PARTICIPATORY CONSERVATION: AN ASSESSMENT OF THE ECO DEVELOPMENT PROGRAMME IN THE FRINGE VILLAGES OF LAOKHOWA AND BURHACHAPORI WILDLIFE SANCTUARIES OF NAGAON, ASSAM

FINAL REPORT

UGC MINOR RESEARCH PROJECT

SUBMITTED TO

UNIVERSITY GRANTS COMMISSION

SUBMITTED BY

SMARAJIT OJAH

Assistant Professor

Department of Geography

Nowgong Girls' College

Nagaon, Assam

2015-16

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CERTIFICATE

This is to Certify that this UGC-Minor Research Project titled "*Participatory Conservation: An Assessment of the Eco Development Programme in the Fringe Villages of Laokhowa and Burhachapori Wildlife Sanctuaries of Nagaon, Assam*" submitted to the University Grants Commission is a record of original and independent research work carried out by Sri Smarajit Ojah, Principal Investigator of the aforementioned project and fulfils and confirms to all the UGC Minor Research Project guidelines.

Date : 21/01/2016

Place : Nagaon, Assam

G. K. Goswami

(G.K. Goswami)

Principal i/c

Nowgong Girls' College

Nagaon, Assam

Principal
Nowgong Girls' College
Nagaon : Assam

DECLARATION

I, *Smarajit Ojah*, hereby declare that this UGC-Minor Research Project titled "*Participatory Conservation: An Assessment of the Eco Development Programme in the Fringe Villages of Laokhowa and Burhachapori Wildlife Sanctuaries of Nagaon, Assam*" submitted to the University Grants Commission is a record of original and independent research work carried out by me.

Date : 21/1/16

Place : Nagaon

(Smarajit Ojah)
Assistant Professor
Department of Geography
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ACKNOWLEDGEMENTS

I would like to express my sincere thanks to the University Grants Commission for sanctioning this project enabling me to carry out the research work in earnest.

I extend my sincere thanks to Sri Gautam Kr. Goswami, Principal i/c, Dr. Ajanta Dutta Bordoloi, Retd. Principal, Nowgong Girls' College and the Governing Body Members of Nowgong Girls' College for facilitating the conduct of this research work.

It is with pride that I acknowledge the contribution of Sri P. Sivakumar and Dr. C. Muthukumaravel towards this research work. Their sincerity, dedication and hard work as Divisional Forest Officers of the Nagaon Wildlife Division have brought about so much positive change to Laokhowa and Burhachapori which I could have never imagined at the start of the research work.

I would like to extend my most heart-felt thanks to all the fringe villagers and members of the Eco Development Committees of Laokhowa and Burhachapori WLSs for their help, cooperation and guidance during the course of this research work.

This work owes a lot to all the frontline forest staff of Laokhowa and Burhachapori Wildlife Sanctuaries, without whose help and support my fieldwork for this study would not have been possible. Their vast field knowledge and experience have taught me so many lessons which no amount of reading could have ever taught me. I would like to place on record my special thanks to Sri Pronabjyoti Baruah, who has always been my constant companion in the field. I would also like to specially thank Sri Ratul Bora, Sri Robin Singh, Sri Bhadra Saikia, Sri Netra Kamal Saikia, Sri Khargeswar Bordoloi, Md. Ali Hussain, Md. Naushad Ali, Sri Tuxeswar Bordoloi, Sri Ranjit Mali and Md. Fuzail Ahmed for their help and cooperation during various stages of my fieldwork. I would also like to extend my special gratitude to Sri Dilip Kr. Bhuyan, Range Officer (Retired), Burhachapori Wildlife Sanctuary and Sri Jinaram Bordoloi, Range Officer, Laokhowa Wildlife Sanctuary for the cooperation, support, care and concern during my fieldwork which will remain a life-time

experience for me. I also extend my special thanks to all the members of the Local Protection Squads for their constant support in the field.

It is the work of these officers, frontline staff, LPS and EDC members who add real meaning to this research work.

I also offer my special thanks to Sri Prasanta Kr. Bordoloi, who has been my guiding force and my strength ever since I started this work. I thank him for selflessly passing on to me, his invaluable treasure trove of knowledge, which he has gathered through all those long years of field experience.

I extend my heartfelt thanks to Sri Kaushik Barua (Assam Elephant Foundation), Dr. Md. Firoz Ahmed (Aaranyak), Dr. Bibhab Talukdar (Aaranyak), Sri Anupam Sarmah (WWF-India), Sri Soumen Dey (WWF-India) and Sri Hiten Kr. Baishya (WWF-India) for extending their help and suggestions during various stages of my research.

I also offer my special thanks to the officers and staff of the following institutions for providing me with the necessary data for the conduct of this research work: Office of the Divisional Forest Officer, Nagaon Wildlife Division, Office of the Western Assam Wildlife Division, Dolabari, Tezpur, Office of the Divisional Forest Officer, Nagaon Division, Office of the Director, Kaziranga Tiger Reserve, Office of the PCCF Wildlife, Baisistha, Guwahati, Directorate of Economic and Statistics, Government of Assam, District Economic and Statistic Office, Nagaon, Deputy Commissioner Office, Nagaon and Land and Revenue Office, Nagaon and Revenue Circle Offices of Nagaon, Directorate of Census, Government of Assam, District Library, Nagaon.

I further extend my thanks to all my colleagues from the Nowgong Girls' College for their help, advice, support and suggestions for my research.

I would like to thank all the non-teaching staff of Nowgong Girls' College for their constant encouragement and support. I also thank all my past and present students from the

Department of Geography, Nowgong Girls' College for their support and interest in my research work.

On a more personal note, I am profoundly indebted to my parents Sri Sahajananda Ojah and Mrs. Bandana Ojah for their constant emotional support and care throughout this work. I would not have been here but for their rock solid support and belief in me. I express my sincere gratitude to my in-laws Sri Chatra Kr. Chetry, Mrs. Chandrani Chetry, my brother, Siddharth Ojah, my would-be sister in law Swagata Baruah and my brother in law Palash Komor for standing by me during the course of this research. I also take this opportunity to thank all my relatives, especially my cousin Avinav Barooah, my aunt Mrs. Monalisha Barooah and my uncle Sri Sanjib Barooah for their invaluable support and encouragement. I express my thanks to my wife Puspa Komor, for her support, encouragement and the immensely valuable advice throughout my research. Now I realise the benefits of having a fellow geographer and research scholar as my better half!

I finally offer my gratitude to Sri Kongkon Goswami of Gigabytes Press and Publication, Nagaon for printing the report at such short notice.

Smarajit Ojah

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CHAPTER 1

INTRODUCTION

1.1 Statement of the Problem

Protected areas (PAs) are recognized as core 'units' for in situ conservation (Chape et. al., 2005) and are society's principal method to conserve important examples of earth's heritage for the long term (Worboys et al. 2005). Setting aside PAs for ecology conservation has been a historical phenomenon. They are nature's storehouse of floral and faunal diversity and are widely regarded as the cornerstones of biodiversity and species conservation.

Article 2 of the Convention on Biological Diversity (CBD) (1993) defines a PA as "*a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives*" (Chape *et. al.*, 2004). According to International Union for Conservation of Nature (IUCN) (2008), a PA is "*a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values*". IUCN identifies six levels of PAs within this broad definition, ranging from strictly protected reserves with limited access to more accessible areas, managed for sustainable resource use (Chape et al. 2003). Approximately one-half of this area is contained within classes I to IV which are associated with traditional PA goals of maintaining natural processes and restricting the scale and scope of human activity (Wright et al. 1996)

Studies have shown that PAs have been one of the most ideal tools to ensure conservation of biodiversity and countering the rapid land use change (Andam et al. 2008, Palomo et al. 2013). According to WCMC/UNEP, there are more than 44,000 PAs worldwide, covering 10.1% of the world's terrestrial surface. Of this, almost 42% (18,400 sites) PAs are in developing countries, which include some of the most biologically rich habitats on earth.

Conservationists and biologists however argue that PAs, in themselves, are not enough; that even if all of the ecological systems contained in PAs remained intact, this would still be woefully insufficient for humanity's future needs. If PAs cannot be secured and managed effectively, then fundamental elements of biodiversity will be lost forever (Wells et al. 2004). Habitat fragmentation is one of the most serious challenges being faced by the PAs of the world. PAs which have been historically linked to one another are now being isolated and made into 'islands of conservation'. This has created a scenario where there has been increasing decline in the possibility of healthy genetic exchange between two separate breeding populations of wildlife species. With time, this habitat fragmentation and resultant inbreeding would lead to severe degradation in the health of the future generations of the species. In this regard, there is an urgent need to re-establish the historical migratory links among PAs. And in order to do this, the management of the units which facilitate the movement of wildlife among PAs needs to be prioritized.

Most of the PAs in developing countries have had long history of human interaction. Millions of people living in most tropical countries have been dependent on forest resources for centuries in order to fulfil their livelihood necessities. Many indigenous communities developing tropical regions still rely on forest resources to cover their livelihood needs which, in turn, make the establishment and management of PAs a difficult task.

In a country like India, the loss of ecological diversity in PAs has been regularly associated with intense human land use and dependency on them for livelihood resources (Bahuguna 2000). Almost all the PAs of India are surrounded by a large number of villages with large populations and characterised by extreme poverty and high population growth rate. The resources they extract from the PAs play a critical role in the livelihood of people living in or adjacent to the PAs. This dependency and extraction on the forest resources has had direct ecological consequences on the PAs and Unsustainable and illegal extraction of forest resources has led to severe habitat degradation and even species diversity loss.

There is much scientific concern regarding this dependency induced loss of biodiversity of PAs and the resultant decrease in capacity of these important 'eco-entities' to provide the important ecosystem services for which they were established. Since this trend was identified and established, protection of ecology and biodiversity of the PAs has become a major goal for nature conservation.

It has been recognised that conservation efforts which disregarded these fundamental dependency issues have only gone on to accentuate the problem of illegal extraction and use of the forest resources by fringe communities. Therefore, in recent times, more emphasis has been given towards involving the local communities in terms of decision making regarding the management of PAs (Kothari, 2003). At the same time, efforts have been made to provide alternatives in livelihood to the dependent fringe dwellers and thus counter the degree of ecological degradation that PAs have been subjected to. This 'participatory model' of conservation is now adopted as the state policy for management of Indian PAs (Badola 2000).

Most of the PAs in developing countries like India have long history of human interaction. Loss of ecological diversity in PAs of such countries has been regularly associated with intense human land use and dependency on them for livelihood resources (Southworth et al. 2004). There is much scientific concern regarding this loss of living organisms and the resultant decrease in capacity of these important ecosystems to provide important ecosystem services. Protection of ecology and biodiversity of PAs has become a major management goal since this trend was identified and established.

Millions of fringe forest dwellers in developing tropical regions, most of which belong to indigenous community groups, still rely on forest resources to cover their livelihood needs, which make the establishment and management of protected areas a difficult task (Chapín 2004). Almost all protected areas of India are surrounded by a large number of villages characterised by extreme poverty and high population growth rate. This contributes towards a huge population in the fringe areas of the protected areas. These resources play an even more vital role to the livelihood dependency of people living in or adjacent to forests and dependency on the forest resources has direct ecological consequences on PAs. In fact, unsustainable extraction of forest resources has led to severe habitat degradation and even species diversity loss in many instances (Ghimire and Pimbert 2006).

To counter this dependency induced degradation, management strategies were adopted wherein; communities which were historically dependent on the forests were alienated from the designated protected areas. These conservation measures were 'exclusionary' in nature and considered human settlements in and around the protected areas as a threat and advocated complete removal of forest settlements. Denying these forest

dependent communities from accessing their right of livelihood from the designated protected areas by 'imposing' on them, an 'exclusionary' model of biodiversity conservation brought these local communities in direct conflict with the protected area managers (Singh 1997). Integrated Conservation and Development Projects (ICDP), which seeks to make the fringe communities a stakeholder in the management of PAs through establishment of Eco Development Committees (EDCs) have attempted to reconcile park management with local needs and aspirations (Wells et al. 2004). Biodiversity conservation in PAs by involving the fringe dwellers and promoting socio-economic development among them through the eco development programme seems to be the best way forward in management of PAs in developing countries like India (Rodgers 2003).

So what ails our PAs? Is loss of biodiversity of PAs due to the resource dependency induced extraction of forest resources by fringe communities? If so, then what are the drivers which make the community dependent on the forest resources? How effective has been the participatory conservation approach in reducing the levels of dependency, or for that matter, in changing the mindsets of the communities towards the PAs? These, in general, are some of the key questions based on which, this study was conceived.

1.2 Study Area

The study was conducted in the fringe villages of two Wildlife Sanctuaries (WLSs) of Assam, the Laokhowa WLS and the Burhachapori WLS. Laokhowa WLS (LWLS) is located between latitudes 26°28'31.85"N to 26°32'13.95"N and longitudes 92°37'57.91"E to 92°47'23.27"E having a total area of 70.1 sq. km in Nagaon district. Burhachapori WLS (BWLS) is located between latitudes 26°30'34.16"N to 26°33'48.96"N and longitudes 92°34'27.31"E to 92°46'10.667"E with a total area of 44.06 sq. km in Sonitpur district (Bora 2003, Phukan & Sharma 2003, Ojah *et al.* 2012, Ojah 2014, Yadava 2014).

The Laokhowa and Burhachapori WLSs (LBWLS) are two contiguous PAs and are notified buffer components of the Kaziranga Tiger Reserve (KTR). Nestled between the Kaziranga National Park (NP) to the east and the Orang NP to the west, both LWLS and BWLS are important PAs of the central Assam conservancy landscape (Ojah *et al.* 2012) (Figure 1.2). The LBWLS is located at a distance of 35 km via the Laokhowa road from

Nagaon town and 45 km via the Samaguri-Laokhowa road. The sanctuaries are also approachable via Naltoni on NH37A at a distance of 18 km. It lies 6.8 km downstream of the Koliabhomora Bridge that connects Nagaon with Sonitpur districts. This bridge is also the westernmost border of the KTR (Figure1.1 and 1.2).

The LBWLS were declared as buffer components of the Kaziranga Tiger Reserve (KTR) in 2007 (Figure 1.3). The PAs are under the management of the Divisional Forest Officer (DFO), Nagaon Wildlife Division and the Director, KTR is the administrative head. The Range Officer (RO), Gorajan Range of LWLS and the RO Dhania Range, BWLS assumes overall responsibility of execution of field responsibilities in LWLS and BWLS respectively. The Conservator of Forests, Northern Assam Circle oversees the functioning of the Nagaon Wildlife Division.

The LBWLS is a representative area of the Assam-Arakan Geological Province and is of recent origin, belonging to the Archaean Eon. The region is comprised predominantly of recent composite alluvial plains and floodplains. The lithological formation of the study area is represented by grey silt and fine to coarse sands which forms the recent composite flood plain with numerous meander scars and scrolls. While clay loam soils dominated the LWLS, the soil of BWLS was predominated by sandy loam to clay loam (Yadava n.d.). A major part of LBWLS is swampy and is criss-crossed by a number of channels and such areas are dominated by peat soil with thick humus content. The paleo-channels and abandoned channels of the region belong to the Holocene period of quaternary ages. The pH of the soils of LBWLS ranged from 5.21 to 6.13. The entire LBWLS is a flat alluvial plain with the average elevation of 48 to 70 meters from the M.S.L.

The Brahmaputra River flows along the northern boundary of the LBWLS in a braiding pattern which leads to the formation of numerous river islands locally called *chars* and *chaporis* which are mainly of two distinct types *viz.* stable and unstable. Stable chars and chaporis have large extent and are characterised by tall grasslands with scattered trees giving the impression of park-land topography whereas unstable islands are devoid of grass cover and are mostly sandy in nature.. As such the soil at various places varies from sandy soil, sandy loam and clayey loam to purely clayey soil (Bora 2003, Phukan and Sharma 2003, Vasu 2003, Yadava n.d.).

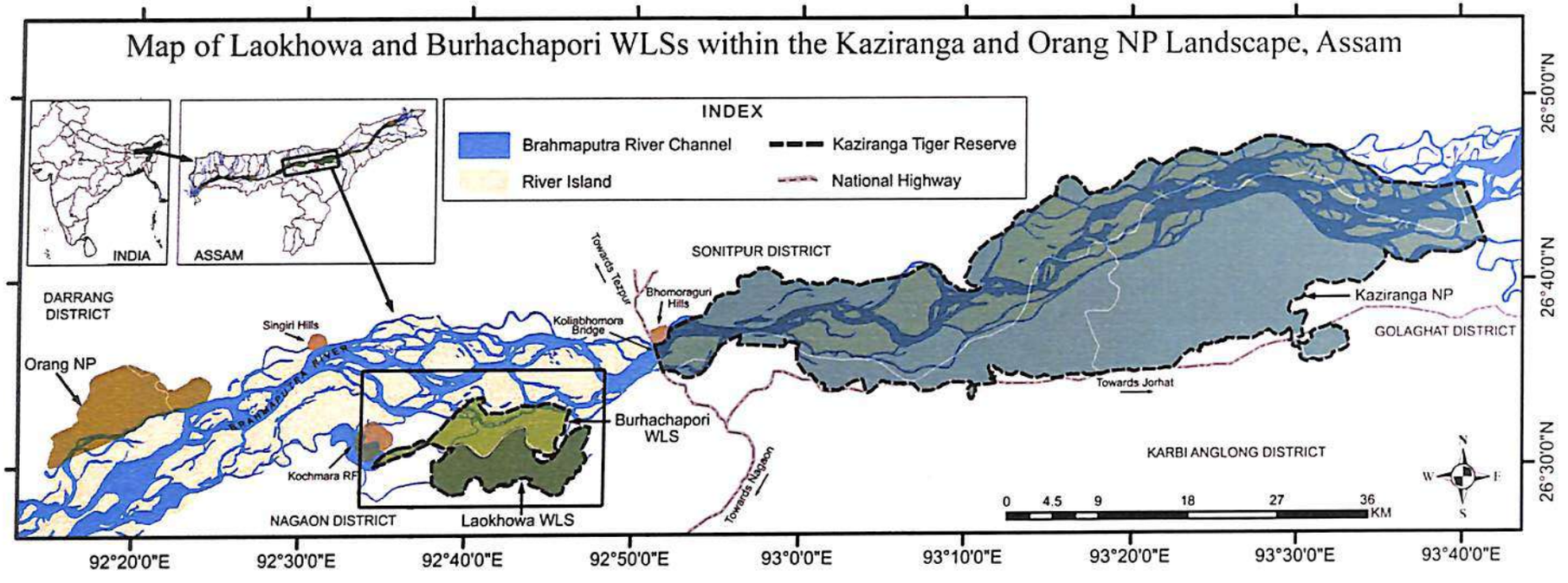

Figure 1.1 - Map of Laokhowa and Burhachapori WLSs within the Kaziranga and Orang NP Landscape, Assam

Source: State Forest Department, Assam (2012)

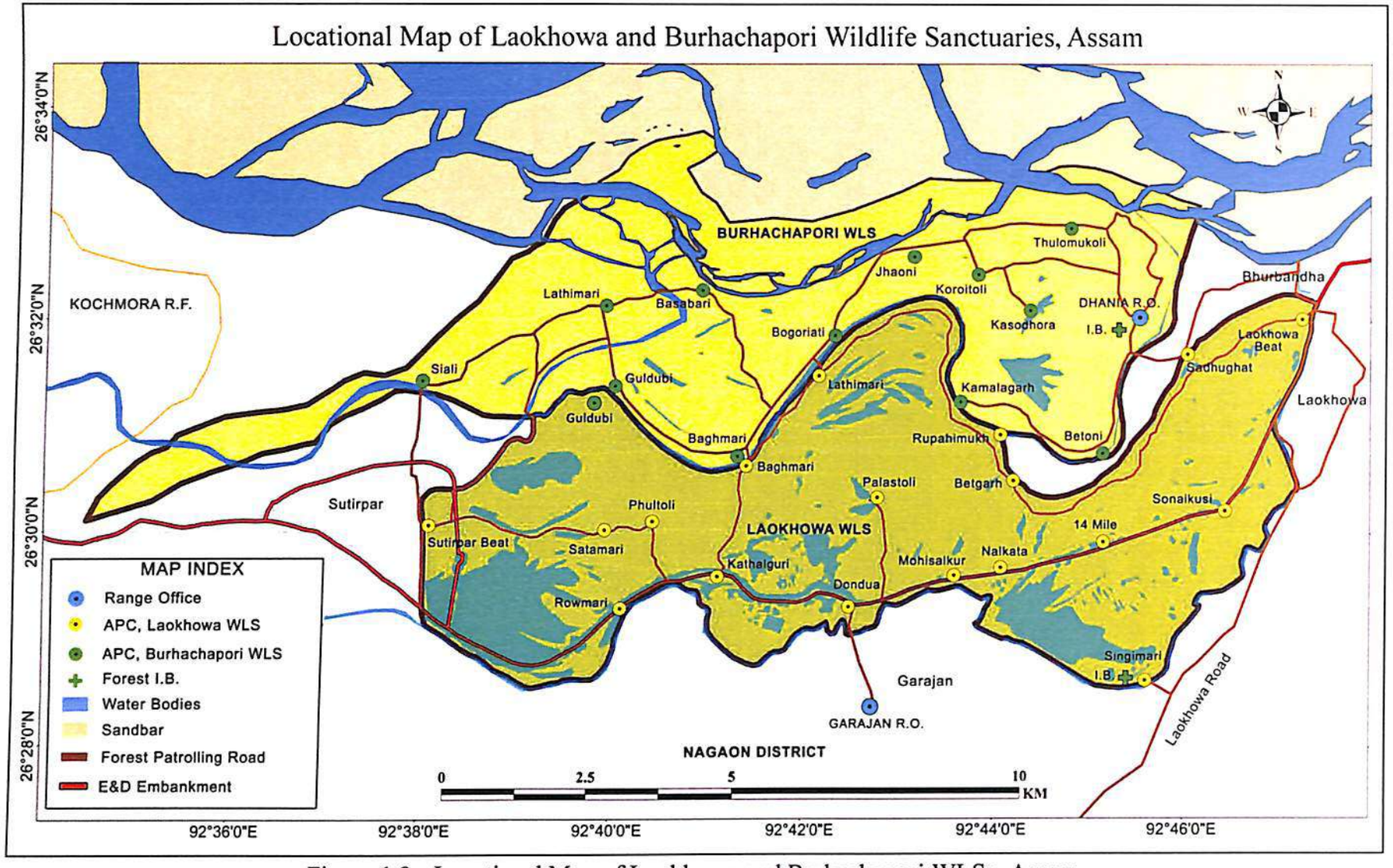

Figure 1.2 - Locational Map of Laokhowa and Burhachapori WLSs, Assam

Source: State Forest Department, Assam & Fieldwork (2011)

The climate of the area can be treated as subtropical monsoon type characterised by four distinct seasons *viz.* monsoon (June- September), retreating monsoon (October-November), winter (December–February) and pre-monsoon (March–May) (Bora 2003).

The mean maximum temperature in LBWLS between 2011 and 2013 ranged from 23.13°C (January) to 33.69°C (August) while the mean minimum temperature for the period ranged from 10.76°C (January) to 24.07°C (August) (Figure 1.6). The surface temperature during November, 2013 in LBWLS ranged from 19.8°C to 31°C (Figure 1.7).

The monthly average rainfall between 2011 and 2013 ranged from 10.2 mm (December) to 339.4 mm (June) (Figure 1.8). On the other hand, the monthly average relative humidity for the same period ranged from 61.4% (March) to 88.8% (July) (Figure 1.9).

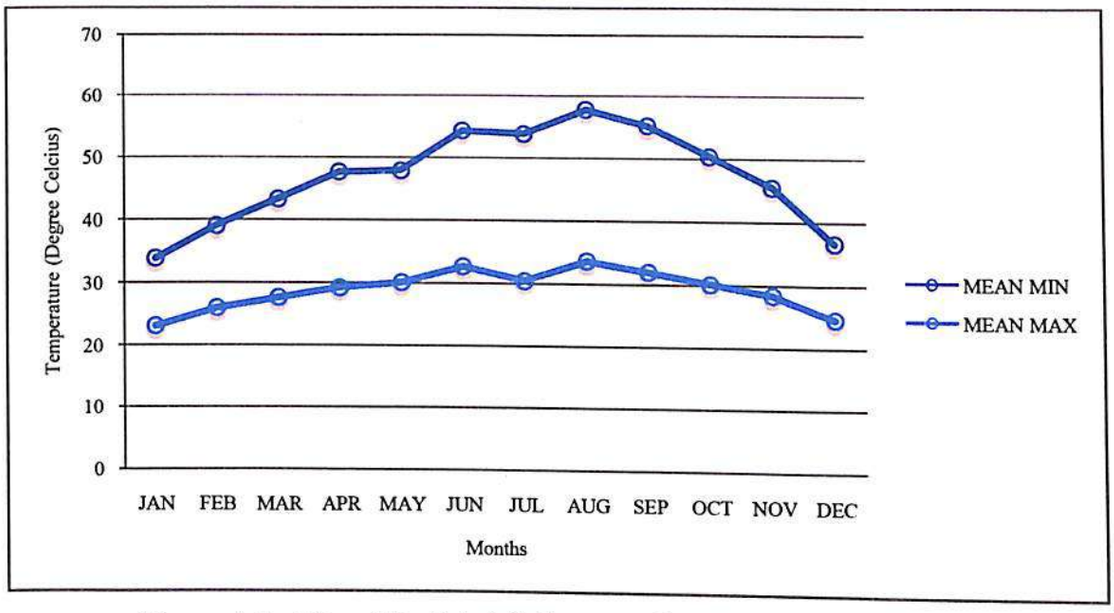

Figure 1.6 - Mean Monthly Minimum and Maximum Temperature in the study area (2011-2014)
Source: State Forest Department, Assam & Defence Research Lab, DRDO, Tezpur

The natural vegetation of LBWLS can be broadly classified into the following four types (Champion and Seth 1968).

These grasslands occupy flood prone areas of LBWLS which dry up during winters. Such alternations are too severe to permit the growth of trees. Therefore, until these areas are

raised due to silt deposition, they will be dominated by the growth of such grasslands. These grassland patches are subjected to annual firing to deter growth of trees and maintain the grass in their early seral stage. The dominant species of grasses are *Saccharum spontaneum, Imperata cylindrica, Phragmites karka, Arundo donax, Saccharum ravannae* etc.

This type of natural forest cover occurs in those areas of LBWLS which remain flooded during monsoons and are dry during the rest of the seasons of the year. These forests give an impression of parkland topography, with scattered tree growth which is of early normal succession on new alluvium soil. Trees are restricted to fire hardy species standing over tall grasses. Simul *Bombax ceiba* is the dominant species followed by species like *Albizia procera, Trewia nudiflora, Randia tomentosa, Ziziphus zuzuba and Ficus glomerata*, among others. *Imperata cylindrica* is the dominant grass species followed by *Saccharum* species.

Such forest types are formed along narrow fringes along the low lying wetlands and they border the swamp forests in the LBWLS. They are characterised mostly by the growth of semi-evergreen trees, which are widely spaced and marked by growth of shrubs and coarse grasses. The major tree species of such forest type are *Bischofia javanica, Termenalia myriocarpa, Lagerstroemia flos-reginae, etc.*

The swamp forests are the dominant species of LBWLS, occupying about 28% of the total landmass. Such forests are characterised by their growth along the low lying areas and are bordered by the Riparian Fringing Forest type. The dominant tree species of this forest type is Hijal *Barrringtonia acutangula* along with *Syzyzium cumini, Ficus glomerata and Trewia nudiflora.* Such type of forests are the dominant vegetation in the swamps along with the associate species as mentioned above, in gregarious form are also found along the banks of freshwater rivers, the edges of freshwater swamps and lagoons and on seasonally flooded lowland plains within the sanctuaries.

The LBWLS is home to large mammals like Asiatic wild buffaloes, royal Bengal tigers, Indian elephants, wild boars etc. The wet alluvial grasslands of the sanctuary sustain a healthy population of herbivores like sambar, barking deer and hog deer. Many nocturnal species like pangolins, slow loris, porcupine, binturong and hare are found in the sanctuaries. Many rare and endangered species of small cats, civets and otters, reptiles etc. are found in

abundance in these two PAs. The highly endangered Gangetic River Dolphins are found in abundance in the waters of the Brahmaputra River flowing through and adjacent to the BWLS. The LBWLS complex, with the expansive grasslands, woody patches and numerous water bodies, streams, nallas and beels supports rich and varied bird life. Apart from numerous species of resident birds, the region serves as the winter visiting ground to many migratory bird species. Till date, more than 290 bird species have been documented in the LBWLS. The arthropods comprise around 70% of the total biodiversity and they contribute a majority percentage of energy that flows through an ecosystem. The LBWLS harbours many rare butterfly species such as the Indian Map Butterfly, Common Birdwing, Fivebar Swordtail, Common Rose, Green Dragontail etc. Among the moths the Atlas moth *Attacus atlas* and *Dysphania militaris* etc. are most common. The diverse habitat of the Burhachapori WLS holds a sizable number of freshwater turtle species. Among them, the endangered Assam Roofed Turtle, (IUCN, 2012) can be observed in communal basking with other species like Indian Roofed and Indian Tent Turtles on fallen dead woods along the bank of the Brahmaputra River, especially between the Thulomukoli to Jhaoni area of BWLS. The numerous beels and channels of LBWLS offer habitat for many turtle species like Spotted Pond Turtle, Peacock Soft-shell Turtle etc. The Tricarinate Hill Turtles are often encountered in the grasslands of the sanctuary. The sandy beach of the Brahmaputra River adjoining the BWLS is an ideal nesting habitat for a number turtle species. The major beels of the LBWLS are regarded as breeding stock for tropical freshwater fishes in this region. Numerous water bodies and rivers have fishes in large quantity as well as in diversity. So far 42 fish species have been documented in the sanctuaries (Bora 2003, Phukan and Sharma 2003, Vasu 2003, Ojah et al 2012, Ojah 2014, Ojah 2015, Ellis et al 2015)

The entire LBWLS landscape used to be teeming with rhinos most of which were poached within a matter of days during the civil unrest of the 1980s. However, most of the original rhino habitat still remains intact. The Indian Rhino Vision 2020 programme envisages the reintroduction of rhinos to the Laokhowa-Burhachapori landscape by 2015-16 (Ellis et al. 2015, Ojah 2012, Ojah & Saikia 2015).

1.3 Forest Fringe Dwellers

The LBWLS is surrounded by a large number of revenue villages from all sides, except in the northern and north-western side of BWLS which is dominated by the Brahmaputra River. Except for three villages (Dhania, Jhaoni and Sisuati) in the eastern fringe of BWLS which falls in the Sonitpur district, all the other villages fall in Nagaon district.

In all, there are 33 revenue villages within a 5 km 'zone of influence' of the two sanctuaries. Further, there are seven taungiya villages (TVs) and one forest village (FV) under the Laokhowa WLS. The villagers on all the sides are mostly consist of immigrant Muslim. The forest villagers are of Bodo community. Bengali Hindus lives in the eastern and western portion. Livestock rearing, firewood collection and fishing are some of the major dependency patterns of the fringe villages. A majority of the fringe dwellers are small and marginal cultivators. The villagers keep large cattle population which are reared for milk and cultivation purposes. As per the survey conducted by the Nagaon Wildlife Division in 2008, there were 21,777 cows, 21,440 bullocks and 971 buffalos in the fringe villages which graze in the two sanctuaries. The sanctuary lies in a very densely populated area. The surrounding population is characterised by poverty, illiteracy and large population and their livelihood to a large extent depends on these sanctuaries (Ojah et al, 2012).

The TVs and FV in LWLS were established by the state forest department between 1953 and 1972 by the state forest department for having adequate labour for undertaking plantation activities. These villages are inhabited entirely by people belonging to the Bodo community and they have been given land rights due to them under the Scheduled Tribes and Other Forest Dwellers Act. The major economic activities of the people of these TVs and FV used to be agriculture along with collection and sale of forest resources. However, in recent times, more and more households are getting engaged in sectors such as business and services, though agriculture still remains the mainstay in terms of economic dependence for the majority.

The Dhania, Jhaoni and Sisuati villages of BWLS are inhabited by Nepalis. Their ancestors settled in and around Burhachapori region way back during the late 1800s. They are

traditional graziers and their livelihood depends upon the rearing of livestock, comprising of cows and buffaloes. Till the time BWLS was a Professional Grazing Reserve (PGR), they used to graze their cattle in the grasslands of Burhachapori. Post 1995, however, since the declaration of Burhachapori as a WLS, the Nepali graziers have been in constant conflict with the forest department regarding the right of grazing their cattle inside the then newly declared WLS. In fact, there used to be a large number of cattle stations, locally called *khuttis* inside the sanctuary area till 2010. Numerous court cases have been contested by both the graziers and the forest department regarding the eviction of these khuttis from inside BWLS. The Jhaoni and Sisuati villages earlier used to be north of BWLS, in the char areas of the Brahmaputra. However, due to loss of these char lands to erosion; the two villages were relocated in and around the existing Dhania village, along the eastern margins of the present BWLS. In fact, during the 1960s, a significant portion of all the three villages were resettled inside the eastern boundary area, near Thulomukoli region of BWLS. Rearing of livestock and sale of milk and milk products still remain the primary economic activities of almost all the households of this community.

The Bengali Muslim community comprises of a majority of the households in the fringe villages of LBWLS. In fact, except for the FV, TVs, Dhania, Jhaoni, Sisuati and Laokhowa, the rest of the fringe villages are dominated by the Bengali Muslim community. The people of this community were brought by the British in this region for working as labours in the jute cultivation fields. Many of the Bengali Muslim families occupied the areas which were vacated by the resident tribal and Bengali families during the outbreak of the kala-azar disease of 1920s. A number of households from the fringe villages of LWLS like Kaliadinga and Kathalguri, among others were resettled during the 1970s and 1980s in the eastern region lying between LWLS and BWLS. They now comprise of No 7 Bhogamukh, No 6 Bhogamukh and No 5 Bhogamukh villages. Fishing and cultivation are the major economic activities of the Bengali Muslims community. The level of literacy is comparatively low, while the degree of poverty and the rate of population growth are high, compared to the rest of the communities residing in the fringes of LBWLS.

Biharis and Bengali Hindus are the other two communities of the fringe villages of LBWLS. While the Biharis are mainly dwellers of the fringe villages to the east and west of BWLS, the Bengali Hindus are dominant in Laokhowa. A number of Bengali Hindu households in the west of BWLS practice large-scale fish cultivation. The Bihari community,

on the other hand is comparatively poorer and most of them work as agricultural and as marginal labours for their sustenance.

1.4 Objectives:

The following are the objectives of the study:

a. Assessment of the need and process of formation of the Eco Development Committees in the fringe villages of Laokhowa and Burhachapori WLS,

b. Assess the nature and degree of dependence of the fringe forest dwellers on LBWLS

c. Evaluation of the understanding of the fringe village dwellers regarding the practice of Participatory Conservation,

d. Analysis of the acceptance and participation level of the fringe village dwellers in the EDCs of their respective villages,

1.5 Significance of the Study

Biodiversity loss in PAs has been a cause for concern among conservationists. In fact, the role and effectiveness of PAs in conservation of ecology has itself become a much-debated subject in the present day context. One of the most important impediments of ensuring effective biodiversity conservation through PAs is the lack of connectivity among them due to habitat fragmentation. The implications and imprints of resource dependency on the short and long term ecology of these PAs due to the legal or illegal resource extraction by fringe dwellers is an aspect which needs in depth study. At the same time, the effectiveness of participatory management practices in addressing the issue of dependency of fringe dwellers and biodiversity loss from PAs is a burning issue of research as well as discussion in the contemporary times.

The Laokhowa and the Burhachapori are two historical PAs of Assam. Both sanctuaries were a flourishing habitat for a number of wildlife species, among which, the great one-horned rhinoceros in LWLS and the Bengal florican in BWLS found prominence.

Yet, past incidences, owing to human actions, have led to extensive degradation of their ecology. In fact, LWLS is still identified by the stigma of the loss of a majority of its rhino population to poachers during the 1980s. This study, probably one of the first long-term studies undertaken in the two PAs, tried to understand firsthand what the prevalent ecological condition of the sanctuaries was. At the same time, the study tried to look into the LBWLS not as individual units of 114.19 square kilometre of forest patch with few scattered wildlife. Rather, it tried to examine their role in establishing landscape level connectivity between Kaziranga and Orang National Parks through the Brahmaputra Riverine wildlife corridor. Dependence of fringe communities on the resources of PAs is a critical question over which many have tried to seek answers from different perspectives. Considering that the laws of the land deemed extraction of forest resources from PAs as 'illegal', this study has attempted to understand the nature and degree of dependence of the fringe communities on the resources of LBWLS. It tried to identify what are the drivers that induce such dependence among the fringe communities. The study also examined the past management history and the management practices as has been implemented by the local forest department in addressing the issues of dependence in order to ensure the conservation of LBWLS.

It is hoped that the findings of this study may be useful in understanding the interplay of dependency and participatory management in PAs and help in ensuring conservation of biodiversity of PAs while simultaneously ensuring the upliftment of the fringe communities of the sanctuaries.

1.6 Methods and Materials

The study was primarily based on quantitative data supplemented by qualitative research inputs wherever it was possible and necessary. The study used both primary as well as secondary data. Primary data was collected through field based surveys and PRA techniques. Secondary data was collected from appropriate sources like books, journals, newspaper articles, websites and government departmental records, among others. The data thus collected was analysed using appropriate tools and techniques. Relevant literature was reviewed to develop a sound theoretical and conceptual framework as well as to develop a strong methodological base to carry out the research work in the right perspective.

1.61. Household Survey

Household surveys to assess the socio economic conditions and dependency aspects of the fringe dwelling communities were conducted during 2011 to 2014 in 10 survey villages. Of the 10 villages, seven were in Nagaon district while three were in Sonitpur district and all three were on the fringe of BWLS. Out of the 10 villages, one was a forest village and another was a taungiya village of LWLS. In all, 10% households of each village were randomly selected for the survey, except in Singimari-Salpara FV, Haldhiasuti TV, Dhania and Sisuati-Jhaoni villages. In these villages, 20 houses were randomly selected as the sample size since 10% sample size yielded lower than 15 households. The total sample size thus was 463 households (Total households in the 10 survey villages was 4277 in 2011, as per the panchayat records). Structured questionnaires were used for collection of household data and a household was the minimum unit of survey.

Frequency tables were generated using SPSS v17 software for analysis of the socio-economic parameters of the households surveyed. Both percentage and frequency values were used during interpretation. Relevant graphs and tables were generated using MS Excel software.

1.6.2 Dependency Driver Analysis

Pearson's correlation coefficient (two-tailed significance) analysis was used to understand the degree of relationship between the socio-economic aspects and indicators of resource dependency. Highly significant variables at 99% confidence limit and significant variables at 95% confidence limit were flagged and analysed. The analysis was firstly done community wise for the five dominant communities and secondly for the pooled data for the ten study villages for deriving the overall dependency drivers of the fringe and forest villages of the two sanctuaries. The parameters pertaining to dependency (Table 1.1) and socio-economic (Table 1.2) aspects are described below -

Table 1.1 - Scoring Methodology for Parameters on Forest Resource Dependency

Dependency Aspects			
Parameters	Variable	Question	Scoring
Livestock	Ownership	Number of livestock owned	No cattle = 0 Between 1 to 25 = 1 Between 26 to 50 = 2 Between 51 to 75 = 3 Between 76 to 100 = 4 Over 100 = 5
	Grazing Area	Where do you graze your Livestock?	No cattle = 0 Stall Fed = 1 Outside WLS =2 Inside WLS = 3
	Income	What is the percentage share from Livestock towards your overall annual Income?	No cattle = 0 0% (Subsistence) = 1 Between 1 to 25 % = 2 Between 26 to 50% = 3 Between 51 to 75% = 4 Between 76 to 100% = 5
Overall Forest Resource	Collection	Do you collect Forest Resources from LBWLS?	No = 0 Yes = 1
	Income	What is the percentage share from such forest resources towards your overall annual Income?	Do not collect = 0 0% (Subsistence) = 1 Between 1 to 25 % = 2 Between 26 to 50% = 3 Between 51 to 75% = 4 Between 76 to 100% = 5
	Legality	Do you feel collection of forest resources is an illegal activity?	No (Legal) = 1 Yes (Illegal) = 2
Fish	Fishing	Do you fish inside LBWLS?	No = 0 (includes those which do not collect any forest resources) Yes = 1
	Duration	If yes, then for how many months during a year do you fish?	Do not fish = 0 Between 1 to 3 months = 1 Between 3 to 6 months = 2 Between 6 to 9 months = 3 Between 9 to 12 months = 4
	Cause	What is the cause for which you fish in LBWLS?	Do not fish = 0 Subsistence = 1 Both Subsistence and Commercial =2 Commercial = 3
Firewood	Collection	Do you collect firewood from inside LBWLS?	No = 0 (includes those which do not collect any forest resources) Yes = 1

	Duration	If yes, then for how many months during a year do you collect firewood?	Do not collect firewood = 0 Between 1 to 3 months = 1 Between 3 to 6 months = 2 Between 6 to 9 months = 3 Between 9 to 12 months = 4
	Cause	What is the cause for which you collect firewood in LBWLS?	Do not collect firewood = 0 Subsistence = 1 Both Subsistence and Commercial =2 Commercial = 3
Thatch	Collection	Do you collect thatch from inside LBWLS?	No = 0 (includes those which do not collect any forest resources) Yes = 1
	Duration	If yes, then for how many months during a year do you collect thatch?	Do not collect thatch = 0 Between 1 to 3 months = 1 Between 3 to 6 months = 2 Between 6 to 9 months = 3 Between 9 to 12 months = 4
	Cause	What is the cause for which you collect thatch in LBWLS?	Do not collect thatch = 0 Subsistence = 1 Both Subsistence and Commercial =2 Commercial = 3

Table 1.2 - Scoring Methodology for Socio-Economic Parameters of Households

Socio-economic Aspects		
Parameters	Question	Scoring
Annual Income	What is the average annual income of your household?	Below 1 Lakh = 1 Between 1 to 2 Lakh = 2 Between 2 to 3 Lakh = 3 Above 3 Lakh = 4
Family Size	How many members are there in your household?	Between 1 to 4 members = 1 Between 5 to 8 members = 2 Between 9 to 12 members = 3 Above 12 members = 4
Education	How many educated members are there in your household?	1 member = 1 2 members = 2 3 members = 3 and so on
House Type	What is the type of your house?	Kutcha = 1 Semi Pucca = 2 Pucca = 3
Distance of household from	What is the distance of your household from the nearest	Between 0 to 500 meters = 1 Between 500 to 1000 meters = 2

LBWLS boundary	boundary of LBWLS?	Between 1000 to 1500 meters = 3 Above 1500 meters = 4
Land Holding	What is the average land holding size of your household?	Up to1 hectare = 1 Between 1 to 3 hectares = 2 Between 3 to 5 hectares = 3 Between 5 to 7 hectares = 4 Between 7 to 9 hectares = 5 Above 9 hectares = 6
Material Possession	What is the level of the material possession of your household?	Level 1 = 1 Level 2 = 2 Level 3 = 3 Level 4 = 4
Perception towards LBWLS	What is the purpose of LBWLS?	Only for livelihood = 1 More livelihood than wildlife concern = 2 Equal livelihood and wildlife concern = 3 More wildlife concern than livelihood = 4 Only for wildlife concern = 5

1.6.3 Survey of EDC Executive Members and Forest Staff

Survey among the EDC executive members was conducted to understand the overall perception of the executive body EDC towards the ongoing EDC programme of LBWLS using the methodology of focused group discussions (FGD) (Mukherjee 1993, 1995, 1997, 2002) as a tool for investigation. The group members were asked 10 open-ended questions followed by discussions (Table 1.3). Altogether, there were 53 participants from the 10 study village EDC executive bodies in this group. The responses were recorded, categorized into appropriate response categories and subsequently analyzed and interpreted to arrive at the conclusions.

Table 1.3: Open-ended questions asked to EDC members during focused group discussions

Sl.	Questions asked to EDC members during the Focused Group Discussions
1	What do you feel is the real purpose of the EDC programme?
2	What should be the foremost priority of the EDC programme?
3	Do you know what is a micro plan and what are the processes involved in its preparation?
4	Are you aware of the various rules and regulations of the EDCs?
5	How frequently do you participate in the EDC programs?
6	If you are not a frequent participant, or have never participated, then what are your

	causes?
7	Who do you feel the EDC really belong to?
8	Why did you become a member of the EDC?
9	Do you feel that the EDC programme is helping in the conservation of LBWLS?
10	Are you satisfied with the overall performance and functioning of the EDC programme?

Focused group discussion method was also used to interview the frontline forest staff of LBWLS. In all, 17 Forester I ranked staff were given the responsibilities of acting as member secretaries of the 28 existing and 10 proposed EDCs and these 17 forest staff comprised of this focused group. They were asked to respond a set of 10 questions followed by discussions (Table 1.4).

Table 1.4: Open-ended questions asked to member secretaries during focused group discussions

Sl.	Summary of questions asked during the FGD
1	What do you feel is the real purpose of the EDC programme?
2	How could EDC members contribute towards conservation of LBWLS?
3	Do you know what is a micro plan and what are the processes involved in its preparation?
4	How familiar are you regarding the various rules and regulations of the EDCs?
5	How has the involvement of the executive members of your EDC been?
6	How do you feel has the involvement been of the general members of your EDC?
7	Who do you feel the EDC really belong to?
8	Do you wish to continue as member secretary of the EDCs?
9	Do you feel that the EDC programme is helping in conservation of LBWLS?
10	Are you satisfied with the overall performance and functioning of the EDC programme?

1.6.4 Map Work

Maps pertaining to various analyses of the study were prepared in ArcGIS 10.1 platform. Survey of India topographic sheets (83B6, 83B7, 83B10, 83B11, 83B14, 83B15) on 1:50,000 scales were used as base maps. Image classification work was undertaken is ArcGIS 10.1 software. using Landsat imageries downloaded from the GLCF website Ortho rectification (constant elevation method) and Pan Sharpening for Landsat 8 imageries was done using Raster Processing option. Classification of imageries was done using maximum likelihood option under Spatial Analyst tool. Quantitative data on change in LULC were tabulated and calculated using MS Excel program.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Protected Areas and Biodiversity

Protected Areas (PAs) are the cornerstone of biodiversity conservation and are the keys to maintenance of habitats; they promote species diversity, allow for species migration and movement and ensure that natural processes across the landscape are effectively maintained (Dudley and Stolton 2009). Across the globe, studies reflecting greater abundance and richness of species and biomass within PAs as compared to outside PAs have established them as an effective tool for biodiversity conservation (Micheli et al. 2004, Mora and Sale 2011).

The role of PAs in ensuring functional species diversity is now well recognised. The establishment of PAs through legislations and acts of law in various countries of the world at present seems to be the best possible way forward to ensure adequate protection for the floral and faunal species harboured within them (Rodrigues, Andelman et al. 2004).

However, mere establishment of protected areas does not guarantee the survival and sustenance of the species therein and in spite of establishment of a number of PAs, biodiversity continues to decline (Butchart et al. 2010, Palomo et al. 2014). There is need for continuous and constant monitoring of species richness and diversity over time and throughout different habitats in order to identify the cause and effect that may arise from the changes occurring therein (Nair et al. 1976). For accurate assessment and documentation of such causes and effects, benchmarks and baselines regarding species' interaction with the ecology need to be created which are free from anthropogenic imprints (Sinclair 2002). And PAs, as of today, offer the most ideal sites for the creation of such benchmarks and baselines (Arcese & Sinclair 1997).

In the present day context, these PAs, which were designed to be free of human interferences, now bear the characteristic marks of human interference. In fact, the capacity

of PAs themselves, to retain their biodiversity value in view of the rapid environmental change and anthropogenic interferences has become a question mark. Studies have shown that local species richness, their diversity and habitat associations are changing rapidly in PAs (Gillingham et al. 2015) raising much concern regarding the risk of loss of biodiversity in PAs among researchers, scientists as well as policy makers. Throughout the world, there is serious concern regarding the fact that the declining population of a particular species may not be detected until it is too late to reverse the loss and the species ultimately becomes extinct (Walker 1992, Lawton and Brown 1993, Kunin and Lawton 1996, Chapin et al. 2000, Sinclair et al. 2002).

With the ever increasing rate of extinction of species owing primarily to human-induced changes to the natural habitats, the need and ability for measurement of biodiversity of a PA is of utmost necessity. In recent times, studies related to species distribution, abundance and diversity in PAs have seen a revival (Gray et al. 2006). Within PAs, there is a need to understand the status and demography of fauna which is possible by estimating the size of its population. Such estimations aid in planning for the management and conservation of the species as well as for the PAs themselves (Varman and Sukumar 1995).

2.2 Protected Areas and Dependency

In spite of the tremendous progress made by the human race in all spheres of life, yet mankind today is faced with an existential crisis due to its inability to maintain a balance between development and resource utilization (Convention on Biological Diversity 2010). This unprecedented crisis has made mankind respond by way of establishing PAs wherever possible and wherever deemed possible.

According to the World Resources Institute, the world has lost about half of its forest cover from 62 million km^2 to 33 million km^2 (Sundrlin *et. al.* 2005). The magnitude of global biodiversity situation is undoubtedly threatened million times higher today than at any time of its history. The present rate of species extinction is estimated to be between 1000 and 10,000 times the historical (pre 10,000 years BP) rate (Wilson, 1988). According to '*2004 IUCN Red List'* currently 15,589 species are threatened with extinction; 12% of world's

known birds, 23% of mammals and 32% of amphibians are also threatened (Baillie *et. al.* 2004).

Most of such biodiversity loss has been taking place in developing countries, arising out of loss of forest cover loss with intense human land use and that too at an alarming rate (Southworth et al. 2004). Deforestation, unsustainable extraction of NTFPs, encroachment and poaching has been identified as the major drivers of this biodiversity loss and this massive degradation of protected areas directly threatens the life and living of 400 million people out of which 50 million are forest indigenous people- who depend on forests for subsistence (Mukul, 2007).

Ever since this trend was observed protection of biodiversity has become a major goal in nature conservation in developing countries like India. Establishing protected areas (National Parks and Wildlife Sanctuaries) has been adopted as the most important 'in-situ' conservation method in India (Rodgers et. al., 2002).

However, the PAs of the world no longer remains the sanctum sanctorum where biodiversity reigns supreme. A large percentage of people in developing tropical regions, including India, still rely on forest resources to meet their livelihood needs, which make the establishment and management of PAs a difficult task (Chapín 2004; Madhusudan and Shankar Raman 2003).

Many researchers have argued that conservation efforts, such as establishing PAs, have often disregard local people's rights, thereby threatening their very existence (Kothari, 2003) and provoking illegal use (Nagendra *et al.* 2006). This thought process has been has been widely discussed, with the effect that more emphasis is now put on rights of use of natural resource by people living in and around PAs (Redford *et al.*, 2000).

Over the last two decades the role of various forest products in the food and livelihood security of fringe dwellers is being increasingly studied and researched. In fact, for a large number of fringe communities, non-timber forest resources are more important forest resources than timber. Some estimates suggests that, part of Southeast Asia's tropical forest promote up to 50 US$ per month per hectare to local people from exploiting forest resources, without considering the commercial timber values (Sedjo, 2002; Caldecott, 1988).

In the Indian context, for instance, Bahuguna (2000) clearly shows the critical role of non-timber forest resources in the welfare of local communities. Their estimate highlights that among the people living in the fringes of the PAs of Madhya Pradesh, Odisha and Gujarat, the average dependency level ranged from 37% to 76%. Mallik (2000) examined the role of NTFP in the subsistence economy of forest dwellers in the state of Orissa and this study shows that the percentage of income derived from forests varied from 22% to 41% in different forest areas.

Singh, (1997) remarks, "*...many of the protected areas include areas, which fringe dwellers have used, sometimes for hundreds of years, to meet their biomass, water and other forest based requirements. Many of these uses have not been codified into rights and in recent years the increase in population and the degradation and decrease of wilderness areas has made many of these uses more intense and widespread. However, given the objectives of wildlife protected areas, most such uses are inimical to the proper protection and management of national parks and some to the protection and management of sanctuaries...*"

In this context, it must be remembered that India's major PA categories comprise of national parks and wildlife sanctuaries, apart from conservation and community reserves. A NP or WLS is "*... an area which is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance. Both are declared for the purpose of protecting, propagating or developing wildlife or its environment. The fundamental difference between NPS and WLS lies in the vesting of rights of people living inside. Unlike a Sanctuary, where certain rights can be allowed, in a National Park, no rights are allowed. Certain rights of people living inside the Sanctuary could be permitted. Further, during the settlement of claims, before finally notifying the Sanctuary, the Collector may, in consultation with the Chief Wildlife Warden, allow the continuation of any right of any person in or over any land within the limits of the Sanctuary...*" (MoEF 2003). The Wildlife (Protection) Act of India, 1972, under which PAs are constituted and governed, declares any extraction of forest resources from NPs as 'illegal by law' and at the same time, declaring as 'legal', certain exclusive rights 'permitted' to people living 'inside' sanctuaries along with allowing people to continue with rights of extraction or any other, on land prior to settlement of claim before the issue of final notification declaring the concerned land as a WLS. Thus, by the decree of law itself, extraction of any resources from PAs, especially WLSs, other than those recognised as

mentioned, is deemed illegal under the provisions of the Wildlife (Protection) Act of India, 1972.

Studies conducted in 171 NPs and WLSs of India during 1980s found that there were about 1.6 million people living in and around 118 PAs (Ghimire and Pimbert 2006). It has been estimated that out of the total wildlife sanctuaries of India, 87% reported populations in their adjacent areas, 73% allowed grazing of livestock within their boundaries, 31% permitting extraction of fodder and 56% reported illegal extraction of non-timber forest produce (Singh, 1997).

Although the collection of forest resources by fringe communities is an age-old practice in India and many other parts of the world, there is little concrete knowledge about the sustainability of long-term, intensive extraction of forest fruits, roots, shoots, bark, resins and other products and what ecological changes follow the commercialization of such extracted forest resources (Sinha and Bawa. 2002). Such information is essential for PA managers, conservationists and local people to understand the subsequent ecological impacts on the wildlife and on the overall ecology of the PAs.

Illegal extraction of forest resources, coupled with other forms of disturbances, has both short and long term consequences on the structure and function of the PA ecology. Overharvesting or continued extraction may alter population size, growth rates and reproductive capacity of harvested species, leading to a reduction in the quantities of non timber forest products (Hall et. al. 1993). The growing population and increasing commercial trade of forest resources has resulted in the harvest of increasing volumes of extraction of such resources (Kuipers 1997, Lange 1998) and has therefore generated concern about overexploitation (Rebelo et al. 1988, Vaisquez et al. 1989, Cunningham 1993, Clay 1997, Rawat 1997). With increased market demand, forest resources have come to play an important role in large-scale commercial income generation and employment in many parts of the world.

Rapid population growth in the fringe areas of PAs coupled with unsustainable and in most cases, illegal, collection of forest resources (Tiwari, 2000) has threatened their long-term viability as an integrated conservation strategy. Despite the advocacy for forest resource extraction as a form of sustainable development for the dependent fringe communities, the

population ecology of many forest resources and the effect of their extraction on the forests remain unstudied, making it difficult to assess the ecological impacts of extraction (Endress et al. 2004).

So how much access should people get in terms of resource extraction, if any, from PAs? What is the impact of such 'illegal extraction', illegal by decree of laws of the land, on the ecology and protection regime of PAs? Conservationists like Karanth (2008) advocate that PAs should be free from the interference of people arguing that promotion of 'sustainable use' approach has not yielded positive results in terms of biodiversity conservation in the PAs of India. This dilution in approach towards PA management of the country has resulted in the loss of about 60% of the protective capability of India's PAs, as compared to what the situation was during the 1980s. With the ever-increasing threat from poaching through ever-increasing demand from a rapidly expanding international market for illegal trade of endangered species and their parts, India's PAs require a renewed protective approach.

Thapar (1995) comments that the very idea for establishing a PA arises from the established fact that prolonged human activities in a natural landscape leads to large scale modification in its eco-environmental aspects which, ultimately affects the natural balance and has the capacity to bring about serious implications on mankind itself.

Karanth (2008), in fact, further argues, "... *The threat of habitat degradation arises when contiguous habitats are fragmented by intrusion of human settlements, roads, railways, or pipelines...human impacts on habitat quality are obvious: an area overgrazed by livestock may support lower densities of wild ungulates than an area without cattle; a forest that is heavily logged for timber may be an inferior habitat for rainforest primates. In other cases, such effects are less obvious. The long-term consequences of the exploitation of non-timber forest products like fruits, leaves, bark, root, gum, resin, rattan and bamboo can be particularly insidious...*"

In India, acts such as the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2008 (Gazette of India 2007) are criticized by many conservationists on the ground that they have diluted the sanctity of the once considered involatile protected spaces of the country and the act has been exploited by land grabbers to grab forest lands (Bhargav 2011). It remains to be seen how far this act has enabled the

transfer of social justice to these traditional forest dwellers (Bose and Kothari 2008) and at the same time, what impact it would have on the perception of these dwellers on the PAs and what would be the effect of such an act on long-term biodiversity of PAs.

Illegal extraction of forest resources from PAs causes extensive biodiversity loss in PAs, as established by a number of studies. Within protected areas, biodiversity loss is often a consequence of illegal resource use. Understanding the patterns and extent of illegal activities is therefore essential for effective law enforcement and prevention of biodiversity declines. Chape et al. 2004, Abram 2008, Lee et al 2009, Mackenzie et al 2011, Tumusiime et al 2011, Critchlow et al. 2015).

2.3 Protected Areas and Participatory Management

Biodiversity conservation through environmental sustainability (Goal 7) is one of the prime objectives of Millennium Development Goals which is strongly linked with its first objective, i.e., eradication of poverty and hunger (IPGRI, 2006). PAs are among the most diverse and widespread ecosystems on earth. Millions of people living in most tropical countries derive a significant part of their livelihoods from various forest products for centuries and therefore, they play a vital role in the livelihoods of people living in or adjacent to forests (Mukul, 2007).

However, to conserve these 'biodiversity storehouses', certain management strategies were adopted wherein; communities which were historically dependent on the forests were alienated from the designated protected areas. These conservation measures were 'exclusionary' in nature and considered human settlements in and around the protected areas as a threat and advocated complete removal of such settlements (Saberwal et al. 2001, Shahabuddin and Rangarajan 2007). Denying these forest dependent communities from accessing their right of livelihood from the designated protected areas by 'imposing' on them, an 'exclusionary' model of biodiversity conservation brought these local communities into direct conflict with the protected area managers (Kothari 2013, Ghimire and Pimbert 2006).

Most of the protected areas in developing countries have long history of human interaction. According to Chao (2012), more than 1.6 billion people throughout the world

rely heavily on forests for their livelihoods and some 350 million people depends only on forest, both for their subsistence and income. Over two billion people, a third of the world's population, use biomass fuels, mainly firewood, to cook and heat their homes and billions rely on traditional medicines for their ailment harvested from the forests. In some 60 developing countries, hunting and fishing on forested land supplies a significant amount of the protein requirements' (Mery *et al.* 2005). Against this backdrop, where policy makers failed to recognise this historical dependence of fringe dwellers on the forest resources for their livelihood while establishing protected areas, frequent conflicts with the local community come as no surprise (Kothari 2003).

During the latter half of the 19th century, many conservationist and social scientists started to question this 'closed' management policy of protected areas. Many studies (Singh, 1997, Wells et al. 1992, Wells et al. 2004, West et al. 2006, Dahlberg et al. 2010) have showed that this closed, top down management approach failed in achieving the primary goal of biodiversity conservation. It was realised that protected areas have limited future prospects without the cooperation and support of local people, especially in developing countries (Wells et al. 2004).

To counter this, planners came up with a more 'inclusive' and 'humane' management approach towards managing protected areas. In this regard, Brandon et al. (1998) rightly observes that protected areas, which were seen as areas designated for conservation of wildlife and forests are now increasingly considered to be drivers and providers of social and economic change and this has been made possible by adoption of participatory conservation practices.

Since the 1980s Integrated Conservation and Development Projects (ICDP) have attempted to reconcile park management with local needs and aspirations (Wells et al. 2004). Eco-development, as an ICDP model, was developed as an integrated, sustainable approach to participatory environment management and development. It is defined in the United Nations' (1997) Glossary of Environmental Statistics as "*... development at regional and local levels, consistent with the potentials of the area involved, with attention given to the adequate and rational use of natural resources, technological styles and organizational forms that respect the natural ecosystems and local social and cultural patterns...*".

Of late, conservation discourse has focused on the issue of linking conservation with development of the periphery, eventually culminating into the eco-development project. The ICDP programme aims to reduce people's dependence on PA resources by generating alternative income and employment avenues and at the same time generate awareness towards conservation ethos, make the people partners in development as well as protection efforts and thus, try to bring about substantial and sustainable improvement in the ecology of PAs (Singh 1994, Shah 2007).

The World Bank 1996 in its self appraisal report mentions that the India Eco development Project (IEP) is a programme which aims at biodiversity conservation intervention in major Indian PAs through the implementation of eco development. The eco development programme is targeted at reducing the negative impact of people's dependency on PAs and their resources and to achieve this, the programme strives to empower fringe communities of PAs by making them stakeholders in the management of the PAs thereby bring about a sense of belongingness among the communities *vis a vis* the PAs (Singh 1997).

Badola (2000), in fact, draws a clear distinction between Joint Forest Management and Eco Development. She states, "*...both joint forest management and eco development emphasizes people's participation in natural resource management through empowerment. However, while under joint forest management villagers are able to obtain a share of forest produce, wildlife laws of India prohibit the extraction of forest produce for human use from national parks and wildlife sanctuaries. The scope for linking eco development with Joint Forest Management is hence limited...* "

PAs, including Tiger Reserves in India are divided into core and buffer zones. While cores comprise mostly of NPs, buffers may include WLSs or even RFs. Resource use has been restricted to the buffer zones where it has been regulated, while core areas are completely closed (Badola 2000). However, Rodgers (1992) states, "*... there is little opportunity for using buffer zones, where these are wildlife sanctuaries, to meet the resource requirements of the local people...*"

A number of studies have been undertaken regarding the structuring, functioning and performance of eco development programmes of various PAs of the country. Karlsson (1999) studies the eco development programme as implemented in the Buxa TR of West Bengal and

mentions that the major thrust of the programme was upon enhancing the participation of the locals in decision making regarding the management of the PA and at the same time, implement developmental projects through popular involvement.

Woodman (2002) in his assessment of the eco development project as implemented in the Pench TR in Madhya Pradesh finds that the performance of the project was hampered severely due to several limiting factors such as lack of trust between the local forest department and the fringe community, lack of experience as well as openness among the officials to accept or implement new ideas in the form of participatory management of PAs and remarks that the overall groundwork necessary prior to implementation of such projects was generally lacking.

Durst et al (2005), during the evaluation of the programme in Periyar TR in Kerala has documented that a number of alternative livelihood opportunities were created by the PA management which were aimed at reducing the dependency of people on the resources of the TR and thus ensuring the conservation of ecology of the reserve. One of the most significant achievements of the particular programme has been the bringing of a group of convicted smugglers back into the mainstream society and at the same time enlisting this reformed group in duties related to protection and conservation. Establishing and providing support to eco tourism ventures of the locals was another significant achievement of the eco development programme in the Periyar TR.

Rajvanshi (2001) in his 'Strategic Environmental Assessment' of the performances of the eco development programme in Gir NP of Gujarat and Ranthambore TR of Rajasthan finds that post evaluation and monitoring of programmes can help in course correction and prevent undesirable outcomes of such projects and at the same time, help in steering the programme towards its goal.

The Manas Maozigendri Ecotourism Society (MMES) was formed in the fringes of Manas TR, Biosphere Reserve and UNESCO World Heritage Site in Assam, with support of over 200 volunteers, among whom, a large chunk comprises of hardened former poachers and loggers. They are employment under the MMES and run twelve anti-poaching and anti-logging camps in the forest in joint patrol with the forest officials inside Manas besides participating in awareness and capacity building activities with the community. Of late, eco

tourism has become a significant source of earnings for the society and its members. The participatory conservation model through eco development in Manas is one of the finest examples of how a successful conservation program could co-exist with promotion of eco-tourism (Sreekanta 2012).

Involving and employing local youths in conservation in Laokhowa and Burhachapori, two WLSs and notified buffers of the Kaziranga TR in Assam through the ongoing eco development programme has been another stand out example in bringing about ecological conservation in PAs through participation of fringe villagers (Ojah et al 2012).

Pabla (1996) studies the eco development programme in Great Himalayan National Park and observed that of the two approaches in implementing an eco development programme *viz.* direct measures for decreasing pressure on PAs in terms of resource extraction and measures of enhancement of capacity of villagers and addressing their socio-economic requirements, it is more often than not, the latter, which the community prefers, while the former is preferred by the forest department. The study mentions that while the eco development programme planning should have integration of both the approaches, there should be adequate mechanisms wherein, the allocation of funds should be prioritized more towards conservation oriented activities.

Eco development activities should ultimately aim at becoming self sustaining and organic and any investments and profits should be pooled into a community fund. Badola (2000) emphasises on the point that programme activities undertaken under eco development must yield short term benefits along with long term tangible benefits.

The state and local forest departments must change their outlook, mindset and approach and become more accepting towards the eco development programme. There is manifold increase in the duties and responsibilities of the frontline forest staff of PAs with the implementation of the eco development programme and here it is necessary to motivate and orient the staff and undertake measures for their capacity building in order to ensure the desired levels of integration between PAs and People through eco development (Badola 1999).

Rodgers (2003) states that unlike as often observed, there is, in fact, no two separate 'paradigms' of conservation approach towards Indian PAs in his critique to Madhusudan and Shankar Raman (2003). He says, "*... planning for protected areas in India as elsewhere in the tropics has accepted the principle of zonation to allow different patterns of resource use and protection. This follows the Man and Biosphere concept of UNESCO and is the rationale behind the core and buffer zones that are typical of many of India's PAs. Most of the buffer zones can be described as zones that permit greater levels of resource use—use that is hopefully sustainable. Such uses would include grazing, timber and other biomass exploitation, including minor forest produce. The core zones would be the less disturbed, less exploited areas of the PA. This conservation activity, widespread through all the states and union territories of India, shows clearly the integration of both the concept of conservation through creating and managing PAs and the concept of allowing different levels of sustainable resource use within the different zones of the PAs. There are not two separate and competing paradigms: they are two distinct parts of a common policy for the conservation of biodiversity...*"

However, Kramer et al (1997) highlights that PAs are indispensable and critical for ensuring long-term conservation of biodiversity and dilution of PAs as a tool for biodiversity conservation through promotion a more people centric approach has not yielded desired results. Balmford (1998) states that almost all PAs of the tropics are faced with pressure from illegal hunting and resource extraction in spite of the implementation of participatory conservation practices. In this context, the observations of Singh (1997) become critical; where he emphasizes that mere eco development will not succeed unless it is backed by effective management and protection of PAs. In fact, the criteria for measuring management effectiveness of PAs as defined by IUCN (Dudley and Stolton 2008) categorizes protection paraphernalia as one of the most important considerations in evaluating the effectiveness of PAs in biodiversity conservation. Therefore, protection along with participation seems to be the way forward in terms of ensuring that the goals and objectives for which the PAs were set up, especially in countries like India, are sustainably achieved.

CHAPTER 3

SOCIO ECONOMIC DYNAMICS OF THE FRINGE DWELLERS OF LBWLS

One of the most critical concerns facing conservation of biodiversity in PAs in developing countries has been the ever-increasing degree of dependency of the fringe dwellers on the natural resources of the PAs. To ensure effective management of biodiversity of PAs and their long-term sustainability, it is imperative that PA managers and policy makers understand the socio-economic dynamics, the needs and aspirations of the fringe dwellers. Once they have a proper understanding of such aspects, the managers would be in a better position to understand the nature of dependence, if any, that the fringe dwellers are having on the PAs and the drivers of dependence.

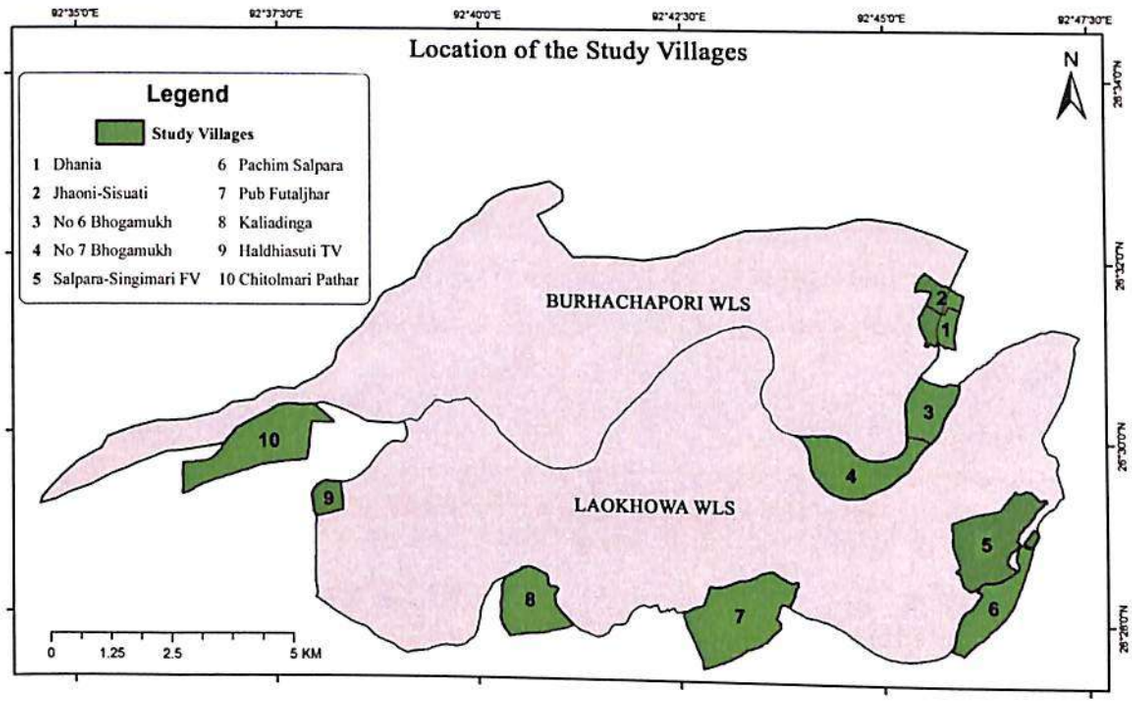

Figure 3.1 - Locational Map of the Study Villages

Source: Fieldwork, 2012, 2013 & 2014

The subsequent paras examine the socio economic dynamics of the fringe dwellers of LBWLS. The study was conducted in 10 fringe, forest and taungiya villages of LBWLS (Figure 4.1). The data on the socio economy and dependency aspects were assessed using percentage (%) and sample representation (n) analysis.

As per the census of India records, the total population of the 10 survey villages was 23,336 persons in 2011 as against 18,358 persons in 2001. There were 4,339 households in 2011 as compared to 3,023 households in 2001. There were 11,937 males against 11,339 females in 2011 whereas, in 2001, there were 9,361 males against 8,997 females.

3.1 Community

Among the surveyed households, 74.3% (n=344) were Muslims while 25.7% (n=119) were Hindus. The dominant Hindu communities were the Bodos at 8.4% (n=40) of the total households, followed by the Nepalis at 8.4% (n=39) households, the Bengali Hindus at 7.3% (n=34) households and finally the Biharis at 1.3% (n=6) households (Figure 3.2). Kaliadinga Pam, Pachim Salpara and No 7 Bhogamukh villages were entirely dominated by Bengali Muslim community while Dhania and Sisuati-Jhaoni were dominated entirely by households belonging to the Nepali community. On the other hand, the households of Haldhiasuti TV and Singimari-Salpara FV were comprised entirely of Bodos. Bengali Muslims were the dominant community in Pub Futaljar at 91.5% (n=119) households followed by 8.5% (n=11) households belonging to the people from the Bengali Hindu community. The household composition of Chitolmari Pathar stood at 58.7% (n=37) Bengali Muslims followed by 36.5% (n=23) Bengali Hindus and 4.8% (n=3) Biharis. Finally, No 6 Bhogamukh was dominated by 87.5% (n=21) Bengali Muslim households followed by 12.5% (n=3) Bihari households (Figure 3.2).

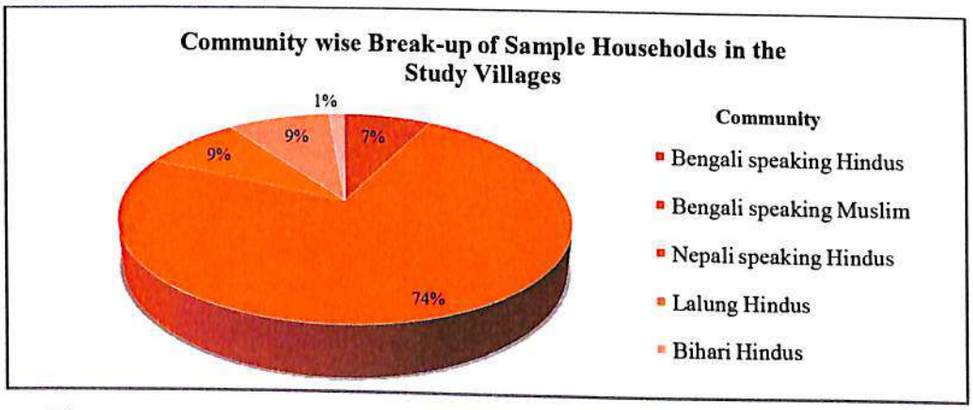

Figure 3.2 - Community wise breakup of the Sample Households in the Study Villages, 2012-14

Source: Fieldwork, 2012-14

3.2 Family Size

In terms of family size, 20.7% (n=96) of the surveyed households had 1 to 4 members in their households while 43.2% (n=200) had 5 to 8 members. Further 30.0% (n=139) households had 9 to12 family members whereas 6.0% households had above 12 members (Figure 3.3). Village wise, Dhania (94.7%, n=18), Sisuati Jhaoni (80%, n=16), Haldhiasuti TV (80%, n=16) and Singimari-Salpara FV (65%, n=13) had maximum families within the 1 to 4 member category. Pub Futaljar (56.2%, n=73), Pachim Salpara (53%, n=35), No 6 Bhogamukh (50%, n=12), No 7 Bhogamukh (46.7%, n=21) and Kaliadinga Pam (46.4%, n=26) had a majority of families within the 5 to 8 member category (Figure 3.3).

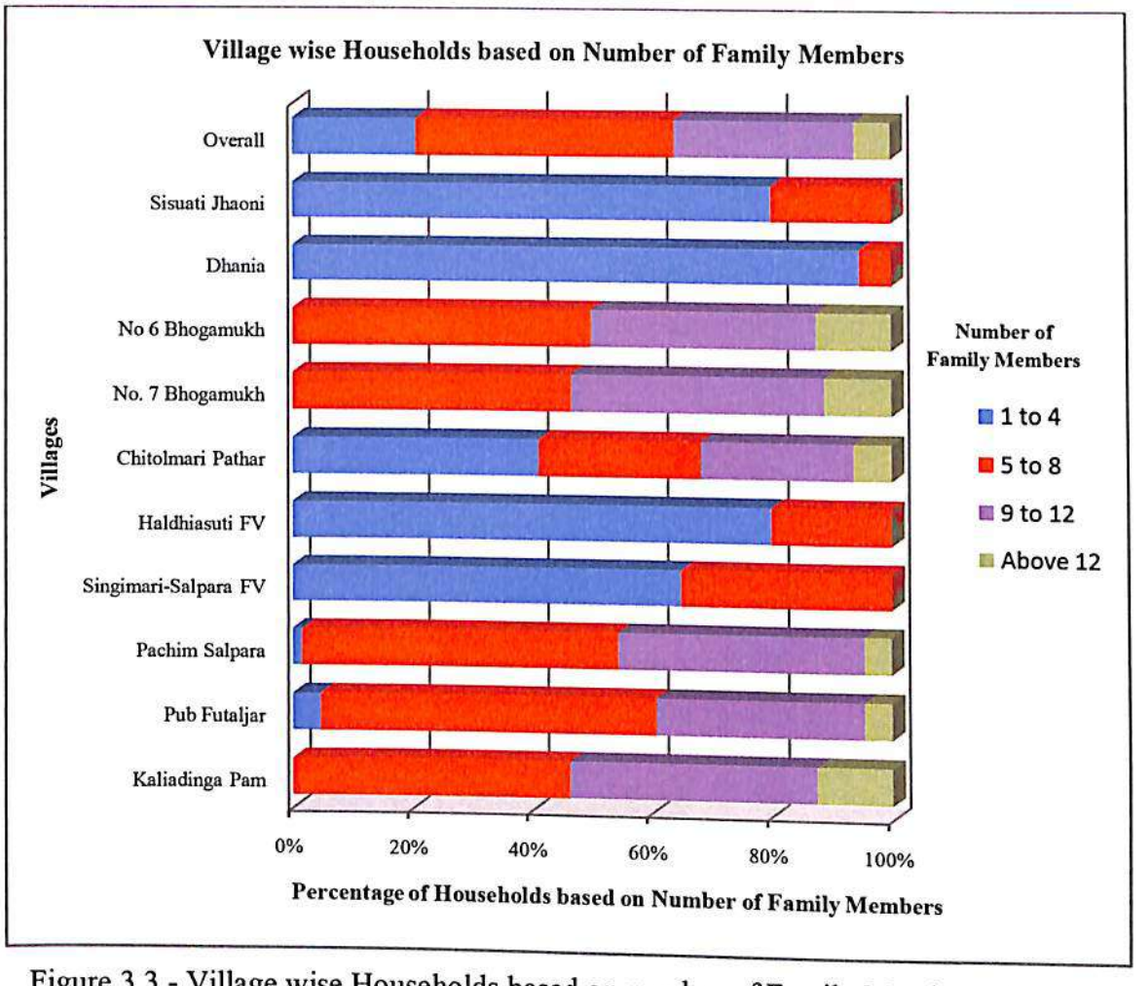

Figure 3.3 - Village wise Households based on number of Family Members, 2012-14

Source: Fieldwork, 2012-14

Community wise, among the Bengali Muslims and Biharis, maximum family sizes were observed among the 5 to 8 members group at 50.3% (n=173) and 66.7% (n=4)

households respectively. Further, 87.2% (n=34) of the Nepali households, 72.5% (n=29) of the Bodo households and 67.6% (n=23) of the Bengalis, had family size of 1 to 4 members (Figure 3.4).

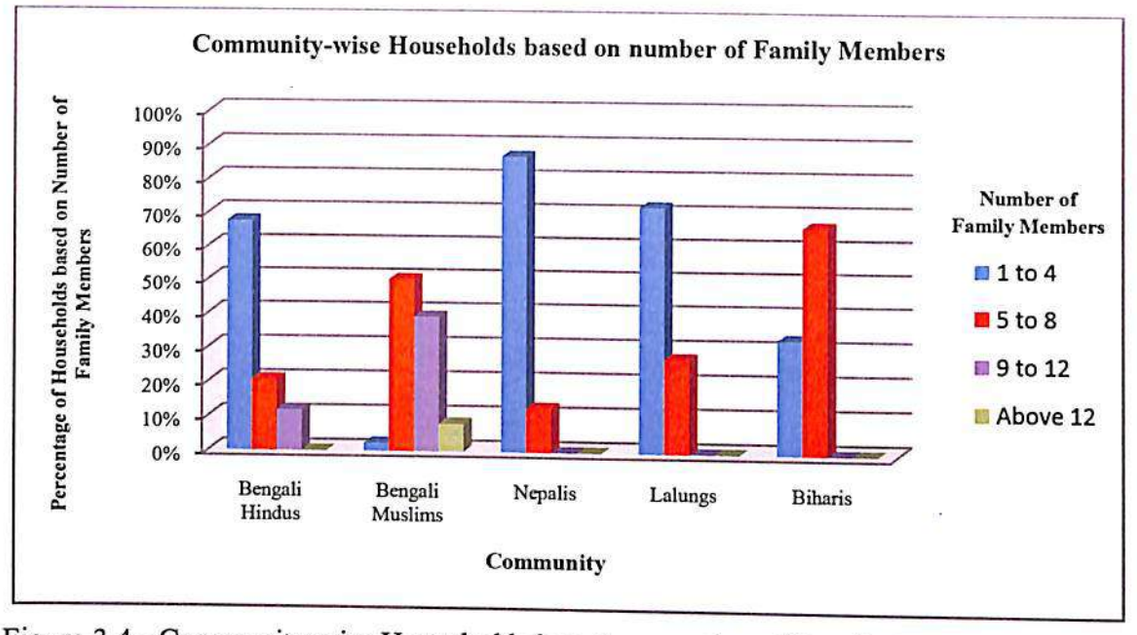

Figure 3.4 - Community wise Households based on number of Family Members, 2012-14

Source: Fieldwork, 2012-14

3.3 Education

In terms of formal education, 9.1% (n=42) of the surveyed households did not have any educated members while 90.9% (n=421) of the households had one or more member in their household, who had received formal education up to 10th class or higher (Table 3.1). Village wise, Kaliadinga Pam had highest number of households with no literate members at 17.9% (n=10) followed by No 7 Bhogamukh at 15.6% (n=7), Pachim Salpara at 12.1% (n=8), Chitolmari Pathar at 9.5% (n=6), Pub Futaljar at 6.9% (n=9), Haldhiasuti TV at 5% (n=1) and No 6 Bhogamukh at 4.2% (n=1). On the other hand, none of the surveyed households in Singimari-Salpara, Dhania and Sisuati-Jhaoni has any illiterate members (Table 3.1).

Table 3.1- Village wise Households based on the number of Educated Persons, 2012-14

Villages		No. of Educated Persons in the Household									Total
		0	1	2	3	4	5	6	7	8	
Kaliadinga Pam	n	10	12	17	8	9	0	0	0	0	56
	%	17.9%	21.4%	30.4%	14.3%	16.1%	.0%	.0%	.0%	.0%	100.0%
Pub Futaljar	n	9	18	34	27	23	8	9	2	0	130
	%	6.9%	13.8%	26.2%	20.8%	17.7%	6.2%	6.9%	1.5%	.0%	100.0%
Pachim Salpara	n	8	12	14	16	6	2	7	1	0	66
	%	12.1%	18.2%	21.2%	24.2%	9.1%	3.0%	10.6%	1.5%	.0%	100.0%
Singimari-Salpara	n	0	8	7	5	0	0	0	0	0	20
	%	.0%	40.0%	35.0%	25.0%	.0%	.0%	.0%	.0%	.0%	100.0%
Haldhiasuti	n	1	7	6	4	2	0	0	0	0	20
	%	5.0%	35.0%	30.0%	20.0%	10.0%	.0%	.0%	.0%	.0%	100.0%
Chitolmari Pathar	n	6	8	20	14	7	1	7	0	0	63
	%	9.5%	12.7%	31.7%	22.2%	11.1%	1.6%	11.1%	.0%	.0%	100.0%
No. 7 Bhogamukh	n	7	5	12	8	5	3	4	1	0	45
	%	15.6%	11.1%	26.7%	17.8%	11.1%	6.7%	8.9%	2.2%	.0%	100.0%
No 6 Bhogamukh	n	1	4	8	5	1	2	1	1	1	24
	%	4.2%	16.7%	33.3%	20.8%	4.2%	8.3%	4.2%	4.2%	4.2	100.0%
Dhania	n	0	3	7	7	2	0	0	0	0	19
	%	.0%	15.8%	36.8%	36.8%	10.5%	.0%	.0%	.0%	.0%	100.0%
Sisuati Jhaoni	n	0	8	8	3	0	0	1	0	0	20
	%	.0%	40.0%	40.0%	15.0%	.0%	.0%	5.0%	.0%	.0%	100.0%
Overall	n	42	85	133	97	55	16	29	5	1	463
	%	9.1%	18.4%	28.7%	21.0%	11.9%	3.5%	6.3%	1.1%	.2%	100.0%

Source: Fieldwork, 2012-14. n = Number of Households

Table 3.2 - Community wise Households based on the number of Educated Persons, 2012-14

Community		Number of Educated Persons in the Household									Total
		0	1	2	3	4	5	6	7	8	
Bengali Hindus	n	0	2	15	10	6	0	1	0	0	34
	%	.0%	5.9%	44.1%	29.4%	17.6%	.0%	2.9%	.0%	.0%	100.0%
Bengali Muslim	n	40	56	88	68	43	16	27	5	1	344
	%	11.6%	16.3%	25.6%	19.8%	12.5%	4.7%	7.8%	1.5%	.3%	100.0%
Nepalis	n	0	11	15	10	2	0	1	0	0	39
	%	.0%	28.2%	38.5%	25.6%	5.1%	.0%	2.6%	.0%	.0%	100.0%
Bodos	n	1	15	13	9	2	0	0	0	0	40
	%	2.5%	37.5%	32.5%	22.5%	5.0%	.0%	.0%	.0%	.0%	100.0%
Biharis	n	1	1	2	0	2	0	0	0	0	6
	%	16.7%	16.7%	33.3%	.0%	33.3%	.0%	.0%	.0%	.0%	100.0%
Overall	n	42	85	133	97	55	16	29	5	1	463
	%	9.1%	18.4%	28.7%	21.0%	11.9%	3.5%	6.3%	1.1%	.2%	100.0%

Source: Fieldwork, 2012-14. n = Number of Households

Community wise, the highest number of households with no literate members was seen was found to be among the Bihari community at 16.7% (n=1) followed by Bengali Muslims (11.6% (n=40) and the Bodos at 2.5% (n=1). On the other hand, none of the Nepali and Bengali Hindu households had any illiterate members (Table 3.2).

3.4 House Type

Among the surveyed households, 54.2% (n=251) were kutcha house type, 36.5% (n=169) were semi pucca houses while 9.3% (n=43) were pucca house types (Figure 3.5). Among the villages, kutcha houses were a majority in Kaliadinga Pam at 67.9% (n=38), No 7 Bhogamukh at 66.7% (n=30), Pachim Salpara at 57.6% (n=38), Pub Futaljar at 56.2% (n=73), Singimari-Salpara FV at 55% (n=11) and Sisuati-Jhaoni at 50% (n=10) households. Haldhiasuti TV had a majority of semi pucca house type at 55% (n=11) while No 6 Bhogamukh had equal number of kutcha and semi pucca houses at 45.8% (n=11) (Figure 3.5).

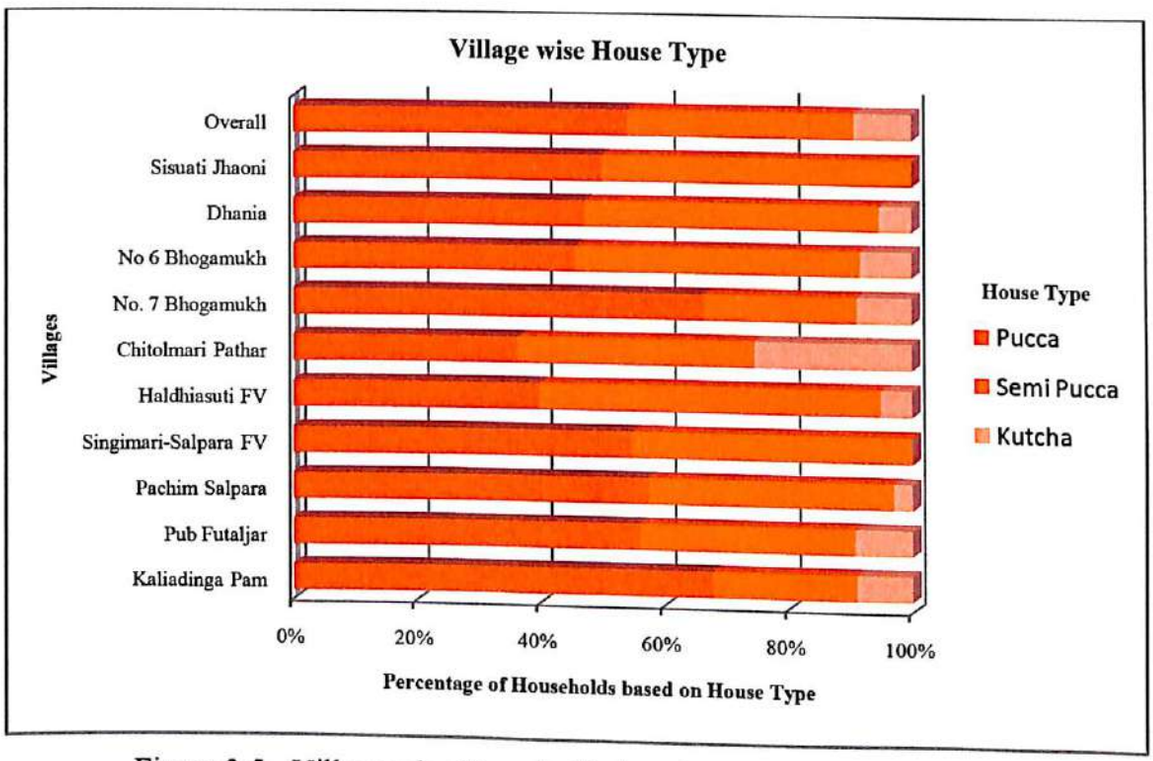

Figure 3.5 - Village wise Households based on House Type, 2012-14
Source: Fieldwork, 2012-14

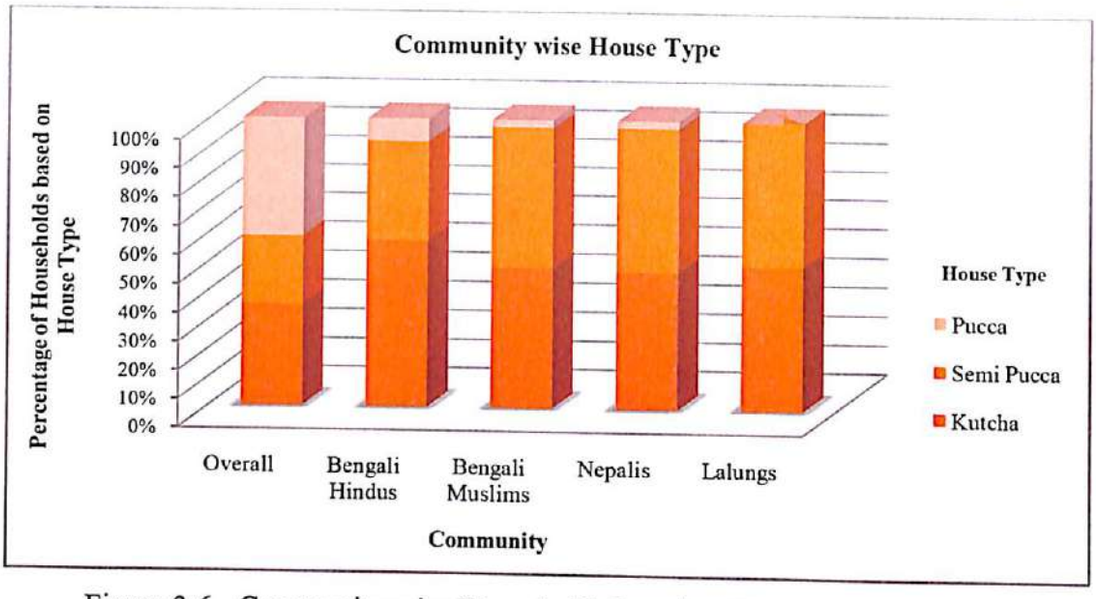

Figure 3.6 - Community wise Households based on House Type, 2012-14

Source: Fieldwork, 2012-14

Community wise, 57.6% (n=198) households of the Bengali Muslims lived in kutcha houses while 34.6% (n=119) lived in semi pucca houses. The households of the Bihari community were divided equally (50%, n=3) between kutcha and semi pucca house type. Further, 48.7% (n=19) of the households of the Nepali community were of kutcha type while an equal number of households of the community belonged to the semi pucca type. Again, 50% (n=20) of the houses of the Bodo community were of semi pucca type while 47.5% (n=19) were of kutcha type. Finally, 41.2% (n=14) households of the Bengali Hindus lived in pucca houses while 35.3% (n=12) lived in kutcha houses (Figure 3.6).

3.5 Distance of Household from LBWLS

Overall, 44.1% (n=204) of the surveyed households were located within a distance of 0 to 500 meters from the boundary of LBWLS. Further, 38% (n=176) households were located at a distance of 500 to 1000 meters, 14.5% households at a distance of 1000 to 1500 meters and 3.5% (n=16) households were located at a distance of more than 1500 meters from the PA boundary. Being dwellers of the forest and taungiya villages of LWLS, all the houses of the Bodo community were naturally confined within the distance of 1000 meters of the boundary of LWLS. Apart from Singimari-Salpara FV and Haldhiasuti TV, all the houses in No 6 Bhogamukh and No 7 Bhogamukh were also confined within 1000 meters from the

boundary of the sanctuaries. Lastly, all the households of Dhania and Sisuati-Jhaoni were confined within 1500 meters of the boundary of BWLS.

3.6 Land Holding

Among the surveyed households, 23% (n=110) had land holding of up to 1 hectare (ha). Further, 32% (n=148) households had land holding between 1 to 3 ha, 20.7% (n=96) between 3 to 5 ha, 9.1% between 5 to 7 ha, 7.6% (n=35) between 7 to 9 ha and finally only 6.9% households had land holding of more than 9 ha (Figure 3.7). Village wise, in Kaliadinga Pam, 37.5%, (n=21) number of households were found to be in the 1 to 3 ha land holding size category followed by 30.4% (n=17) households in the below 1 ha category. In Pub Futaljhar, 33.1% (n=43) households were in the 1 to 3 ha category followed by 27.7% (n=36) households in the 3 to 5 ha category. More than half (53%, n=35) of the households of Pachim Salpara were having 1 to 3 ha land holding size. Again, Singimari-Salpara and Haldhiasuti villages had maximum households in the 5 to 7 ha land holding category at 45% (n=9) and 35% (n=7) households respectively. Both these villages had 25% (n=5) of the households each in the 7 to 9 ha land holding category. On the other hand, 30.2% (n=19) of the households of Chitolmari Pathar had land holding of above 9 ha. No 7 Bhogamukh and No 6 Bhogamukh had a majority of the households in the below 1 ha land holding category at 44.4% (n=20) and 41.7% (n=10) respectively. These two villages had 40% (n=18) and 33.3% (n=8) households each in the 1 to 3 ha land holding category. Dhania had maximum households in the 1 to 3 ha category at 47.4% (n=9) followed by 21.1% (n=4) households in the below 1 ha category. Finally, Sisuati-Jhaoni had 30% (n=6) of the households in the 1 to 3 ha land holding category followed by 20% (n=4) households in the above 9 ha land holding category (Figure 3.7).

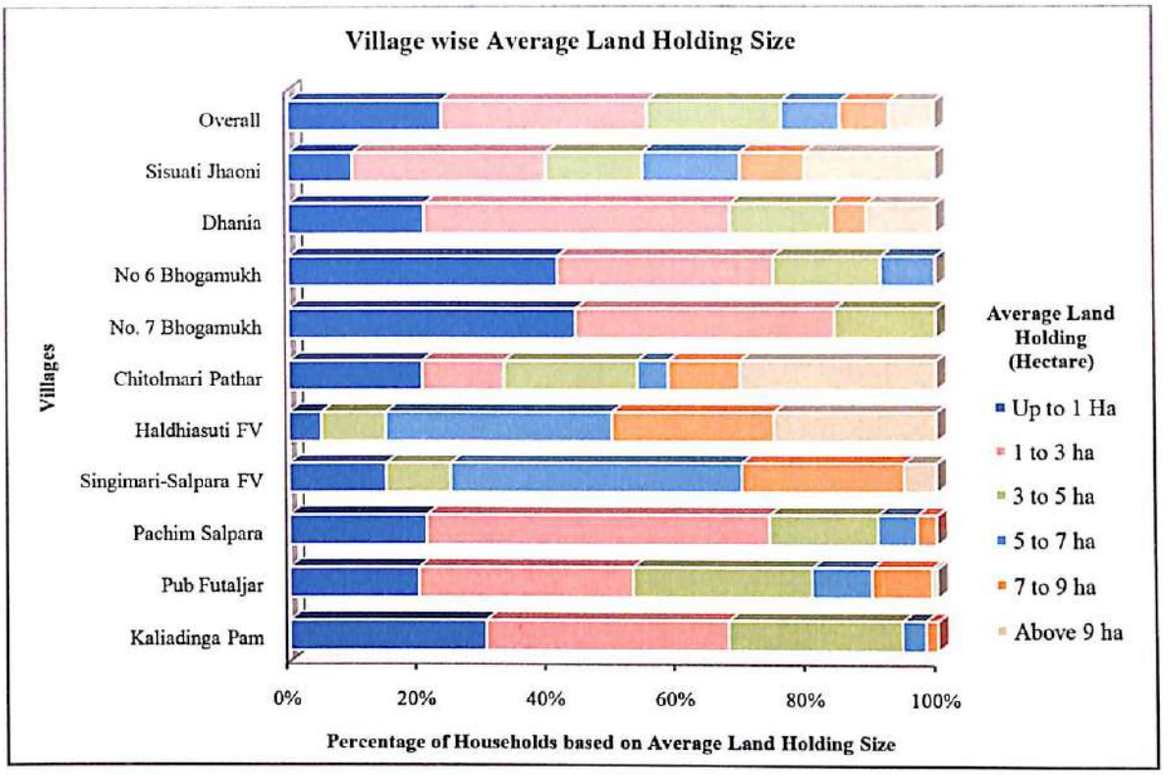

Figure 3.7 - Village wise Households based on Average Land Holding Size, 2012-14

Source: Fieldwork, 2012-14

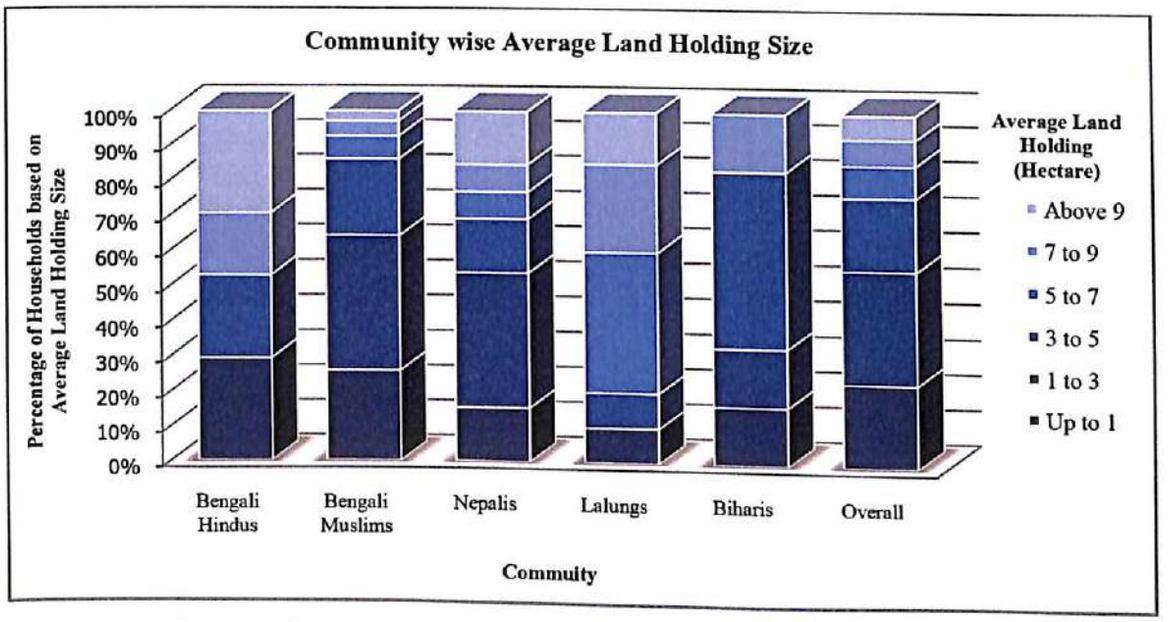

Figure 3.8 - Community wise Households based on Average Land Holding Size, 2012-14

Source: Fieldwork, 2012-14

Community wise, 29.4% (n=10) of the households of the Bengali Hindu community had up to 1 ha land holding while an equal number of households of the community also had above 9 ha land holding. Maximum households of the Nepalis and the Muslims, at 38.5% (n=15) and 38.4% (n=132) respectively, had land holding of 1 to 3 ha. Further, 50% (n=3) households of the Bihari community were having land holding of 3 to 5 ha. Finally, 40% (n=16) of the households of the Bodo community were having 5 to 7 ha land holding size (Figure 3.8).

3.7 Material Possession

Material possessions of the surveyed households were divided into 4 hierarchical categories. Households having possession of three or more of the items among own kutcha house, bicycle, radio, fishing net and basic mobile phone were categorized as Level 1 households. Those having a minimum of three items among own kutcha/semi pucca house, bicycle, TV, fishing net and two or more basic mobile phones were classified as Level 2 households. Those in possession of minimum three of the items like own semi pucca/pucca house, two-wheeler, TV, power tiller and multiple smart phones were categorized as Level 3 households. Finally, those households which were in possession of a minimum of three items from among pucca house, multiple TVs, 2 or more two wheelers, power backup and power tiller/tractor were classified as Level 4 households. Thus, the level of material possession of the households was assessed in a hierarchical order of Level 1 as lowest to Level 4 as highest.

A majority of the surveyed households, comprising of 34.3% (n=159) belonged to the Level 4 material possession category followed by 28.5% (n=132) households in the Level 3 category, 25.5% (n=118) in the Level 2 category while 11.7% (n=54) of the households belonged to the Level 1 category of material possession. Village wise, Dhania had the highest number of villages in the Level 4 category at 63.2% (n=12) while 26.3% (n=5) households of the village were in the Level 2 category. In Sisuati-Jhaoni, 50% households were in the Level 3 category followed by 25% (n=5) households each in the Level 4 and Level 2 categories. None of the households of Dhania and Sisuati-Jhaoni was in the Level 1 category. In Kaliadinga, 35.7% (n=20) households were in the Level 3 category while 30.4% (n=17) were in the Level 4 category. However, 26.8% (n=15) households of Kaliadinga were in the Level 1 category. Pub Futaljar had 46.9% (n=61) households in Level 4 category followed by 24.6% (n=32) households in the Level 3 category. Pachim Salpara, on the other hand, had

40.9% (n=27) households in the Level 2 category followed by 28.8% (n=19) households in Level 4 category. Further, 40% (n=8) households of Singimari-Salpara were in the Level 2 category while 25% (n=5) households were equally distributed in the Level 1 and Level 3 category. A majority of the households in Haldhiasuti were in the Level 2 category at 40% (n=8) followed by 30% (n=6) in Level 3 category. Similarly, Chitolmari Pathar too had 38.1% (n=24) households in the Level 3 category followed closely by 34.9% (n=22) households in the Level 4 category. Only 1.6% (n=1) households of the village were in the Level 1 category. No 6 Bhogamukh, on the other hand, had approximately equal percentage of households across all the levels, the highest percentage being in the Level 2 and Level 4 categories with 29.2% (n=7) households in each category. Finally, 31% (n=14) of the households of No 7 Bhogamukh were in the Level 2 category followed by 28.9% (n=13) and 26.7% (n=12) households in the Level 3 and Level categories respectively (Figure 3.9).

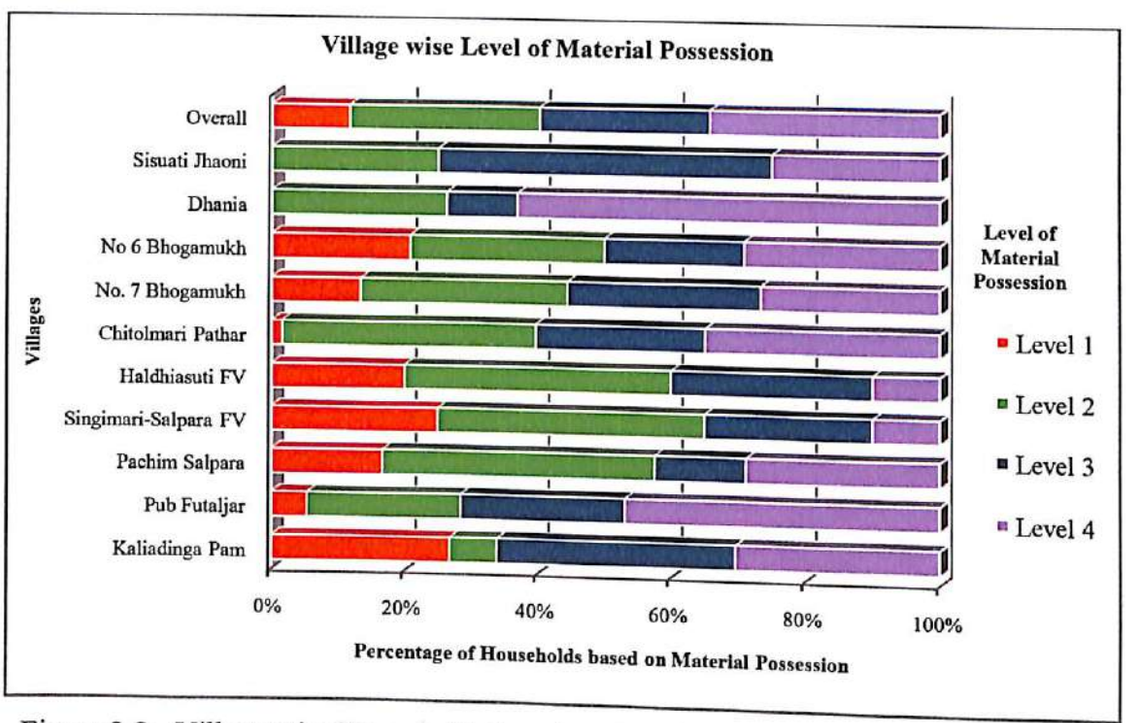

Figure 3.9 - Village wise Households based on Level of Material Possession, 2012-14

Source: Fieldwork, 2012-14

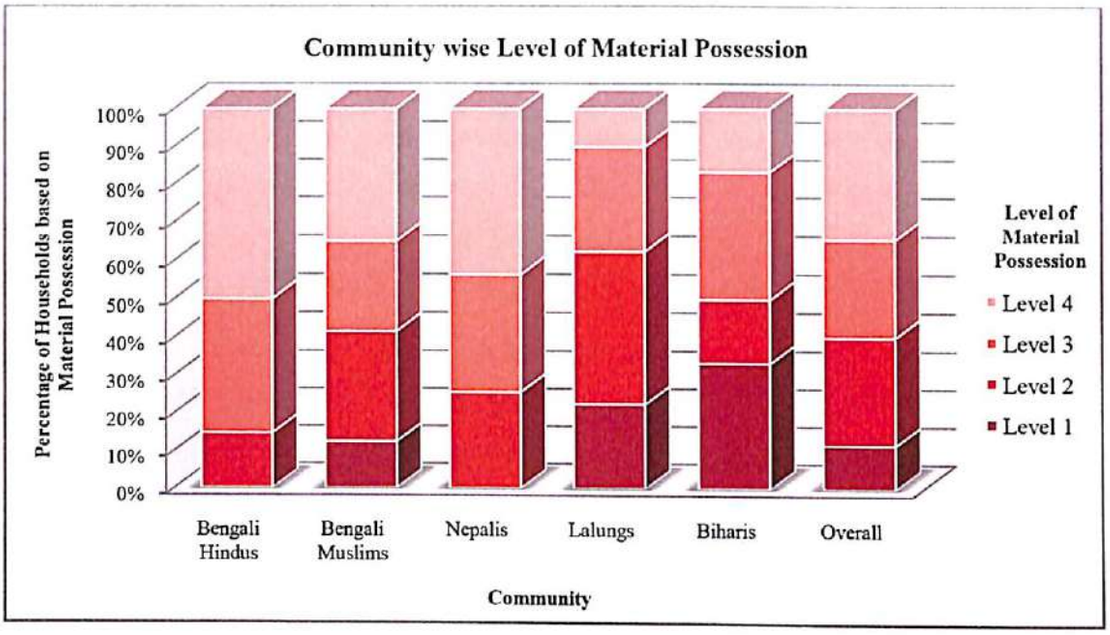

Figure 3.10 - Community wise Households based on Level of Material Possession, 2012-14

Source: Fieldwork, 2012-14

Community wise, a majority of the households of the Bengali Hindus, Nepalis and Bengali Muslims were in the Level 4 category at 50% (n=17), 43.6% (n=17) and 34.9% (n=120) households respectively. On the other hand, a majority of the households of the Bodos were in the Level 2 category at 40% (n=16) while a majority of the households of the Bihari community was equally distributed at 33.3% (n=2) within the Level 1 and Level 3 categories (Figure 3.10).

3.8 Income Aspects

Among the surveyed households, 38.2% (n=177) households were having the average annual income of between Rs 2 to 3 Lakh per annum while 34.6% (n=160) households were within the Rs 1 to 2 Lakh average annual income category. Further, 14.9% (n=69) households earned below Rs 1 Lakh per annum on an average and 12.3% (n=57) households earned above Rs 3 Lakh per annum. In Kaliadinga Pam village, 55.4% (n=31) households belonged to the Rs 1 to 2 Lakh annual income category followed by 33.9% (n=10) households in the Rs 2 to 3 Lakh category. In Pub Futaljar, 41.5% (n=51) households belonged to the Rs 1 to 2 Lakh category, 25.4% (n=33) households in the below Rs 1 Lakh category and 23.8% (n=31) households in the Rs 2 to 3 Lakh category. In Pachim Salpara, an equal percentage of 34.8% (n=23) households were in the below Rs 1 Lakh and Rs 1 to 2 Lakh income categories.

Again, 55% (n=11) households of Singimari-Salpara were in the Rs 1 to 2 Lakh category followed by 25% (n=5) households in the Rs 2 to 3 Lakh category while the rest of the households were in the below Rs 1 Lakh category. Haldhiasuti had 40% (n=8) households in the Rs 1 to 2 Lakh category followed by 35% (n=35) households in the Rs 2 to 3 Lakh category. Chitolmari Beel, on the other hand, had a majority of their households within the Rs 2 to 3 Lakh category at 60% (n=38) households followed by 16% (n=16) households in the above Rs 3 Lakh category. Both No 6 Bhogamukh and No 7 Bhogamukh had 60% (n=27) and 54.2% (n=13) households each in the Rs 2 to 3 Lakh category. Dhania had a majority of the households in the above Rs 3 Lakh category at 42.1% (n=8), which was also the highest number of households among all the villages in this income category. Finally, Sisuati-Jhaoni had 65% (n=13) households in the Rs 2 to 3 Lakh category followed by 25% (n=5) of the households within the above Rs 3 Lakh annual income category (Figure 3.11).

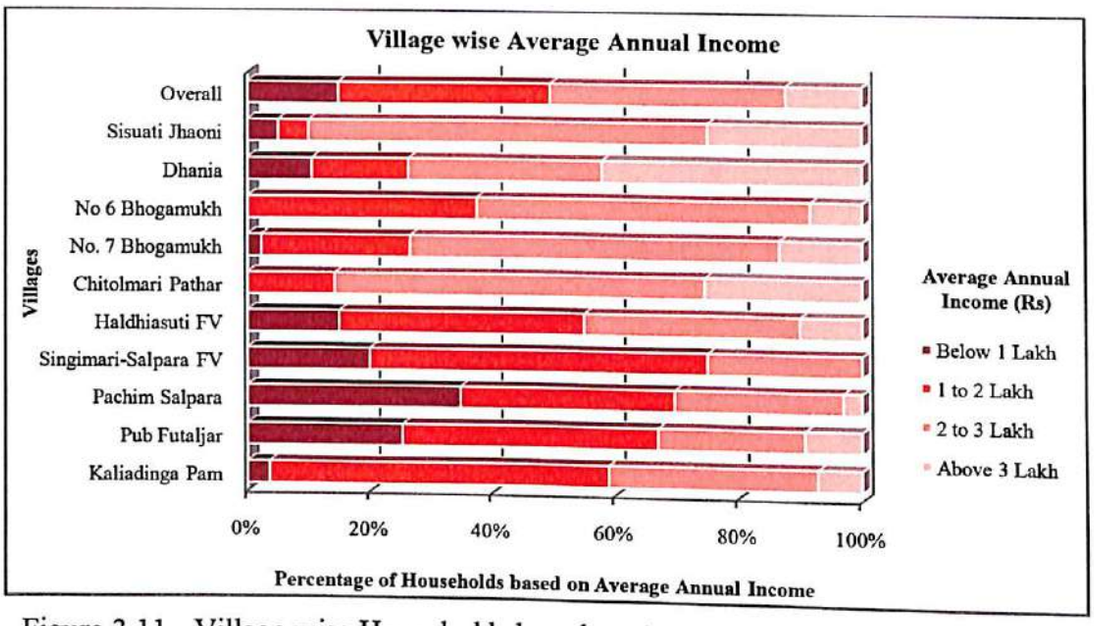

Figure 3.11 - Village wise Households based on Average Annual Income, 2012-14
Source: Fieldwork, 2012-14

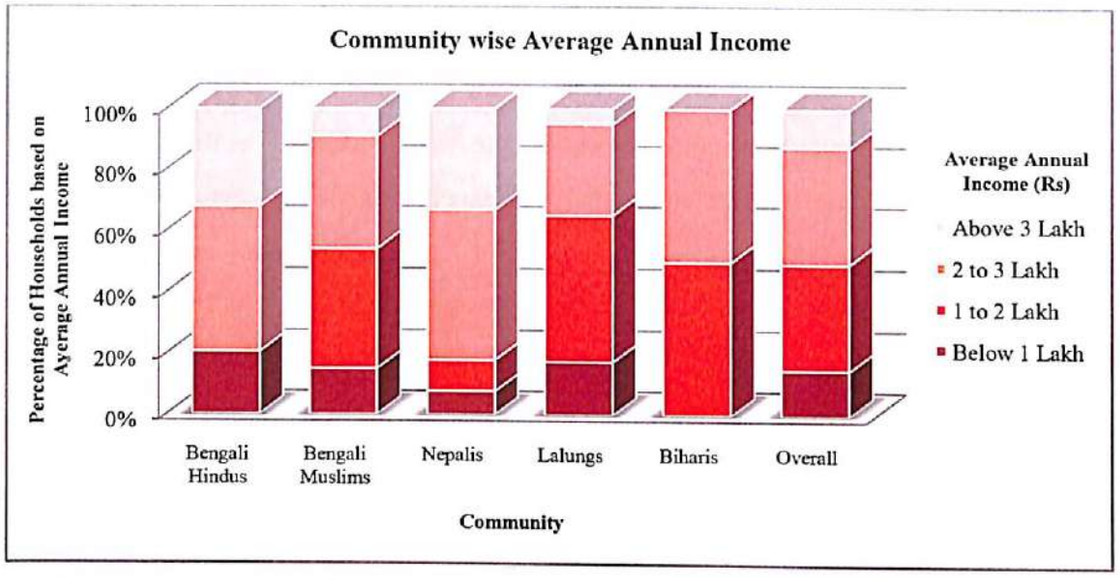

Figure 3.12 - Community wise Households based on Average Annual Income, 2012-14

Source: Fieldwork, 2012-14

Community wise, 47.1% (n=16) households of the Bengali Hindus belonged to the Rs 2 to 3 Lakh annual income category followed by 32% (n=11) households in the above Rs 3 Lakh category. The rest of the households earned below Rs 1 Lakh per year. Among the Bengali Muslims, 39% (n=134) households earned between Rs 1 to 2 Lakh per year followed by 36.9% (n=127) households in the Rs 2 to 3 Lakh category. Further, 48.7% (n=19) Nepali households were within the Rs 2 to 3 Lakh category and 33.3% (n=13) in the above Rs 3 Lakh category. Further, 47.5% (n=19) of the Bodo households belonged to the Rs 1 to 2 Lakh category followed by 30% (n=12) households in the Rs 2 to 3 Lakh category. Finally, the households of the Bihari community were equally divided at 50% (n=3) within the Rs 1 to 2 Lakh and Rs 2 to 3 Lakh income categories (Figure 3.12).

3.9 Income Sources

It was seen that 72.8% (n=337) of the households derived a major portion of their income from engagement in the primary sector. Of this, agriculture was the primary income source for 36.9% (n=171) households, fishing for 23.3% (n=108) households, livestock rearing accounted for 8.2% (n=38) households while income earned from collection and sale of forest resources as a primary income source accounted for 4.3% (n=20) of the households. Further, dairying constituted the primary income source for 1.9% (n=9) households. On the

other hand, service sector as a primary income source accounted for 7.1% (n=33) households, engagement as agricultural labour for 7.1% (n=33) households, large business for 4.1% (n=19) households, while 3.5% (n=16) households were each deriving their primary income from petty business establishments and engagements as other marginal workers (Table 3.3).

Among the villages, it was seen that 8.3% (n=2) of the households from No 6 Bhogamukh were engaged in collection and sale of forest resources, followed by 7.6% (n=5) households in Pachim Salpara, 6.7% (n=3) in No 7 Bhogamukh, 6.3% (n=8) in Pub Futaljar, 1.8% (n=1) in Kaliadinga Pam and 1.6% (n=1) households in Chitolmari Pathar village. Fishing was the primary income source for 48.2% (n=27) households in Kaliadinga Pam, 39.7% (n=25) in Chitolmari Pathar, 22.7% (n=15) in Pachim Salpara, 22.2% (n=10) in No 7 Bhogamukh, 20.8% (n=5) in No 6 Bhogamukh, 18.5% (n=24) in Pub Futaljar and 5% (n=1) households in Singimari-Salpara and Haldhiasuti villages. Cattle rearing was the primary income source in 50% (n=10) households in Sisuati-Jhaoni, 47.4% (n=9) households in Dhania, 12.5% (n=3) in No 6 Bhogamukh, 8.9% (n=4) in No 7 Bhogamukh and 7.1% (n=4) in Kaliadinga Pam, among others. Dairying was the primary income source for 25% (n=5) of the households from Sisuati-Jhaoni and 21.1% (n=4) households in Dhania village (Table 3.3).

Table 3.3 - Village wise Households based on Primary Income Source, 2012-14

Village		Primary Income Source									
		Sale of Forest Resource	Agriculture	Fishing	Livestock Rearing	Agricultural Labour	Other Marginal Labour	Petty Business	Large Business	Service	Dairying
Kaliadinga Pam	n	1	19	27	4	5	0	0	0	0	0
	%	1.8%	33.9%	48.2%	7.1%	8.9%	.0%	.0%	.0%	.0%	.0%
Pub Futaljar	n	8	52	24	4	15	2	0	9	16	0
	%	6.2%	40.0%	18.5%	3.1%	11.5%	1.5%	.0%	6.9%	12.3%	.0%
Pachim Salpara	n	5	29	15	1	8	1	2	2	3	0
	%	7.6%	43.9%	22.7%	1.5%	12.1%	1.5%	3.0%	3.0%	4.5%	.0%
Singimari-Salpara	n	0	7	1	0	0	4	5	1	2	0
	%	.0%	35.0%	5.0%	.0%	.0%	20.0%	25.0%	5.0%	10.0%	.0%
Haldhiasuti	n	0	7	1	0	0	4	3	3	2	0
	%	.0%	35.0%	5.0%	.0%	.0%	20.0%	15.0%	15.0%	10.0%	.0%
Chitolmari Pathar	n	1	27	25	3	1	0	1	3	2	0
	%	1.6%	42.9%	39.7%	4.8%	1.6%	.0%	1.6%	4.8%	3.2%	.0%
No. 7	n	3	20	10	4	1	3	2	0	2	0

Bhogamukh	%	6.7%	44.4%	22.2%	8.9%	2.2%	6.7%	4.4%	.0%	4.4%	.0%
No 6 Bhogamukh	n	2	7	5	3	3	2	0	0	2	0
	%	8.3%	29.2%	20.8%	12.5%	12.5%	8.3%	.0%	.0%	8.3%	.0%
Dhania	n	0	1	0	9	0	0	2	1	2	4
	%	.0%	5.3%	.0%	47.4%	.0%	.0%	10.5%	5.3%	10.5%	21.1%
Sisuati Jhaoni	n	0	2	0	10	0	0	1	0	2	5
	%	.0%	10.0%	.0%	50.0%	.0%	.0%	5.0%	.0%	10.0%	25.0%
Overall	n	20	171	108	38	33	16	16	19	33	9
	%	4.3%	36.9%	23.3%	8.2%	7.1%	3.5%	3.5%	4.1%	7.1%	1.9%

Source: Fieldwork, 2012-14. n = Number of Households

Community wise, collection and sale of forest resources was the primary income source for 8.8% (n=3) of the Bengali Hindus and 4.9% (n=17) of the Bengali Muslims. Fishing was the primary livelihood source for 29% (n=10) of the Bengali Hindus, 27.6% (n=95) of the Bengali Muslims, 16.7% (n=1) of the Bihari households and 5% (n=2) of the Bodo community households. Livestock rearing, on the other hand, was the primary income source for 48.7% (n=19) of the Nepali households followed by 5.2% (n=18) households of the Bengali Muslims and 2.9% (n=1) households of the Bengali Hindus households. Dairying, as a primary livelihood source, was prevalent only among the Nepali community, constituting 23.1% (n=9) of the households. Agriculture was the predominant income source for 50% (n=3) Bihari households, 39.5% (n=136) Bengali Muslim households, 44.1% (n=15) Bengali Hindu households 35% (n=14) Bodo households and 7.7% (n=3) Nepali households. The rest of the households of the communities were engaged in activities other than those related to the primary economic sector, such as service and business, among others (Table 3.4)

Table 3.4 - Community wise Households based on Primary Income Source, 2012-14

Primary Income Source	Community					
	Bengali Hindus	Bengali Muslims	Nepalis	Bodos	Biharis	Overall
Collection and Sale of Forest Resource	8.8% (3)	4.9% (17)	.0% (0)	.0% (0)	.0% (0)	4.3% (20)
Agriculture	44.1% (15)	39.5% (136)	7.7% (3)	35.0% (14)	50.0% (3)	36.9% (171)
Fishing	29.4% (10)	27.6% (95)	.0% (0)	5.0% (2)	16.7% (1)	23.3% (108)
Livestock rearing	2.9% (1)	5.2% (18)	48.7% (19)	.0% (0)	.0% (0)	8.2% (38)
Agricultural Labour	11.8% (4)	8.4% (29)	.0% (0)	.0% (0)	.0% (0)	7.1% (33)
Other	.0% (0)	2.3% (8)	.0% (0)	20.0% (8)	.0% (0)	3.5% (16)

Marginal Labour						
Petty Business	.0% (0)	1.5% (5)	7.7% (3)	20.0% (8)	.0%	3.5% (16)
Large Business	2.9% (1)	3.2% (11)	2.6% (1)	10.0% (4)	33.3% (2)	4.1% (19)
Service	.0% (0)	7.3% (25)	10.3% (4)	10.0% (4)	.0% (0)	7.1% (33)
Dairying	.0% (0)	.0% (0)	23.1% (9)	.0% (0)	.0% (0)	1.9% (9)

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

3.10 Perception towards LBWLS

Among the surveyed households, 44.3% (n=206) believed that there should be equity of LBWLS in terms of being a source of livelihood for them and as a wildlife area. Further, 29.2% (n=135) believed that the importance of the LBWLS as a livelihood source should hold predominance over wildlife concerns while 6% (n=28) were of the opinion that the two sanctuaries should be meant only for livelihood sources for the fringe dwellers. On the other hand, only 8.2% (n=38) households believed that the LBWLS was meant only for wildlife and there should be no access to people for extraction of forest resources from them. Village wise, a majority of the households from Kaliadinga Pam (39.3%, n=22), Pub Futaljar (46.9%, n=61) Pachim Salpara (50%, n=33), Singimari-Salpara (55%, n=11), Haldhiasuti (45%, n=9), Chitolmari Pathar (34.9%, n=22), No 6 Bhogamukh (45.8%, n=11) and Sisuati-Jhaoni (55%, n=11) believed in equal importance to livelihood and wildlife concerns in terms of LBWLS. In No 7 Bhogamukh, majority of the households believed in predominance of livelihood over wildlife concerns, at 42.2% (n=19). In Dhania, an equal 47.7% (n=9) households each believed in prominence of livelihood opportunities compared to wildlife as well as equal importance to livelihood and wildlife conservation concerns in LBWLS. Further, 19.6% (n=11) of the households from Kaliadinga Pam, 10% (n=2) from Haldhiasuti, 8.3% (n=2) from No 6 Bhogamukh, 6.7% (n=3) from No 7 Bhogamukh, 6.1% (n=4) from Pachim Salpara, 3.2% (n=2) from Chitolmari Pathar and 3.1% (n=4) households in Pub Futaljhar believed that LBWLS should be meant only for livelihood support of the fringe communities (Figure 3.13).

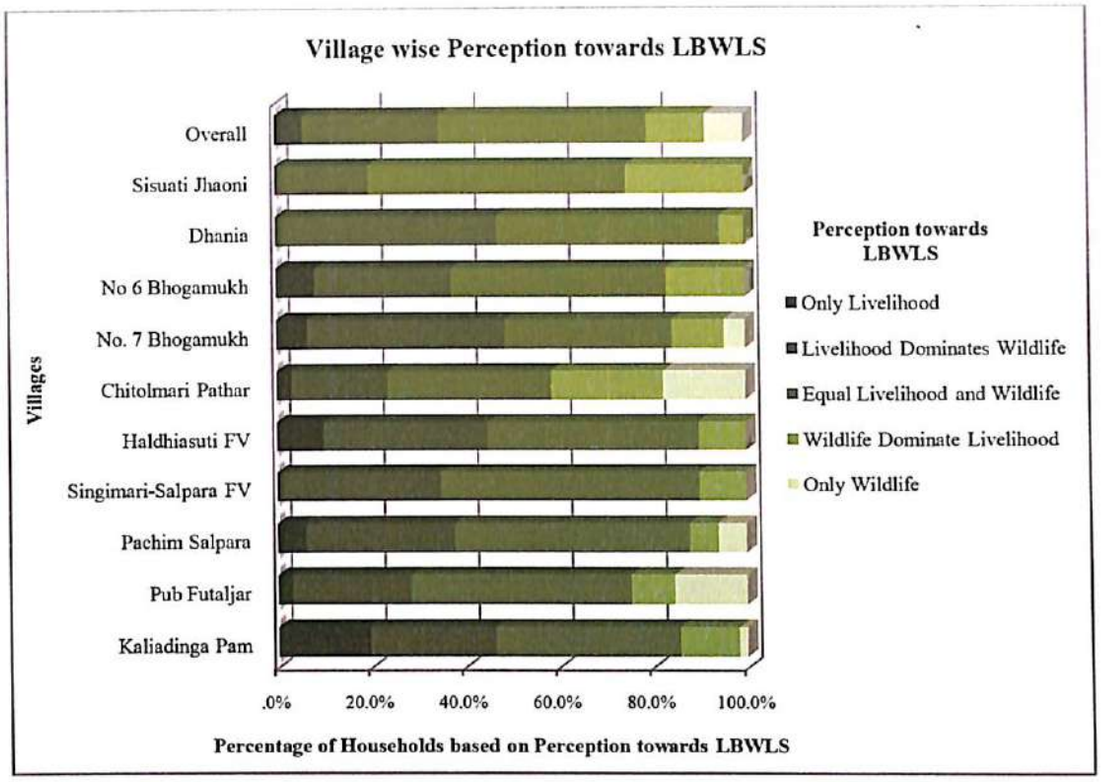

Figure 3.13 - Village wise Households based on Perception towards Laokhowa and Burhachapori WLSs, 2012-14

Source: Fieldwork, 2012-14

Community wise, 32.4% of the Bengali Hindus believed that there should be equal preference to livelihood access over wildlife concerns, 26.5% (n=9) felt that the sanctuaries should be exclusively for wildlife conservation, 23.5% households felt that livelihood should dominate wildlife concerns and the rest felt that there should be some access to livelihood, though wildlife should take precedence. Among the Bengali Muslims, 43.9% (n=151) believed there should be equity in livelihood and wildlife concerns, 28.8% believed livelihood should have preference over wildlife concerns, 11.3% (n=39) felt wildlife should dominate livelihood issues, 8.4% (n=29) felt the PAs should be exclusively for wildlife while 7.6% (n=26) opined that the LBWLS should be meant only for livelihood of the fringe dwellers. Further, 51.3% (n=20) of the Nepali households felt that there should be equity between livelihood and wildlife concerns, 33.3% (n=13) felt livelihood issues should predominate wildlife and 15.4% (n=6) felt wildlife concerns should dominate, though livelihood access should be allowed to certain extent. Among the Bodo households, 50% (n=20) felt that there should be equity between livelihood and wildlife conservation issues,

35% (n=14) believed livelihood should have preference over wildlife concerns, 10% (n=4) opined wildlife should predominate livelihood issues and 5% (n=2) felt that the sanctuaries should be only for livelihood. Finally, 50% (n=3) Bihari households opined that there should be equal preference to livelihood access over wildlife concerns, 33.3% believed wildlife should dominate livelihood concerns and 16.7% (n=1) said livelihood issues of the fringe dwellers should take precedence over wildlife conservation issues (Figure 3.14).

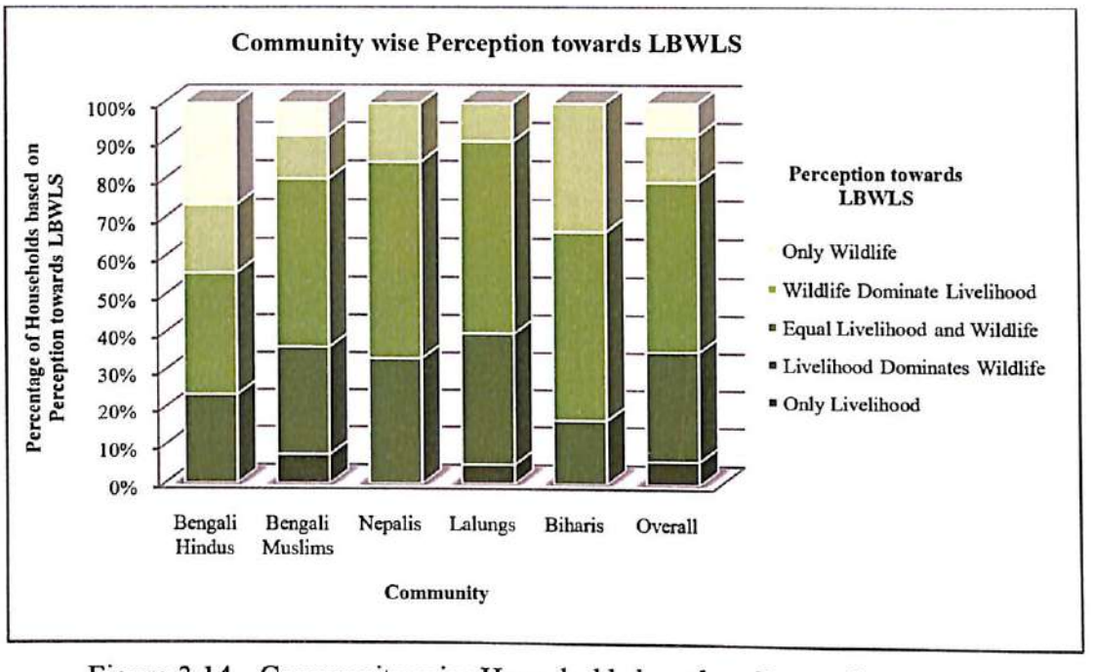

Figure 3.14 - Community wise Households based on Perception towards Laokhowa and Burhachapori WLSs, 2012-14

Source: Fieldwork, 2012-14

CHAPTER 4

DEGREE OF FOREST RESOURCE EXTRACTION FROM LBWLS BY THE FRINGE DWELLERS

In order to understand the issues of dependency and plan for alternative PA management strategies, it becomes incumbent to study the operational human activities and biotic pressures and examine their trends of change. Both Laokhowa and Burhachapori have been subjected to various degrees of anthropogenic interferences throughout their history. Biotic pressure in the form of cattle grazing, along with activities such as felling of trees, lopping of branches, collection of non-timber resources such as thatch, fruits, simul cotton pods etc. seems to have all left their characteristic imprints on the ecology of the two PAs.

4.1 Livestock Grazing

The grasslands of both Laokhowa and Burhachapori have been subjected to heavy grazing pressure arising out of the presence of a large cattle population both inside and outside the two PAs. The cattle tend to enter the two sanctuaries through almost all the sides. In all, 64 locations were identified as regular entry points for cattle in to the LBWLS (Figure 4.1). In LWLS, there are 44 locations of cattle entry and the major entry points are all along the flood control (E&D) embankment that runs through its southern boundary. In BWLS, there are 20 major entry points located mostly along its eastern and western fringes. A few entry points are located along the northern boundary of BWLS and cattle from the nearby-inhabited river islands like Lanke *tapu* and Sandhya *tapu* enter the PA for grazing. Apart from the cattle from the fringe villages, the cattle of the traditional cattle stations, locally known as *khuttis* that existed inside BWLS until 2010. Though these khuttis have been relocated outside BWLS by the NWLD since 2010, most of the cattle of these khuttis still graze inside the two sanctuaries.

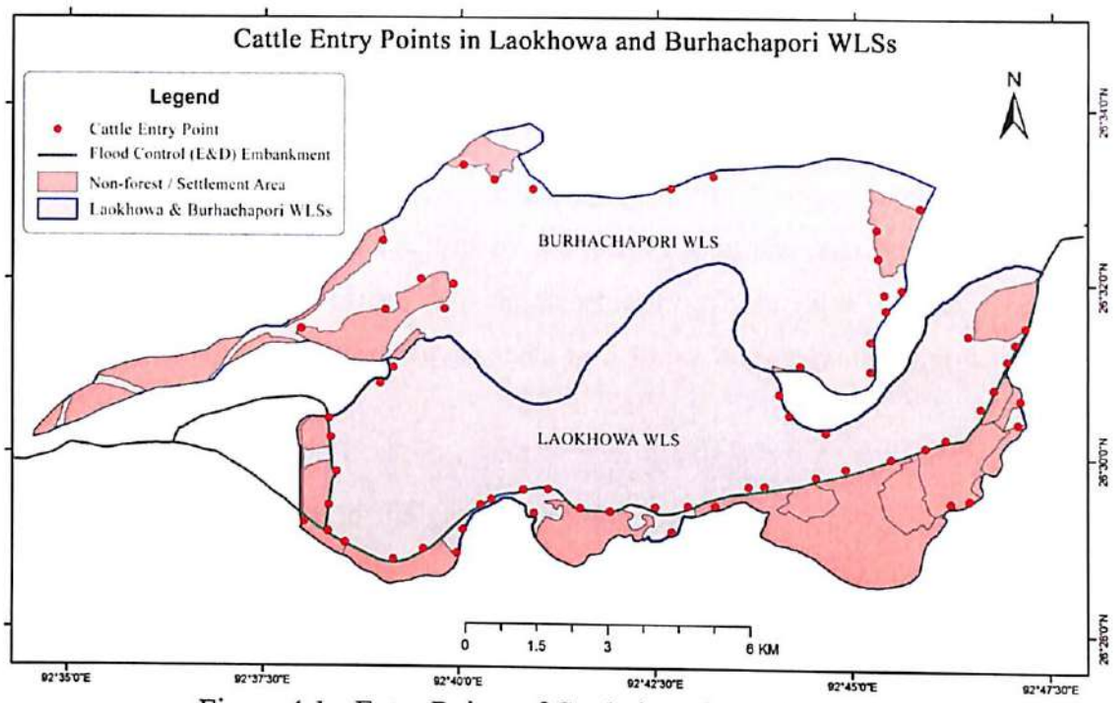

Figure 4.1 - Entry Points of Cattle into the LBWLS Complex

Source: Fieldwork, 2012, 2013 & 2014

The cattle feed mostly on a variety of grass species dominated by the Poaceae family. Overall, eight major grass species have been identified from the sample plots on the line transects and they comprised of 96.66% of the cattle fodder (Table 4.1).

Table 4.1 - Major Livestock Fodder in Laokhowa and Burhachapori WLSs (2012 - 2015)

Sl.	Scientific Name	Family	Local Name	Occurrence (%)	Habitat
1	*Imperata cylindrica*	Poaceae	*Ulu kher*	50.73	Terrestrial
2	*Cynodon dactylon*	Poaceae	*Dubori bon*	13.48	Terrestrial
3	*Hemarthria compressa*	Poaceae	*Locosa ghah*	8.32	Terrestrial
4	*Saccharum spontaneum*	Poaceae	*Kahua*	7.61	Terrestrial
5	*Saccharum ravannae*	Poaceae	*Ekora*	6.96	Terrestrial
6	*Vetiveria zizanioides*	Poaceae	*Birina*	4.88	Terrestrial
7	*Phragmites karka*	Poaceae	*Khagori*	2.23	Terrestrial
8	*Arundo donax*	Poaceae	*Nal*	2.45	Aquatic
9	*Axonopus compressus*	Poaceae	*Shukla Ghah*	2.01	Terrestrial

Source: Fieldwork, 2012- 2015

The cattle graze inside the sanctuaries throughout the year, except during high floods. During the summer months, they start entering the sanctuaries between 7 am to around 8.30 am. During the winters, they enter the PAs between 7.30 to 9 am. Until 2011, the cattle used to be accompanied by herders, usually comprising of 2 to 5 young boys. The entry of such herders has been regulated since 2011 by the forest department and a majority of the cattle herds now enter unaccompanied into the sanctuaries. These cattle remain inside the PAs throughout the day and start to exit around 5 to 6.30 pm during summers and around 3.30 to 5.30 pm during winters.

Significant decline in the population of grazing livestock was observed in BWLS between 2011 and 2013. During 2011, 16,548 individual livestock (11,899 cows and 4,649 buffaloes) were counted along the 20 line transects in both the PAs. Of this, 4,915 cattle were observed in LWLS (4,594 cows and 321 buffaloes) while in BWLS, 11,633 cattle were observed (7,305 cows and 4,328 buffaloes) (Figure 4.2 and 4.3). Overall, 8,116 signs of grazing were observed in the sample plots of the line transects in LWLS while 6,525 signs were observed in BWLS. The higher number of grazing signs in spite of lower number of cattle indicates that the grazing cattle were spatially more widely dispersed in LWLS than compared to BWLS (Figure 4.2 and 4.4). Maximum cattle in BWLS were observed in and around regions like Siyali, Lathimari, Basabari, Baghmari and Jhaoni in 2011 since almost all the *khuttis* used to be located in these areas until 2010. High concentration of grazing cattle was observed throughout LWLS, except for a few core locations such as Lathimari and Palashtoli areas.

In 2012, the number of observed cattle in LBWLS decreased to 13,788 (10,865 cows and 2,923 buffaloes). Since the removal of the *khuttis* from inside BWLS in 2010, the number of livestock in the sanctuary was found to have decreased considerably. From 11,633 cattle in 2011 in BWLS, number decreased to 8,479 in 2011 (6,224 cows and 2,525 buffaloes). Maximum decrease was observed in of Block 2 (1,133 cattle) and Block 3 (1,031 cattle) of BWLS. However, some increase was recorded in Block 4 of BWLS, the reason being most of the khuttis which were removed from BWLS were relocated near the Siyali region outside the boundary of BWLS and the cattle of these khuttis kept entering the PA boundary for grazing. LWLS, however, recorded a marginal increase in the cattle number at 5,039 (4,641 cows and 398 buffaloes) in 2012 than compared to 2011 (Figure 4.2 and 4.3). Marked decrease in signs of grazing along the line transects was recorded in both the sanctuaries during 2012 (7016 in

LWLS and 5767 in BWLS). Block 2 of BWLS recorded a significant decrease, from 1,655 signs to 499 grazing signs. Blocks 1 and 3 too recorded some decrease, while Block 4 of BWLS recorded an increase of 938 signs. The decrease of grazing signs in Block 6 of LWLS may be attributed to the award of land rights to the forest villagers and subsequent use of the land for cultivation, thereby preventing grazing. Apart from Block 6, other blocks of LWLS which recorded decrease in grazing signs than as compared to 2011 are Blocks 1, 2, 3 and 4 while Block 5, the westernmost block, recorded a slight increase (Figure 4.3 and 4.4).

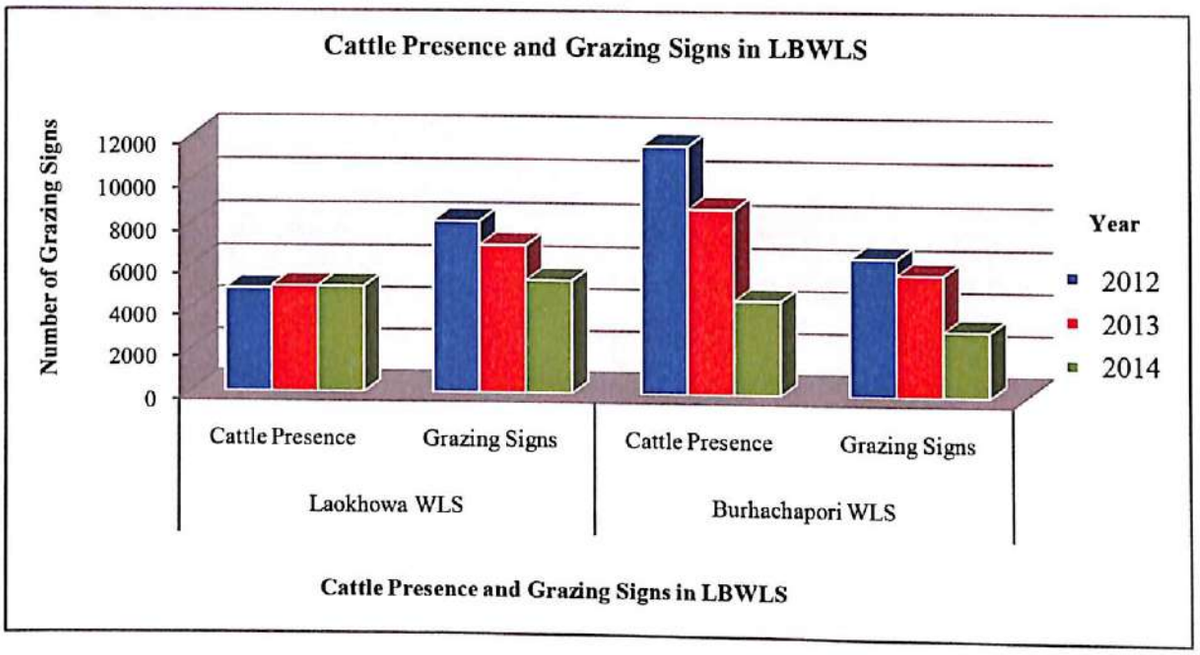

Figure 4.2 - Cattle Presence and Grazing Signs in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)

Source: Fieldwork

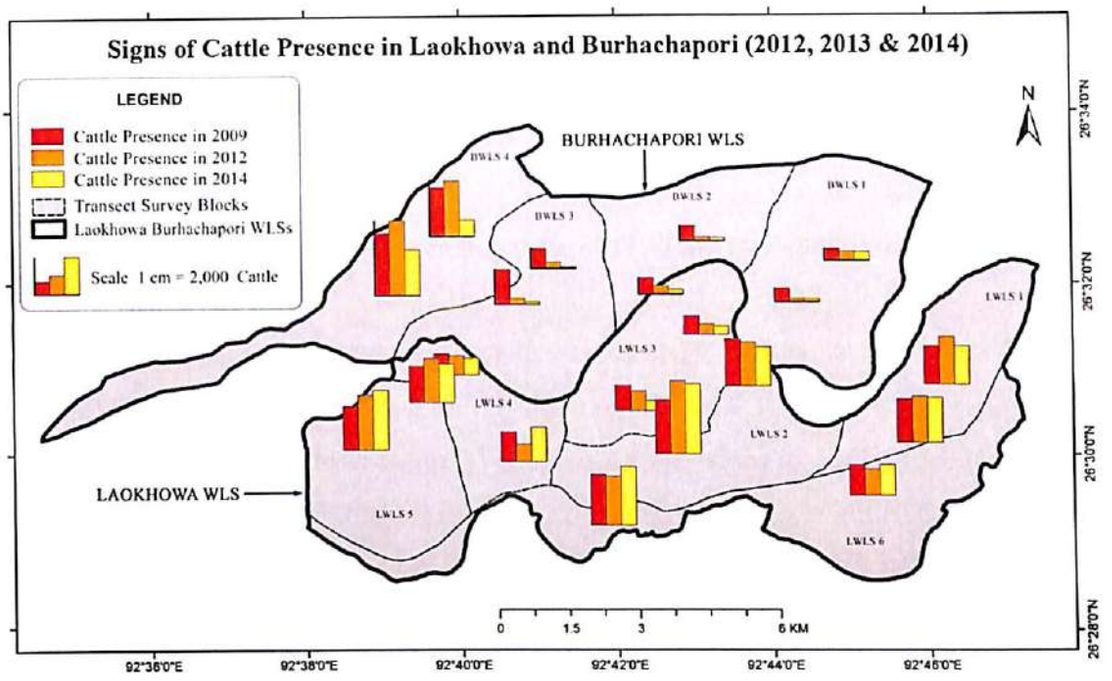

Figure 4.3 - Cattle presence in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)

Source: Fieldwork

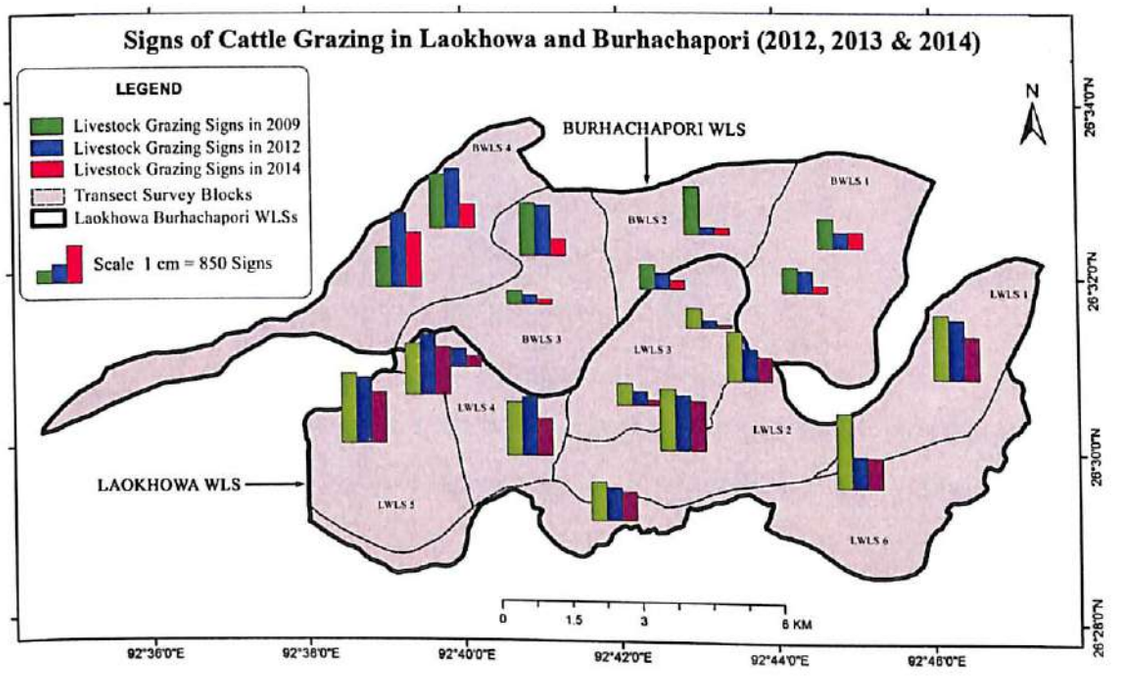

Figure 4.4 - Grazing Signs in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)

Source: Fieldwork

During 2013, the total number of livestock grazing inside the LBWLS decreased further to 9,491 cattle (7,649 cows and 1,842 buffaloes). Of this, 4,466 cattle (3,069 cows and 1,397 buffaloes) were observed in BWLS while 5,025 cattle (4,603 cows and 422 buffaloes) were observed in LWLS. Block 4 of BWLS recorded a significant decrease of 3,610 cattle population during 2013 than as compared to 2011. This was mainly due to the restrictions imposed on the entry of cattle of the relocated *khuttis* near Siyali into the sanctuary. In LWLS, marked decrease in cattle presence was recorded in Blocks 1, 2 3 and 4 while some increase was recorded in Blocks 5 and 6 (Figures 4.2 and 4.3). Signs of grazing, on the other hand, showed an overall decrease in BWLS, from 5,767 signs in 2011 to 3,092 signs in 2013. Between 2012 and 2013, the signs of grazing recorded along transects showed marked decrease from 7,016 signs in 2012 to 5,362 signs in 2013 in LWLS. This indicate a concentration of grazing activities of the cattle within confined grassland patches, instead of the dispersed trend of grazing as was evident earlier in the sanctuary (Figure 4.2 and 4.4).

4.2 Felling, Lopping of Trees and Collection of Firewood

The number of signs of freshly felled trees encountered on line transects walks during 2011 stood at 105 collectively in both the sanctuaries. Of this, 71 were recorded in LWLS and 34 in BWLS. Highest number of signs was observed in Blocks 1 and 2 of BWLS and in Blocks 2 and 4 of LWLS (Figures 4.5 and 4.6). The major trees felled comprised mainly of *Bombax ceiba* (*Simul*), *Albizia procera* (*Koroi*) and *Trezvia nudiflora* (*Bhelkor*). Incidents of tree felling increased during the onset of the monsoon season and whenever rainfall occurs for a few days consecutively. This enables the tree fellers to tie the logs behind a couple of large male buffaloes and then they are dragged along the wet, slippery floor forest floor. A number of signs of logs of felled trees being dragged out of the PAs were encountered during field work and almost all of these signs were traced to the Kaliadinga village in the southern boundary of LWLS and a few to Bhogamukh No. 7 village in the eastern fringe of both LWLS and BWLS. The overall problem of tree felling decreased considerably during 2012. In all, 11 such signs were recorded in both the PAs (5 in LWLS and 6 in BWLS). Significantly, no signs of tree felling were recorded during 2013 in both LWLS and BWLS (Figures 4.5 and 4.6).

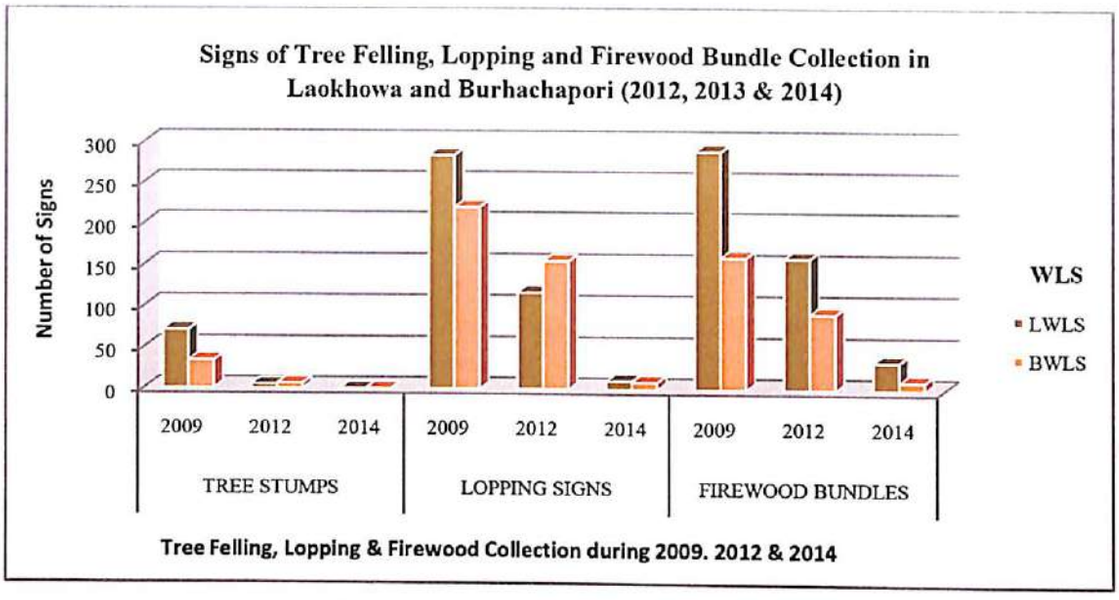

Figure 4.5 - Signs of Tree Felling, Lopping and Firewood Bundles in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)

Source: Fieldwork

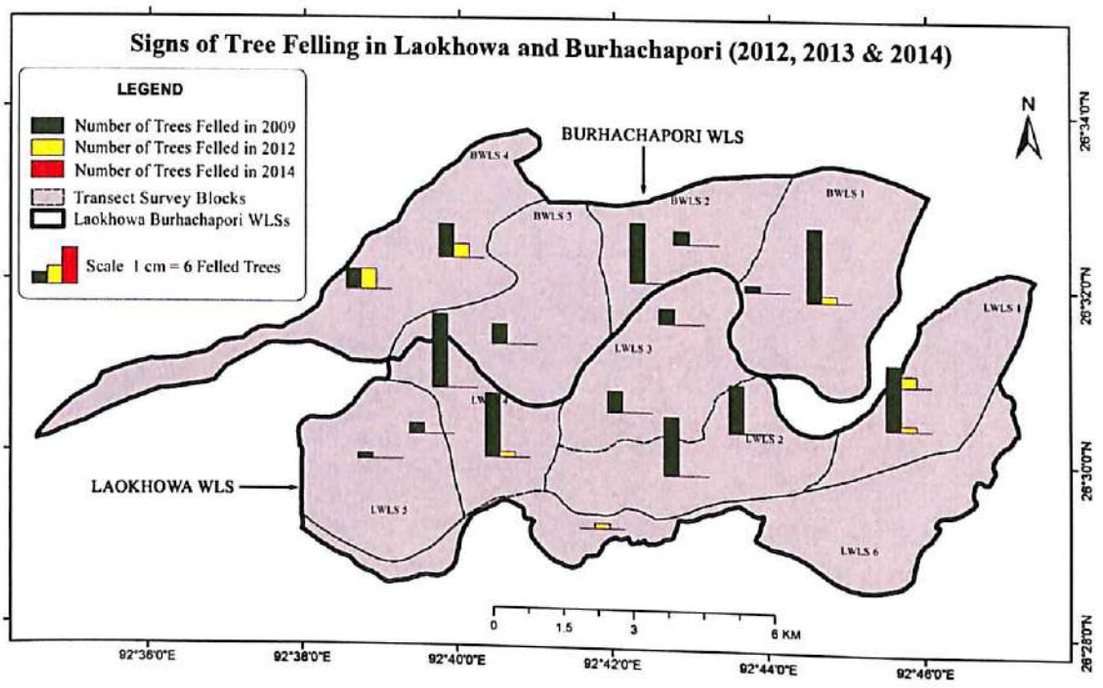

Figure 4.6 - Signs of felling of trees on block wise transects in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)

Source: Fieldwork

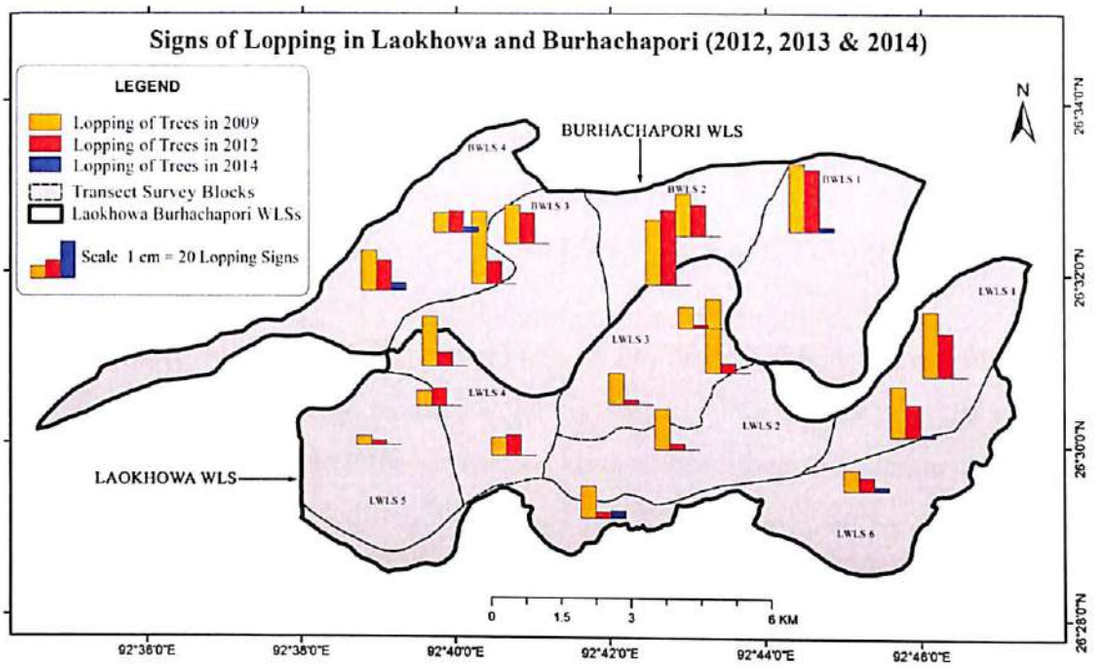

Figure 4.7 - Signs of Lopping in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)

Source: Fieldwork

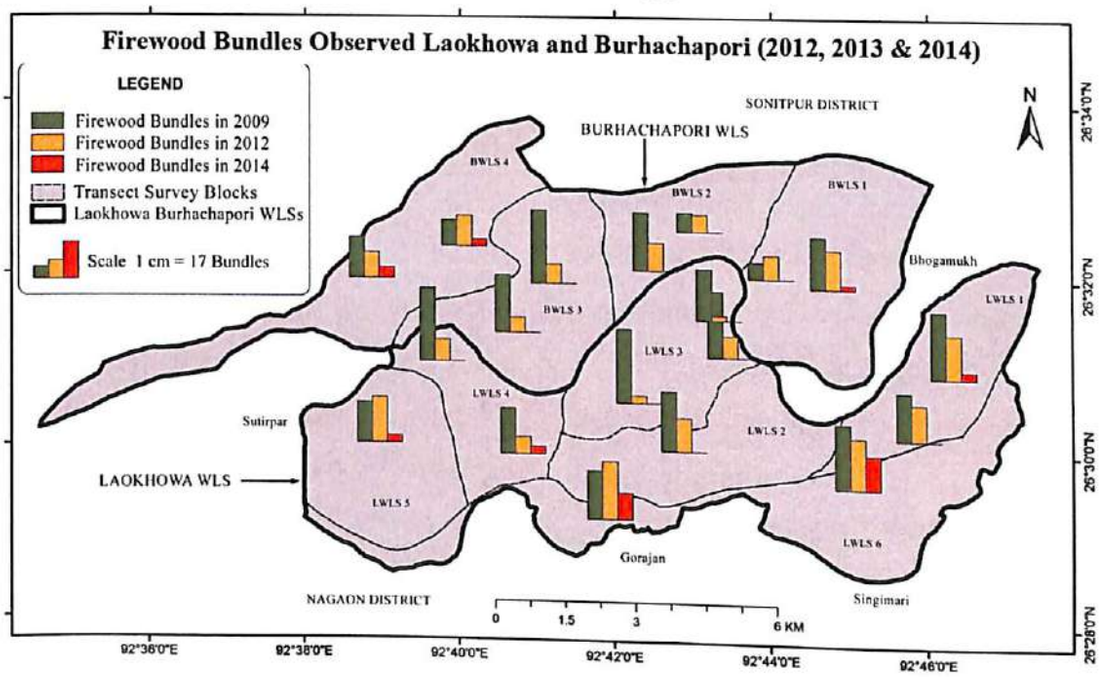

Figure 4.8 - Bundles of Firewood in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)

Source: Fieldwork

Loping of trees in LBWLS is done mainly for the purpose of firewood collection. During 2011, signs of lopping of branches on transects were observed in 504 trees in both PAs (284 in LWLS and 220 in BWLS). There was an overall decrease in incidences of lopping during 2012, which went down to 272 signs (117 in LWLS and 155 in BWLS). Only 19 such signs were observed during 2013 (10 in LWLS and 9 in BWLS) (Figure 4.5 and 4.7).

The lopped branches of the trees along with dry branches, which break off naturally, are gathered and tied into large bundles weighing 50 to 150 kg. Apart from the men flock, women and children also carry the smaller bundles as head load. The larger bundles were usually transported using modified bicycles. During 2011, 449 firewood bundles were observed during transect walks (289 in LWLS and 160 in BWLS). This number went down to 251 in 2012 (159 in LWLS and 92 in BWLS). In 2013, only 44 firewood bundles were observed during transect walks (34 in LWLS and 10 in BWLS) (Figures 4.7 and 4.8).

4.3 Thatch Cutting and Collection

There were a number of thatch *mahals* in both LWLS and BWLS before their declaration as WLSs, which ceased operation after their declaration as PAs. Nevertheless, illegal collection of thatch from the grasslands of LBWLS has remained a widespread problem. *Imperata cylindrica* (*Ulu kher*) is the dominant grass species collected from the sanctuaries followed by other species such as *Saccharum ravannae* (*Ekora*), *Saccharum spontaneum* (*Kahua*) and *Vetiveria zizanioides* (*Birina*). The thatch is cut, tied into bundles and mostly transported as head load. On an average, the weight of each bundle of thatch consisting of predominantly *Imperata* and *Saccharum* grasses is between 25 to 70 kg. The larger bundles were carried by two or more persons and sometimes, modified bicycles were used for transporting them out of the sanctuaries. In the Siyali and Lathimari region of BWLS, evidence regarding the use of horse drawn carts and bullock carts for transport of the thatch bundles was observed during 2011 and 2012 (Figure 4.9).

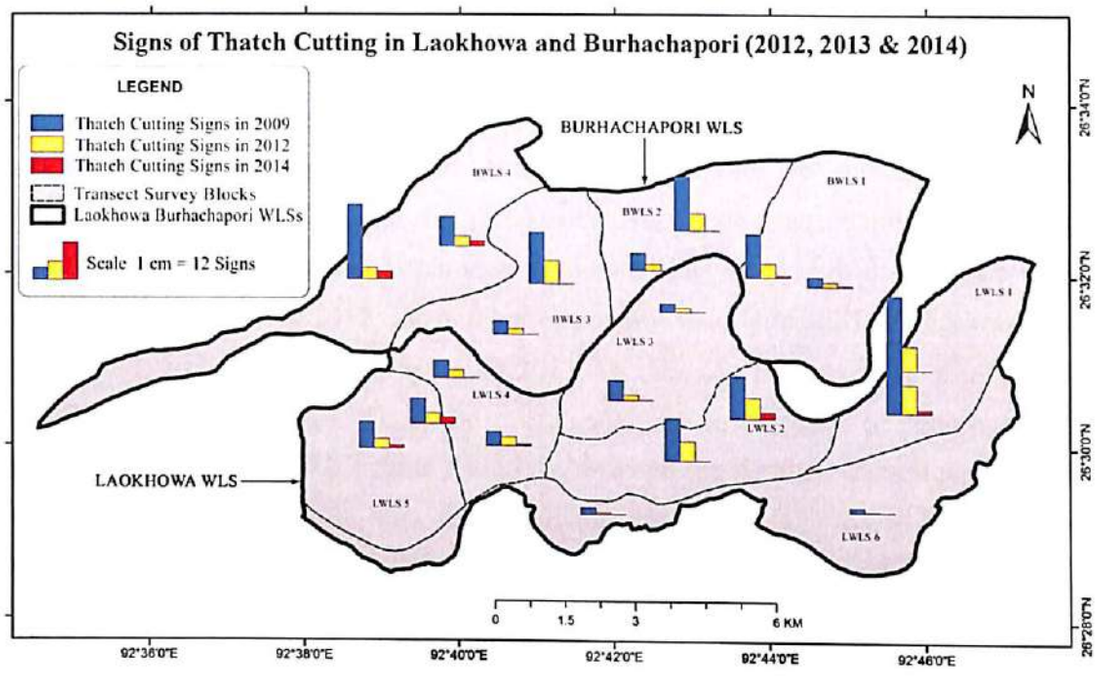

Figure 4.9 - Thatch Cutting in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)
Source: Fieldwork

In 2011, overall, 694 signs (364 in LWLS and 330 in BWLS) of thatch cutting and sightings of thatch bundles were recorded on the transects. Maximum signs were recorded from transects of Blocks 1, 2 and 3 of BWLS while Blocks 1 of LWLS recorded significant number of signs of thatch cutting and collection during 2011. During 2012, the signs of thatch collection decreased to 248 observations (145 in LWLS and 103 in BWLS), all transects and blocks recorded significant fall in terms of the signs. In 2013, the overall number decreased further to 42 signs (24 in LWLS and 18 in BWLS). Though Block 6 of LWLS has recorded significantly low signs of thatch collection, it may be attributed to the fact that the entire region bears the imprint of either human settlement or agricultural land use and is therefore devoid of natural grasslands (Figure 4.9).

4.4 Fishing

Prior to declaration as WLSs, there used to be 21 fish mahals in the LBWLS (11 in LWLS and 10 in BWLS). The operation of these mahals was ceased following the grant of WLS status. Nonetheless, it was seen during the surveys that fishing is widespread in almost all the wetlands of the two PAs. In all, 21 major fishing sites were identified in the LBWLS complex. Of this, 7 sites were in BWLS, including the Brahmaputra River stream which

flows through the northern part of the sanctuary. The rest of the 14 sites were distributed in LWLS. During 2011, fishing was detected in all the 21 sites. During the 2011 survey period, total number of engaged in fishing as observed in the LBWLS was 783 persons, of which 592 were in LWLS and 191 in BWLS. Except for core sites 16 and 17 in Palashtoli and Lathimari, very high fishing disturbance was observed in all other fishing sites in LWLS. The sites in BWLS, including the Brahmaputra channel had very high disturbance in terms of fishing activities. During 2012, the number of persons fishing inside LBWLS was recorded at 832 persons, which was an increase from 2011. Of this, 656 persons were observed in LWLS and 176 persons in BWLS. Thus, the overall increase in presence of persons indulging in fishing activities during 2012 came from LWLS while the number of such persons decreased in BWLS. Similar to 2011, high fishing disturbance was observed in all fishing sites of LBWLS. In 2013, however, the number of persons fishing inside LBWLS decreased considerably to 311 persons of which, 254 persons were in LWLS and 57 persons were observed in BWLS. No persons engaged in fishing were observed in fishing sties number 2, 3 and 4 of BWLS and 16 and 17 of LWLS (Figure 4.10).

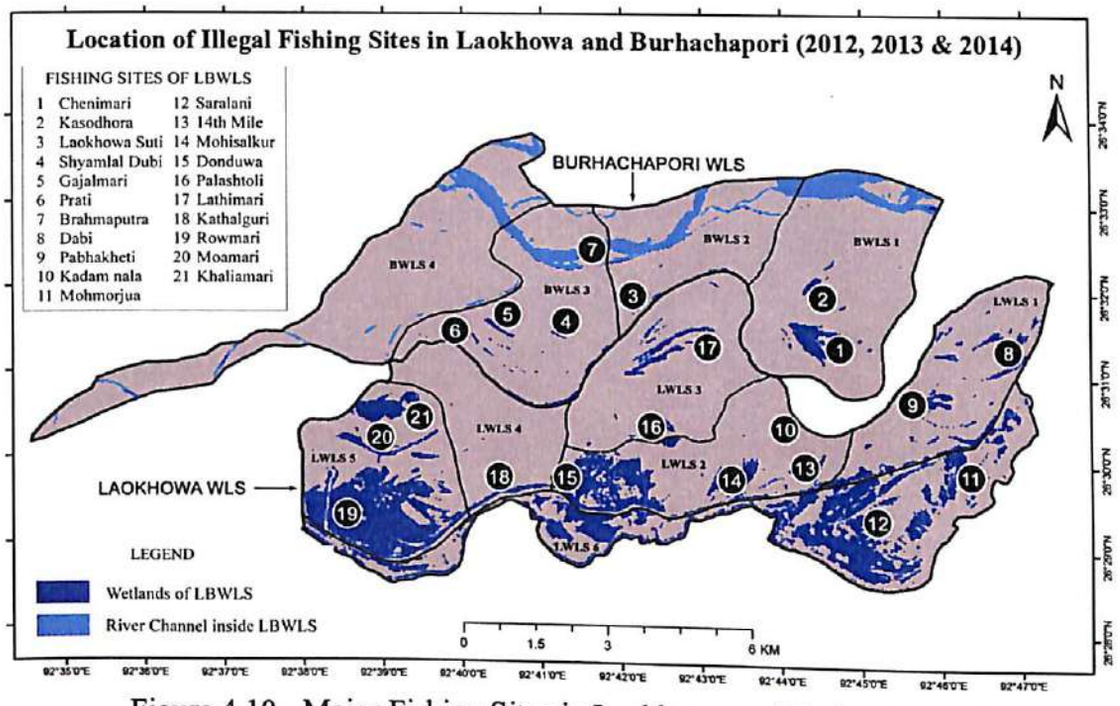

Figure 4.10 - Major Fishing Sites in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)

Source: Fieldwork

4.5 Presence of Human Beings

Inflow of people inside LBWLS with the intention of illegal extraction of forest resources has been a perennial problem. Apart from the purpose of resource extraction, a number of persons used to stay inside BWLS in the *khuttis*. During 2011, 1,466 persons were observed inside LBWLS during the transect surveys, of which, 1002 were recorded in LWLS while 464, were in BWLS. Of the 464 persons in BWLS, 36 were dwellers in temporary accommodations in the *khuttis*. In 2012, the overall observed number of persons in LBWLS decreased somewhat to 1,209 (876 in LWLS and 333 in BWLS). No khutti dwellers were seen in BWLS in 2012, due to the removal of the khuttis from BWLS in 2010. In 2013, the presence of 766 persons was recorded on transects, of which, 570 were in LWLS while 196 were in BWLS. In all the three survey years, the maximum number of persons was recorded in Block 4 of BWLS and in Block 6 of LWLS. Both these blocks suffer from extensive encroachment and other forms of anthropogenic interferences like agriculture (Figure 4.11).

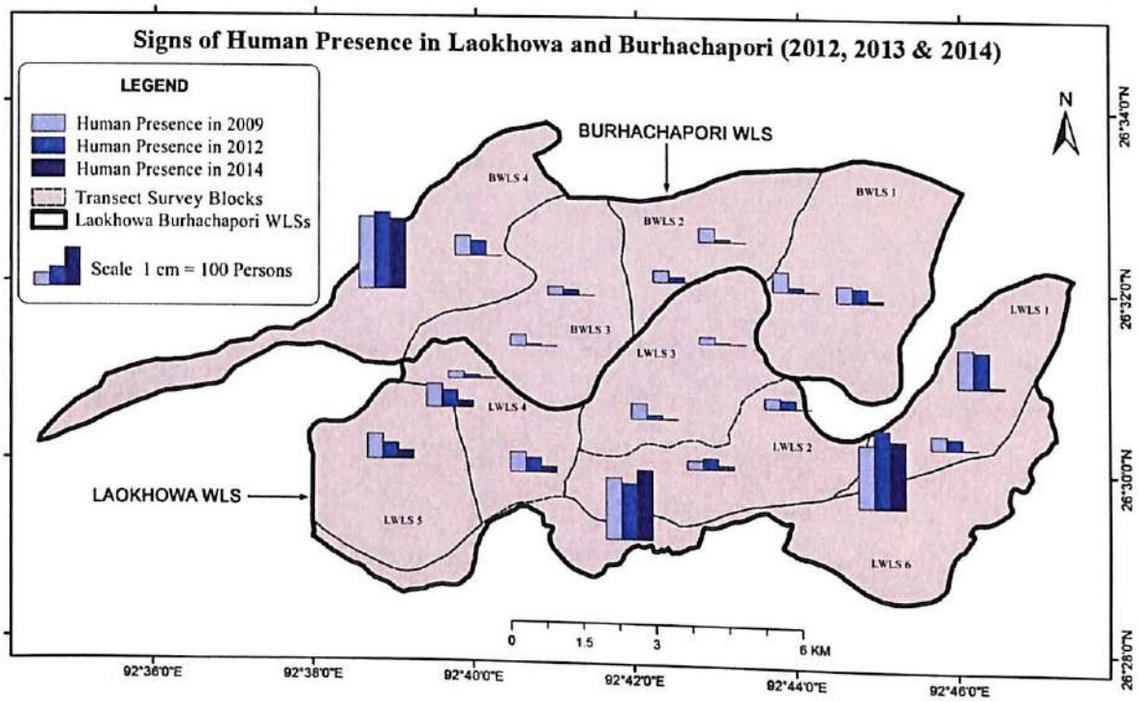

Figure 4.11 - Human Presence in Laokhowa and Burhachapori WLSs (2012, 2013 and 2014)
Source: Fieldwork

CHAPTER 5

NATURE & DRIVERS OF DEPENDENCE

5.1 Nature of Dependence

The major activities pertaining to forest resource dependency and illegal resource extraction by the households surveyed can be summarized into the broad categories of livestock rearing and forest resource extraction. Rearing of grazing livestock, especially cows and buffaloes, among the fringe villages of LBWLS was of two types *viz.* those keeping their cattle in the cattle shed of their own households and those keeping their cattle in designated cattle stations, called *khuttis*. Number of cattle and their grazing areas, among others, were also a major factor of dependence on LBWLS. On the other hand, the extraction of forest resources from LBWLS was found to be mostly involving fishing, firewood collection and thatch collection.

5.2.1 Livestock Rearing

Among the households surveyed, 82.9% (n=384) owned livestock. Of this, 40.6% (n=188) households owned less than 25 livestock while 6% (n=28) households owned more than 100 livestock (Table 5.1). Among the villages, more than 90% of the households of Sisuati-Jhaoni (100%, n=20), Dhania (94.7%, n=18), Pachim Salpara (92.4%, n=61), No 6 Bhogamukh (91.7%, n=22), Kaliadinga Pam (91.1%, n=51) and No 7 Bhogamukh (91.1%, n=41) were livestock owners. Further, 31.6% (n=6) households of Dhania and 30% (n=6) households of Sisuati-Jhaoni owned more than 100 livestock. The ownership of cattle was comparatively less in Singimari-Salpara and Haldhiasuti at 30% (n=6) and 25% (n=5) respectively (Table 5.1).

Table 5.1 - Village wise Households based on Ownership of Livestock, 2012-14

Village	No Livestock	Category of Livestock Ownership				
		Below 25	25 to 50	50 to 75	75 to 100	Above 100
Kaliadinga Pam	8.9% (5)	57.1% (32)	26.8% (15)	1.8% (1)	1.8% (1)	3.6% (2)
Pub Futaljar	19.2% (25)	45.4% (59)	24.6% (32)	7.7% (10)	.0% (0)	3.1% (4)
Pachim Salpara	7.6% (5)	60.6% (40)	30.3% (20)	.0% (0)	.0% (0)	1.5% (1)
Singimari-Salpara	70.0% (14)	30.0% (6)	.0% (0)	.0% (0)	.0% (0)	.0% (0)
Haldhiasuti	75.0% (15)	25.0% (5)	.0% (0)	.0% (0)	.0% (0)	.0% (0)
Chitolmari Pathar	12.7% (8)	25.4% (16)	54.0% (34)	3.2% (2)	.0% (0)	4.8% (3)
No. 7 Bhogamukh	8.9% (4)	40.0% (18)	35.6% (16)	8.9% (4)	.0% (0)	6.7% (3)
No 6 Bhogamukh	8.3% (2)	29.2% (7)	25.0% (6)	25.0% (6)	.0% (0)	12.5% (3)
Dhania	5.3% 91)	21.1% (4)	.0% (0)	42.1% (8)	.0% (0)	31.6% (6)
Sisuati Jhaoni	.0% (0)	5.0% (1)	15.0% (3)	50.0% (10)	.0% (0)	30.0% (6)
Overall	17.1% (79)	40.6% (188)	27.2% (126)	8.9% (41)	.2% (1)	6.0% (28)

Source: Fieldwork, 2012-14. Figures in Parenthesis indicate Number of Households

Subsistence and Commercial Livestock Rearing

Livestock rearing as a subsistence activity was practiced by 28.3% (n=131) of the households while 54.6% (n=253) households reared livestock for commercial purpose. Village wise, households practicing subsistence livestock rearing were found in all villages except Dhania and Sisuati-Jhaoni. On the other hand, the households of Singimari-Salpara, which owned livestock, only practiced subsistence livestock rearing. The highest percentage of households practicing subsistence livestock rearing was in Chitolmari Pathar at 46% (n=29) households, followed by No 7 Bhogamukh at 37.8% (n=17) households and Pachim Salpara at 30.3% (n=10), among others (Table 5.2).

Maximum households practicing commercial livestock rearing were observed in Sisuati-Jhaoni village at 100% (n=20) households followed by Dhania at 94.7% (n=18) households. Further, 70.8% (n=17) households of No 6 Bhogamukh village practiced commercial livestock rearing followed by Kaliadinga Pam at 66.1% (n=41), Pachim Salpara at 62.1% (n=41), Pub Futaljhar at 53.1% (n=69), No 7 Bhogamukh at 53.3% (n=24) and finally Chitolmari Pathar at 44% (n=22) households. Only 5% (n=1) households from Haldhiasuti reared livestock for commercial purposes (Table 5.2).

Table 5.2 - Village wise Households based on Subsistence and Commercial of Livestock Ownership, 2012-14

Village	No Livestock	Households with Livestock	
		Subsistence	Commercial
Kaliadinga Pam	8.9% (5)	25.0% (14)	66.1% (37)
Pub Futaljar	19.2% (25)	27.7% (36)	53.1 (69)
Pachim Salpara	7.6% (5)	30.3% (20)	62.1 (41)
Singimari-Salpara FV	70.0% (14)	30.0% (6)	0% (0)
Haldhiasuti FV	75.0% (15)	20.0% (4)	5% (1)
Chitolmari Pathar	12.7% (8)	46.0% (29)	41.3% (26)
No. 7 Bhogamukh	8.9% (4)	37.8% (17)	53.3% (24)
No 6 Bhogamukh	8.3% (2)	20.8% (5)	70.8% (17)
Dhania	5.3% (1)	.0% (0)	94.7% (18)
Sisuati Jhaoni	.0% (0)	.0% (0)	100% (20)
Overall	**17.1% (79)**	**28.3% (131)**	**54.6% (253)**

Source: Fieldwork, 2012-14. Figures in Parenthesis indicate Number of Households

4.2.1.3 Livestock Grazing Area

In all, 69.1% (n=320) of the households owning livestock grazed their cattle inside LBWLS while 11.2% (n=52) households grazed them outside the PAs. Only 2.5% (n=12) households practiced stall-feeding of their livestock. Further, 95.7% (n=180) households owning below 25 livestock, 86.5% (n=109) of the households owning 25 to 50 livestock and 75.6% (n=31) of the households owning 50 to 75 livestock depended on the two PAs for grazing their cattle. Households owning more than 75 livestock, comprising mostly of the khutti owners, grazed their cattle outside the PAs (Table 5.3)

Table 5.3 - Livestock Grazing Area for Households, 2012-14

Category of Livestock Ownership	No Livestock	Grazing area for Livestock		
		Inside WLSs	Outside WLSs	Stall Fed
No Livestock	17.1% (79)	-	-	-
Below 25	-	95.7% (180)	3.2% (6)	1.1% (2)
25 to 50	-	86.5% (109)	5.6% (7)	7.9% (10)
50 to 75	-	75.6% (31)	24.4% (10)	.0% (0)
75 to 100	-	.0% (0)	100% (1)	.0% (0)
Above 100	-	.0% (0)	100% (28)	.0% (0)
Overall	**17.1% (79)**	**69.1% (320)**	**11.2% (52)**	**2.6% (12)**

Source: Fieldwork, 2012-14. Figures in Parenthesis indicate Number of Households

Village wise, 90.9% (n=60) households of Pachim Salpara, 84.4% (n=38) of No 7 Bhogamukh, 83.9% (n=47) of Kaliadinga Pam, 79.2% (n=19) of No 7 Bhogamukh and 75.4% (n=98) households of Pub Futaljar depended on the sanctuaries in terms of livestock grazing. On the other hand, 55% (n=11) of the households of Sisuati-Jhaoni, 47.4% (n=9) households of Dhania and 42.9% (n=27) of Chitolmari Pathar, among others, grazed their cattle outside the PAs. Stall-feeding, confined only to Chitolmari Pathar, was practiced only in 19% (n=12) of the overall surveyed households (Table 5.4).

Table 5.4 - Village wise Households based on Livestock Grazing Area, 2012-14

Village	No Livestock	Grazing Area for Livestock		
		Inside WLSs	Outside WLSs	Stall Fed
Kaliadinga Pam	8.9% (5)	83.9% (47)	7.1% (4)	.0% (0)
Pub Futaljar	19.2% (25)	75.4% (98)	5.4% (7)	.0% (0)
Pachim Salpara	7.6% (5)	90.9% (60)	1.5% (1)	.0% (0)
Singimari-Salpara	70.0% (14)	30.0% (6)	.0% (0)	.0% (0)
Haldhiasuti	75.0% (15)	25.0% (5)	.0% (0)	.0% (0)
Chitolmari Pathar	12.7% (8)	42.9% (27)	25.4% (16)	19.0% (12)
No. 7 Bhogamukh	8.9% (4)	84.4% (38)	6.7% (3)	.0% (0)
No 6 Bhogamukh	8.3% (2)	79.2% (19)	12.5% (3)	.0% (0)
Dhania	5.3% (1)	47.4% (9)	47.4% (9)	.0% (0)
Sisuati Jhaoni	.0% (0)	55.0% (11)	45.0% (9)	.0% (0)
Overall	**17.1% (79)**	**69.1% (320)**	**11.2% (52)**	**2.6% (12)**

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

Table 5.5 - Livestock Grazing Area based on the nature of cattle ownership, 2012-14

Subsistence / Commercial Livestock Rearing	No Livestock	Grazing Area for Livestock		
		Inside WLSs	Outside WLSs	Stall Fed
No Livestock	17.1% (79)	-	-	-
Subsistence	-	86.3% (113)	6.1% (8)	7.6% (10)
1 to 25%	-	92.5% (161)	6.3% (11)	1.1% (2)
26 to 50%	-	87.2% (41)	12.8% (6)	.0% (0)
51 to 75%	-	20.0% (2)	80.0% (8)	.0% (0)
Above 75%	-	13.6% (3)	86.4% (19)	.0% (0)
Overall	**17.1% (79)**	**69.1% (320)**	**11.2% (52)**	**2.6% (12)**

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

Among households owning livestock for subsistence purposes, 86.3% (n=113) depended on the PAs for grazing their cattle, while 6.1% (n=8) grazed them outside the PA

area and only 7.6% (n=10) stall-fed their cattle. On the other hand, 92.5% (n=161) households earning 1 to 25% of their annual income from livestock rearing and 87.2% (n=41) of those earning 26 to 50% of their annual income from livestock rearing, grazed their cattle inside the PAs. Further 13.6% (n=3) of those earning more than 75% of their annual income from livestock rearing, grazed them inside LBWLS. On the other hand, 86.4% (n=19) of households having share of earning above 75% from livestock grazed their cattle outside LBWLS (Table 5.5).

4.2.1.4 Income from Livestock

In terms of income from livestock, 4.8% (n=22) of the surveyed households responded that more than 75% of their average annual income came from livestock rearing. Further, 28.3% (n=174) households derived 1 to 25% of their average annual income from the livestock. Among the different categories of livestock ownership, 43.1% (n=81) households owning below 25 livestock, 55.6% (n=70) households with 25 to 50 cattle and 53.7% (n=22) households with 50 to 75 livestock, earned between 1 to 25% of their overall annual income from livestock rearing (Table 5.6).

Table 5.6 - Livestock Ownership among Households based on Income from Livestock Rearing, 2012-14

Category of Livestock Ownership	No Livestock	Subsistence Livestock Rearing	Contribution of Income from Livestock towards Overall Income through Commercial Livestock Rearing			
			1 to 25%	26 to 50%	51 to 75%	Above 75%
No Livestock	17.1%	-	-	-	-	-
Below 25	-	46.8% (88)	43.1% (81)	9.0% (17)	1.1% (2)	.0% (0)
25 to 50	-	29.4% (37)	55.6% (70)	14.3% (18)	.0% (0)	.8% (1)
50 to 75	-	14.6% (6)	53.7% (22)	17.1% (7)	2.4% (1)	12.2% (5)
75 to 100	-	.0% (0)	.0% (0)	100.0% (1)	.0% (0)	.0% (0)
Above 100	-	.0% (0)	3.6% (1)	14.3% (4)	25.0% (7)	57.1% (16)
Overall	**17.1%**	**28.3% (131)**	**37.6% (174)**	**10.2% (47)**	**2.2% (10)**	**4.8% (22)**

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

Village wise, 45% (n=9) households from Sisuati-Jhaoni and 31.6% (n=6) households from Dhania derived more than 75% of their annual earnings from livestock rearing. Villages like Kaliadinga Pam (58.9%, n=33), Pachim Salpara (51.5%, n=34), No 6 Bhogamukh (45.8%, n=11), Pub Futaljar (40%, n=52), Sisuati-Jhaoni (40%, n=8), Dhania (31.6%, n=6)

and No 7 Bhogamukh (31.1%, n=14), among others, earned less than 25% of their income from cattle (Table 5.7).

Table 5.7 - Village wise Livestock Ownership among Households based on Income from Livestock Rearing, 2012-14

Villages	No Livestock	Subsistence Livestock Rearing	Commercial Livestock Rearing			
			Contribution of Income from Cattle to the Overall Household Income			
			1 to 25%	26 to 50%	51 to 75%	Above 75%
Kaliadinga Pam	8.9% (5)	25.0% (14)	58.9% (33)	5.4% (3)	.0% (0)	1.8% (1)
Pub Futaljar	19.2% (25)	27.7% (36)	40.0% (52)	10.0% (13)	.8% (1)	2.3% (3)
Pachim Salpara	7.6% (5)	30.3% (20)	51.5% (34)	9.1% (6)	1.5% (1)	.0% (0)
Singimari-Salpara	70.0% (14)	30.0% (6)	.0% (0)	.0% (0)	.0% (0)	.0% (0)
Haldhiasuti	75.0% (15)	20.0% (4)	5.0% (1)	.0% (0)	.0% (0)	.0% (0)
Chitolmari Pathar	12.7% (8)	46.0% (29)	23.8% (15)	12.7% (8)	1.6% (1)	3.2% (2)
No. 7 Bhogamukh	8.9% (4)	37.8% (17)	31.1% (14)	15.6% (7)	6.7% (3)	.0% (0)
No 6 Bhogamukh	8.3% (2)	20.8% (5)	45.8% (11)	12.5% (3)	8.3% (2)	4.2% (1)
Dhania	5.3% (1)	.0% (0)	31.6% (6)	26.3% (5)	5.3% (1)	31.6% (6)
Sisuati Jhaoni	.0% (0)	.0% (0)	40.0% (8)	10.0% (2)	5.0% (1)	45.0% (9)
Overall	**17.1% (79)**	**28.3% (131)**	**37.6% (174)**	**10.2% (47)**	**2.2% (10)**	**4.8% (22)**

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

Dairying is the primary income source for 1.9% (n=9) of the total surveyed households and all of these households are confined to Dhania. Dairying is practiced exclusively by the Nepali community, comprising of 23.1% (n=9) households within the community. Dairying as an industry is practiced largely in a traditional form by these households. All the dairying units function from the households. Apart from milk, other dairy products from dairying include cream, *paneer*, *ghee*, *mawa* and curd. Almost all of these dairy products are sold in dairy shops of Tezpur town in Sonitpur district. In addition to milk and milk products, other income sources from livestock rearing included sale of cattle and buffaloes. The average rate of milk is Rs. 36.00 per liter; Rs. 280 per kg for cream; Rs. 350 per kg for paneer; Rs. 210.00 per kg for ghee; Rs. 200 per kg of mawa and Rs. 150 per kg of curd. There is an average increase of 20 to 25% in the cost of these products when made out of buffalo milk. The price for a healthy adult male buffalo is Rs. 15,000.00 and Rs. 25,000.00 for a milch buffalo. Male calves of cows are mostly sold off at prices ranging from Rs 4,000.00 to 8,000.00 depending on the health and age while a milch cow is priced at Rs 12,000 to Rs. 15,000.00.

4.2.2 Collection of Forest Resources

4.2.2.1 Forest Resource Collection and Perception

Overall, 72.8% (N=337) of the surveyed households were engaged in collection of forest resources from LBWLS. Among the villages, 92.4% (n=61) of the households from Pachim Salpara, 91.1% (n=51) households from Kaliadinga Pam, 80% (n=36) from No 7 Bhogamukh, 73.8% (n=96) from Pub Futaljar, 70.8% (n=17) from No 6 Bhogamukh and 70% (n=14) households from Haldhiasuti, among others, were engaged in collection of different types of resources from LBWLS. Further, it was seen that though a significant percentage of households were involved in collection of forest resources, yet a majority of the surveyed households (75.2%, n=348) was of the view that collection of forest resources is an illegal activity, the highest percentage of such households being from Dhania (89.5%, n=17). Among the villages, the maximum percent of households which felt that forest resource collection was legal, belonged to No 7 Bhogamukh at 37.8% (n=17) households (Table 5.8).

Table 5.8 - Village wise Households involved in Collection of Forest Resources and their Perception towards Forest Resource Collection, 2012-14

Villages	Households involved in Collection of Forest Resources		Perception towards Collection of Forest Resources	
	No	Yes	Legal	Illegal
Kaliadinga Pam	8.9% (5)	91.1% (51)	33.9% (19)	66.1% (37)
Pub Futaljar	26.2% (34)	73.8% (96)	23.1% (30)	76.9% (100)
Pachim Salpara	7.6% (5)	92.4% (61)	19.7% (13)	80.3% (53)
Singimari-Salpara	55.0% (11)	45.0% (9)	25.0% (5)	75.0% (15)
Haldhiasuti	30.0% (6)	70.0% (14)	20.0% (4)	80.0% (16)
Chitolmari Pathar	41.3% (26)	58.7% (37)	22.2% (14)	77.8% (49)
No. 7 Bhogamukh	20.0% (9)	80.0% (36)	37.8% (17)	62.2% (28)
No 6 Bhogamukh	29.2% (7)	70.8% (17)	29.2% (7)	70.8% (17)
Dhania	63.2% (12)	36.8% (7)	10.5% (2)	89.5% (17)
Sisuali Jhaoni	55.0% (11)	45.0% (9)	20.0% (4)	80.0% (16)
Overall	**27.2% (126)**	**72.8% (337)**	**24.8% (115)**	**75.2% (348)**

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

4.2.2.2 Fishing

Among the surveyed households, 52.5% (n=243) were engaged in fishing inside the two sanctuaries. Of this, 38.2% (n=177) households were fishing inside LBWLS for more

than 9 months a year, 12.3% (n=57) for 6 to 9 months and 1.9% (n=9) households for 3 to 6 months a year. Village wise, 87.5% (n=49) households of Kaliadinga Pam and 83.3% (n=55) households from Pachim Salpara were engaged in fishing inside the PAs, followed 58.5% (n=76) from Pub Futaljhar and 53.3% (n=24) households from No 7 Bhogamukh villages. None of the households of Dhania and Sisuati-Jhaoni villages was engaged in fishing (Table 5.9).

Table 5.9 - Village wise Households based on Subsistence and Commercial type of Fishing, 2012-14

Villages	No Forest Resource Collection	No Fishing	Cause for Fishing in the PAs		
			Subsistence	Both Commercial and Subsistence	Commercial
Kaliadinga Pam	8.9% (5)	3.6% (2)	48.2% (27)	.0% (0)	39.3% (22)
Pub Futaljar	26.2% (34)	15.4% (20)	30.8% (40)	13.8% (18)	13.8% (18)
Pachim Salpara	7.6% (5)	9.1% (6)	27.3% (18)	37.9% (25)	18.2% (12)
Singimari-Salpara FV	55.0% (11)	25.0% (5)	15.0% (3)	5.0% (1)	.0% (0)
Haldhiasuti FV	30.0% (6)	25.0% (5)	25.0% (5)	20.0% (4)	.0% (0)
Chitolmari Pathar	41.3% (26)	30.2% (19)	14.3% (9)	.0% (0)	14.3% (9)
No. 7 Bhogamukh	20.0% (9)	26.7% (12)	37.8% (17)	.0% (0)	15.6% (7)
No 6 Bhogamukh	29.2% (7)	37.5% (9)	25.0% (6)	.0% (0)	8.3% (2)
Dhania	63.2% (12)	36.8% (7)	.0% (0)	.0% (0)	.0% (0)
Sisuati Jhaoni	55.0% (11)	45.0% (9)	.0% (0)	.0% (0)	.0% (0)
Overall	**27.2% (126)**	**20.3% (94)**	**27.0% (125)**	**10.4% (48)**	**15.1% (70)**

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

Fishing inside LBWLS for subsistence purpose was practiced by 27% (n=125) of the surveyed households. Further 10.4% (n=48) households were involved both commercial and subsistence forms of fishing while 15.1% (n=70) households were engaged in purely commercial fishing activities in LBWLS. Among the villages, 48.2% (n=27) households of Kaliadinga Pam, 37.8% (n=17) from No 7 Bhogamukh and 30.8% (n=18) households from Pub Futaljar, among others, were engaged in subsistence fishing activities inside LBWLS. Further, 37.9% (n=25) households of Pachim Salpara, 20% (n=4) from Haldhiasuti, 13.8% (n=18) Pub Futaljar and 5% (n=1) from Singimari-Salpara villages were involved in both subsistence and commercial fishing. On the other hand, 39.3% (n=22) households of Kaliadinga Pam, 18.2% (n=12) of Pachim Salpara, 15.6% (n=7) of No 7 Bhogamukh, 14.3%

(n=9) of Chitolmari Pathar, 13.8% (n=12) of Pub Futaljar and 8.3% (n=2) households of No 6 Bhogamukh were engaged in commercial form of fishing (Table 5.9).

4.2.2.3 Firewood Collection

Of the total surveyed households, 34.6% (n=160) households were engaged in collection of firewood from the two PAs. Of this, 8% (n=37) households were engaged in firewood collection for 3 to 6 months, 25.7% (n=119) households for 6 to 9 months and 0.9% (n=4) households for more than 9 months a year. Village wise, maximum number of households involved in firewood extraction belonged to the Haldhiasuti TV at 45% (n=9) households followed by Chitolmari Pathar at 41.3% (n=26) households, Sisuati-Jhaoni at 40% (n=8), Kaliadinga Pam at 35.7% (n=20) and Pub Futaljhar at 34.6% (n=45) households, among others (Table 5.10).

Table 5.10 - Village wise Households based on Subsistence and Commercial type of Firewood Collection, 2012-14

Villages	No Forest Resource Collection	No Firewood Collection	Cause for Firewood Collection from the PAs		
			Subsistence	Both Commercial and Subsistence	Commercial
Kaliadinga Pam	8.9% (5)	55.4% (31)	14.3% (8)	7.1% (4)	14.3% (8)
Pub Futaljar	26.2% (34)	39.2% (51)	13.1% (17)	10.8% (14)	10.8% (14)
Pachim Salpara	7.6% (5)	60.6% (40)	12.1% (8)	10.6% (7)	9.1% (6)
Singimari-Salpara FV	55.0% (11)	15.0% (3)	30.0% (6)	.0% (0)	.0% (0)
Haldhiasuti FV	30.0% (6)	25.0% (5)	45.0% (9)	.0% (0)	.0% (0)
Chitolmari Pathar	41.3% (26)	17.5% (11)	27.0% (17)	.0% (0)	14.3% (9)
No. 7 Bhogamukh	20.0% (9)	48.9% (22)	20.0% (9)	.0% (0)	11.1% (5)
No 6 Bhogamukh	29.2% (7)	54.2% (13)	12.5% (3)	.0% (0)	4.2% (1)
Dhania	63.2% (12)	.0% (0)	36.8% (7)	.0% (0)	.0% (0)
Sisuati Jhaoni	55.0% (11)	5.0% (1)	40.0% (8)	.0% (0)	.0% (0)
Overall	**27.2% (126)**	**38.2% (177)**	**19.9% (92)**	**5.4% (42)**	**9.3% (43)**

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

Collection of firewood from LBWLS for subsistence purpose was seen to be prevalent among 19.9% (n=92) of the total households while 5.4% (n=42) households were engaged in both commercial as well as subsistence firewood collection. Further 9.3% (n=43) households were engaged in firewood collection for commercial purposes from LBWLS (Table 4.20). Village wise, 45% (n=9) households of Haldhiasuti, 40% (n=8) households of Sisuati-Jhaoni,

36.8% households of Dhania and 30% (n=6) households of Singimari-Salpara, among others, were engaged in subsistence firewood collection. Again, 10.8% (n=14), 10.6% (n=7) and 7.1% (n=4) households from Pub Futaljar, Pachim Salpara and Kaliadinga Pam were involved in both commercial and subsistence firewood collection. Further, 14.3% (n=9) households of Chitolmari Pathar, 14.3% (n=8) households of Kaliadinga Pam, 11.1% (n=5) households of No 7 Bhogamukh, 10.8% (n=14) households from Pub Futaljar, 9.1% (n=6) households from Pachim Salpara and 4.2% (n=1) households from No 6 Bhogamukh were engaged in commercial firewood collection activities (Table 5.10).

4.2.2.4 Thatch Collection

Among the surveyed households, 6% (n=28) were engaged in collection of thatch from the two PAs. Of this, an equal 39.3% (n=11) households were engaged in thatch collection for 3 to 6 months and 6 to 9 months respectively while, 21.4% (n=6) households collected thatch for more than 9 months a year. Village wise, 20.6% (n=13) households of Chitolmari Pathar and 8.3% (n=2) of No 6 Bhogamukh, among others, were engaged in thatch collection (Table 5.11).

Table 5.11 - Village wise Households based on Subsistence and Commercial type of Thatch Collection, 2012-14

Villages	No Forest Resource Collection	No Thatch Collection	Cause for Thatch Collection from the PAs		
			Subsistence	Both Commercial and Subsistence	Commercial
Kaliadinga Pam	8.9% (5)	85.7% (48)	1.8% (1)	.0% (0)	3.6% (2)
Pub Futaljar	26.2% (34)	71.5% (93)	.0% (0)	.0% (0)	2.3% (3)
Pachim Salpara	7.6% (5)	87.9% (58)	.0% (0)	.0% (0)	4.5% (3)
Singimari-Salpara FV	55.0% (11)	45.0% (9)	.0% (0)	.0% (0)	.0% (0)
Haldhiasuti FV	30.0% (6)	70.0% (14)	.0% (0)	.0% (0)	.0% (0)
Chitolmari Pathar	41.3% (26)	38.1% (24)	6.3% (4)	1.6% (1)	12.7% (8)
No. 7 Bhogamukh	20.0% (9)	71.1% (32)	.0% (0)	4.4% (2)	4.4% (2)
No 6 Bhogamukh	29.2% (7)	62.5% (15)	.0% (0)	.0% (0)	8.3% (2)
Dhania	63.2% (12)	36.8% (7)	.0% (0)	.0% (0)	.0% (0)
Sisuati Jhaoni	55.0% (11)	45.0% (9)	.0% (0)	.0% (0)	.0% (0)
Overall	**27.2% (126)**	**66.7% (309)**	**1.1% (5)**	**.6% (3)**	**4.3% (20)**

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

Only 1.1% (n=5) of the surveyed households were involved in subsistence thatch collection while 0.6% (n=3) households were engaged in both subsistence and commercial

collection and 4.3% (n=20) households in purely commercial form of thatch collection from LBWLS. Village wise, 6.3% (n=4) households from Chitolmari Pathar and 1.8% (n=1) households Kaliadinga Pam were engaged in subsistence level collection of thatch. Further, 4.4% (n=2) households of No 7 Bhogamukh and 1.6% (n=1) households of Chitolmari Pathar were engaged in both subsistence and commercial collection. Again, 12.7% (n=8) households of Chitolmari Pathar, 8.3% (n=2), 4.5% (n=3) from Pachim Salpara, 4.4% (n=2) from No 7 Bhogamukh, 3.6% (n=2) from Kaliadinga Pam and 2.3% (n=3) from Pub Futaljar were involved in commercial collection of thatch from LBWLS (Table 5.11).

4.2.3 Income from Forest Resources

It was seen that 27.2% (n=126) of the surveyed households did not indulge in collection of forest resources while 26.3% (n=122) households collected them for subsistence purpose. Hence, these households did not have any share of income from forest resources towards their overall average annual household income. The rest of the 46.4% (n=215) households received different levels of income from commercial forest resource collection and sale. Of this, 22.7% (n=105) households received 1 to 25% of their overall income from collection and sale of forest resources, 11% (n=51) households received 25 to 50% share, 9.3% (n=43) households received 40 to 75% share and 3.5% (n=16) households received more than 75% of their income from collection and sale of forest resources (Table 4.24). Village wise, 75.6% (n=34) households of Bhogamukh, 67.9% (n=38) from Kaliadinga Pam, 65.2% (n=43) of Pachim Salpara, 46.2% (n=60) of Pub Futaljar and 45.8% (n=11) households of No 6 Bhogamukh, among others, received various levels of income from forest resources collection and sale. Further, 15.2% (n=10) households of Pachim Salpara, 3.1% (n=4) from Pub Futaljar, 1.8% (n=1) from Kaliadinga Pam and 1.6% (n=1) households from Chitolmari Pathar received more than 75% of their annual income from forest resources. Again, Pachim Salpara at 15.2% (n=10), Kaliadinga Pam at 14.3% (n=10) and Pub Futaljar at 11.5% (n=15), among others, had a number of houses which received 50 to 75% of their income from forest resources (Table 5.12).

Table 5.12 - Village wise Households based on
Contribution of Income from Forest Resources to Overall Household Income, 2012-14

Village	No Forest Resource Collection	Subsistence Collection	Share of Income from Collection and Sale of Forest Resources to Overall Household Income			
			Below 25%	25 to 50%	50 to 75%	Above 75%
Kaliadinga Pam	8.9% (5)	23.2% (13)	33.9% (19)	17.9% (10)	14.3% (8)	1.8% (1)
Pub Futaljar	26.2% (34)	27.7% (36)	19.2% (25)	12.3% (16)	11.5% (15)	3.1% (4)
Pachim Salpara	7.6% (5)	27.3% (18)	27.3% (18)	7.6% (5)	15.2% (10)	15.2% (10)
Singimari-Salpara	55.0% (11)	35.0% (7)	5.0% (1)	5.0% (1)	.0% (0)	.0% (0)
Haldhiasuti	30.0% (6)	40.0% (8)	10.0% (2)	15.0% (3)	5.0% (1)	.0% (0)
Chitolmari Pathar	41.3% (26)	25.4% (16)	17.5% (11)	7.9% (5)	6.3% (4)	1.6% (1)
No. 7 Bhogamukh	20.0% (9)	4.4% (2)	51.1% (23)	15.6% (7)	8.9% (4)	.0% (0)
No 6 Bhogamukh	29.2% (7)	25.0% (6)	25.0% (6)	16.7% (4)	4.2% (1)	.0% (0)
Dhania	63.2% (12)	36.8% (7)	.0% (0)	.0% (0)	.0% (0)	.0% (0)
Sisuati Jhaoni	55.0% (11)	45.0% (9)	.0% (0)	.0% (0)	.0% (0)	.0% (0)
Overall	**27.2% (126)**	**26.3% (122)**	**22.7% (105)**	**11.0% (51)**	**9.3% (43)**	**3.5% (16)**

Source: Fieldwork, 2012-14. *N.B.: Figures in Parenthesis indicate Number of Households*

5.2 Drivers of Dependency

Dependency of a person arises out of needs. Dependency of a fringe community on forest resources is similarly defined and determined by the inherent socio-economic dynamics prevalent in the environs of the community concerned. In order to find out the drivers of dependency, Pearson's product-moment coefficient was carried out between the parameters of dependency and socio economic scenario (Table 4.26). The analysis was firstly done for each of the five identified fringe dwelling communities of LBWLS and secondly for the pooled data for the ten study villages for deriving the overall dependency drivers of the fringe and forest villages of the two sanctuaries.

Table 5.13: Indicators for Correlation Analysis

Socio Economic Indicators	Forest Resource Dependency Indicators	
Annual Income		Ownership
Family Size	Livestock	Grazing Area
Education		Income from Livestock
House Type		Collection of Forest Resources
Distance of House from PA	Overall	Income from Forest Resource Collection
Boundary	Dependence	and Sale
Average Land Holding		Perception of Legality regarding

		collection and Sale of Forest Resources
Level of Material Possession		Fishing
Perception towards the LBWLS	Fish	Duration of Fishing
		Cause for Fishing
		Firewood Collection
	Firewood Collection	Duration of Collection
		Cause for Collection
		Thatch Collection
	Thatch Collection	Duration of Collection
		Cause for Collection

Among the households of the 10 study villages, the Pearson's correlations yielded 43 highly significant coefficients at 99% level of significance and 8 significant coefficients at 95% level of significance. Out of the highly significant coefficients, 14 were positively related while 29 were negatively correlated. Among the significant coefficients, three were positively related while five were negatively correlated (Table 5.13).

5.2.1 Livestock Rearing

Highly significant positive correlation existed between ownership of livestock and annual income ($r = 0.314$, $p<0.01$) indicating higher the ownership of livestock, higher is the annual income of the households and between ownership of livestock and land holding ($r = 0.124$, $p<0.01$) indicating higher land holding with higher livestock ownership. Further, grazing area for livestock had highly significant positive correlation with annual income ($r = 0.286$, $p<0.01$) and with level of material possession ($r = 0.103$, $p<0.01$), indicating higher grazing area with higher annual income and higher level of material possession respectively. Highly positive significant correlation also existed between income from livestock and annual income ($r = 0.120$, $p<0.01$) indicating higher the income from livestock, higher is the annual income and between income from livestock and material possession level ($r = 0.093$, $p<0.01$). On the other hand, significant positive correlation existed between grazing area and material possession ($r = 0.103$, $p<0.05$) indicating higher the grazing area, more is the level of material possession and between income from livestock and material possession ($r = 0.093$, $p<0.05$).

Highly significant negative correlation existed between income from livestock and perception towards LBWLS ($r = -0.206$, $p<0.01$) indicating higher the income from livestock, lesser is the perception of the LBWLS as wildlife areas. Significant negative correlation also existed between ownership of cattle and perception towards LBWLS ($r = -0.104$, $p<0.05$) (Table 5.14).

5.2.2 Overall Forest Resource

Highly significant positive correlation existed between collection of forest resources with family size ($r = 0.260$, $p<0.01$), indicating higher degree of forest resource collection with higher size of households and similarly between income from forest resources and family size ($r = 0.308$, $p<0.01$). Further, highly significant positive correlation existed between the perception of illegality of forest resource collection and house type ($r = 0.308$, $p<0.01$), indicating higher the quality of houses, more the households though of resource collection as illegal. Highly positive correlation was also observed between perception of illegality of forest resource collection with land holding size ($r = 0.222$, $p<0.01$) and with perception towards LBWLS ($r = 0.196$, $p<0.01$).

On the other hand, highly significant negative correlation existed between collection of forest resources with annual income ($r = -0.196$, $p<0.01$), family size ($r = -0.260$, $p<0.01$), education ($r = -0.187$, $p<0.01$), house type ($r = -0.366$, $p<0.01$) and land holding ($r = -0.490$, $p<0.01$). Significant negative correlation was also observed between collection of forest resources with material possession ($r = -0.113$, $p<0.05$) and between income from forest resources and annual income ($r = -0.116$, $p<0.05$), indicating higher the collection of forest resources, lesser the level of annual income. This highlights the fact that it is the poor households, which receive higher percentage of their annual income from forest resource collection. Further, significant negative correlation also existed between the perception of illegality of forest resource collection with family size ($r = -0.128$, $p<0.05$) (Table 5.14).

Table 5.14: Pearson's Correlation Coefficient between Socio-Economic and Dependency Aspects in the Study Villages, 2012-14

SOCIO ECONOMIC ASPECTS	DEPENDENCY ASPECTS														
	Livestock			Overall Forest Resource			Fish			Firewood			Thatch		
	Ownership	Grazing Area	Income	Collection	Income	Legality	Fishing	Duration	Cause	Collection	Duration	Cause	Collection	Duration	Cause
Annual Income	.314**	.286**	.120**	-.286**	-.116*	.074	-.279**	-.251**	-.135**	-.004	.012	.023	.097*	.085	.146**
Family Size	-.047	.048	.062	.260**	.308**	-.128**	.366**	.357**	.294**	.010	.005	.146**	.065	.044	.038
Education	-.050	-.065	-.076	-.187**	-.138**	.052	-.195**	-.197**	-.160**	-.041	-.030	-.088	.011	-.002	-.023
House Type	.071	.040	-.065	-.366**	-.289**	.154**	-.321**	-.312**	-.225**	-.125**	-.131**	-.139**	-.020	-.021	.002
Distance of House from PAs	-.057	-.007	-.079	-.003	-.024	.000	.016	.029	-.010	.024	.024	.029	-.007	.042	-.017
Land Holding	.124**	.085	-.005	-.490**	-.444**	.222**	-.406**	-.404**	-.343**	-.153**	-.141**	-.213**	-.094*	-.057	-.069
Material Possession	.088	.103*	.093*	-.113*	-.046	-.049	-.065	-.057	-.057	.053	.051	.087	-.054	-.076	-.015
Perception towards LBWLS	-.104*	-.047	-.206**	-.374**	-.265**	.196**	-.235**	-.220**	-.216**	-.120**	-.112*	-.099*	.023	.020	.013

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

5.2.3 Fishing

Highly significant positive correlation existed between fishing inside LBWLS and family size ($r = 0.366$, $p<0.01$), between duration of fishing and family size ($r = 0.357$, $p<0.01$) and between cause for fishing as more commercial and family size ($r = 0.294$, $p<0.01$). They indicate that lager the size of families more is the degree, duration and commercial type of fishing by the households.

Highly significant negative correlation existed between fishing with annual income ($r = -0.279$, $p<0.01$), education ($r = -0.195$, $p<0.01$), house type ($r = -0.321$, $p<0.01$), land holding ($r = -0.406$, $p<0.01$) and perception towards LBWLS as a wildlife area ($r = -0.235$, $p<0.01$). Highly significant negative correlation also existed between duration of fishing in LBWLS with annual income ($r = -0.251$, $p<0.01$), education ($r = -0.197$, $p<0.01$), house type ($r = -0.312$, $p<0.01$), land holding ($r = -0.404$, $p<0.01$) and perception of LBWLS as wildlife area ($r = -0.220$, $p<0.01$). Further, highly significant negative correlation also existed between cause of fishing in LBWLS as more commercial than subsistence and annual income ($r = -0.135$, $p<0.01$), education ($r = -0.160$, $p<0.01$), house type ($r = -0.225$, $p<0.01$), land holding ($r = -0.343$, $p<0.01$) and perception of LBWLS as wildlife area ($r = -0.216$, $p<0.01$) (Table 5.14).

5.2.4 Firewood Collection

Highly significant positive correlation existed between cause for firewood collection as more commercial and family size ($r = 0.146$, $p<0.01$).

Highly significant negative correlation existed between firewood collection and house type ($r = -0.125$, $p<0.01$), land holding ($r = -0.153$, $p<0.01$) and perception towards LBWLS as a wildlife area ($r = -0.120$, $p<0.01$). Highly significant negative correlation also existed between duration of firewood collection in LBWLS with house type ($r = -0.131$, $p<0.01$) and land holding ($r = -0.141$, $p<0.01$). Further, highly significant negative correlation also existed between cause of firewood collection in LBWLS as more commercial than subsistence and house type $r = -0.139$, $p<0.01$) and land holding ($r = -0.213$, $p<0.01$). On the other hand, significant negative correlation existed between duration of firewood collection with perception towards LBWLS as a wildlife area ($r = -0.112$, $p<0.05$) and between cause for

firewood collection more for commercial purpose and perception towards LBWLS as a wildlife area ($r = -0.099$, $p<0.05$) (Table 5.14).

5.2.5 Thatch Collection

Highly significant positive correlation was found to exist between cause for collection of thatch as more commercial and annual income ($r = 0.146$, $p<0.01$). Further, significant positive correlation was found to exist between collection of thatch collection and annual income ($r = 0.097$, $p<0.05$) (Table 5.14).

CHAPTER 6

ASSESSMENT OF THE PARTICIPATORY MANAGEMENT PROGRAMME OF LBWLS

6.1 Formation and constitution of Eco Development Committees

The inclusion of the Laokhowa and Burhachapori wildlife sanctuaries under KTR enabled the NWLD to access to adequate funds to undertake participatory conservation initiatives in the fringe and forest villages of the two PAs. The process of public consultations for establishing Eco-development committees (EDCs) was initiated by the division in 2008. In the year 2009, the division completed the process of formation of 17 EDCs in the fringe and forest villages of the LWLS and 11 EDCs in the fringe villages of BWLS. In 2011, 10 more EDCs were proposed to be formed, 8 in the fringe villages of LWLS and 2 in Brahmaputra's north bank villages of Telia Gaon and Gupteswar Singori under the under BWLS (Ojah et al. 2012, Ojah & Saikia 2015). The EDCs were formed under the Joint (people's participation) Forest Management Rules – 1998, under NWLD Forest Development Authority (FDA) and are under the jurisdiction of the Director, Kaziranga Tiger Reserve (Ojah et. al. 2012) (Figure 6.1). The EDCs constitute of two bodies - the executive body and the general body. The executive body consists of one president and one vice-president either elected or nominated by the villagers. The post of the member secretary is held by a forest staff of the rank of a forester I or above who is nominated by the Divisional Forest Officer (DFO) and acts as the representation of the forest department in the EDC. One post of the executive committee s reserved for either the local panchayat president or the panchayat secretary. The executive committee has seven more members elected or nominated by the villagers and of these seven members; three members must be women representatives. The executive body is looks after the day-to-day functioning and management of the EDC and the body remains in power for a period of two years from the date of constitution. The accounts of the EDC are jointly operated by the president and the member secretary. It is the responsibility of the executive body to convene regular general body meetings and keep the general body members informed about the accounts and all major decisions. The general body is requires the registration of a minimum of 60% of the total population of the village

and efforts should be made to include at least one member from every family of the village (Bora, 2013, Yadava, n.d.) (Figure 6.2).

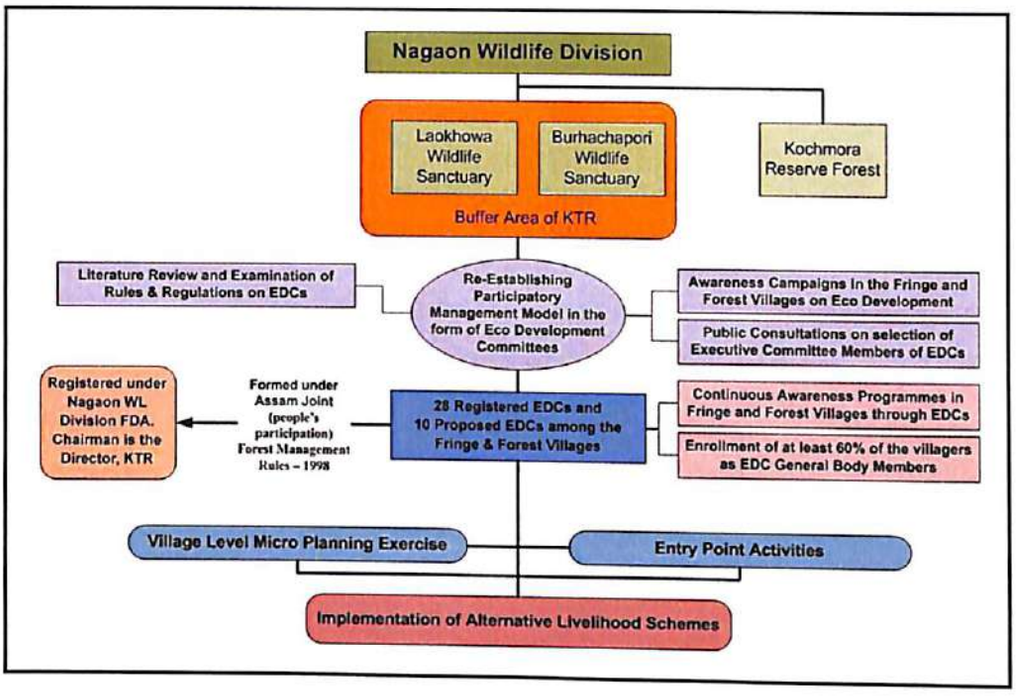

Figure 6.1 - Framework of the EDC Programme in Laokhowa and Burhachapori WLSs

Source: Ojah et al. 2012, State Forest Department, Assam

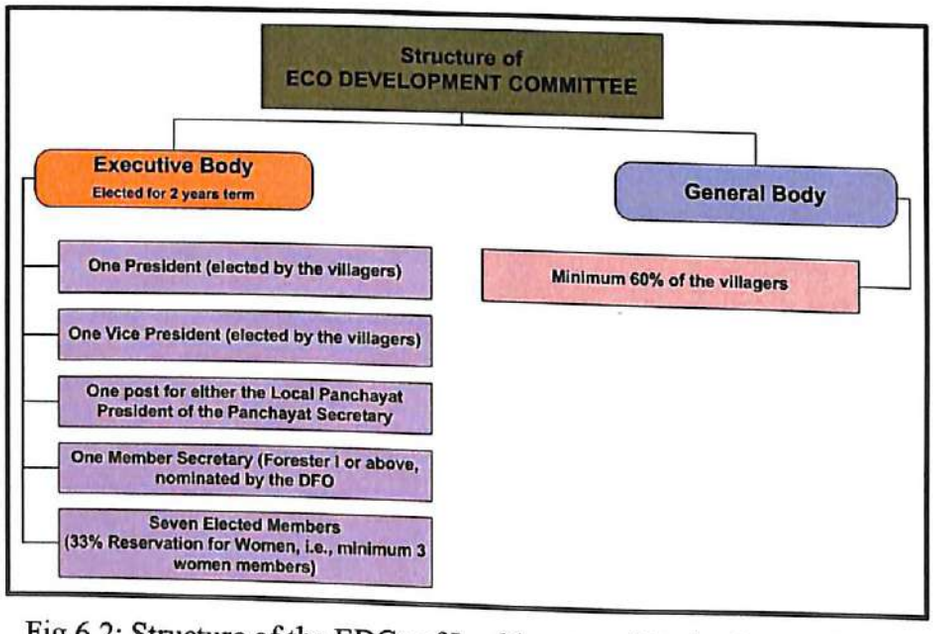

Fig 6.2: Structure of the EDCs of Laokhowa and Burhachapori WLSs

Source: Ojah et al, 2012 and State Forest Department, Assam

6.2 Entry Point Activities

Entry-point activities are meant for 'ice-breaking' and building up rapport of the Forest Department with the fringe communities. These activities help in undertaking accurate need assessment of the community and knowledge gained through such activities help in undertaking sustainable and community-acceptable alternative livelihood activities in the near future. Between 2010 and 2014, a number of entry point activities were carried out in the fringe and forest villages of LBWLS by the NWLD through the EDCs. EDC bank accounts were opened which are jointly operated by the president and the member secretary of each EDC. Table 6.1 depicts the head wise entry-point activities undertaken by the Nagaon Wildlife Division in the EDCs.

Table 6.1: Entry Point Activities undertaken by the Nagaon Wildlife Division in the EDCs of Laokhowa and Burhachapori WLSs (2010 to 2014)

Sl.	Entry Point Activities	No. of EDCs	Beneficiaries (Individuals/Families)	Year
1	Awareness camps	28	18,560 persons in a total of 45 awareness camps	2010, 2011, 2012, 2013, 2014
2	Construction of new school buildings	3	3 schools	2010, 2011, 2013
3	Repair of existing school buildings	7	11 schools	2011, 2012
4	Construction of community hall	6	-	2010, 2011
5	Repair of community clubs	2	-	2011
6	Construction of village market sheds	4	-	2011, 2012
7	Construction of common waiting sheds	2	2 sheds constructed near village markets	2012
8	Construction of public toilets	6	11 latrines and 12 urinals	2011, 2012
9	Repair of village roads	11	86 km of village roads	2010, 2011, 2012
10	Construction of water storage tanks	7	-	2011, 2012
11	Provision of tube wells	10	40 individuals	2010
12	Provision of school uniforms	4	200 students in 4 Schools	2011
13	Solar power facilities in schools	4	4 schools	2009
14	Free health camp	22	6,357 individuals	2009, 2011, 2012

15	Plantation of roadside trees	14	-	2009,2011, 2012, 2013
16	Community sports and games	4	76 individuals	2009, 2011
17	Exposure visit of EDC members to Kaziranga and Orang NPs	16	120 individuals	2011, 2012
18	Participation of school students in nature camps in Kaziranga NP	4	16 students	2012, 2013
19	Salary payment to school teacher of forest villages	2	2 teachers	2011, 2012, 2013, 2014
20	Construction of highlands for cattle	2	-	2010,2011

Source: State Forest Department, Assam, 2014-15

The various entry-point activities as listed in Table 6.1 can be classified into six major groups, *viz.* distribution of school uniforms and support to school infrastructure; construction of new village infrastructure; repair of existing village infrastructure; awareness, exposure visits and incentives; micro plan preparation; and others (Figure 5.30). In FY2010-11, Rs. 21, 38,902 was sanctioned and spent on various activities, of which Rs. 12, 74,667, (59.59%) was spent in the construction of new infrastructure in the villages such as community halls, drinking water tanks, school buildings, market sheds, waiting sheds, village highlands and public toilet facilities. Rs 2, 84,225 (13.29%) was spent on providing uniforms to schoolchildren and providing solar lights to schools. Further, Rs 2, 80,000 (13.09%) was spent on the repair of existing community halls, religious buildings and village roads. Rs 2, 50,000 (11.69%) was spent on awareness camps, plantations, exposure visits and payment of incentives to the local protection squad (LPS) members. The rest of the amount (2.34%) were spent on activities like payment of salaries to teachers of forest village schools, opening of EDC bank accounts, organisation of community sports programme, etc (Figure 6.3 and Table 6.1).

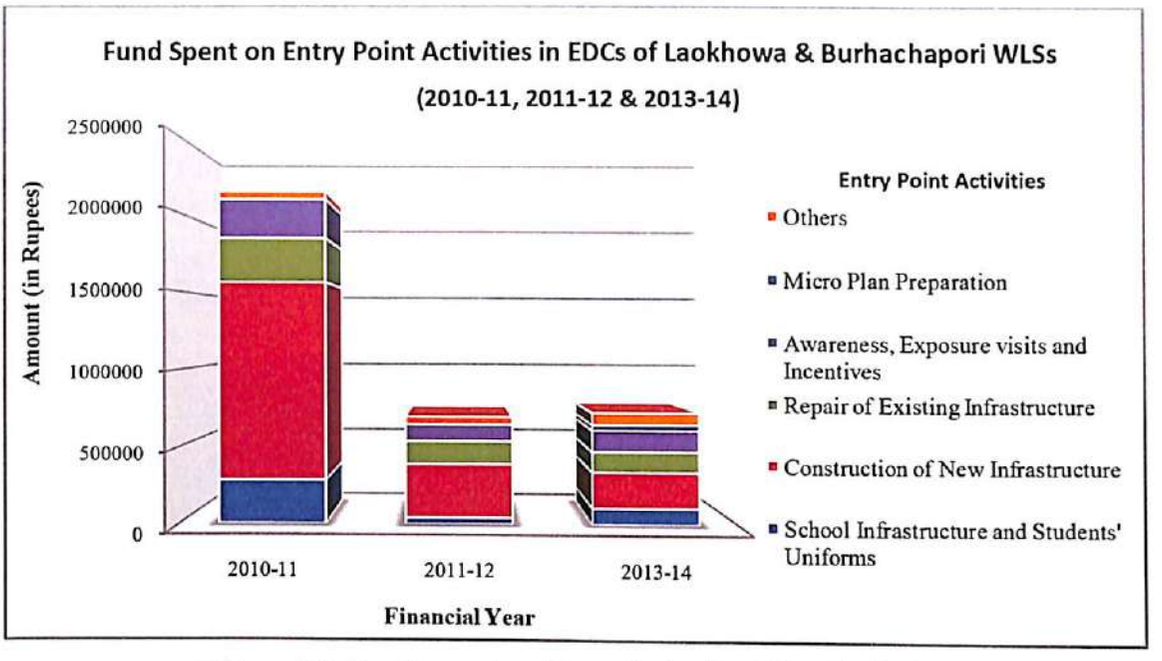

Figure 6.3: Funds spent on Entry Point Activities in the EDCs of Laokhowa and Burhachapori WLSs (2010-11, 2011-12 & 2013-14)
Source: State Forest Department, Assam, 2014-15

During FY2011-12, the total funds sanctioned and spent by the NWLD for undertaking entry point activities was Rs 7,00,000 of which, Rs 3,50,000 (50%) was spent in construction of new infrastructure; Rs 1,50,000 (21.43%) on repair of existing infrastructure; Rs 1,10,000 (15.71%) on awareness activities and incentives to LPS members; Rs 40,000 (5.71%) on providing school uniforms and the rest (7.14%) on payment of salaries of forest village school teachers, providing tube wells etc (Figure 6.3 and Table 6.2).

No funds were sanctioned for entry point activities during FY2012-13. During FY2013-14, an amount of Rs 7, 28,561 was sanctioned and spent on entry point activities. Of this, Rs 2,35,561 (32.33%) was spent on creation of new village infrastructure; Rs 1,40,000 (19.22%) on awareness activities, exposure tours and incentives to LPS members; Rs 1,34,000 (18.39%) on repair of existing facilities and infrastructure; Rs 1,05,000 (14.41%) on providing school uniforms to students along with desks and benches to schools; Rs 79,000 on payment of salaries of forest village school teachers etc. and Rs 35,000 (4.8%) on preparation of integrated micro plans for three EDCs of BWLS (Figure 6.3 and Table 6.2).

Table 6.2: Funds spent on Entry Point Activities in the EDCs of Laokhowa and Burhachapori WLSs (2010-11, 2011-12 & 2013-14)

Heads of Entry Point Activities	2010-11		2011-12		2013-14	
	Amount (Rs)	%	Amount (Rs)	%	Amount (Rs)	%
School Infrastructure and Students' Uniforms	284225	13.3	40000	5.7	105000	14.4
Construction of New Infrastructure	1274677	59.6	350000	50.0	235561	32.3
Repair of Existing Infrastructure	280000	13.1	150000	21.4	134000	18.4
Awareness, Exposure visits and Incentives	250000	11.7	110000	15.7	140000	19.2
Micro Plan Preparation		0.0		0.0	35000	4.8
Others	50000	2.3	50000	7.1	79000	10.8
TOTAL	**2138902**	**100.0**	**700000**	**100.0**	**728561**	**100.0**

Source: State Forest Department, Assam, 2014-15

6.3 Alternative Livelihood Activities

The implementation of entry point activities and preparation of integrated micro plans paved the way for implementing alternative livelihood schemes in a few of the fringe village EDCs of LBWLS. With funds allocated under PT scheme and in consultation with the EDC members, the NWLD, in 2009, initiated the formation of a participatory conservation mechanism through setting up of Local Protection Squads (LPS). Motivated youths from some of the EDCs were selected and trained as LPS members. The squads are mandated to aid the forest department in matters related to conservation of the LBWLS in the fringe and forest villages. Apart from undertaking tasks on intelligence gathering, mitigation of human-wildlife conflict issues and acting as trained tourist guides, the members also participate in joint patrolling duty with the frontline forest staff inside the sanctuaries, (Yadava, n.d.). As on March 2015, there were 24 LPS members of which, 14 are serving in and around LWLS while 10 are in and around BWLS. The squad members are being paid monthly stipend of Rs. 5,000 each by the NWLD under PT. The performance of the members is evaluated on a quarterly basis a year and changes are made accordingly by the DFO. This experiment of establishing LPS units is now proposed taken up in other PAs such as Kaziranga National Park (Yadava, n.d.).

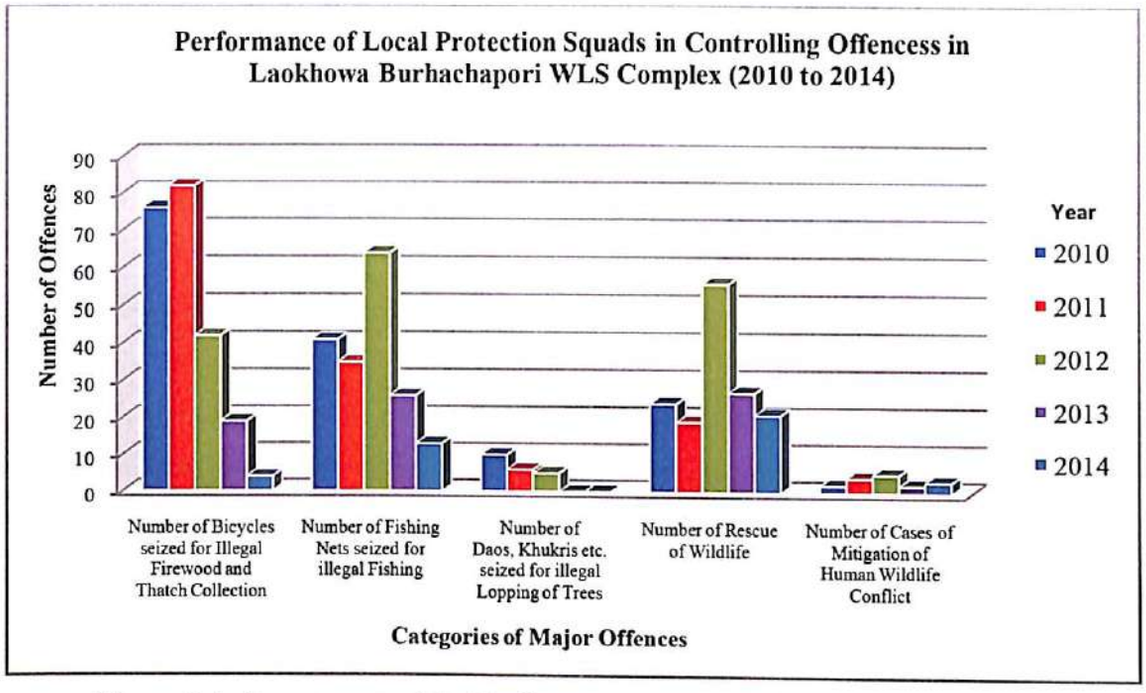

Figure 6.4: Assessment of the Performance of the LPS on the Conservation and Protection scenario of Laokhowa and Burhachapori WLSs (2010 to 2014)
Source: State Forest Department, Assam

It was seen that since their formation in 2009-10, the LPS members, aided the frontline staff in tackling major offences such as seizure of bicycles used for transportation of illegally collected firewood and thatch, seizure of fishing nets from persons indulging in illegal fishing inside LBWLS, seizure of tools used for lopping of trees for firewood, rescue of wildlife, especially during floods and tackling human-wildlife conflict cases in the fringe villages. Between, 2010 and 2014, the degree of offences in the two sanctuaries has gone down considerably (Figure 6.4). One of the biggest advantages that the LPS provided was to tackle issues of conflict that arises between the fringe villagers and the forest staff when the later confronts persons indulging in illegal extraction of forest resources. Since the LPS belong to the villages, it became easier to tackle such illegalities and resultant confrontations. Further, during human wildlife conflict scenarios, which arise mostly due to straying of rhinos, Asiatic wild buffaloes, elephants and tigers, among others into the fringe villages, these LPS members play a crucial role in crowd control. Further, given their familiarity with the geography of the region, it becomes easier for the frontline staff to plan and undertake drive out operations with the LPS.

The increased inflow of tourists to LBWLS, especially in the Dhania range of BWLS, encouraged the fringe village EDCs of the sanctuary to look for alternative livelihood opportunities in the field of providing service to the tourists (State Forest Department, Assam, 2014a, 2014b, 2014c). This led to the formation of service-oriented community eco-tourism ventures in the form of the Burhachapori Eco Resort and the Bhogamukh River Tourism Boat facilities.

The Burhachapori Eco Resort under the Dhania and Sisuati EDCs, supported by the NWLD started operations since November 2014. The resort is managed by a committee selected jointly by the EDC members and the NWLD. The villagers of Dhania, Jhaoni and Sisuati contributed 0.3 hectare of land for the construction of the resort in the Dhania village. The NWLD contributed an amount of Rs 5 Lakh under PT for setting up a traditional Nepali cottage which serves as a dining cum meeting hall of the resort (Yadava, 2014, Yadava n.d.). The resort caters to the food requirement of the tourists visiting Laokhowa and Burhachapori. The committee members have started to market traditional artifacts, crafts, apparels, clothing and dairy products as well as publicity materials. This Eco Camp is also acting as a resource centre for the EDCs and JFMCs of the other PAs and RFs as well. EDCs from Eaglenest WLS of Arunachal Pradesh, JFMCs of Golaghat district and trainee range forest officers of Central Academy for State Forest Service (CASFOS), Burnihat, have all visited the Dhania and Jhaoni-Sisuati EDCs in BWLS for undertaking case studies regarding their management. An analysis of the data shows that since opening, the resort has served meals to more than 2000 visitors. For every meal served in the resort, 30% of the cost is deposited into the EDC community account, which goes into those development activities of the village, which are prioritized by the EDC general body members. As per the EDC records, until 31 March 2015, an amount of Rs. 67, 830.00 was deposited into the community account (Ojah & Saikia, 2015).

Recognizing the potential of development and increasing demand for river-based eco-tourism, especially for boating facility among the tourists visiting BWLS, the No. 7 Bhogamukh EDC, with support from the NWLD started operating a mechanised country boat (*bhutbhuti*) since November 2014. The boat can accommodate 20 to 25 tourists per trip. The boat is operated and maintained by a committee, whose members are nominated jointly by the EDC members and the NWLD. As per the benefit sharing mechanism, for a single ride, 30% of the earnings are deposited into the EDC community account, which is used for

developmental activities in the village and till 31st March, 2015, Rs. 34, 300.00 was deposited into the community account (Ojah & Saikia, 2015).

6.4 People's Participation in the EDC Programme

As on March 2015, 86.88% (75,842 persons) of the total villagers from the fringe and forest villages of LBWLS were registered as EDC members (calculated against 2011 primary census abstract population data). Of this, 77.19% (58,539 persons) belonged to 25 EDCs under LWLS and 22.81% (17,303 persons) from 13 EDCs of BWLS. Of the total members, 84.79% (64,307 persons) belonged to the approved EDCs while 15.21% (11,535 persons) belonged to the 10 proposed EDCs.

Examination of records of the NWLD shows 100% membership of villagers from the FV and TVs of LWLS. Membership in the EDCs of Pub Amrakanda, Chitolmari Pathar (West), Dhania, Nama Kaliadinga, Dhingbori Chapori, Pachim Amrakanda, Chitolmari Beel (NC) and Pachim Salpara were between 90 to 99% of the villagers. The EDCs of Sutirpar, Bhogamukh No 4 and Gorajan had membership of between 60 to 70% while the least membership, below 70% of the villagers, was recorded from Telia Gaon, Gupteswar Singori and Dhingbori Pathar EDCs. The rest of the 17 EDCs had membership of 80 to 90% villagers out of the total population of their respective villages. Thus, the overall participation of the villagers in the ongoing EDC programme was much above the minimum recommended percentage of 60% (Figure 5.32). In terms of community level participation, it was seen that 72.65% (55,101 persons) members belonged to the Muslim community while 27.35% (20,741 persons) belonged to other communities comprising of Nepali, Bihari, Lalung and Bengali communities (Figure 6.5).

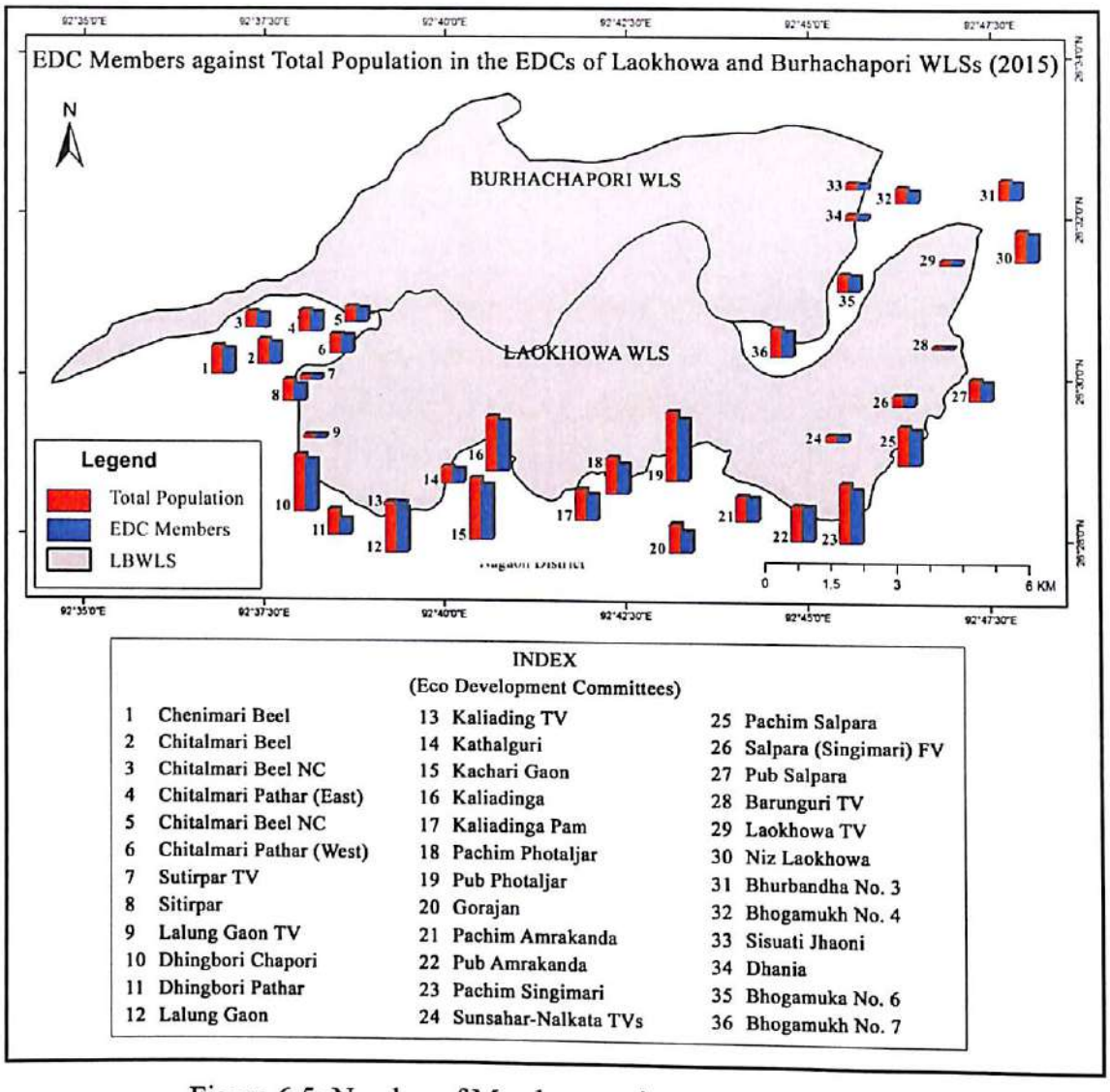

Figure 6.5: Number of Members against Total Population in the Eco Development Committees of Laokhowa and Burhachapori WLSs (2015) (Excluding Gupteswar Singori and Telia Gaon EDCs)

Source: Fieldwork and State Forest Department, Assam, 2014-15

6.5 Assessment of the EDC Programme

Pearson's correlation coefficient analysis was undertaken in order to gain a perspective regarding the performance of the ongoing EDC programme in LBWLS. Parameters pertaining to perception of the villagers towards the ongoing EDC programme and towards the LBWLS as a wilderness conservancy, aspects of livestock rearing, along with dependency on the forest resources of LBWLS in general and in terms of fishing,

firewood and thatch collection in particular were correlated with the beneficiary households of the EDC programme. The correlation analysis was undertaken with the overall sample households of the 10 survey villages and with the sample households of each of the fringe dwelling communities of LBWLS.

Among the Bengali Hindu households, the Pearson's correlations yielded one highly significant, negatively correlated coefficient at 99% level of significance and four significant coefficients at 95% level of significance, all of which were positively correlated.

Significant positive correlation was found between being EDC beneficiaries with perception about illegality regarding collection of forest resources ($r = 0.341$, $p<005$). This indicated that indicating that households with higher perception of forest resource collection as legal received more benefits under the EDC programme. Significant positive correlation was found between being EDC beneficiaries with fishing inside LBWLS ($r = 0.350$, $p<005$), longer duration of fishing in the PAs ($r = 0.402$, $p<005$) and cause for fishing as more commercial than subsistence ($r = 0.420$, $p<005$). These indicated that more benefit is passed to through the EDC programme to those households which were more involved in illegal fishing inside LBWLS, which were involved for longer duration and in commercial form of fishing inside the PAs (Table 6.3). These were positive signs for the EDC programme, for it is meant to target and pass on benefits to households with higher dependency.

Table 6.3: Pearson's Correlation Coefficient among EDC Beneficiary Households with Perception towards EDCs and LBWLS and Dependency Parameters (2012-14)

Parameters		EDC BENEFICIARY HOUSEHOLDS					
		Overall Beneficiary	Community wise				
			Bengali Hindus	Bengali Muslims	Nepalis	Lalungs	Biharis
Perception	Positive regarding the EDC Programme	**.116***	.003	**.166****	-.216	.192	-.316
	Positive Perception towards LBWLS	**-.212****	-.265	-.058	.175	.217	.000
Livestock Rearing & Grazing	Ownership	-.007	**-.482****	**-.182****	-.116	-.267	.343
	Grazing Area	.056	.084	.040	.099	.217	.686
	Income	**-.109***	.050	.068	.229	.152	.426
Overall Forest Resource	Collection	**.103***	.233	**.142****	-.002	.144	.250
	Perception about Illegality	**-.158****	**.341***	.085	-.002	.250	.250
	Income	.051	.305	**.167****	-.171	-.077	.316

Fishing	Fishing	**.115***	**.350***	**.160****	-.002	.150	.250
	Duration	**.106***	**.402***	**.145****	.[a]	.160	.[a]
	Cause	**.116***	**.420***	**.149****	.[a]	.165	.[a]
Firewood	Collection	.087	.153	**.114***	-.019	.101	.250
	Duration	.040	.024	.049	-.061	.040	.[a]
	Cause	.007	.206	.005	-.036	.040	.[a]
Thatch	Collection	.042	.233	.056	-.002	.144	.250
	Duration	**.132****	.[a]	**.140****	.[a]	.[a]	.[a]
	Cause	**.107***	.[a]	-.100	.[a]	.[a]	.[a]

Source: Fieldwork

N.B.: ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed), a No representation of sample within the parameter.

Highly significant negative correlation existed between being an EDC beneficiaries with ownership of livestock ($r = -0.482$, $p<001$). This indicated that households with higher number of livestock were lesser in number in terms of being EDC beneficiaries. Many of the livestock owners who owned larger number of cattle were cattle station owners. These cattle stations were evicted from BWLS during 2010 and at that time, these owners were completely against the forest department and most refused to be a part of the EDC programme. Due to this, households with larger number of cattle showed a highly significant negative correlation with being EDC beneficiary.

Among the Bengali Muslim households, the Pearson's Correlation Coefficient yielded eight highly significant coefficients at 99% level of significance, of which, seven were positively correlated and one was negatively correlated. Further, there was one significant positively correlated coefficient at 95% level of significance.

Highly significant positive correlation existed between being EDC beneficiaries with a positive perception regarding the EDC programme ($r = 0.116$, $p<001$), indicating more the benefits received, more positive is the feeling regarding the programme. Highly significant positive correlation also existed between being EDC beneficiaries with overall collection of forest resources ($r = 0.142$, $p<001$), income from forest resources ($r = 0.167$, $p<001$), fishing inside LBWLS ($r = 0.160$, $p<001$), duration of fishing ($r = 0.145$, $p<001$), cause for fishing as more commercial ($r = 0.149$, $p<001$) and duration of thatch collection ($r = 0.140$, $p<001$). All these indicated that more benefits were accorded to those households which were having higher degree of dependency in terms of overall forest resource collection and income from

the same, degree, duration of fishing and the cause for fishing being more commercial along with duration of thatch collection. Further, significant positive correlation was found to exist between being EDC beneficiaries and collection of firewood from LBWLS ($r = 0.140$, $p<001$), indicating more benefits being passed to households with higher dependency on firewood (Table 6.3).

Highly significant negative correlation existed between being EDC beneficiaries and ownership of livestock ($r = -0.182$, $p<001$). This again highlighted the lack of willingness of households of the Bengali Muslim community which owned cattle stations to participate in the EDC programme as beneficiaries during the time of survey, as was evident with the Bengali Hindu households. None of the households of the rest of the communities exhibited any significant correlation with being EDC beneficiary households (Table 6.3).

Overall, the Pearson's Correlation Coefficient yielded three highly significant coefficients at 99% level of significance, of which, one was positively correlated and two were negatively correlated. Further, there were seven significant positively correlated coefficients at 95% level of significance of which, six were positively correlated and one was negatively correlated.

Highly significant positive correlation existed between being EDC beneficiaries and duration of thatch collection ($r = 0.132$, $p<001$) indicating more benefit to households with higher dependency on thatch collection and with longer duration of thatch collection. Further, significant positive correlation existed between being EDC beneficiaries and positive perception towards the EDC programme ($r = 0.116$, $p<005$) indicating higher the benefits received, more positive was the feeling regarding the programme. Significant positive correlation also existed between EDC beneficiaries and collection of forest resources ($r = 0.103$, $p<005$), fishing ($r = 0.115$, $p<005$), duration of fishing ($r = 0.106$, $p<005$), cause for fishing as more commercial ($r = 0.116$, $p<005$) and cause for collection of thatch as more commercial ($r = 0.107$, $p<005$). It all indicated that more EDC based benefits were accorded to households with higher dependency on fishing, households indulging in fishing for longer duration and in commercial fishing and commercial thatch collection (Table 6.3).

Highly significant negative correlation existed between being EDC beneficiary and perception towards the LBWLS as an area meant more for wildlife ($r = -0.212$, $p<001$),

indicating more EDC benefit was passed to those families which thought that the LBWLS were meant less for wildlife and more for livelihood. Further, highly significant negative correlation also existed between being EDC beneficiaries and perception about the collection of forest resources as illegal ($r = -0.158$, $p<001$) indicating again that more benefits of the EDC programme was given to those households which thought that such collection was a legal activity.

6.6 Perception of the EDC Executive Members towards the programme

Altogether, there were 53 participants from the 10 study village EDC executive bodies in this group. Though almost all the executive members (92.5%) felt that the real purpose behind the EDC programme was both conservation and livelihood support, a majority (77.4%) expressed that if more emphasis were given to developmental issues in the fringe villages, then tackling conservation issues of LBWLS would become much easier. Significantly, only 45.3% felt that they knew what an integrated village micro plan is and only 20.8% said that they were aware of the process involved in the preparation of micro plans since they participated in such exercises before. Further, 64.2% of the executive members expressed that they consider themselves relatively aware regarding the rules and regulations that govern the functioning of an EDC. On the other hand, 37.7% said that their attendance in various EDC programmes was regular while 45.3% said their attendance such programmes was irregular. However, 17% said they could hardly attend such programmes. The major reasons attributed for irregular, or lack of attendance were inconvenience of time and/or venue (36.4%), prior commitments (33.3%) and lack of timely information regarding the programmes (21.2%), among others. It was felt by 35.8% of the respondents that the EDCs belonged exclusively to the forest department, while the rest (64.2%) believed that though it was collaboration between the department and the villagers. Further, 84% said that their main goal in becoming EDC executive members was to ensure better livelihood for the villagers while 16% said they became EDC executive members out of the desire to contribute towards the conservation of LBWLS. A significant majority (94.3%) of the respondents felt that the EDC programme did contribute towards the conservation of the LBWLS. On the other hand, 35.8% executive members responded that they were more or less satisfied with the overall performance of the programme.

The overall opinions and suggestions as forwarded by the executive members regarding the programme may be categorized into the following two broad categories -

a. Decision making - The executive members felt that though the EDCs are supposed to be a collaborative effort between the department and the villagers, yet the overall control of the EDC in terms of decision making regarding entry point activities and alternative livelihood schemes rests, more often than not, on the department and they said that the opinions of the EDC members should have more weight in terms of decisions taken in the functioning of the EDCs.

b. Securing livelihood support - The executive members felt that even though the overall participation and enrolment of the villagers in the general body of the EDCs was high, yet fund allocation for undertaking livelihood support activities was extremely poor. Given the high rate of poverty prevalent in the fringe villages, a lot more needs to be done regarding securing adequate funds and ensuring timely release of the same for undertaking intensive livelihood support initiatives, involving a much higher percentage of the EDC members than has been possible till now.

6.7 Forest staff and their perception towards the EDC programme

Out of 17 Forester I ranked staff acting as member secretaries of the EDCs, respondents, 64.7% expressed that the primary purpose of the EDC programme was both conservation of LBWLS and livelihood support for fringe dwellers while 35.3% said that it was conservation of the sanctuaries. In terms of contribution of EDC members towards conservation of LBWLS, 47.1% said their most important contribution may be through support to forest staff during operations conducted in the villages for arrest of illegal trespassers, encroachers, poachers, tree fellers, etc.; 41.2% said it may be through giving up illegal collection of forest resources and 11.8% said that it may be through cooperation during human-wildlife conflict cases. On the other hand, 88.2% of the respondent said that they were familiar with the concept of a micro plan while 82.4% said they were aware of the process of preparation of a micro plan. Further, 82.4% respondents felt that they knew the rules and regulations regarding the functioning of an EDC. In terms of involvement of EDC executive members, 23.5% felt that their degree of involvement was higher than expected, 41.2% felt it was as expected and 35.3% felt it was below expected. Again, regarding the

involvement of the general members of the EDCs, 11.8% said it was higher than expected, 17.6% said it was as expected while 58.8% felt the degree of involvement was below expected. All the respondents said that the EDC programme is a joint programme between the forest department and the fringe dwellers. Further, 64.7% of the interviewed staff responded that, given a choice, they would continue to remain as member secretaries of the EDC committees. A majority, 82.4% felt that the programme was contributing towards the conservation of LBWLS. On the other hand, 35.3% of the respondent staff said that they were more or less satisfied with the ongoing EDC programme.

6.8 Management Initiatives in establishing Participatory Conservation Practices

The protection offered by the 'mahaldars' of LWLS to the rhinos and to other flora and fauna till Laokhowa was a RF may be considered as a form of participatory conservation in the then Laokhowa RF . Till 1979, the 'mahaldars' who were having the rights of operating the fish and thatch mahals in the RF, were also made responsible for the safety of the rhinos and other flora and fauna therein. When Laokhowa was declared a WLS in 1979, the operation of such mahals was stopped and as such, the mahaldars were no longer involved in the security of the rhinos in particular and for the overall flora and fauna of the newly created sanctuary.

The first formal effort at establishing a formal participatory conservation model in LWLS was started during 2002 when 11 EDCs were established. However, the effort did not sustain due to lack of funds for undertaking entry point activities, preparation of micro plans and for carrying out alternative livelihood activities.

A renewed effort towards the implementation of a participatory conservation model in the real sense were initiated by the forest department in LBWLS after the inclusion of the two sanctuaries under Project Tiger as buffer components of the KTR. With this, the NWLD had the access to adequate funds for formation of 28 EDCs and to undertake entry point activities in the villages through the EDCs. While the executive bodies were formed in 2009, the process of enrollment of the general body members commenced from 2010 and till March

2015, 86.88% (75,842 persons) of the villagers were enrolled as general body members of the 28 EDCs. In order to gain the confidence of the fringe dwellers, entry point activities were undertaken between 2010 and 2014. Such activities included distribution of uniforms among school children, construction and repair of village infrastructure, awareness activities, exposure visits and preparation of micro plans for initiation of alternative livelihood activities in the villages. Almost all the funds received for undertaking these activities were sanctioned under Project Tiger.

6.9 Addressing Conflict and Dependency Issues through People's Participation

It was interesting to note that one of alternative livelihood schemes that were implemented by the NWLD was in the Dhania and Sisuati-Jhaoni EDCs in BWLS in the form of the Burhachapori Eco Resort. The villagers from these villages have always been in conflict with the department due to the presence of their khuttis inside the BWLS. Since the cattle stations were evicted and relocated outside the PA boundaries in 2010 following the order of the Hon'ble High Court of Guwahati, the conflict situation worsened between 2010 and 2012. It was only after the conduct of a number of awareness camps and discussions were undertaken with the villagers and finally the villagers agreed to participate in the EDC programme. Accordingly, entry point activities were undertaken in earnest in these villages which finally helped to bridge the gap between the department and the Nepali villagers. Following the preparation of the village micro plans, the forest department initiated the construction of the Burhachapori Eco Resort in Dhania village. The department provided Rs 5 Lakh under PT while the villagers contributed the land for the construction of the resort. The resort formally started operations from November 6 2014. Run by a committee constituted together by the NWLD and the general body of the EDCs, the resort caters to the food requirement of the tourists visiting LBWLS and 30% of the total cost of the food served to tourists is deposited into the EDC community account. Till March 2015, an amount of Rs. 67, 830.00 was deposited into the community account.

The second alternative livelihood initiative was started in the No 7 Bhogamukh village of BWLS. The villagers of this village have been highly dependent on the resources of

the PAs. A committee was formed by the NWLD and the general body of the No 7 Bhogamukh EDC were given a mechanised country boat to cater to the growing demand for boating facility among tourists visiting BWLS, Further, 30% of the earnings is deposited into the EDC community account and till March 2015, Rs. 34, 300.00 has been deposited into the account. It again needs to be mentioned here that villages such as No 6 Bhogamukh, No 7 Bhogamukh and Kaliadinga Pam have had significant conflict with the forest department. In fact, many of the villagers of No 7 Bhogamukh and Kaliadinga Pam had even blocked and obstructed the conduct of field visits for the present study during 2007-08. And it has been the positive impact of the entry point activities that these villages and the others are now coming forward to be a part of this participatory conservation model.

The role of the LPS members towards the biodiversity conservation and conflict resolution in LBWLS has been notable. This particular participatory protection mechanism has now been suggested as a model than needs to be adopted in other PAs of Assam like KNP.

The EDC programme was implemented with the objective of reducing the dependency of the fringe dwellers on the resources of LBWLS. Therefore, the programme meant to target those households which were having higher degree of dependence on the PAs and aimed to provide benefits through the entry point and alternative livelihood initiatives to such households. It was seen that the emphasis was given on the selection of those households as EDC beneficiaries which had significant degree of dependence on forest resources, particularly on thatch and fish and their commercial collection and sale. Further, priority was also given to the selection of those households as EDC beneficiaries, which had comparatively lesser degree of perception towards LBWLS as an area meant for wildlife, along with those households which perceived collection of forest resources was legal. On the other hand, it was seen that those households which received benefits under the EDC programme held a positive view regarding the programme.

It was seen during the study that in spite of being the dwellers of the forest and taungiya villages, the members of the Lalung community exhibited much lesser degree of dependence on the PAs compared to the other communities. In fact, only two of the socio-economic parameters, education and perception about LBWLS, among the community were significant enough to induce dependence on the forest resources. Entry point activities of the

NWLD seems to have addressed the need for enhancing the level of education among the Lalung community as well as conduct more awareness camps to improve the perception of the people of the community towards the fact that the PAs as wildlife reserves. An important factor contributing towards the relatively low dependence is the settlement of rights and demands of the Lalung community during 2009-10, under the 'The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006'. Under this act, the NWLD provided legitimate land due to each household. This has helped in not only reducing the dependency among the community, but has also helped in reduction of conflicts with the forest department. This highlights the positive effect of the Act in reducing the dependency of the forest dwellers on the PAs.

The conduct of awareness programmes among the Nepali community seems to have had a positive effect in reducing the degree of dependence, since this parameter was not found to be significant as a driver for inducing dependency. Further, the involvement of the cattle station owners in the running and management of the Burhachapori Eco Resort highlights the positive achievement of the programme since such households were initially reluctant to participate in the programme owing to the eviction of their cattle stations from inside BWLS. Socio-economic parameters such as annual income, type of household and size of land holding were seen to be significantly influenced by dependency parameters pertaining to livestock rearing, forest resource collection and more specifically, firewood collection. Since a majority of the households of the community were dependent on livestock rearing as a source of economic sustenance, the EDC programme should target at providing hybrid cattle and promote stall feeding among the households. Providing alternatives to firewood usage in the form of setting biogas facilities seems viable given the more than adequate availability of dung from the livestock. The EDC programme should also target the promotion of the dairy industry of the Nepali villages and seek to integrate the industry with the functioning of the resort.

It was seen that the Bihari community of the fringe villages of LBWLS did not have any dependence on the major resources of the PAs. A few poor households, which lived very close to the PAs indulged in occasional collection of some minor forest products such as ferns and simul cotton pods. Only a few households with larger family members and lesser number of educated persons were dependent on the PAs for livestock rearing and income from livestock. The programme has already engaged some of the households for working as

labours in BWLS under the IRV2020 rhino translocation project. The EDC programme should target the dependent households and provide them with alternative options in order to help them overcome this relatively low degree of dependence.

Next to the Bengali Muslims, it was the Bengali Hindu community which was found to be having higher degree of dependence on the PAs. Though the degree of ownership of livestock and their grazing inside PAs were found to be significantly related to their annual income, yet, it was seen that the income from livestock did not comprise of a significant percentage of their annual income. Therefore, the EDC programme should seek to control the issues of grazing of livestock inside the PAs and number of livestock ownership through awareness activities instead of providing them with alternative livelihood options pertaining to livestock rearing. Generation of awareness should not me difficult given the fact that most households of the community which rear livestock, perceive LBWLS as more of a wildlife area. Similarly, dependency issues pertaining to fishing and firewood collection too can be addressed through awareness. However, unlike the livestock rearing households, those households which indulged in collection of forest resources, particularly fish and firewood, regarded LBWLS as areas meant more as a source of livelihood. Many of such households also considered collection of forest resources as legal. Most of such dependent households were seen to be residents of kutcha houses, lived nearer to the PAs and had relatively low land holdings and material possession. Therefore, in this case, along with awareness, the EDC programme should provide the households with some alternative mechanisms for ensuring reduction of their dependence of the forest resources. The programme should seek to generate employment and earning sources for these households through opportunities under MNREGA and other such schemes of line agencies.

The Bengali Muslim community, with almost 75% of the total population of the fringe villages, also has the highest degree of dependence on the PAs among all the communities. The households of the community depicted significant influence of dependency aspects such as livestock rearing and forest resource collection, especially, fish, firewood and thatch on almost all the socio-economic parameters that were examined in the study. However, similar to the Bengali Hindus, it was seen that the degree of influence of livestock rearing on the annual income share of the Bengali Muslim livestock rearing households too was insignificant. While this again highlights the fact that generation of awareness remains the best approach for the EDC programme, yet given the higher degree of negativity among such households regarding the importance of LBWLS as wildlife areas, much more focused,

intensive and continuous awareness programmes are required in this case. At the same time, it was seen that these households were in possession of relatively larger land holdings. The EDC programme should explore the possibility of promoting some portion of their land holdings as grazing area for their livestock by providing them with funds for plantation of fodder grass species and thereby gradually reduce the grazing pressure on the PAs.

The alternative livelihood initiative of LBWLS, though at a comparatively nascent stage, has in fact demonstrated that it is indeed possible to bridge the gap between the department and the villagers and both can work together towards the reduction of dependency of the fringe dwellers on the resources of PAs, decrease conflict situations and ensuring overall development of the villagers as well as the PAs. EDCs members from Arunachal Pradesh, Golaghat, besides students from various colleges, institutes and schools have visited the BWLS to study and understand the ongoing EDC programme. . The forest department is actively pursuing the case of implementing various governmental development schemes like the Mahatma Gandhi National Rural Employment Generation Scheme (MNREGS) through the EDCs. If this plan succeeds, then the department can immediately start implementing the identified alternative livelihood schemes as mentioned in the village micro plans. It was seen that commercial fishing and firewood collection among the Bengali Muslim households was relatively insignificant and most families indulging in such activities were characterized by socio-economic dynamics such as large family size, low level of education, poor quality of houses and smaller land holdings. These households also had lower perception of LBWLS as wildlife concerns. All these indicate that most of the households were relatively poor. Therefore, in addition to awareness, the EDC programme must seek to address the root causes of poverty in order to ensure the decrease in dependency levels. However, given the extremely high population of the community, it would be difficult to sustain any alternative livelihood programme only through funds under the schemes of the forest department. Rather, the EDC programme should aim to integrate all possible schemes and opportunities of the line agencies so as to ensure constant flow of funds and sustenance of the alternative livelihood programme in the villages dominated by the Bengali Muslim community.

Though the EDC programme has been successful to some extent in reducing the issues of conflict between the forest department and the fringe dwellers of LBWLS, yet in order to ensure the long-term sustainability of this participatory conservation model, it needs to be more focused in addressing the dependency drivers of the fringe community. At the

same time, it was seen that the number of awareness activities has decreased since 2014. With the implementation of the alternative livelihood programmes, the state forest department seems to have ceased further entry point activities in other villages. Given the moderate degree of success of the ongoing alternative livelihood programmes in some of the EDCs, there has been increasing demand among other EDC members to start such activities in their respective villages. A number of youths have also expressed their desire to be a part of the LPS. With the upcoming rhino translocation to LBWLS, the forest department needs to ensure that support, participation and cooperation of the fringe dwellers towards the sanctuaries. In order to ensure this, the participatory conservation mechanism as being implemented in the fringe villages of the two PAs needs to be further strengthened and made sustainable in the long term. And for this, the state and central governments should allocate more funds, ensure timely disbursement of such funds and integrate the EDC programme with parallel employment generation schemes of line agencies in order to enable the division to implement entry-point and alternative livelihood activities in more fringe villages of LBWLS.

CHAPTER 7

SUMMARY AND CONCLUSION

7.1 Summary

Protected areas are regarded to be the most preferred tool for *in-situ* biodiversity conservation and for ensuring sustainable, long-term conservation of the world's natural history. PAs have been at the forefront in the effort of humankind to ensure that the diversity of flora and fauna that we enjoy today, are preserved for generations to come. To achieve this goal, various classes and categories of PAs have been established through legislations worldwide and at present, they cover over 10% of the world's total geographic area. Since PAs provide one of the least anthropologically disturbed ecology, they are the most ideal natural laboratories for studying and understanding the various forms and processes as to how ecosystems functions and species interact with the ecology. Further, it is important to document the flora and fauna that exists in PAs so as to have a benchmark against which any future changes can be compared against and evaluated with. Environmentalists have, for long, emphasised on the documentation of faunal richness and diversity in PAs and have devised numerous field methods and techniques for undertaking such studies (Varman and Sukumar 1995).

There is a growing worry regarding the myriad of challenges that PAs are having to face in terms of the ever increasing anthropogenic disturbances to their ecology. And if these challenges are not met and the disturbances are not reduced, then there will be a great risk of losing some of the world's most biologically rich habitats forever (Chapin et al. 2000).

PAs work best, when they are not in isolation and exist as nodes within a larger network (Haddad 1999). This ensures a free, unobstructed flow of genes among different meta-populations and also utilization of resources from other ideal habitats when existing habitat(s) come under stress. When the historical and natural linkages that exists among PAs is disrupted, it not only leads to loss of genetic diversity but also exposes the species to face

the challenges posed by the annual environmental stresses such as drought and flood, among others. In recent years such stressors are, in all probability, liable to get exacerbated by the vicissitudes of climate change. To mitigate such threats, priority must be accorded to the preservation and conservation of these migratory corridors and thereby ensure optimum performance of the PAs as a tool for long-term biodiversity conservation (Meyers et al.1987).

More than 40% of the world's PAs are located in the developing countries. Almost all PAs in developing countries have had a long history of human interaction. A significant percentage of people depend on the natural resources of PAs for their livelihood sustenance. It is widely believed that endeavour for biodiversity conservation through PAs will not sustain if it is indifferent to the reliance of the communities on the PAs and the historical linkages that the people have had with them. The 'closed approach' of managing PAs have not only gone on to alienate the fringe dwellers but have also given birth to an antagonistic feeling among them vis-a-vis the PA managers (Kothari, 2003). This has gone on to accentuate the illegal extraction and collection of forest resources causing great harm to the ecology of the PAs (Nagendra et al. 2006). The very idea of establishing PAs as sanctum sanctorum of biodiversity remains violated owing to such illegal resource extraction and overwhelming dependency.

Under such circumstances, an urgent need emerged to adopt a new approach of managing PAs by taking into consideration, the needs and aspirations of the fringe communities. The new approach, regarded to be more 'inclusive' and 'humane' regarded PAs not as mere tools for biodiversity conservation, but one that provided ecosystem services and become drivers of socio-economic change. In India, such a participatory conservation model was floated as the India Eco Development Project since the 1980s. Under the project, the process of involving the fringe people in the management of PAs and exploring ways and means for decreasing their dependence on the PAs by providing them with sustainable alternative livelihood options was initiated in many PAs (Badola 2000).

However, many conservationists argued that such a conservation model was contrary to the very rationale of establishing PAs in the first place - to ensure conservation of biodiversity. There has been a substantially large body of work which seeks to establish the need for PA management to be more inclusive and consider the 'rights' and 'needs' of the community regarding the natural resources of PAs. It is also equally important to develop an

understanding regarding the very nature of dependence of the fringe communities along with aspects such as how and to what extent; such dependence influences the ultimate goal of conservation of biodiversity.

Nevertheless, Rodgers (2003) has established that there are no two separate management paradigms for PA management; rather, both approaches are complimentary to each other and therefore, protection, combined with participation should be the way forward for managing the PAs.

It was in this perspective that the present study was conducted in the fringe villages of Laokhowa and Burhachapori wildlife sanctuaries of Assam. The two PAs have historically derived their conservation value based on of the presence of key species such as the one-horned rhinoceros and the Bengal florican, among others. It was way back in 1907, when Laokhowa, along with Kaziranga, were declared as a reserve forest at the behest of Lady Mary Curzon, on the basis of its resident rhino population. However, the protection regime and conservation status of both PAs were dealt with a severe blow during the 1980s owing to withdrawal of armed protective cover of the PAs and subsequent poaching of the resident rhino population. With the passage of time, dependence of the fringe communities on the resources of the PAs and subsequent increase in the biotic and anthropogenic disturbances grew exponentially leading to large-scale degradation of the ecology of both PAs. There was a general neglect and negative attitude of the PA managers and the society as a whole towards the sanctuaries owing to the stigma inherited from the massacre of the rhinos.

Inclusion of the LBWLS as buffers of the newly-formed Kaziranga Tiger Reserve in 2007 provided the much-needed impetus towards the revival of the two PAs. The Nagaon Wildlife Division, which was entrusted with the management of LWLS and BWLS, could now access funds from key government sponsored schemes such as the Project Tiger scheme, among others, for implementation of a participatory conservation model involving the fringe communities, addressing the issues of their dependence and at the same time, work for enhancing the protective regime of the two PAs.

The present work studied the degree of forest resource extraction from LBWLS by fringe dwellers and sought to understand the nature of dependence of the fringe communities on the forest resources and at the same time identify the socio-economic drivers underpinning

such dependence. The study further assessed the ongoing participatory conservation management practices is implemented in the fringe villages of LBWLS and as the same time sought to correlate the nature and degree of dependence with the ongoing participatory management practices.

The study was conducted during 2011 to 2014. It employed various methods and methodologies in its approach towards the inquiries made towards its stated objectives. It employed both qualitative and quantitative discourses in order to collect primary and secondary data. Surveys in randomly sampled households and PRA interviews were conducted to collect data on dependency issues from ten fringe villages the PAs. Further, random surveys, field participations and interactions with frontline staff, EDC members and fringe dwellers along with consultation of management and working plans, among others, were used as methods for understanding the various perspectives on participatory management aspects of the PAs.

7.2 Findings

The following were the significant findings of the study:

A vast majority of the households of the fringe villages were found to be livestock owners. However, it was the Nepali and Bengali Muslim communities which were seen to be having the maximum dependency on livestock as a livelihood. A small percentage of households mostly belonging to the Nepali and Bengali Muslim communities were cattle station owners with significantly high livestock population. These households were not dependent on the PAs for grazing their cattle since their relocation to areas outside LBWLS in 2010; rather it was the marginal livestock owners which depended on the grasslands of the sanctuaries for livestock grazing.

The study identified socio-economic variables such as income level, nearness of the households to the sanctuary boundary, land holding and material possession as the critical factors influencing livestock dependency among the Bengali Hindus. Aspects such as income level, family size, education, land holding and perception towards LBWLS were identified as important dependency determinants among the Bengali Muslims. Further, among the Nepalis,

income level, house type and land holding were the major socio-economic determinants of livestock dependency. Education and perception towards the PAs were the important factors among the Lalung community while family size and education were found to be the major influencing factors of livestock dependency among the Bihari community.

More than 80% of the fringe dwelling households were involved in forest resource collection in various forms and extent. Dependency on firewood collection was found across all the communities, among which, the dependence among Nepalis was found to be significant. The Bihari community did not indulge in firewood collection while only the Bengali Muslims were indulging in commercial firewood extraction. Similarly, extraction of thatch from the PAs was seen only among some households of the Bengali Muslims most of which was for commercial purposes. It was seen that the Bengali Hindus, Bengali Muslims and Lalungs were engaged in fishing in the PAs, of which the former two were mostly engaged in commercial fishing.

It was seen that the except for family size, all the other observed socio-economic variables significantly influenced the degree of dependence on fishing among the Bengali Hindus. Family size, house type, distance of households from the PAs, level of material possession and perception towards LBWLS were the significant influencing factors among the community regarding dependency on firewood. Further, among the Bengali Muslims, except for factors such as distance of households from PAs and level of material possession, all the other socio-economic variables were significant in influencing the degree of dependence on fishing. Further, variables such as family size, education, house type, land holding and material possession were the major influencing factors of dependency on firewood while income level was the sole significant factor influencing dependency on thatch among the Bengali Muslim community. Among the Nepali community, aspects such as annual income and land holding size significantly influenced their dependence on firewood.

In spite of being dwellers of the forest and taungiya villages of LWLS, none of the socio-economic indicators were found to be significant among the Lalung community as drivers of dependency on forest resource collection. In fact, the settlement of their demands and allocation of land rights among under the 'The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006' during the year 2019-10 seemed to have had a positive influence of the dependency aspects among the households of the Lalung

community. On the other hand, the Bihari community was not involved in fishing or extraction of resources such as firewood and thatch.

Entry-point activities, facilitated mainly by Project Tiger funds, were undertaken among all the EDCs of LBWLS by the NWLD between 2010 and 2014 at a total cost of Rs 35, 67,463.00. The entry point activities were found to have been effective in resolving conflicts among the fringe dwellers and the forest department and this has paved the way for the initiation of alternative livelihood projects under the EDC programme.

The Burhachapori eco tourism resort run by the Dhania and Sisuati-Jhaoni EDCs and the mechanised tourist boat operated by the No 7 Bhogamukh EDC were two major alternative livelihood programmes were initiated by the state forest department in the region since November 2014. Both projects have been able to generate a decent amount of funds out of their earnings which is being used for community development activities.

The Local Protection Squads, comprising of motivated youths from the fringe villages has been implemented by the Nagaon Wildlife Division as a participatory protection mechanism in LBWLS. The LPS was found to have been instrumental in the controlling the degree of illegal forest resource extraction from LBWLS by the fringe dwellers and has helped in reducing conflict issues between the fringe villagers and the forest staff. The squads have led from the front in the control of human-wildlife conflict in the fringes of LBWLS.

Altogether, 86.88% of the villagers of the 28 fringe, forest and taungiya villages were enrolled as EDC members. Emphasis was given on the selection of those households as EDC beneficiaries which depended on the forest resources of LBWLS for their livelihood. It was seen that those households which earned a significant portion of their income from livestock were initially reluctant to participate in the EDC programme as beneficiaries. Further, households which perceived LBWLS as an area meant less for wildlife and more for livelihood and households which perceived collection of forest resources was legal were given priority in the selection process as EDC beneficiaries. Those households which received benefits under the EDC programme were seen to hold a positive opinion about the EDC programme.

It was seen that the degree of awareness regarding the need and importance of integrated village micro plans was low among the EDC executive members. A majority of the members felt that the ongoing EDC programme had contributed positively towards the conservation and revival of the LBWLS. The executive members were also of the opinion that more funds should be allocated to the EDCs so that alternative livelihood programmes could be initiated in more fringe villages. The forest staff serving as member secretaries of the EDCs was of the opinion that the degree of participation and involvement of general body member was below expectations while a majority of them felt that the programme has proven to be beneficial for LBWLS.

The lack of awareness among the fringe forest dwellers was reflected by the fact that most of them regarded livestock grazing and forest resources collection from the PAs as legal. At the same time, a majority believed that the PAs and their resources were more necessary for their livelihood sustenance rather than for wildlife conservation. This highlights the need for the conduct of more focused and sustained awareness activities among the villagers. However, with the implementation of the alternative livelihood programme, the forest department has ceased to undertake entry point activities. The EDC programme also needs be more specific towards addressing the dependency drivers in order to address the issues of dependence among the fringe dwelling communities.

7.3 Conclusion

The Laokhowa and Burhachapori are two historic PAs of Assam. Human negligence and mismanagement led to the severe degradation of their ecology during the 1990s decade. In spite of the heavy biotic and anthropogenic pressure on the two PAs during the last few decades, the overall ecology of the sanctuaries was seen to be more or less intact. It was the stigma of the 1983 incident of rhino poaching which led to overall neglect of the management of the PAs by the forest department. However, the sanctuaries got a new lease of life with their inclusion as buffers of the Kaziranga Tiger Reserve in 2007. This move enabled the Nagaon Wildlife Division to establish a strong participatory conservation mechanism and undertake measures to revive the WLSs. There was a sense of realization that the LBWLS were important components in ensuring landscape level conservation for the central Assam PA network, involving Kaziranga and Orang NPs.

Since the later part of the last decade, the overall biotic and anthropogenic disturbance in the PAs has declined considerably leading to an improvement in the degree of habitat usage of the wild fauna. However, certain issues such as encroachment, relatively low level of awareness regarding the importance of PAs, high forest dependency of the fringe forest dwellers, among others, still persists. It is hoped that the participatory conservation mechanism would help the forest department in tackling these issues.

After more than three decades, the sanctuary complex is all set become home for rhinos with the upcoming translocation of rhinos under the IRV2020 programme. The participatory conservation and PA management initiatives have contributed positively towards reviving the ecology of Laokhowa and Burhachapori WLSs. With the increase in the tourism, the PAs are now gaining more acceptances among the larger society, which has helped in removing the stigma associated with them since the 1980s. It is the need of the hour to ensure that these management and conservation initiatives are made sustainable and organic in the long run. And once this is achieved, the two sanctuaries will not only see their revival back to their past glory, but will also become a stand-out example of the 'inclusive' and 'humane' approach of ensuring the conservation of biodiversity in protected areas.

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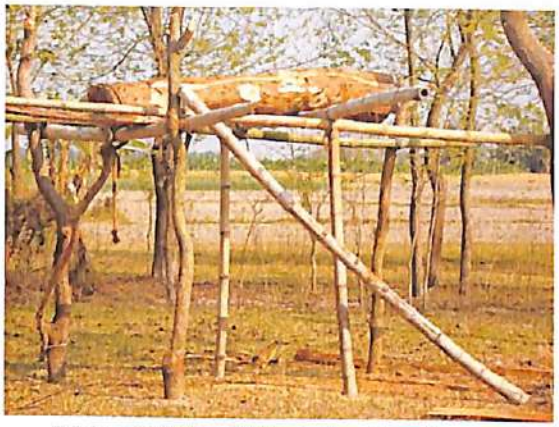
PHOTO PLATE 1

ILLEGAL TREE FELLING AND FIREWOOD COLLECTION FROM LBWLS



Make-shift Saw Mills in Sandhya Tapu

Modified Bicycles used for Transportation of Logs

Forest Villagers extracting Firewood from LBWLS

Women and Children carrying Firewood Bundles in front of the 14th Mile APC of LWLS

Firewood collected from LBWLS kept for Commercial Sale in Gorajan Town

Mark made by felled tree logs dragged along the forest floor of LBWLS using Domestic Buffaloes

Photo Credit: Researcher

PHOTO PLATE 2

ILLEGAL FISHING AND THATCH COLLECTION FROM LBWLS

Use of banned Mosquito Nets for Fishing in BWLS

A Fisherman in LWLS

Children indulging in illegal fishing in LWLS

Poisoning of Laokhowa Suti using Thyodene

Destruction of Wetland Habitat in the name of Community Fishing (Bawa) in LBWLS

Bundles of thatch extracted from LBWLS kept for sale in weekly markets in Rupahi Town

Photo Credit: Researcher

PHOTO PLATE 3

CATTLE STATIONS AND LIVESTOCK GRAZING IN LBWLS

A Cow Cattle Station (Khutti) in BWLS

A Buffalo Cattle Station in BWLS

Cattle entering LBWLS from fringe Villages

Livestock Grazing in the PAs' Degraded Grasslands

A Buffalo with a Bell tied to its Neck which acts

Grazed degraded grass blades in LBWLS

Photo Credit: Researcher

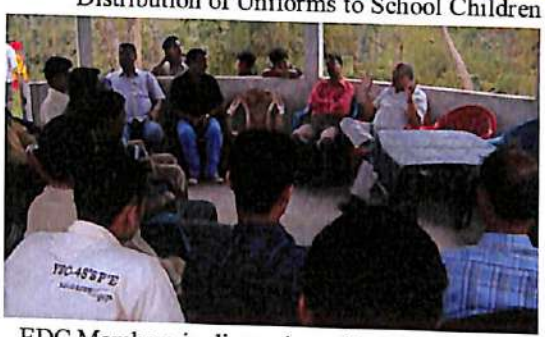
PHOTO PLATE 4

ENTRY POINT ACTIVITIES OF THE EDC PROGRAMME

Distribution of EDC Registration Certificates

Distribution of Uniforms to School Children

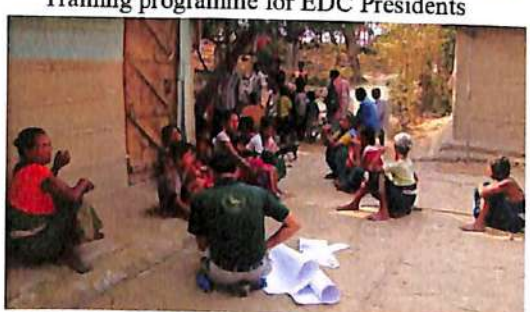
Free Medical Check-up of Fringe Villagers



EDC Members in discussion with Director, KTR

Training programme for EDC Presidents

Newly Constructed School Building in Dhania



Public Discussion for Village Micro Plan Preparaton

Inaguration of Public Toilets in Sutirpar EDC

Photo Credit: Researcher

PHOTO PLATE 5

ALTERNATIVE LIVELIHOOD ACTIVITIES OF THE EDC PROGRAMME

Inauguration Ceremony of Burhachapori Eco Resort

Student Tourists in front of the Resort

Dining Hall of the Eco Resort

Tourists enjoy Traditional Dishes in the Resort

Discussion with NTCA o the Resort and EDCs

Resort Committee in discussion with WWF-India

Training on Community Based Conservation

Newly Developed Home Stay in Sisuati-Jhaoni

Photo Credit: Researcher


MINOR RESEARCH PROJECT
NOWRONG GIRLS COLLEGE