered.

Reduction in crop yield due to tree-shade

Shade is considered the most important factor limiting crop yield in wet sites (Lawson et al. 1995). The local communities in ACA reported during the PRA exercises that crop yields decreased by a quarter in the farms adjacent to private or community woodlots.

But this was not a concern outside ACA because there are not such woodlots. It was also reported that the effects of tree-shade were more significant for small landholders. Often large landholding farmers changed their farms to private woodlots by planting trees, thereby creating mosaics of small farms situated close to woodland (Plate 6.1). The present research did not assess the impact of tree-shade on crop yield. However, it is recognised that investigation of the effects of tree-shade from private woodlots on crop yield should be undertaken to analyse conservation costs and benefits fully.

Plate 6. 1 Shade effects from a private woodlot established just next to a millet farm in ACA

6.2.4 Devolving management authority

The community-based protected area management approach in ACA is based on empowerment of the local communities and devolution of authority and responsibility over natural resources to the local communities. The Conservation Area Management Regulation (CAMR 2053) 1996, under the 1993 amendment of National Parks and Wildlife Conservation Act, provided a legal basis to involve the local communities in conservation. However, about three quarters of the respondents in ACA (72.8%, n = 114) were not aware of CAMR. This indicates that CAMR is not fully implemented in the area.

In general, community members have either not heard of or not read about CAMR thoroughly. Even among the CAMC members who were responsible for implementation of CAMR, 58.3% of the CAMC related respondents (n = 36) knew very little about the details of CAMR. Among the CAMC members (n = 36), only 36.1% reported that the CAMR is useful. The evidence suggests that the local communities in ACA are not aware of the importance and usefulness of the Conservation Area Management Regulation (CAMR). It can be argued based on this evidence that CAMC members are not yet capable of dealing with legal issues.

The results of assessing perceptions of CAMR showed that about three quarters of the respondents (73.6%, n = 114) were unaware of it. The mean scores of individual perception statements ranged from 2.63 to 3.78. On a 1-5 scale, a higher mean score indicates better perception. The mean single perception score was 3.19 indicating that most of the respondents, in general, either do not know or have no opinion of CAMR. The Cronbach's alpha was 0.97. The results indicate that awareness of the CAMR among the respondents within ACA is very low. Of the total respondents within ACA (n = 114), only 24.6% reported that CAMR is acceptable. Within different community groups in ACA, the majority of women (96.4%, n = 24) and occupational groups (94.1%, n = 17) were unaware of CAMR. However, slightly more than a quarter of CAMC (36.1%, n = 36), local leaders (31.3%, n = 32) and tourism groups (27.3%, n = 11) reported that the present CAMR is acceptable to them. The evidence suggests that the importance of regulation and of CAMR has not yet reached to different groups with a local community. It also indicates that awareness on CAMR is restricted within a few influential groups of people within ACA.

However, the Conservation Area Management Committees were reported to have authority and responsibilities regarding planning, decision-making and implementing conservation programmes in ACA by more than three quarters of the respondents (see Chapter V). A very high proportion of the respondents (91.2%, n =114) in ACA also reported that the ownership of forest lies with CAMCs. Although the results indicated that local communities were aware of rights and power of local institutions to utilise and manage natural resources in ACA, a majority of respondents of structured interviews including the CAMC members knew very little about CAMR. From this it can be argued that the rights and power devolved to local communities have not been effectively practised within ACA. Therefore, CAMCs actions need to be closely monitored and supported by capacity building training.

Table 6.7 Mean score results of perceptions of CAMR among local communities in ACA

Statements	Responses (%)					Mean	±
	SA	A	N	D	SD		SD
1. The CAMR is complementary to the local system	14	12	72.0	1.0	0	3.78	0.77
2. The CAMR is highly ambitious	1.8	3.5	78.1	7.0	9.6	2.80	0.72
3. The CAMR is people-centred	17.5	7.0	72.8	1.8	0.9	3.39	0.83
4. The CAMR has devolved power	17.5	7.9	71.9	1.8	0.9	3.39	0.82
5. The CAMR has centralised power	1.8	4.4	72.8	3.5	17.5	2.70	0.87
6. The CAMR is difficult to put in practice	0	4.4	72.8	4.4	18.4	2.63	0.83
7. The CAMR needs some amendments	3.5	7.9	76.9	2.6	9.6	2.93	0.80
8. The CAMR helped to develop the local institutions	19.3	6.1	71.9	2.6	0	3.42	0.83
9. The CAMR made conservation effective	18.4	6.2	72.8	2.6	0	3.40	0.82
10. The CAMR is accepted by the local communities	21.0	5.3	73.7	0	0	3.47	0.82

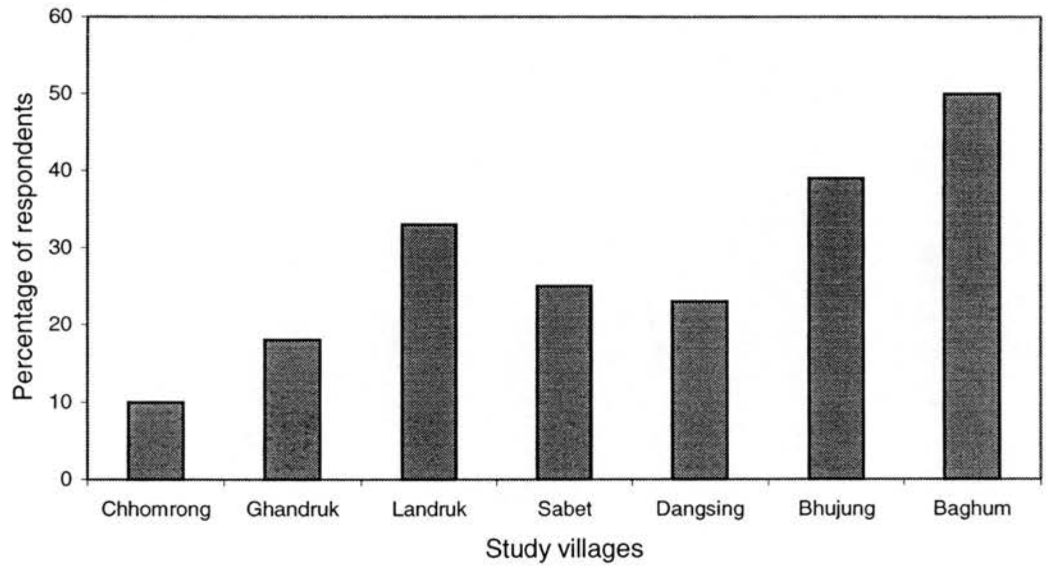
N = 114, SA, strongly agree; A, agree; N, no opinion and do not know; D, disagree, and SD, strongly disagree. Respondents assigned a score of 5 for SA, 4 for A, 3 for N, 2 for D, and 1 for SD. Source: Structured interviews

Table 6.8 Acceptability of CAMR to different community groups in ACA

Community groups	Responses in Percentage			Total respondents (n)
	Yes	No	Do not know	
CAMC	36.1	8.3	55.6	36
Local leaders	31.3	0	68.8	32
Tourism	27.3	0	72.7	11
Women	5.6	0	96.4	18
Occupational	5.9	0	94.1	17

Source: Structured interviews

Figure 6.7 Knowledge about the details of CAMR among the respondents in ACA based on structured interviews



6.3 Discussion

6.3.1 Rationale for involvement in conservation

Resource exploitation is governed by the perceived self-interest of various individuals and groups (McNeely 1988). It is often believed that the community-based conservation approach provides local communities with environmentally sound, economically sustainable alternatives to destructive land use (Kremen et al. 1994). Some studies have found that ecosystem services such as watershed protection alone do not provide adequate incentives for involvement in conservation (Kremen et al. 1994). Therefore, it is often useful to understand individual or group's reasons for changing their behaviour to become involved in and contribute to a conservation programme.

A majority of the respondents in ACA reported three principal reasons for their involvement in conservation. These were provision for sustainable subsistence use of plant resources from forests, an increase in conservation interest and awareness, and integration of local needs such as infrastructure development, provision of seedlings of fodder and fuelwood trees for plantation, village sanitation improvement and provision of alternative energy sources which has been made available alongside conservation. Infield and Namara (2001) reported that local people involved in communities-based conservation in Uganda were primarily interested in the development contributions rather than support for conservation or providing access to resources. In contrast, local communities in ACA have considered access to resources as a major incentive for them to become involved in conservation. The explanation could be that access to wild resources, particularly fuelwood and fodder, is very important to rural communities in ACA because the majority of them depend on them for their livelihood. This suggests that if local needs and concerns are appropriately taken into account, it provides an incentive to local communities to be involved in conservation.

Similarly, the respondents outside ACA reported that sustainable use of resources, an increase in awareness and integration of the local needs were considered as the main reasons for involvement in conservation, particularly of forests. The government's emphasis on forest management by local communities, which gives importance to a sustainable supply of forest produce for subsistence needs (Shrestha 1995) were reflected by these results. The major difference is that integration of local needs outside ACA focuses only on extractive use of resources such as timber, fuelwood and fodder. Discussions with the respondents outside ACA revealed that they realised the need for conservation of forests through various government programmes. It is also interesting to note that they were encouraged to become involved in conservation by learning from the community approach within ACA. Without any surprise, infrastructure development was not an incentive to involve in conservation outside ACA because such developments were generally not integrated with conservation.

Many communities, particularly in Africa, are involved in conservation of biodiversity because they receive direct economic benefit from wildlife management and utilisation (Gillingham & Lee 1999; Metcalfe 1994; Wainwright & Wehrmeyer 1998). It has been reported that the involvement of local communities is often based on support to social development or because they receive direct benefits from wildlife utilization (Infield & Namara 2001; Mehta & Kellert 1998). Hackel (1998) warned that if rural communities accept conservation management approaches because of their economic benefits, they may reject them at some point in the future if a better economic alternative is presented. But, the evidence shows that it is not the case in ACA. Local communities in ACA were involved in conservation primarily due to the autonomy given to local communities to use and manage of wild resources, particularly plant resources. However, a study in Tanzania has shown that access to wildlife-related benefits does not necessarily lead to establishment of mutually beneficial partnerships for wildlife conservation between local communities and the state (Gillingham & Lee 1999). This emphasizes that an increase in understanding and awareness of conservation issues among local communities together with substantial attention given to integration of local needs with conservation activities, are equally important in generating positive attitudes towards conservation.

Access to park resources remains a debatable issue (Infield & Namara 2001). However, work undertaken earlier indicated that park-people conflicts and disincentives for involvement of local communities in conservation, particularly in protected areas in Nepal, were result of denial of access to wild resources that local people need for their livelihoods (Mishra 1982a; Mishra 1982b; Nepal & Weber 1995b; Sharma & Wells 1996). Indeed, this was one of the reasons for the shift in global conservation policy from strict protection to community-based conservation. The present evidence suggests that access to wild resources required for the livelihoods of local communities has been given proper consideration in ACA.

The use of wild living resources remains an essential livelihood strategy for many people in developing countries with the potential to provide incentives for conservation (Hutton & Leader-Williams 2003). It has been argued that the future success of conservation in Nepal depends on the ability to provide local villagers with sufficient and varied resources to secure their livelihood (Studsrod & Wegge 1995). Therefore, sustainable subsistence use of wild resources as an incentive for community involvement in conservation is a positive indicator of success of the conservation programme. Article 11 of CBD also stresses adoption of economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biodiversity. However, the sustainable subsistence use concept has neither been clearly defined in the ACA Management Plan nor regularly monitored by the ACA authority. This leads to the point that there is ambiguity on sustainability of wild resources use in ACA. There is also a potential risk that unmonitored utilization of resources may result in unnoticed loss of some ecologically important species.

6.3.2 Benefits of conservation

Local communities support conservation initiatives when the latter generate a flow of direct benefits to them (McNeely 1995). The cost - benefit ratio of conserving a protected area must ultimately be positive for the local communities if the area is to prosper in the long term (McNeely 1995). The current evidence shows that local communities in ACA have received various direct and indirect benefits from the conservation initiative, which can be broadly categorised into consumptive use benefits, benefits from improved social services, and benefits from various economic opportunities. In general, most of the benefits received by local communities in ACA were non-monetary and for subsistence purposes.

Consumptive use benefits

Fuelwood, fodder, timber, wild vegetables and other non-timber forest products, particularly *nigalo* (*Arudinaria* sps.) are major consumptive uses of forests. Among these products, fuelwood and fodder are the most important resources for subsistence use to local communities in the study area. Consumptive uses are clearly of greatest importance to local communities in developing countries, where biological resources are most often collected and used (Blaikie & Jeanrenaud 1997). The communities in ACA considered that relatively un-bureaucratic and self-governing local management of the resources and rights for access to wild resources in forests such as fuelwood, fodder and timber were the major consumptive use benefits. The Conservation Area Management Regulation 2053 provides legal authority to manage and utilize the resources by local communities. Therefore, the imposition of the protected area regulations, in general, has not prohibited subsistence use of these resources. This is very different from other protected areas in Nepal where resource management and protection are carried directly by the government without much involvement of local community (Nepal 2002a) and where in reality local communities do not have a formal role, except in buffer zone, in most of the protected areas in Nepal (Sharma & Wells 1996). The present results also contrast with many communities living within or outside protected areas in Nepal and outside the country, where access to resources are either through illegal ways or only under strict license (Abbot & Mace 1999; Fortin & Gagnon 1999; Hough 1991a; Mishra 1982a; Sharma 1990; Straede & Helles 2000). Therefore, this is one of the major strengths of the conservation area, where it is directly contributing to local livelihoods.

The growing tendency of local communities to utilize larger proportions of fuelwood and fodder trees from private woodlots has also reduced pressure on forests and improved accessibility of these resources to local people without private woodlots within villages in ACA (see Chapter V). Although Kellert et al. (2000) outlined a highly uneven distribution of the benefits among different groups in a community, the conservation initiatives in ACA do seem to have improved benefit-sharing, particularly in wild resource allocation and use, among all groups in a community. However, the poorer households still do not have private woodlots, and therefore, it is generally the rich households that are able to take benefit of private woodlots development.

Plate 6.2 All groups of a community have equal access to wild resources in ACA for subsistence activities such as bamboo for weaving a bamboo basket

A similar situation was reported in the legal use of game meat in Tanzania (Holmern et al. 2002). A member of occupation group in Landruk village settlement mentioned during the structured interview: "*although we do not have private woodlots, we have equal access to fuelwood and fodder in forests. Therefore, we do not have problem of fuelwood and fodder*," indicating that inequity on resource allocation among different groups in a community was not an issue. However, many younger members of occupational groups, particularly from Ghandruk village strongly argued that they were not properly consulted and listened to by the ACA authorities.

Benefits from improved social services

Improvement in basic social services such as good sanitation and drinking water, primary healthcare and basic education improve human development outcomes and also help to reduce poverty by raising human capability levels (UNDP 2002b). Social development services with a strong system of local management are major visible and important benefit received by local communities within ACA. The present finding was broadly consistent with the finding of Mehta and Heinen (2001). Comparatively the majority of ACA villages have good sanitation, drinking water facilities, trails, bridge, primary healthcare, primary education both for children and adults, provision of electricity and most importantly a system of community management of these services. Improvement in village infrastructures in ACA was one of the main economic justifications of the conservation area. These facilities, therefore, have helped to improve the living standard of local communities of ACA.

The majority of village infrastructure development projects are either financed through the revenue from park entry fees or from the support of international donors. Similar infrastructural development benefits have been reported from other community-based projects (Infield & Namara 2001; Kangwana & Mako 2001; Metcalfe 1994; Pearl 1994; Wainwright & Wehrmeyer 1998). An overwhelming majority of respondents in the conservation area displayed satisfaction with social services development. The social services such as trail, school, bridges, health-post, water, electricity, which were either nonexistent or used to be seasonal before the conservation initiative, have been made available throughout the year. The official records of ACA also support these results (Kim & Karky 2001; KMTNC-ACAP 1997, 1999, 2001b). The results indicate that some of the key aspects of ACA objectives are being achieved. ACAP has insisted on community participation, in cash or labour, in these social development projects to avoid investing as 'gifts' (Feldmann 1994). This is based on the belief that when local community are interested enough in a venture to invest on it, they will have a greater interest in ensuring that the venture succeeds (Feldmann 1994). Community involvement in social services has been reported as not significant in the rest of Nepal (UNDP 2002b).

Plate 6.3 ACAP has insisted on community participation, in cash or labour, in social development projects to avoid investing as 'gifts'. Therefore, local communities participate in each and every village infrastructural development scheme.

On the other hand, certain infrastructure developments such as drinking water schemes, health facilities and school development were also reported to have been improved outside ACA. One of the explanations for the non-significance difference in responses regarding these development activities between inside and outside ACA could be the government's emphasis on the national development of drinking water, health and education sectors. The Nepal Human Development Report 2001 also indicated improvements in these sectors in the country (UNDP 2002b). Various donor agencies are also actively working on delivering these development programmes outside ACA. There is also an influence of ACA on some of the surrounding neighbouring villages. Some of the government and other agencies have prioritised infrastructural development only outside ACA.

Although the social services are better in comparison to villages outside, observations during the research found that some of the infrastructure in the villages is not yet adequate. The majority of the study villages do not have adequate health and educational facilities. Secondary school students travel long distances, to attend a secondary school, travel times ranging from 30 minutes to 3 hours per day. The academic standards of the schools have not improved, although there has been considerable improvement in physical infrastructure of schools. This is indicated by the low performance of the majority of schools of the area in the annual national school-leaving certificate (SLC) exam. One possible explanation for this low performance is that the government pays the teacher's salaries, which are generally not enough to attract qualified teachers in the area. On the other hand, relatively intelligent students who can afford to pay high tuition fees often study in private schools at city centres. This indicates an urgent need for coordination with the government agencies to upgrade the academic standards of schools within ACA.

Benefits from various economic opportunities

The major economic benefits received by local people of ACA at a community level were the investment of ACAP to improve social services, inputs on agriculture and livestock improvement, employment opportunities and through various trainings to develop economic opportunities. But, the majority of individual residents in ACA, except tourism entrepreneurs, have not been found to receive direct monetary benefits from conservation.

However, ACAP's annual investment in conservation and development, which is financed either through sharing of revenue from the entry fee or from the support of international donors, is one of the major economic benefits to local communities. KMTNC has been authorised by the government of Nepal to collect 'Conservation Area Entry Fee' in ACA. Unlike most national park entry fees or other fees from park such as safari hunting (Lewis & Alpert 1997; Metcalfe 1994), these fees do not to go to national government treasury but are retained by KMTNC for conservation projects in ACA. This sensible arrangement is unique to Nepal and little-known elsewhere (Sharma & Wells 1996). Over the last thirteen years (1989/90 to 2000/01), slightly more than £3.8 million (NRs. 471 million) revenue was collected from visitors and about £2.7 million (NRs. 330 million) was in the form of support from international donors. Of the total income during the period, £5.8 million was invested in conservation and development programmes such as schools building, health centre, drinking water, bridge, access improvement, village sanitation and including costs for establishing forest nurseries, community plantations, and local capacity building in the entire ACA. Similar types of investment have been not been reported from other protected areas in Nepal.

Support for agriculture and livestock development was another economic benefit received by local communities in ACA, which was significantly better compared to communities outside. However, the benefit was limited to subsistence use. Discussions with the local communities, particularly in the southwest ACA villages, suggest that they do not receive enough support in agriculture and livestock either from ACAP or from government agencies. Although agriculture and livestock farming are the major economic activities in the conservation area, it is clear that effective delivery of these benefits to local communities is still a weak aspect of the ACA programme.

ACA communities have opportunities to participate in training, which provides them with skills to organise economic activities. This result is supported by official reports. It has been reported that more than 8,000 local residents from the entire area of ACA were trained during 1986 to 2000 (KMTNC-ACAP 1997, 1999, 2001b). Of the total 314 training events, 41.4% was focused on economic activities such as fruit tree management, vegetable seed production, tea production, goat farming, acting as local guides, lodge management, cooking and baking (KMTNC-ACAP 1997, 1999, 2001b). It is not surprising that such a wide range of training was not observed outside ACA. The district profile prepared by the Kaski District, which includes Ghandruk, Chhomrong, Landruk villages indicated that, in general, the majority of the district-based development agencies do not accord priority to conducting local skill and capacity development training (Koirala 2001). The training in ACA has helped to develop a positive attitude towards conservation (Mehta & Heinen 2001) and to organise local communities to initiate various economic activities. The results also indicate that training related to agriculture should involve members from the occupational group.

It has been reported that with the exception of lodge operation and other tourism businesses, many community members have not yet been able to benefit financially from conservation (Nepal et al. 2002). However, evidence suggests that economic opportunities such as horticulture, poultry, bakery, and employment opportunities for skilled persons have been increased within the ACA villages. Nepal et al. (2002) reported that more than 1500 local people are employed by lodges alone in the southern slopes of the Annapurna area. Employment of the local communities within the ACA management was also found to be significant. Of the total 242 staff, 49.6% are locally hired (KMTNC-ACAP 2003b). In contrast, it has been reported that local employment has been entirely neglected in management of protected areas in China (Ghimire 1997). Despite efforts of ACAP, most of the economic activities in ACA were as yet limited to subsistence. Therefore, as argued elsewhere by Wainwright and Wehrmeyer (1998), it is unclear that the present employment opportunities in ACA are sufficient to induce the desired effect.

Various consumptive, social and economic benefits have a cumulative effect on attitudes of local communities of ACA. In contrast to the respondents outside ACA, attitudes towards conservation is found to be very positive (also see Chapter V). The respondents in ACA were well aware of benefits from the conservation. The majority of them were very positive on various benefits such as the institutional development, authority and responsibility of resource management, local system of governance, involvement of women, improvement in water sources, and increase in wildlife population. The VDC Chairperson, Lumle VDC comments: "*the most important support we received from*

ACA management is 'haushala' (inspiration) to work in conservation and development", indicating the important role played by ACA management in mobilisation and involvement of local communities. In contrast, local communities are not yet involved in conservation and protection strategies in many other countries (Fortin & Gagnon 1999; Sharma & Wells 1996). Therefore it can be concluded that although the local communities have not yet been found to receive direct monetary benefits from conservation, their livelihoods have improved with better access to resources, improved social services, enhanced conservation awareness and other economic opportunities.

6.3.3 Costs of conservation

Despite many important benefits of protected areas, local communities often have to bear the costs after an area is declared as a protected area (Ghimire & Pimbert 1997; McNeely 1995). The costs vary from country to country and often depend on the objectives. It has been well documented that establishment of protected areas in different countries has had a number of negative consequences to local communities (Hough 1988; Lusigi 1982; McNeely 1995; Mishra 1982a; Spergel 1997). The community-based conservation approach and all integrated conservation and development projects are designed to provide compensation or appropriate substitutions to reduce the need of local communities to exploit protected areas (Spergel 1997).

A surprisingly high proportion of the respondents within ACA reported that they have not encountered any major difficulty as a result of conservation, although crop damage by wildlife in ACA was found to be a significant problem. However, the result needs to be treated cautiously, as respondents may be reluctant to speak against the conservation programme. Nevertheless, a possible explanation could be that access to wild resources such as fuelwood and fodder, and tangible improvements in basic social services supplemented by conservation awareness outweigh any difficulties encountered. This suggests that if local communities perceive direct benefits from wild resources conservation, they are more likely to accept crop damage (Naughton-Treves 1997). On the other hand, a high proportion of respondents outside ACA reported that they were facing problems owing to restrictions on forest resource utilization and a lack of grazing land. Similarly, the concern raised by a small proportion of respondents from the occupational group in ACA regarding problems due to restriction of forest utilisation and a lack of grazing land need a proper consideration from the ACA authority.

Crop damage by wildlife

Although a majority of the respondents reported no difficulties resulting from conservation in ACA, crop damage by wildlife was yet found to be significantly high compared with outside. Recent studies have reported similar crop losses in protected areas elsewhere (Madhusudan 2003; Mehta & Heinen 2001; Miah et al. 2001; Naughton-Treves 1997; Rao et al. 2002a; Sekhar 1998; Studsrod & Wegge 1995). The results show that there is a clear perception of wildlife damage within ACA and that this view is substantiated by physical evidence of crop loss, forming a significant part of income. The situation is significantly worse within ACA than outside, presumably as a result of conservation measures.

The extent and intensity of crop damage may vary, depending on the cropping patterns (Rao et al. 2002a). The results indicate that on average a household in ACA loses about a quarter of the annual maize production due to wildlife damage where a fairly large proportion of households (18% of the total respondent households) were reported not even able to meet their food needs (Banskota & Sharma 1995b). Therefore, this is a substantial annual loss for local communities. It is important to highlight that the majority of local communities in ACA are at or below subsistence level (Gurung & DeCoursey 1994a). Discussions with the local communities indicated that the problem of crop damage has increased with conservation. Studies have shown that crop damage by wild animals, in general, is one of the main reasons for park-people conflict (Mishra 1982a; Osborn & Parker 2003; Sharma 1990; Weladji & Tchamba 2003). It is worth noting that despite the acute problem of crop damage in ACA, local communities have neither demanded compensation nor has CAMC recommended compensation. However, during discussions local communities reported that an application for permission to kill crop-damaging animals has been made by CAMCs to the ACA management. The explanation for not demanding compensation by local communities could be that the social services provided by the ACA management and the trust of local communities towards management might have discouraged speaking against current policy. This does not mean that local people were not concerned about the damage. Some questionnaire survey respondents expressed their frustration by criticising the ACA management for not giving proper attention on the issue. Therefore, it is reasonable to argue that crop damage could potentially be a major source of conflict between local communities and the ACA management in future, if proper consideration is not given immediately.

The results suggest that there is no significant difference in species responsible for crop damage in different villages. In contrast to reports from elsewhere (Sekhar 1998; Studsrod & Wegge 1995), there were only a few animal species responsible for crop damage. The Rhesus macaque and porcupine have been found to be the major problem animals in ACA. However, respondents in Ghandruk, Landruk and Chhomrong villages also reported barking deer as a problem animal. Discussions with local communities indicate that the problem from the Rhesus macaque and porcupine did exist before establishment of the conservation area. They also reported a traditional system of controlling these animals. Before wildlife hunting and killing was banned in the area, local communities used to drive away or kill some of these animals annually. Trapping and killing of a few rhesus macaques was reported to be enough to keep away other animals from farmlands for a year. Another explanation for increase in crop damage by these animals could be due to an increase in community woodlots nearby farmlands. These woodlots have provided cover for these species thereby increasing the crop damage incidents. In contrast, the problem was not found to be serious outside ACA. The result suggests that the wildlife human conflict, particularly crop damage by wildlife is not a recent problem in the area. However, the legal prohibitions on killing of crop damaging animals have increased the crop damage. A similar situation was reported from Kibale National Park, Uganda (Naughton-Treves 1997).

A high proportion of the respondents indicated that these crop-damaging animal species should be culled. This is not a surprising result and is a reflection of their concern over the present situation. Other recent studies have also shown a similar pattern of response from local communities (Mehta & Heinen 2001; see also Songorwa et al. 2000; Weladji & Tchamba 2003). The evidence suggests that crop damage have affected food security of the local communities, because staple food grains such as maize, millet and potatoes are the worst affected. Studies have shown that crop damage by wildlife is one of the reasons for a negative attitude among local communities towards conservation even though they receive benefits from conservation (Akama et al. 1995; Fiallo & Jacobson 1995; Heinen 1993; Newmark et al. 1993; Parry & Campbell 1992; Studsrod & Wegge 1995). Therefore, it is clear that the ACA management should address the preference of local communities in ACA for controlled killing of pest animals to minimize crop damage.

It is important to note that none of these animals are in the 2002 IUCN Red List of Threatened Species (IUCN 2002). According to 2002 IUCN Red List, Rhesus macaque is in the lower risk category and Himalayan Black bear is in the vulnerable category which means it is not critically endangered or endangered but it is facing risk of extinction in the wild in the medium-term future (IUCN 2002). Barking deer, leopard and porcupine are not in the IUCN endangered species list. However, present conservation regulations do not allow both CAMCs and ACA management to control wildlife and this is causing problems. According to the Conservation Area Management Guidelines, the ownership of wildlife remains with the government; hence permission from the government is generally required and can be obtained to control such problem animals.

Most of the conservation personnel working for the government and other agencies consulted during the research strongly agreed that pest animals should be controlled. Some of them were of the opinion that local communities in ACA are conserving in a very practical way, therefore, conservation should not jeopardise their livelihoods. One of the senior conservationists commented: "*ACA management is more conservative than local communities in this issue*", indicating that the ACA management has not addressed the issue effectively. Discussions with PRA participants suggest that occasionally porcupine, Rhesus macaque, barking deer and Himalayan black bear are killed illegally when there are severe threats from these animals. The primary reason for these illegal actions by local communities in ACA is the protection of farm productivity and not directs monetary or subsistence benefits from the wildlife. Similar actions by local communities have also been reported from protected areas in India (Rao et al. 2002a).

Livestock depredation by wildlife

Livestock losses within ACA and outside were not found to be significantly different. The incidence of livestock depredation in ACA was reported by less than a quarter of the respondents. Although it was reported that increase in wildlife has in turn led to livestock depredation in ACA (Banskota & Sharma 1995b), no evidence was found during the study to substantiate the report. In contrast, a study in Royal Bardia National Park reported that about half of the households lost livestock to predators each year (Studsrod & Wegge 1995). However, in the monetary term, losses of domestic animals per household per year is higher in ACA than as reported by Studsrod and Wegge (1995). In contrast, the monetary loss per household per year is comparatively lower than as reported by Sekhar (1998) in Sariska Tiger Reserve, India.

A majority of the PRA participants in ACA believed that an increase in the population of ungulates particularly barking deer has reduced livestock depredation. They mentioned that in the past local people use to hunt barking deer, therefore leopards used to kill livestock. One explanation for a decrease in livestock depredation in ACA, therefore, could be that the prey-predator balance in ACA has altered. However there are other potential reasons. Free grazing of domestic stock in forests has decreased considerably. As a result, competition between livestock and ungulates for grazing in the forest has been reduced. Evidence also suggests that there has also been a reduction in the number of small-bodied livestock such as goats and sheep thereby reducing the likelihood of depredation. Studsrod et al. (1995) and Sawarakar (1986) reported that leopards kill small sized animals such as goats and sheep. The common forest leopard is the only carnivore species held responsible for killing of livestock both in ACA and outside. It could be concluded that livestock depredation in ACA is insignificant, probably because of increase in ungulate population and decrease in number of small-bodied livestock.

In contrast, it has been reported from other protected areas that an increase in livestock population densities has also increased conflict with wildlife (Sekhar 1998). Parry et al. (1992) reported that 59% of the households with livestock in Botswana complained of livestock losses during a year. The present evidence also does not support the statement that conflict with rural communities in ACA as a result of livestock depredation by large carnivores has increased in the recent years (Jackson et al. 1996).

6.3.4 Devolvement of management authority

One of the assumptions examined by the research is that the present rules and regulations provide a good framework for the involvement of local communities in the planning and management of ACA. The ACA Operational Plan prepared in 1986 explicitly mentioned that Conservation Area Regulations should delegate authority to the Panchayat Nature Conservation Committee (equivalent to the present Conservation Area Management Committee) to manage their own resources which should include the authority to apprehend offenders, apply fines, enforce regulations, distribute income, etc. as per the Committee's policy proposal (Sherpa et al. 1986).

The Conservation Area Management Regulation 2053 (CAMR1996) and the Conservation Area Management Guidelines 2056 (CAMG 1999) published by the government under rights provided by the National Parks and Wildlife Conservation Act, 2029 (1972) devolved management authority to local communities of ACA (KMTNC 1996, also see Appendix 3.5). Approval of these two important documents suggests that the government is committed to devolve ownership rights and control to ACA communities. This contrasts with other community-based conservation where there is a lack of policies at national level to involve communities in conservation (Feldmann 1994). CAMR and CAMG have emphasized delegation of management authorities to the local communities by entitling the Conservation Area Management Committee (CAMC) as a main local institution. CAMR also authorised CAMCs to constitute sub-committees to conduct conservation and development work systematically (KMTNC 1996). These documents also outline the functions, duties and authorities of CAMCs and sub-committees. CAMR supplemented by CAMG also provides authority and responsibility to manage funds by the CAMCs, which are earned from user fees for grazing and forest product utilisation (KMTNC 1996, 1999).

Evidence supports that present rules and regulations have enabled the involvement of local communities in the planning and management of ACA. Devolution of authority and responsibility for the management of natural resources to local communities through CAMR and CAMG could be considered as a major shift in conservation policy in Nepal. Although there are many examples of community-based conservation, such policies and laws to legitimise community involvement in conservation through ground level local institutions are generally rare elsewhere in the world (see also Metcalfe 1994; Murphree 1994; Songorwa et al. 2000).

However, the key challenge to ACA management and local communities is to implement the regulations properly on the ground. As indicated earlier, the results of this study suggest that almost three quarters of the respondents were not aware of CAMR. Surprisingly, more than half of CAMC related respondents were also unaware of CAMR and therefore, they did not have any knowledge of the usefulness of CAMR. Even those who reported knowledge of CAMR were found to be neutral on various statements regarding CAMR (Table 6.7). This suggests that although CAMR focuses on community involvement, it has not yet reached out to the community level successfully. It was found that there is a clear lack of awareness regarding CAMR. The evidence also raises a question regarding the capability and interest of CAMCs in handling legal issues.

6.5 CONCLUSION

The community-based protected area management approach implemented in ACA has certainly delivered benefits to local communities. The approach has empowered them with respect to sustainable use of resources, while at the same time it has helped to improve basic social services in villages, by directly involving them in project planning, decision-making, implementation and monitoring. There was no significant difference in responses among different groups such as man, women and occupational group. However, the evidence demonstrates that there is a possibility of increasing these benefits and reducing costs to the communities. This might require further active management of the area. The principal reasons given for the involvement in conservation suggest that the integration of different components such as sustainable use of resources, conservation awareness and local needs was invaluable. The degree of integration of different components may vary from one area to another. Therefore, careful integration with self-adjustments to the changing local and national political, economic and environmental forces is essential.

The costs and benefits of the community-based protected area management implemented in ACA are complicated to assess. The level of costs and benefits varied slightly among different groups (stakeholders) within a community. The results suggest that cumulative benefits from conservation at a community level are high. Local communities have received a wide range of benefits such as consumptive use benefits, benefits from social services and benefits from various economic opportunities. It can be argued that a decrease in livestock depredation is one of the important economic benefits of the conservation. However, the single most important cost due to conservation, which is crop damage by wildlife at the individual household level, is found to be critical. The negative results, from the point of view of local communities, indicate that the management policy will need reviewing or modifying. Therefore, one possible solution is to give more authority and responsibility to local community for their crop protection.

The present conservation policies and regulations give ample opportunities for involving local communities in conservation. The present conservation regulations have provided essential responsibilities and authority to local communities for the implementation of the community-based protected area management approach. However, this was found to be not as effective as was anticipated, as sufficient attention was not given to building capacity to handle legal issues. This emphasizes a need for increased investment in capacity building of local communities, particularly CAMC members.

This chapter has demonstrated the level of effectiveness of community involvement in conservation in delivering benefits to the local communities in ACA. The discussion has shown that tourism is one of the important elements in ACA. The following chapter assesses the impacts of tourism in ACA.

CHAPTER VII

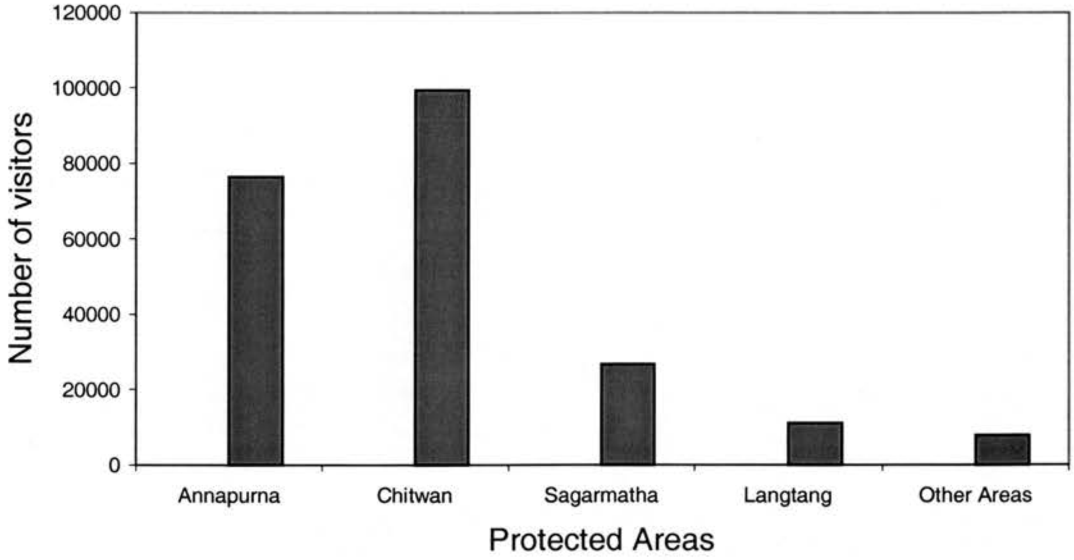
TOURISM IN THE ANNAPURNA CONSERVATION AREA: AN OPPORTUNITY OR A THREAT TO CONSERVATION?

7.1 INTRODUCTION

Tourism has emerged as the fastest growing industry worldwide and has remained at the forefront of global economic growth (Campbell 1999; Sharma 2000). National parks and other protected areas have a well-established connection with tourism (Boyd 2000). For example, parks in Costa Rica have played a very important role in development of tourism (Aylward et al. 1996). Tourists visit parks and protected areas because such areas can provide experiences that cannot be encountered elsewhere (Eagles & McCool 2002).

Tourism has rapidly become one of Nepal's most important development sectors as well as until recently the country's largest and most reliable source of foreign exchange earnings (Wells 1994a). The importance of tourism in Nepal is underlined by the fact that tourism earnings comprised 3.8 per cent of the GDP of Nepal in 1996 and accounted for 18 per cent of total foreign exchange earned (Sharma 2000). As elsewhere in the world, protected areas have played a significant role in driving Nepal's tourism industry (Nepal 2000b). National parks and protected areas such as the Royal Chitwan National Park, the Sagarmatha National Park, and the Annapurna Conservation Area are the main tourist destinations outside the Kathmandu Valley in Nepal (Figure 7.1) (Nepal 2000b; Wells 1994a; Williams et al. 2001).

Figure 7.1 Number of foreign visitors to different protected areas of Nepal in year 2000. It is evident that ACA has the second highest visitors number.
Source: DNPWC (2001) and KMTNC-ACAP (2003a)



Tourism in protected areas is considered to provide significant opportunities for economic advancement (Eagles & McCool 2002). Tourist expenditure on routes to the park and in communities adjacent to or within the area may be significant, leading to increased income, alleviation of poverty and opportunities for vertical advancement in the tourism business (Eagles & McCool 2002). Tourism also assists in protecting the resources on which it is based through generation of revenue for park management agencies (Eagles & McCool 2002). This can often provide a powerful economic justification for conserving biological resources, particularly in protected areas (McNeely 1988). However, there are other roles that tourism plays which are often overshadowed by its obvious economic role (Eagles & McCool 2002). These include social and environmental impacts; some considered negative, other positive and some neutral (Eagles & McCool 2002). It is acknowledged that tourism is always likely to be associated with some negative impacts (Nepal 2000a). A balanced interaction between tourism, parks and local communities or between biophysical resources and people is expected to provide mutual benefits for all (Nepal 2000a). It is also considered important for strengthening the conservation capacity of the park authority and, at the same time, influencing local attitudes toward conservation (Mehta & Heinen 2001; Nepal 2000a). Local communities in and around the mountain parks of Nepal such as the Sagarmatha National Park and the Annapurna Conservation Area have received substantial income and employment benefits from tourism (Nepal et al. 2002; Wells 1994a).

However, benefits from tourism do not always result in increased conservation support from local communities (Walpole & Goodwin 2001). If residents have had negative experiences of park formation and management, then, despite gaining benefits from tourism, they may still have negative attitudes towards the park (Walpole & Goodwin 2001). However, in some cases local communities that benefited economically from tourism have been found to be more positive about tourism than those without such benefits (Mehta & Kellert 1998; Walpole & Goodwin 2001). Studies have also shown that tourism has degraded trails and recreational areas threatening the resources upon which this type of tourism depends (Farrell & Marion 2001; Nepal et al. 2002). Farrell et al. (2001) reported that tourism development in protected areas has an impact on wildlife, which includes feeding and other disturbances to animals. Increased pressure on forest resources for fuelwood has been reported, particularly from the Sagarmatha National park, Nepal as a result of tourism (Nepal et al. 2002; Rogers & Aitchison 1998).

The focus of this chapter is to address the contribution of tourism within the context of the Annapurna Conservation Area, which is one of the most famous tourist destinations in Nepal. ACA is well known for different forms of tourism such as adventure, nature based and ecotourism. Tourism development and management in ACA has been considered as a good example of ecotourism (Williams et al. 2001). For example, it was the winner of the British Airways Tourism for Tomorrow global award in 1991. The key hypothesis is that tourism has a net positive impact on the ecology and socio-economy of protected areas. This hypothesis was tested using both biophysical and social science research information. The availability within ACA of having areas both with and without tourism was used to analyse the overall impact of tourism in conservation. In addition, this chapter compares the attitudes of local communities with and without tourism towards conservation.

The chapter firstly considers biophysical situation in villages affected by tourism and those lying outside direct contact within ACA. It then examines socio-economic effects of tourism, again contrasting the tourist villages with non-tourist villages.

7.2 BIOPHYSICAL IMPACT OF TOURISM IN THE CONSERVATION AREA

All forms of tourism can produce negative impacts on the natural environment (Buckley 2001). Ecotourism, which is generally considered as compatible with biodiversity conservation, can also cause degradation of natural areas if unregulated (Davenport et al. 2002). The impact of tourism on the natural environment depends on the nature of the ecosystem as well as the human activity concerned (Buckley 2001), as well as the availability of facilities and the policies and regulations of the park and the nation (Davenport et al. 2002). These impacts may include: crushing or clearance of vegetation; soil modifications; introduction of weeds and pathogens; water pollution; visual impacts and disturbance to wildlife. The present research has focused on the impacts of tourism on forest resources and wildlife populations. The environmental conditions and the level of anthropogenic disturbance in forests were measured by assessing a few key variables such as tree density, basal area, species diversity, presence of regeneration and density of cut-stumps. The sampling design and research methodology are described in the Chapter 4. The forest survey was carried out in 25 forest stands within 3 villages with tourism and 2 villages without tourism.

The mean tree density of the trees $\geq$ 10 cm dbh in areas with tourism was 1814 $\pm$ 325 trees ha^{-1}. In areas without tourism, the value recorded was 1864 $\pm$ 432 trees ha^{-1} (Table 7.1 and Fig 7.1). A two-sample t-test of the log transformed tree density showed no significant difference ($P > 0.87$) between areas with and without tourism. The mean basal area ($\pm$ SE) for areas with tourism was 124.5 $\pm$ 21 m^2ha^{-1} whereas the value in areas without tourism was 93.7 $\pm$ 18 m^2ha^{-1} (Fig 7.2). A Mann-Whitney test showed no statistical differences between areas with and without tourism. Similarly, the mean Shannon index of diversity ($\pm$ SE) was 1.28 $\pm$ 0.13 for areas with tourism and 1.26 $\pm$ 0.13 in areas without tourism. A Mann-Whitney U-test indicated that there were no statistical differences between the medians of species diversity index. Mann-Whitney U-tests showed that there were no statistical differences in seedling ($P > 0.72$) and sapling ($P = 0.60$) densities in areas with and without tourism (Table 7.1). The evidence suggests that there is no difference in forest structure in terms of density, basal area, species diversity and regenerations of tree species between areas with and without tourism in ACA. Therefore, it can be argued that tourism, at present, does not have an impact on the structure of forests in ACA. However, a higher density and lower basal area of trees in the Ghandruk village settlement (figs 7.1 and 7.2) suggest that these are new growth trees. The Ghandruk village settlement, which is assumed to be an area of highest potential impact of tourism within ACA, has been in a process of recovery from initial forest loss that may have been caused by tourism development.

Table 7.1 Mean density, basal area and species diversity of all the trees $\geq$ 10 cm dbh and sapling densities, seedling densities and cut-stumps in twenty-five forest plots within ACA in villages with and without tourism

	With tourism	Without tourism
Density (trees ha^{-1})	1814 $\pm$ 325	1864 $\pm$ 432
Basal area (m^2 ha^{-1})	124.5 $\pm$ 21	93.7 $\pm$ 18
Shannon-Weiner Index	1.28 $\pm$ 0.13	1.26 $\pm$ 0.13
Sapling density (plants ha^{-1})	5053 $\pm$ 1298	6374 $\pm$ 3063
Seedling density (plants ha^{-1})	19890 $\pm$ 4300	17447 $\pm$ 6384
Cut-stumps (stumps ha^{-1})	905 $\pm$ 237	316 $\pm$ 60

Figure 7.2 Distribution of mean tree density per hectare within forests of different villages with and without tourism in ACA

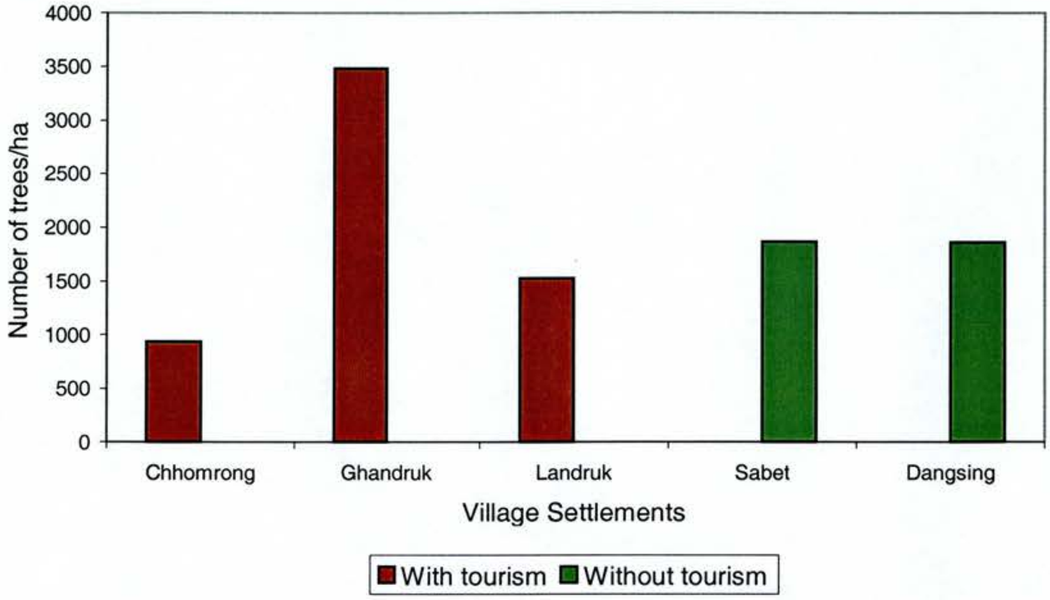
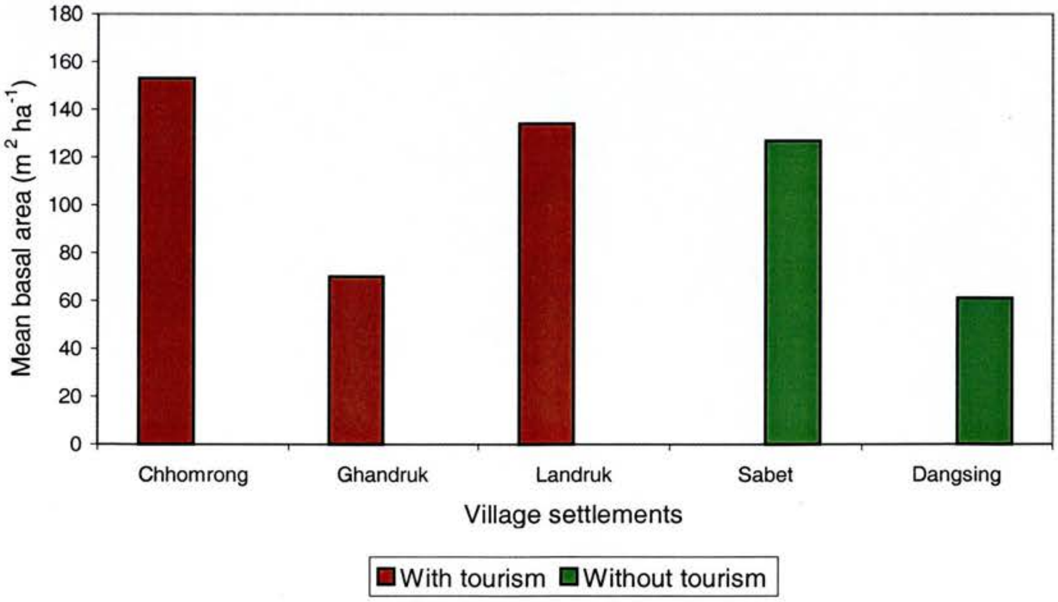
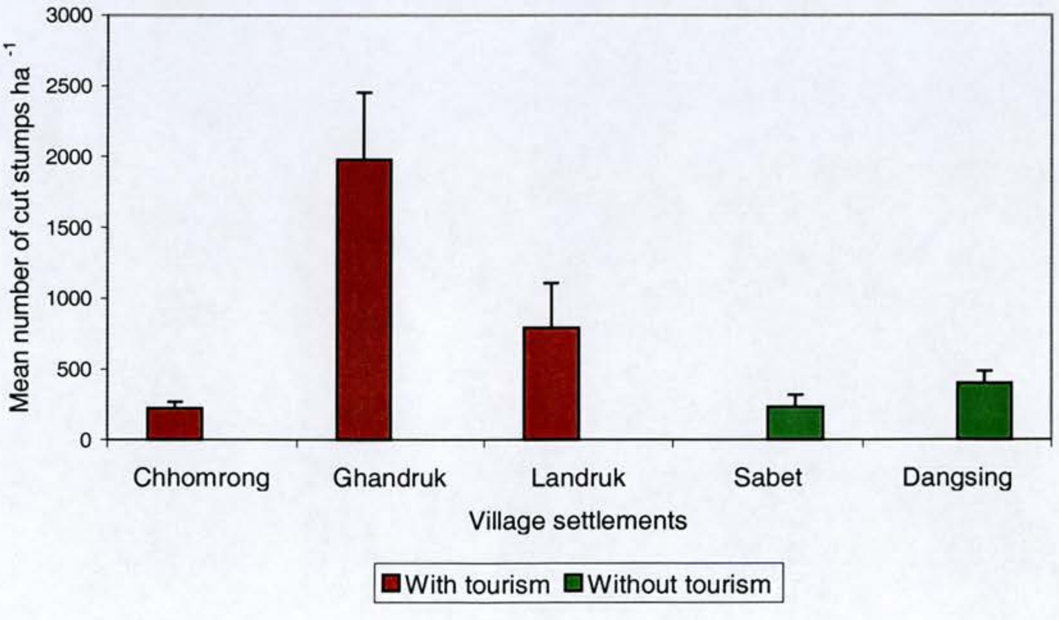


Figure 7.3 Distribution of mean basal area ($m^2\ ha^{-1}$) of trees within forests of different villages with and without tourism in ACA



Disturbance to forests as a result of the human activity was measured by using variables such as cut stumps, livestock dung and grazing livestock. Mann-Whitney tests of these variables indicated that there were no statistical differences between areas with and without tourism in ACA (cut stumps $P > 0.44$, livestock dung $P = 1$ and grazing livestock $P > 0.54$). The mean number of cut stumps of trees ($\pm$ SE) was 905 ± 237 trees ha^{-1} in areas with tourism whereas the value was 316 ± 60 trees ha^{-1} in areas without tourism in ACA (Fig 7.2). Similarly, grazing domestic animals and presence of dung in areas with tourism were 71 ± 65 animals ha^{-1} and 134 ± 56 dung counts ha^{-1} respectively. The same values in areas without tourism were 85 ± 55 animals ha^{-1} and 113 ± 73 dung counts ha^{-1} respectively. The results indicate that there is no statistical difference in the degree of anthropogenic impacts between areas with and without tourism in ACA. For this reason, I suggest that anthropogenic impacts to forests do not accelerate with tourism, if the conservation policies and regulations of a park properly address the issues.

Figure 7.4 Distribution of mean number of cut-stumps (ha^{-1}) of trees within forests of different villages with and without tourism in ACA



Changes in wildlife populations, as mentioned earlier (Chapter V), were mainly estimated through the social surveys. A participatory wildlife matrix scoring method indicated an increasing trend of wildlife population size in both areas with and without tourism. An overwhelming majority of respondents of structured interviews in villages with (80%, n = 55) and without (80%, n = 59) tourism reported that the wildlife populations have increased in ACA over a decade. More than three quarters of respondents of a questionnaire survey in both villages with (91%, n = 43) and without tourism (76%, n = 46) strongly agreed with the statement that wildlife hunting is minimal at present. An overwhelming majority of respondents (98%, n = 46) in villages without tourism strongly disagreed with the statement that villagers still do hunting. The same value in villages with tourism was 67% (n = 43). However, wildlife sightings and pellet group counts during the forest survey were higher in forest areas with tourism than without. Wildlife was sighted on four different occasions in areas with tourism whereas wildlife was sighted only two times in areas without tourism. Similarly, mean pellets counted during forest surveys in 17 sites with tourism were 2.0 ± 1.0 pellet groups. The mean pellets counted in 8 sites without tourism were 0.5 ± 0.4 pellets groups. The evidence indicates that wildlife populations are found to be higher in villages with tourism than villages without tourism. However, the results also suggest that compared to the areas without tourism, the hunting pressure is higher in areas with tourism.

Increase in the problem of waste disposal was also brought up during PRA exercises. Most of the participants in PRA exercises mentioned that solid waste such as beer bottles, cans, and plastic bottles has become a major solid waste problem in villages with tourism. However, they also mentioned that the Tourism Management Committees are active in managing this solid waste with the help of ACA management. ACA has been found to be supporting the Tourism Management Committee by helping them to construct rubbish pits, local incinerators and recyclable waste collection centres. The evidence indicates that tourism at present does not exhibit any significant negative impacts on forest resources and wildlife populations in ACA. These results suggest that tourism management and other conservation actions in ACA have prevented the negative tourism impacts.

7.3 SOCIAL IMPACT OF TOURISM IN THE CONSERVATION AREA

The social data for the research was mainly collected through structured interviews and a questionnaire survey. The result shows that an overwhelming majority of respondents in both villages with (100%, n = 55) and without (97%, n = 59) tourism reported that they were involved in conservation activities. The main reasons given for their involvement in conservation were rights given to local community for sustainable use of wild resources; an increase in their conservation awareness; because of integration of their basic local needs with conservation and support for village infrastructures development (Table 7.2).

Table 7.2 Perceptions of respondents for involvement in conservation in villages with and without tourism in ACA

Incentives	With tourism* (%) (n = 55)	Without tourism* (%) (n = 59)
1. Sustainable use of resources	76	68
2. Community ownership	33	14
3. Local empowerment	26	5
4. Management authority	47	12
5. Integration of local needs	55	46
6. Involvement of women	33	15
7. Conservation awareness	64	66
8. Infrastructure development	47	37
9. Tourism income	15	14

- The total in each column is more than 100% because it is a multiple answer question.
- Data source: Structured interviews

However, a higher proportion of respondents from villages with tourism also reported that community ownership, local empowerment and management authority further contributed to their involvement in conservation (Table 7.2). Surprisingly, a small but equal proportion of respondents from both categories of village considered income from tourism as an incentive, indicating that income from tourism has not been perceived as the principal factor for their involvement in conservation. The results indicate that there are no major differences in the perceived incentives to be involved in conservation between these categories of village. However, evidence shows that institutional development aspects, such as ownership and authority, are not yet considered as incentives for conservation in villages without tourism. It can be argued that institutional development has not been accomplished in villages without tourism.

7.3.1 Attitudes towards conservation and development

A majority of respondents in both categories of village held a positive attitude towards conservation and development efforts taking place in their villages (Table 7.3 and 7.4). About 31% of the respondents in villages having tourism strongly agreed with the statement that the present conservation initiative in their villages is successful (Table 7.3). In contrast, the same statement was strongly agreed by 61% respondents in settlements without tourism (Table 7.4). A Mann-Whitney U test showed that the residents in villages without tourism have a significantly better attitude towards conservation activities than residents with tourism ($P = 0.001$).

Table 7.3 Attitudes of residents towards overall conservation and development in villages with tourism

Attitude Statements	Responses (%)					Mean	± SD
	SA	A	N	D	SD		
1. I regard the present conservation initiative in my village as successful.	31	64	5	0	0	4.3	0.53
2. I am very satisfied with the present village development activities.	31	60	2	7	0	4.1	0.78

n = 55, SA, strongly agree; A, agree; N, neutral; D, disagree and SD, strongly disagree. Respondents assigned a score of 5 for SA, 4 for A, 3 for N, 2 for D, and 1 for SD. Data source: Structured interviews

However, the Mann-Whitney U test showed no significant difference in residents' attitude towards development activities ($P > 0.12$). Respondents from both categories of village reported that greenery in the village has increased, wildlife populations have increased, village sanitation has improved and village infrastructures have developed with the conservation intervention. This difference in result suggests that tourism does not significantly contribute to develop positive attitudes towards conservation.

Table 7.4 Attitudes of residents towards overall conservation and development in villages without tourism

Attitude statements	Responses (%)					Mean	± SD
	SA	A	N	D	SD		
1. I regard the present conservation initiative in my village as successful.	61	39	0	0	0	4.6	0.49
2. I am very satisfied with the present village development activities.	42	54	2	2	0	4.4	0.61

n = 59, SA, strongly agree; A, agree; N, neutral; D, disagree and SD, strongly disagree. Respondents assigned a score of 5 for SA, 4 for A, 3 for N, 2 for D, and 1 for SD. Source: Structured interviews

Table 7.5 Perceived improvement in infrastructure development by community members in villages with and without tourism

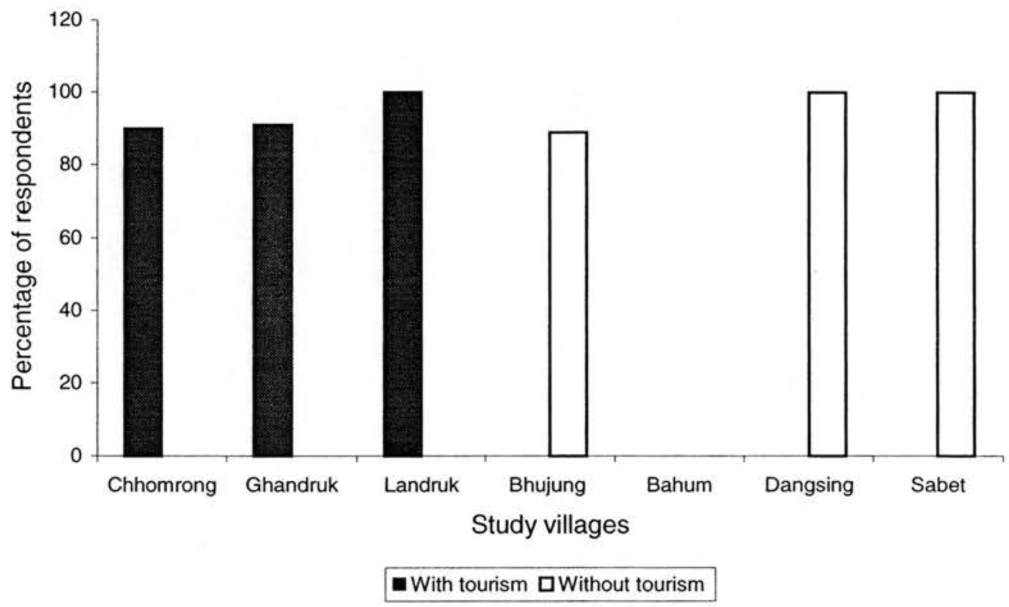
Basic Infrastructure	With tourism (%) (n = 55)	Without tourism (%) (n = 59)	χ^2	P - Value
1. Drinking water facilities	89	83	0.86	> 0.3
2. Bridge improvement	96	76	9.5	= 0.002
3. Village access improvement	95	88	1.4	> 0.2
4. Health facility	82	61	5.9	< 0.01
5. Support for school	87	88	0.02	> 0.8
6. Irrigation improvement	9	5	0.7	> 0.4
7. Support for electricity	100	63	25.4	< 0.001
8.Agriculture development	56	83	9.6	= 0.002

Source: Structured interviews

7.3.2 Perceived improvements in social services

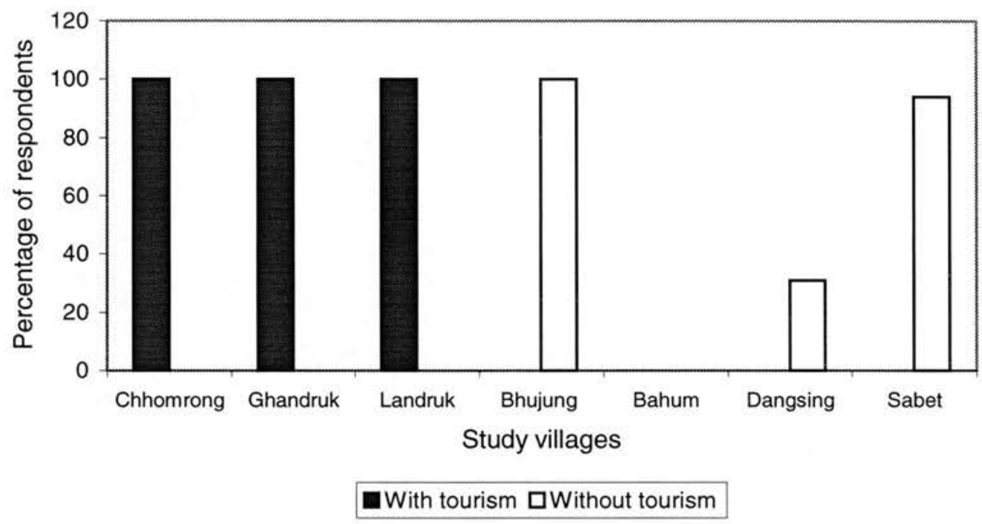
A majority of respondents in both villages with and without tourism reported that social services such as drinking water, access to villages, school infrastructure, bridges, provision of electricity and agriculture have improved in their villages with the conservation intervention. However, a higher proportion of respondents in villages with tourism reported having better facilities of bridges (96%, n = 55), health facilities (82%, n = 55) and provision of electricity (100%, n = 55). χ^2 tests indicated that there were significant differences in the proportion responses from residents in villages with and without tourism (Table 7.5).

Figure 7.5 Perceived improvement in bridges in villages with and without tourism



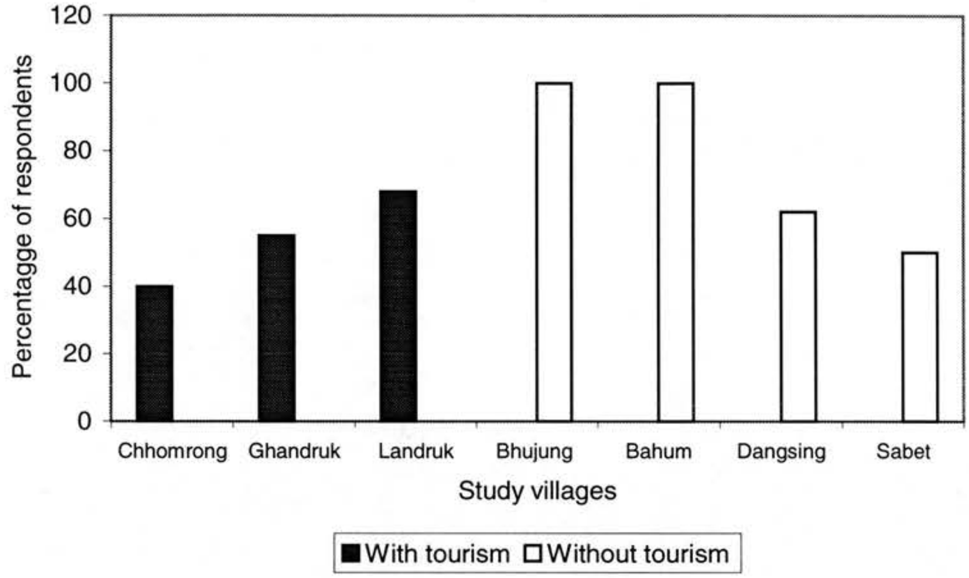
In contrast, a high proportion of respondents from villages without tourism reported that they have received better support in agriculture such as agricultural training, provision of vegetable seeds, support in livestock farming etc. There was a significant difference in responses from residents in villages with and without tourism (P = 0.002). Although certain major village infrastructure developments have been reported to be significantly greater in villages with tourism, the evidence shows that villages without tourism also equally benefiting from various social services including improved provisions for drinking water, village accesses and agricultural development (Figures. 7.4. 7.5 and 7.6).

Figure 7.6 Availability of electricity as a source of alternative energy in villages with and without tourism



A noticeably higher proportion of respondents in both areas reported that they have received opportunities for skill development training. However, given the indication of significantly low support for development of bridges, health-posts and micro-hydro plants in villages without tourism, it can be argued that higher financial investments in rural infrastructural development are being made predominately in villages with tourism. A higher investment in micro-hydro in the villages with tourism is reasonable because the hydro electricity has helped to reduce pressure on forests. However, the differences in bridges and health-post suggest that the financial resource allocation strategy for village infrastructural development will need reviewing and modification. Similarly, agricultural development has not been given priority by the conservation authority in villages with tourism, suggesting that there is a lack of a linkage between agricultural development and tourism.

Figure 7.7 Perception of local communities regarding the support for agriculture development



7.3.3 Difficulties due to conservation

Slightly more than a quarter of respondents in both categories of village reported that they have encountered a number of difficulties due to conservation. A χ^2 test indicated that there was no difference in these proportions between the villages. Similarly, less than a quarter of respondents in both areas reported that they have experienced difficulties such as restriction of forest resources use, a control of hunting, restrictions on commercial harvesting and crop damage by wildlife (Table 7.6). There were no statistical differences between the two categories of village regarding these difficulties.

However, a small proportion of respondents from villages without tourism reported that a lack of grazing land has made their living difficult. A χ^2 test indicated significant differences in these issues between these village categories. The evidence suggests that conservation intervention has not made the majority of villagers' lives more difficult whether tourism is present or not. However, the results indicate that a certain proportion of local communities had experienced difficulties due to a lack of grazing areas. This difference from the point of view of local communities suggests that livestock farming is still an important economic activity in villages without tourism, which will need additional attention from the management.

Table 7.6 Perceived difficulties experienced by local communities following introduction of conservation measures

Difficulties	With tourism (%) (n = 55)	Without tourism (%) (n = 59)	χ^2	P -Value
1. Experience any difficulties	29	29	0.001	= 1
2. Restriction of forest utilization	6	15	2.9	> 0.08
3. Control of hunting	4	10	1.8	> 0.17
4. Lack of grazing land	0	7	3.8	> 0.04
5. Restriction of commercial harvesting	2	5	0.9	> 0.34
6. Frequent intervention by conservation authorities	2	0	1.08	> 0.29
7. Decrease in forest-based small-scale industry	0	2	0.9	> 0.33
8. Crop damage and livestock depredation	15	17	0.1	> 0.72

Source: Structured interviews

Wildlife-human conflicts

More than three quarters of the respondents from villages with tourism reported that they were having problems of crop damage by wildlife (Table 7.7). In contrast, less than a quarter of respondents from villages without tourism reported the same problem (Table 7.7). All the respondents in villages with tourism reported that they have experienced such problems. The evidence suggests that although the problem of crop damage is acute in villages with tourism, villages without tourism do not escape the problem.

Table 7.7 Perceived problems due to crop damage by wildlife experienced by local communities

Villages	Always	Often	Sometimes	Rarely	Never
1. With tourism	78	12	11	0	0
2. Without tourism	22	52	22	2	2

Source: A questionnaire survey

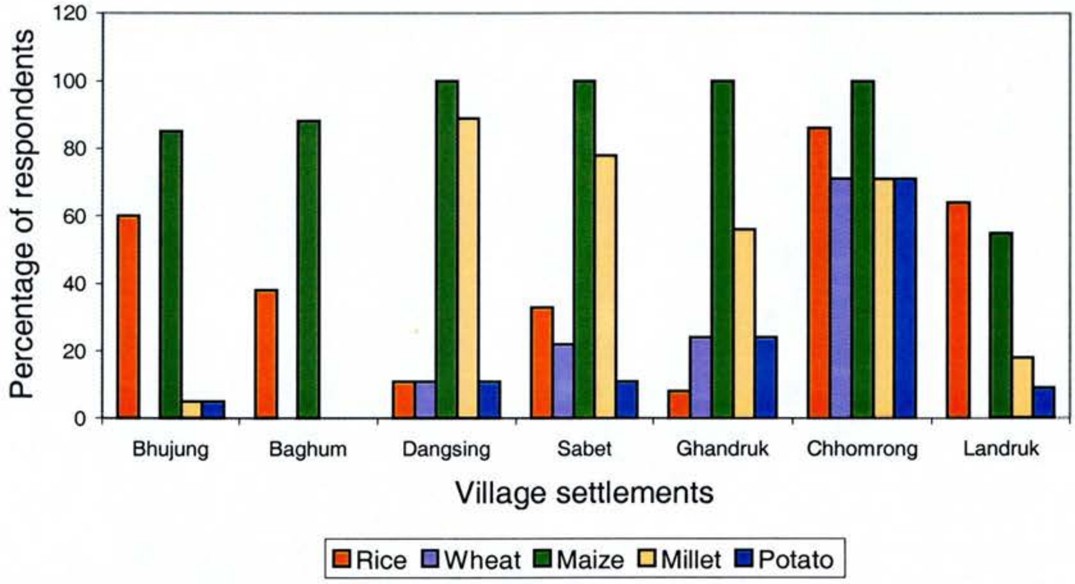
Maize, Millet, and paddy rice were the key crops damaged by wildlife in both village categories. Mann-Whitney U tests showed that there were no differences in damage of maize, millet or rice. However, wheat and potato damage was significantly greater in villages with tourism (Table 7.8) because these crops are widely grown in these villages. Only about a quarter of respondents in villages without tourism reported that they grew wheat and potatoes, whereas more than three quarters of the respondents in villages with tourism indicated that they grew these crops. The results clearly indicate that wildlife damage has been experienced in villages both with and without tourism. However, the evidence suggests that the degree of perceived damage is higher in the villages with tourism.

Table 7.8 Estimated mean (± SE) proportion of crop losses (loss per household as a percentage of total production)

Crops	With tourism	Without tourism	Mann-Whitney U Test	P – Value
Rice	9.8 ± 2.7	3.3 ± 1.0	951.0	0.72
Wheat	11.9 ± 3.9	1.8 ± 1.4	792.0	0.01
Maize	23.0 ± 4.2	24.0 ± 4.5	923.0	0.58
Millet	12.6 ± 2.6	10.4 ± 3.2	848.0	0.19
Potatoes	10.5± 3.0	2.2 ± 1.5	774.0	0.007

Source: A questionnaire survey

Figure 7.8 Perceived damage to different crops by wildlife experienced by local communities in villages with and without tourism based on a questionnaire survey



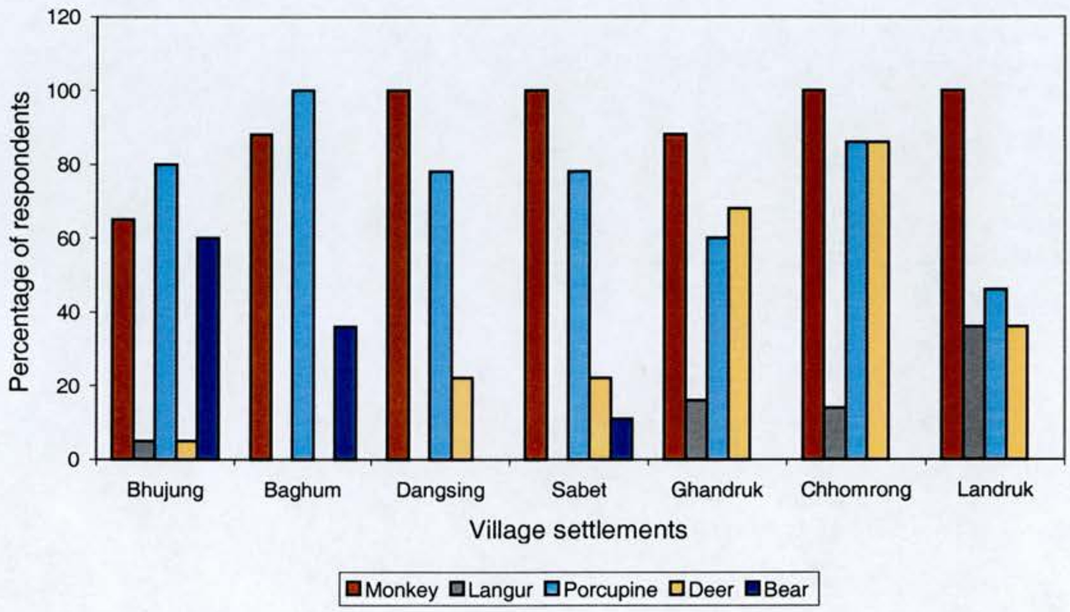
The Rhesus monkey, common langur, porcupine, barking deer and bear were considered as the crop-damaging wildlife species. The Rhesus monkey was found to be the main problem animal in both village categories (Table 7.8 and Figure 7.9). Except the Rhesus monkey, respondents in villages with tourism have experienced significantly higher problems from common langur and barking deer in comparison to respondents in villages without tourism. In contrast, porcupine and bear were perceived as problem animals by a significantly higher proportion of respondents in villages without than with tourism. Although residents in both villages have experienced problems from wildlife, the evidence shows that wildlife species damaging crops are different (Table 7.7). Therefore, it might be argued that there is a certain degree of impact from tourism on the behaviour of pest wildlife species. For example, the barking deer and common langur, which are forest dwelling animals, are responding less to human disturbances.

Table 7.9 Perceived list of major crop-damaging wildlife species

Pest wildlife species	With tourism (%) (n = 43)	Without tourism (%) (n = 46)	χ^2	P – Value
Rhesus monkey	93	83	2.2	0.14
Common langur	21	2	7.8	0.005
Porcupine	61	83	5.4	0.02
Barking deer	63	11	26	0.001
Bear	5	35	12.5	0.001

Source: A questionnaire survey

Figure 7.9 Major pest wildlife species as experienced by local communities in villages with and without tourism



The above discussion and evidence from earlier chapter shows that crop damage by wildlife has been found to be a problem. This section will look at the perceived problem of livestock depredation by wildlife. A questionnaire survey revealed that the average livestock unit (LSU) per household was 8.5 in villages with tourism and 4.6 in villages without tourism. A t-test showed no statistical difference in average livestock units between villages with and without tourism ($P > 0.06$). More than a quarter of respondents in both villages with and without tourism reported that they have experienced livestock depredation by wildlife. Among them only a small proportion of respondents (5%, n = 43) in villages with tourism reported that they have experienced the problem either permanently or frequently. The same value was about a quarter (22%, n = 46) in villages without tourism (Table 7.10).

Table 7.10 Perceived problems due to livestock depredation experienced by local communities

Villages	Always	Often	Sometimes	Rarely	Never
2. With tourism	0	5	12	16	67
2. Without tourism	9	13	9	4	65

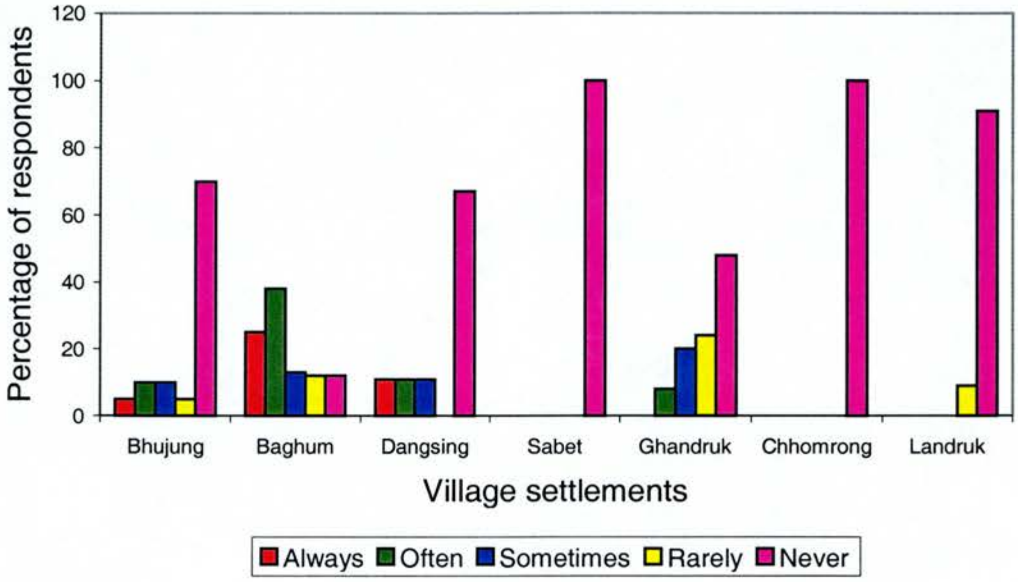
The common forest leopard is the main carnivore species held responsible for livestock depredation. The estimated total kills of livestock in the past three years as reported by the respondents were 22 (6.8 in livestock unit) and 17 (8.2 in livestock unit) livestock respectively in both village categories (Table 7.10). The evidence indicated that in compared to crop damage, problem of livestock depredation is not severe in the area. Although residents in villages without tourism has perceived frequent depredation, estimates of livestock depredation in past three years show no differences. This indicates that livestock depredation is not a major problem in both village categories.

Table 7.11 Estimated livestock killing by wildlife over a three-year period (1999 – 2001) as reported by the respondents in a questionnaire survey

Households	With tourism (n = 43)	Without tourism (n = 46)
Average Livestock Unit (LSU)	8.5	4.6
Livestock killed		
Buffaloes	0	0
Cattle	3	6
Goats and sheep	19	11
Total kills	22	17
Total kill in LSU	6.8	8.2
Average LSU loss (mean ± SE)	0.16 ± 0.08	0.17 ± 0.06

Livestock Unit (LSU) is calculated as a buffalo = 1.5 LSU; cattle = 1 LSU and Goats and sheep = 0.20 LSU (Source: Sekhar 1998)

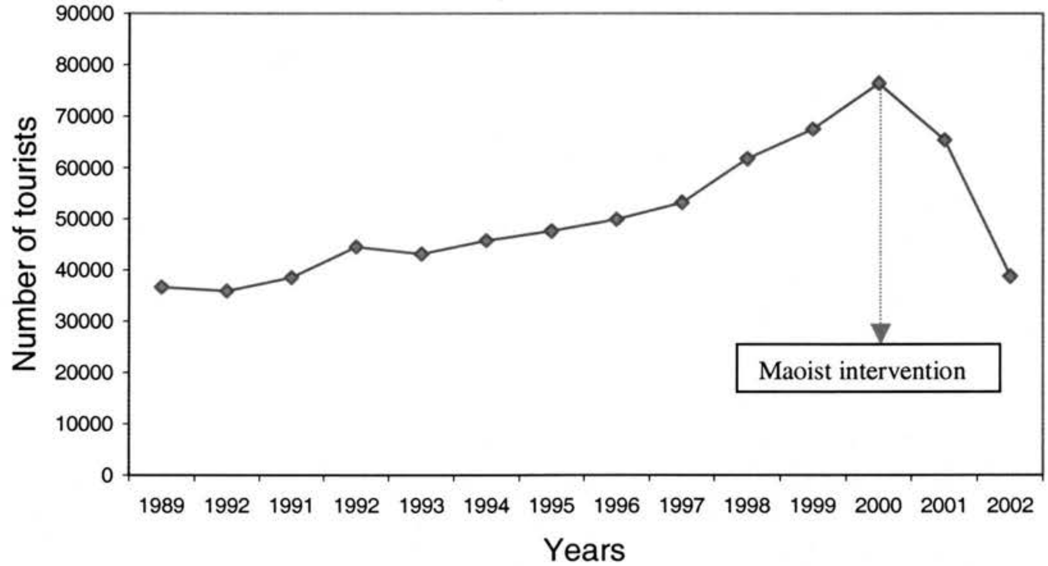
Figure 7.10 Perceived livestock depredation by wildlife in villages with and without tourism



7.4 DISCUSSION

The Annapurna Conservation Area is the most popular trekking destination in the Nepalese Himalayas (Banskota & Sharma 1995b). Two major types of trekkers, organised group and independent trekkers visit the area. Organised group trekkers are those who are participating in an agency-arranged trek and are camping, while independent trekkers are those who travel in their own and stay in local tourist lodges. Tourism data indicates that there is an increasing trend in the annual number of visitors to ACA (Figure 7.11). However, the recent decrease in tourism due to national and international political problems, and a state of insecurity in the country has shown that tourism is vulnerable. Similar experience was reported from the Congo Basin (Tutin 2002).

Figure 7.11 Annual number of foreign visitors to the Annapurna Conservation Area in Nepal. It is evident that there is a trend in increase of visitors to ACA. However, implications of political disorder and insecurity in the country have been indicated by decrease in the visitors' number from 2001. Source: KMTNC-ACAP (2003a)



ACA was created partly in order to alleviate environmental degradation linked to trekking tourism by managing conservation and development (KMTNC 1997; Pobocik & Butalla 1998; Sherpa et al. 1986). Sustainable development of tourism is one of the principal goals of the ACA management (KMTNC 1997). ACAP was the Global Winner of the British Airways Tourism for Tomorrow Award in 1991, a scheme that gives professional recognition to sustainable projects. The tourism management in ACA is considered globally to be a good example of community involvement (Cater 1994). Moreover, the tourism revenue has helped to restore degraded features of the natural and cultural environment in ACA (Gurung & DeCoursey 1994a). The ratio analysis of the annual incomes (tourism revenue, support from donors and other incomes) against annual budget of ACA clearly shows surplus in income (see chapter VIII). The average percentage ratio of the income from tourism revenue against annual budget for a five-year period from 1996/97 to 2000/01 shows that the revenue covers 85% of the annual budget. Therefore, this revenue has become a major driving force in the overall conservation and development policy in ACA. By contrast, many park authorities and institutions both in Nepal and in other developing countries are still seeking a mechanism for durable funding of parks (Newar 2003; Wilkie & Carpenter 1999a). However, as all forms of tourism produce negative impacts on the natural environment (Buckley 2001), ACA is not likely to be free from such negative impacts and needs to monitor its effects.

7.4.1 Biophysical Impacts

Impacts on forest structure

The research shows a number of interesting outcomes of the community-based conservation and tourism management in ACA, which contradict some earlier reports. The environmental impacts of mountain tourism have been noted from previous work, particularly in the case of deforestation or forest degradation caused by demands for fuelwood. This is largely generated by tourists and associated tourism activities (MacLellan et al. 2000; Sharma 1998a). It was reported that most tourist lodges still used fuelwood for cooking and room heating (Nepal et al. 2002) and therefore tourism is contributing to deforestation problems (Pobocik & Butalla 1998). However, the present forest survey results clearly indicate that there are no significant differences in tree densities, basal areas, species diversity and regeneration between the two village categories within ACA. This result also contradicts that of a study carried out the Sikkim Himalaya (Rai & Sundriyal 1997). It was reported that massive use of fuelwood and timber felling has changed the forest composition and density (Rai & Sundriyal 1997). However, the present research indicates that tourism does not have a significant impact on structure and composition of forests in ACA because various conservation activities including provision of alternative form of energy have been successfully introduced in ACA. This finding is also supported by the report of Shrestha (undated), emphasising that tourism does not exhibit any significant impact on natural vegetation in ACA.

Evidence from earlier research on fuelwood use by the local communities and tourist lodges also indicated a considerable decrease in fuelwood use after the conservation intervention (see Chapter V). One possible explanation is that successful development of community and private woodlots through establishment of tree plantations, together with an increase in conservation awareness and the introduction of alternative energy sources such as fuel-efficient stoves, kerosene, liquid petroleum gas, solar technology and electricity - have all contributed to reducing pressure on forests. Probably the 'self-sufficiency in fuel' policy of ACA for organised trekking groups has also contributed to a reduction in fuelwood use. Other studies have also reported a reduced demand for fuelwood through an increase in use of different sources of energy in ACA (Banskota & Sharma 1995b; KMTNC-ACAP 2001a; Nepal et al. 2002). This indicates that the conservation intervention has been successful in dramatically reducing pressure on forests for fuelwood.

A study in the Sagarmatha (Everest) National Park in Nepal has reported that although forest health within the park has improved through strict management practices and use of alternative energy (Rogers & Aitchison 1998), establishment of the park has deflected pressure on the forest to adjacent areas (Nepal et al. 2002; Rogers & Aitchison 1998). It was also recently reported that in the Sagarmatha National Park there has been a serious lack of sustained management activity, with greater tourism impacts and uncontrolled forest cutting (Hamilton 2002). This contrasts with ACA because there is no reported case of such deflection of pressure on neighbouring forests outside ACA. The reason for this could be that the community-based protected area management approach, with its focus on provision of alternatives to fuelwood, and education to local communities and tourists, has produced a high level of co-operation with local communities and tourists in ACA. An information brochure for tourists and hotel management training with emphasis on environmental conservation has found to be effective (KMTNC-ACAP 1997). The Tourism Management Committee, which is a local institution for management of tourism working under CAMC, has actively played a role in promoting alternative energy in tourist lodges. This contrasts sharply with the top-down imposition of regulations for park management used in the Sagarmatha (Gary 2000; Rogers & Aitchison 1998). The growing trend in the use of alternative energy sources such as kerosene, LPG, solar technology and electricity in the ACA lodges is an indicator of changes in fuel use pattern by tourist lodges (KMTNC-ACAP 2001a). A study on impact of alternative energy in ACA also reported a significant reduction in the use of fuelwood after the introduction of alternative energy sources (CRES 1996).

Examining the breakdown of results between both village categories in ACA suggests that Ghandruk village has a higher tree density, higher cut-stump density and lower basal area than other villages within ACA. The evidence indicates that there was previously significant pressure on the forests surrounding this village. It is not a surprising result because in the past, local tourist lodges use a considerably high quantity of fuelwood (Saito 1990). However, recent research in the village reported a significant reduction in fuelwood use by local tourist lodges (CRES 1996). Another plausible explanation for this could be that the increasing popularity of this village settlement for tourism has resulted in increased pressure on forests, as more people are attracted to the village settlement in search for employment. As a leader of a women's group in Ghandruk village settlement mentioned, "*Fuelwood and timber in forests, at present, are often collected by Rais (local people from eastern Nepal who has migrated in search of employment). They do not harvest the resources sensitively because the forests do not belong to them. I am against employing Rais to harvest wild resources.*" Such comments indicate that there are some problems in resource harvesting. This also suggests that as the activities of the community-based conservation and tourism management have created opportunities for employment or improved livelihood, the area becomes a pole of attraction to economic refugees (Tutin 2002). However, from the evidence of the higher mean tree density in forests of the Ghandruk village, it can be argued that newly regenerated forests are developing probably because of conservation. From this we can see that although tourism can have a negative impact on forests, these impacts can be reduced by careful planning and sensitive management both of natural resources and tourism (Eagles & McCool 2002). Nevertheless, the higher density of cut stumps in Ghandruk village emphasises the need for regular monitoring and even educating employees from outside who work in the ACA villages.

Impacts on livestock herding

Similarly, it was reported that an increase in tourism has prompted local herders in ACA to switch to tourism-related enterprises (Shrestha & Ale 2001) and thereby reduced livestock herding practices (Nepal 2000a). A study in the Spanish Central Pyrenees reported a similar drop in livestock farming with tourism development because there was competition of tourism for labour and fertile land (Marine-Yaseli & Martinez 2003). However, the evidence shows that there were no significant differences in average livestock unit per household, grazing domestic animals and dung in forests between these village categories in ACA. Discussions with local communities during the research suggest that there is a decreasing trend of livestock populations in both village categories (also see Chapter 5). Hence it is reasonable to argue that tourism is not the prime reason for the decrease in livestock numbers in ACA. The reasons for a reduction in livestock could be due to labour shortages, a decreasing interest of young people in traditional farming, increased involvement in tourism-related businesses and temporary migration within or outside the country for employment. Although the decrease in livestock numbers will reduce pressure on forests, the present changes in livestock numbers could bring changes in the subsistence agricultural system of the area.

Impacts on wildlife populations

Wildlife populations were reported to have increased after the introduction of conservation initiatives. The results indicate that there is no difference in perception of respondents in both village categories regarding an increase in wildlife populations. Compared to the pre-conservation intervention situation, an overwhelming majority of respondents in both village categories strongly agreed that hunting is minimal at present. However, a significantly higher proportion of respondents in villages with tourism compared to villages without tourism agreed that villager's still undertake hunting. This suggests that tourism can result in an increased level of hunting, presumably because more people are attracted to tourist routes in search of employment (Newsome et al. 2002). Although there was occasional hunting in villages with tourism, the evidence suggests that tourism has a positive social contribution for the conservation of wildlife. A study in Australia has also reported positive social impacts of ecotourism in the conservation of sea turtles (Tisdell & Wilson 2002) presumably because the tourists involved are more sympathetic to the cause of environmental protection and conservation.

The direct effect of tourist activity on wildlife depends largely on the intensity of tourist development, the resilience of the species to the presence of tourists, and their subsequent adaptability (Cater 1987). Some negative impacts on wildlife behaviour were observed in villages with tourism during the field research, particularly close by camping sites. Camping by organised trekking groups within villages and forest areas is one of the tourism activities in ACA. Groups of animals especially the common langur and birds such as crows scavenging on the discarded food and other litter in camping sites were frequently sighted in forests of villages with tourism. Whittaker and Knight (1998) recognised three different types of behavioural responses, namely avoidance, attraction and habituation as being fundamental in understanding wildlife responses to humans. From this evidence we can deduce that some wildlife has become habituated to humans for food in tourism areas. Similar behavioural changes in wildlife have been described by Newsome et al. (2002). This could have serious health and behavioural implications in the future (Newsome et al. 2002). Protected area managers are often unaware of tourism impacts on wildlife (Farrell & Marion 2001). Hence, a detailed study on the ways that the behaviour of key wildlife species has changed in ACA could help to manage tourism in a more sensitive way in the future.

Impacts on the physical environment

Another visible difference between these village categories in ACA concerns impacts on the physical environment. The construction of new tourist lodges or expansion of existing tourist lodges in villages with tourism has been increased.

Plate 7.1 New distinctly visible and relatively large modern buildings for tourist lodges in Ghandruk overshadowing the local houses. These lodges do not blend well with the landscape thereby creating visual impacts.

This finding was also supported by the ACA tourism facilities survey report (KMTNC-ACAP 2001a). The construction of new buildings is a visible sign of land-use impact in many of protected areas frequented by tourists (Byers 1987). There is an increase in the number of new lodges, which are built in a modern design undermining the traditional local style in ACA (KMTNC-ACAP 2001a). These new tourist lodges do not blend with the landscape thereby creating visual impacts. This was apparent in several villages with tourism in the present study area. A recent study in Indonesia has indicated a similar trends in the development of tourist lodges in the Komodo National Park (Walpole & Goodwin 2000). Similar development was also reported from the Sagarmatha National

Park in Nepal (Nepal et al. 2002). Nevertheless, annex 13 of Conservation Area Management Guidelines has listed criteria for lodge operation in ACA. It explicitly mentions that the ACA management must approve the design of the new buildings. However, the present evidence shows that the enforcement of this authority by the ACA management remains ineffective. It was also reported that overnight capacities of the places have come close to saturation based on the present number of tourists (Nepal et al. 2002). The negative impacts from a point of view of the tourism management indicate that effective implementation of present conservation policies will substantially help to increase the management effectiveness in ACA because such policies are already in place.

7.4.2 Social-economic impacts

The social impacts of tourism including various types of tourism such as sustainable tourism, eco-tourism, and nature-based tourism, have been widely discussed in the literature. Social impact refers to 'the sum total of all the social influences that come to bear upon the host society as a result of tourist contact' (Prasad 1987, p.10). Such impacts can both benefit and impose costs on the community (Wearing 2001). There can be a range of socio-economic impacts such as revenue-sharing, effects on income distribution, inflation, employment and infrastructure development (Lindberg 2001; Nepal et al. 2002; Wearing 2001). Generally, economic impacts of tourism are considered positive, and social and environmental impacts are perceived as negative (Liu et al. 1987). However, Banskota and Sharma (1995b) reported that the social and environmental carrying capacities have been improved in ACA but enough focus has not been given to the economic carrying capacity.

Reasons for involvement in conservation

Although tourism is a driving force for conservation in the area, a majority of the respondents in villages with tourism did not consider benefits from tourism as the main reason for their involvement in conservation. The respondents in both village categories considered instead that sustainable subsistence uses of wild resources were the major incentive. This is not a surprising result because only a small proportion of households in the area direct gain monetary or other material benefits from tourism. Thus only a small proportion of respondents in villages with tourism considered tourist income as an incentive to involve in conservation. A case study for the area has shown that only 12% of the economically active population of Ghandruk village is directly engaged in tourism (Banskota & Sharma 1995b). However, surprisingly, a similar proportion of respondents from villages without tourism considered income from tourism as an incentive. The reason given was that they have an ambition to develop tourism in their villages, as they see good potential for tourism development there. They argued that tourism flourished in many of the ACA villages such as Ghandruk and Chhomrong because the local communities were actively involved in conservation. The experience of other villages has encouraged them to become involved in the conservation initiatives with all of the perceived benefits.

Attitudes towards conservation and development

Despite generally having positive attitudes towards conservation, the respondents from villages with tourism were not found to be more positive towards conservation than those without tourism. However, there was no difference in attitude towards development benefits. One respondent in a village settlement with tourism commented: "*In the initial stage of ACA we were told that local residents will be allowed to undertake hunting and collection of medicinal plants once these resources recover in nature. After more than a decade of our commitment, the populations of these resources have now increased in the forests but there is no initiative for commercial utilisation of these resources for the benefits of local communities.*" This indicates that many residents of villages with tourism have a high expectation from conservation, but it has not yet been realised in practice. This might suggest that there may be a period of expectation during which attitudes are positive in anticipation of future benefits (Doxey 1975 cited in Walpole & Goodwin 2001). On the other hand, there was increase in crop damage by wildlife. The evidence clearly indicates that benefits from tourism do not always result in increased support for conservation. This finding is broadly consistent with the finding of Walpole and Goodwin (2001). A study conducted by them in the Komodo National Park, Indonesia reported that there was no positive relationship between receipt of tourism benefits and support for conservation. However, it contradicts with the statement that tourism influences local attitude towards conservation (Nepal 2000a).

Perceived social benefits

Significantly higher investments in infrastructure schemes such as micro-hydro schemes, health centres and bridges were reported from villages with tourism. This suggests that tourism has helped to generate resources for these schemes and also increased the capacity of local communities to contribute to these schemes. Furthermore, the growing concern of tourism impacts on the environment might have helped to justify raising funds for these infrastructures particularly micro-hydro schemes in villages with tourism. Similar benefits from tourism in improving social services were reported from the Sagarmatha National Park (Rogers & Aitchison 1998). Nevertheless, villages without tourism within ACA have also received support for basic infrastructure development as originally intended in setting up of the conservation area. Improvement in basic infrastructure required in villages is one of the objectives of ACA (KMTNC-ACAP 1997). Greater emphasis to develop sustainable agriculture in ACA was given to villages without tourism (KMTNC-ACAP 1997). Therefore, local communities in villages without tourism were reported to have received better support for agricultural development. Despite this, it is reasonable to argue that there is inequity in the amount of financial investments in infrastructure development schemes in those villages with and without tourism in ACA.

Although the evidence suggests better infrastructural facilities in villages with tourism, it was observed that a majority of the trekking trails beyond villages in tourism areas were not well maintained compared to villages without tourism. However, the trails within villages in both villages were found to be well maintained and kept very clean. Trail erosion and degradation due to tourism is recognised as a major management issue (Newsome et al. 2002). Above and beyond increased pressure by trekking tourism over these trails, the ever increasing number of mules for transporting tourism-related supplies such as kerosene, liquid petroleum gas, cement, food items etc. has contributed much to degradation of these trails. Nevertheless, the trails in ACA were reported to be in much better condition than those in the Sagarmatha National Park (Nepal et al. 2002).

Difficulties due to conservation

The respondents in both village categories reported that they have not perceived any major difficulties due to conservation. This suggests that tourism has neither escalated problems nor eased these problems, although a majority of respondents in both villages have experienced increased difficulties due to crop damage. A small proportion of residents in villages without tourism, however, have perceived a lack of grazing areas as a difficulty. A severe problem of grazing areas has been reported in other protected areas in Nepal (see Chapter 5). A similar problem of grazing was also reported in community forests in Mugu district, Nepal (Nightingale, personal communication). This difference from the point of view of local communities suggests that livestock farming is still an important economic activity in villages without tourism, which needs a proper consideration by the management.

Wildlife-human conflicts

Crop damage by wildlife was perceived to be higher in villages with tourism. However, the estimated proportions of mean losses of the major crops such as maize, millet and rice by each household were not found to be different in these villages. This suggests that tourism is not a factor contributing to an increase or decrease in crop losses. Nevertheless, damage to wheat and potatoes, relatively large amounts of which are consumed in tourism sectors, were high in villages with tourism. Although some variations in crop damage between farms and villages were reported in other studies

(Naughton-Treves 1997; Studsrod & Wegge 1995), the villages with higher crop losses will tend to become more dissatisfied with conservation and are more likely to display negative attitudes in the future (Dogan 1989).

The problem of crop damage by the Rhesus monkey was found in all studied villages within ACA. However, the problems from common langur, barking deer, porcupine and bear were either localised in villages with tourism or in those without tourism. This finding corroborates that of other studies (Naughton-Treves 1997; Studsrod & Wegge 1995). A study in the Kibale National Park, Uganda has reported primates such as baboons and copithecine monkeys as the 'worse pests' (Naughton-Treves 1997). A crop damage study in the Royal Bardia National Park, Nepal has shown variation in damage caused by different wildlife species according to crop and distance from the park (Studsrod & Wegge 1995). Tourist activities could result in the avoidance of optimal resting and feeding areas by some animals (Newsome et al. 2002). In the present study, a significantly higher proportion of respondents in villages with tourism reported damage by common langur and barking deer and significantly fewer reported damage by porcupine and bear. This might suggest that the ability of wildlife species to withstand an influx of tourists varies from species to species (Cater 1987; Newsome et al. 2002).

The common langur and barking deer are forest dwelling species in ACA (Inskipp & Inskipp 2001). The evidence suggests that these species have started to respond less to human disturbances in villages with tourism because of frequent but safe encounters with humans. This finding suggests their behavioural responses to humans may have changed. It is reasonable to argue that tourism has induced changes in behaviour and therefore, the animal species are responding less to human disturbances. There is a considerable body of research that suggests that wildlife becomes accustomed to and becomes more dependent on humans for food (see Newsome et al. 2002). For example, chimpanzees were reported to become habituated to tourists in Uganda (Johns 1996). On the other hand, significantly less damage to crops by bears in villages with tourism suggests that the animal avoids highly disturbed areas. Scientific information about bear activity in the wild is very limited in Nepal. These findings are preliminary and therefore, there is a need for more focused scientific research to assess behavioural impacts.

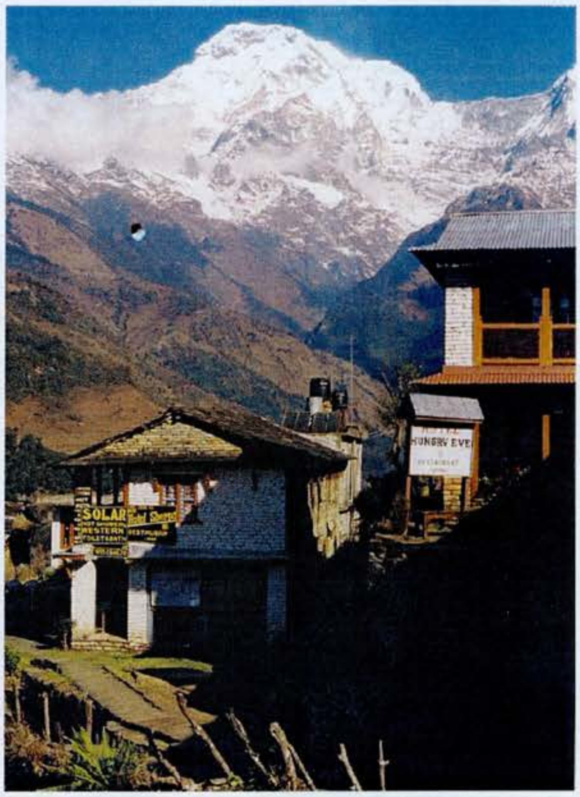
Leopards were the main predator of livestock in both village categories. The depredation problems by leopard were also reported in other studies (Rao et al. 2002a; Sekhar 1998). In the present research, there was no significant difference between livestock depredation in these two categories of villages. This suggests that tourism does not have a direct impact on livestock depredation.

Economic benefits of tourism

Income generation and employment from tourism enterprises such as jobs for porters, cooks, and guides are the major economic benefits of tourism in the area. Nepal et al. (2002) reported that more than 1500 local people are employed by lodges alone in the southern slopes of the Annapurna area. Lodge owners in ACA are clearly benefiting from tourism (Wells 1994a). Nevertheless, not all employment benefits accrue to local communities (MacLellan et al. 2000).

Therefore, ACA management policy needs to manage the disbursement of benefits more carefully if it wants to avoid potential grievances in future. There is little doubt that tourism has brought economic opportunities to remote mountain areas of Nepal where agriculture and animal husbandry were traditionally the main occupations of most households (MacLellan et al. 2000). Observations have shown that these opportunities have increased access to better housing conditions, education and healthcare in villages with tourism. However, communities in villages without tourism do not have such earning opportunities, thus they are still engaged in subsistence activities.

Plate 7.2 Local communities have benefited from tourist lodges operation. These lodges are established in the major trekking routes.

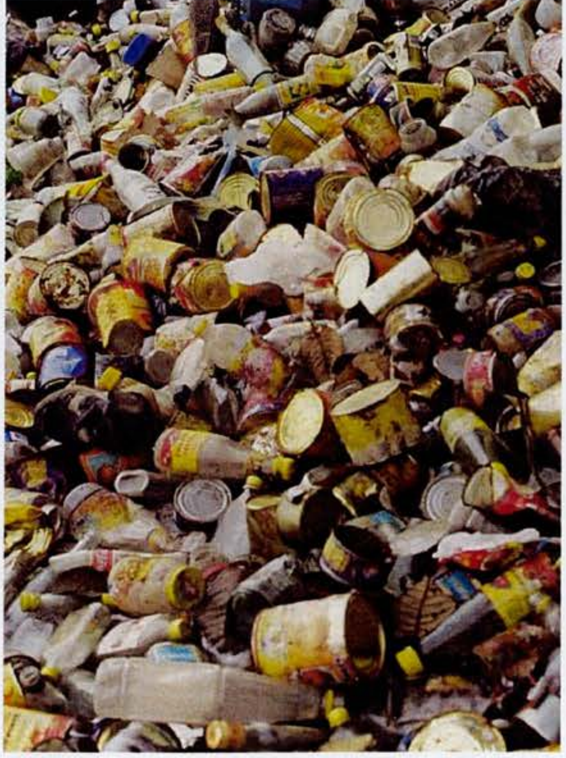


Tourism generated waste

The above section has shown that tourism generates economic opportunities. However, tourism also generates both biodegradable and non-biodegradable wastes. Wastes, both solid and liquid, have increased significantly with the increase in the number of tourists requiring food, beverages and other services (KMTNC-ACAP 2001b). Deposition of solid wastes is a serious concern because decomposition is an extremely slow process in the high mountain environment (Banskota & Sharma 1995a). Its effects and significance depend on the volume produced, the application of recycling, waste prevention strategies and the nature of the receiving environment (Newsome et al. 2002). A promising effort made in ACA to manage solid waste was observed during the field research. The concept of Waste Recycling Centres initiated by local Tourism Management

Committees with the guidance of the ACA management was found to be very promising. The aim of these recycling centres is to collect and recycle non-biodegradable waste such as plastic containers, glass bottles and tin cans. Other studies have also reported a systematic management of solid waste in ACA (Nepal et al. 2002; Sharma 1998a)}. A similar initiative on solid waste management has been reported from the Sagarmatha (Everest) National Park (Nepal et al. 2002; Rogers & Aitchison 1998). In contrast such efforts were reported lacking in the Langtang National Park, which is the third most popular trekking destination in Nepal (Banskota & Sharma 1998).

Plate 7.3 Solid wastes collected from different lodges for recycling at the Waste Recycling Centre, Chhomrong. These recyclable and reusable wastes were transported to Pokhara, the nearest city centre. These wastes, in the past, used to be either disposed of in nearby streams or buried into the ground.



Some villages with tourism such as Chhomrong, have been found to be very successful in preventing the accumulation of plastic water bottles and glass beer bottles. The lodge management committee of the village has successfully decided to ban on use of plastic water bottles and glass beer bottles, and instead encouraged the use of boiled water, electric water filters and canned beer. However, in some villages with tourism such as Landruk, hiding of solid waste by disposing it away from sight rather than management was observed. A similar pattern of solid waste disposal was reported from the Langtang National park (Lama et al. cited in Banskota & Sharma 1998). It was also reported that teahouses on the trekking routes were not effectively managing waste (KMTNC-ACAP 2001a). This indicates that success of these initiatives often depends on the skill and commitment of tourism entrepreneurs, the capacity of the Tourism Management Committees, and regulating and monitoring capacity of the ACA management to implement such initiatives. On the other hand liquid waste, such as chemicals from baths and toilets, has not been found to be managed effectively. Although the relative impact of sewage disposal depends on volumes discharged, the degree of treatment and the dilution factor (Newsome et al. 2002), freshwater and soil systems are particularly in risk of ecological damage from chemicals. Further studies on the impacts of sewage disposal on the soil and water system are needed.

Tourism also brings inflation and an imbalance to the village economy (Lindberg 2001). The majority of foodstuffs, fuel sources and households items come from outside the region. Therefore, tourism causes economic leakage and local inflation by driving up prices without necessarily creating local economic opportunities (Lindberg 2001; Pobocik & Butalla 1998). Local communities have also expressed their growing concern regarding shortage of labour in agriculture, which is deflected to tourism. This pattern has been observed by others elsewhere (Cater 1994; MacLellan et al. 2000; Nepal et al. 2002). Therefore, the costs and benefits of tourism are not evenly distributed within a community (Cater 1987). It was also observed during the research that tourist lodges were paying relatively higher wages to skilled people in village. For example, a mason was paid Rs. 600 per day for construction of a stonewalled gate to the lodge, whereas the normal village rate is Rs. 180. This clearly indicated that the benefits to one group or individual in a community may be a cost to others in the same community (Cater 1987). Therefore, an attempt has to be made to reduce the leakages from the economy and increasing the linkages with the local economy, particularly with agriculture (Banskota & Sharma 1995b; Eagles & McCool 2002; Nepal 2000b).

7.5 CONCLUSION

Tourism is widely held to be responsible for different environmental, socio-cultural and economic impacts in Nepal (Nepal et al. 2002; Pobocik & Butalla 1998; Rogers & Aitchison 1998; Sharma 1998a). However, the number of trekkers alone does not indicate the intensity of impacts (Sharma 1998a). For instance tourism impact is reported to be higher in the Sagarmatha (Everest) National Park than in the Annapurna Conservation Area, although the latter receives a higher number of tourists (Nepal et al. 2002). This suggests that tourism provides conservation with economic justification and also strengthens the conservation capacity of the park authority by bringing resources to conservation (Gurung & DeCoursey 1994b; Nepal 2000a; Newsome et al. 2002). However, if tourism is weakened, then there are direct consequences to the ability of park to fund necessary activities (Eagles & McCool 2002; Wight 1998).

From the above discussion, it can be deduced that positive impacts can come about with careful planning and management of tourism and conservation working together with local communities. Improved forest conditions and a perceived increase in wildlife populations in these villages are indicators of these impacts. The crop damage and livestock depredation by wildlife recorded between both village categories was similar. Social services were visible in both groups of villages, although certain infrastructural inputs were found to be higher in villages with tourism. Therefore, tourism, principally through generation of revenue, is directly making positive contributions to conservation and development in the ACA villages both with and without tourism. The present situation in ACA is considered as a win-win-win scenario where environment, local communities and tourists are all benefiting (Nepal 2000a). The research suggests that tourism is an opportunity rather than a threat to conservation and development of the Annapurna Conservation Area given the management strategies currently in place.

Tourism development in ACA is considered to be a benchmark for the development of tourism in other areas of Nepal (Doggart & Doggart 1996). Nevertheless, there is evidence of some negative impacts, which do need appropriate management responses. This shows that tourism without some negative impact is difficult to achieve (Nepal 2000a). Trail degradation and construction of new lodges in modern design indicated that some members of community will not put environmental concern before profit (Pobocik & Butalla 1998). This clearly indicates a need to strengthen present law enforcement mechanisms to reduce such impacts. Research is needed on other changes such as behaviour of some wildlife species. The waste management system developing in ACA needs regulating and monitoring by the management. There is also a clear need for broadening economic opportunities from tourism to local communities. This analysis also suggests that careful addressing of present negative impacts of tourism could help to further encourage environmental, socio-cultural and economic development whilst maintaining the central concept of conservation.

CHAPTER VIII

COMMUNITY INVOLVEMENT IN CONSERVATION: DOES IT WORK?

8.1 INTRODUCTION

Establishment of a protected area does not in itself ensure that the biodiversity within the area will be adequately protected (Harrison et al. 1982). There is very little knowledge of the status of many protected areas (Hocking et al. 2000). These conservation interventions still often fail to sustain target species and ecosystems (Mascia et al. 2003). It has been suggested that the western concept of protected areas has narrowed down the vision of protected areas to being untouched and pristine wilderness (Suri 1996). This has led, alternatively, to a growing sense among a group of conservationists that for effective park management, local people should be closely involved in the management of protected areas (Brandon & Wells 1992; DNPWC 1996; Oviedo & Brown 1999; Rao et al. 2002b; Wells & Brandon 1992). The Durban Action Plan prepared in the Vth World Parks Congress also emphasised recognising and guaranteeing the rights of local communities in relation to natural resources and biodiversity conservation (IUCN 2003b).

Therefore, there is a trend towards more inclusive protected area management approaches. Community-based conservation is one of the approaches that address the issue. The main assumption of this approach is that if local communities are involved in conservation and allowed to share benefits from conservation, they will help protect biodiversity. This was recognised by the revised IUCN guidelines for protected area management categories, that provided concrete opportunities for the involvement of local communities in conservation (Oviedo & Brown 1999). However, proponents of the strictly protectionist approach have recently argued that the presence of human beings is ultimately incompatible with conservation of biological diversity and have thus advocated a renewed emphasis on tight protection through authoritarian enforcement practices (Oates 1999; Terborgh 1999; Terborgh & Peres 2002). On the other hand, the recent reports from Myanmar and Nepal have indicated that even protected areas with strict protection have not been found to be effective (Hamilton 2002; Rao et al. 2002b). It is equally important to note that many protected areas only exist on paper and lack effective protection and management (IUCN 2003b). Therefore, a reversion of conservation policy to strict protectionism based on government-led, authoritarian practices makes little sense from both moral and practical perspectives (Wilshusen et al. 2002).

Considering the present debate on state management and community-based management among the conservation community, this chapter analyses the effectiveness of the community-based conservation approach promoted in Nepal, with specific reference to ACA. It considers the ecological and social effectiveness of the approach. The hypotheses postulated at the outset of the thesis are re-examined in the light of the research findings. The conclusions drawn from this study and the implications that the results have for the improvement in the community-based conservation approach in Nepal and elsewhere in the world are considered.

The chapter first considers the ecological and social effectiveness of the community-based conservation approach. It will look at the implications of current policy and legislations. The chapter also assesses the implications of tourism in the conservation initiatives. It then considers sustainability of the community-based conservation approach. The usefulness of the research method applied in the study will be assessed in the following section. The chapter also discusses the wider applicability of this work within the country and elsewhere in the world. The following section outlines some suggestions for improving the effectiveness of the ACA management. The final section of the chapter summarises the conclusions drawn from the study.

8.2 ECOLOGICAL EFFECTIVENESS OF THE APPROACH

The biophysical results presented in the previous chapters have revealed a notable degree of ecological effectiveness of community involvement in conservation in the Annapurna Conservation Area. The evidence has shown that local community activities do not necessarily damage natural resources. To provide further insights on these issues, two research questions posed at the beginning of the thesis will be addressed in this section. These were: (1) has the involvement of local communities in protected area management had any influence on the pattern of forest use and its impact on forest resources? and (2) have any changes in wildlife populations occurred as a result of community participation in protected area management?

The presence of human populations within protected areas is considered as one of the most difficult problems for park managers (Terborgh & Peres 2002). Terborgh and Peres (2002) argued that people damage the ecological system by clearing land, hunting, fishing, persecuting predators, and commercialising natural resources. A study conducted in the Wolong Nature Reserve for Giant Panda in China has also concluded that local people in the reserve were the main cause for the destruction of forests and of panda habitat (Liu et al. 1999). This suggests that human activities are considered incompatible with the conservation of biological diversity (Terborgh 1999; Terborgh & Peres 2002). It is not surprising that a majority of protected areas in Nepal is, therefore, established by either forcibly relocating local communities or by prohibiting from use of resources inside a protected area with a similar justification (McLean & Straede 2003; Nepal 2002a). However the data presented in Chapter 5 demonstrate that the forest structure and composition inside ACA is in better condition than outside ACA, with higher tree basal areas, higher tree species diversity and higher tree species richness. The evidence indicates that involvement of local people contributes to conservation of forests and consequently wildlife habitats. This confirms that strict protected area management, which often had devastating impacts on the local livelihoods (McLean & Straede 2003) is not only the option for conservation of biodiversity in Nepal and elsewhere in the world.

Protected areas have been reported to reduce deforestation everywhere, with the exception of Asia (Newton et al. 2003). It was reported that forests are being lost at an alarming rate in southern Sumatran, even within protected areas (Kinnaird et al. 2002). The simple fact is that a majority of local people living within and around protected areas in developing countries depend on park resources to meet their daily energy needs (Liu et al. 1999; Rao et al. 2002b). Fuelwood utilisation from forests is one of the main causes of forest depletion in Nepal (UNEP 2001). This is basically due to the lack of an alternative fuel to wood. Therefore, fuelwood collection for household consumption has been allowed in the Sagarmatha National Park and two other mountain national parks in Nepal (Sharma 1990). The local communities in the Chitwan National Park fulfil their fuelwood need by illegally collecting from the park during the annual grass-cutting season (Lehmkuhl et al. 1988). A decade ago, fuelwood collection by local communities was reported as one of the major threats in ACA (Wells & Brandon 1992). However, use of fuelwood has been found to be dramatically decreased in ACA. It is evident that a decrease in the collection of fuelwood and other subsistence resource has induced a favourable environment for the improvement of forest resources.

A study on diversity and structure of the bird community in the Himalayan sub-alpine region has reported that bird density, species richness and diversity are significantly lower in heavily utilised forest (Laiolop 2004). It was reported that exploitation of forests for fuelwood and grazing can be a threat to forest survival in the longer term because it curtails or prevents re-growth and regeneration (Nepal et al. 2002). It was also claimed that musk deer densities were significantly lower in over exploited stands in the Himalayan region (Buffa et al. 1998 cited in Laiolop 2004). This clearly indicates that reduction in over exploitation of forest resources will improve forest condition and increase biological diversity.

The results support the fact that a good way to reduce human pressure on a park is to develop alternative resources for local communities (Struhsaker 2002). It is evident that the conservation initiatives have provided support to local communities and tourist lodges with various alternatives such as private woodlots and alternative sources of fuel such as micro-hydro electricity, kerosene, solar and LPG. Therefore, local communities and tourist lodges, at present, are using different forms of fuel including wood from private woodlots. These changes in the resource use pattern have reduced pressure on natural forests, which is indicated by the comparatively lower numbers of cut-stumps in forests within ACA. The result also suggests that there is a behavioural change in use of fuelwood. Local communities have reduced the quantity of the fuelwood use. If halting and slowing down of forest degradation are reasonable environmental goals to protect biodiversity (Schwartzman et al. 2000), then the community involvement in conservation in Nepal must be considered as successful. Although there is a shift away from the use of fuelwood from forests, it was reported that most of the local communities and a proportion of lodges in ACA still depend on fuelwood as their main source of fuel (KMTNC-ACAP 2001a). This indicates that fuelwood use needs monitoring and there is a need for continuous promotion of alternative sources of fuel particularly in tourist lodges and teashops.

Poaching of wildlife for subsistence and commercial purpose is one of the challenges faced by many protected areas in the world (Brockelamn & Dearden 1990; Gracia & Goodman 2003; Mishra 1997; Nepal 2002b; Rao et al. 2002b; Sekhar 1998; Terborgh & Schaik 2002; Walsh et al. 2003; Wells & Brandon 1992). Hunting has been argued as a cause of extinction of many animal species (Rao & McGowan 2002). Controls of poaching are not often initiated by local communities; but instead they are externally enforced (Metcalfe 1994). This leads on to the situation where *illegal actions* such as poaching are undertaken by the communities themselves (Metcalfe 1994).

Traditionally, Nepal has been a famous place for big game hunting (Shaha & Mitchell 2001). With the onset of conservation initiatives, a team of army safeguarded most of the protected areas in Nepal. But, still some of the poaching reports are very alarming such as killing of 25 rhinoceroses in seven months in 2002. The present research revealed that a similar poaching situation existed in ACA before the conservation intervention. The research revealed that certain high value wildlife species such as musk deer were poached by commercial hunters to a level of local extinction. Although hunting of wildlife in ACA was a part of long-standing tradition, it was not often driven by subsistence needs. However, the evidence from the present research shows that establishment of ACA has effectively controlled hunting. Abandonment of hunting by local people was one of the most notable achievements made by ACA. More importantly, the local communities and ACA personnel have also actively working to control commercial poaching groups. It was reported that local communities patrolled forests, confiscated snares and traps, and caught poachers (KMTNC-ACAP 1999). Therefore, poachers at present cannot roam unimpeded in the area because the local people are acting as a conservation watchdog. This clearly indicates that involvement of local communities in conservation directly contributes to wildlife conservation. It also reinstates the point that wildlife protection is possible without involving the army.

The results presented demonstrate that wildlife populations in ACA are stable if not increasing. The major reasons for population stability or an increase in wildlife population are an enhancement of conservation awareness, the control of hunting, and improvements in wildlife habitats. Frequent sightings of barking deer, which was previously a sought-after game animal hunted by the local communities of the area, is a good indicator of successful control in hunting. Similarly, increase or stability in populations of Himalayan Tahr, barking deer, Koklas pheasant and Satyr Tragopans are good indicators of conservation effectiveness. The low level of hunting within ACA indicates that viable populations of most species will persist if direct threats do not increase. The evidence clearly suggests that the involvement of local community, together with law enforcement to support local initiatives for controlling illegal hunting, helps to make wildlife conservation effective.

The evidence discussed clearly demonstrates that community involvement in conservation is effective in the maintenance of ecological integrity of a protected area. However, the unrealistic aim of a protected area to maintain untouched and pristine wilderness, as promoted by the strict protectionist approach, may not be achievable. Nevertheless, the present study has provided strong evidence that the approach has helped to reduce deforestation, improve forest structure and composition, reduce hunting and help to stabilise if not increase the wildlife populations in the area. These are generally the principal aims of most protected areas around the world.

8.3 SOCIAL EFFECTIVENESS OF THE APPROACH

Protected area establishment and the formation of appropriate management procedures can have a profound effect on the livelihoods of local communities (Calhoun 1991; Hough 1991b). As discussed earlier, protected areas will not survive for long whenever local community remain impoverished and is denied access to needed resources inside protected areas (Brechin et al. 1991). Therefore, the community-based conservation approach, where local communities have a key role in the decision-making processes (Kothari et al. 2000), is considered to generate positive rather than negative social impacts. The results in Chapters 5 and 6 have revealed a significant social effectiveness of community involvement in conservation in the Annapurna Conservation Area. Three research questions posed initially deal with these points. They were: (1) has the community involvement changed attitudes, awareness and behaviour of local communities towards conservation and protected area management? (2) what are the crucial elements that encourage local people to become involved in conservation initiatives of a protected area? and (3) what are the costs and benefits of conservation to a local community within a protected area?

Most protected areas have little local support because the parks have been established with insufficient consultations and without consideration of local livelihood needs (Ghimire & Pimbert 1997; Hamilton et al. 2000). Therefore, local communities within and around protected areas in developing countries generally have negative attitudes towards conservation (Akama et al. 1995; Ite 1996; Nepal & Weber 1995a). Negative attitudes of local communities towards protected areas have also been reported from Nepal (Heinen 1993; Nepal & Weber 1995c; Sharma 1990). On the other hand, it has been realised that the success or failure of conservation programmes is often primarily determined by social factors (Mascia et al. 2003). The evidence from the research has shown that an overwhelming majority of local communities in ACA have positive attitudes toward conservation and development. This is an important indicator of the social effectiveness of the community-based conservation approach promoted in ACA. The results presented have further demonstrated that local communities have a good knowledge of the purpose of conservation. It is also evident that local communities are aware of the conservation impacts, notably improvements in forest conditions, increases in wildlife populations, improvements in village sanitation and social services. The changes in their attitudes and enhancement of conservation awareness have also been demonstrated by changes in their behaviour towards conservation. These are characterised by community actions such as close involvement of local communities in conservation decisions, changes in resource use patterns, establishment of community and private woodlots and the abandonment of hunting by local communities.

Although local communities held positive attitudes towards conservation, they often held negative attitudes towards park authorities because of poor behaviour of park staff, lack of local participation in park establishment, conflicts on resource use and a lack of visitations to a village by park staff (Akama et al. 1995; Badola 1998; Fiallo & Jacobson 1995; Gillingham & Lee 1999; Infield & Namara 2001; Newmark et al. 1993). The relationship between park staff and local communities in national parks and wildlife reserves in Nepal as a whole is also not encouraging (Acharya 2003; Post-Reporter 2001b). It was reported that there is inadequate coordination between park authority and local people in the Chitwan National Park, Nepal (DNPWC/PPP 1999). Confrontation with protected area army guards is one of the problems faced by local communities (McLean & Straede 2003). However, the results of the present study contradict with these tendencies. The results demonstrate that attitudes of people towards the conservation authority can be highly positive. A majority of residents in ACA believe that they were in regular communication with the conservation authorities, a situation that does not exist outside ACA. Local communities in ACA believe that they are consulted, informed and listened to properly in conservation and development activities. It substantiates the fact that the ACA management has developed a strong partnership with local communities in conservation. Therefore, it can be concluded that the mutual trust and partnership between local communities and the ACA management have made an important contribution in strengthening the conservation initiative.

The concept of community-based conservation implies that local communities have an adequate institutional base for management, and this in turn implies that they have a sanctioned authority that implements its responsibilities (Murphree 1994). The V^{th} IUCN World Parks Congress has stressed the need for management and establishment of protected areas in full compliance with the rights of local communities (IUCN 2003b). Until recently, most of the protected areas established in Nepal followed a strict protectionist approach with the armed forces available to control any illegal activities (Maskey 1997). Therefore, there is inadequate participation of people in park management (DNPWC/PPP 1999). However, Nepal has set an example of conventional wildlife management as well as a model of community-based protected area management. ACA provides a national model of community-based protected area management. Hence a significant role of local communities in park management has been devolved through local institutions. The clear evidence of establishment of the Conservation Area Management Committees (CAMC) in each VDC within the conservation area indicated development of local institutions. CAMC has been devolved with management responsibility and authority (see Appendix 3.6). The present study has demonstrated that local communities are aware of CAMC's role in planning, designing, and implementing conservation and development projects. Local communities are also aware that ownership of forest resources lies with the Conservation Area Management Committee. The results suggest that rights and responsibilities for and means to manage wild resources have been granted successively to the local institutions. The results of this research emphasise that local communities have understood and became aware of importance of collective actions for effectiveness of their actions. However, the evidence shows that there are inadequate managerial capabilities of CAMC particularly regarding enforcement of the regulations.

Negative attitudes towards park among local communities were developed generally from perceived restrictions on resource use (Fiallo & Jacobson 1995). Generally, local communities and other civil society interest groups are not sufficiently engaged in identification and management of protected areas (IUCN 2003b). Therefore, imposing protected areas on local communities means that they have lost their access to traditionally used resources (Mishra 1982b). But, most protected areas in the developing countries have suffered greatly from illegal human activities, thereby threatening wild flora and fauna despite good wildlife laws in place (Brockelamn & Dearden 1990; Fox et al. 1996; Kothari 1994; Mishra 1997; Nepal 2002a; Nepal 2002b; Nepal et al. 2002; Rao et al. 2002b; Sekhar 1998; Wardojo 1994). It was reported that local communities in Nepal still use park resources either legally or illegally for their subsistence needs from most of the protected areas (Editor 2003; Lehmkuhl et al. 1988; Sharma 1990). Therefore, for local people to support protected areas, local communities should whenever possible, be allowed to remain and have access to resources on a sustainable yield basis (Brechin et al. 1991). Sustainable use of resources has been developed as a means of meeting needs such as food, health, energy and other fundamental local community needs. The conservation approach in ACA has indeed addressed the local needs. The evidence in Chapter 6 suggests that the most important *raison d'être* for the involvement of local communities in conservation is the right of access to resources. The evidence clearly demonstrates that the provision of access to resources provided by the ACA management has encouraged local participation in conservation. The data also shows that the involvement was also encouraged by enhanced conservation education and awareness, integration of local needs and aspirations, and support for social services.

Generally, local communities have to borne the costs of and received few benefits from protected areas (IUCN 2003b). Some of the costs of protected areas on rural communities are the restriction of access to traditionally used resources (Mishra 1982b); the game laws which allowed hunting by permit only made their normal subsistence hunting illegal (Lusigi 1982); the disruption of local cultures and economies by tourists (Hough 1988); increased depredation on crops and livestock by wild animals (Mishra 1982b) and displacement of people from their traditional lands leading to social and cultural disruption, enforced poverty, anomaly shown by symptoms of hopelessness, and even death (Calhour 1972 and Lusigi 1984 cited in Hough 1988). Although Nepal has made substantial efforts in involving local community in conservation, there are yet many protected areas in Terai lowland with low level of community participation in decision-making. This has directly threaten the livelihoods and the cultural heritage of local people such as displacement from villages, lack of access to resources; escalating damage by wildlife; problem of cattle grazing and even misbehaviour by the soldiers and park staff (Acharya 2003; Editor 2003; McLean & Straede 2003; Post-Reporter 2001b).

However, ACA has focused in dual objectives of protecting and improving local livelihoods and ameliorating ecological conditions. It is evident that local communities have received substantial benefits from conservation, notably consumptive use of resources, improved social services, legal rights of accesses to resources, and various economic opportunities. It is apparent that local needs such as access to fuelwood, fodder and timber have been improved with the conservation intervention. The standard of living of local communities within the protected area has improved through the improvement in social services in village settlements such as drinking water, health centres, access roads, improved school infrastructures and bridges. However, the evidence demonstrates that there was a disproportionate financial investment in social services with higher investment in villages with tourism. The agriculture training opportunity was not distributed equally among different groups within a community. The result indicates that some groups within a community have perceived more difficulties due to conservation. The results also reveal that most of the economic activities before and even after ACA were limited to subsistence.

Although community-based protected area management in ACA has provided substantial benefits to local communities, the local communities have also incurred certain costs. The results demonstrate that the single most important cost due to conservation in ACA was crop damage by wildlife. Crop damage by wildlife is one of the most widespread human-wildlife conflicts (De Boer & Baqete 1998; Kharel 1997; Miah et al. 2001; Naughton-Treves 1997; Rao et al. 2002a). The problem exists in most of protected areas in Nepal. It is evident from the research that the damage was very high at the individual household level and has had an impact on food security of local communities. It is obvious therefore that the ACA management should take initiative to prevent and mitigate the human-wildlife conflict. Although social and economic problems reported elsewhere in other protected areas have been significantly addressed in ACA, the single factor of human-wildlife conflicts was still found to be inadequately addressed by the management. On the other hand, decreases in livestock depredation in ACA represent an important achievement. Therefore, effectively preventing or mitigating the problem of crop damage by wildlife in ACA could substantially increase credibility of the community-based conservation approach.

8.4 IMPLICATIONS OF POLICY AND LEGISLATIONS

Policy and legal constraints are probably the single biggest obstacle to community-based conservation (Worah 2002). Communities are often not actively participating in planning and management (Metcalfe 1994; Songorwa et al. 2000; Wainwright & Wehrmeyer 1998). However, the conservation history of Nepal shows progressive development of nature conservation policies with careful consideration of the social, economic and political climate within which it occurs (Heinen & Kattel 1992; Keiter 1995). The new conservation laws underlie the philosophy of community-based conservation by incorporating community involvement in management. One of the

ACA's achievements has been in facilitating the creation of the new legislation. This section will address one of the research questions of the thesis by examining whether the present policies offer enough incentive for the involvement of local people in the planning and management of the protected area.

Appropriate and fair enforcement of conservation policy and regulations is basic to park management (Brockelamn et al. 2002). A local conservation leader Mr. Min Bahadur Gurung mentioned that, "*Generally, in a community there are always some cheaters or politically motivated locals or special interest groups acting against conservation. Therefore, we need law enforcement to bring them into the main stream of conservation*", indicating the importance of law enforcement in community-based protected area management. Law enforcement in community-based protected areas is different from other strict protected areas because legal enforcement is a means to empower local communities to effectively manage resources rather than displacing them from the area or denying them access to resources. Legal enforcement also helps local communities to control violators of rules within the community or from outside. However, the results indicate that local communities should have enough knowledge of conservation policy and regulations for effective enforcement of these regulations.

The community-based conservation programmes have generally been reported to be successful in reducing poaching, improving conservation through an increase in wildlife game scouts, direct economic benefits from trophy hunting and some development schemes (Lewis & Alpert 1997; Metcalfe 1994; Wainwright & Wehrmeyer 1998). However, the management decisions are often controlled by district or state owned institutions (Metcalfe 1994). It was argued that it is difficult to change government's exclusionary policies and legislation, and move ownership, rights and control over resources to local communities (Songorwa et al. 2000). Consequently, the discourse of community-based conservation translated into changed policies and practices are often lacking (Adams & Humle 2001). However, Nepal's national park management policies have shifted from a centralised management system to a community-based management system to better sustain valuable resources (Keiter 1995). The Conservation Area Management Regulation (CAMR) and the Conservation Area Management Guidelines are the two major policy documents, which have enabled local communities to live legally within a park and to benefit from appropriate devolved management responsibility to the local communities. The success of ACA is based on these supportive legislations and policies that empower local communities and significant reduction of the direct role of the government in the management of the protected area.

In contrast to strict centrally controlled management regulations for national parks, abiding by the Conservation Area Management Regulations has made local livelihoods easier by the fact that they are allowed to live legally within a park and ownership of forests has been returned to them by devolution of management authority. The regulations allowed CAMC to retain harvesting fees within the village, which in the past used to be paid to a distant government authority. More importantly, it has strengthened the local system of regulated subsistence harvest of resources. This has reduced the risks of overexploitation of resources for commercial purpose as in an open access resource system because communities control the resources and commercial resource harvesting is not allowed.

The conventional conservation regulations do not allow involving local people in conservation. For example, the resettlement programme of villages inside the Royal Chitwan National Park, which is still ongoing, was forced upon the local people and managed without any interaction with or consideration of their culture and livelihood (McLean & Straede 2003). The ACA approach sharply contradicts with these conventional conservation approaches. Local communities are in the centre of the approach. Local empowerment and attention given to the legitimacy of local institutions, particularly CAMC, through these documents indicate the importance given to involvement of local communities in conservation. In comparison to FUG outside ACA, CAMC has more authority and responsibility, and therefore performs vital and diverse functions for communities, including resource management, control of hunting, mobilization of labour, coordination of infrastructure development, conflict resolution and cultural activities. However, it is evident that the local communities still do not have adequate managerial capabilities, particularly in financial management and implementation of CAMR, to manage the conservation area effectively. Therefore, additional time and resources must be allocated to build and strengthen the capacity of CAMC. The focus of such activities should be in enhancing traditional management skill with appropriate scientific techniques, enabling financial management, developing capacity to implement regulations, and human resources development.

8.5 IMPLICATIONS OF TOURISM

Most of the ecologically based tourist activities in the Himalayan mountain region are confined to national parks and protected areas that are rich in bio-cultural diversity (Williams et al. 2001). The data presented in Chapter 7 demonstrate that ACA has the highest visitor-numbers among mountain-protected areas in Nepal. Consequently, the ACA management has given high priority to reducing the environmental impacts of tourism and to increasing the local economic benefits from tourism (Nepal 2000b). It is evident that careful planning and management of tourism has positive impacts in ACA. The section will address three of the research questions of the thesis (1) is tourism an incentive for conservation? (2) has tourism accelerated the degradation of forest resources, wildlife and other resources? and (3) is tourism an incentive for local communities' involvement in conservation?

Ensuring effective management and securing sufficient financial resources are vital if protected areas are to continue to provide benefits and fulfil their role in biodiversity conservation (IUCN 2000). However, many protected areas particularly in the developing countries are severely under-financed (Wilkie & Carpenter 1999b; Wilkie et al. 2001). As a result, the financial security of protected areas was called for during the Vth IUCN Parks Congress (IUCN 2003b). Protected area management in Nepal is also suffering from insecurity in financial resources. The government of Nepal has recently decided to hand over the management of some protected areas to non-governmental and private groups to reduce the financial burden on a national budget (Newar 2003). Whilst globally there is a significant gap in funding protected areas, the evidence and discussion in Chapter 6 indicates that ACA is moving towards self-financing through tourism revenue. Such opportunities do not exist outside ACA and in other protected areas in Nepal. There is evidence that, until recently, a major portion of the ACA annual budget was financed through tourism revenue. Tourism, therefore, is an incentive for conservation in ACA. Tourism has provided a unique opportunity for the area from which both villages with and without tourism have benefited.

All forms of tourism produce negative impacts on the natural environment (Buckley 2001) and benefits provided by tourism for conservation are not often comparable to the costs involved in the conservation of the protected areas concerned (de los Mentros 2002). Consequently tourism is often singled out as one of the threats to protected area management (Ervin 2003). Tourism is considered to have significant negative impact on forest, vegetation and wildlife in the mountain areas of Nepal because of the demands for fuelwood and associated tourism activities (MacLellan et al. 2000). However, the results here demonstrate that tourism, at present, do not have significant negative impacts on the structure of and composition of forests and its wildlife. Direct anthropogenic impacts to forests such as livestock grazing and fuelwood collection do not seem to have accelerated with tourism, if there are effective conservation policies and regulations in place. However, some of the observed negative impacts of tourism on wildlife behaviour should not be underestimated and need to be addressed by the ACA management.

Impacts of tourism on the physical environment such as big modern buildings for tourist lodges are evident in some villages. However, the results demonstrate that social services, local attitudes towards development, opportunities for skill development training, crop damage by wildlife, livestock depredation, and other difficulties due to conservation were not found to be different in village settlements with or without tourism. The success of tourism management in ACA has demonstrated that the problem with tourism in highland regions in Nepal is essentially one of mismanagement rather than of an impossibly fragile environment (Jenner and Smith 1992 cited in Gary 2000). Probably, this could be true in most of the Himalaya regions and other similar environments.

Although tourism presents a unique opportunity for local communities and the ACA management, the development of tourism policy in ACA is still reactive, with a weak conceptual and policy basis. The absence of a tourism management plan in ACA indicates that the complexity and opportunity of tourism management in the area has been either underestimated or not fully understood (also see section 8.9). The discussions suggest that tourism is not an incentive for local communities to become involved in conservation because they do not gain direct monetary benefit. Therefore, attempts have to be made at a local level to link tourism with the wider economic base, particularly with agriculture (Nepal 2000b) and to increase spending per visitor, which will bring in more money to the local economy (Eagles & McCool 2002). The local tourism entrepreneurs must be encouraged to use local labour and products to reduce the economic leakages.

8.6 Sustainability of the Approach

The ultimate success or failure of the community-based protected area management will be evaluated in terms of sustainability of the approach but sustainability is a difficult concept to define precisely. However, using the concept of the Convention on Biological Diversity (CBD) and the Brundtland definition of sustainable development, the issues of sustainability in community-based protected area management can be examined.

Sustainable use is defined in CBD Article 2 *'as the use of the components of biological diversity in a way and at rate that does not lead to the long term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present* *and future generations*' (CBD 1994). Sustainable development is defined as '*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*' (WECD 1987). Sustainable development is a multi-disciplinary phenomenon, requiring not only an understanding of the ecological aspects of resources use, but also socio-economic and political dimensions (also see Auty & Brown 1997; Brown 1997). This suggests that the sustainability of the community-based approach in ACA is also influenced by the roles of protected area management, local communities, and tourism.

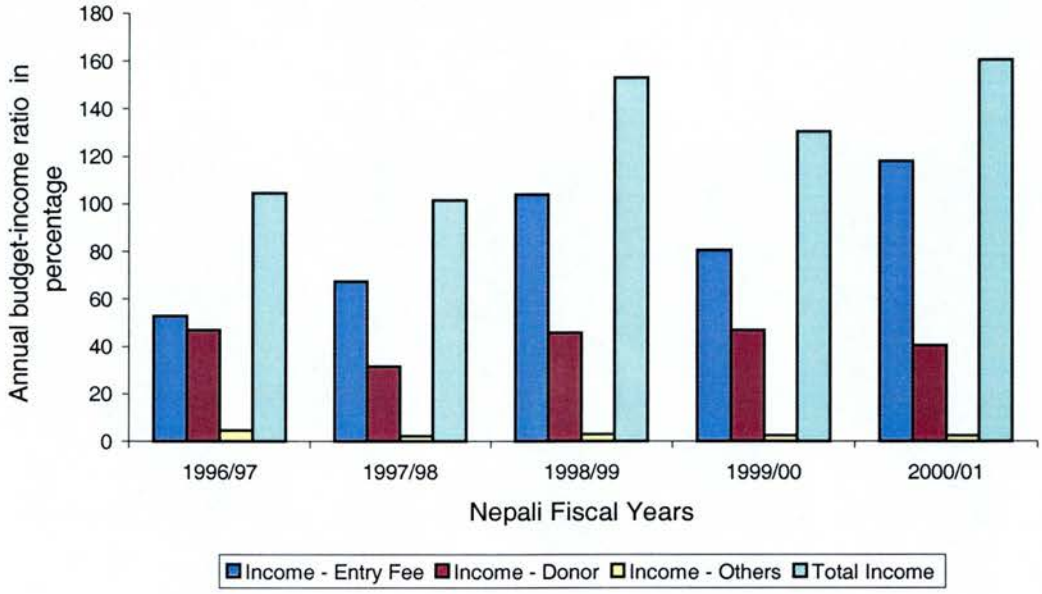
The biophysical results demonstrate positive impacts of community involvement in conservation. Sustainability of resource use has been practiced by local communities and has been indicated by reduced hunting pressure, increased dependency on private or community woodlots for fuel and fodder needs, and evidence of reduced use of fuelwood by tourist lodges. Therefore, local community use and tourism have not degraded the forest resources in the area. The increases in wildlife populations indicate wildlife habitat improvement. However, the evidence of significant level of crop damage by wildlife indicates the need for regulating the numbers. These promising results have indicated a high prospect of sustainability in resource utilisation. Nevertheless, there is a lack of sufficient scientific data including current wildlife populations, demand and supply of resources, which makes the estimation of long-term sustainability uncertain.

Community involvement is the goal of community-based protected area management. However, the question of decentralisation is a strong determinant of the extent to which local communities can be meaningfully involved in conservation (Little 1994). The rights of access to resources, the ability to enforce these rights, and development of local conservation institutions for management and accountability as mentioned by Martin (1997) are clear indications of the development of a sustainable use system in ACA. The main local institution, CAMC, has been addressing a comprehensive range of conservation problems and issues including decision making regarding conservation and development, managing resources, control of hunting, and developing community woodlots. Real delegation of authority and proprietorship rights on natural resource management to CAMC by the government has strengthened the local conservation institutions. Positive attitudes, behaviour and commitments among local communities towards conservation have influential impacts on the sustainability of the approach. Although the local communities have developed positive attitudes, effectively managed resources and controlled open access resource system, it is evident that local communities do not yet have adequate managerial capacity. In the same way, the problems emerging from the increased wildlife are a result of a lack of effectively developed authority. The lack of knowledge of the present regulations among local communities indicates that the expected level of sustainability might not be achievable currently.

Ensuring effective management and securing sustainable financial resources is vital if protected areas are to continue to provide benefits and fulfil their role in biodiversity conservation (WCPA/IUCN 2000). It is evident from this study that tourism assists in protecting the resources on which it is based through revenue to park management agencies (Eagles & McCool 2002). The ACA management has the special privilege of retaining tourism revenues. The analysis of the annual incomes (tourism revenue, support from donors and other incomes) against annual budget of ACA shows a surplus in income (Figure 8.1).

The average percentage ratio of the income from tourism revenue against annual budget for a five-year period from 1996/97 to 2000/01 shows that the revenue covers 85% of the annual budget. The revenue from tourism collected as entry fees has become a major driving force in the overall conservation and development in ACA. The gradual shift of the ACA management from donor supported to self-financing is a promising indicator of financial sustainability (Bajracharya 2002). This is a unique example in Nepal, where the government with limited resources to finance protected areas has encouraged exploration of management alternatives (Newar 2003).

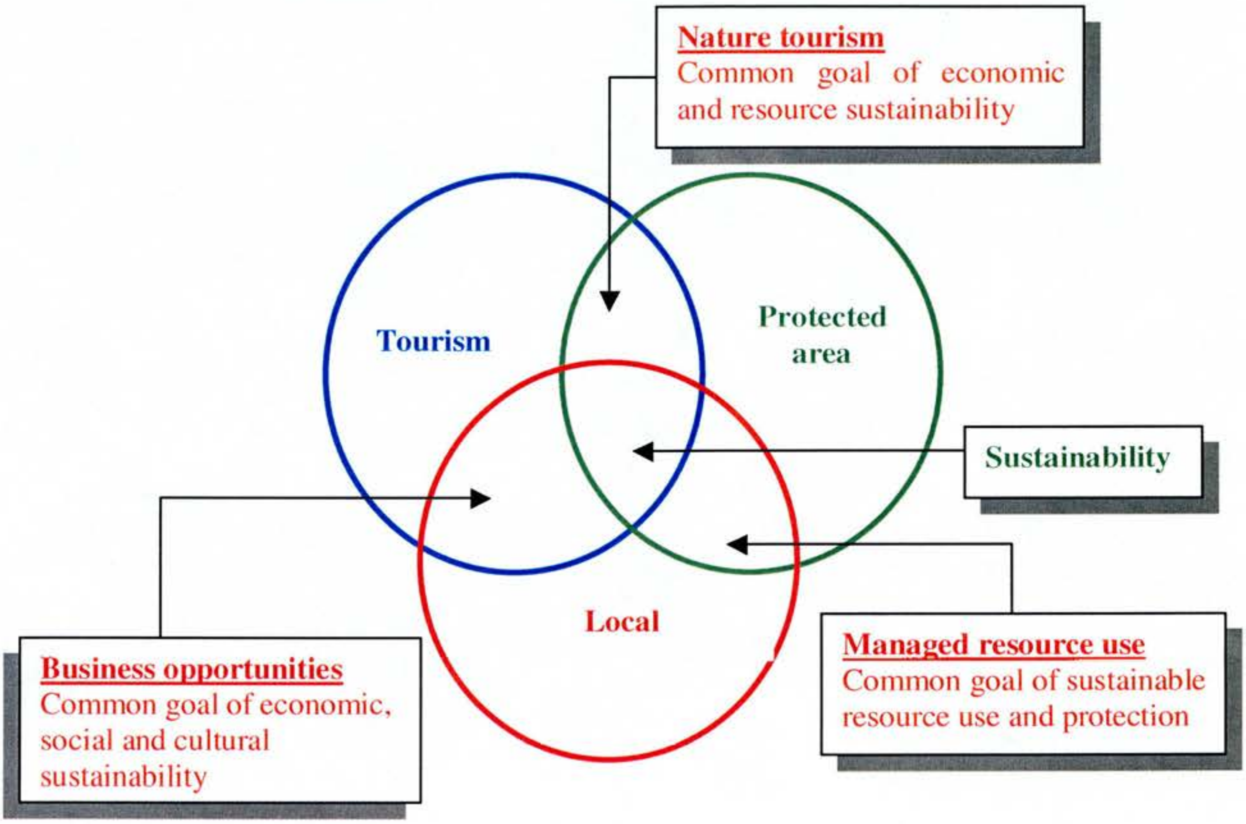
Figure 8.1 Comparison of the ACA income and the ACA annual budget ratio in percentage for a five-year period (1996/97 – 2000/01)



Data Source: KMTNC-ACAP

Maoist insurgency and the threat of political instability can, however, severely damage tourism business. The recent decrease of tourists in ACA clearly demonstrates that the risks due to political unrest and the insurgency markedly affect tourism demand (also see Chapter 7). If tourism is weakened in ACA, then there are direct consequences to the ability of park to fund its current activities. However, a decrease in annual tourism revenues might not immediately jeopardize resource management in ACA because an effective system of resource management by local communities is in place. The positive attitudes and conservation awareness among the local communities will not allow them to immediately break their rules of conservation. Nevertheless, a prolonged state of insecurity and lawlessness due to political instability and the insurgency might discourage unified and committed actions of local communities to conserve resources in the future.

Figure 8.2 A balanced approach to a sustainable community-based protected area management. There are shared influences of protected area management, local communities, and tourism. Adapted from Eagles and McCool (2002).



The discussions presented here clearly demonstrate that the sustainability of the community-based protected area management in ACA depends on a careful balance between local communities, park management and tourism (Figure 8.2). At present, tourism in the area has provided financial resources for the management of the protected area. Local communities and the protected area are contributing and benefiting from the community-based conservation on the sustainable use of the protected area resources, sustainable development of village settlements and effective management of the area. Local communities have appreciated the role of the protected area. The protected area management has accepted local communities as the partners in conservation and legally empowered them to take greater responsibilities. Local community and protected area management has provided better opportunities for the nature tourism in ACA by effective management of tourism. Figure 8.2 further illustrates the roles of these groups in sustainability. However, it is also evident from this discussion that there are many challenges in currently attaining this balance.

8.7 USEFULNESS OF RESEARCH METHOD APPLIED

Evaluating the impact of community involvement in conservation is difficult despite the fact that attempts made in this research to develop a variety of both social and ecological methodologies. The problem in ACA appears to be the lack of initial baseline databases to assess whether social and ecological indicators change over time. Previous studies in ACA have inclined more often either towards ecological aspects or towards social aspects without considering their interactive effects. However, the simple fact is that biological processes and resources are fundamentally linked to the lives of local communities in the Himalaya (Hatley & Thompson 1985).

The integrated biophysical science and social survey has provided substantial and reasonably reliable information. It suggests that information on the success of a conservation initiative in the Himalayas hinge on the connection between ecological and social issues. The present research offers a sound foundation for more comprehensive monitoring of the community-based protected area management in ACA, other similar protected areas in Nepal or elsewhere in the world. The researcher's earlier association with the area and its people has helped to acquire a much greater depth of information. A majority of the respondents including villagers, ACA staff and national conservation policy makers appreciated and enthusiastically cooperated, because unlike most of the previous researches, they probably expected that the outcomes will have immediate management implications and actions. Most of the time they have encountered researchers who have neither any previous knowledge of the area nor any long-term commitment to the future of the area.

The application of participatory methods enabled key factors to be explored concerning local community's perceptions regarding various resource management initiatives. As data collection and analysis were undertaken together with local communities, the communities were often able to visualise the impacts and implications of the conservation. However, it is appreciated that the validity and reliability of the information generated through this method is highly influenced by the skill of the facilitator. The facilitator must have good communication skills, listening skills, knowledge of local culture and the ability to ask relevant questions. The stratification of a village community based on gender, occupation and caste ensured that the *voiceless* were heard, that other norms were followed, that learning occurred, and practical results were produced (World-Bank 1996). Use of visual tools such as photographs, matrices, Venn diagrams, maps were found to be very effective. The information obtained was usually validated through triangulation. Triangulation was achieved by using different methods of data collections, and cross-referencing individual responses with those from the biophysical survey, structured individual interviews, focal group discussion and questionnaire survey. The information generated from participatory methods was generally found valid and reliable. However, on certain occasions when a sense of insecurity was high as a result of a number of rebel group's activities, the participatory tools were not found to be effective. Local villagers were fearful to speak out openly in a group or tried to avoid a group discussion. In contrast, structured individual interviews were found to be more useful and appropriate in such circumstances.

The structured individual interview method allowed a greater depth of information to be obtained regarding peoples' experiences, opinions, aspirations, attitudes and feelings (May 1997). As the method relies upon the use of a questionnaire as the data collection instrument, the participatory research conducted prior to structured interviews was found to be useful in preparation, refinement and rewording of the questionnaire. A team of three people conducted the interviews and respondents were encouraged to clarify or amplify an answer as in semi-structured interviews. To permit comparability between responses, generally, the same person posed questions in a similar way throughout the research. However, allowing a respondent to probe an answer occasionally deviated from the pre-conceived structure of the interview and thus prolonged some of the interviews. Involvement of three persons in interviews was found to be effective because different individuals were responsible for recording the data in a questionnaire, posing and probing questions, and maintaining a good rapport and keeping the interview on track. The situation where many people may not reply truthfully in response to questions asked by a third party, was reduced by probing and cross-referencing information with data from participatory research. The structured individual interviews were found to be very useful in generating substantial quantitative data.

The questionnaire survey on wildlife-human conflicts allowed an analysis of the severity of the conflict in the area. A majority of the respondents of the questionnaire survey cooperated because the concern that was reflected in participatory discussions was then separately addressed by the research. The information obtained on crop damage by wildlife could not be validated through a crop damage survey at each farm. However, several other studies have reported that villagers tend to over-report the scale of the problem (Gillingham & Lee 2003; Sekhar 1998). Therefore, further research on crop damage at each farm level will be valuable.

The integration of various biophysical and social survey methods provided a fuller understanding of conservation impacts to be obtained by observing the situation on the ground to which people referred. The methods explored the present status of wildlife and forest resources, and current pressures on forest resources within intensive use and protected forest zones. For example, increased use of fuelwood from private woodlots was verified by sampling wood stacks at the household level and density of cut stumps. Higher quantity of wood species such as alder (*Alnus nepalensis*) in a stack validates the information on use of private woodlots. Information from participatory research and structured interviews were useful in assessing anthropogenic disturbances to forests. The forest samples that were sited in a time series manner were found to be more realistic and meaningful than distance in high mountain terrain. However, use of satellite imagery and aerial photographs obtained at periodic intervals as used in the Wolong Nature Reserve, China (Liu et al. 2001) could have given a better picture of pre-and post-protected area establishment changes in forests cover. There were insufficient coverage available for the present research and insufficient time to analyse what was available. Therefore, such analysis is recommended in the future.

Similarly, the problems of crop damage indicated in participatory research and structured interviews were confirmed through the wildlife-human conflicts questionnaire survey. Improvement in forest conditions claimed by an overwhelming number of people was also confirmed through the ecological survey. This suggests that these methods allowed valid and reliable information to be acquired. However, data analysis revealed some differences between the results of participatory research with structured interviews and the questionnaire survey. A majority of participants during the participatory research reported livestock depredation by wildlife. However, the questionnaire survey revealed that livestock depredation by wildlife was less of a problem. Similarly, it was reported during the participatory discussion that CAMR has strengthened conservation initiatives. However, in reality a majority of the people were found to be unaware of CAMR. This indicates that villagers occasionally appeared to pretend that they were aware of all issues and concerns of their village in a participatory discussion.

The methods successfully meet the objectives of the study and it can be claimed therefore that the integration has been effective. However, there were several limitations of the study that might have influenced the findings and probably reduced their accuracy. The circumstances in which the research was conducted and timing were primary limiting factors for the study. Most of the research was carried out during an extremely unfavourable political situation. One of the PRA exercises was carried out in the presence of armed rebels (also see Chapter 4). This state of psychological pressure made our work relatively difficult. The forest survey was much more challenging both in terms of difficult terrain and insecure political situation. A majority of villagers or other people I consulted during the research suggested leaving out the forest research because the rebel groups were active in most of the forests. There was an equal danger of an attack by military during the research in forest by confusing our research group with the rebel groups. At that time the military were actively searching for rebels groups in the forest area by a helicopter. Therefore, the forest survey was conducted only in 'safe villages' within selected research sites. The findings would have been more precise if forest survey results could have been obtained from the entire selection of study villages. Further, the forest survey results represent only one particular season of a year. There might be variation particularly among regenerating species and anthropogenic disturbances according to the season. These are aspects, which deserve to be followed up in future research.

8.8 THE WIDER APPLICABILITY OF THIS WORK

Despite the ongoing debate, the local communities' role in protected area is being accepted, encouraged and, indeed, embraced in different parts of the world (Brown & Kothari 2002). In this context, the outcomes of the present study will have a wide applicability in creating, developing, and improving community-based protected area management systems. The study will also provide an arena for improvements of park-people relationships in many protected areas. Although the findings should be considered only within the specific socio-economic, political and cultural parameters of the study area, some recommendations can be made that may be broadly applicable to similar situations elsewhere.

The most fundamental shift made by ACA in the protected areas of Nepal is acceptance that local communities can live legally within the protected area and continue traditional activities compatible with the objectives of the protected area. The ACA approach emphasised that the IUCN category VI proved to be equally effective in both conservation of biodiversity and improving local livelihood concerns. A careful balance between ecological integrity of the protected area with the social and economic needs of the local communities has made conservation and development achievable. The real involvement of local communities in conservation was achieved by enabling and empowering local communities in resource management through enhancing their conservation awareness and attitudes, appropriate policy and legislation, social services addressing social and economic needs of the local communities, and maintaining mutually beneficial relationship between the local communities and the protected area staff. It is, therefore, undisputable that the aim of the community-based protected area management cannot be pursued within strictly protected nature reserves within the IUCN categories I, II and III, where wilderness protection is generally the main management goal. This implies that community-based conservation should be fostered in those protected areas that value the interactions between people and nature, and view management activities as a critical aspect of protection, as is the case for IUCN categories V and VI (Oviedo & Brown 1999).

The results show that an overwhelming majority of local communities including women were involved in conservation of their local resources. It is evident that resources were effectively managed. The right of access to resources for the livelihood and ultimately the authority on resources management, which are granted to local communities, has been one of the key elements that encouraged local communities to conserve their resources. The results have indicated that right of access to resources has been found to be a major incentive for local communities to be involved in conservation. It also indicates that protected area management must be adapted in ways that respects local communities rights and traditions (Oviedo & Brown 1999).

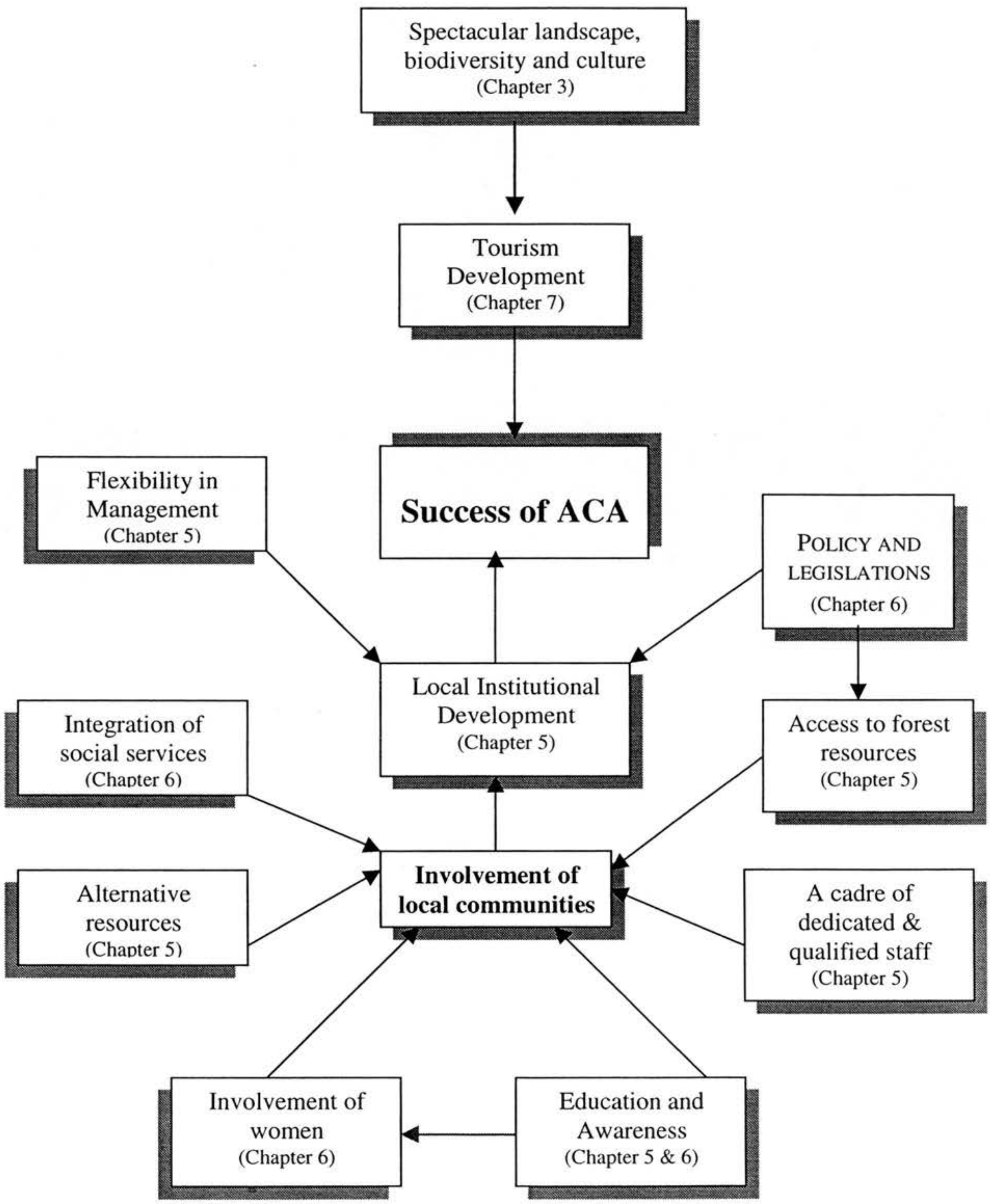
Education ought to be a way of equipping people for the future (Burton 1975). Therefore, education that delivers relevant knowledge regarding conservation was found to be unquestionably another important element for community-based protected area management. The more a community understands the values of resources in their area, the more reasons its members will find to justify its conservation (Western 1994a). Traditionally local communities in the middle hill and mountain areas were aware of conservation needs. However, the study has demonstrated that awareness and understanding of conservation issues among the local communities in throughout study sites within ACA was comparatively higher than outside. Local communities had positive attitudes towards conservation. The changes in their attitudes have been expressed by their behaviour and conservation actions in the area. These changes have encouraged local communities to conserve natural resources, wildlife habitat and wildlife. Some of the typical examples were establishment of active local conservation institutions, abandonment of hunting, establishment of private and community woodlots, appreciation of increases in wildlife population, emerging trend of reduced fuelwood use, appreciation of the role of a protected area, and effectively maintaining village sanitation and infrastructures. The local communities, at present, enjoy a stronger sense of identity because of the community-based protected area.

The interests of local communities and park staff should be compatible for successful collaboration. Most conservation failures are the result of mismatched interests (Western 1994a). The mutual trust and respect between local communities and park staff indicate that the approach is successful in developing good relations between the park and local communities. Therefore, the 'park staff harassment' often referred to with respect to the enforcement of park regulations by staff (Infield & Namara 2001) has not been an issue in ACA. The mutual trust, respect and regular interactions to discuss local specific issues have encouraged to believe among local community that the benefits outweigh the costs. However, there is a potential danger that the park managers and staff may not take concrete efforts towards conservation because they may want to maintain mutual trust and respect with local communities.

Policy and legislation supporting decentralisation are required to enable local communities to initiate, manage and protect community-based initiatives (Jeanrenaud 1999; Worah 2002). The existing conservation policy and legal documents in ACA provide a unique opportunity to involve and empower local communities in conservation. These documents have granted responsibilities and authorities of forest resource management to local institutions. Local institutional development has resulted from these policies. These policies and regulations enhanced ownership feeling and a sense of belonging among local communities. In general, the community-based approach has been enhanced with appropriate policy and legislation. However, as Western et al. (1994) point out, policies alone will be ineffective in the absence of sufficient education, awareness, local leadership, scientific knowledge, and institutional capacity, which often are lacking. It is evident that awareness of and compliance with the regulations was lacking in ACA. There is also a need for the CAMC Management Action Plan to demonstrate a systematic approach to managing community-based protected area at the ground level.

Local communities deserve improvements in their livelihood conditions by improved social services and better economic opportunities within their village. Therefore, the protected area management should have regard to the social and economic well being of local communities. This indicates that basic social services and benefits from various economic opportunities must be integrated in community-based conservation. It is evident in ACA that the establishment of the community-based protected area has played a positive role to improve social services in village settlements such as drinking water, access roads, schools and bridges. These supports have encouraged local communities to participate in conservation and in development. However, the results also reveal that most of the economic activities were limited to subsistence.

Figure 8.3 The focus on economic and livelihood incentives is not enough for the success of a community-based protected area. There are various attributes, which contributed in the success of the community-based approach in ACA. Some of the major attributes are presented here in a diagrammatic form.



From the above discussion, it is clear that conservation is the sum of many interrelated and integrated activities that contribute to the sustainability and maintenance of biodiversity (Western 1994b). Therefore, a careful integration of different elements based on the ecological, political and socio-economic situations of the area is considered to be crucial for the success of community-based conservation. The evidence has shown that development can be linked successfully to conservation. It indicates that the approach works. New conservation areas are emerging in Nepal based on the ACA approach. Other conservation projects could draw lessons from this community-based model of protected area management.

8.9 Suggestions for improving the effectiveness of the ACA approach

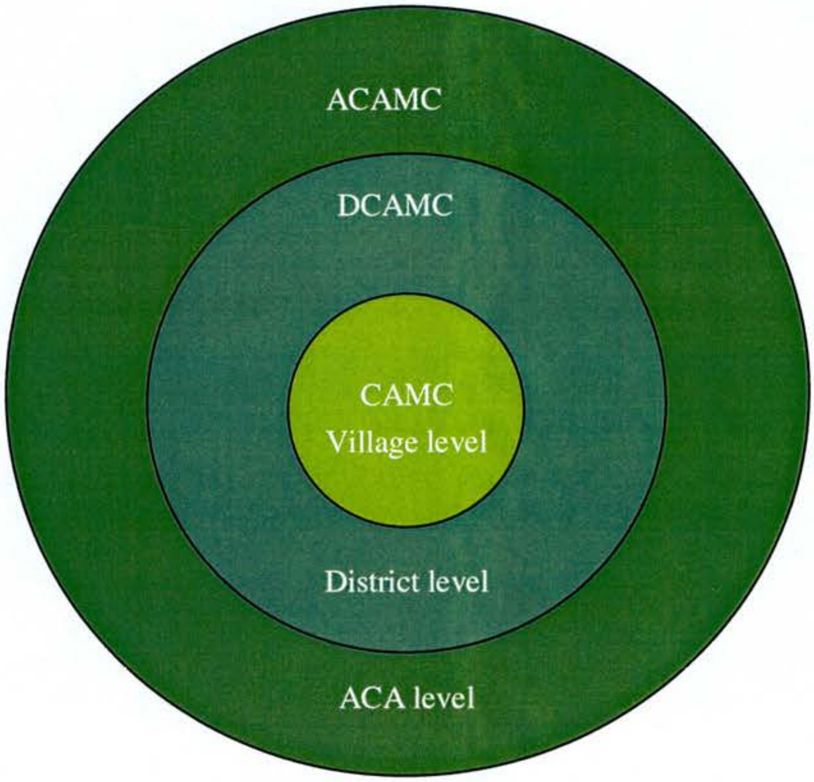
Community-based protected area management is a *process*, which should keep on developing by continuously addressing both internal and external issues. Educating, enabling and empowering local communities to take a greater role in protected area management by themselves will always have importance. To achieve lasting success, it is equally important to address effectively the potential weaknesses of the approach. Some suggestions to strengthen the community-based protected area management that emerged in the study are discussed below.

Expanding CAMC beyond a village political boundary

The major drawback of community-based conservation is its localised nature and therefore, local communities are often ignorant of the larger political, economic and environmental forces that touch every society (Western 1994a) and find it difficult to manage resources that have a wide geographical spread (Agrawal & Gibson 2001). Equally, biodiversity extends well beyond the boundaries of any single community or collection of communities. Therefore, decisions made at a district or regional level may prove critical for community-based conservation programmes (Little 1994). Ignorance or denial of such forces are likely to weaken the community (Western 1994a). The main local conservation committees in ACA function and use their rights only within the political boundary of a VDC. Furthermore, there is inadequate communication and interactions between CAMCs operating in neighbouring VDCs, hence limiting their political ability to deal with district and regional issues. Consequently, there is a need for additional tiers in the community management structure (KMTNC-ACAP 2000a), which are elaborated below.

A conceptual new community management structure is proposed to address issues beyond village level boundaries (Figure 8.4). The present structure aims to enable local communities to be represented and participate at local, regional and national levels. ACA is spread over five political districts. Therefore, five district level conservation area management committees (DCAMC) have been proposed. The role of DCMC will be to manage the protected area from district level perspectives by coordinating with all the CAMCs of a district and other outside forces such as a district development committee and other agencies. Selected members from each CAMC of a district should be represented in a DCAMC. Furthermore, an Annapurna Conservation Area Management Committee (ACAMC), a committee at ACA level, is also proposed. ACAMC will have a broad role of monitoring and coordinating between five DCAMCs plans and actions. ACAMC will have also a major role of coordinating and negotiating with national policy level groups for the benefit of ACA such as national policy development and national level infrastructure development (road and hydropower). ACAMC should have the capability and authority to challenge and negotiate any outside forces against their conservation policy. Therefore, legal recognition of the new management structure through amendment in present regulations is required. Successful development of these new tiers will give management autonomy to the local communities. However, excessive bureaucracy with these new tiers should be avoided.

Figure 8.4 A conceptual management hierarchy for a community-based protected area management. CAMC operates at a village level. DCAMC will be responsible for regional level conservation issues. An ACAMC will coordinate among regional committees and focus on national policy issues that affect the protected area.



Preventing and mitigating human-wildlife conflicts

Human-wildlife conflicts, particularly as a result of crop damage have been reported from the majority of protected areas in developing countries (Jackson undated; Kharel 1997; Madhusudan 2003; Maih et al. 2001; Naughton-Treves 1997; Rao et al. 2002a; Sekhar 1998; Weladji & Tchamba 2003). Therefore, the Vth IUCN World Parks Congress also raised the concern that if protected areas and other pertinent authorities fail to address such conflicts adequately, local support for conservation declines (IUCN 2003c). The results of the present study demonstrate that the ACA management authority has failed to tackle the problem of crop damage by wildlife. Consequently, for the sustainability of community-based conservation, conflict mitigation must be a high priority in order to maintain and enhance their involvement in conservation. The overriding conservation aim should be to enhance the long-term sustainability of the protected area itself than the survival of every individual 'pest animals' involved in a conflict situation (Karanth & Madhusudan 2002). This does not mean that all the pest animal species should be killed but that the ACA management together with local communities need to explore all possible ways to prevent and mitigate human-wildlife conflicts due to crop damage.

Strengthening capacity of local institutions

Community-based protected area management will only succeed if there are local institutions and a network of institutions capable of dealing with different levels of issue. The policy and regulations in ACA have provided a strong legal basis for local institutions to function in planning and management of the protected area. The devolution of responsibility and authority to local communities is an indicator of success. However, the majority of local institutions do not yet have enough capacity to deal with legal issues and issues beyond their village boundaries, indicating a strong need for strengthening the capacity of local institutions. Additional time and resources need to be allocated to build and strengthen the capacity of local institutions particularly CAMC.

Enhance positive impacts of tourism development

There is evidence that tourism is one of the major components behind the success of the community-based conservation in ACA. The special privilege of retaining the tourism revenues within the area has made implementation of various conservation and development activities possible. It is evident that positive impacts can come about with careful planning and management of tourism and conservation together with local communities. However, the desire to increase business also encourages overexploitation and environmental destruction (Western 1994a), which need appropriate monitoring and timely management responses. On the other hand, there is also a clear need for broadening economic opportunities from tourism to local communities. Consequently, to manage tourism effectively, a comprehensive management plan is required and the ACA management needs to give priority to develop a tourism management plan. The plan should explicitly address issues such as linking tourism with the local economy and reducing some of the observed negative impacts of tourism.

Research and monitoring

Research helps to reveal the truth for 'evidence-based conservation' (Sutherland 2000). Research and continuous monitoring is required to identify the problems of protected areas and to evaluate priorities for responding to them (Schaik et al. 2002). This stresses the point that application of "*scientific methods*" is essential for the effective management of a protected area. As the community-based conservation approach is about people and about species or ecosystems, application of both ecological and social sciences is equally important. In the absence of a systematic programme to monitor the state of protected areas, it is impossible to know whether conservation efforts are being successful (Terborgh & Davenport 2002).

It is argued therefore that research and monitoring should be a high priority of ACA for management effectiveness. However, at present, research and monitoring has been accorded the least priority in terms of annual budget allocation in ACA. In the last five years (fiscal year 1996/97 to 2000/01), ACA has invested less than one percent of its total annual budget in this type of activity. There is a wide gap in knowledge regarding social and ecological issues of the area, which could have direct impacts on management. For example, information on demographic changes, changes in wildlife populations, impacts of livestock grazing, impacts of crop damage by wildlife, economic impacts of conservation, financial costs and benefits of conservation, demand and supply condition of resources and tourism impacts on wildlife are some of the issues that need addressing. As ACA is extremely diverse with different stakeholders, the future research and monitoring should consider each of the main stakeholders such as ethnic origin, caste, age, gender, profession and economic and social status of the area. The present research has provided a base line for such assessment and monitoring.

8.10 Conclusions

This study has provided the most detailed analysis so far available on the ecological and social impacts of community-based protected area management in Nepal. The overall assessment demonstrates that community-based protected area management has been successful in balancing ecological integrity and the social needs of the Annapurna region. Instead of relocating people from a protected area as in a national park, which often has devastating impacts on local livelihoods, the ACA approach has given consideration to enhance local livelihood activities. Sustainable use of resources has been developed as a way of meeting local subsistence needs. The environmental degradation and wildlife hunting have been reduced indicating that current human activities do not necessarily damage natural ecosystems. More importantly, a system of local community management has been developed. The evidence shows that the community-based protected area management works. The most important reasons for the success of the community-based model in ACA are:

- Development of local conservation institutions;
- Rights to access and control over resources devolved to local communities;
- Appropriate policy and legislation in place to enable community involvement;
- Strong emphasis given to strengthen local capacity to manage resources, and enhance awareness and attitudes towards conservation;
- Mutual trust and partnership between local communities and park authorities;
- Effective programmes and policies to support local needs and aspirations;
- Successful involvement of a NGO in the protected area management and;

- A sustainable source of finance to support the initiatives.

The success achieved in ACA might not be easily achievable in other areas within the country and outside. ACA is unique in terms of management, landscape, finance, and people and their culture, which would not be available in other areas. The management of ACA by a NGO, the KMTNC, with full support from the national government, is an exceptional arrangement in protected area management in Nepal. ACA has land formation with diverse habitats and spectacular view. As a result, ACA has attracted international donors and visitors to the area. The conservation initiative in the area has been financed through overseas donors and the tourism revenues. In addition, the local people in ACA have a strong culture of working together for the benefit of the society through their traditional institutions. Therefore, the success of conservation initiative in ACA is not just about biodiversity conservation but the whole '*package*' that ACA offers.

Local communities were found to be empowered through appropriate authorities, policies and legislation to conserve species, whole ecosystems and landscapes. The improved awareness and improved attitudes towards conservation have strengthened local community's commitments to conserve resources. Tourism has become a vehicle for conservation. The integration of tourism, local communities and protected area management are the key factors influencing the success of the community-based protected area approach. A careful and strategic balance of these three elements does appear to deliver continued sustainability within ACA. However, such efforts could be put at risk by threats from national and international political problems. There is a growing danger that the present state of insecurity and instability in the country not only reduces tourist numbers and demolishes park infrastructure but also reduces the capacity of local communities and the park staff to manage resources. There are many examples elsewhere in the world where civil war in a country has led to dysfunction of protected area management (Hart 2002; Oates 2002). This gives a stark warning that the protected area may be at risk in future, if the Maoist insurgency undermines all the achievements made to date.

Finally, there are certain potential flaws in the management of the protected area that need to be corrected. Although there is no significant difference in responses among different stakeholders such as man, women and occupational caste group, the results indicates that poorest group of people, particularly occupational caste group (Kami, Damai and Sarki) should be given more opportunities for participation in conservation and also sharing conservation benefits. Many issues such as human-wildlife conflicts, enhancing legal knowledge among local communities, reducing observed negative impacts of tourism, spreading tourism benefits more widely and greater application of scientific research for evidence-based management have not yet been properly addressed by the management authorities. However, the research has clearly shown that if authority and responsibility are given to the local communities who have to bear the consequences of conservation, there should be a more environmentally and socially just system. The evidence of the study has proved the effectiveness of the approach. It is argued that the principles of the approach can be replicated in Nepal and probably elsewhere, wherever there is a traditional link between biological processes and resources to the livelihood of the local community. But each case will require appropriate modifications with respect to culture, socio-economic and ecological situations. In the light of these findings, the research concludes that community-based approaches could be a good alternative to a conventional people exclusive park formation in many situations, particularly in developing countries.

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APPENDICES

Appendix 3.1

King Mahendra Trust for Nature Conservation: A Brief Introduction

The King Mahendra Trust for Nature Conservation (KMTNC) was established in 1982 by a legislative act. KMTNC is mandated as an autonomous, non-profit and non-governmental organisation to work in the field of nature conservation in Nepal. It is honoured to receive the august patronage of His Majesty King Gyanendra Bir Bikram Shah Dev, and is privileged to have His Royal Highness Crown Prince Paras Bir Bikram Shah Dev as the Chairman. The Trust is governed by the Board of Trustees of prominent national and international personalities in nature conservation and sustainable development. A network of international partners supports the Trust. Currently there are seven KMTNC's partners in the United Kingdom, the United States of America, Canada, Germany, France, the Netherlands, and Japan.

KMTNC's mission is to promote, conserve and manage nature in all its diversity balancing human needs with the environment on a sustainable basis for posterity - ensuring maximum community participation with due cognisance of the linkages between economics, environment and ethics through a process in which people are both the principal actors and beneficiaries. The mission is supported by the following guiding principles:

- Always enduring a balance between human needs and the environment to guarantee long-term sustainability.
- Always seeking maximum community participation in which the local people are recognised both as principal actors and beneficiaries.

- Always linking economic, environmental and ethical factors in conservation activities.
- Always managing operations based on sound economic principles.
- Always aiming for quality in all activities.

Over two decades, KMTNC has successfully under taken over 100 small and large projects on nature conservation, biodiversity protection, and sustainable rural development programmes. The Trust's experience over the years has shown that the conservation efforts in poor and overpopulated country such as Nepal cannot be successful unless it addresses the needs and welfare of the local people. Holistic and integrated conservation and development programme with active people participation aimed at promoting local guardianship thus have been the focus of all KMTNC's activities.

Geographically, the Trust's activities in Nepal have spread from tropical low lands to high Himalayas including Trans-Himalayan regions. The most notable among them is the Annapurna Conservation Area Project (ACAP), a world class eco-tourism model initiated by the King Mahendra Trust for Nature Conservation (KMTNC) and World Wildlife fund for Nature (WWF) to manage the Annapurna region (Newar 2003). At present, the Annapurna Conservation Area Project, which manages the Annapurna Conservation Area (ACA) is the largest and most successful undertaking of KMTNC. ACA covers an area of 7,629 sq. km. and is home to over 120,000 local people of different ethnic, cultural and linguistic groups. It is also a treasure house for mountain biodiversity. Current other KMTNC activities are management of the Manaslu Conservation Area Project inGorkha, the Central Zoo in Kathmandu, the Biodiversity Conservation Centre in Chitwan, and the Bardia Conservation Programme in Bardia.

Some of the major KMTNC's strengths are listed below:

- Royal patronage and leadership have contributed recognition and prestige to the Trust nationally and internationally.
- As a national NGO, the Trust can operate projects with flexibility and speed unhindered by bureaucratic red tape as in the public sector.
- The KMTNC Act gives clear mandate and authority to complement and supplement the government efforts in nature conservation and protected area management.
- Governing Board of Trustees consists of distinguished and recognized national and international personalities.
- Network of chapters provides international linkages and recognition.
- Recognized as a non-political and competent NGO with high credibility; substantial and rich experiences gained in nature conservation activities since the beginning of its operations; pioneering achievements of the Trust in nature conservation regarded as impressive by different groups of stakeholders, conservation agencies and donors.
- Confidence and goodwill earned from donors, as the Trust is able to achieve output as per their expectations.
- Credibility and rapport with local community, accepted as service provider by local community and responsive to local needs.
- Integrated/holistic/grass root approach; directly working with stakeholders; directly working with stakeholders; respect for traditional practices, maximization of local resources.
- At the project level, effective coordination and communication with local government agencies such as the Ministry of Forest and Soil Conservation, the National Planning Commission, the Department of National Parks and Wildlife Conservation, the Department of Tourism and so on.

- Bottom to top planning followed at the project level.
- Experienced, trained, competent and committed staff in the field projects; effective teamwork and good communication within field level projects.
- Impressive qualification, specialization and expertise of staff in various disciplines related to nature conservation.
- Excellent physical facilities and well-equipped offices suited to the work undertaken in field offices.
- Capacity to design and implement innovative programs such as integrated conservation and development project in ACAP.

Note: This document has been adapted from KMTNC (2000) and KMTNC's official web page www.kmtnc.org.np (KMTNC 2003).

Appendix 3.2

A LIST OF SOME IMPORTANT MAMMALS AND BIRDS FROM ACA

MAMMALS

A TOTAL OF 101 MAMMAL SPECIES HAVE BEEN REPORTED FROM THE ANNAPURNA CONSERVATION AREA.

No.	English Name	Scientific Name
1.	Argali	Ovis ammon
2.	Asiatic Black Bear	*Ursus thibetanus*
3.	Assam Macaque	*Macaca assamensis*
4.	Black-striped Weasel	*Mustela strigidorsa*
5.	Beech Marten	*Martes foina*
6.	Bengal fox	*Vulpes bengalensis*
7.	Bharal	*Pseudois nayaur*
8.	Brown Bear	*Ursus arctos*
9.	Clouded Leopard	*Neofelis nebulosa*
10.	Common Goral	*Naemorhedus goral*
11.	Common House Mouse	*Mus musculus*
12.	Common Palm Civet	*Paradoxurus hermaphroditus*
13.	Crab-eating Mongoose	*Herpestes urva*
14.	Eurasian Lynx	*Lynx lynx*
15.	European Otter	*Lutra lutra*
16.	Golden Jackal	*Canis aureus*
17.	Grey Wolf	*Canis lupus*
18.	Hanuman Langur	*Semnopithecus entellus*
19.	Himalayan Marmot	*Marmota himalayan*
20.	Himalayan Musk Deer	*Moschus chrysogaster*
21.	Himalayan Tahr	*Hemitragus jemlahicus*
22.	Hoary-bellied Squirrel	*Callosciurus pygerythrus*
23.	Hodgson's Flying Squirrel	*Petaurista magnificus*
24.	House Shrew	*Suncus murinus*
25.	Indian Flying-fox	*Pteropus giganteus*
26.	Indian Grey Mongoose	*Herpestes edwardsii*
27.	Indian Hare	*Lepus nigricollis*
28.	Indian Muntjac	*Muntiacus muntjak*
29.	Indian Pangolin	*Manis crassicaudata*
30.	Indian Porcupine	*Hystrix indica*
31.	Jungle Cat	*Felis chaus*

32.	Kiang	*Equus kiang*
33.	Large Indian Civet	*Viverra zibetha*
34.	Leopard Cat	*Prionailurus bengalensis*
35.	Leopard	*Panthera pardus*
36.	Mainland Serow	*Naemorhedus sumatraensis*
37.	Malayan porcupine	*Hystrix brachyura*
38.	Marbled Cat	*Pardofelis marmorata*
39.	Masked Palm Civet	*Paguma larvata*
40.	Nubra Pika	*Ochotona nubrica*
41.	Orange-bellied Squirrel	*Hylopetes alboniger*
42.	Red Fox	*Vulpes vulpes*
43.	Red Panda	*Ailurus fulgens*
44.	Rhesus Macaque	*Macaca mulatta*
45.	Royle's Pika	*Ochotona roylei*
46.	Siberian Weasel	*Mustela sibirica*
47.	Small Indian Civet	*Viverricula indica*
48.	Smooth-coated Otter	*Lutrogale perspicillata*
49.	Snow Leopard	*Uncia uncia*
50.	Yellow-bellied Weasel	*Mustela kathiah*
51.	Yellow-throated Marten	*Martes flavigula*

Source: (Inskipp & Inskipp 2001)

BIRDS

A TOTAL OF 474 BIRDS SPECIES HAVE BEEN REPORTED FROM THE ANNAPURNA CONSERVATION AREA.

No.	English Name	Scientific Name
1.	Satyr Tragopan	*Tragopan satyr*
2.	Koklass Pheasant	*Pucrasia macrolopha*
3.	Himalayan Monal	*Lophophorus impejanus*
4.	Cheer Pheasant	*Catreus wallichii*
5.	Blood Pheasant	*Ithaginis crentus*
6.	Kalij Pheasant	*Lophura leucomelana*
7.	Lammergeier	*Gypaetus barbatus*
8.	Himalayan Griffon	*Gyps himalayensis*
9.	Golden Eagle	*Aquila chrysaetos*
10.	Grey-backed Shrike	*Lanius tephronotus*
11.	Red-billed Blue Magpie	*Urocissa erythrorhyncha*
12.	Scarlet Minivet	*Pericrocotus flammeus*
13.	Yellow-bellied Fantail	*Rhipidura hypoxantha*
14.	Brown dipper	*Cinclus pallasii*
15.	Chestnut-bellied Rock Thrush	*Monticola rufiventris*
16.	Blue-fronted Redstart	*Phoenicurus frontalis*
17.	White-capped Water Redstart	*Chaimarrornis leucocephalus*
18.	Little forktail	*Enicurus scouleri*
19.	Himalayan Bulbul	*Pycnonotus leucogenys*
20.	Grey-hooded Warble	*Seicercus xanthoschistos*
21.	Rufous Sibia	*Heterophasia capistrata*
22.	Green-tailed Sunbird	*Aethopyga nipalensis*
23.	Dark-breasted Rosefinch	*Carpodacus nipalensis*
24.	Collared Grosbeak	*Mycerobas affinis*
25.	Ashy Wood Pigeon	*Columba pulchricollis*
26.	Asian koel	*Eudynamys scolopacea*
27.	Black Eagle	*Ictinaetus malayensis*
28.	Brown Fronted Woodpecker	*Dendrocopos auriceps*
29.	Cattle Egret	*Bubulcus ibis*
30.	Common Kingfisher	*Alcedo atthis*
31.	Crested Serpent Eagle	*Spilornis cheela*
32.	Dark-sided Flycatcher	*Muscicapa sibirica*

Source: (Inskipp & Inskipp 2001)

Appendix 3.3

PROTECTED AREAS COVERAGE IN NEPAL

No.	Protected Area	Physiographic Region	Area in km^2	Buffer Zone km^2
1.	Annapurna Conservation Area	Middle and High Mountains	7629	-
2.	Dhorpatan Hunting Reserve	High-Mountain	1325	-
3.	Kanchunjunga Conservation Area	Middle and High Mountains	2035	-
4.	Khaptad National Park	Mid-Mountain	225	-
5.	Koshi Tappu Wildlife Reserve	Terai	175	-
6.	Langtang National Park	Middle and High Mountains	1710	420
7.	Makalu-Barun National Park	High-Mountain	1500	830
8.	Manaslu Conservation Area	Middle and High Mountains	1663	-
9.	Parsa Wildlife Reserve	Siwalik	499	-
10	Rara National Park	High-Mountain	106	-
11	Royal Bardia National Park	Terai-Siwalik	968	328
12	Royal Chitwan National Park	Terai-Siwalik	932	750
13	Royal Suklaphanta Wildlife Reserve	Terai	305	-
14	Sagarmath National Park	High-Mountain	1148	275
15	Shey Phoksundo National Park	High-Mountain	3555	449
16	Shivapuri National Park	Mid-Mountain	144	-
	Total		23,919	3051
	Total Area	26,970		
Total percentage of country's land		18.32		

Appendix 3.4

A CHRONOLOGY OF THE ACA DEVELOPMENT

1971	Field reconnaissance in the region to determine the potential for a National Park made by T. S. Choate.
1974	John Bowler, a FAO consultant followed up in 1974 and supported recommendation for a National Park.
1980	The area proposed as a *Rashtriya Prakritik Manoronjon Sthall* (National Recreational Area) by Mr. Karna Shakya.
March 1985	Concern expressed by the late King Birendra following an unofficial tour of the Western Development region, of the delicate imbalance between conservation of the natural resources in the region and economic growth.
March 1985	Directive to determine protective status, requiring a management plan to balance basic needs of the local inhabitants and tourism development and nature conservation.
May 1985	'A Nepal Plan' was put forwarded by Bruce Bunting and M. R. Wright from the World Wildlife Fund.
June 1985	KMTNC carried out a study in the Annapurna region. The team prepared the Annapurna Conservation Area Project - Operational Plan.
March 1986	The Governing Board of KMTNC approved the ACAP Operational Plan
July 1986	The Operational Plan approval from high level government officials in the meeting chaired by HRH Prince Gyanendra Bir Bikram Shah
September 1986	His Royal Highness Prince Gyanendra Bir Bikram Shah, Chairman of Trust, made the official announcement of the establishment of ACAP at WWF - International 25th Anniversary in Assisi, Italy

December 1986	First Regional Headquarters established in Ghandruk. A pilot programme initiated.
November 1987	The Cabinet approved the ACAP Operational Plan for implementation
April 1989	Pilot programme evaluation and Stage 1 needs assessment made by a Nepalese Team
11th November 1989	**DRV Environmental Award 1989** from the German Travel Bureau of West Germany
January 1990	ACAP expanded to Stage I area with establishment of a field office in Lwang
1991	"**Tourism for Tomorrow"** Award UK, a regional level awarded to ACAP
21st February 1992	The Ghandruk Forest Management Committee was awarded "***J. Paul Getty Wildlife Conservation Award***" by WWF US.
1992	**ACAP** was awarded a global level "**Tourism for Tomorrow"** Award UK
5th June 1994	The Ghandruk Conservation and Development Committee was awarded "***Global 500 Award***" by UNEP.
December 1996	Promulgation of the Conservation Area Management Regulations in Nepal Gazette
December 1996	The Conservation and Development Committee was legally recognised as Conservation Area Management Committee based on the regulation
19th January 1996	**HRH Prince Gyanendra Bir Bikram Shah** laid Foundation stone for construction work of Conservation Education Centre cum Head Quarters Office Building of ACAP at Hariyokharka, Pokhara
1997	The Governing Board of KMTNC approved ACAP Management Plan
15th June 1998	HRH Prince Gyanendra Bir Bikram Shah inaugurated the Conservation Education Centre cum Head Quarters Office Building of ACAP at Hariyokharka, Pokhara

14th November 2000	**"Conservation Merit Award –WWF"** awarded to Min Bahadur Gurung, Chairperson, Ghandruk Conservation Area Management Committee
2001	ACAP HQ Pokhara and field offices in Lwang, Sikles, and Bhujung were attacked and damaged by the Maoist rebel group
21st June 2001	**HMG Nepal** approved extension of extended ACA management responsibility by KMTNC for next ten years.
December 2001	Chairman of Machhapuchhare VDC and ex-officio member of CAMC was shot dead by the rebel group.
November 2002	The ACAP office at Ghandruk attacked and destroyed by the rebel group.

Appendix 3.5

Some important points from the Conservation Area Regulation 2053 (1996) and its Guidelines 2056 (1999)

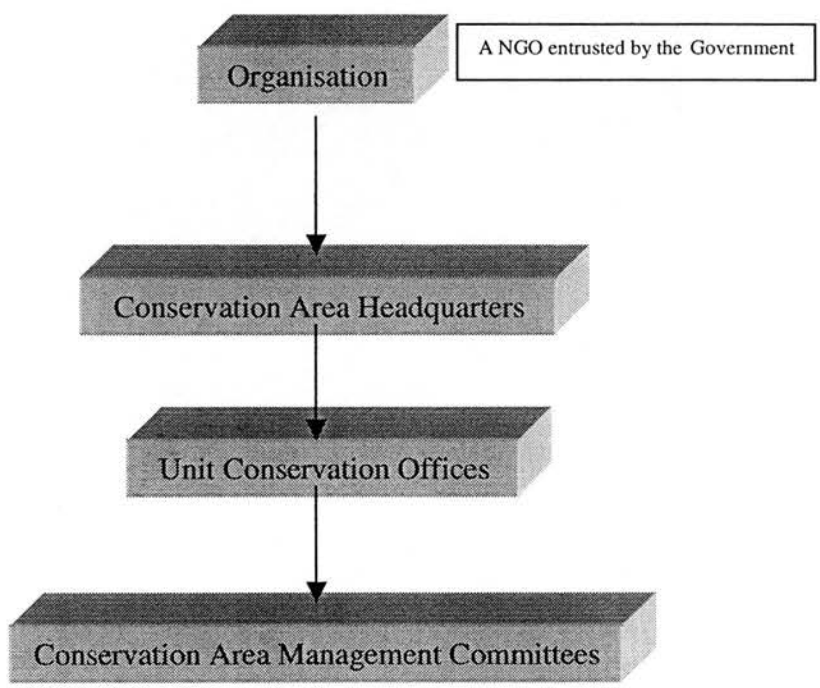
The conservation history of Nepal shows progressive development of nature conservation policies with careful consideration of the social, economic and political climate in which it occurs. The realisation of the severity of the park-people conflict has led the government to approve legislation allowing for (1) the creation of conservation areas in addition to more-strictly protected areas such as national parks and wildlife reserves, and (2) the management of buffer zones around more strictly protected areas. The new laws underlie the philosophy of community-based conservation by incorporating community participation in management.

The conservation area regulation was endorsed by the government in 1996 under rights provided by the 1973 Act, which is eight years after statutory revisions of Act and formal designation of the first conservation area. Some of the key points of the conservation area regulation are elaborated here.

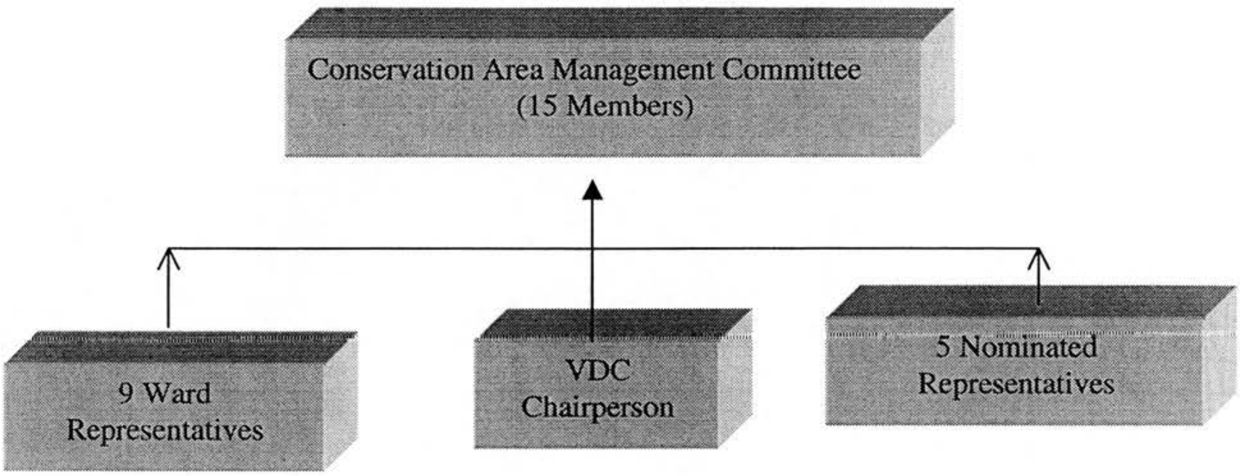
- The conservation area regulation part 3 defines the role of local community by the designation of Conservation Area Management Committees (CAMCs).
- The regulation defines the basic organisational structure and roles of organisation, park headquarters, Chief officer and conservation officers.
- The regulation allows for the division of the conservation area into conservation management units. The divisions of the conservation management unit are based on settlement pattern, traditional resource use practices, and accessibility to the villages and existing resource use conflicts.

- The conservation officer is responsible to constitute the Conservation Area Management Committees (CAMCs) for each village development committee (VDC) located within the conservation area.
- The CAMCs are 15-member committees where the VDC chairperson is a designated member. One member is elected among local users in each ward and the conservation officer nominates 5 members.
- Nomination by the Conservation officers should include representation of women and economically deprived groups in each committee. The members select a chairperson and secretary from among them.

- The organisational structure of a Conservation Area is as follows:



Representation in CAMC



The main duties of CAMCs include

1. Preparation of a management action plan for conserving the environment and sustainable management of the resources. The management action plan should give priority to the management of forests, wildlife and watersheds; cultural heritage conservation; conservation education; community development and alternative energy promotion.
2. Issue permits and collect revenues from the local community for allowing fishing, forest resource utilisation, grazing and other natural resources utilisation. The Committee should decide the amount of fees. The income from these revenues should be utilised by the Committees according to their approved Management Work Plan.
3. The Committees are also entitled to receive 50% of the total income received from legal actions against a person who has done prohibited activity against the regulation.

4. Implement programmes to control soil erosion and landslides; forest resources conservation; natural resources and wildlife conservation; environmental management and creative community development.
5. Call at least six meetings per year and half of the members must be present for the meeting to proceed. Simple majority must make all the decisions. The discussion agendas and decisions of a meeting should be properly recorded.
6. The Committee may constitute sub-committees to conduct the work systematically.
7. Accounts of the Committees should be maintained as suggested by the Conservation Authority.
8. Annual auditing of income and expenditure of the Committees should be done through a registered auditor appointed by the Conservation Authority.

The following activities are either forbidden or need permission from the Chief of a conservation area:

1. Without having written permission from the chief, damage to wildlife habitat; stone gravel mining and removal; possession of firearms, poisons; and electric shocking in rivers and streams are prohibited in the conservation area.
2. The ownership of wildlife in a conservation area remains in the government. Hence, approval from the government is required for wildlife hunting in the conservation areas.
3. No one shall cause damage to public properties such as roads, bridges, office buildings, signboards within a conservation area.
4. Entry permit is required to foreign citizens to enter into a conservation area.
5. Permission from chief of a conservation area is required to conduct scientific research in the area.
6. A licence is needed to initiate a professional or any other works in a government owned land.

7. All the enterprises operated within a conservation area should be registered in respective unit conservation offices.
8. Permission to harvest non-timber forest products such as medicinal plants could be issued which should exclude any outlawed plant species.
9. The government should depute a team of staff with authority to inspect, search arrest; hear the cases; and take legal action to those who act against the regulation.

Sources: (Heinen & Kattel 1992; Heinen & Mehta 1999; Keiter 1995; KMTNC 1996, 1999)

Appendix 3.6

Ethnic groups and Castes within ACA

Gurungs, Tibeto-Mongol ethnic group, are the dominant group in the southern slopes of Annapurna range. The early economy was herding, hunting and swidden (slash and burn) agriculture adapted to rugged highlands and high forests. Today, they grow rice, wheat, maize, millet and potatoes in their terraced fields, and have recently been active in tourism. A great majority of Gurungs join the Gurkha soldiers in the United Kingdom and India. Majority of Gurungs follow mix of Buddhism, Hinduism and Animism. Nevertheless, earlier religion they followed was Animistic and Shamanic , akin to the pre-Buddhist Bon religion of Tibet.

Magars are Tibeto-Burmese group and spread over the area with a major cluster in southwest. The basis economy of the group is agriculture and animal husbandry. Magars are also part of the Gurkha soldiers outside Nepal.

Thakalia are another Tibeto-Mongol ethnic group settled in Thak Khola in Kali Gandaki valley in ACA. The Thakalis, with their outstanding aptitude for business and trade, are among the most successful businessmen in Nepal. The economy is largely based on the salt trade. They do grow barley, wheat, buckwheat, maize, radishes and potatoes. In the recent decade, the Thakalis have become involved in Tourism and relatively very successful in the region. The religion of Thakalis are Buddhist (Lamaism) and Bon Po.

Managaba or Manang Gurung are Tibeto-Mongol group settling in the upper Marshyangdi Valley with its main settlement at Manang. Formerly grain and potato farmers and livestock keepers, the Managba have gained influence and wealth through trade privileges and tourism. The settlement is within the famous Annapurna circuit trek.

Bahuns rank highest in the caste hierarchy of the Indo-Aryan caste group. Along with the Chhetri they constitute the dominant social class of Nepal. They are scattered around the lower hills and valleys of the Annapurna Conservation Area. The main economic activities of Buhans are farming and government service. The Bahuns are followers of Hinduism.

Chhetris rank second highest in the Indo-Aryan caste group. They are scattered around the lower hills and valleys of the Annapurna Conservation Area. The main economic activities of the Chhetris are farming, government service and military services. The Hinduism is the main religion followed by Chhetri.

Occupational groups

Damais are caste group of tailors and musicians. **Kamis** are blacksmiths and **Sarki** are the caste group of leather and shoemakers. They have low social stratum and they are present throughout the southern slope of Annapurna region in the vicinity of Gurungs. Besides their traditional occupations, some of them work as wage labours for Gurung, Bahun and Chhetri within the village, usually paid for in grain. There is also growing trends of sharing cropping *(adhiya)* with the landlords and ex-armies.

Sources: Bista, (2000); Messerschmidt, (1976) and Nepal, (2002)

Appendix 3.7

THE STUDY VILLAGE COMMUNITIES

Study Sites	Longitude (E)	Latitude (N)	Altitude (m)	District	Inside or Outside PA	Tourism	Major Ethnic groups
Chhomrong	83°49	28°25	2110	Kaski	Inside	Yes	Gurung
Ghandruk	83°48	28°22	1935	Kaski	Inside	Yes	Gurung
Landruk	83°49	28°22	1570	Kaski	Inside	Yes	Gurung
Dangsing	83°44	28°20	1710	Kaski	Inside	No	Gurung
Sabet	83°44	28°20	1650	Kaski	Inside	No	Gurung
Thulo Pokhari	83°57	28°14	1490	Kaski	Outside	Yes	Magar & Chhetri
Mauja	84°03	28°16	1335	Kaski	Outside	No	Gurung
Aantighar	84°02	28°16	1630	Kaski	Outside	No	Gurung
Bhujung	84°15	28°18	1638	Lamjung	Inside	No	Gurung
Taksar	84°15	28°13	1350	Lamjung	Outside	No	Gurung
Baghum	84°16	28°16	1645	Lamjung	Inside	No	Gurung
Maling	84°17	28°12	1604	Lamjung	Outside	No	Gurung
Bhulbhule	84°22	28°17	820	Lamjung	Outside	Yes	Gurung
Ngadi	84°24	28°18	1015	Lamjung	Outside	Yes	Gurung

Appendix 4.1

FOREST INVENTORY DATA RECORD SHEET

Recorded By:
Date:
Location:
Altitude:
Aspect:

VDC:
Plot No:
GPS points:
Slope:
% Crown cover:

S. No.	Species	Diameter	Plot Code*	Remarks
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

* A = 2 m x 2 m plot B = 5 m x 5 m plot c = 10 m x 10 m plot

Appendix 4.2

GENERAL OBSERVATION SHEET
FOREST SITE CHARACTERISATION

EVIDENCE OF WILDLIFE

S. No.	Species	Number of animals	Type of sighting
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

EVIDENCE OF GRAZING ANIMALS

S. No.	Species	Number of animals	Type of sighting
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

SIGN OF RESOURCE HARVEST

S. No.	Cut Stumps	Lopping	Remarks
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

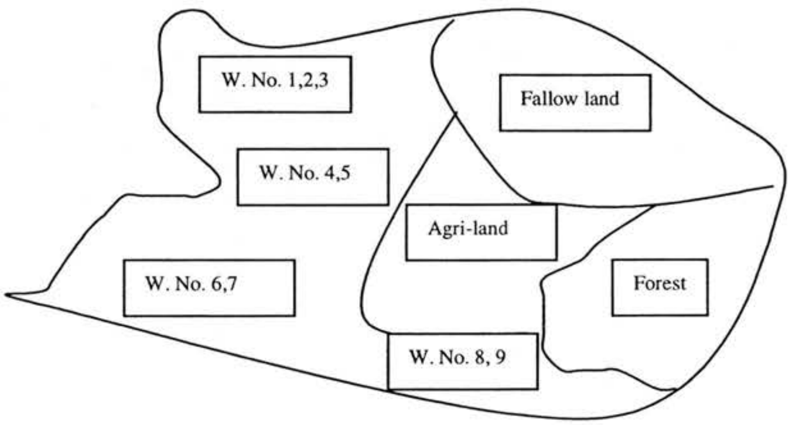
Appendix 4.3

Participatory rural appraisal tools

Participatory Mapping: The aim of the participatory mapping is to get useful information that reveals local perception of boundaries, resource availability and distribution (Freudenberger 1994). The mapping of the forest resources was used to identify forest areas the community use of various purpose. The participants were asked to define the forest areas they use for different purposes. Focus group discussion approach was used to explore interesting changes over time.

Rather than actually doing another map, the participants were asked to alter forest cover or any other forest characters on the original map by changing the amount of grains (maize, beans, broad beans) to show how they have changed over the time. The map will be drawn on a brown paper.

Example: Map of a village



Calendars: Calendars are tools that help to explore changes taking place over the period of a year and are used to find out what happens in different seasons (Freudenberger 1994). The calendar was used to find out what kinds of forest products especially non-timber forest products (NTFPs) are harvested at different times of a year. Once the seasonal utilisation patterns are established, a focus group discussion approach was used to explore the importance, utilisation and management practices.

Example: Forest Products collection calendar

IMPORTANCE		Forest Products Collection Calendar			
Marketing	Home Use				
	•••••• 12 ••••••			Bamboo	
•••••• 6			Med. Plants		
	••• 6 •••		Vegetables		
	•••• 4		Asparagus		
•••••• 6	•••••• 6		Bamboo		
	•••••• 12 ••••••	Fodder		Fodder	
	•••••• 12 ••••••			Fuel	
		Summer	Monsoon	Winter	Spring

The higher the value higher the importance as indicated by the number.

Matrix: Matrix analysis is a powerful technique that can be adapted to many different kinds of information needs. There are different kinds of matrices in use. A historical matrix was used for gathering information on wildlife abundance and social development in the village over time. Photographs of the key indicator mammals and birds species were used to elicit information on abundance at different time periods. The participants were asked to analyse the changes in the wildlife population and social development over the time through a focus group approach.

1. What are the reasons for increase or decrease?
2. Which are the animals are in high demand? Why?
3. Who controls hunting and poaching?
4. What is the frequency of hunting?
5. Do any of the animals decreased have a particular importance for either household consumption or for sale?
6. Are there any problems with the increase in some animal species?

Example: Historical Matrix to analyse the change in wildlife population

Indicator \ Period	20 Years ago	10 Years Ago	Today	The future
Black bear	☆☆☆☆☆☆☆	☆ ☆ ☆	☆ ☆ ☆ ☆ ☆ ☆	☆☆☆☆☆☆☆☆
Musk deer	☆☆☆☆☆	☆ ☆	☆ ☆ ☆	☆ ☆ ☆ ☆
Barking deer	☆☆☆☆☆☆☆	☆ ☆ ☆ ☆	☆ ☆ ☆ ☆ ☆ ☆	☆☆☆☆☆☆☆☆☆☆
Himalayan Tahr	☆☆☆☆☆☆☆	☆ ☆ ☆	☆ ☆ ☆ ☆ ☆	☆ ☆ ☆ ☆☆☆ ☆
Pheasants	☆☆☆☆☆	☆ ☆	☆ ☆ ☆ ☆ ☆	☆☆ ☆☆☆ ☆ ☆
Vultures	☆☆☆☆☆☆☆	☆☆☆☆☆☆☆	☆☆☆☆☆☆☆	☆☆☆☆☆☆☆

Venn Diagram: The Venn diagram is a kind of social map of the community which shows an influence of individuals or groups on decision-making, as well as the relations between village institutions and outside forces, such as government services or development agencies (Freudenberger 1994). To analyse the different stakeholders in the resource management, to identify who makes decision about resource use and who influence the decision regarding resource conservation; the Venn diagram was drawn. To elaborate the diagram, discussion was initiated after entirely completing the diagram. The discussion focused on following issues:

1. Who are the major stakeholders in the resource management?
2. Which people or groups have power to make rules concerning resource management?
3. What is woman's role in decision-making?
4. What happens when there is a conflict?
5. Are any of the institutions or groups noted gained or losing power on time passes? Why?

Appendix 4.4

SRUCTURED INTERVIEW QUESTIONNAIRE

Recorded By:	Date:	VDC:
Respondent's name:	Age:	Sex: **M** or **F**

1. Please check one category that defines conservation.

a) Protection of wildlife and forest.
b) Controlling hunting and illegal harvesting of resources.
c) Sustainable management of biological and cultural resources.
d) Any other.

2. Describe some conservation initiatives in which you are involved.

a) Plantation of tree seedling in the community land.
b) Active involvement in conservation decisions.
c) Initiatives to control illegal activities in forests.
d) Abiding all the community decisions regarding conservation
e) Any other.

3. Please check one or more categories that encourage you to become involved in conservation.

a) Sustainable use of resources.
b) Community ownership of resources
c) Empowerment of the local community.
d) Devolution of power to the local community.
e) Authority for the management of resources.
f) Integration of local needs with conservation.
g) Minimum interference from park authority.
h) Involvement of women in conservation activities.
i) Education and awareness initiatives.
j) Infrastructure development activities.
k) Income from tourism.
l) The conservation area regulation.
m) Others
n) All
o) None

4. What are the following conservation initiatives that you particularly like?

a) Strict control on wildlife hunting.
b) Restriction on commercial harvesting of any forest products.
c) Plantation of tree seedlings around the village periphery.
d) Seasonal collection of resources.
e) Strict implementation of the conservation area regulations.
f) Limitation on the harvest of fuel-wood and timber.
g) Use of alternative energy devices such as micro hydro, kerosene, improved cooking stove, solar water heater.
h) Others

5. Who is involved in conservation planning?

a) Village conservation committee
b) Village council
c) Park authority
d) Forest ministry
e) All
f) None

6. Who makes the conservation policy?

a) Village conservation committee
b) Village council
c) Park authority
d) Forest ministry
e) All
f) None

7. Who makes the conservation decisions?

a) Village conservation committee
b) Village council
c) Park authority
d) Forest ministry
e) All
f) None

8. Village conservation committee has authority for following conservation decisions.
{Scale: 1= Agree 2=Disagree 3=Don't know (Neutral)}

a) Quantifying a particular resource harvest for domestic use
b) Specifying harvesting techniques

c) Deciding on the date and period of harvest
d) Actions to take if some community member/s break the rules
e) Deciding on commercial harvest of resources
f) Issuing permit for wildlife hunting
g) Controlling outsiders on use of the resources
h) Defining priorities for conservation in the village
i) Taking actions against poachers
j) Other

9. Who have the ownership of forest?

a) Park authority
b) Village Conservation Committee
c) Village Council
d) The Government

10. Have you noticed any changes before and after conservation initiatives?

a) Yes b) No c) Don't know

11. How do you judge the conservation and development initiatives?

Extremely Successful ⟷ Extremely unsuccessful

1. 2. 3. 4. 5.

Extremely Satisfactory ⟷ Extremely unsatisfactory

1. 2. 3. 4. 5.

12. Conservation initiatives have resulted in following benefits to the community. (Please pick a number from the scale to show how much you agree or disagree and jot in the space to the right of the item.

Scale: 1= Strongly agree 2=Agree 3=Neutral 4=Disagree 5=Strongly disagree

a) Easy availability of fodder and fuel wood.
b) Institutional development in the village.
c) Effective protection of forest and wildlife.
d) Improvement in the basic infrastructures.
e) Introduction of different alternative devices.

f) Toilets and sanitation improvement in the village.
g) Local capacity building.
h) Conservation education and awareness.
i) Technical support in agriculture, health and infrastructure.
j) Economic opportunity creation.
k) Promotion of village.
l) Devolution of power to the local community.
m) Involvement of women.
n) Security of access to resources.
o) Local system of governance.
p) Increased wildlife population.
q) Improved forest condition.
r) Abundant bamboo, medicinal plants and wild vegetables in forest.
s) Intensity and frequency of landslide decreased.

13. Have any individuals or groups encountered difficulties due to the conservation initiatives?

a) Yes b) No c) Don' t know

14. What are the major difficulties resulting from the conservation initiatives?
(Please pick a number from the scale to show how much you agree or disagree and jot in the space to the right of the item.

Scale: 1= Strongly agree 2=Agree 3=Neutral 4=Disagree 5=Strongly disagree)

a) Restriction on forest resources.
b) Control in hunting.
c) Lack of grazing land.
d) Restriction on commercial harvesting of resources.
e) Frequent intervention by the park authority.
f) Crop damage or livestock depredation by wildlife.
g) Inequity on resource allocation.
h) Greater influence of tourism.
i) Forest product based village industry could not flourish.
j) Human casualties due to wildlife have increased.

15. Please check any of conservation benefits you received.

- ❑ Improved trail and access
- ❑ Drinking water
- ❑ Bridge
- ❑ Health centre
- ❑ Agricultural support
- ❑ Tree seedlings

- ❑ Education
- ❑ Irrigation
- ❑ Electricity
- ❑ Fodder and fuel wood
- ❑ Bamboo
- ❑ Wild vegetables such as Asparagus
- ❑ Medicinal herbs
- ❑ Technical training
- ❑ Any others

16. Please put a check mark in the space in front of any word or phrase that describes the Conservation Area Management Regulations (CAMR).

______ Technical	______ Important
______ Flexible	______ Encouraging
______ Centralised	______ Revolutionary
______ Devolved power	______ Appropriate
______ Unrealistic	______ Inadequate
______ Confusing	______ Useless
______ Overlapping	______ Impractical
______ Rigid	______ People-centred

17. Who possesses the legal jurisdiction?

a) Park authority
b) Village conservation committee.
c) Village council.
d) Government

18. Are the present conservation area regulations satisfactory?

a) Yes b) No c) Don't know

19. Please pick a number from the scale to show how much you agree or disagree on the following statements and jot in the space to the right of the item.

Scale: 1= Strongly agree 2=Agree 3=Neutral 4=Disagree 5=Strongly disagree)

a) The CAMR legally complemented local system of resource management.
b) The CAMR is highly ambiguous.
c) The CAMR is a people-centred regulation.
d) The CAMR aims to devolve power to local community.
e) The CAMR follows a centralised approach.
f) The CAMR cannot be put into practice.

g) The CAMR needs a major amendment.
h) The CAMR played a key role in local institutional development.
i) The CAMR made the conservation initiatives very effective.
j) The local community has accepted the CAMR.
k) Others

20. Please pick a number from the scale to show 'how often' an action has been taken and jot in the space to the right of the item.

Scale: 1= Always 2=Often 3=Sometimes 4=Rarely 5=Never)

a) The park authority is in touch with local institutions.
b) The park authority is in touch with local community.
c) Local institutions are consulted, informed and listened in appropriate ways.
d) The community's interests in the natural resources conservation are compatible with the park authority.
e) The decisions from the park authority are against the community interest.
f) The local community is involved in planning and designing a new project.
g) The local institutions follow the CAMR.
h) The local institutions take legal actions.
i) The local institutions call regular meeting.
j) The local institutions make decision according to consensus.
k) The local community does not obey the decisions made by the local institutions.
l) The park authority rejects the decisions made by the local institution.
m) Others

21. What is the role of the park authority (ACAP) in the area?

a) Conservation decision maker
b) Conservation planner
c) Conservation catalyst/facilitator
d) Development agency
e) Funding agency
f) All
g) None

22. Following activities could make the conservation initiatives much more effective. Please pick a number from the scale to show how much you agree or disagree on the following statements and jot in the space to the right of the item.

Scale: 1= Strongly agree 2=Agree 3=Neutral 4=Disagree 5=Strongly disagree

a) Strict controls on resource use make the initiatives more effective.
b) Commercial harvesting of certain NTFP should be allowed.
c) Seasonal hunting of certain wildlife species should be permitted.

d) Pest wildlife species should be regularly culled.
e) Amendments of some points in the CAMR are crucial.
f) Replication and sharing of experiences among the conservation areas.
g) More investments in local capacity building.
h) Changing the present role of park authority from management to advisory.
i) Others

23. What are the major challenges ahead for the success of the community-based conservation?

a) Financial resources
b) Political commitments
c) Uncontrolled tourism
d) New contradictory government policies
e) Commitment of the park authority
f) Cohesiveness of community
g) Capacity of the local community
h) Others

Appendix 4.5

WILDLIFE DAMAGE STUDY

QUESTIONNAIRE SURVEY FORMAT

Name:		Gender	M	F	Age:
Village:	Ward No.			District:	

1. What is the total land holding?
2. What is the status of your farm?
a) Private
b) Lease
3. What are the major crops grown in your farm?
(a) Rice (b) Wheat (c) Maize (d) Millet (e) Potato (f) Others (specify)
4. What is the annual average production of each crop? Please check any one in each row.

Crop	< 500 kg	500 - 1000 kg	1000 - 1500 kg	> 1500 kg
Rice				
Wheat				
Maize				
Millet				
Potato				
Others				

Do you have livestock?

Yes No

5. If yes, how many of these livestock do you have?

6. Are they free grazing or stall-fed?

Livestock	Buffaloes	Cows	Ox	Goats	Pigs	Others
Number						
Stall-Fed (**S**)/ Free grazing (**F**)						

7. What are the sources of fodder for your livestock?
a) Forest
b) Private farm
c) Others (specify)

8. Do you have any problems from wildlife?

Please pick a number from the scale to show 'how often' an action has been taken and jot in the space to the right of the item.

Scale: 1= Always 2=Often 3=Sometimes 4=Rarely 5=Never)

a) Wildlife damage crops.
b) Livestock are injured by wildlife
c) Livestock are killed by wildlife.
d) I encountered wildlife.
e) I was attacked by wildlife.
f) My family member was injured by wildlife attack.
g) My family member was killed by wildlife attack.
h) Limit in freedom of movements.
i) Other problems (specify)

8. What are the crops damaged by wildlife?
9. What is an average damage to each crop?

Crop	Rice	Wheat	Maize	Millet	Potato	Others
Damaged Crop						
% Damaged						
Pest Wildlife						

10. What are the key problem animals?
a) Common leopard
b) Himalayan black bear
c) Rhesus monkey
d) Langur monkey
e) Jackal
f) Porcupine
g) Others (specify)

11. Did any of your livestock killed or injured by wildlife last year?

S. No.	Livestock	Injured	Killed	Wildlife?
a)	Buffalo			
b)	Cow			
c)	Goat			
d)	Sheep			
e)	Ox			
f)	Chicken			
g)	Others (specify)			

12. Where was it killed or injured?
(a) Forest (b) Livestock shed in pasture land (c) Village

13.Has the wildlife population increased over last 10 years?
(Please pick a number from the scale to show how much you agree or disagree and jot in the space to the right of the item.

Scale: 1= Strongly agree 2=Agree 3=Neutral 4=Disagree 5=Strongly disagree)

a) The frequency of wildlife damage of crops has increased.
b) The frequency of livestock killing by wildlife in the village has decreased.
c) The frequency of livestock killing in the forest and pasture has increased.
d) Wildlife is frequently encountered in forest.
e) Protection of forest helped to increase wildlife population.
f) Wildlife was freely hunted 10 year ago.
g) Wildlife hunting is minimal compared to 10 year before.
h) Villagers do hunting.
i) Individuals from neighbouring villages come for hunting.
j) Conservation awareness helped to conserve the wildlife.
k) Integrated conservation programme helped to protect wildlife.
l) The CAMR helped to protect wildlife.
m) Pest wildlife should be killed.
n) We should not protect wildlife.

14.What kind of protection measures did you adopt to save your crops and livestock?
a) Improving fencing in agriculture field and livestock shed.
b) Regularly watching the wildlife.
c) Using scarecrow.
d) Others (specify)
e) No preventive measures.

15.How do you think you can reduce these incidences?
a) Culling pest species annually.
b) On the spot killing of pest species by the local community.
c) Providing compensation.
d) Properly guarding.
e) Others (specify)

16.Are you involved in any of the conservation activities?
a) Yes b) No
19. Do we need to initiate conservation activities?
a) Yes b) No c) Don' know

20. Do you have any suggestions about measures that the conservation institution should take?

Appendix 4.6

QUESTIONING ROUTE FOR POLICY MAKERS

A. **Conservation in general**

1. What are the most important issues in the conservation of biodiversity in Nepal?
2. How do you judge the effectiveness of the present protected area management system in Nepal?

B. **Conservation Area concept**

3. What was the main reason for shift in conservation policy from strict-protection to community-based conservation?
4. What features of this new initiatives do you see as a unique and innovative?
5. How do you compare a national park and conservation area from a management perspective? Which is much more efficient and effective in terms of costs and benefits to conservation?
6. To what extent did the community-based conservation fulfil the national conservation goal?
7. Are the laws and regulations sufficient and working?
8. How do you visualise the future of the community-based conservation?

C. **Local empowerment**

9. What are the crucial elements that encourage local people to become involved in conservation initiatives of a protected area?
10. Do you consider empowerment of local communities important in this approach?
11. Do the present policies offer enough grounds for empowerment of local people in protected area management?
12. Do you consider tourism as an incentive for conservation?

D. **Future Direction**

13. Do you foresee any major hindrance for successful management of community-based conservation?
14. What has been or are the obstacles and difficulties?
15. What do you suggest to overcome the hindrance and /or strengthening the community-based conservation?
16. Do you recommend replicating this approach within and outside the country? Why?
17. Do you have any other advice or observation on to future direction?

Appendix 4.7

SLOPE CORRECTION TABLE FOR DIFFERENT SIZE QUADRAT

Slope Correction Table			
Slope Degrees	**Quadrat Size (m x m)**		
	2 x 2	**5 * 5**	**10 *10**
13	3.89	24.35	97.4
14	3.88	24.25	97.0
15	3.86	24.15	96.6
16	3.84	24.02	96.1
17	3.82	23.9	95.6
18	3.80	23.8	95.1
19	3.78	23.70	94.6
20	3.76	23.50	94.0
21	3.74	23.40	93.4
22	3.71	23.20	92.7
23	3.68	23.00	92.0
24	3.65	22.90	91.4
25	3.62	22.70	90.6
26	3.59	22.50	89.9
27	3.56	22.30	89.1
28	3.53	22.10	88.3
29	3.5	21.90	87.5
30	3.46	21.70	86.6
31	3.43	21.40	85.7
32	3.39	21.20	84.8
33	3.36	21.00	83.9
34	3.31	20.70	82.9
35	3.28	20.50	81.9
36	3.24	20.20	80.9
37	3.20	20.00	79.9
38	3.15	19.70	78.8
39	3.11	19.40	77.7
40	3.06	19.20	76.6
66	1.63	10.20	76.6

Appendix 5.1

TREE DATA FOR ALL FOREST SURVEYS PLOTS

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
1	1	2	Guheli	Elaeagnus parvifolia	Elaegnaceae	9.5
2	1	2	Kopile	Malus baccata	Lauraceae	26.8
3	1	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8.8
4	1	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	36.5
5	1	3	Guheli	Elaeagnus parvifolia	Elaegnaceae	9.5
6	1	3	Kopile	Malus baccata	Lauraceae	26.8
7	1	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8.8
8	1	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	36.5
9	1	4	Kopila	Malus baccata	Lauraceae	46.3
10	1	4	Jhyanu	Eurea cerasifolia	Theaceae	10
11	1	4	Gahnaune	Vibernum erubescens	Sambuceceae	4.5
12	1	4	Gahnaune	Vibernum erubescens	Sambuceceae	4.8
13	1	4	Gahnaune	Vibernum erubescens	Sambuceceae	4.5
14	1	4	Falant	Quercus lamellosa	Fagaceae	37
15	1	4	Kopila	Malus baccata	Lauraceae	10.5
16	1	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	22.5
17	1	4	Kopila	Malus baccata	Lauraceae	29
18	1	4	Falant	Quercus lamellosa	Fagaceae	126.3
19	1	5	Guras	Rhododendron sps.	Ericeceae	22.3
20	1	5	Guheli	Elaeagnus parvifolia	Elaegnaceae	21
21	1	5	Guras	Rhododendron sps.	Ericeceae	22.5
22	1	5	Guheli	Elaeagnus parvifolia	Elaegnaceae	22.8
23	1	5	Lokar (kalo)	Fraxinus sps.	Oleaceae	51
24	1	5	Lokar (kalo)	Fraxinus sps.	Oleaceae	33
25	1	5	Lokar (kalo)	Fraxinus sps.	Oleaceae	30.5
26	1	5	Lokar (kalo)	Fraxinus sps.	Oleaceae	43
27	1	5	Kandhe	Ilex dipyrena	Aquifoliaceae	90.5
28	1	5	Bodar	Acer oblongum	Aceraceae	29
29	1	6	Guras	Rhododendron sps.	Ericeceae	63.3
30	1	6	Guras	Rhododendron sps.	Ericeceae	36.3
31	1	6	Guras	Rhododendron sps.	Ericeceae	32.8
32	1	6	Gandhe			46.3
33	1	6	Guras	Rhododendron sps.	Ericeceae	58.3
34	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	12.8
35	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	19.5
36	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	20.3
37	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	7
38	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	21.3

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
39	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8.5
40	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	10.5
41	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	14.8
42	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	18.5
43	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	14.5
44	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	23
45	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	9.3
46	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	21.5
47	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	23.5
48	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8.5
49	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	5.5
50	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	11.5
51	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	31.8
52	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8.5
53	2	2	Gahnaune	Vibernum cotinifolium	Sambuceceae	6.3
54	2	2	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	11.3
55	2	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	18.8
56	2	3	Kandhe Pat			26
57	2	3	Bodar	Acer oblongum	Aceraceae	5.3
58	2	3	Bodar	Acer oblongum	Aceraceae	11
59	2	3	Silinge	Taxus baccata	Taxaceae	48.5
60	2	3	Bhalayo	Semecarpus anacardium	Anacardiaceae	9
61	2	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	4.5
62	2	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	11.3
63	2	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	17.3
64	2	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	5.8
65	2	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	17.5
66	2	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	23.5
67	2	3	Guras	Rhododendron arboreum	Ericeceae	26
68	2	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	11.5
69	2	3	Guras	Rhododendron arboreum	Ericeceae	48.8
70	2	3	Guras	Rhododendron arboreum	Ericeceae	32.3
71	2	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	11
72	2	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	5.8
73	2	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	15.8
74	2	3	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	48.3
75	2	3	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	7.8
76	2	3	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	7.5
77	2	3	Bhalayo	Semecarpus anacardium	Anacardiaceae	15.8
78	2	3	Kandhe Pat			26
79	2	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	6
80	2	3	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	12
81	2	3	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	9
82	2	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	6.3

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
83	2	3	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	6.3
84	2	3	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	6.3
85	2	3	Thorche			3
86	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	12.3
87	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	10.5
88	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	7.3
89	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	14.8
90	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	8.3
91	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	15
92	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	5.5
93	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	17.5
94	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	14.3
95	2	4	Bodar	Acer oblongum	Aceraceae	7
96	2	4	Bodar	Acer oblongum	Aceraceae	4.5
97	2	4	Bodar	Acer oblongum	Aceraceae	8.8
98	2	4	Bodar	Acer oblongum	Aceraceae	7
99	2	4	Guras	Rhododendron sps.	Ericeceae	9.8
100	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	8
101	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	9.8
102	2	4	Kandhe Pat			9.5
103	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	10.8
104	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	7
105	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	11.5
106	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	22.3
107	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	12.5
108	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	8
109	2	4	Amphi	Pyrularia edulis	Santalaceae	5.3
110	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	4.5
111	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	8.3
112	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	9
113	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	12.5
114	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	9.5
115	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	6.3
116	2	4	Chhyuda			9
117	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	12
118	2	4	Da Dabe	Symplocos ramosissima	Symplocaceae	10.5
119	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	6.3
120	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	9.5
121	2	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	8.8
122	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	6.8
123	2	4	Guras	Rhododendron arboreum	Ericeceae	10.8
124	2	4	Guras	Rhododendron arboreum	Ericeceae	16.5
125	2	4	Guras	Rhododendron arboreum	Ericeceae	20.5
126	2	4	Guras	Rhododendron arboreum	Ericeceae	33

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
127	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	7.8
128	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	10.5
129	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	7
130	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	7.3
131	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	5.8
132	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	7.3
133	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	5
134	2	4	Bodar	Acer oblongum	Aceraceae	7.8
135	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	7.5
136	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	11.5
137	2	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	7
138	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	9.3
139	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	13.5
140	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	4.8
141	2	5	Bodar	Acer oblongum	Aceraceae	29.5
142	2	5	Bodar	Acer oblongum	Aceraceae	17.8
143	2	5	Kopila	Malus baccata	Lauraceae??	15.3
144	2	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	5.5
145	2	5	Guras	Rhododendron sps.	Ericeceae	15.5
146	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	12.5
147	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	10.8
148	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	12.5
149	2	5	Guras	Rhododendron sps.	Ericeceae	34.3
150	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	19.8
151	2	5	Guras	Rhododendron sps.	Ericeceae	20
152	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	6.3
153	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	24.5
154	2	5	Guras	Rhododendron sps.	Ericeceae	19.5
155	2	5	Bodar	Acer oblongum	Aceraceae	23.3
156	2	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	23
157	3	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	7
158	3	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	13
159	3	1	Uttis	Alnus nepalensis	Betulaceae	47.8
160	3	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	14
161	3	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	11.3
162	3	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	14
163	3	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8.8
164	3	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	9.8
165	3	1	Gahnaune	Vibernum erubescens	Sambuceceae	13.5
166	3	1	Fir Fire	Acer oblongum	Aceraceae	13
167	3	1	Guyeli	Elaeagnus parvifolia	Elaegnaceae	8.8
168	3	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	20.8
169	3	2	Guras	Rhododendron arboreum	Ericeceae	44.5
170	3	2	Shikhri Ghans	Boehmeria rugulosa		6.5

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
171	3	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	29.5
172	3	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	7.5
173	3	2	Pate	Eurya accuminata	Theaceae	18.8
174	3	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	17.5
175	3	2	Pate	Eurya accuminata	Theaceae	16
176	3	3	Falant	Quercus lamellosa	Fagaceae	15
177	3	3	Jhyanu	Eurya cerasifolia	Theaceae	16.5
178	3	3	Bhalu Ghans			11.5
179	3	3	Lekh Champ	Michelia kissopa	Magnoliaceae	39
180	3	3	Jhyanu	Eurya cerasifolia	Theaceae	10.3
181	3	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	12.5
182	3	3	Falant	Quercus lamellosa	Fagaceae	54.5
183	3	3	Jhyanu	Eurya cerasifolia	Theaceae	11.3
184	3	3	Phokshe			35.5
185	3	3	Kopile Kaulo	Persea sps.	Lauraceae	21.8
186	3	3	Kopile Kaulo	Persea sps.	Lauraceae	13.8
187	3	3	Kopile Kaulo	Persea sps.	Lauraceae	51
188	3	3	Phokshe			48.3
189	3	3	Phokshe			43.8
190	3	3	Kopile Kaulo	Persea sps.	Lauraceae	7.5
191	3	4	Bodar	Acer oblongum	Aceraceae	17.5
192	3	4	Falant	Quercus lamellosa	Fagaceae	92.5
193	3	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	11
194	3	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	8.8
195	3	4	Kopile Kaulo	Persea sps.	Lauraceae	22.5
196	3	4	Falant	Quercus lamellosa	Fagaceae	45
197	3	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	10
198	3	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	7
199	3	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	5
200	3	4	Falant	Quercus lamellosa	Fagaceae	46.3
201	3	4	Tokan (Podar)	Lindera pulcherima	Lauraceae	55
202	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	19.5
203	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	13.3
204	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	7.5
205	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	5.5
206	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	5.8
207	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	26.3
208	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	15.5
209	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	10.8
210	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8
211	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	23.5
212	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	28.8
213	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8.8
214	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	21.3

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
215	3	5	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	11.3
216	3	6	Michire Falant	Quercus glauca	Fagaceae	21.3
217	3	6	Nakkale	Aroliaea sps.		23.8
218	3	6	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	36.3
219	3	6	Champ	Michelia champaca	Magnoliaceae	51
220	3	6	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	29.5
221	3	6	Champ	Michelia champaca	Magnoliaceae	95
222	3	6	Bairo Ghansh			28
223	3	6	Tokan (Podar)	Lindera pulcherima	Lauraceae	23.3
224	3	6	Kathe Kaulo	Persea gamblei	Lauraceae	21.5
225	3	6	Nakkale	Aroliaea sps.		11.5
226	3	6	Pate	Eurya accuminata	Theaceae	31.5
227	3	6	Nakkale	Aroliaea sps.		31.3
228	3	6	Nakkale	Aroliaea sps.		6.3
229	3	6	Nakkale	Aroliaea sps.		5.5
230	3	6	Bairo Ghansh			19.3
231	3	7	Saur	Betula alnoides	Betulaceae	30
232	3	7	Jhakre			31.3
233	3	7	Jhakre			24.5
234	3	7	Jhakre			18.3
235	3	7	Bodar	Acer oblongum	Aceraceae	16
236	3	7	Nakkale	Aroliaea sps.		44.5
237	3	7	Nakkale	Aroliaea sps.		30
238	3	7	Saur	Betula alnoides	Betulaceae	90
239	3	7	Sikhre	Boehmeria rugulosa		34.5
240	3	7	Nakkale	Aroliaea sps.		9.3
241	3	7	Champ	Michelia champaca	Magnoliaceae	105
242	3	8	Dab Dabe	Symplocos ramosissima	Symplocaceae	11
243	3	8	Kopile Kaulo	Persea sps.	Lauraceae	13.8
244	3	8	Bodar	Acer oblongum	Aceraceae	21.8
245	3	8	Michire Falant	Quercus glauca	Fagaceae	130
246	3	8	Michire Falant	Quercus glauca	Fagaceae	11.8
247	3	8	Dab Dabe	Symplocos ramosissima	Symplocaceae	13.3
248	3	8	Bodar	Acer oblongum	Aceraceae	11
249	3	8	Saur	Betula alnoides	Betulaceae	57.5
250	3	8	Kopile Kaulo	Persea sps.	Lauraceae	27.5
251	3	8	Dab Dabe	Symplocos ramosissima	Symplocaceae	14.5
252	3	8	Mallo	Viburnum mullah	Sambucaceae	20.5
253	3	8	Dab Dabe	Symplocos ramosissima	Symplocaceae	5.5
254	3	8	Pate	Eurya accuminata	Theaceae	10
255	3	8	Dab Dabe	Symplocos ramosissima	Symplocaceae	7.5
256	3	8	Dab Dabe	Symplocos ramosissima	Symplocaceae	7
257	3	8	Dab Dabe	Symplocos ramosissima	Symplocaceae	7
258	3	8	Dab Dabe	Symplocos ramosissima	Symplocaceae	5.8

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
259	4	1	Jhyanu	Eurya cerasifolia	Theaceae	13.8
260	4	1	Jhyanu	Eurya cerasifolia	Theaceae	12.8
261	4	1	Chilaune	Schima wallichii	Theaceae	100
262	4	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	9.8
263	4	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	9.3
264	4	1	Pate Jhyanu (Jhingane)	Eurya accuminata	Theaceae	10
265	4	1	Pate Jhyanu (Jhingane)	Eurya accuminata	Theaceae	23
266	4	1	Pate Jhyanu (Jhingane)	Eurya accuminata	Theaceae	21.3
267	4	1	Pate Jhyanu (Jhingane)	Eurya accuminata	Theaceae	23
268	4	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8.8
269	4	1	Pate Jhyanu (Jhingane)	Eurya accuminata	Theaceae	15
270	4	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	16
271	4	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	12
272	4	2	Gahnaune	Vibernum cotinifolium	Sambuceceae	10
273	4	2	Dab Dabe	Symplocos ramosissima	Symplocaceae	7.5
274	4	2	Lekh Angeri	Lyonia sps.	Ericaceae	8.8
275	4	2	Uttis	Alnus nepalensis	Betulaceae	32
276	4	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	33
277	4	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	38.3
278	4	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	9.3
279	4	2	Pate Jhyanu	Eurya accuminata	Theaceae	46.5
280	4	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	13
281	4	3	Falant	Quercus lamellosa	Fagaceae	12
282	4	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	11.3
283	4	3	Amphi	Pyrularia edulis	Santalaceae	26.3
284	4	3	Falant	Quercus lamellosa	Fagaceae	130
285	4	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	10
286	4	3	Falant	Quercus lamellosa	Fagaceae	42.3
287	4	3	Falant	Quercus lamellosa	Fagaceae	27.5
288	4	3	Amphi	Pyrularia edulis	Santalaceae	12
289	4	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	16.3
290	4	3	Gahnaune	Vibernum cotinifolium	Sambuceceae	14.5
291	4	4	Bodar	Acer oblongum	Aceraceae	9.3
291	4	4	Bodar	Acer oblongum	Aceraceae	12
293	4	4	Bodar	Acer oblongum	Aceraceae	12.3
294	4	4	Guras	Rhododendron arboreum	Ericeceae	11.5
295	4	4	Falant	Quercus lamellosa	Fagaceae	23.5
296	4	4	Bodar	Acer oblongum	Aceraceae	16.5
297	4	4	Guras	Rhododendron arboreum	Ericeceae	50
298	4	4	Bodar	Acer oblongum	Aceraceae	13.3

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
299	4	4	Bodar	Acer oblongum	Aceraceae	15
300	4	4	Guras	Rhododendron arboreum	Ericeceae	25.5
301	4	4	Guras	Rhododendron arboreum	Ericeceae	16.8
302	4	4	Aarupate Kui (Thaske)			25
303	4	4	Guras	Rhododendron arboreum	Ericeceae	16.3
304	4	4	Guras	Rhododendron arboreum	Ericeceae	16
305	4	4	Guras	Rhododendron arboreum	Ericeceae	23.5
306	4	4	Guras	Rhododendron arboreum	Ericeceae	34
307	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8.8
308	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	8
309	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	13.8
310	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	17.8
311	5	2	Jhyanu	Eurya cerasifolia	Theaceae	37
312	5	2	Jhyanu	Eurea cerasifolia	Theaceae	26.3
313	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	15
314	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	16.3
315	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	13.5
316	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	15
317	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	21
318	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	13.3
319	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	16.5
320	5	2	Jhyanu	Eurya cerasifolia	Theaceae	25.8
321	5	2	Jhyanu	Eurya cerasifolia	Theaceae	16
322	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	31.3
323	5	2	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	25.5
324	5	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	9.5
325	5	3	Jhyanu	Eurya cerasifolia	Theaceae	10.5
326	5	3	Jhyanu	Eurya cerasifolia	Theaceae	8.3
327	5	3	Lot Salla (Sali)	Taxus baccata	Taxaceae	12.5
328	5	3	Guras	Rhododendron arboreum	Ericeceae	19.5
329	5	3	Guras	Rhododendron arboreum	Ericeceae	26.3
330	5	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	38
331	5	3	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	10.3
332	5	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	6.3
333	5	3	Guras	Rhododendron arboreum	Ericeceae	13.8
334	5	3	Guras	Rhododendron arboreum	Ericeceae	11.8
335	5	3	Jhyanu	Eurya cerasifolia	Theaceae	11.8
336	5	3	Mallo	Vibernum mullah	Sambucaceae	9.8
337	5	3	Guras	Rhododendron arboreum	Ericeceae	14
338	5	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	9.8
339	5	3	Jhyanu	Eurya cerasifolia	Theaceae	9.5
340	5	3	Guras	Rhododendron arboreum	Ericeceae	10.3
341	5	3	Jhyanu	Eurya cerasifolia	Theaceae	10.3

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
342	5	3	Guras	Rhododendron arboreum	Ericeceae	8.5
343	5	3	Guras	Rhododendron arboreum	Ericeceae	10.3
344	5	3	Guras	Rhododendron arboreum	Ericeceae	9
345	5	3	Guheli	Elaeagnus parvifolia	Elaegnaceae	9.8
346	5	3	Guras	Rhododendron arboreum	Ericeceae	10.5
347	5	3	Bodar	Acer oblongum	Aceraceae	10.8
348	5	3	Bodar	Acer oblongum	Aceraceae	8.3
349	5	3	Guras	Rhododendron arboreum	Ericeceae	7.5
350	5	3	Guras	Rhododendron arboreum	Ericeceae	8.5
351	5	3	Guras	Rhododendron arboreum	Ericeceae	10
352	5	3	Guras	Rhododendron arboreum	Ericeceae	10.3
353	5	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	43.3
354	5	4	Gahnaune	Vibernum cotinifolium	Sambuceceae	8.5
355	5	4	Gahnaune	Vibernum cotinifolium	Sambuceceae	7
356	5	4	Gahnaune	Vibernum cotinifolium	Sambuceceae	9.3
357	5	4	Parke Guhe			34.5
358	5	4	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	52.5
359	5	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	44
360	5	5	Gahnaune	Vibernum cotinifolium	Sambuceceae	23.8
361	5	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	26
362	5	5	Aarupate	Prunus nepaulensis	Rosaceae	13.8
363	5	5	Bodar	Acer oblongum	Aceraceae	51.3
364	5	5	Bodar	Acer oblongum	Aceraceae	20.5
365	5	5	Bodar	Acer oblongum	Aceraceae	29.5
366	5	5	Bodar	Acer oblongum	Aceraceae	23.8
367	5	5	Falant	Quercus lamellosa	Fagaceae	145
368	5	5	Ful Champ	Michelia champaca	Magnoliaceae	151.3
369	5	5	Dab Dabe	Symplocos ramosissima	Symplocaceae	31.8
370	6	1	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	9.3
371	6	1	Bilaune	Maesa chisia	Myrsinaceae	30
372	6	2	Jhyanu Pate	Eurya accuminata	Theaceae	11.8
373	6	2	Mel Kandha			8.8
374	6	2	Jhyanu Pate	Eurya accuminata	Theaceae	12
375	6	2	Jhyanu Pate	Eurya accuminata	Theaceae	9
376	6	2	Guehlo	Elaeagnus parvifolia	Elaegnaceae	8.3
377	6	2	Guhelo	Elaeagnus parvifolia	Elaegnaceae	12
378	6	2	Guhelo	Elaeagnus parvifolia	Elaegnaceae	9.3
379	6	2	Guhelo	Elaeagnus parvifolia	Elaegnaceae	12
380	6	2	Guhelo	Elaeagnus parvifolia	Elaegnaceae	8.3
381	6	2	Jhyanu Pate	Eurya accuminata	Theaceae	11.5
382	6	2	Jhyanu Pate	Eurya accuminata	Theaceae	9.5
383	6	2	Malloh	Vibernum mullah	Sambucaceae	10.8
384	6	2	Jhyanu	Eurya cerasifolia	Theaceae	10.3
385	6	2	Falant	Quercus lamellosa	Fagaceae	10.8

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
386	6	2	Falant	Quercus lamellosa	Fagaceae	27.5
387	6	2	Malloh	Vibernum mullah	Sambucaceae	9.3
388	6	2	Uttis	Alnus nepalensis	Betulaceae	43.5
389	6	2	Uttis	Alnus nepalensis	Betulaceae	19.5
390	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	43.8
391	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	43.8
392	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	42.5
393	6	3	Dab Dabe	Symplocos ramosissima	Symplocaceae	20.8
394	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	14.3
395	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	11
396	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	22.5
397	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	9.8
398	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	18.8
399	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	23.5
400	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	18.5
401	6	3	Raktachandan	Daphniphyllum himalense	Daphniphyllaceae	9
402	6	4	Jhyanu	Eurya cerasifolia	Theaceae	31.3
403	6	4	Falant	Quercus lamellosa	Fagaceae	93.5
404	6	4	Jhyanu	Eurya cerasifolia	Theaceae	21.3
405	6	4	Dudhilo	Ficus nemoralis	Moraceae	37.5
406	6	4	Jhyanu	Eurya cerasifolia	Theaceae	11.5
407	6	4	Jhyanu	Eurya cerasifolia	Theaceae	14
408	6	4	Jhyanu	Eurya cerasifolia	Theaceae	19.8
409	6	4	Jhyanu	Eurya cerasifolia	Theaceae	20
410	6	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	9
411	6	4	Jhyanu	Eurya cerasifolia	Theaceae	10.8
412	6	4	Jhyanu	Eurya cerasifolia	Theaceae	8.8
413	6	4	Falant	Quercus lamellosa	Fagaceae	75
414	6	4	Falant	Quercus lamellosa	Fagaceae	80
415	6	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	20
416	6	4	Jhyanu	Eurya cerasifolia	Theaceae	21.3
417	6	4	Dab Dabe	Symplocos ramosissima	Symplocaceae	8
418	6	4	Jhyanu	Eurya cerasifolia	Theaceae	16.3
419	7	1	Chilaune	Schima wallichii	Theaceae	11.3
420	7	1	Chilaune	Schima wallichii	Theaceae	17.8
421	7	1	Chilaune	Schima wallichii	Theaceae	10.8
422	7	1	Chilaune	Schima wallichii	Theaceae	10.8
423	7	1	Chilaune	Schima wallichii	Theaceae	13
424	7	1	Katus	Castanopsis indica	Fagaceae	21.5
425	7	1	Chilaune	Schima wallichii	Theaceae	17.5
426	7	1	Bakle	Cleyera ochnacea		10.8
427	7	1	Kafal	Myrica esculenta	Myricaceae	12.5
428	7	1	Chilaune	Schima wallichii	Theaceae	7.8
429	7	1	Chilaune	Schima wallichii	Theaceae	19.8

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
430	7	1	Chilaune	Schima wallichii	Theaceae	15.5
431	7	1	Chilaune	Schima wallichii	Theaceae	17.3
432	7	1	Chilaune	Schima wallichii	Theaceae	31.5
433	7	1	Chilaune	Schima wallichii	Theaceae	17.8
434	7	1	Chilaune	Schima wallichii	Theaceae	10
435	7	2	Chilaune	Schima wallichii	Theaceae	28.3
436	7	2	Chilaune	Schima wallichii	Theaceae	30.5
437	7	2	Katus	Castanopsis indica	Fagaceae	8.8
438	7	2	Chilaune	Schima wallichii	Theaceae	17.5
439	7	2	Kafal	Myrica esculenta	Myricaceae	16.3
440	7	2	Chilaune	Schima wallichii	Theaceae	7.8
441	7	2	Chilaune	Schima wallichii	Theaceae	13.5
442	7	2	Katus	Castanopsis indica	Fagaceae	8.8
443	7	2	Chilaune	Schima wallichii	Theaceae	13.3
444	7	2	Chilaune	Schima wallichii	Theaceae	15
445	7	3	Katus	Castanopsis indica	Fagaceae	12.5
446	7	3	Chilaune	Schima wallichii	Theaceae	14
447	7	3	Chilaune	Schima wallichii	Theaceae	16
448	7	3	Chilaune	Schima wallichii	Theaceae	24.5
449	7	3	Chilaune	Schima wallichii	Theaceae	15.8
450	7	3	Chilaune	Schima wallichii	Theaceae	12.5
451	7	3	Chilaune	Schima wallichii	Theaceae	26.3
452	7	3	Mallato	Macaranga pustulata	Euphorbiaceae	13.5
453	7	3	Chilaune	Schima wallichii	Theaceae	11.5
454	7	3	Katus	Castanopsis indica	Fagaceae	26
455	7	3	Chilaune	Schima wallichii	Theaceae	10.5
456	7	3	Angeri (Thaune)	Lyonia ovalifolia	Ericaceae	12.8
457	7	3	Chilaune	Schima wallichii	Theaceae	19
458	7	3	Chilaune	Schima wallichii	Theaceae	12
459	7	3	Chilaune	Schima wallichii	Theaceae	23.3
460	7	4	Chilaune	Schima wallichii	Theaceae	18.8
461	7	4	Chilaune	Schima wallichii	Theaceae	25
462	7	4	Chilaune	Schima wallichii	Theaceae	20.3
463	7	4	Bhakimlo	Rhus javanica	Anacardiaceae	9.5
464	7	4	Chilaune	Schima wallichii	Theaceae	14.3
465	7	4	Chilaune	Schima wallichii	Theaceae	24
466	7	4	Chilaune	Schima wallichii	Theaceae	16.3
467	7	4	Kafal	Myrica esculenta	Myricaceae	23.3
468	7	4	Chilaune	Schima wallichii	Theaceae	28.5
469	8	1	Chilaune	Schima wallichii	Theaceae	17
470	8	1	Katus	Castanopsis indica	Fagaceae	8.8
471	8	1	Katus	Castanopsis indica	Fagaceae	10.3
472	8	1	Katus	Castanopsis indica	Fagaceae	6
473	8	1	Kafal	Myrica esculenta	Myricaceae	16

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
474	8	1	Kafal	Myrica esculenta	Myricaceae	11.3
475	8	1	Kafal	Myrica esculenta	Myricaceae	11.8
476	8	1	Chilaune	Schima wallichii	Theaceae	10
477	8	1	Katus	Castanopsis indica	Fagaceae	8
478	8	1	Katus	Castanopsis indica	Fagaceae	10.8
479	8	1	Katus	Castanopsis indica	Fagaceae	11.8
480	8	1	Katus	Castanopsis indica	Fagaceae	8.8
481	8	1	Katus	Castanopsis indica	Fagaceae	11.3
482	8	1	Katus	Castanopsis indica	Fagaceae	14
483	8	1	Katus	Castanopsis indica	Fagaceae	13.5
484	8	2	Chilaune	Schima wallichii	Theaceae	8.8
485	8	2	Chilaune	Schima wallichii	Theaceae	14.5
486	8	2	Chilaune	Schima wallichii	Theaceae	10
487	8	2	Chilaune	Schima wallichii	Theaceae	16
488	8	2	Katus	Castanopsis indica	Fagaceae	12
489	8	2	Katus	Castanopsis indica	Fagaceae	11.3
490	8	2	Katus	Castanopsis indica	Fagaceae	22
491	8	2	Chilaune	Schima wallichii	Theaceae	23.5
492	8	2	Chilaune	Schima wallichii	Theaceae	18.5
493	8	2	Kyamun	Eugenia operculata	Myrtaceae	10
494	8	2	Chilaune	Schima wallichii	Theaceae	16.3
495	8	2	Chilaune	Schima wallichii	Theaceae	8.5
496	8	2	Chilaune	Schima wallichii	Theaceae	11.3
497	8	2	Chilaune	Schima wallichii	Theaceae	14
498	8	2	Katus	Castanopsis indica	Fagaceae	20
499	8	3	Katus	Castanopsis indica	Fagaceae	11.5
500	8	3	Chilaune	Schima wallichii	Theaceae	20
501	8	3	Mauwa	Engelhardtia spicata	Juglandaceae	15
502	8	3	Chilaune	Schima wallichii	Theaceae	35
503	8	3	Damauro			12
504	8	3	Chilaune	Schima wallichii	Theaceae	9
505	8	3	Jamun	Eugenia jambolana	Myricaceae	6
506	8	3	Tinju	Diospyrus embryopteris		9.5
507	8	3	Chilaune	Schima wallichii	Theaceae	9
508	8	3	Katus	Castanopsis indica	Fagaceae	8.8
509	8	3	Katus	Castanopsis indica	Fagaceae	10.5
510	8	3	Chilaune	Schima wallichii	Theaceae	10.8
511	8	3	Chilaune	Schima wallichii	Theaceae	9
512	8	3	Katus	Castanopsis indica	Fagaceae	9.3
513	8	3	Chilaune	Schima wallichii	Theaceae	12.3
514	8	3	Katus	Castanopsis indica	Fagaceae	13.3
515	8	4	Katus	Castanopsis indica	Fagaceae	10.5
516	8	4	Chilaune	Schima wallichii	Theaceae	13
517	8	4	Katus	Castanopsis indica	Fagaceae	10

S. No.	Site Village	Plot No.	Local name	Scientific name	Family	DBH (cm)
518	8	4	Katus	Castanopsis indica	Fagaceae	10
519	8	4	Chilaune	Schima wallichii	Theaceae	14.5
520	8	4	Katus	Castanopsis indica	Fagaceae	13.5
521	8	4	Chilaune	Schima wallichii	Theaceae	11.3
522	8	4	Chilaune	Schima wallichii	Theaceae	16.3
523	8	4	Chilaune	Schima wallichii	Theaceae	10.5
524	8	4	Chilaune	Schima wallichii	Theaceae	8.5
525	8	4	Chilaune	Schima wallichii	Theaceae	21.3
526	8	4	Katus	Castanopsis indica	Fagaceae	9.5
527	8	4	Chilaune	Schima wallichii	Theaceae	8.5
528	8	4	Damauro			12
529	8	4	Chilaune	Schima wallichii	Theaceae	14.3
530	8	4	Katus	Castanopsis indica	Fagaceae	9.5
531	8	4	Damauro			8.3
532	8	4	Chilaune	Schima wallichii	Theaceae	20.3
533	8	4	Damauro			13.8
534	8	4	Damauro			14

Appendix 5.2

List of structured interview respondents

Respondent's Name	Gender	Age	Village	VDC	District	ACA	Tourism
Pyari Gurung	Female	51	Ghandruk	Ghandruk	Kaski	Inside	With
Prem K Gurung	Female	50	Ghandruk	Ghandruk	Kaski	Inside	With
Mim K Gurung	Female	35	Ghandruk	Ghandruk	Kaski	Inside	With
Min B. Gurung	Male	70	Ghandruk	Ghandruk	Kaski	Inside	With
Iswor B Gurung	Male	30	Ghandruk	Ghandruk	Kaski	Inside	With
Buddhi B Gurung	Male	70	Ghandruk	Ghandruk	Kaski	Inside	With
Chak B Gurung	Male	55	Ghandruk	Ghandruk	Kaski	Inside	With
Kisam Gurung	Male	34	Ghandruk	Ghandruk	Kaski	Inside	With
Shanker M Gurung	Male	52	Ghandruk	Ghandruk	Kaski	Inside	With
Til B Gurung	Male	54	Ghandruk	Ghandruk	Kaski	Inside	With
Kul B Sunar	Male	47	Ghandruk	Ghandruk	Kaski	Inside	With
Sahadeb Gurung	Male	31	Ghandruk	Ghandruk	Kaski	Inside	With
Min P Gurung	Male	63	Ghandruk	Ghandruk	Kaski	Inside	With
Tej B Gurung	Male	61	Ghandruk	Ghandruk	Kaski	Inside	With
Dil M Gurung	Male	61	Ghandruk	Ghandruk	Kaski	Inside	With
Karma K Gurung	Female	58	Ghandruk	Ghandruk	Kaski	Inside	With
Hari M Gurung	Female	36	Ghandruk	Ghandruk	Kaski	Inside	With
Chij B Gurung	Male	75	Ghandruk	Ghandruk	Kaski	Inside	With
Jagdip Gurung	Male	31	Ghandruk	Ghandruk	Kaski	Inside	With
Ram P Chalise	Male	35	Ghandruk	Ghandruk	Kaski	Inside	With
Mait L Gurung	Male	65	Ghandruk	Ghandruk	Kaski	Inside	With
Deu B Gurung	Male	63	Ghandruk	Ghandruk	Kaski	Inside	With
Gaj B Gurung	Male	37	Ghandruk	Ghandruk	Kaski	Inside	With
Gopal Gurung	Male	37	Ghandruk	Ghandruk	Kaski	Inside	With
Purna Pariyar	Male	26	Ghandruk	Ghandruk	Kaski	Inside	With
Rudra B Gurung	Male	73	Ghandruk	Ghandruk	Kaski	Inside	With
Kashi M Gurung	Female	56	Ghandruk	Ghandruk	Kaski	Inside	With
Parbati Gurung	Female	31	Ghandruk	Ghandruk	Kaski	Inside	With
Sun B Gurung	Male	70	Ghandruk	Ghandruk	Kaski	Inside	With
Man B Pariyar	Male	53	Ghandruk	Ghandruk	Kaski	Inside	With
Chamare Gurung	Male	78	Ghandruk	Ghandruk	Kaski	Inside	With
Yam B Gurung	Male	21	Ghandruk	Ghandruk	Kaski	Inside	With
Chinta B Gurung	Male	53	Ghandruk	Ghandruk	Kaski	Inside	With
Raj K Gurung	Female	37	Chhomrong	Ghandruk	Kaski	Inside	With
Nauli K Gurung	Female	54	Chhomrong	Ghandruk	Kaski	Inside	With
Sher B Gurung	Male	50	Chhomrong	Ghandruk	Kaski	Inside	With
Om B Gurung	Male	63	Chhomrong	Ghandruk	Kaski	Inside	With
Najar M Gurung	Male	37	Chhomrong	Ghandruk	Kaski	Inside	With
Gunja M Gurung	Male	42	Chhomrong	Ghandruk	Kaski	Inside	With
Chitra B. Gurung	Male	57	Chhomrong	Ghandruk	Kaski	Inside	With

Respondent's Name	Gender	Age	Village	VDC	District	ACA	Tourism
Iswor B Gurung	Male	62	Chhomrong	Ghandruk	Kaski	Inside	With
Ram P Gurung	Male	56	Chhomrong	Ghandruk	Kaski	Inside	With
Deu M Gurung	Male	25	Chhomrong	Ghandruk	Kaski	Inside	With
Maya Gurung	Female	33	Landruk	Lumle	Kaski	Inside	With
Juna K Poudel	Female	31	Landruk	Lumle	Kaski	Inside	With
Bir Suba Gurung	Female	43	Landruk	Lumle	Kaski	Inside	With
Prem B Gurung	Male	52	Landruk	Lumle	Kaski	Inside	With
Ghanashyam Chapagain	Male	42	Landruk	Lumle	Kaski	Inside	With
Krishna B Gurung	Male	65	Landruk	Lumle	Kaski	Inside	With
Buddhi Gurung	Male	43	Landruk	Lumle	Kaski	Inside	With
Purna B Kami	Male	52	Landruk	Lumle	Kaski	Inside	With
Moti B Gurung	Male	52	Landruk	Lumle	Kaski	Inside	With
Dambar B Gurung	Male	55	Landruk	Lumle	Kaski	Inside	With
Ai B Gurung	Male	42	Landruk	Lumle	Kaski	Inside	With
Hanindra Gurung	Male	49	Landruk	Lumle	Kaski	Inside	With
Tek B Gurung	Male	42	Bhujung	Bhujung	Lamjung	Inside	Without
Sut B Gurung	Male	51	Bhujung	Bhujung	Lamjung	Inside	Without
Chij B Gurung	Male	56	Bhujung	Bhujung	Lamjung	Inside	Without
Ram K Gurung	Female	29	Bhujung	Bhujung	Lamjung	Inside	Without
Tej B Gurung	Male	63	Bhujung	Bhujung	Lamjung	Inside	Without
Ram B Gurung	Male	50	Bhujung	Bhujung	Lamjung	Inside	Without
Lal P Gurung	Male	46	Bhujung	Bhujung	Lamjung	Inside	Without
Balsingh Gurung	Male	59	Bhujung	Bhujung	Lamjung	Inside	Without
YamSarki Gurung	Male	63	Bhujung	Bhujung	Lamjung	Inside	Without
Bhakti K Gurung	Female	60	Bhujung	Bhujung	Lamjung	Inside	Without
Tirtha B Gurung	Male	73	Bhujung	Bhujung	Lamjung	Inside	Without
Jit B Gurung	Male	61	Bhujung	Bhujung	Lamjung	Inside	Without
Nar B Gurung	Male	28	Bhujung	Bhujung	Lamjung	Inside	Without
Prem B BK	Male	26	Bhujung	Bhujung	Lamjung	Inside	Without
Nanda R BK	Male	53	Bhujung	Bhujung	Lamjung	Inside	Without
Sarki BK	Male	53	Bhujung	Bhujung	Lamjung	Inside	Without
Dil K Pariyar	Female	48	Bhujung	Bhujung	Lamjung	Inside	Without
Jun K BK	Female	29	Bhujung	Bhujung	Lamjung	Inside	Without
Prem Ghale	Male	43	Bahum	Uttarkanya	Lamjung	Inside	Without
Padam S Ghale	Male	66	Bahum	Uttarkanya	Lamjung	Inside	Without
Gopal Ghale	Male	64	Bahum	Uttarkanya	Lamjung	Inside	Without
Ashmati Gurung	Female	28	Bahum	Uttarkanya	Lamjung	Inside	Without
Ganga Gurung	Male	42	Bahum	Uttarkanya	Lamjung	Inside	Without
Shesh B Gurung	Male	48	Bahum	Uttarkanya	Lamjung	Inside	Without
Tok P Ghale	Male	37	Bahum	Uttarkanya	Lamjung	Inside	Without
Chandra Ghale	Male	48	Bahum	Uttarkanya	Lamjung	Inside	Without
Santa B Ghale	Male	52	Bahum	Uttarkanya	Lamjung	Inside	Without

Respondent's Name	Gender	Age	Village	VDC	District	ACA	Tourism
Trikashi Gurung	Female	20	Bahum	Uttarkanya	Lamjung	Inside	Without
Nar B BK	Male	66	Bahum	Uttarkanya	Lamjung	Inside	Without
Sumitra BK	Female	47	Bahum	Uttarkanya	Lamjung	Inside	Without
Til B Gurung	Male	43	Dangsing	Dangsing	Kaski	Inside	Without
Ras K Gurung	Female	52	Dangsing	Dangsing	Kaski	Inside	Without
Bal D Gurung	Female	55	Dangsing	Dangsing	Kaski	Inside	Without
Indra K Gurung	Male	29	Dangsing	Dangsing	Kaski	Inside	Without
Bais B BK	Male	36	Dangsing	Dangsing	Kaski	Inside	Without
Chandra B Pariyar	Male	60	Dangsing	Dangsing	Kaski	Inside	Without
Jug B Pun	Male	51	Dangsing	Dangsing	Kaski	Inside	Without
Ash B Gurung	Male	55	Dangsing	Dangsing	Kaski	Inside	Without
Chij K Gurung	Female	64	Dangsing	Dangsing	Kaski	Inside	Without
Dil B Sarki	Male	60	Dangsing	Dangsing	Kaski	Inside	Without
Purna B Gurung	Male	67	Dangsing	Dangsing	Kaski	Inside	Without
Jit B Gurung	Male	47	Dangsing	Dangsing	Kaski	Inside	Without
Devendra Sherchan	Male	34	Dangsing	Dangsing	Kaski	Inside	Without
Chandra D Gurung	Male	63	Sabet	Dangsing	Kaski	Inside	Without
Jay B Gurung	Male	66	Sabet	Dangsing	Kaski	Inside	Without
Kamal B Gurung	Male	56	Sabet	Dangsing	Kaski	Inside	Without
Raju Gurung	Male	31	Sabet	Dangsing	Kaski	Inside	Without
Khim P Sherchan	Male	50	Sabet	Dangsing	Kaski	Inside	Without
Mait K Gurung	Female	26	Sabet	Dangsing	Kaski	Inside	Without
Raj K Gurung	Female	73	Sabet	Dangsing	Kaski	Inside	Without
Chitra B Pariya	Male	39	Sabet	Dangsing	Kaski	Inside	Without
Suk B Gurung	Male	40	Sabet	Dangsing	Kaski	Inside	Without
Purna B Gurung	Male	59	Sabet	Dangsing	Kaski	Inside	Without
Bal B BK	Male	48	Sabet	Dangsing	Kaski	Inside	Without
Nar B Gurung	Male	61	Sabet	Dangsing	Kaski	Inside	Without
Bir D Gurung	Male	71	Sabet	Dangsing	Kaski	Inside	Without
Durga B BK	Male	50	Sabet	Dangsing	Kaski	Inside	Without
Karna B Gurung	Male	55	Sabet	Dangsing	Kaski	Inside	Without
Dhan B BK	Male	58	Sabet	Dangsing	Kaski	Inside	Without
Kamala Tulachan	Female	37	Sarangkot	Sarangkot	Kaski	Outside	With
Tara Jisi	Female	30	Sarangkot	Sarangkot	Kaski	Outside	With
Uma N Chapagain	Male	59	Sarangkot	Sarangkot	Kaski	Outside	With
Kul P Timilsina	Male	82	Sarangkot	Sarangkot	Kaski	Outside	With
Bhim P Chapagain	Male	55	Sarangkot	Sarangkot	Kaski	Outside	With
Bal K Sharma	Male	47	Sarangkot	Sarangkot	Kaski	Outside	With
Ram B Timilsina	Male	42	Sarangkot	Sarangkot	Kaski	Outside	With
Moti L Timilsin	Male	27	Sarangkot	Sarangkot	Kaski	Outside	With
Teeka Thapa	Female	35	Sarangkot	Sarangkot	Kaski	Outside	With
Man K Thapa	Female	47	Sarangkot	Sarangkot	Kaski	Outside	With

Respondent's Name	Gender	Age	Village	VDC	District	ACA	Tourism
Mana Baral	Female	35	Sarangkot	Sarangkot	Kaski	Outside	With
Laxman Baniya	Male	43	Sarangkot	Sarangkot	Kaski	Outside	With
Ram P Thapa	Male	55	Sarangkot	Sarangkot	Kaski	Outside	With
Tirtha B Magar	Male	50	Sarangkot	Sarangkot	Kaski	Outside	With
Durga Timilsina	Male	36	Sarangkot	Sarangkot	Kaski	Outside	With
Ran B Thapa	Male	49	Sarangkot	Sarangkot	Kaski	Outside	With
Samundra Thapa	Male	36	Sarangkot	Sarangkot	Kaski	Outside	With
Bhoj B Gurung	Male	44	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Karna B Ghale	Male	60	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Promod Ghale	Male	25	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Nanda R Tamang	Male	39	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Arjun Gurung	Male	29	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Man B Tamang	Male	50	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Shyam P Gurung	Male	55	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Lal P Ghale	Male	65	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Khem P Gurung	Male	58	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Ram K Pariyar	Male	25	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Ram M Gurung	Female	36	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Chandra D Taman	Female	35	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Santa K Bhandar	Male	46	Ngadi	Bhulbhule	Lamjung	Outside	With
Chimi D Gurung	Male	50	Ngadi	Bhulbhule	Lamjung	Outside	With
Ram B Bhandari	Male	46	Ngadi	Bhulbhule	Lamjung	Outside	With
Man L Gurung	Male	58	Ngadi	Bhulbhule	Lamjung	Outside	With
Til B Gurung	Male	40	Ngadi	Bhulbhule	Lamjung	Outside	With
Durga B Pariyar	Male	65	Ngadi	Bhulbhule	Lamjung	Outside	With
Suk P Gurung	Male	36	Ngadi	Bhulbhule	Lamjung	Outside	With
Padam K Gurung	Female	43	Ngadi	Bhulbhule	Lamjung	Outside	With
Kanya K Gurung	Female	22	Ngadi	Bhulbhule	Lamjung	Outside	With
Mani P Gurung	Male	63	Taksar	Gilung	Lamjung	Outside	With
Bal Ram Pari	Male	36	Sarangkot	Sarangkot	Kaski	Outside	With
Kho M Gurung	Female	26	Mauja	Mauja	Kaski	Outside	Without
Samar B Gurung	Male	60	Mauja	Mauja	Kaski	Outside	Without
Chet B Gurung	Male	65	Mauja	Mauja	Kaski	Outside	Without
Bishnu K Gurung	Female	40	Aantighar	Mauja	Kaski	Outside	Without
Dil K Gurung	Female	60	Aantighar	Mauja	Kaski	Outside	Without
Purna K Gurung	Female	60	Aantighar	Mauja	Kaski	Outside	Without
Bijay L Gurung	Female	52	Aantighar	Mauja	Kaski	Outside	Without
Gopal D Gurung	Male	62	Aantighar	Mauja	Kaski	Outside	Without
Amar B Gurung	Male	77	Aantighar	Mauja	Kaski	Outside	Without
Padam B Gurung	Male	81	Aantighar	Mauja	Kaski	Outside	Without
Dilli R Sapkota	Male	47	Aantighar	Mauja	Kaski	Outside	Without
Masina Pariyar	Male	27	Aantighar	Mauja	Kaski	Outside	Without

Respondent's Name	Gender	Age	Village	VDC	District	ACA	Tourism
Mani R Pariyar	Male	32	Aantighar	Mauja	Kaski	Outside	Without
Sakuntala Gurung	Female	55	Mauja	Mauja	Kaski	Outside	Without
Tak K Gurung	Female	32	Mauja	Mauja	Kaski	Outside	Without
Lekh K Gurung	Female	35	Mauja	Mauja	Kaski	Outside	Without
Netra B BK	Male	54	Mauja	Mauja	Kaski	Outside	Without
Namansingh Guru	Male	71	Mauja	Mauja	Kaski	Outside	Without
Parshu R Gurung	Male	64	Mauja	Mauja	Kaski	Outside	Without
Bhesh J Gurung	Male	61	Mauja	Mauja	Kaski	Outside	Without
Dev B Gurung	Male	52	Mauja	Mauja	Kaski	Outside	Without
Buddhi M BK	Male	53	Mauja	Mauja	Kaski	Outside	Without
Dal B Gurung	Male	48	Mauja	Mauja	Kaski	Outside	Without
Chandra D Gurun	Male	65	Taksar	Gilung	Lamjung	Outside	Without
Ram S Gurung	Male	69	Taksar	Gilung	Lamjung	Outside	Without
Bina S Gurung	Male	60	Taksar	Gilung	Lamjung	Outside	Without
Gam B Gurung	Male	56	Taksar	Gilung	Lamjung	Outside	Without
Hum B BK	Male	28	Taksar	Gilung	Lamjung	Outside	Without
Kesh B Bk	Male	40	Taksar	Gilung	Lamjung	Outside	Without
Shila Gurung	Female	26	Taksar	Gilung	Lamjung	Outside	Without
Ash B Gurung	Male	49	Taksar	Gilung	Lamjung	Outside	Without
Nar B Gurung	Male	52	Taksar	Gilung	Lamjung	Outside	Without
Nanda M Gurung	Male	46	Taksar	Gilung	Lamjung	Outside	Without
Hari P Gurung	Male	65	Taksar	Gilung	Lamjung	Outside	Without
Amar B Gurung	Male	44	Taksar	Gilung	Lamjung	Outside	Without
Dikendra Gurung	Male	32	Maling	Maling	Lamjung	Outside	Without
Nam B BK	Male	40	Maling	Maling	Lamjung	Outside	Without
Nanda P Gurung	Male	54	Maling	Maling	Lamjung	Outside	Without
Ud Ras Gurung	Male	53	Maling	Maling	Lamjung	Outside	Without
Panch B Gurung	Male	60	Maling	Maling	Lamjung	Outside	Without
Harka B BK	Male	33	Maling	Maling	Lamjung	Outside	Without
Rukh B Gurung	Male	42	Maling	Maling	Lamjung	Outside	Without
Chandra M Gurun	Female	70	Maling	Maling	Lamjung	Outside	Without
Shree K Gurung	Female	47	Maling	Maling	Lamjung	Outside	Without
Pancha M Gurung	Female	42	Maling	Maling	Lamjung	Outside	Without

Appendix 5.3

List of questionnaire survey respondents

Respondent's name	Gender	Age	VDC	Village	District	ACA	Tourism
Mait Lal Gurung	Male	65	Ghandruk	Ghandruk	Kaski	Inside	With
Deu Bahadur Gurung	Male	63	Ghandruk	Ghandruk	Kaski	Inside	With
Man Bahadur Pariyar	Male	53	Ghandruk	Ghandruk	Kaski	Inside	With
Gaj Bahadur Gurung	Male	37	Ghandruk	Ghandruk	Kaski	Inside	With
Chamare Gurung	Male	78	Ghandruk	Ghandruk	Kaski	Inside	With
Birdhwoj Gurung	Male	71	Ghandruk	Ghandruk	Kaski	Inside	With
Yam Bahadur Gurung	Male	21	Ghandruk	Ghandruk	Kaski	Inside	With
Raju Gurung	Male	19	Ghandruk	Ghandruk	Kaski	Inside	With
Kul Bahadur BK	Male	64	Ghandruk	Ghandruk	Kaski	Inside	With
Deu Bahadur Gurung	Male	53	Ghandruk	Ghandruk	Kaski	Inside	With
Dal Bahadur Gurung	Male	68	Ghandruk	Ghandruk	Kaski	Inside	With
Bhor Bahadur Gurung	Male	36	Ghandruk	Ghandruk	Kaski	Inside	With
Kamala Gurung	Male	42	Ghandruk	Ghandruk	Kaski	Inside	With
Shir B. Gurung	Male	72	Ghandruk	Ghandruk	Kaski	Inside	With
Sahadeb Gurung	Male	23	Ghandruk	Ghandruk	Kaski	Inside	With
Buddhi Gurung	Male	31	Ghandruk	Ghandruk	Kaski	Inside	With
Man Kaji Gurung	Male	71	Ghandruk	Ghandruk	Kaski	Inside	With
Prem Kumari Gurung	Female	50	Ghandruk	Ghandruk	Kaski	Inside	With
Parbati Gurung	Female	31	Ghandruk	Ghandruk	Kaski	Inside	With
Kasi Maya Gurung	Female	56	Ghandruk	Ghandruk	Kaski	Inside	With
Shir Shuva Sunar	Female	47	Ghandruk	Ghandruk	Kaski	Inside	With
Ganga Rasaili	Female	24	Ghandruk	Ghandruk	Kaski	Inside	With
Mim Kumari Gurung	Female	35	Ghandruk	Ghandruk	Kaski	Inside	With
Devi Gurung	Female	50	Ghandruk	Ghandruk	Kaski	Inside	With
Nanda Kumari Gurung	Female	61	Ghandruk	Ghandruk	Kaski	Inside	With
Ram P. Gurung	Male	56	Ghandruk	Chhomrong	Kaski	Inside	With
Jum Kaji Gurung	Male	28	Ghandruk	Chhomrong	Kaski	Inside	With
Hitu Gurung	Male	30	Ghandruk	Chhomrong	Kaski	Inside	With
Due Kumar Gurung	Male	25	Ghandruk	Chhomrong	Kaski	Inside	With
Nanda Kumari Gurung	Female	28	Ghandruk	Chhomrong	Kaski	Inside	With
Tara Devi Gurung	Female	19	Ghandruk	Chhomrong	Kaski	Inside	With
Draupati Thapa	Female	30	Ghandruk	Chhomrong	Kaski	Inside	With
Balupadhyaya Poudel	Male	78	Lumle	Landruk	Kaski	Inside	With
Rup B. Gurung	Male	35	Lumle	Landruk	Kaski	Inside	With
Sete Gurung	Male	88	Lumle	Landruk	Kaski	Inside	With
Kaladhar Joshi	Male	44	Lumle	Landruk	Kaski	Inside	With
Moti B. Gurung	Male	52	Lumle	Landruk	Kaski	Inside	With
Lilati Poudel	Female	50	Lumle	Landruk	Kaski	Inside	With
Jau Maya Gurung	Female	41	Lumle	Landruk	Kaski	Inside	With
Tulshi Maya Pariyar	Female	50	Lumle	Landruk	Kaski	Inside	With
Laxmi Bhandari	Female	22	Lumle	Landruk	Kaski	Inside	With
Laxmi B. K.	Female	40	Lumle	Landruk	Kaski	Inside	With
Naina Singh Gurung	Female	57	Lumle	Landruk	Kaski	Inside	With

Respondent's name	Gender	Age	VDC	Village	District	ACA	Tourism
Aash Bahadur Pariyar	Male	55	Dangsing	Dangsing	Kaski	Inside	Without
Suk Bahadur BK	Male	22	Dangsing	Dangsing	Kaski	Inside	Without
Tul Bahadur BK	Male	18	Dangsing	Dangsing	Kaski	Inside	Without
Jit Bahadur Gurung	Male	47	Dangsing	Dangsing	Kaski	Inside	Without
Sakta Bahadur Gurung	Male	63	Dangsing	Dangsing	Kaski	Inside	Without
Lil Bahadur Gurung	Male	54	Dangsing	Dangsing	Kaski	Inside	Without
Dil Bahadur Kachal	Male	60	Dangsing	Dangsing	Kaski	Inside	Without
Bal Devi Gurung	Female	55	Dangsing	Dangsing	Kaski	Inside	Without
Gita Gurung	Female	40	Dangsing	Dangsing	Kaski	Inside	Without
Raj Man Gurung	Male	37	Dangsing	Sabet	Kaski	Inside	Without
Gupti Man Gurung	Male	64	Dangsing	Sabet	Kaski	Inside	Without
Suk Bahadur Pariyar	Male	23	Dangsing	Sabet	Kaski	Inside	Without
Karna Bahadur Gurung	Male	55	Dangsing	Sabet	Kaski	Inside	Without
Durga Bahadur BK	Male	50	Dangsing	Sabet	Kaski	Inside	Without
Dal Bahadur Gurung	Male	74	Dangsing	Sabet	Kaski	Inside	Without
Dhan Bahadur BK	Male	58	Dangsing	Sabet	Kaski	Inside	Without
Meena Gurung	Female	28	Dangsing	Sabet	Kaski	Inside	Without
Nan Shuva Gurung	Female	38	Dangsing	Sabet	Kaski	Inside	Without
Chandra Muni Gurung	Male	78	Bhujung	Bhujung	Lamjung	Inside	Without
Chij B Gurung	Male	56	Bhujung	Bhujung	Lamjung	Inside	Without
Gopal B Gurung	Male	64	Bhujung	Bhujung	Lamjung	Inside	Without
Tej B Gurung	Male	63	Bhujung	Bhujung	Lamjung	Inside	Without
Tek B Gurung	Male	42	Bhujung	Bhujung	Lamjung	Inside	Without
Shyam B Gurung	Male	29	Bhujung	Bhujung	Lamjung	Inside	Without
Kalu BK	Male	46	Bhujung	Bhujung	Lamjung	Inside	Without
Sher Bahadur Gurung	Male	67	Bhujung	Bhujung	Lamjung	Inside	Without
Balashing Gurung	Male	59	Bhujung	Bhujung	Lamjung	Inside	Without
Chamasarki Gurung	Male	63	Bhujung	Bhujung	Lamjung	Inside	Without
Sul Bahadur BK	Male	66	Bhujung	Bhujung	Lamjung	Inside	Without
Mangal B. Pariyar	Male	34	Bhujung	Bhujung	Lamjung	Inside	Without
Prem Bahadur BK	Male	26	Bhujung	Bhujung	Lamjung	Inside	Without
Udimaya Gurung	Female	51	Bhujung	Bhujung	Lamjung	Inside	Without
Bhakti K Gurung	Female	60	Bhujung	Bhujung	Lamjung	Inside	Without
Dil K Gurung	Female	34	Bhujung	Bhujung	Lamjung	Inside	Without
Harimaya K Gurung	Female	51	Bhujung	Bhujung	Lamjung	Inside	Without
Parbati Gurung	Female	36	Bhujung	Bhujung	Lamjung	Inside	Without
Durapati BK	Female	52	Bhujung	Bhujung	Lamjung	Inside	Without
Junkashi BK	Female	29	Bhujung	Bhujung	Lamjung	Inside	Without
Lure BK	Male	45	Uttarkanya	Baghum	Lamjung	Inside	Without
Pura Devi Gurung	Female	52	Uttarkanya	Baghum	Lamjung	Inside	Without
Tirth Kumari Gurung	Female	22	Uttarkanya	Baghum	Lamjung	Inside	Without
Budhha Kashi Gurung	Female	54	Uttarkanya	Baghum	Lamjung	Inside	Without
Ash Kumari BK	Female	35	Uttarkanya	Baghum	Lamjung	Inside	Without
Sumitra BK	Female	47	Uttarkanya	Baghum	Lamjung	Inside	Without

Respondent's name	Gender	Age	VDC	Village	District	ACA	Tourism
Shesh Kumari Gurung	Female	26	Uttarkanya	Baghum	Lamjung	Inside	Without
Man Manya Gurung	Female	60	Uttarkanya	Baghum	Lamjung	Inside	Without
Akkal B Thapa	Male	30	Sarangkot	Sarangkot	Kaski	Outside	With
Ran B Thapa	Male	49	Sarangkot	Sarangkot	Kaski	Outside	With
Khim B Thapa	Male	56	Sarangkot	Sarangkot	Kaski	Outside	With
Tek B Baniya	Male	29	Sarangkot	Sarangkot	Kaski	Outside	With
Durga Timilsina	Male	30	Sarangkot	Sarangkot	Kaski	Outside	With
Ram B Thapa	Male	55	Sarangkot	Sarangkot	Kaski	Outside	With
Laxman Baniya	Male	33	Sarangkot	Sarangkot	Kaski	Outside	With
Balaram Pahari	Male	37	Sarangkot	Sarangkot	Kaski	Outside	With
Raju Pariyar	Male	28	Sarangkot	Sarangkot	Kaski	Outside	With
Gopal Nepali	Male	38	Sarangkot	Sarangkot	Kaski	Outside	With
Ganesh Baniya	Male	34	Sarangkot	Sarangkot	Kaski	Outside	With
Chin B pariyar	Male	69	Sarangkot	Sarangkot	Kaski	Outside	With
Min B Thapa	Male	33	Sarangkot	Sarangkot	Kaski	Outside	With
Gore Pariyar	Male	39	Sarangkot	Sarangkot	Kaski	Outside	With
Ram P Timilsina	Male	42	Sarangkot	Sarangkot	Kaski	Outside	With
Samundra Thapa	Female	36	Sarangkot	Sarangkot	Kaski	Outside	With
Mana Baral	Female	35	Sarangkot	Sarangkot	Kaski	Outside	With
Man Bir Tamang	Male	50	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Ram Krisha Pariyar	Male	29	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Chandra Devi Tamang	Female	35	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Minsari Tamang	Female	50	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Sannt Maya Tamang	Female	25	Bhulbhule	Bhulbhule	Lamjung	Outside	With
Durga B. Pariyar	Male	75	Bhulbhule	Ngadi	Lamjung	Outside	With
Suk B. Gurung	Male	36	Bhulbhule	Ngadi	Lamjung	Outside	With
Krishna B. Gurung	Male	35	Bhulbhule	Ngadi	Lamjung	Outside	With
Kanya Kumari Gurung	Female	22	Bhulbhule	Ngadi	Lamjung	Outside	With
Bal Maya Gurung	Female	26	Bhulbhule	Ngadi	Lamjung	Outside	With
Buddhi Man BK	Male	53	Mauja	Mauja	Kaski	Outside	Without
Dambar Bahadur BK	Male	39	Mauja	Mauja	Kaski	Outside	Without
Sthir Bahadur Gurung	Male	56	Mauja	Mauja	Kaski	Outside	Without
Dal Bahadur Gurung	Male	48	Mauja	Mauja	Kaski	Outside	Without
Tek Bahadur Gurung	Male	51	Mauja	Mauja	Kaski	Outside	Without
Nar Bahadur Gurung	Male	76	Mauja	Mauja	Kaski	Outside	Without
Dil Shuva Gurung	Female	40	Mauja	Mauja	Kaski	Outside	Without
Kho Maya Gurung	Female	26	Mauja	Mauja	Kaski	Outside	Without
Lila Kumari Gurung	Female	50	Mauja	Mauja	Kaski	Outside	Without
Meena Gurung	Female	40	Mauja	Mauja	Kaski	Outside	Without
Keshari Gurung	Female	52	Mauja	Mauja	Kaski	Outside	Without
Nanda Lal BK	Male	51	Mauja	Aantighar	Kaski	Outside	Without
Dil Kumari Gurung	Female	60	Mauja	Aantighar	Kaski	Outside	Without
Purna Kumari BK	Female	50	Mauja	Aantighar	Kaski	Outside	Without
Keshari Pariyar	Female	39	Mauja	Aantighar	Kaski	Outside	Without

Respondent's name	Gender	Age	VDC	Village	District	ACA	Tourism
Masina Pariyar	Female	27	Mauja	Aantighar	Kaski	Outside	Without
Panmati Pariyar	Female	60	Mauja	Aantighar	Kaski	Outside	Without
Vijay Laxmi Gurung	Female	52	Mauja	Aantighar	Kaski	Outside	Without
Harka Bahadur BK	Male	33	Maling	Maling	Lamjung	Outside	Without
Chok Man BK	Male	28	Maling	Maling	Lamjung	Outside	Without
Rukha B. Gurung	Male	42	Maling	Maling	Lamjung	Outside	Without
Shree Kumari Gurung	Female	47	Maling	Maling	Lamjung	Outside	Without
Pancha Maya Gurung	Female	42	Maling	Maling	Lamjung	Outside	Without
Man Kumari gurung	Female	32	Maling	Maling	Lamjung	Outside	Without
Hari Prasad Guruung	Male	65	Gilung	Taksar	Lamjung	Outside	Without
Purn Singh B K	Male	41	Gilung	Taksar	Lamjung	Outside	Without
Tek Bahadur Gurung	Male	33	Gilung	Taksar	Lamjung	Outside	Without
Amar Bahadur Gurung	Male	44	Gilung	Taksar	Lamjung	Outside	Without
Ash Bahadur B K	Male	49	Gilung	Taksar	Lamjung	Outside	Without
Sul Bahadur B K	Male	67	Gilung	Taksar	Lamjung	Outside	Without
Sita Gurung	Female	26	Gilung	Taksar	Lamjung	Outside	Without
Ran Kumari Gurung	Female	25	Gilung	Taksar	Lamjung	Outside	Without
Bambi Gurung	Female	63	Gilung	Taksar	Lamjung	Outside	Without
Rankashi Gurung	Female	37	Gilung	Taksar	Lamjung	Outside	Without

Appendix 5.4

List of semi-structured interview respondents

Respondent's Name	Organisation	Designation
Dr. Chandra P. Gurung	WWF Nepal Programme	Country Representative
Mr. Arup Rajouriya	King Mahendra Trust for Nature Conservation	Member Secretary
Dr. Uday R. Sharma	Department of Plant Resources	Director General
Mr. Gehendra Gurung	King Mahendra Trust for Nature Conservation	Director ACAP
Dr. Swayambhu M. Amatya	Department of National Parks and Wildlife Conservation	Director General
Mr. Sagendra Tiwari	Natural Resource Programme, IUCN Nepal	Coordinator
Dr. Pralahd Yonzon	Resources Himalaya	Team Leader
Mr. Yam B Gurung	King Mahendra Trust for Nature Conservation	Officer-in-Charge, ACAP Ghandruk
Mr. Ram Chnadra Nepal	King Mahendra Trust for Nature Conservation	Sencior conservation officer, ACAP
Mr. Roshan Sherchan	King Mahendra Trust for Nature Conservation	Conservation Officer, ACAP

Appendix 5.5

Results of statistical analysis
Chapter V

5.5.1. Tree Density per hectare compared inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	1830	256
Outside ACA	12	1561	165

Mann-Whitney test for tree density per hectare

Study site	Plot number	Median	W	P
Inside ACA	25	1436	469.5	0.871
Outside ACA	12	1641.5		

5.5.2. Comparison of stands basal area inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	114.6	15.5
Outside ACA	12	50.0	16.8

Mann-Whitney test for stand basal area per hectare

Study site	Plot number	Median	W	P
Inside ACA	25	109.12	574.0	0.0014
Outside ACA	12	34.14		

5.5.3. Comparison of species diversity inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	1.28	0.09
Outside ACA	12	0.91	0.11

Mann-Whitney test for species diversity

Study site	Plot number	Median	W	P
Inside ACA	25	1.38	550	0.0167
Outside ACA	12	0.83		

5.5.4. Comparison of species evenness inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	0.79	0.04
Outside ACA	12	0.73	0.05

Mann-Whitney test for species evenness

Study site	Plot number	Median	W	P
Inside ACA	25	0.87	517	0.178
Outside ACA	12	0.75		

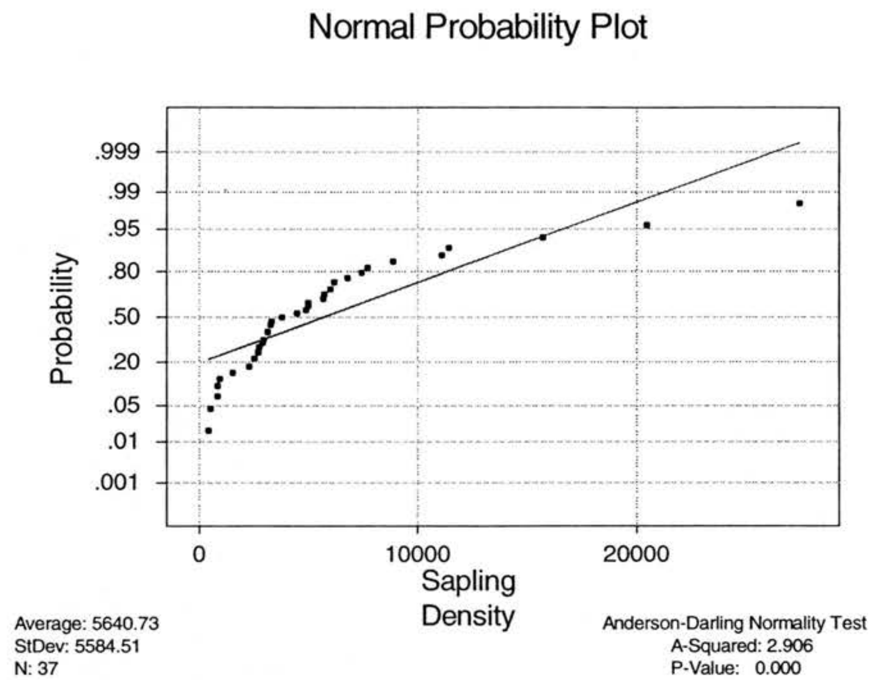
5.5.5. Comparison of sapling density per hectare inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	5476	1287
Outside ACA	12	5984	983

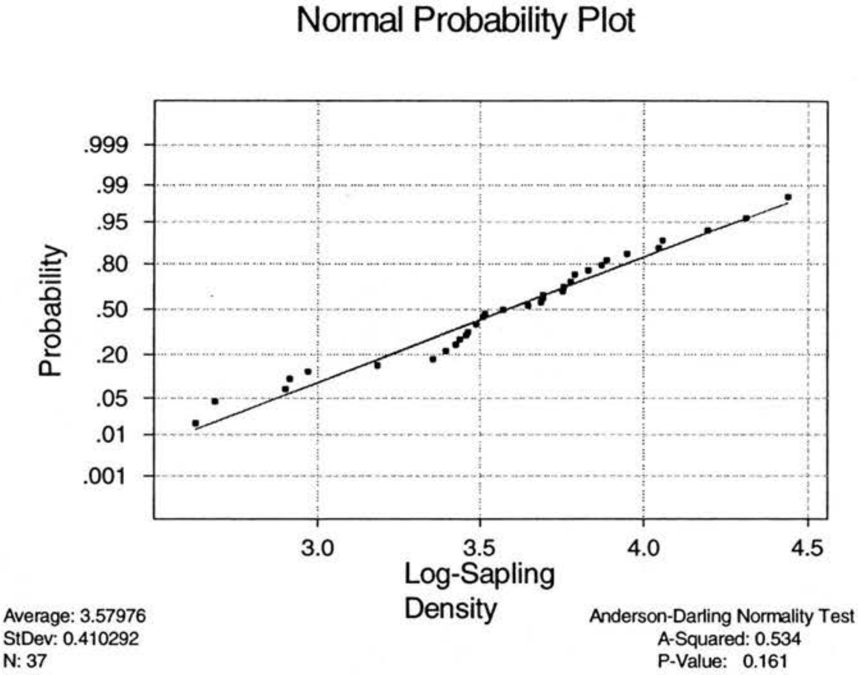
Two sample t-test for log transferred sapling density

Study site	Plot number	Mean	St.Dev.	SE mean	P
Inside ACA	25	3.5	0.46	0.09	0.124
Outside ACA	12	3.7	0.19	0.05	

Normality test of sapling density data

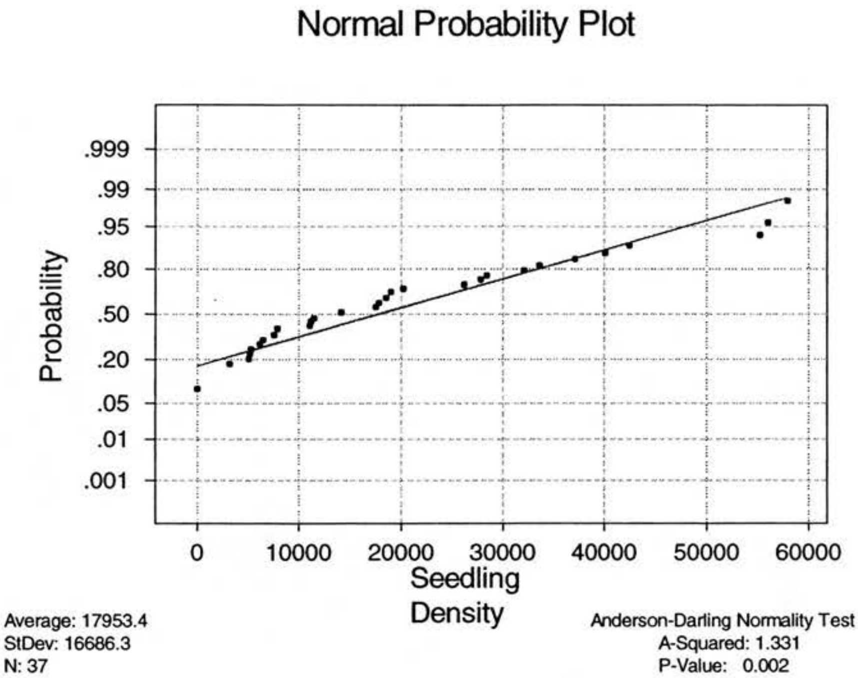


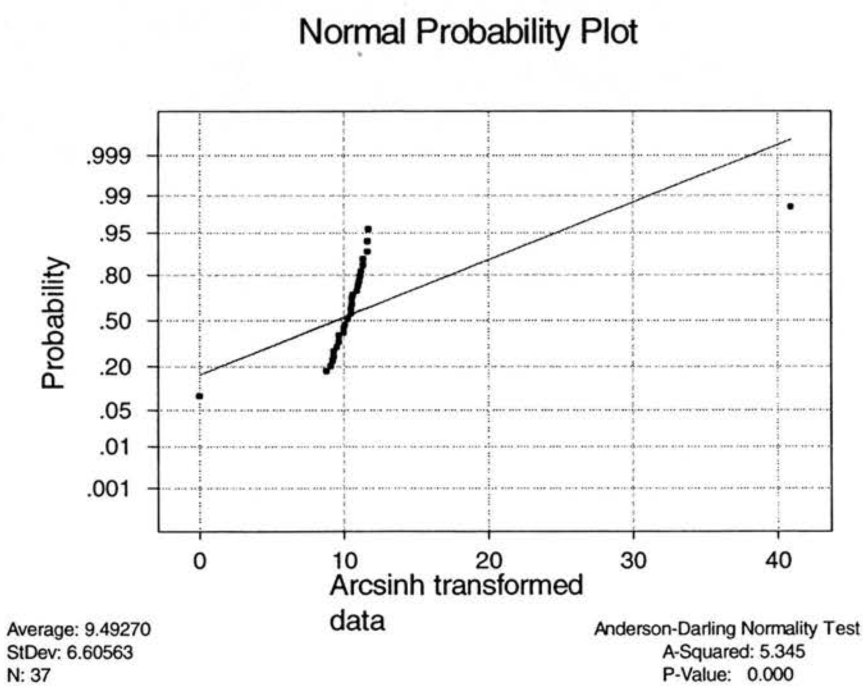
The Anderson-Darling Normality test was used to confirm whether the data follow a normal distribution. In the Anderson-Darling Normality test, the smaller the p-value is, the less likely the sample came from a normal distribution. In other words, if the p-value is equal or greater than 0.05, then the sample is most likely came from a normal distribution (Minitab 2000). Above normal probability plot shows that the sapling density data are not normally distributed. Therefore, the data were first transformed to normalise by a log transformation (de Vause 2002). The normal probability plot below confirms that the data are normally distributed after the log transformation.



5.5.6. Comparison of seedling density per hectare inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	19108	3498
Outside ACA	12	15548	4418


Normal Probability Plot
.999
.99
.95
.80
.50
.20
.05
.01
.001
Probability
0
10000
20000
30000
40000
50000
60000
Seedling Density
Average: 17953.4
StDev: 16686.3
N: 37
Anderson-Darling Normality Test
A-Squared: 1.331
P-Value: 0.002


Normal Probability Plot
.999
.99
.95
.80
.50
.20
.05
.01
.001
Probability
0
10
20
30
40
Arcsinh transformed data
Average: 9.49270
StDev: 6.60563
N: 37
Anderson-Darling Normality Test
A-Squared: 5.345
P-Value: 0.000

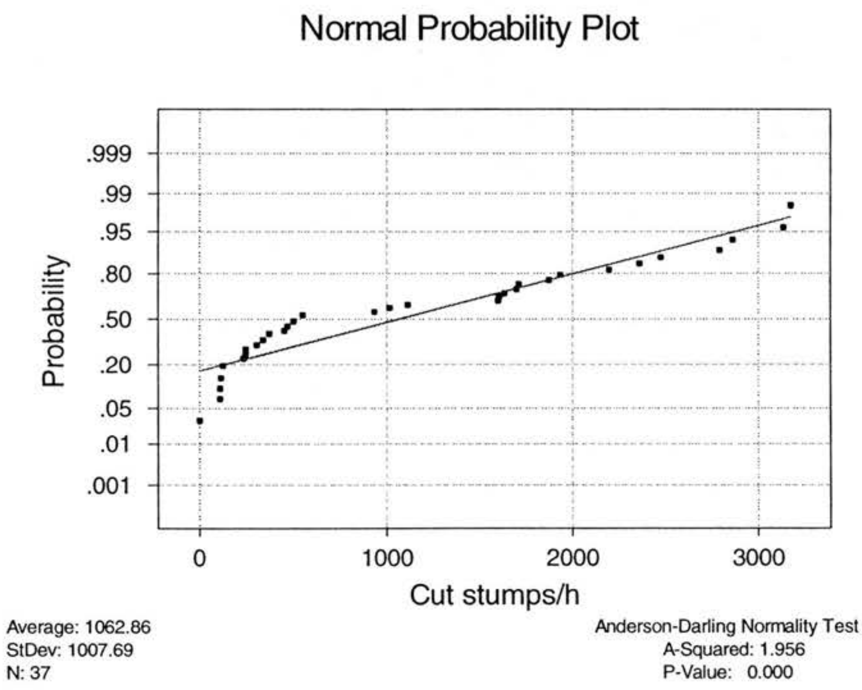
The Anderson-Darling Normality test showed that the data is not normal even after the arcsinh transformation. The arcsinh transformation was used since the data has zeros (Fowler et al. 1998). Therefore, Mann-Whitney test was used.

Mann-Whitney test for species evenness

Study site	Plot number	Median	W	P
Inside ACA	25	17493	484.5	0.77
Outside ACA	12	11240		

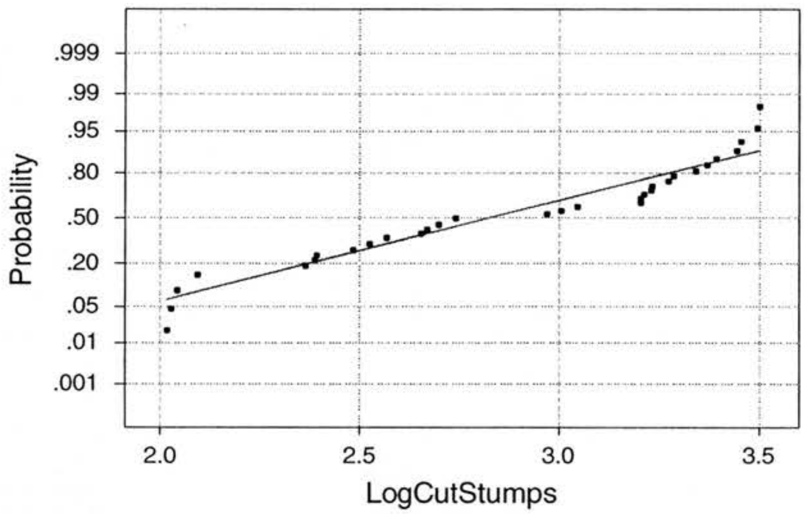
5.5.7. Comparison of cut stumps density per hectare inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	716	170
Outside ACA	12	1785	275



The Anderson-Darling Normality test showed that the data was not normally distributed even after a log transformation. As the p-value is smaller than 0.05, it is less likely that the sample came from a normal distribution. Therefore, Mann-Whitney test was used.

Normal Probability Plot



Average: 2.81991
StDev: 0.500195
N: 35

Anderson-Darling Normality Test
A-Squared: 0.974
P-Value: 0.013

Mann-Whitney test for cut stump density

Study site	Plot number	Median	W	P
Inside ACA	25	334	376.5	0.0015
Outside ACA	12	1792		

5.5.8. Comparison of grazing livestock counted inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	75.5	46.9
Outside ACA	12	16.7	16.7

Mann-Whitney test for grazing livestock counted

Study site	Plot number	Median	W	P
Inside ACA	25	0	486.5	0.721
Outside ACA	12	0		

5.5.9. Comparison of livestock dung counted inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	127.3	44.0
Outside ACA	12	59.3	50.0

Mann-Whitney test for dung counted

Study site	Plot number	Median	W	P
Inside ACA	25	0	505	0.338
Outside ACA	12	0		

5.5.10. Comparison of wildlife pellets counted per hectare inside and outside ACA

Study site	Plot number	Mean	SE Mean
Inside ACA	25	156	68.3
Outside ACA	12	0	0

Mann-Whitney test for wildlife sighting

Study site	Plot number	Median	W	P
Inside ACA	25	1.0	536	0.049
Outside ACA	12	0.0		

Appendix 6

Results of statistical analysis
Chapter VI

6.1 Perceived changes in village over a decade period based on structured interviews with local communities within ACA

Statements	Responses in Percentage					Mean	SD
	SA	A	N	D	SD		
1. Easy availability of fuel and fodder	89.5	8.8	0.9	0	0.9	4.85	0.49
2. Institutional development in the village	76.3	21.1	2.6	0	0	4.73	0.49
3. Effective protection of wildlife and forest	86.0	13.2	0	0.9	0	4.84	0.43
4. Improvement in the basic infrastructures	78.1	19.3	0.9	0.9	0.9	4.73	0.61
5. Introduction of the AE technologies	40.4	32.5	5.3	4.4	17.5	3.73	1.47
6. Improvement in health and sanitation	93.9	5.3	0	0.9	0	4.92	0.36
7. Local capacity building	41.2	42.1	9.6	6.1	0.9	4.16	0.90
8. Conservation education and awareness	69.9	28.3	0.9	0.9	0	4.67	0.54
9. Technical support – Agri, health, etc.	50.0	36.8	5.3	6.1	1.8	4.27	0.94
10. Creation of economic opportunities	40.4	41.2	4.4	3.5	10.5	3.97	1.24
11. Development of the village	69.3	28.1	1.8	0	0.9	4.64	0.60
12. Devolution of power to local community	68.1	26.5	5.3	0	0	4.60	0.58
13. Involvement of women in C+D activities	93.9	6.1	0	0	0	4.93	0.24
14. Dev. of local system of governance	59.6	31.6	8.8	0	0	4.50	0.65
15. Increase in wildlife population	91.2	4.4	2.6	1.8	0	4.85	0.53
16. Improved forest conditions	84.2	14.0	1.8	0	0	4.82	0.42
17. Abundance in NTFPs	69.5	30.7	27.2	1.8	0.9	4.06	0.90

N= 114 only inside PA, SA, strongly agree; A, agree; N, no opinion; D, disagree and SD, strongly disagree

6.2 Perceived changes in village over a decade period based on structured interviews with local communities outside ACA

Statements	Responses in Percentage					Mean	SD
	SA	A	N	D	SD		
1. Easy availability of fuel and fodder	36.5	38.8	8.2	9.4	7.1	3.88	1.20
2. Institutional development in the village	28.2	57.6	4.7	5.9	3.5	4.01	0.94
3. Effective protection of wildlife and forest	32.9	41.2	14.1	5.9	5.9	3.89	1.11
4. Improvement in the basic infrastructures	25.9	58.8	3.5	7.1	4.7	3.94	1.00
5. Introduction of the AE technologies	9.4	44.7	11.8	15.3	18.8	3.10	1.31
6. Improvement in health and sanitation	31.8	43.5	7.1	9.4	8.2	3.81	1.21
7. Local capacity building	10.6	56.5	17.6	3.5	11.8	3.50	1.11
8. Conservation education and awareness	10.6	72.9	3.5	7.1	5.9	3.75	0.95
9. Technical support – Agri, health, etc.	14.1	30.6	7.1	18.8	29.4	2.81	1.49
10. Creation of economic opportunities	4.7	29.4	14.1	8.2	43.5	2.43	1.41
11. Development of the village	10.6	71.8	10.6	2.4	4.7	3.81	0.83
12. Devolution of power to local community	31.8	32.9	17.6	3.5	14.1	3.64	1.34
13. Involvement of women in C+D activities	61.2	34.1	2.4	2.4	0	4.54	0.66
14. Dev. of local system of governance	21.2	56.5	15.3	2.4	4.7	3.87	0.93
15. Increase in wildlife population	17.6	57.6	12.9	4.7	7.1	3.74	1.03
16. Improved forest conditions	30.6	47.1	17.6	2.4	2.4	4.01	0.89
17. Abundance in NTFPs	5.9	24.7	41.2	15.3	12.9	2.95	1.07

N= 85 only outside PA, SA, strongly agree; A, agree; N, no opinion; D, disagree and SD, strongly disagree

6.3 Support received by local communities for agriculture development based on structured interviews with local communities

S. No.	Inside ACA		Outside ACA	
	Yes (%)	No (%)	Yes (%)	No (%)
1. Support for agriculture development	66.7	33.3	36.5	63.5
2. Support for improved cereal crop seeds	13.2	86.8	0	100
3. Support for training and study tour related to sustainable agricultural practices	16.7	83.3	0	100
4. Support for cash crop development	3.5	96.5	0	100
5. Support for effective livestock management	19.3	80.7	0	100

6.4 Reliability analysis on a single scale perception of the local communities of CAMR based on structured interviews

Statements	Scale Mean if item deleted	Scale variance if item deleted	Corrected Item Mean Total Correlation	Alpha if Item is deleted
1. The CAMR is complementary to the local system	45.33	196.59	0.978	0.968
2. The CAMR is highly ambitious	44.76	224.00	0.824	0.974
3. The CAMR is people-centred	45.34	195.99	0.972	0.968
4. The CAMR has devolved power	45.35	195.94	0.968	0.968
5. The CAMR has centralised power	44.64	230.495	0.710	0.977
6. The CAMR is difficult to put in practice	44.58	232.350	0.774	0.977
7. The CAMR needs some amendments	44.83	220.812	0.771	0.975
8. The CAMR helped to develop the local institutions	45.37	194.838	0.974	0.968
9. The CAMR made conservation effective	45.35	195.648	0.971	0.968
10. The CAMR is accepted by the local communities	45.42	192.601	0.990	0.967
Reliability coefficients				
Number of cases	114			
Number of items	10			
Cronbach's Alpha	**0.9745**			

6.5 Reliability analysis on a single scale attitude of the local communities towards park staff

Statements	Scale Mean if item deleted	Scale variance if item deleted	Corrected Item Mean Total Correlation	Alpha if Item is deleted
1. ACA management is in regular contact with local institutions.	42.42	30.14	0.52	0.71
2. ACA management is in regular contact with local communities.	41.50	27.04	0.68	0.68
3. Local institutions are consulted, informed and listened in appropriate ways.	41.51	27.26	0.63	0.69
4. The community's interests in the natural resources conservation are compatible with the park authority.	41.18	30.19	0.57	0.70
5. The local community is involved in planning and designing a new project.	40.59	33.57	0.27	0.74
6. The local institutions follow the CAMR.	41.40	34.73	0.18	0.75
7. The local institutions take legal actions.	40.53	34.74	0.15	0.76
8. The local institutions call regular meeting.	40.52	33.25	0.47	0.72
9. The local institutions make decision according to consensus.	40.57	35.87	0.12	0.75
10. The local community obey the decisions made by the local institutions.	40.92	33.91	0.20	0.75
11. The park authority accepts the decisions made by the local institution.	4.083	30.15	0.50	0.71
Reliability coefficients				
Number of cases	180			
Number of items	11			
Cronbach's Alpha	**0.7492**			

6.6 Relationship between park and people in ACA

Statements	Respondents inside PA (%)						
	A	O	OC	R	N	Mean	SD
1. PA in touch with local authority in the village	13.2	83.3	3.5	0	0	4.09	0.39
2. PA in touch with local communities	20.2	74.6	5.3	0	0	4.14	0.48
3. Local institutions consulted, informed and listened	21.4	67.9	8.0	2.7	0	4.08	0.63
4. PA and local community's interest compatible	16.8	81.4	0	1.8	0	4.13	0.47
5. Communities are involved in planning	88.6	5.3	3.5	0	2.6	4.77	0.75
6. Local institutions implemented the CAMR	24.6	9.6	64.9	0.9	0	3.57	0.87
7. Local institutions take legal actions	89.5	5.3	0.9	1.8	2.6	4.77	0.78
8. Local institutions hold regular meetings	83.3	13.2	3.5	0	0	4.79	0.48
9. Decisions are made in consensus	76.3	19.3	4.4	0	0	4.71	0.54
10. Local communities obey decisions	56.1	25.4	8.8	5.3	4.4	4.23	1.09
11. PA accepts local decisions	83.3	3.5	7.9	1.8	3.5	4.6	0.96

N= 114 only inside PA; A, Always; O, Often; OC, Occasional; R, Rare and N, Never

6.6 Relationship between conservation authority and people outside ACA

Statements	Respondents outside PA (%)						
	A	O	OC	R	N	Mea n	SD
1. Conservation authority in touch with local authority in the village	20.2	14.3	21.4	13.1	31	2.79	1.51
2. Conservation authority in touch with local communities	27.4	0	16.7	17.9	38.1	2.60	1.63
3. Local institutions consulted, informed and listened	26.2	3.6	9.5	21.4	39.3	2.55	1.64
4. Conservation authority and local community's interest compatible	42.3	11.3	23.9	8.5	14.1	3.59	1.45
5. Communities are involved in planning	48.2	29.4	11.8	7.1	3.5	4.11	1.09
6. Local institutions implemented the FUG regulations	23.5	40.0	30.6	1.2	4.7	3.76	0.98
7. Local institutions take legal actions	65.9	16.5	9.4	0	8.2	4.31	1.18
8. Local institutions hold regular meetings	47.1	35.3	14.1	3.5	0	4.25	0.83
9. Decisions are made in consensus	57.6	20.0	15.3	5.9	1.2	4.27	1.00
10. Local communities obey decisions	47.1	11.8	27.1	8.2	5.9	3.85	1.26
11. Conservation authority accepts local decisions	37.6	16.5	35.3	7.1	3.5	3.77	1.13

N= 85 only outside PA; A, Always; O, Often; OC, Occasional; R, Rare and N, Never

6.7. Impact of conservation initiatives on agriculture development

Impact of Conservation Initiatives- Statements	Respondents (%)		
	Yes	No	Don't know
1. Impact on agriculture development	41.2	50	8.8
2. Conservation of local agro-biodiversity	4.4	95.6	0
3. Availability of improved cereal crop seeds	13.2	86.8	0
4. Availability of vegetable seeds and seedlings	38.6	61.4	0
5. Training and study tour related to sustainable agriculture	16.7	83.3	0
6. Support in cash crop development	3.5	96.5	0
7. Support for effective livestock management	19.3	80.7	0

Appendix 7

DATA ANALYSIS RESULTS
Chapter VII

7.1 Two-sample t-test of the log transformed tree densities within ACA in villages with and without tourism

Tourism	Number of plots	Mean	Standard Deviation	Standard Error	DF	P
With	17	3.18	0.27	0.07	12	0.874
Without	8	3.20	0.27	0.09		

7.2 Mann-Whitney test for the mean basal area per hectare within ACA in villages with and without tourism

Tourism	Number of plots	Median	W	P
With	17	114	227	0.75
Without	8	70		

7.3 Mann-Whitney test for the mean species diversity within ACA in villages with and without tourism

Tourism	Number of plots	Median	W	P
With	17	1.4	228.5	0.68
Without	8	1.3		

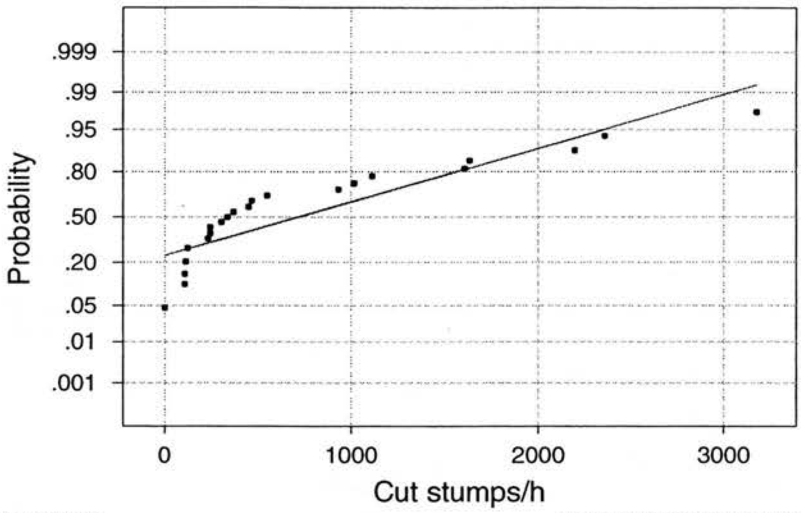
7.4 Mann-Whitney test for the mean seedling densities per hectare within ACA in villages with and without tourism

Tourism	Number of plots	Median	W	P
With	17	17493	227.5	0.727
Without	8	16342		

7.5 Mann-Whitney test for the mean sapling densities per hectare within ACA in villages with and without tourism

Tourism	Number of plots	Median	W	P
With	17	2857	211.5	0.60
Without	8	3155		

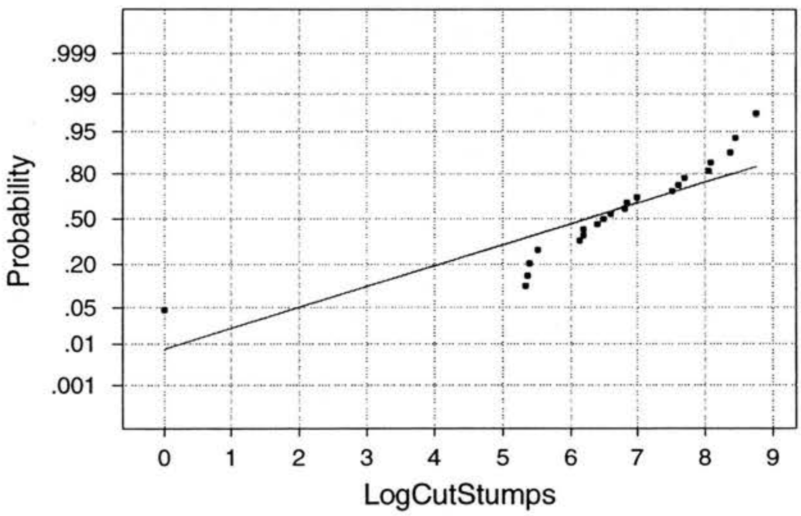
Normal Probability Plot



Average: 716.48
StDev: 850.135
N: 25

Anderson-Darling Normality Test
A-Squared: 2.156
P-Value: 0.000

Normal Probability Plot



Average: 6.2328
StDev: 2.15882
N: 25

Anderson-Darling Normality Test
A-Squared: 1.687
P-Value: 0.000

7.6 Mann-Whitney test for the mean cut stump densities per hectare within ACA in villages with and without tourism

Tourism	Number of plots	Median	W	P
With	17	334	234	0.449
Without	8	309		

7.7 Perceived changes in the village over a decade period

S. No.	Reasons for involvement in conservation	Respondents in Percentage			
		Tourist (n=55)		Non-tourist (n=59)	
		Yes	No	Yes	No
1.	Noticed any changes over a decade period	100	0	100	0
2.	Greenery in the village	84.5	5.5	90.0	10.1
3.	Improvement in the village cleanliness	76.4	23.6	78	22
4.	Increase in wildlife population	80.0	20.0	80.0	20
5.	Development in the village	85.5	14.5	93.2	6.8

7.8 Perception of respondents for their involvement in conservation

S. No.	Reasons for involvement in conservation	Respondents in Percentage			
		Tourist (n=55)		Non-tourist (n=59)	
		Yes	No	Yes	No
1.	Sustainable use of resources	76.4	23.6	67.8	32.2
2.	Community ownerships of resources	32.7	67.3	13.6	86.4
3.	Local empowerment	25.5	74.5	5.1	94.9
4.	Devolution of power	18.2	81.8	5.1	94.9
5.	Resource management authority	43.6	56.6	11.9	88.1
6.	Integration of conservation and development	54.5	45.5	45.8	54.2
7.	Minimum interference by park authority	14.5	85.5	5.1	94.9
8.	Involvement of women in C+D	32.7	67.3	15.3	84.7
9.	Education and awareness on conservation	63.6	36.4	66.1	33.9
10.	Support for infrastructure development	47.3	52.7	37.3	62.7
11.	Income from tourism	16.4	83.6	13.6	86.4

7.9 Attitudes of residents towards overall conservation and development in ACA villages with tourism

S. No.	Judgments of C + D	Respondents in Percentage Tourist Area			
		SA	A	N	SD
1.	Conservation initiatives	30.9	65.5	3.6	0
2.	Development initiatives	30.9	60	1.8	7.3

SA, Strongly agree; A, Agree; N, Neutral; SD; Strongly disagree

7.10 Attitudes of residents towards overall conservation and development in ACA villages without tourism

S. No.	Judgments of C + D	Respondents in Percentage Non-tourist Area			
		ES	S	N	US
3.	Conservation initiatives	61	39	0	0
4.	Development initiatives	42.4	54.2	1.7	1.7

SA, Strongly agree; A, Agree; N, Neutral; SD; Strongly disagree

7.11 Perceived improvements in social services

Benefits Received	Respondents (%) Tourism		Respondents (%) Without Tourism	
	Yes	No	Yes	No
1. Access roads improvement	94.5	5.5	88.1	11.9
2. Drinking water facilities	89.1	10.9	83.1	16.9
3. Bridge improvement	96.4	3.6	76.3	23.7
4. Health-care facilities	81.8	18.2	61.0	39.0
5. Support for agriculture development	54.5	45.5	78.0	22.0
6. Availability of different tree seedlings	98.2	1.8	98.3	1.7
7. Support for School	87.3	12.7	88.1	11.9
8. Support in irrigation	9.1	90.9	5.1	94.9
9. Support in micro-hydro electricity	100	0	62.7	37.3
10. Fodder and fuel wood improvement	94.5	5.5	98.3	1.7

7.12 Estimated annual percentage loss of the total crop production by wildlife within ACA villages with tourism

S. No.	Damaged crop	Respondents' in percentage (Tourism area)			
		0 – 20% Loss	21 – 50% Loss	51 – 75% Loss	> 75% Loss
1.	Rice	89.6	6.3	4.2	0
2.	Wheat	87.5	6.3	2.1	4.2
3.	Maize	66.7	27.1	0	6.3
4.	Millet	85.4	12.5	2.1	0
5.	Potato	79.2	16.7	2.1	2.1

7.13 Estimated annual percentage loss of the total crop production by wildlife within ACA villages without tourism

S. No.	Damaged crop	Respondents' in percentage (Non-tourist area)			
		0 – 20% Loss	21 – 50% Loss	51 – 75% Loss	> 75% Loss
1.	Rice	97.8	2.2	0	0
2.	Wheat	97.8	0	2.2	0
3.	Maize	67.4	19.6	6.5	6.5
4.	Millet	84.8	8.7	4.3	2.2
5.	Potato	97.8	0	2.2	0