HUMAN IMPACT ON FORESTS IN THE MIDDLE HILLS OF NEPAL

(In two volumes)

By

TEJ BAHADUR SINGH MAHAT

Dissertation submitted for the degree of
Doctor of Philosophy
at the Australian National University, Canberra.

VOLUME I

January, 1985

STATEMENT OF ORIGINALITY

Except where acknowledged, this dissertation is my own work.

I.B.S. Jahat.

....

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to my supervisor, Professor D.M. Griffin, for his keen interest in this study and for his guidance and advice throughout its course.

I am also very grateful to my advisor, Dr K.R. Shepherd, for his keen interest in the work and for the valuable advice and criticism he provided throughout.

The A.N.U. Forestry Department provided a very friendly environment for my work and I received valuable help and encouragement from many other of its members. In this regard I would particularly like to thank Dr L.T. Carron for advice received during development of the thesis topic, Dr M.T. Tanton and Mr T. Raath for assistance with the photographic appendix, Mrs J. Fenton for preparation of maps, Ms Paula Reid for guidance in using the library facilities and Mr J.A. Curtis, of the Nepal-Australia Forestry Project, who helped me and my family in many ways during our stay in Canberra.

I thank all those interviewed in Nepal, particularly in the Chautara Division, for their time and patience. My thanks are also due to Dr D.A. Gilmour and Mr D.P. Parajuli and the staffs of the Nepal-Australia Forestry Project and the Chautara Forest Division for assistance during the field work in Nepal.

I also wish to thank Messrs A. Fearnside, R.G. Campbell and S.J. Midgley for help in obtaining material for the study.

For help in finalising my thesis, I am grateful to Mr N.M. Semple, who proof-read it and provided much useful advice, and to Mrs Elizabeth Campbell, Miss Heather Minns and Mrs Elizabeth Robinson, who typed it.

I am grateful to the Nepal-Australia Forestry Project for much assistance, in both Australia and Nepal, in connection with my study. The experience I shared with this Project in the Chautara Division prior to undertaking the formal study provided motivation and much material for the study. For this I am grateful.

I should like to record my gratitude to the Australian Development Assistance Bureau for the financial assistance provided through the Nepal-Australia Forestry Project for this study.

I also thank His Majesty's Government of Nepal for allowing me to undertake this study.

During our stay in Canberra my family enjoyed the companionship of many friends who helped greatly to ease the burden of my studies. In this regard I would particularly like to mention Susan Salthouse, Dao Midgley, Noel Semple, Don and Eleanor Stodart, Dorothy Brown and their families.

I am deeply indebted to my family in Nepal - particularly my father and mother - who motivated me to undertake the study and have constantly encouraged me throughout its course.

Finally I extend my very special thanks to my wife Meena and our children Anu, Sony and Kumar (Baboo) who shared with me the pleasure and pains of a long graduate study at Canberra. I could not have gone through this study without their loving support, patience and tolerance.

ABSTRACT

This dissertation seeks to set in a historical context man's influence on the forests of the Nepalese Pahad (the Middle Hills and montane areas). This is a complex task because the forests have never stood apart as a separate sector in Nepal but have always been interwoven with other land uses and with political, social, demographic and economic change.

There are three depths of consideration, associated with three sources of information. In the first, sources of information are almost entirely secondary but they enable a general picture of Nepal as a least developed country to be given, with emphasis on those aspects that have any bearing on forests. In the second, the attention is focussed on Sindhu Palchok and Kabhre Districts, for which the author was the Divisional Forest Officer from 1973 to 1980. Here, much material is derived from the author's personal knowledge. Finally, ten panchayats in the two Districts, centred on the village of Thokarpa, are examined in detail largely using data gained from the author's own field work undertaken during the course of his Ph.D. studies.

The study leads to a number of conclusions. First, that the deforestation of the Pahad is not a recent phenomenon but has a long history, being well established by the late 18th century at least. Within the two districts there is now no forest land suitable for conversion to arable land, with the possible exception of some areas on the southern slopes of the Mahabharat Lekh. It appears that the situation has been the same for many decades and probably for more than a century. Second, that deforestation in much of the Pahad,

and certainly in Sindhu Palchok and Kabhre, was caused mainly by the joint attack of government land use policy and subsistence agriculture. Government policy promoted the conversion of forest to agriculture in order to maximize agricultural surpluses and land taxes. Further, the forest was used extensively for many purposes that extended beyond simple subsistence living, e.g. fuel for many manufacturing processes and timber for the construction of the towns of the Kathmandu Valley. Subsistence living involved a multi-faceted use of the forest mainly for timber, fuelwood and fodder, the latter closely linking the forest to agriculture. Thus the productivity of the agricultural land depended significantly on the manure of animals fed on tree leaves. In many areas the combined effects of lopping, browsing and fire have caused the degeneration of the surviving forest.

These studies also show that the condition, distribution and extent of forests in a district can only be understood in the light of a comprehensive historical survey of all the factors that have had effects. The factors have different effects in different areas so that extrapolation from one area to another is fraught with danger. Thus deforestation is likely to have occurred earliest and most intensively in areas where government pressure was most easily and continuously applied, such as in the heartland of Sindhu Palchok and Kabhre including the Thokarpa area.

The dissertation also records factors which led to the emergence of community forestry in the Chautara Forest Division, a development that has since spread through much of Nepal. In the light of much evidence of neglect of the welfare of the peasants of the Pahad by the government through much of Nepalese history and of the state's poor custodianship of the nation's forests, the emergence of a sense of local, community-based responsibility for the forested land is seen as the most likely way to arrest, even reverse, the slow deterioration of the forests with all the adverse environmental impacts this entails.

TABLE OF CONTENTS

Volume II

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
APROSC	Agricultural Projects Services Centre
B.S.	Bikram Sambat, the Hindu calendar
c.	ca., circa, about
C.B.S.	Central Bureau of Statistics
C.D.O.	Chief District Officer
CEDA	Centre for Economic Development and Administration
D.F.O.	Divisional Forest Officer
dbh	diameter at breast height
Dept.	Department
Div.	Division
Dy.C.C.F.	Deputy Chief Conservator of Forests
EAPD	Economic Analysis and Planning Division
ERTS	Earth Resources Technology Satellite
F.	Forest, block studied by the author
FAMSD	Food and Agriculture Marketing Services Department
FAO	Food and Agriculture Organisation
FRS	Forest Resources Survey Office
Govt.	Government
HMGN	His Majesty's Government of Nepal
HMG Nepal	His Majesty's Government of Nepal
I.	Interviewee number
IDA	International Development Agency
IHDP	Integrated Hill Development Project
K.	Khola
Kabhre	Kabhre Palanchok
LSU	Live Stock Unit
MFA	Ministry of Food and Agriculture
NAFP	Nepal-Australia Forestry Project
P.M.	Prime Minister
pers.comm.	Personal communication
R.	River

SATA	Swiss Association for Technical Assistance
Sambat	Bikram Sambat, the Hindu calendar
TU	Tribhuwan University
UN	United Nations
UNDP	United Nations Development Programme
W.B.	World Bank

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

GENERAL INTRODUCTION

Deforestation has in recent decades become a topic of widespread concern to a great diversity of people, amongst whom are forest conservationists, biologists, watershed managers, commercial timber traders and, above all, those in lesser developed countries whose lives depend directly or indirectly on forest products such as fuelwood. Numerous articles in newspapers are evidence that this topic is also seen to be of general interest to many not immediately affected.

Despite the holding of many conferences and workshops and development of a large literature, there has been great confusion on such fundamental issues as the amount, rate and causation of deforestation. Earlier estimates of tropical forest resource made by FAO varied greatly because of inadequacies in the methods used to gather data and only in 1982 did the report of Landy present data that have been generally accepted. Some of Landy's words about the nature of the problem are worth quoting:

> "In an era where speed is of the essence, people who use information are in a hurry and they either do not take, or else they have not got, the time needed to collect and interpret the mass of information available. In their defense it should be said that this work of organization and interpretation of existing information is long, boring and in any case, much less stimulating than the work involved in juggling with models and other intellectual games... that, unfortunately, very often involve the use of doubtful data. We can also say in their defense that for some time now the world's press has taken up the problem of the reduction and degradation of tropical forests and some confusion has developed particularly as regards the concepts and the entities in discussion.

> Are we talking of tropical countries or developing countries? Of closed tropical forests or of all tropical tree and/or shrub formations? Are we talking only of moist tropical forests or of all tropical forests? When we speak of the depletion in the tropical forests, are we talking about a reduction of forest areas or only of a reduction in the growing stock through logging, which, (is it necessary to repeat?) is an integral part of forest management and development. There has been a lot of debate in recent years on the problems of tropical forest resources without, however, there being any attempt to organize the existing information nor to introduce some clarity in the concepts being utilized."

If such problems exist in establishing the extent of the current resource they are even greater in determining causation in relation to the rate of deforestation. Who, or what, are the villains and how serious and rapid are their depradations? To begin to provide answers to such questions requires the development of some historical depth of knowledge but all too often this is least available where it is most needed. Forest history is relatively well-known, and sometimes surprisingly detailed over a period of centuries, for individual forest areas, for much of North America and Europe but these are not the continents in which the crisis of deforestation is occurring. In Asia, Africa and Latin America much change occurred before the regular keeping of written records and even during colonial time the record is often scanty. Yet the crisis is located in these continents and it is here that increasing efforts are being made to reverse what is often reported as a rapidly deteriorating situation. However, the real rates of change (particularly within specific forest types) are seldom known accurately and the current rates cannot be set in an historical context. Causation, both current and historic, is often equally debatable. In the absence of such essential background it is impossible to establish a well-based forest policy for a country or even to produce an adequate appraisal of a proposed assistance project. Neisslein (1984) has asked the question 'Can historical research be of help in forest policy decisions?'and not surprisingly concludes that it can be of considerable assistance.

A major aim of this dissertation is to support this contention by attempting to establish the place of forestry in the developing context of Nepalese history. This is a complex task because the forests have never stood apart as a separate sector in Nepal but have always been inextricably interwoven with other land uses and with political, social, demographic and economic change. Special attention is given to the Pahad because of the subsequent development of the dissertation. (The Pahad lies between the high Himalaya to the north and the low elevation, flat Terai zone bordering India to the south. It comprises the heavily-populated Middle Hills and the higher montane zone to the north, at the altitudinal limit of human activity.)

The main body of this dissertation divides into three parts reflecting three depths of consideration and three sources of information. In the first (Chapters 2 and 3), a general picture of Nepal is given, with emphasis on those aspects that have any bearing in the widest sense on forest. Here, the sources of information are almost entirely secondary but this material in toto has never before been brought together in a way that emphasizes its relevance to forestry. In the second (Chapter 4), the field of vision is reduced and attention is focussed on two districts, Sindhu Palchok and Kabhre Palanchok, which formed the Chautara Forest Division until the reorganization of the territorial structure within the Ministry of Forests and Soil Conservation in 1983. (In general usage, the name of the second district is usually abbreviated to Kabhre and this practice will be adopted throughout this dissertation.) The author was Chautara Divisional Forest Officer from early 1973 to early 1980 and much of the material is derived from his personal knowledge and observations, although secondary sources are also utilized. In the third part (Chapter 5) the field of vision is further reduced to encompass a study in detail of an area centred on the village of Thokarpa lying on the eastern slopes of the Sun Kosi river and within the former Chautara Forest Division. The content of this part is based on information gathered by the author in the field between November 1982 and February 1983 during the course of his Ph.D. studies. This information includes specific field observations and the results of an extensive series of personal interviews with local residents conducted by the author.

It is anticipated that the rationale for this dissertation will be better understood by the reader if the major theses that arise from it and the evidence to support them are set out in this Introduction. There are two. First, that the deforestation of the Pahad is not a recent phenomenon but has a long history, being well established by the late 18th century at latest. Second, that deforestation in much of the Pahad, and certainly in Sindhu Palchok and Kabhre was caused by the joint attack of government land use policy and subsistence agriculture. Government policy promoted the conversion of forest to agriculture and the use of the forest for many purposes that extended beyond simple subsistence living. Subsistence agriculture involved a multi-faceted use of the forest mainly for timber fuelwood and fodder, the latter closely linking the forest to agriculture.

A number of corollaries arise from these two main theses. The first is that the condition, distribution and extent of forests in a district can only be understood in the light of a comprehensive historical survey of all the factors that have had effects. A second is that these factors will have different effects in different areas. Extrapolation from one area to another is therefore fraught with danger. Thus deforestation is likely to have occurred earliest and most intensively in areas where government pressure was most easily and continuously applied, such as in the heartland of Sindhu Palchok and Kabhre including the Thokarpa area.

The dissertation is concerned with these two main themes, the long-standing nature of the deforestation and the joint causes of this deforestation. In addition, and towards the end, this dissertation records factors which led to the emergence of community forestry in the Chautara Forest Division, a development that has since spread through much of Nepal. In the light of much evidence of the neglect of the welfare of the peasants of the Pahad by governments through much of Nepalese history and of the state's poor custodianship of the nation's forests, the emergence of a sense of local, community-based, responsibility for the forested land is seen as the most likely way to arrest, even reverse, the slow deterioration of the forests with all the adverse environmental impacts this entails.

Two conventions adopted are best noted at this early stage. Dates are given according to the Christian calendar for wider intelligibility although the Hindu calendar might be seen as more appropriate in a Nepalese setting. The conversion is easily made: the year B.S. (Bikram Sambat) is obtained by adding 57 to the year A.D. Second, the author carried out many personal interviews, the details of which are given in Appendix III. In the text information obtained is attributed to a person or persons interviewed by giving each person a number, e.g. (I.24). Appendix IV gives a list of interviewees.

A photographic appendix (VII) is included and it is recommended that readers look through this before reading the text in order to gain some visual appreciation of the field study area which forms the subject of Chapter 5. Because of the general nature of many photographs they are not always referred to individually in the text.

A Glossary of Nepalese words and terms may be found immediately before the Bibliography in Volume 1 of this dissertation.

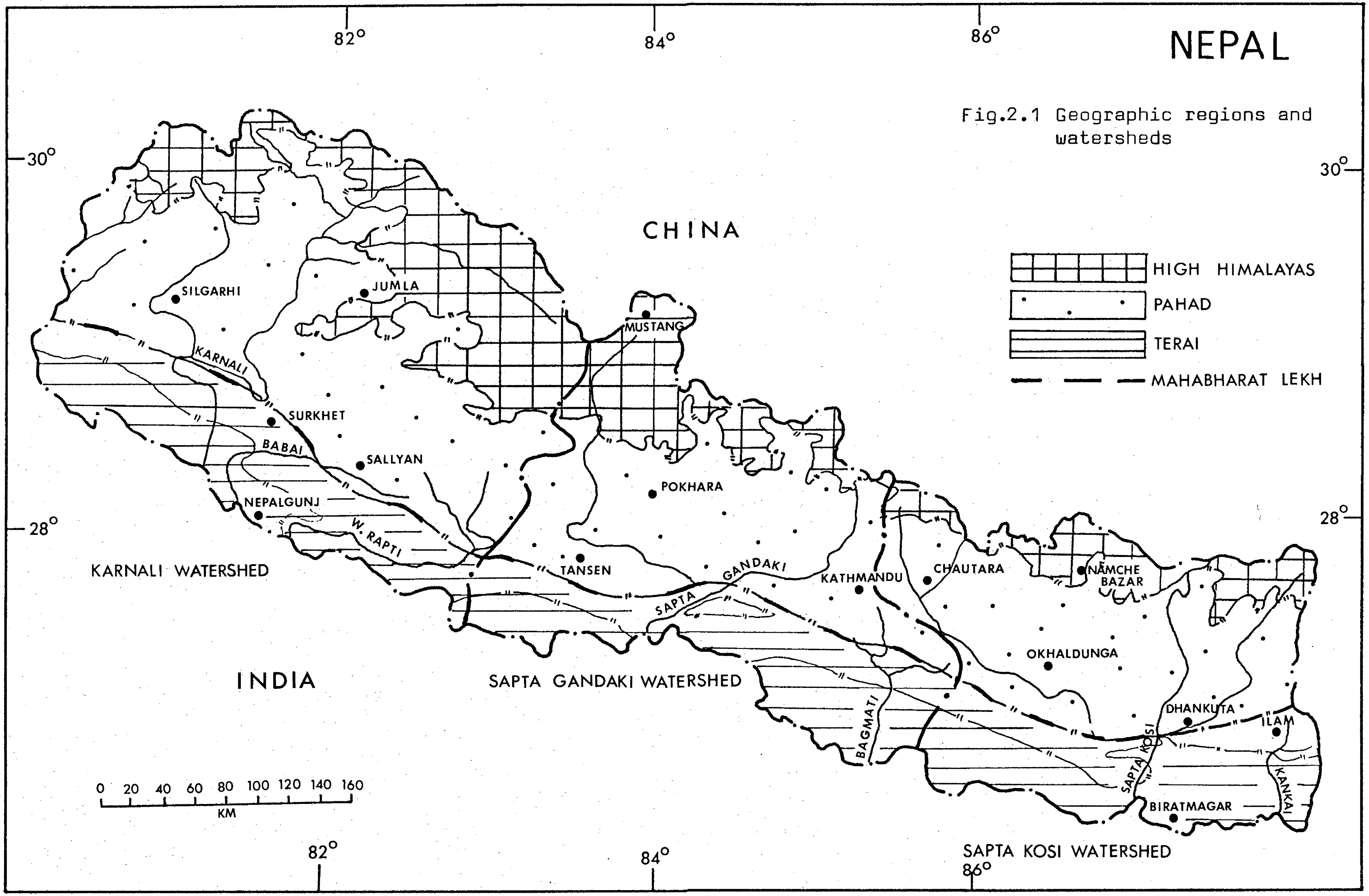


Fig.2.1 Geographic regions and watersheds

CHAPTER 2

INTRODUCTION TO NEPAL

2.1 GEOGRAPHY

2.1.1 General

Nepal is a landlocked country of 144,181 km^2 lying between the Himalaya to the north and the Indo-Gangetic plain to the south. It lies between 80° 4' and 88° 10' east and 26° 20' and 30° 27' north, with maximum length and breadth of 900 and 240 km respectively: the nearest coastline is 1,127 km distant in the Bay of Bengal. The elevation varies from 60 to 8,848m above sea level.

From south to north, the country may be divided into three geographic regions (the Terai, Pahad and High Himalaya), with further subdivisions (Fig. 2.1).

The Terai. The southernmost region (23% of Nepal by area) is the Terai, with four major sub components. The most southerly is the Terai proper, a part of the Indo-Gangetic Plain, generally at 100-300m above sea level. The soils are alluvial clay and silt deposits and are now extensively used for agriculture, although they carried extensive forest until 30 years ago. Bordering the Terai proper is the Bhabar zone, slightly more elevated, and consisting of deep deposits of gravel and boulders. Only major rivers cross the Bhabar zone on the surface; most drainage is underground. This 13 km wide belt was heavily forested until recently but many areas now support marginal agriculture.

The Churia range (also called the Siwalik (Siva-Lekh) hills) rises abruptly from the plains and forms the northern boundary of much of the Terai. Of average elevation 1,500m, much of the Churia range is composed of coarse-grained sediments. The soils are relatively poor and easily subject to severe erosion so the area remains mainly covered by forest. In certain areas, dun valleys (running approximately WNW-ESE) lie between the Churia range and the next range, the Mahabharat Lekh. These dun valleys were densely forested until recently, protected by both government policy and virulent malaria. Since the eradication of malaria in the mid-1950s, they have been progressively cleared for agriculture.

The Pahad. The Pahad (43% of Nepal by area) lies to the north of the Terai, and its southernmost component is the Mahabharat Lekh with an elevation of 1,500 to 3,000m. This range, broken only by a few major rivers, forms a formidable barrier between India to the south and the Nepalese heartland to the north. Although the northern slopes are somewhat gentler than the southern the relief is generally very steep. Colonization by man generally occurred from the north and now the northern slopes have a population density comparable to that of the source districts. Southern slopes, however, at least in Kabhre District, (interviews conducted by D.M. Griffin, (1983a) pers. comm.) were settled in the last 100 years and population density remains lower. Much forest remains on the Mahabharat Lekh, although it is under considerable pressure.

North of the Mahabharat Lekh lie the Middle Hills, the heartland of Nepal. This area forms 30% of Nepal, is 60 to 100 km in breadth, extends the length of the country and, somewhat arbitrarily, lies below 2,300m. Two-thirds of Nepal's population lives here, favoured by a relatively equable, agreeable climate. The geomorphology is very complex but is dominated by the extreme relief provided by hills and valleys, continuous hill slopes from 600 to 3,500m being not uncommon. Agriculture is largely undertaken on terraces and most land suitable for agriculture has for long been reclaimed from forest. Highest productivity occurs in a few tectonic basins, e.g. Kathmandu Valley and Pokhara Valley, and on tars, old river bench terraces.

In the Middle Hills, arable agriculture is largely limited to elevations below 2,000m. Between 2,300 m and the tree-line at about 4,000 m lies the montane zone (about 18% of Nepal) largely covered in coniferous forest and grass and herb fields and populated by transhumant pastoralists.

The High Himalaya. Within this zone are to be found the main Himalayan range, the Tibetan Marginal Mountains (only in western Nepal) and the trans-Himalayan valleys. Although grazing may occur up to 5,000m (the permanent snowline in central Nepal) in summer and some of the dry inner valleys are inhabited, the zone is of little economic significance except in terms of mountaineering and tourism.

The main Asian watershed lies not along the crest of the Himalaya but rather on the Tibetan Marginal Mountains. North of these, drainage is into the Tsangpo system, south into the Indo-Gangetic systems. The main river systems draining through Nepal are from east to west, the Sapta Kosi, Sapta Gandaki and the Karnali, each with many (traditionally considered to be seven, sapta) tributaries. There are many smaller, but still large, rivers such as the Bagmati draining the Kathmandu Valley area. Most follow a southerly course in their northern portions but then follow an east-west line for extensive distances north of the Mahabharat Lekh before breaching that range into the Terai.

2.1.2 Geology and soils

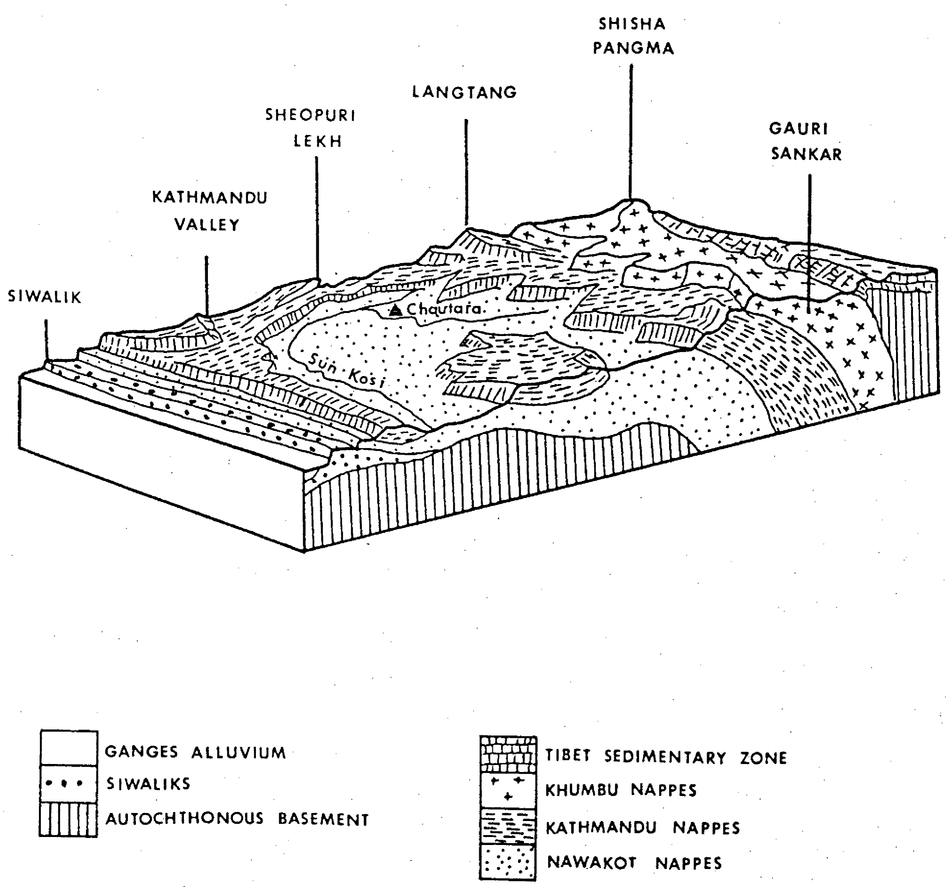
According to the current theories of plate tectonics the southern continent of Gondwanaland broke up about 100 million years ago and one part, now India, moved to collide with the Eurasian plate about 53 million years ago. Many sedimentary strata were laid down in the sea then lying between India and Eurasia and these strata were subsequently compressed, folded and thrown up as the Indian plate underwent progressive subduction under Tibet. The upthrust strata form the Himalaya and much of Nepal (Hagen, 1961). Geologically, therefore, the rocks of Nepal consist of not only sedimentary strata, e.g. sandstone, limestone, dolomite, but also many metamorphic rocks, e.g. slates, schists and gneisses, and plutonic rocks, e.g. granites. Erosion and subsequent deposition have led to the creation of many alluvial areas, both in valleys and, more importantly, in the Bhabar and Terai. (A tectonic block diagram of eastern Nepal including the Chautara region is shown in Fig. 2.2.)

Hills soils are generally of coarse to medium texture with very high permeability. They are generally acid and are often podsolized at higher elevations. Fertility is usually low to moderate. Boron deficiency is widespread. Alluvial soils in the Terai and elsewhere vary greatly in texture and productivity. Some clays in hotter drier areas are moderately alkaline (Sharma, 1974; Shrestha and Sharma, 1980).

2.1.3 Climate

The Himalaya are the dominant influence on the Nepalese climate and the country may be divided altitudinally into tropical, subtropical, temperate and alpine climate zones.

Fig. 2.2 Tectonic block-diagram of East-Central Nepal including Chautara



(Adapted from Hagen, 1961)

The southeast monsoons bring heavy rainfall in summer, between June and September. The average annual rainfall of Nepal is about 1,600 mm, 75-80% of which occurs during this monsoon period. The mean annual rainfall ranges from 300 mm or less in the west in the region of the Tibetan Marginal Mountains to over 3,500 mm along the southern slopes of the Annapurna range near Pokhara. Although most of Nepal receives rainfall varying between 1,000 and 2,000 mm per annum, (2,000 mm at Chautara, in the special study area (see Fig. 2.3)) the rainfall distribution pattern varies both in north-south and east-west directions. Generally, the eastern part of the country receives earlier and more rainfall from the summer monsoons than the west whereas the winter rainfall declines from west to east but there are several local exceptions to these general patterns.

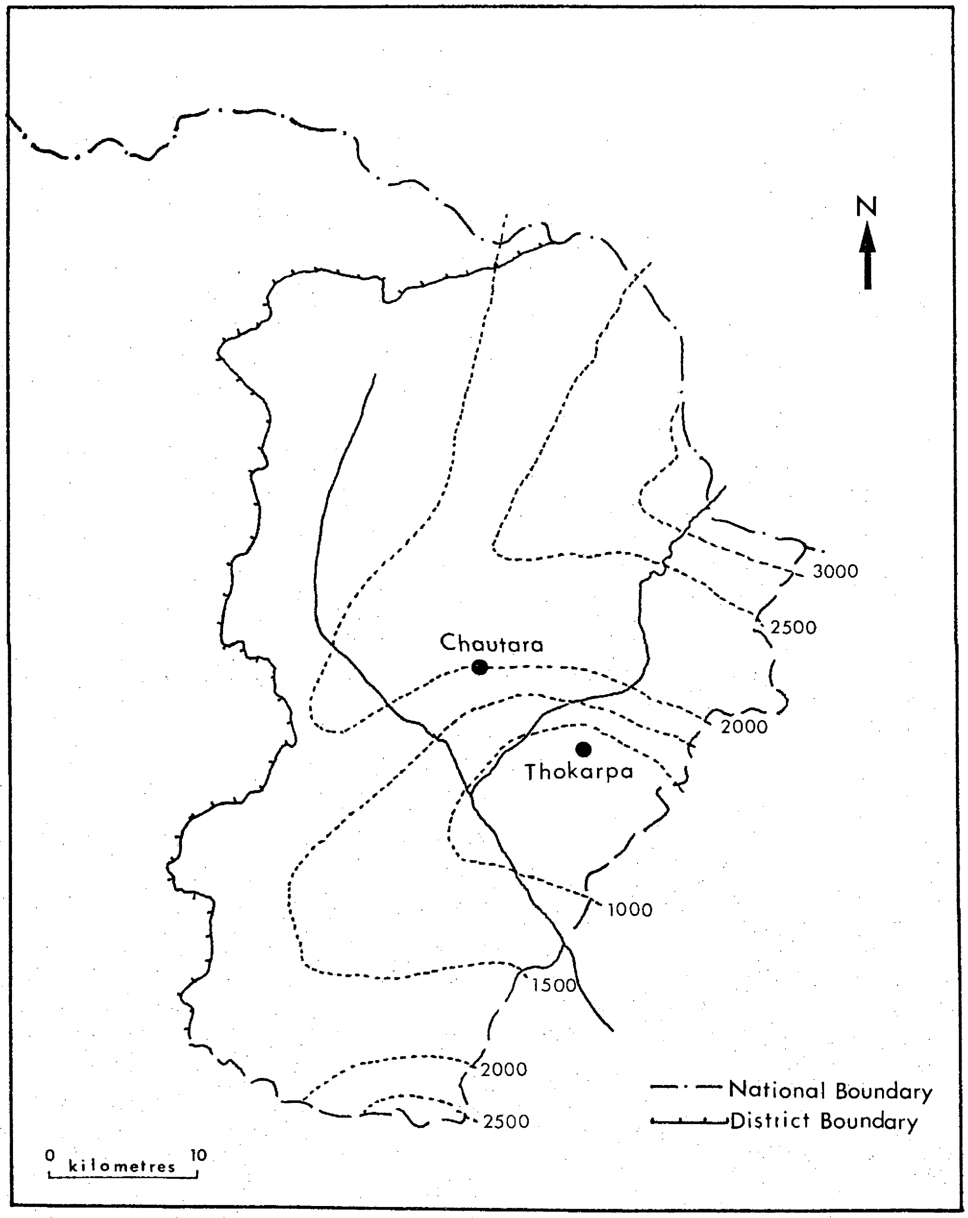
The summer maximum temperatures range from 40°C in the Terai to about 28°C in the Pahad. During the winter the maximum and minimum temperatures are about 23°C and 7°C for the Terai, and 15°C and 4°C for Chautara at an elevation of about 1,500m in the Pahad.

2.1.4 Forest and other land use areas

Table 2.1 presents estimates of areas under various land uses prepared by the Forest Resources Survey Office (1964), Economic Planning Division of Ministry of Food and Agriculture (1971/72), International Development Agency Settlement Mission (1972) and the National Planning Commission (1975 and 1980). The accuracy of the estimates is very doubtful because only the first is based on original survey information. Further, there are great uncertainties concerning the definitions of 'forest' and 'pasture land'. In many cases areas designated as forest are in fact mere shrubberies which themselves

Fig. 2.3 Rainfall, Sindhu Palchok & Kabhre Districts

(see also Fig. 4.1)



grade into rough grazing land (pakho). Further, the various agencies involved have put forward different types of land use data and large discrepencies occur between these. Therefore, an assessment of the past extent of forest and deforestation on the basis of historical statistical data is not possible. However, available information from the past few decades clearly indicates that land use patterns are changing fast in some of Nepal. This has been especially true in the case of the diminishing forest area, which is directly proportional to increasing agricultural land area. Nationally, inappropriate land use practices have tended to intensify erosion and hence reduce agricultural productivity, forcing further encroachment onto land not previously used for agriculture. The cycle, in turn, is repeated, further reducing both the agricultural productivity and the forest area and yield. This has perpetuated a continuing deterioration of the population's living standards.

Land use changes and, particularly, the loss of forest areas and consequent gain in agriculture land have been particularly significant in the Terai but much less so in the Middle Hills. The fact that even trained foresters like Collier (1928) and others defined Nepal's Terai forest resource as an 'inexhaustible' source of timber for export as railway sleepers and other goods, indicates that the abundance of forest resource in Nepal was taken for granted. Hardly any attempt was made to assess it until recently. This misleading conclusion largely contributed to the at first gradual and then more accelerated process of deforestation of the Terai in the last 50-60 years.

Table 2.1 Various estimates of land use in Nepal. Areas expressed in units of 1000 ha: figures in parenthesis are percentages.

Land use category / Source	FRS[1]	MFA(EAPD)[2]	IDA Mission[3]	National Planning Commission[4]		Change
Date	1964	1970/71	1972	1974	1980	1974-1980
Forests	6400	4500	5000	4823 (34.2)	4099.7 (29.1)	-723.3 (-15.0)
Cultivated land	3200	2000	2300	2326 (16.5)	3126.8 (22.2)	800.8 (34.4)
Land under snow	2900[5]	2100 (15.0)	2100 (15.0)	2112.1 (15.0)	2112.1 (15.0)	-
Non-reclaimable	400[6]	2600	-	30[7] (0.21)	30[7] (0.21)	-
Reclaimable[8]	900	1800 (12.7)	1700 (12.7)	1785.7 (12.7)	1785.7 (12.7)	-
Water bodies				400 (2.8)	400 (2.8)	-
Others	300[9]	1100	3000[10]	2629.1 (18.6)	2551.6 (18.1)	-
Total	14100	14100	14100	14100	14100	

[1]FRS - Forest Resources Survey study undertaken in 1963-64 (HMG Nepal, 1967,1973).

[2]MFA(EAPD) - Ministry of Food & Agriculture, Economic Analysis and Planning Division (HMG Nepal, 1971).

[3]IDA Mission - International Development Agency (quoted in HMG Nepal, 1983)

[4]National Planning Commission (HMG Nepal, 1975 and 1980).

[5]Includes alpine non-snow areas in far western Hills.

[6]Urban and village areas, barren and badly eroded lands.

[7]Settlements and roads.

[8]Grass land/ pasture land.

[9]Water. [10]Mainly wastelands, built-up areas, non-reclaimable land and shrub.

In the last 3 or 4 decades different agencies and authors were involved in making assessments of the country's forest resource. Tables 2.2 to 2.5 and the accompanying brief description provide regional breakdowns of the relevant data generated by these investigators. The data indicate that much of the loss in forest area of the past few decades has taken place in the Terai and the Siwalik regions. It was this apparent loss of Terai and Siwalik forest resource in recent times that has been generalised by many writers and reporters for the whole of Nepal including the Middle Hills region.

Regional breakdown of forest resources.

The Forest Resources Survey office made the first attempt at comprehensive assessment of forest resources in Nepal in 1963-1964 (Forest Resources Survey, 1967, 1973). It presented the data on Nepal's total forest area of 6.4 Mha, at that time, in terms of two very broad ecological regions: the Terai and Hills, with 1.8 Mha and 4.6 Mha of forest cover respectively (Table 2.2). An entire area in the highest northern mountainous belt, however, was left out and this, according to later estimates (FAO/UNDP, 1980; Table 2.3), contained 0.1 Mha of high altitude (montane) forest.

The data for the Terai included the Bhabar, dun valleys and even the Churias besides the Terai proper. Thus the first effort of scientific measurement of Nepal's forest resources presented only rough estimates for very broad ecological regions.

Table 2.2 Forest area and growing stock in 1964. Data from Forest Resources Survey (HMG Nepal, 1967, 1973). Figures in parenthesis are percentages.

Geographic region	Area (Million ha)			Growing stock				
				Volume		Yield		
	Total land	Non-forest	Forest	Total cu.ft.	Per hectare cu.ft.	Total annual yield cu.ft.	Annual yield per ha. cu.ft.	Annual yield %
Hills	10.707 (76.0)	6.128 (43.5)	4.579 (32.5)	11025.9	2407.9	210.19	45.90	1.91
Terai	3.373 (24.0)	1.550 (11.0)	1.823 (13.0)	6179.5	3389.7	143.12	78.51	2.32
Nepal	14.080 (100)	7.678 (54.5)	6.402 (45.5)	17205.4	2687.0			

The World Bank's 'Agriculture Sector Survey of Nepal (1974)' based its estimates on data from the 1972 earth resources technology satellite (ERTS). The following areas of forest (in Mha) were said to be present in 1972: Terai and Bhabar (1.2), Siwalik and lower Mahabharat (0.5), upper Mahabharat (2.5) and southern Himalayan valleys (probably equivalent to the Middle Hills) (1.0), a total of 5.2 Mha. These data were further compared with those obtained by aerial photography in 1964 for the Forest Resources Survey and it was concluded that there had been a total loss of c. 340,000 ha of forest land (equivalent to 3% since 1964) in the Terai. Loss of 180,000 ha of this forest was attributed to official settlement of hill people, and another estimated 50,000 ha to illegal migration.

The IDA Settlement Mission, based on the 1972 ERTS imagery analysis, also indicated a loss of 57% merchantable stock since 1964 in the Terai.

In 1980 FAO/UNDP published a study based on the interpretation of 1975 ERTS imagery at 1:50,000 scale and provided a regional breakdown (Table 2.3).

The latest data on land use and particularly the extent of forest area and decline of forest cover since 1964 in various geographical regions of Nepal are provided by a study done by a Canadian firm of resource management consultants (Robinson, Merritt and de Vries, 1983) for the Water and Energy Commission (Ministry of Water Resources, HMG Nepal) in 1982.

Table 2.3 Land use by regions in 1975. Areas expressed in units of 1 Mha. Data from FAO/UNDP (1980). Figures in parenthesis are percentages.

Geographic Region	Area	Cover type[1]		
		Forest	Agriculture	Brush
High Himalaya	3.3611 (100)	0.1008 (3.0)	0.0336 (1.0)	3.2267 (96.0)
Transition	2.5134 (100)	1.2064 (48.0)	0.4524 (18.0)	0.8546 (34.0)
Middle Mountain	4.2067 (100)	1.1779 (28.0)	1.3461 (32.0)	1.6827 (40.0)
Siwaliks	1.8187 (100)	1.2003 (66.0)	0.3819 (21.0)	0.2364 (13.0)
Terai	2.1799 (100)	0.4142 (19.0)	1.6567 (76.0)	0.1090 (5.0)
Total (Nepal)	14.0798 (100)	4.0996 (29.1)	3.8707 (27.5)	6.1094 (43.3)

[1] Cover types are defined as:

Agriculture: cultivated land.

Forest lands with at least 50% tree canopy.

Brush: grass or shrublands in most of the country. In the High Himalaya, areas of ice, snow and rock masses and alpine meadows are included.

This study presents data according to three major watersheds and three geographic regions, i.e. in nine zones in all. The data presented for the three major watersheds of Karnali, Sapta Gandaki and Sapta Kosi include also, for reasons of simplicity, the minor river basins in their vicinities. The three geographic regions are the Hills, Siwaliks and Terai. The high Himalaya region is not included as it is either barren rock or under perennial snow and supports no forest. The Hills region includes the middle and the lower Himalayan regions. The Mahabharat Lekh forms the border

Table 2.4: Land use areas (ha) determined from aerial photography and Landsat imagery. Data from HMG Nepal, Ministry of Water Resources, Water and Energy Commission (1983).

Geographic region & area	Land use	Aerial photography		Landsat imagery	
		1964	1977/78	1972	1979
Terai	Forest	896,486	639,506		
	Scrub/shrub	12,490	19,967		
(2,448,400 ha)	Sub-total	908,976	659,473	739,417	576,238
	Non-forest	1,433,648	1,652,520		1,747,469
	Open	2,614	762		-
	Water	103,162	135,645		124,693
	Total	2,448,400	2,448,400	2,448,400	2,448,400
Siwaliks	Forest	1,394,033	1,142,169		
	Scrub/shrub	65,081	168,403		
(1,582,000 ha)	Sub-total	1,459,114	1,310,572	1,346,282	1,313,559
	Non-forest	59,666	197,243		242,898
	Open	44,232	25,298		-
	Water	18,989	48,887		25,599
	Total	1,582,000	1,582,000	1,582,000	1,582,000
Hills	Forest	2,222,338	2,266,888		
	Scrub/shrub	1,873,993	1,778,448		
(7,689,000 ha)	Sub-total	4,096,331	4,045,336	3,755,548	3,723,771
	Non-forest	2,879,577	2,625,204	3,050,802	2,783,463
	Open	614,050	948,005	717,982	1,114,419
	Water	99,043	70,015	164,666	67,346
	Total	7,689,000	7,689,000	7,689,000	7,689,000

Table 2.5: Percentage land use areas determined from aerial photography and Landsat imagery. From HMG Nepal (1983).

Geographic region & area	Land use	Aerial photograph		Landsat imagery	
		1964	1977/78	1972	1979
Terai	Forest	36.6	26.1		
	Scrub/shrub	0.5	0.8		
(2,448,400 ha)	Sub-total	37.1	26.9	30.2	23.5
	Non-forest	58.5	67.5		71.4
	Open	0.1	0.0		-
	Water	4.2	5.5		5.1
	Total	100	100		100
Siwaliks	Forest	88.1	72.2		
	Scrub/shrub	4.1	10.6		
(1,582,000 ha)	Sub-total	92.2	82.8	85.1	83.0
	Non-forest	3.8	12.5		15.4
	Open	2.8	1.6		-
	Water	1.2	3.1		1.6
	Total	100	100		100
Hills	Forest	28.9	29.5		
	Scrub/shrub	24.4	23.1		
(7,689,000 ha)	Sub-total	53.3	52.6	48.8	48.4
	Non-forest	37.4	34.1	39.6	36.2
	Open	8.0	12.3	9.3	14.5
	Water	1.3	0.9	2.1	0.9
	Total	100	100	100	100

between the Hills and the Siwaliks region. From the foothills of the Siwaliks to the south is the Terai region.

For the purpose of land use classification this study further attempted to divide what is generally classed as forest land into forest and shrub/scrub areas. Other land use categories considered were non-forest areas, open areas and water. According to this study, categories can be defined as follows:

Forest - areas covered by commonly recognised tree species of any size and with a crown closure of at least 10%.

Shrub/scrub - areas currently stocked with shrubs and unmerchantable tree species of up to 6m height. A light overstorey of trees with commercial content may exist. If the crown closure of this overstorey is less than 10% the shrub/scrub classification is applied.

Non-forest - all agricultural land, grassland and high mountain meadow areas which are considered to be agricultural. Remnants of forest growth may be found in pasture areas: if the crown closure on such areas is less than 10%, the non-forest classification applies.

Open area - land devoid of any vegetation and includes landslides, rock and permanent snow covered areas.

Water - lakes, rivers, riverbeds and out-washes.

For determining forest and shrub/scrub areas, this study used aerial photographs of 1964 (1:12,000 scale) and 1977/78 (1:50,000 scale) and Landsat images of 1972, 1976 and 1979 (1:250,000 scale). Sampling techniques were used to estimate forest areas from 1964 and 1977/78 aerial photographs. The standard errors of the estimates were calculated and compared to determine whether the difference in forest areas estimates for the period (1964-1977/78) was statistically significant. With the Landsat imagery, 100% dot count for the Terai and Siwalik regions and 50% dot count for the Hills region was conducted. Forest area estimates for 1964 and 1977/78, from aerial photographs, differentiate between forest and shrub/scrub, but the areas calculated for 1972 and 1979 from Landsat images present combined areas of shrub/scrub and forest.

Associated with its sources of information, this study also had its limitations. Thus 1964 aerial photography provided full coverage of the Terai and Siwaliks regions but the Hills region was only partially covered by east-west flight lines approximately 16 km apart. The 1977/78 aerial photography, however, provided complete coverage for all regions. Also, cloud cover and availability of images limited the usefulness of Landsat imagery. Moreover, an accurate distinction between forest and shrub/scrub could not be made using Landsat.

For the purpose of estimating forest depletion rates, this study uses the annual per capita fuelwood consumption figures estimates by the Tribhuwan University in 1976. These estimates are of the order of 30 ft^3 ($0.85m^3$) in the hills and 20 ft^3 ($0.57m^3$) in the Terai and vary greatly from other estimates (see Section 4.4.1).

These estimates, moreover, make the rather speculative prediction that to meet the fuelwood needs alone of the local population at the current rate of consumption, all the accessible forests of the Hills would disappear in less than 15 years time or by the year 1990 and those of the Terai in about 25-30 years or by about the turn of the current century (Tribhuwan University, 1976).

Despite these limitations the Water and Energy Commission (Robinson, Merritt and de Vries, 1983) study presents by far the most comprehensive picture, so far, of the extent of forest area and the loss in forest cover since 1964 in various geographic regions of Nepal.

The comparison of aerial photographs of 1964 and 1977 suggests that:

For the Hills region losses of 47,200 ha or 1.5% over a period of 13 years occurred, or an average annual loss of 0.11% This value for loss of forest areas is not statistically significant for any of the hill regions of the three watersheds.

For the Terai and the Siwaliks regions losses of 249,800 ha and 148,500 ha occurred or 27.5% and 10.2% respectively. The average annual loss of forest cover in the Terai was 2.1% and in the Siwaliks 0.8% (Table 2.6).

The study, therefore, concludes that in the Hills region little or no reduction in forest area had occurred during the period 1964-1977/78. Crown closure was reduced, however, particularly in the Sapta Gandaki and Sapta Kosi watersheds, suggesting a process of

Table 2.6: Estimated loss of forest area 1964-1977, based on aerial photography data. From HMG Nepal, Ministry of Water Resources, Water and Energy Commission (1983).

Geographic region	Year	Air photo scale	Total land area ha	Forest cover		Loss of forest cover 1964-1977			
				Area ha	Proportion %	Total loss		Total loss	
						ha	%	ha	%
Terai	1964	1:12,000	2,448,400	909,300	37.1				
	1977	1:50,000		659,500	26.9	249,800	27.5	19,200	2.11
Siwaliks	1964	1:12,000	1,582,000	1,459,100	92.2				
	1977	1:50,000		1,310,600	82.8	148,500	10.2	11,423	0.78
Hills	1964	1:12,000	7,689,000	4,096,300	53.3				
	1977	1:50,000		4,049,100	52.7	47,200	1.5	3,631	0.11
Mountains			2,360,300	-	-				
Nepal (total)	1964		14,079,700	6,464,700	45.9				
	1977			6 019,200	42.7	445,500	6.9	34,269	0.53

deterioration within the forest itself.

The apparent high forest loss between 1964 and 1977/78, largely limited to the Terai region, was mostly the result of extensive clearing for agriculture and commercial timber operations aided by an increased fuelwood demand by the much larger population.

In the Siwaliks region there was a loss of 10.2% during this period, with the heaviest rate of depletion in the Sapta Kosi watershed.

In general the results of Landsat imagery analysis are similar to those obtained from analysis of aerial photographs. Again, loss of forest area in the Hills region was shown to be insignificant, but average annual percentage losses in forest area in the Terai region were somewhat higher (Table 2.7).

A quite different and fallacious view of the rate of recent deforestation can be obtained by comparing data which are not really comparable, in that they are based on different definitions of land use categories and are derived from different survey techniques. An example involving both errors is the statement of Metz-Fox (1983) that a rough estimate of the decline in forest area in the Middle Hills between 1964 and 1975 can be gained from HMG Nepal (1973) and FAO/UNDP (1980); the data being 4.6 Mha (by aerial photography) and 3.1 Mha (by Landsat imagery) respectively. A loss of c. 33% in a decade would indeed be serious but in fact there was little loss in area, as shown by the correct comparisons noted in the previous paragraph.

Table 2.7: Estimated loss of forest area 1972-1979, based on Landsat imagery at scale 1:250,000. Data from HMG Nepal, Ministry of Water Resources, Water and Energy Commission (1983).

Geographic region	Year	Total land area ha	Forest cover[1] Area ha	Forest cover[1] Proportion %	Loss of forest cover 1972-1979 Total ha	loss %	Annual ha	loss %
Karnali Watershed:								
Terai	1972	683,000	341,700	50.0				
	1979		280,600	41.1	61,100	8,700	25.5	3.6
Siwaliks	1972	662,300	564,200	85.2				
	1979		533,800	80.6	30,400	4,300	7.6	1.1
Hills	1972	3,390,700	1,586,500[2]	46.8				
	1979		1,740,400	51.3	-	-	-	-
Sapta Gandaki Watershed:								
Terai	1972	883,000	215,009[3]	24.4	-	-	-	-
	1979							
Siwaliks	1972	579,000	494,900	85.5	-	-	-	-
	1979							
Hills	1972	2,092,200	1,122,465	53.7	-	-	-	-
	1979			39.7[3]	-	-	-	-
Sapta Kosi Watershed:								
Terai	1972	882,400	116,000	13.2				
	1979		80,600	9.1	35,400	5,100	30.5	4.4
Siwaliks	1972	340,500	289,400	85.0				
	1979		282,400	82.9	7,000	1,000	2.4	1.3
Hills	1972	2,206,100	1,151,600[3]	52.2				
	1979		1,046,600	47.4	105,000			

[1] Figures include forest and shrub/scrub areas.

[2] Difference in areas not applicable (increase due to northern portion of 1972 Landsat not being available.

[3] Difference in areas not applicable due to incomplete coverage.

2.2 POPULATION CHARACTERISTICS

2.2.1 Demographic data

Principal data concerning the Nepalese population are given in Tables 2.8 to 2.11.

Table 2.8: Regional distribution of population (x1000). From HMG Nepal, Central Bureau of Statistics (1975). Figures in parenthesis are percentages.

Geographic region	1911	1920	1930	1941	1952/54	1961	1971	1981[1,2]
Pahad	3584 (64.0)	3452 (62.0)	N.A.	4145 (66.0)	5558 (67.3)	6344 (67.4)	7210 (62.4)	8461 (56.3)
Terai	2055 (36.0)	2122 (38.0)	N.A.	2139 (34.0)	2699 (32.7)	3069 (32.6)	4346 (37.6)	6560 (43.7)
Nepal	5639	5574	5533	6288	8257	9413	11556	15023

[1] HMG Nepal, National Population Commission, (1982).

[2] The Gorkha Patra, 3 November 1983, Kathmandu.

Table 2.9: Population distribution and density, 1981. Figures in parenthesis show percentages.

Geographic Region	Population[1]	Land area[2] Total km^2	Land area[2] Cultivated land km^2	Density of population per km^2 Total	Density of population per km^2 Cultivated land	Persons per ha cultivated land
Pahad	8,460,926 (56.33)	109,410 (78.0)	16,350 (51.4)	77	518	5.2
Terai	6,559,525 (43.67)	32,670 (22.0)	15,445 (48.6)	201	425	4.3
Nepal	15,022,839 (100)	142,080 (100)	31,795 (100)	106	473	4.7

[1] HMG Nepal, National Population Commission, 1982.

[2] ADB/HMG Nepal (1982).

Table 2.10: Percentage annual growth rate of population.
From HMG Nepal, National Population Commission (1982).

Region	1952/54-1961	1961-1971	1971-1981
Pahad	2.19	1.29	1.61
Terai	0.69	3.54	4.20
Nepal	1.68	2.07	2.66

Table 2.11: Life expectancy (in years). From Tuladhar *et al.* (1977).

	1952/54	1954	1961-1971	1974/75
Males	25.6	27.1	42.9	46.0
Females	25.7	28.1	38.9	42.5

Key factors emerging from the Tables are the rapid rate of population growth since 1930, the high population density, particularly in terms of cultivated land area, and the increasing fraction of the total population living in the Terai. This last factor is largely attributable to permanent migration of hill people to the Terai at a rate of about 0.7% per annum. Although no accurate data are available, it is estimated (Tuladhar *et al.*, 1978) that up to 1,000,000 people seasonally migrate with their herds to the warmer, lower valleys and Terai during the dry winter period whilst others move to seek wage employment in the towns, especially in the Terai and India. Unlike many developing countries, migration in Nepal has been largely from rural to rural area, not from rural to urban (see Table 2.12).

Table 2.12: Rural and urban populations (%). From Thapa, (1980).

	1952/54	1961	1971
Rural	97.2	96.43	96.0
Urban	2.8	3.57	4.0

2.2.2 Ethnic composition and religious allegiance

Nepal has experienced migration of people of Tibeto-Burman ethnic groups from the north and east and of Indo-Aryan groups from the south and west, and this pattern is still to be discerned in the ethnic composition and language groups of different areas (Table 2.13).

Buddhism and Hinduism have for long been the two main religions of Nepal, each predominating at different periods. Although Hinduism is officially the state religion, Mahayana Buddhism and liberal Hinduism have merged to a considerable degree in Nepal and the data of Table 2.14 have to be interpreted cautiously.

In broad summary the Hindu population of mainly Indo-Aryan origin is particularly dominant demographically in the west and at altitudes to about 1,500m. The Buddhist people of Tibeto-Burman origin live mostly in the east and at higher altitudes. Such distinctions are becoming further blurred, however, because of the extensive migration to the Terai.

Table 2.13: Population by main language groups (%). From HMG Nepal, Central Bureau of Statistics (1975, 1977); Tuladhar *et al.* (1978); The Gorkha Patra, 2 November, 1983, Kathmandu.

Language	1952/54	1961	1971	1981
Nepali	48.7	51.0	52.4	58.3
Maithili	16.8	12.8	11.5	11.1
Bhojpuri	0.2	6.1	7.0	7.6
Tharu	4.4	4.3	4.3	3.6
Tamang	6.0	5.5	4.8	3.5
Newari	4.7	4.0	3.9	3.0
Others	19.2	16.3	16.1	12.9
Total (millions)	8,257	9,413	11,556	15,023

Table 2.14: Population by religion (%). From HMG Nepal, Central Bureau of Statistics (1975, 1977) and Tuladhar *et al.*(1978).

Religion	1952/54	1961	1971	1981
Hinduism	88.9	87.7	89.4	89.5
Buddhism	8.6	9.3	7.5	5.3
Islam	2.5	3.0	3.0	2.6
Others	<0.1	<0.1	0.1	2.6

2.2.3 Population of Sindhu Palchok and Kabhre

The Sindhu Palchok and Kabhre Districts are two of the most heavily populated areas of Nepal. According to the 1971 census Sindhu Palchok was seventeenth in a population ranking by districts and Kabhre held the second highest population in the Pahad region, coming next only to Syangja District. In Kabhre the population grew at an average annual rate of 2.29% giving it one of the highest growth rates in the Pahad from 1971 to 1981. For Sindhu Palchok the growth rate was 1.21% pa (Table 2.15).

Table 2.15: Population of Sindhu Palchok and Kabhre Districts. From HMG Nepal Central Bureau of Statistics (1975) and HMG Nepal National Population Commission (1982).

District	Total population 1981	Total population 1971	Placing 1971	Annual growth rate 1971-1981
Sindhu Palchok	232,804	206,384	17	1.21
Kabhre	307,604	245,165	2	2.29

(The density of population per sq.km. and persons per ha of cultivated land are given in Table 2.30.)

Table 2.16 presents the population in 1971 and 1981 of the Thokarpa region (Thokarpa and surrounding panchayats) included in the author's detailed study (Chapter 5). Thokarpa panchayat itself was divided into two (Thokarpa and Kalika) panchayats in 1982.

Settlement patterns and demographic units

The predominantly rural population of Sindhu Palchok and Kabhre lives in large to small villages or in hamlets of only a few houses. Like the rest of the Pahad, the districts are characterised by mainly multi-ethnic settlements, with settlements of Mongoloid peoples predominating only at higher altitudes. The settlement patterns within the population units vary according to ethnic composition. The Sherpa and Newar, and sometimes the Tamang, communities generally live in closely clustered houses. Hindu occupational castes and groups tend to congregate into separate hamlets. The Chhetris and Brahmins live in scattered houses but a hamlet in a village may often

Table 2.16: Population of Thokarpa region, 1971. From HMG Nepal, Central Bureau of Statistics (1975).

Panchayats	Total 1971	Male	Female
Sindhu Palchok District			
1. Thokarpa[1])			
2. Kalika[1])	3,877	1,989	1,888
3. Lisankhu	4,271	2,138	2,133
4. Sunkhani	1,934	984	950
5. Yamna-Dandagaun	1,736	869	867
Kabhre District			
6. Bekh Simle	2,005	994	1,001
7. Chaubas	1,992	990	1,002
8. Sano-Bangthali	1,792	951	841
9. Saping Bhumlu	3,187	1,577	1,610
10. Simthali-Dandakharka	1,389	734	665
Total 1971	22,183	11,226	10,957
1981	26,327[2]		

[1] Thokarpa was undivided in 1971, Population figures include Kalika also.

[2] 1981 population figures are calculated at 1.21 and 2.29 % pa growth rates for Sindhu Palchok and Kabhre respectively.

consist of members of the same clan. In these rural areas almost all household families live in their own houses. There are very few households that share houses with other relatives, and there are some that own more than one house per family. The houses are built almost wholly from locally available material (see section 5.5). Every household also builds livestock sheds, the size and number of which depends on the requirements of an individual family. The animals are also temporarily stabled in seasonal sheds (goths).

These sheds are temporary and their location is changed about every few weeks during the dry season. The idea is to manure with animal dung and compost, and so maintain the soil fertility of scattered fields separate from farmers' homesteads and forming various fragments of their holdings.

Prior to the 1961 administrative reorganisation and during the Rana rule, the two districts formed the East No. 1 administrative district under a district administrator (Bada Hakim) located at Chautara. Sindhu Palchok and Kabhre were its two constituent sub-districts which were further subdivided into various revenue sub-divisions (thums) and villages. The 1961 reorganisation created two separate development districts and their constituent panchayats and wards - see Tables 2.17 and 2.18.

Table 2.17: Composition of East No. 1 District, 1952. From HMG Nepal, Central Bureau of Statistics (1975).

Districts	Revenue sub-divisions (thums)	Villages	House-holds	Houses	Total population
Sindhu Palchok	8	658	32,515	32,405	179,365
Kabhre	31	833	32,963	32,874	190,873
East No. 1	39	1,491	65,478	64,279	370,238

Table 2.18: Recent population distribution in Sindhu Palchok and Kabhre. From ADB/HMG Nepal (1983).

	Panchayats			Households	Average family size	Population	
	1971	1981	1982	1971	1971	1971	1981
Sindhu Palchok	69	54	79	38,427	5.35	206,384	232,804
Kabhre	99	68	96	41,613	5.89	245,165	307,604
Chautara Division	168	122	175	80,040	5.64	451,549	540,408

Table 2.19: Population trends in Sindhu Palchok and Kabhre. From HMG Nepal, Central Bureau of Statistics (1975); ADB/HMG Nepal (1983).

	1911	1920	1930	1941	1952	1961	1971	1981
East No.1	NA	213,703	NA	248,787	370,238		451,549	540,408
Sindhu Palchok	NA	NA	NA	134,782	179,365		206,384	232,804
Kabhre	NA	NA	NA	114,005	190,873		245,165	307,604

The data in Table 2.19 show that in the 40 years since 1941 the population in the two districts had doubled with an average growth rate of nearly 3% pa. The population in Kabhre increased by more than two and a half times during the same period growing at a much higher rate of 4.25% pa. In Sindhu Palchok, the average growth rate has been relatively low (1.82% pa). The rate of population growth has slowed down somewhat in the last two decades primarily due to migration to the Terai.

Ethnic composition

An indication of ethnic variations in the population of the two districts is given in Tables 2.20 and 2.21. Nepali is understood and spoken by almost all people of the area, and Hinduism and Buddhism - the two main faiths of the area - have completely and inseparably intermingled here as in other areas of the Pahad.

Table 2.20: Religious allegiance, 1971. From HMG Nepal, Central Bureau of Statistics (1975). Percentages are in parenthesis.

	Total	Hinduism	Buddhism	Islam	Jainism	Other religion
Sindhu Palchok	206,384 (100)	142,645 (69.12)	63,635 (30.83)	25	7	-
Kabhre	245,165 (100)	162,833 (66.42)	82,051 (33.47)	31	2	248

Table 2.21: Mother tongue, 1971. From HMG Nepal, Central Bureau of Statistics (1975). Percentages are in parenthesis.

Mother tongue	Sindhu Palchok	Kabhre
Nepali	117,434 (57.0)	143,605 (58.6)
Tamang	61,905 (30)	72,605 (29.5)
Newari	14,200 (6.9)	26,311 (10.7)
Sherpa Bhote	8,736 (4.23)	1,165 (0.48)
Magar	166	439
Raikirati	26	49
Gurung	852	23
Limbu	26	-
Sunwar	14	65
Danuwar	2	33
Local district dialect	2,721 (1.22)	642 (0.26)
Other Languages	292	28

Literacy and education

Illiteracy is a common feature of the population and is higher among its female section. Those who have had any access to schooling form a very small proportion of the whole population of the two districts even today (Table 2.22). Despite being adjacent to the capital city of Kathmandu which also has a long history of civilization, art and learning, Sindhu Palchok and Kabhre have remained basically illiterate and backward areas. Until 1973 there were only two high schools in Sindhu and not many more in Kabhre; all existed more in name than in actuality. Primary schooling was also very limited. Necessary infrastructure, qualified teachers, and teaching material and equipment were totally inadequate.

The new education system introduced in the area in late 1973 paid much greater attention to improving schooling by providing trained teachers, teaching material, equipment, infrastructure and more funds. Primary schooling was made free and compulsory. In general, the system contributed considerably towards promoting education in rural areas. Though the latest data on education are not available, an improvement is apparent through the enthusiasm and motivation of local peasant farmers to see their children educated and prepared for a better future. There remains, however, a great deal more to be done in the direction of rural education which has a direct bearing on every aspect of rural development in Pahad Nepal.

Table 2.22: Education of economically active population, 10 years or older, in 1971. From HMG Nepal, Central Bureau of Statistics (1975). Figures in parenthesis are percentages.

	Total	No schooling	Primary Yrs 1-5	Secondary		Intermediate Yrs 11-12	Under-graduate	Post-graduate
				Lower Yrs 6-8	Higher Yrs 9-10			
Sindhu Palchok								
Both sexes	106,482 (100)	105,225 (98.8)	598 (0.56)	253	331	50	20	5
Male	69,770 (100)	68,553 (98.31)	572 (0.82)	247	325	48	20	5
Female	36,712 (100)	36,672 (99.9)	26 (0.07)	6	6	2	-	-
Kabhre								
Both sexes	131,985 (100)	129,028 (97.8)	1,198 (0.91)	704	819	147	64	25
Male	76,232 (100)	73,375 (96.3)	1,160 (1.53)	677	792	143	62	23
Female	55,753 (100)	55,653 (99.8)	38 (0.07)	27	27	4	2	2

Table 2.23: Economically active population, 10 years or older, 1971. From HMG Nepal, Central Bureau of Statistics (1975). Figures in parenthesis are percentages.

	Total			Economically active			Inactive
	10 years and over						
Area	Both sexes	Males	Females	Both sexes	Male	Female	Both sexes
Sindhu Palchok	150,684	77,125	73,559	106,482 (70.7)	69,770 (90.5)	36,712 (49.9)	44,202 (29.3)
Kabhre	174,708	87,329	87,379	131,985 (75.5)	76,232 (87.3)	55,753 (63.8)	42,723 (24.5)

Table 2.24: Sources of employment for persons 10 years or older in 1971. From HMG Nepal, Central Bureau of Statistics (1975). Figures in parenthesis are percentages.

Industry	Sindhu Palchok			Kabhre		
	Total Both sexes	Male	Female	Total Both sexes	Male	Female
Agriculture, forestry and fishing	102,776 (96.5)	66,650 (95.5)	36,126 (98.4)	127,899 (96.9)	72,544 (95.2)	55,355 (99.3)
Mining and quarrying	-	-	-	-	-	-
Manufacturing	867 (0.84)	533 (0.76)	334 (0.91)	687 (0.52)	590 (0.77)	97 (0.17)
Electricity, gas and water	188	182	6	14	14	-
Construction	575	541	34	51	51	-
Commerce	446	321	125	1,349	1,126	223
Transport and communication	74	73	1	158	157	1
Finance & business service	17	17	-	58	54	4
Personal & community service	1,539	1,453	86	1,769	1,696	73
Total	106,482 (100)	69,770 (100)	36,712 (100)	131,985 (100)	76,232 (100)	55,753 (100)

Economic activities of population

The overwhelming majority of the population in the two districts (97% of workforce) is engaged in farming, including agriculture, forestry, livestock husbandry and some fishing (Tables 2.23 to 2.24).

2.3 POLITICAL HISTORY AND GOVERNMENT SYSTEMS

2.3.1 Early history of Kathmandu Valley and surrounding areas

According to local traditions (including I.35) the Kiratis were the original inhabitants of the central hills, next came the Paharis and then the Tamangs. The traditional name of the parts of Sindhu Palchok and Kabhre lying to the east of Banepa is Wallo-Kirat (Near-Kirat). All the above communities were of Tibeto-Burman origin. Indo-Aryan penetration occurred at an early date and it is likely that the cities of the Kathmandu Valley were founded in about the 1st century A.D.(Kawakita, 1977). Certainly, the Lichavis were well established by the 4th century A.D. In the 7th century A.D., a Lichavi Kchhetriya prince, Amsu Verma, rose to power and gained such fame that his name appears in the contemporary annals of China and Tibet. Amsu Verma's daughter married the Tibetan ruler Srong-tsan Gyampo and this coincided with the commencement of an increased influence of Tibetan civilization on Nepal. There is evidence that the pagoda-style of architecture had arisen in the valley at least by the rule of another Lichhavi prince, Narendra Deva in the mid 7th century A.D. and it soon spread throughout much of eastern Asia.

In about 1200 A.D., the Lichhavis were succeeded by the Newar Malla dynasty as the rulers of the Kathmandu Valley. By the end of the 15th century the dynasty had fragmented as the three sons of Yaksha Malla established the three kingdoms of Kathmandu, Bhadgaon (Baktapur) and Lalitpur (Patan). The characteristic intricately-carved woodwork of the buildings of the valley cities dates from these and later Malla times. These Newar Malla kings of Kathmandu, though also derived from a high caste Hindu family and bearing the same dynastic name, were distinct from the Khasa Malla rulers of Jumla. The powerful Khasa Malla rulers had established the kingdom of Jumla and ruled from about the 11th to the 14th centuries in the Karnali region to the west. These Khasa Malla kings of Jumla were, before the Gorkhalis, the most powerful rulers of parts of Nepal, Kumaon and western Tibet.

During the mid 18th century Nepal consisted of some sixty principalities. To the east of the three Kathmandu Valley kingdoms were situated the kingdoms of Chaudandi and Bijayapur which controlled the hill regions south of Tibet and the Terai area between the Mechi and Bagmati rivers. The kingdom of Makwanpur situated to the south of Kathmandu Valley consisted of the central Terai districts of Bara, Parsa and Lantahat, part of Chitwan in the inner Terai and some territories in the adjoining hills. Political divisions in the region situated west of Kathmandu belonged to the two loosely affiliated alliances of Chaubisi and the Baisi confederations. The Chaubisi confederation was a loose affiliation formed by the 24 Kchhetriya-ruled principalities in the Gandaki region to the west and south of the Kathmandu Valley. The Baisi confederation was another alliance of 22 Kchhetriya-ruled principalities further west in the Karnali region which were formed by the disintegration of the powerful kingdom of the Khasa Malla rulers of Jumla. Palpa, ruled by the Sen Kchhetriya kings was the biggest and most powerful of the Chaubisi states and had encompassed a large area before the 18th century. Founded by a Kchhetriya Prince of Lamjung in 1559, Gorkha was the last Hindu principality established in the western Hills and was never included in the list of the Chaubisi states. Rulers such as Ram Shah (1606-1633) established a firm family rule over Gorkha (Regmi, 1961, 1975).

2.3.2 The rise of the House of Gorkha and the process of political unification of Nepal (1744-1846)

Prithivi Narayan Shah ascended to the throne of Gorkha on 3 April 1743 and soon after launched on an untiring mission to extend Gorkhali power and to unify the petty states within what is now the border of Nepal. He met with astounding success. Initial preparations for the conquest of the three kingdoms of the Kathmandu Valley started in 1744, when Nuwakot was annexed. Sindhu Palchok and Kabhre were subjugated in 1748, giving control of important trade routes to Tibet. The kingdoms of Makwanpur, Chaudendi and Bijayapur followed. The Kathmandu valley kingdoms of Kathmandu, Patan and Bhaktapur were conquered by 1769 and the Gorkhali capital was moved from Gorkha to Kathmandu. Kathmandu was then established as the centre of political and administrative activity in Nepal, which by the time of Prithivi Narayan Shah's death in 1775 included the Kathmandu Valley all the Hills region east of Kathmandu to the Tista River bordering Sikkim, all the eastern Terai, the inner Terai region to the Mechi River and some parts of the western Hills region.

The task of unification was carried on by Prithivi Narayan Shah's descendants. By 1789, the Chaubisi and the Baisi states in the western region had been annexed, extending the frontiers to the Mahakali. Kumaon was conquered in 1790 and the Gorkhali army, by 1808, had reached Kangra, across the Jumna to the Sutlej River. The frontier of Nepal thus extended 2,100 km from the Tista River in the east to the Sutlej in the west.

Gorkhali ambitions of territorial expansion extended even beyond these sub-Himalayan hill areas to strategic access routes to the north of the main Himalayan range and to the Tibetan provinces bordering Nepal. The Gorkhali invasion of Tibet in 1788 and the treaty that followed, granted Nepal important concessions in Lhasa along with some territorial concessions in the bordering province of Tsang. A second Nepalese invasion of Tibet and capture of the Tsang capital led to the direct confrontation in 1791 of the Gorkhalis with China's Ching dynasty forces for the control of power and influence in the Tibetan region. After some initial success, the Chinese suffered severe setbacks. The understanding that followed settled Nepal's northern frontiers, retained her commercial privileges in Tibet, and gave her the right to make direct contacts with China by sending periodic missions to Peking. Such direct contact was considered important in the light of the perceived British threat from the south.

These political changes within Nepal and on her northern frontiers occurred about the same time as far-reaching changes in the political situation were taking place in adjacent India to the south. While the Gorkhali rulers consolidated the territory of Nepal in the Himalaya, the British were spreading their political control over the Indo-Gangetic plain by subjugating the native Indian rulers. These two forces, the Gorkhalis in the Himalayas and the British in the Indo-Gangetic plain, confronted each other in the Terai and British demands for evacuation of the Terai territory were unacceptable to the Gorkhali government.

The resultant British-Nepal war (1814-16) and the Treaty of Sagauli, gave the British East India Company highly important advantages. A large portion of Nepalese territory was surrendered to the British, i.e. all territory between the Mechi and the Tista rivers in the east, between the Mahakali and Sutlej rivers (including the Himalayan districts of Almora, Nainital, Garhwal, Dehra Dun and Simla) in the west and all of the Terai region between the Mahakali and Kosi rivers. (Some of these territories, i.e. the Terai region between the Mechi and Mahakali rivers were subsequently restored to Nepal in December 1816 and November 1860.) (Stiller, 1976; Regmi, 1978b.)

During the early period of the Gorkhali regime, the king both ruled and reigned: there was no limitation on his authority. His role as the head of the administration was, however, limited because the administrative machinery was designed only to raise taxes and defend the country. The king as the head of the state performed several duties. He appointed and dismissed government servants through the pajani (a system of annual screening and renewal of government employment), distributed favours and made land grants in the form of jagirs (land grants in lieu of pay for government employment) and birtas (land grants as special favours with no set time).

The pajani and land grants formed the most powerful of the king's tools with which he controlled the authority of the state and the loyalty of the nobility, military commanders, soldiers and others in the system. Moreover the traditional principle of state ownership of land aided in the king's control of the general population.

The king was the source of law. He issued regulations, allocated revenues, controlled expenditures and audited accounts. He declared war, made peace and signed treaties. He thus enjoyed absolute powers as the head of the state and the legislative, executive and judicial powers were centred on him. The king was helped in the discharge of his duties by high ranking officials and nobility of his choice, called bhardars and kazis. During the reign of Phrithivi Narayan Shah, and to some extent till the time of Rajendra Bikram Shah, the bhardars respected the powers of the monarch and remained loyal to the throne.

There were, however, serious flaws in the system. Thus there was no clear demarcation of functions among officials. Military commanders became civil administrators as well as judges. No cash salary was paid to the civil and military personnel who instead received either birta or jagir land grants. High ranking official posts were given by the king to a few families forming a very small section of the total population. This system of allocating position and power to a family line had a great and malign political impact.

Political instability was mainly caused by internal conflicts between members of the nobility and even of the royal family.

After the death of Prithivi Narayan Shah the monarchs in many cases were minors and the country was ruled by regents, who invariably were queen mothers. For this reason the period 1777-1846 is also called 'The Period of Regency'. The regent queen mothers were mostly unaware of the intricacies of politics and administration and favouritism and administrative malpractices occurred extensively.

Throughout Nepal's post-1769 history participation in the political process had become the exclusive domain of the Chhetri and Brahmin families. The Brahmins often acted as advisers for and gave support to the Chhetris. These Chhetri and Brahmin families had followed King Prithivi Narayan Shah from Gorkha to Kathmandu and played a prominent role in the process of political unification of Nepal. The more prominent families formed the Chhetri bhardari nobility, consisting of the Shah, Thapa, Panday, Basnet and Chautariya families. These were principal competitors for power and office. (Kunwar, a Chhetri sub-caste that rose to power and prominence as the Rana family in the mid-19th century, was still one of the less influential sections of these families in the 18th and the early 19th century.) Some Newar families were also aligned with and gave support to the principal Chhetri families.

Rivalry between these bhardar family groups gave rise to constant intrigues that became the way of political life. The family was the principal source of identity. Especially in the subsequent years loyalty to the family was more important than loyalty to the ruling class or even to the country. Transfer of power was only by means of violence because constitutional channels were absent.

In 1799, King Rana Bahadur Shah, a grandson of Prithivi Narayan Shah, abdicated in favour of an infant son, Girban, and went into voluntary exile in India. He returned 5 years later to resume administration but was assassinated in 1806. Bhim Sen Thapa, a member of the nobility, became prime minister and ruled the country with virtually unchallenged authority for 31 years (1806-1837). Especially after the conclusion of the British-Nepal (1814-16) war, this strong prime minister of Nepal greatly increased the power of his office at the expense of the monarch and the bhardari.

Originally, despite the unlimited authority of the king, extensive consultations on any major decision had been an integral part of the political process of Gorkha. This was the basis of the bhardari, the consultative body of nobles (Stiller, 1976; Rose and Scholz, 1980) whose very name suggests that they were those who carried the burden of the nation and solved her problems. Bhim Sen Thapa greatly undermined this Gorkhali political process and the position of king and took most of the important decisions by himself (Stiller, 1976). Civil administration became practically non-existent. Though Bhim Sen Thapa was dismissed and imprisoned in 1837 and eventually committed suicide in jail in 1839, he had through his example of an authoritarian tenure of office of prime minister already paved the way for the establishment of the Rana family rule of hereditary prime ministers in subsequent years.

In the period of nearly nine years that followed Bhim Sen Thapa, Nepal experienced further political instability due to rivalry and struggle for power between the factions of King Rajendra, his two queens and Crown Prince Surendra, each of whom had supporters in the nobility. In quick succession there were five prime ministers, representing different family groups. In 1845 a government was formed with Jung Bahadur Kunwar as one of its four members. However, political conflict among the nobility continued. These factors ultimately resulted in the Kot (Courtyard) Massacre of September 1846 (Stiller, 1976).

2.3.3 The Rana Period (1846-1950)

In the Kot Massacre and the Bhandarkhal incident soon after virtually all the leaders of the Thapa, Chautariya, Panday and Basnet families were eliminated or forced to flee the country. Jung Bahadur Kunwar became the Prime Minister and Commander-in-Chief of Nepal and most of the key positions in the administration went to Jung Bahadur's brothers and others in his family (Joshi and Rose, 1966).

The Bhandarkhal incident (Joshi and Rose, 1966), following the exposure of a conspiracy against the King, the Crown Prince and Prime Minister Jung Bahadar Kunwar, also led to the expulsion of the junior queen from the palace and the royal authority held by her. She was forced to leave Nepal for Benaras in India. King Rajendra, who accompanied her, was deposed in 1847. Thus, not only all the potential rival noble families to the Kunwar family were eliminated, but also the royal family itself was greatly weakened. For Jung Bahadur Kunwar, who combined in himself great personal courage, shrewd intelligence and political insight and had the full support of his brothers, it took only a short time to outmanoeuvre both the royal and noble families. He established his own powerful family rule of hereditary prime ministers and reduced the king eventually to a mere figurehead.

The new King Surendra made Jung Bahadur the Maharaja of Koski and Lamjung in 1856, and conferred on him the title of Rana in 1858. Both the Prime Ministership and the honour of Maharaja were for life and were made inheritable within the family. Succession was based on seniority first among Jung Bahadur's brothers and then among his sons and nephews. The title of Rana conferred on Jung Bahadur became subsequently the family name for him and his descendants. Jung Bahadur was also invested with special powers to appoint and dismiss government officials, to declare war or make peace with foreign powers, to dispense justice and punishments, and to make new laws and modify or repeal old ones relating to administrative, judicial and military departments of the government.

The hereditary Rana family rule established by Jung Bahadur lasted from 1846 to 1950 with ten prime ministers belonging to three generations. Jung Bahadur was the most outstanding, but Chandra Shumshere and Judha Shumshere were also very significant. Mohan Shumshere was the last of the hereditary Rana prime ministers and headed the first government in the interim period during the transfer of power in 1951.

The administrative and political system of the Ranas

Jung Bahadur occupies a distinct place in the history of Nepal as the founder of Rana rule and for the foundations he laid of new administrative, defence and legal systems in the country.

He was one of the ablest statesmen Nepal has ever produced. His concern not only in the interest of his family rule but also for the stability of the country and the welfare of the people of Nepal found expression in the reforms and programs of change that he introduced. His interest and keenness in the techniques of government and in the organisation of defence were enhanced by the visit he made to England in 1850-51. On his return he initiated an organised system of public administration, created a civil administration and organised the defence service on contemporary British lines. The civil and military employees of the government started receiving their salaries in cash rather than through the jagir lands of the past. Through the introduction for the first time in 1854 of a written social and legal code (the muluki ain) that codified various laws (sanads and sawals) of the country he made the first efforts to enforce uniform laws throughout the country. Though incorporating a few Brahminic principles, Jung Bahadur's code for the most part retained the customs of each community or ethnic group in Nepal. A panel system and regional law courts were introduced and the new law books were sent to district officials with instruction to administer justice according to the provisions therein (Pradhan, 1976; Regmi, 1978b; Rose and Scholz, 1980).

Jung Bahadur exhibited keen interest even in the conservation of natural resources such as the forests and wildlife, both in the plains and the hills. Available records from the Chitwan and the Chautara division areas bear testimony to this fact. Documents I have sighted clearly indicate the already existing state of enhanced deforestation of Sindhu Palchok and Kabhre and Prime Minister Jung Bahadur's concern over it (see Appendix I). He issued strict orders through his brother, Commander-in-Chief Ronoddip Singh Kunwar, in June 1874 for the conservation of forest and wildlife in the

Anaikat region, including the Panchkhal, Lamidanda, Hokse and Bokse forest areas of Kabhre district. Unauthorised hunting of birds and animals, grazing, lopping, burning or encroachment of forest for converting it into agricultural land were prohibited. Destruction of forest by burning and its use for slash-and-burn agriculture (khoriya) were made serious crimes and punishable by imprisonment for up to 12 months along with the confiscation of the reclaimed land. Less serious crimes regarding forest and wildlife were fined in cash. The local functionaries were directed to enforce these orders and protect the forest and wildlife in their areas (Appendix I). Similar measures taken by Jung Bahadur made Chitwan a wildlife sanctuary for the protection of rhinoceros and other animals (Upreti, 1973).

The establishment of Jung Bahadur and his Rana family as the focus of political power within Nepal emulated and extended the example set by Bhim Sen Thapa. The new system, however, departed even further from traditional lines and in so doing planted the seeds of its eventual downfall. Key elements were as follows. The monarchy, which had been the focal point of the traditional political system was reduced to a nonentity and the king was confined to the palace. Even the king's seal, the Lal Mohur, was monopolized by the Ranas, who later introduced their own seal, the Khadga Nisana, which then became the effective seal of authority. The perpetuation of Rana rule was ensured by the total elimination from political leadership of all the other bhardari families. Eventually only Ranas were permitted to marry members of the royal family.

The Rana rule continued and expanded the efforts of previous governments to centralize the decision-making process of the government, and they were able to carry this to an ever expanding range of subjects. The monolithic type of government inherited from Bhim Sen Thapa's time became even more highly centralized during the Rana rule. All the government officials, both civil and military, were directly responsible to the prime minister. The Rana prime minister also became the head of the judiciary in the country. The higher ranks of civil and military administration became mostly the domain of the Rana family. The Rana governors (bada hakims) also headed the district administrations which, though much better organised, continued to be mainly concerned with the maintenance of law and order and the collection and maximisation of revenues. Again, as in the case of Bhim Sen Thapa's administration, the Rana administration remained military oriented and civil and military administration merged in so far as the higher officials up to the level of district administrator were given military ranks and subjected to military discipline. The system of government as it developed became an instrument largely to carry out the personal wishes and interest of the ruling Rana prime minister and his immediate family, and it was divorced from its accountability both to the people and to the crown. A tradition gradually developed where the word of the Rana prime minister was regarded as above the law, and the constitutional provisions of Jung Bahadur's 1854 legal code were lost.

In the field of foreign policy, in comparison to the persistent policy of 'peace without cordiality' of the previous government, an early good rapport and continued friendship with the British became another important feature of the Rana rule. Jung Bahadur personally led an army in support of the British in the Indian Mutiny of 1857.

Bir Shumshere permitted, in 1885, the open recruitment of Gurkhas of Nepal for the British Indian Army. Chandra Shumshere and Judha Shumshere provided substantial support of men and materials to the British during the First and the Second World Wars. The British reciprocated in kind by supporting the Rana rule as well as through concrete benefits to Nepal in general. It was in this context that the western Terai territory lost in the war of 1814-1816 was returned to Nepal in 1860 and a treaty formally recognising Nepal's sovereign independent status was signed in 1923 (Joshi and Rose, 1966). To the north, the peace negotiations following the Nepal-Tibet war of 1854-56 led to agreement by Tibet to pay Nepal an annual tribute, which was paid regularly until 1953 (Regmi, 1978b).

As the family was the basis of power and position in pre-1846 Nepal, suppressing those in opposition rather than accommodating them was the norm, and periodic court intrigues were directed towards elimination of competing families. The rise of the Rana family to power was therefore the consequence of internal changes within the framework of the traditional political system of the kingdom. The Rana system surpassed its predecessors only in the sense that it created for itself a legal status for its role as a political elite, and through it gave itself a special continuing social status. Most importantly, the political power wielded by the Ranas enabled them to acquire land and other economic resources far in excess of what were available to anyone else. This became the principal element of discord leading to the unpopularity of the Rana rule. This unpopularity was, however, limited mostly to the competing families, a small percentage of the total population, and deprived of their own chances of exploiting the country's resources and people for their own benefit. Though the changes in the holders of state office amounted, by tradition, to changes in the holders of land, this hardly affected the rest of the country and its peasantry, who were not owners but only tenants of land; their taxes still had to be paid. Thus even the complete change in the central political elite and aristocracy produced by Jung Bahadur and his successors mattered little to the already greatly oppressed peasantry in village Nepal.

Despite the persistent efforts to establish firmly and to perpetuate the authority of the system, political challenges to the Rana family rule grew as the internal and external environment gradually changed. Any political opposition to the Rana ruling class in the latter part of the 19th century was, however, still limited to the traditional ruling order, the bhardars and the royal family, whose principal concern was only the restoration of the pre-1846 power structure. Opposition from outside these local political factions was extremely feeble (Joshi and Rose, 1966). The most serious challenges, however, were divisions within the Rana family itself. Particularly as the issue of succession to the office of prime minister became more complex, the dissident groups within the Rana family became restless. A place in the roll of succession primarily determined the political and economic security of a faction within the Rana family. Bir Shumshere, Chandra Shumshere and Judha Shumshere and their individual families effected purges within the Rana family to establish distinct advantages for their own family lines in the roll of succession. The resultant roll debarred other Ranas who then posed the most serious threat to Rana rule by the mid-1930s. The end of the Rana regime was thus hastened by its own system of succession to the office of political power which created divisions within the family.

Although the introduction of western-style education in the country was slow and restricted, there emerged from 1920 onwards a small group of middle class educated political elites in Kathmandu. Exposure of students and other Nepalese living in Benaras, Calcutta and Dehra Dun to Indian political movements also helped to some extent the cause of the political opposition. The Gurkha soldiers returning home to the villages of Nepal from different theatres of two world wars also brought back with them their experiences of the modern world and contributed significantly to a change in the outlook in village Nepal, especially in the hills.

Attempts to introduce a new constitutional system in 1948 in line with what was emerging in India failed and the 104-year-old Rana family rule finally came to an end as the result of a number of bold moves by King Tribhuwan in 1950. He put his own and his family's lives and the continuation of the royal line at stake to reinstate the authority of the monarchy and to attempt to establish a democratic government system for the administration of the country. The incident triggered a period of rapid political change resulting in the fall of the Rana family rule in late December 1950. The episode was, however, hardly a mass movement or a popular revolution in as much as it was restricted to only a few towns. Its leadership was typically representative of either the traditional political elite groups or that of the urban middle class that forms, even today, a very small percentage of the country's total population. The vast majority of the country's population living in the villages remained nearly totally unrepresented and hence unconcerned due to their correct assessment of the fact that any such change did not affect them greatly. They were still likely to remain deprived.

2.3.4 Interim period of party politics (1951-60)

The change from the Rana family rule to a more democratic pattern of government marks the beginning of Nepal's efforts towards modern political system building. This started with an interim period of experimentation through the development of political parties. King Tribhuwan was restored to the throne and assigned the role of mediator of any dispute within the government. A rapid succession of weak ministries followed, with various parties and their factions struggling for control of central authority. Political turmoil in the eastern Hills and in the Terai and agrarian unrest aggravated the state of prevailing general disorder. Gradually the power of the Nepali Congress Party grew until it was able to form a single party government. Opposition party policies continued to be essentially negative and highly personal in character. The lack of popular support for political parties which had developed by the middle of the 1950s could be attributed to the prevailing situation within the country that was summarized by two prominent party leaders as:

> '...rampant corruption, bribery, unemployment, inflation, famine and anarchy; dangerous state of currency; exploitation of peasants more than ever, lack of communication, irrigation, education and public health facilities; loss of independence of judiciary; suppression of rights of people and resources of production...' (Joshi and Rose, 1966).

Although these were the charges hurled at the Prime Minister and his cabinet by dissatisfied opposition leaders, they represented, in a real sense, the popular dissatisfaction with political parties and their irresponsible role in handling administration of the country.

Within this chaotic situation the Shah dynasty soon resumed its position of importance and King Tribhuwan emerged as the central figure in the political leadership struggle. The King appointed cabinets according to the powers granted to him by the Interim Government Act, 1951. But with the opposition leaders discrediting the appointed ministers and weakening their effectiveness, the King became involved in directly negotiating specific issues and making government decisions. Several amendments to the Interim Govt. Act further enabled him to deal directly with law and order problems. His interaction with the bureaucracy and the army further strengthened his position as the central figure. Thus, whereas previously the crown had been only the symbol, since 1951 it had acquired the place of a powerful instrument for national unity. King Tribhuwan's Royal Proclamation of 1954 had already established the Crown as the source of all legislative, executive and judicial authority.

Thus had evolved the place of monarchy and the state of party politics in the process of democratic experimentation in Nepal by the time King Tribhuwan died in March 1955 and Crown Prince Mahendra became the King of Nepal.

King Mahendra started his reign with determined efforts to improve upon the situation of political chaos and economic crisis that he inherited. In particular, the National Planning Commission was formed and the First Five Year (1956-61) Plan was prepared. A comprehensive land reform program was also announced and a ban was put on forced labour.

Extensive tours of various remote parts of the country brought King Mahendra in direct contact with the local people and elites, and their problems. He dispensed immediate justice, expedited government decisions and distributed gratuities. This direct and personal contact was unprecedented and brought the monarch closer to his people and enabled him to make shrewd evaluation of the motives of the elites and political leaders. Similarly several tour commissions sent to various parts of the country brought back with them many appropriate proposals for development of the districts.

On the political front, King Mahendra further experimented with party politics. As a result many cabinets followed and the scene was dominated by negative and highly personal politics.

The disputes were resolved only by the King's announcements setting the date of parliamentary elections to be 18 February 1959 and making provisions for the establishment of a Constitution Drafting Committee. The King promulgated the new constitution on 12 February 1959.

The idea of parliamentary democracy was a totally new concept to the cultural traditions of Nepal. Lack of modern education and a very low rate of literacy left the majority of the people completely unexposed to the concepts and practices of the outside world. Even the period following the 1950 change had proved to be disappointing.

Therefore, how far the new constitution's innovation of a parliamentary type of democracy would realize the aspirations of the common man had to be tested with the passage of time.

General elections were held but a turnout of only 42% of the eligible voters in the country to cast their votes reflected both an uncertainty in the minds of the people about the new system as well as a typical lack of interest among the masses to any change that did not directly affect them. The Nepali Congress was returned to power with an unexpected 74 seats from the 109 parliamentary constituencies although it polled only 38% of the total votes cast (Joshi and Rose, 1966). In July 1959, the King confirmed the Nepali Congress leader B.P. Koirala as the new Prime Minister.

B.P. Koirala, whose political career between 1951 and 1959 had been confined to the task of reorganising the Nepali Congress and serving as its chief spokesman, quickly moved to strengthen party control over the bureaucracy. Congress supporters were promoted to top administrative positions both in the centre and in the districts. Any direct contact between administrative officials and the palace was forbidden. The new appointees were put on a one year period of probation, similar to the old pajani system, during which they had to prove their acceptability to the Nepali Congress Party government. Moreover, the party appointed its own members to a parallel 'development bureaucracy' and 'district development officers' appointed from among the party cadres started playing their role throughout the country. Such steps channelled development funds directly to areas of party interest, particularly to the Terai and a few other urban centres, thus bypassing the regular channels of government resource allocations. The Nepali Congress Party, as a result, continued to grow in membership and strength during 1959-60. (Joshi and Rose, 1966; Rose and Scholz, 1980.)

The most serious charge against the Nepali Congress government was its inability to maintain law and order in various parts of the country. Delegations of victims from disturbed areas arrived in Kathmandu to seek royal protection and the restoration of peace and order in their respective areas. In 1960, King Mahendra decided to resort to emergency powers granted to him by the constitution. He dismissed the Koirala government and dissolved the parliament. This ended the decade-long interim experimental period of party politics. In all, twelve cabinets from various parties and their coalitions had taken part in this exercise that failed to establish a central authority and a democratic order in the country.

2.3.5 The Panchayat Polity (1962 onwards)

King Mahendra instituted panchayat polity in 1962 as the new national political system based on local people's committees called panchayats that would build 'democracy from the grass roots'. The new system did not recognise a need for political parties for the practice of democracy. The assumption that the people's committees had played a traditional role at the village level in predominantly rural Nepal formed the basis for the institution of the partyless panchayat political system.

Key features of the new structure were Village, District and National Panchayats. The Village Panchayat, with nine constituent Wards and a total population of 3000-5000, had a Village Assembly and a Village Council (Panchayat). All persons 21 years of age or over and living in the designated area were members of the Assembly. The Council (Panchayat) consisted of a President (Pradhan Pancha), Vice-President and nine members each representing a constituent ward.

The District Panchayat also had an assembly and a similar Council. The assembly was to meet twice a year and formulate the general policy and budget for the District: the Council was then to implement the decisions. The National (Rastriya) Panchayat was to be a national unicameral legislature consisting of both elected and appointed members. Ministers were to be appointed by the King from members of the Rastriya Panchayat.

Although subsequently modified by King Birendra's constitutional amendments of 1975 and 1980, the features of the partyless panchayat polity have been modified only slightly, mainly in regard to number of members and method of election or appointment of officers of the various panchayats. The panchayat polity has been under continual attack by those seeking a multi-party system but most people in the Pahad still appear to see little benefit in any change.

On the domestic front, the regimes under King Mahendra adopted a program of continuous change directed towards the gradual modernisation of the Nepalese economy, social structure and administrative system. The new rule actually introduced more extensive reforms than those the Congress regime had only proposed. The birta reforms introduced earlier were implemented more forcefully. The new legal code introduced in 1963 rejected traditional caste principles and emphasised the equality of rights of all citizens.

The 1964 Land Reform Act was designed to free the cultivator from the powerful local elites and to improve their status. It brought changes in landlord-tenant relationships and the tenant was granted an inalienable right to the land he was cultivating and on which he paid tax. Establishment of local work level credit institutions were directed towards elimination of the traditionally exploitive relationship between the village money lender and debtor. The 1963 legal code had already abolished various unpaid labour obligations. In short, the tenant gained legal landholding rights.

Economic development was a major topic of discussion and debate throughout the 1950s but the credit for making the words 'planning' and 'development' part of Nepal's national vocabulary must go to King Mahendra. Development programs began to attract significant amounts of foreign aid.

When King Birendra assumed the throne in January 1972 the monarch's dominant position was well established. Controversy between the pro- and anti-panchayat forces was, however, growing and a re-evaluation of the panchayat system became necessary. Eventually, King Birendra decided to resolve the controversy through a national referendum in 1980 which was a challenge to the politicians of both pro- and anti-panchayat orders to prove their representative credibility. Supporters of the panchayat system won by a convincing margin, securing 55% of the national votes and a majority in 54 out of 75 districts of the country. In the Middle Hills region, which still forms the heart of Nepal, the panchayat side won in 33 out of 40 districts and the mountain districts on the Tibetan border gave them over 70% of the total votes. The multi-party side obtained a majority in 11 out of 20 Terai districts bordering India and the three urban districts of Kathmandu Valley. The referendum demonstrated that the party system lacked support in all the mountain districts, most of the Hills districts and many of the Terai districts, and that their popularity did not extend beyond the urban areas (Smith, 1981). The most important factor misjudged by the multi-party advocates was the feelings of the vast majority of Nepal's population that lived in the rural areas. It was again proved that the rural Nepalese people concern themselves primarily with what, as they saw it, would change their plight. The foundation of the panchayat system was self-government at the village level and this had been functioning for nearly two decades with majority support. Further, most communities had benefited from the development programs, even though on a small scale, during this period. No other political system in Nepal had ever made such efforts at the village level. King Birendra announced constitutional changes in December 1980 incorporating the reforms in the panchayat system supported by the majority in the referendum. Table 2.25 shows the scale of current local level representation of the panchayat system.

Table 2.25: Local (village, town and district) panchayats elections, 1982. Data from Shahi, S.B. (1982) and Khanal, N.D. (1982).

Local panchayat units	Position	Total No.	No per unit
Village (4022)	President (Pradhan Pancha)	4,022	1
	Vice-President	4,022	1
	Council (Panchayat) members	36,198	9
	Assembly members	144,792	36
	Sub-total	189,034	47
Town (29)	President (Pradhan Pancha)	29	1
	Vice-President	29	1
	Council (Panchayat) members	416	15*
	Assembly members	2,049	70*
	Sub-total	2,523	87
District (75)	Chairman	75	1
	Vice-Chairman	75	1
	Council members	675	9
	Sub-total	825	11
Total		192,382	

* - Average number

2.4 AGRICULTURE

2.4.1 An overview

Agriculture predominates in the socio-economic life of people in Nepal, accounting for more than two-thirds of the GDP, 80% of export earnings and over 90% of employment. Farm income forms 85% of total annual income of average rural households, 60% being derived from crops (mainly cereal grains) and 25% from livestock (Nepal Rastra Bank, 1980). Data on amounts and distribution of cultivated land are very suspect because of the imprecision of both surveys and definitions of land use categories. Estimates, stated by the authors to be the best available, are given in Table 2.26.

Table 2.26: Agricultural land in Nepal by geographic regions, 1981. From ADB/HMG Nepal (1982). Percentages are in parenthesis.

Geographic region	Total area Mha	Cultivated land Mha
Hills and mountains	10.94 (100)	1.63 (15)
Terai	3.27 (100)	1.54 (47)
Nepal	14.2 (100)	3.18 (22)

The farming system

On Nepal's rugged terrain has evolved a complex agri-pastoral life style in which the three main components, crop production, livestock husbandry and forestry, are closely and inseparably integrated. The farmer who cultivates land also raises livestock and depends on the forest for the support of both. This practice is very different from that often followed in modern times in developed countries, where farming may be exclusively devoted either to crop production or raising of livestock, and forestry is largely seen as an independent commercial enterprise isolated from the other two. In Nepal, however, a change in one of the components of the farming system will have large implications on the others. These interactions were not well understood in the past and programs of agriculture, livestock and forestry development were conceived in isolation.

Farming conditions are very different in the Pahad and the Terai. The extreme and complex topography of the Pahad results in a complex ecological mosaic. Cultivated land is mostly terraced, the terraces having been carved by the Nepalese farmers over many centuries. Unirrigated dry upland terraces, rain-fed only in the monsoon, predominate but wherever possible terraces are irrigated for paddy production. The principal crops are cereals: maize, paddy, millet, wheat and barley. Potatoes are the only significant cash crop. Above 2000m, the terrain becomes more rugged, mountain slopes steeper and little land is cultivated because of the unfavourable conditions. (Few crops will ripen in the continual cloud belt present at c. 2000m during the monsoon.) Traditionally the hill farmers relied on themselves and their neighbours, and their age-old farming system promoted self-reliance and self-sufficiency to a great degree. Farming today is still at the same subsistence level. The average farm size is now c. 0.5 ha in the Pahad, though 2 ha would normally be needed for subsistence.

In the flat Terai plains conditions are easier and more uniform. Owing to relative abundance of arable land, more irrigation and easier transportation, the Terai has produced surplus cereal and cash crops. Land holdings in the Terai are in general larger with an average of 2 ha per family and over 60% of families have holdings larger than 1 ha. Most farms produce a surplus. Over 80% of cropped area in the Terai is under cereal crops with rice predominating. Wheat is an important winter crop following rice in irrigated areas. Maize is also important in central and western Terai regions. Sugar cane, tea, tobacco, oil seeds and jute are major cash crops of the Terai region.

Area, production and yield of food grains

Key data for agriculture production are given in Table 2.27

Table 2.27: Area, production and yield of cereal grains, and total cropped area. Quoted in ADB/HMG Nepal (1982). Figures in parenthesis are percentages.

	Pahad		Sub-total	Terai	Nepal total
	Mountains	Hills			
Cropped area ('000 ha)			949.5 (37.2)	1604.8 (62.8)	2554.3 (100)
Cereal area ('000 ha)	108.32 (4.7)	774.35 (33.4)	882.67 (38)	1438.36 (62)	2321.03 (100)
Cereal grains production ('000 t)	154.89 (3.9)	1298.22 (32.6)	1453.11 (36.5)	2529.45 (63.5)	3982.56 (100)
Yield (t/ha)	1.43	1.68	1.65	1.76	1.72

These production and yield levels are low. Though some increases in the total production of food grains has been recorded, basically due to increase in agricultural area, the yield per unit of cultivated area has not increased. The increase in growth rate of cereal grain production has not kept pace with the growth rate of cereal area suggesting that the average yield has in fact been decreasing.

The progress in increasing food production has remained unimpressive despite malaria eradication and extension of agricultural area through forest clearance in the Terai. Thus the average annual growth rate of cereal grain production for Nepal increased between 1967/68 and 1978/79 by only 1.27% for Nepal as a whole, 1.46% for the Terai and 0.95% for the Pahad. Forest clearance resulting in increased area under cereal crops was responsible for the higher total production of cereal grains in the Terai but the small growth in the Pahad resulted mainly from an increased land use intensity (HMG/N (FAMSD), 1975; Khandka and Gautam, 1981). The bringing of new areas of land under cultivation in the Pahad satisfied the needs of a few families only despite the government's continued policy of recognising and regularising new land reclamation (Hal abadi and Ailani parti lands registration regulation of HMG Nepal).

This very low rate of growth of cereal production, moreover, has been unable to keep pace with the population growth. Also, there is no guarantee that even this low rate will continue in future because most forest land, even in the Terai, that could be converted into arable agriculture has already been cleared. Because of all these factors and the increasing population (see section 2.2.1), the per capita production of food grains has declined between 1967/68 and 1978/79 from 177 to 161 kg in the Pahad, from 504 to 433 kg in the Terai, and 295 to 266 kg for Nepal as a whole. The Pahad has been the worst affected (despite the migration of part of the hill population to the Terai) recording a drop in production per capita of 13.5% since 1970.

Consumption of and demand for food grains, and nutritional adequacy

Consumption patterns show that maize is the staple food in the Pahad and rice in the Terai. The per capita consumption of total cereal was 152 kg for the Pahad and 184 kg for the Terai in 1979/80. Projections for the future are given in Table 2.28.

Regarding the nutritional requirements of the Nepalese population, World Bank (1976) estimates show that the normal subsistence level nutrient intake should provide an average of 11.3 MJ (2700 kcal) per adult per day (9.2 MJ or 2200 kcal for minimum subsistence level). FAO (1981) estimates show that nutrient intake actually available to the Nepalese population provided a total of 8.02 MJ per caput per day, only 87% of the required nutritional level for minimum subsistence. Of the daily available nutrient intake over 93% was supplied by vegetable products and only under 7% from animal products. Cereals provided 75% of the nutrient supply and intake of protein was very low (only 46 g per capita per day of which animal protein formed 15%).

Table 2.28: Projected demand and net production of cereal in edible form in Nepal, in units of 1000 tonnes, 1980-2000. Data from HMG Nepal, Ministry of Food and Agriculture (1981).

Region	1980	1985	1990	2000
Pahad	-349	-504	-768	-1,517
Terai	+389	+316	+206	-345
Nepal	+40	-188	-562	-1,862

2.4.2 Crop husbandry and its significance in Sindhu Palchok and Kabhre

Sindhu Palchok and Kabhre are in most ways typical of the Pahad. Farming is the main economic activity (see Table 2.29) and is a mixed crop-livestock enterprise supported by forestry. In both districts much of the land cannot be cultivated due to difficult terrain (Table 2.30). There is a characteristic shortage of fertile lowland (khet) suitable for paddy growing.

Table 2.29: Population, 10 years or older, by major occupation and industry group, 1971. From HMG Nepal, Central Bureau of Statistics (1975). (Figures in parentheses are percentages.)

District	Population	Economically active population
Sindhu Palchok	150,684 (100)	106,482 (70.7)
Kabhre	174,684 (100)	131,985 (75.5)

District	Economically active population	Occupation Group		Industry Group	
		Farm workers	Others	Rural[1]	Others
Sindhu Palchok	106,482 (100)	102,759 (96.5)	3,723 (3.5)	102,776 (96.5)	3,518 (3.4)
Kabhre	131,985 (100)	127,884 (96.9)	4,101 (3.1)	127,899 (96.9)	4,086 (3.1)

[1] Rural includes agriculture, forestry, livestock, fisheries.

Table 2.30: Arable land, food grain production and population

	Sindhu Palchok	Kabhre	Source
Physical area (ha)	260,036	126,810	
Cultivated land -			
- area (ha)	17,834	16,500	1,2
- % of total area	6.9	13.0	
Population (1981)	232,804	307,604	3
Density of population (per km^2)	90	242	
Persons per ha of cultivated land	13	19	
Total cropped area (ha)	19,567	25,503	4
Cereal grains -			
- area (ha)	17,556	24,256	4
- cereal area as % of total cropped area	90	95	
- production-total (tonnes)	31,926	45,266	4
-per capita (kg)	137	147	

Source: [1] Quoted in Shrestha (1982).

[2] Nepal Rastra Bank (1972).

[3] HMG Nepal Population Commission (1982)

[4] HMG Nepal (1977)

Maize is the staple cereal which grows on the unirrigated dry upland terraces (pakho bari) along with millet, some wheat and barley. These upland crops form the predominant basis of the total farming system. In the higher hill areas of Sindhu Palchok potato predominates, but buckwheat, barley and some wheat are also grown. Here only one crop of each is harvested annually but at slightly lower (1900-2600m) altitudes two crops of barley, wheat, maize, millet, potato and soyabean may be harvested. Cropping intensity, defined as the ratio of total cropped area to area of land cultivated, is very high for both districts. Though the cropping intensity is related to both quality of land and cropping patterns, small farmers seem to cultivate their holdings more intensively than farmers with larger holdings (APROSC, 1977; HMG-N/MFA, 1971). The necessity to produce every year the maximum food supply from their small holdings motivates small farmers to raise the crop intensity on available land and an excess of labour over land resource permits them to do so. Generally speaking, a higher cropping intensity is more possible in lowland khet areas than in dry bari lands at upper altitudes because availability of irrigation is an important factor for cropping intensity. Crop production activities are almost entirely carried out within the framework of traditional practices wherein human labour, animal draught power, farmyard manure and compost, and monsoon rain water are the main inputs. Relative to other inputs, labour is the most abundant resource and is surplus to requirements in many areas. By contrast, cropland is the most limited resource. As a result labour has been used lavishly in making full and intensive use of the available land. Consequently, labour efficiency in terms of output of agricultural products per hour of labour used has been low despite the diligence and skill of hill farmers (Shrestha, 1982; APROSC, 1977; Nepal Rastra Bank, 1972; FAMSD, 1971).

Table 2.31 gives an indication of current cropped area, total production and average yield of main crops in Sindhu Palchok and Kabhre districts.

Main crops

Paddy rice grows in valley bottoms and lowland (khet) areas, but continues to 1500m elevation wherever slope permits and irrigation is possible. Paddy is mainly a monsoon crop and mostly local varieties are used.

Maize, probably introduced to Nepal shortly before the 18th century (Regmi, 1971), is grown mostly on slopes up to about 2500 m altitude but exceptionally ascends up to 3000m. The terraces are mainly outsloping on unirrigated bari/pakho lands. Varieties used are mostly local.

Millet (finger millet) is cultivated mainly with maize. Normally millet is germinated in seed beds and seedlings transplanted between maize rows during July, about a month before maize harvest. All varieties used are local. Millet may also be grown at higher altitudes, above 2000m, as an independent crop wherever microclimate permits. Millet is the third most important crop of the area. Millet has the advantage of storing well though its yields are lower than that of maize. This is, therefore, the reserve food crop of the local community.

Table 2.31: Major Crop Statistics, 1976/1977. From HMG Nepal (1977)

District	Paddy	Maize	Millet	Wheat	Barley	Sub-total Cereal	Potatoes	Oil seeds	Sugar cane	Tobacco	Total crops
Sindhu Palchok -											
- Area ha	3,900	9,500	2,450	1,382	324	17,556	1,897	99	10	5	19,567
%	(19.9)	(48.6)	(12.5)	(7.1)	(1.7)		(9.7)	(0.5)	(0.05)		
- Production (tonne)	8,970	18,450	2,740	1,480	286	31,926	10,066	43	135	3	
- Average yield tonne/ha	2.3	1.94	1.12	1.07	0.90	-	5.30	0.43	13.5	0.600	
Kabhre -											
- Area ha	5,810	9,800	2,046	6,528	72	24,256	495	570	152	30	25,503
%	(22.8)	(38.4)	(8.0)	(25.6)	(0.3)		(1.9)	(2.2)	(0.6)	(0.1)	
- Production (tonne)	16,080	18,990	2,430	7,703	63	45,266	2,722	284	2,128	18	
- Average yield tonne/ha	2.77	1.94	1.19	1.18	0.87	-	5.5	0.5	14	0.600	

Wheat is gaining importance and comes after maize, paddy and millet. It is cultivated in the winter after paddy on lower khetland areas and after maize on upland bari areas. Mostly local varieties are grown, but some imported varieties are being introduced.

Barley is mostly grown at high altitudes as a winter crop. A naked barley, karu, from the Tibetan plateau is also grown above 2000m. It is planted from July to December and the yields are very low.

Other crops

Potato, introduced to Nepal about the same time as maize, is the main cash crop of the area. At present it is primarily a high altitude summer crop continuing up to the upper limit of cultivation at c.2700m. Here it forms an important part of local diet. At lower altitudes, around 1200m, it is grown as a winter crop and used as a subsidiary food.

Sugarcane occupies a small area and is used to produce locally processed raw brown sugar.

Grams and pulses (including beans, peas, lentils, black grams) are grown on terrace ends and bunds between paddy fields, with maize, or as garden crops to form an important part of daily local diet, dal.

Mustard is grown for oil seed. It is intercropped with wheat in winter or grown after maize at all altitudes. The seed is either locally crushed for oil for home consumption in cooking or sold commercially. Broad-leaf mustard grown for salad as a garden crop is also common.

Ground nut is grown at lower altitudes as a monsoon crop. Its yield is either consumed locally or sold in Kathmandu for cash income.

Vegetables like spinach, radish, broadleaf mustard and potato are common during winter, and cauliflower, cabbage, turnip, garlic, onion, broccoli, peas, beans and coriander are also grown. During summer, tomato, colocacia, green beans, pumpkins, cucurbits, gourds, cow pea, okra, brinjal (eggplant), lady's finger, capsicum and chillies are all grown. These basically form a part of the local subsistence diet and are not usually grown for commercial purposes.

Fruits, nuts and berries: The existence of different climatic types permits the growing of a wide variety of fruits, nuts and berries, including banana, guava, mango, pineapple, jackfruit, sweet orange (mandarine), lime, lemon, sweet lime, pear, peach, plum, pomegranate and apple. Most households in the area grow some fruit trees in homestead gardens, mostly for home consumption. Commercial horticulture is much less practised, although at higher altitudes in Helambu some apple production now occurs in private and government orchards.

Cropping patterns

Two basic cropping patterns are practised in the area: paddy-based for irrigated (khet) and maize-based for unirrigated (bari/pakho) lands. Paddy is the preferred crop and is grown wherever possible.

Paddy-based rotations: Seed beds are sown after the first monsoon showers and transplanting takes place when the monsoons deepen in late June to August. Harvesting occurs in November-December. In khet lands the summer paddy is followed by wheat or potato as winter crop, though the insufficient residual moisture from post-monsoon showers in October-November limits germination of a winter crop.

Maize-based rotations: Maize is sown in April and harvested in late August. It is often double-cropped, either intercropped with soya-beans or relay-cropped with millet. Interplanting of millet is done in July and harvest occurs in November-December. In some bari lands at higher altitudes maize and wheat are grown as winter crops, being harvested in April. After harvesting these winter crops, such land is then cultivated with millet as a summer crop.

Adequacy

Current data on food grain production are not available for Sindhu Palchok and Kabhre. The data on food grain production for 1974/75 have, therefore, been used by the author to compute daily average per capita food intake in the area from local production. In energy values, these are 5.12 MJ (1222 k cal) for Sindhu Palchok and 5.25 MJ (1253 k cal) for Kabhre (Table 2.32). Nutrient intake and hence average energy available per person in both the districts is, therefore, lower than the national average for Nepal derived by Brown *et al.* (1968) and FAO (1981) as well as those for the adjacent hill districts of Rasuwa and Nuwakot derived by World Bank (1976). The current situation is unlikely to be better.

Table 2.32: Daily average per capita food intake in Sindhu Palchok and Kabhre, 1974/75. Data are quoted or derived from World Bank,(1976) or ADB/HMG Nepal, (1982).

	Paddy	Maize	Millets	Wheat	Barley	Potato	Total	Other foods[7]	G.Total
(a) Sindhu Palchok:									
Cropped area[1] (ha)	3,900	9,500	2,500	2,270	360	1,800	20,330		
Average yield (tonne/ha)	2.3	1.95	1.12	0.51	0.98	5.25			
Production (Gross)[1] (tonne)	8,970	18,525	2,800	1,156	353	9,450	41,254		
Less									
Taxes, rents and storage[2] and other losses (tonne)	897.0	1,852.5	280.0	115.6	35.5	945.0	4,125.6		
Seeds[3] (tonne)	214.0	427.0	75.0	227.0	9.7	1,800.0	2,752.7		
Net balance (tonne)	7,859.0	16,245.5	2,445.0	813.4	308.0	6,705.0	34,375.9		
Consumable proportion[4] (%)	60	90	90	90	90	90			
Consumable proportion (tonne)	4,715.4	14,621.0	2,200.5	732.1	277.2	6,034.5	28,580.1		
Energy supplied (kJ/g)	14.6	14.4	13.7	13.7	14.0	3.38			
Total energy ($Jx10^{12}$)	66.9	210.2	30.1	10.0	3.9	20.4	343.4		
Energy/person/day (MJ)[5]							4.40	0.66	5.06
(b) Kabhre:									
Cropped area[1] (ha)	5,700	9,800	2,110	6,400	75	400	24,485		
Average yield (tonne/ha)	2.47	1.90	1.63	1.10	0.88	5.50			
Production (Gross)[1] (tonne)	14,107	18,620	3,437	7,040	66	2,200	45,570		
Less									
Taxes, rents and storage[2] and other losses (tonne)	1,410.7	1,862.0	343.7	704.0	6.0	220.0	4,546.4		
Seeds[3] (tonne)	313.5	441.0	63.3	640.0	2.25	40.0	1,500.1		
Net balance (tonne)	12,382.8	16,317.0	3,030.0	5,696.0	57.75	1,940.0	39,423.55		
Consumable proportion[4] (%)	60	90	90	90	90	90			
Consumable proportion (tonne)	7,429.7	14,685.3	2,727.0	5,126.4	52.0	1,746.0	31,766.4		
Energy supplied (kJ/g)	14.6	14.4	13.7	13.7	14.0	3.38			
Total energy ($Jx10^{12}$)	108.4	211.2	37.3	70.1	0.73	5.9	433.6		
Energy/person/day (MJ)[5]							4.52	0.68	5.20

NOTES:

1 HMG Nepal (1976).

2 Taxes, rents, storage and losses together are calculated at 10%. Conversion losses due to husk, bran, etc., to bring into consumable form and seeds are calculated separately.

3 Seeds: Seed requirements/ha for different crops are c.20% of total production for wheat and potato, and 2.5% for other grains.

4 Consumable proportion is calculated by using conversion rates of 60% for rice and 90% for other food crops.

5 Populations of Sindhu Palchok and Kabhre are estimated to be 213,967 and 262,396 respectively in 1974/75 and have been computed from 1971 figures at the annual growth rates of 1.21% for Sindhu Palchok and 2.29% for Kabhre.

6 Other foods include mainly sugar, meat, fruit, vegetable oil, milk and milk products, etc., and are calculated at c. 15% (ADB/HMG Nepal, 1982).

It should be noted that the data in Table 2.32 and the conclusions drawn from them for 1974/75 differ substantially from those published elsewhere (Table 2.33). The author is unable to reconcile the differences but both sets of data indicate a serious food deficit by 1979/80.

Table 2.33: Food balance situation in Sindhu Palchok and Kabhre districts betwen 1975 and 1980. Quoted in ADB/HMG Nepal (1982).

	Surplus or deficit + or - (tonnes)		
	1974/5	1978/9	1979/80
Sindhu Palchok	+1,538	-2,127	-6,992
Kabhre	+1,528	- 517	-4,777

2.4.3 Livestock

Livestock husbandry is a vital component of the Nepalese farming system. To the Nepalese farmer it provides both goods and services in the form of food, dung and other products, farm work and transport, and additional source of income.

Nepal's livestock population in 1979/80 consisted of 5.98 million cattle, 2.60 million buffalo, 3.65 million goats, 0.56 million sheep, 0.36 million pigs and 8.31 million poultry. Though during the preceding 13 years the annual increase in population of cattle was only 0.17% and that of sheep and goats only 0.26% (the buffalo population declined by 1.3%), Nepal has one of the highest livestock populations per unit of land area. (Rajbhandari and Shah, 1981; ADB/HMG-Nepal, 1982).

Table 2.34 gives the distribution of livestock population.

Table 2.34: Distribution of livestock population in units of one million by ecological regions. Data from Rajbhandari and Shah (1981). Figures in parenthesis show percentages.

Livestock	Nepal	Pahad High Hills	Pahad Middle Hills	Pahad Hills total	Terai
Cattle	5.98 (100)	0.90 (15)	3.15 (53)	4.05 (68)	1.94 (32)
Buffalo	2.58 (100)	0.36 (14)	1.69 (65)	2.05 (79)	0.65 (25)
Goat	3.65 (100)	0.57 (16)	2.27 (62)	2.84 (78)	0.81 (22)
Sheep	0.56 (100)	0.16 (28)	0.32 (58)	0.48 (86)	0.08 (14)
All ruminants	12.77 (100)	1.99 (15)	7.43 (58)	9.42 (73)	3.40 (27)
Pig	0.36 (100)	0.044 (13)	0.18 (50)	0.224 (63)	0.134 (37)
Poultry	8.21 (100)	0.635 (7)	5.70 (70)	6.34 (77)	1.84 (23)

It is seen that the Pahad has a very large proportion of livestock: on an average a household of 5 to 6 persons maintains 5 to 6 livestock units, averaging 1 LSU to each person (livestock units - buffalo 1.5; cow 1; sheep, goat, pig 0.2).

It is interesting to note (Table 2.35) that only small proportions of male animals of each category, except cattle, make up the total.

Table 2.35: Percentages of male, female and young in livestock populations. Data from Rajbhandari and Shah (1981)and ADAB/HMG Nepal, (1982).

Livestock	Adult stock		Young stock
	Male	Female	
Cattle	37	33	30
Buffalo	6	53	41
Goats	12	53	35
Sheep	14	53	33
Pigs	8	72	20
Poultry	15	40	45

In Nepal the cow has both social and spiritual significance. It is illegal to slaughter cattle, and any other form of female livestock. The high proportion of adult male cattle is perhaps due to the need for draught animals in agricultural activities. Males of all the other species are extensively slaughtered for meat.

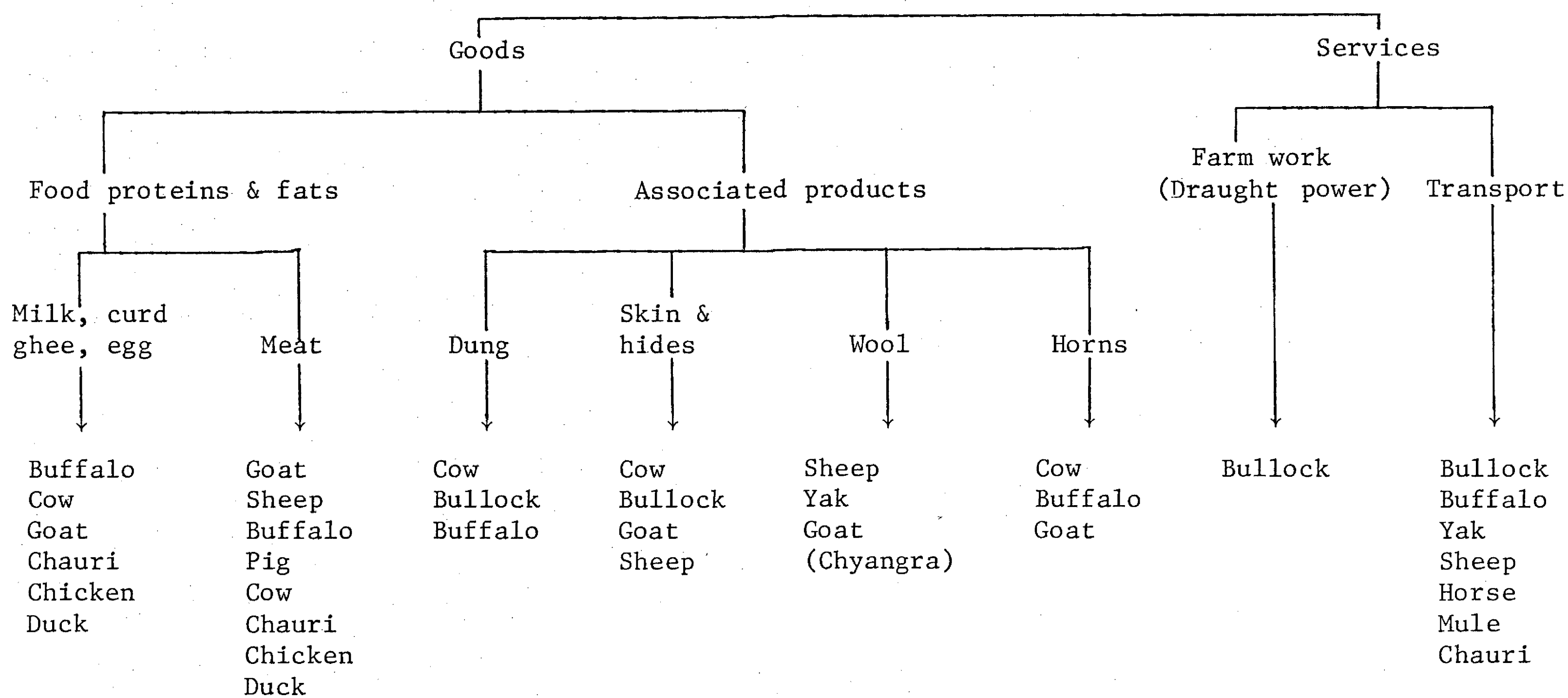
With a contribution of about 15% of total GDP and 25% of agricultural GDP (27% in the Pahad), livestock occupy a significant place in the Nepalese economy.

The use and production of various kinds of livestock are shown in Fig. 2.4 and described below.

Types of livestock raised

Cattle, yak and chauri, buffalo, goats, sheep, pigs and poultry are raised by farmers.

Figure 2.4. Livestock production and main uses



Cattle. The local hill cattle are characteristically small, the live weight of an adult cow being c. 180 kg. The main use of the cattle is to provide draught power for which purpose castrated males are used. It is estimated that about 2 million bullocks are used for draught power in Nepal (ADB/HMG Nepal, 1982). In the Pahad some 1.2 million are used, working on an average 96 days in a year (HMGN,1971). On each working day the bullocks would be engaged from dawn to dusk with very little respite. Most of these days of hard labour fall in the dry part of the year, covering three-fourths of the total time involved, when the work involves breaking of hard compacted soil and the fodder supply is lowest. On an average a pair of bullocks in the hills ploughs 1.6 ha of cropped land each year. The above study showed that in Kabhre District each household maintained on an average 3 to 4 (3.29) large animals (cattle and buffalo). Of these about one-fifth (0.65) consisted of adult male cattle. Both the New Era (1981) and APROSC (1977) studies for Sindhu Palchok also showed that the number of bullocks per farm is directly related to the size of holdings. Farmers with large holdings need more draught power and an additional quantity of manure for their fields.

The cow yields only a small quantity of milk, estimated to be c. 160-180 l per lactation. This is mostly consumed at home and seldom sold. The main reason for keeping female cattle is to breed bullocks. The calving intervals are longer than 2 years and calf mortality is very high. Fodder shortage is the principal factor limiting cattle production.

Another major aspect of cattle production is dung output for composting. The importance of the organic manuring of fields for maintaining soil fertility is very high and is unlikely to diminish in the foreseeable future, particularly because chemical fertilisers are largely beyond the reach of hill farmers in Nepal. Cattle, buffalo, goats and sheep play a vital role in converting agricultural waste and forest biomass into useful manure through composting. Estimates show that the dung of adult cattle can produce 0.83 t of compost per year, sufficient to provide 4.1 kg nitrogen (as N), 2.0 kg phosphorus (as P_2O_5) and 4.1 kg potassium (as K_2O) to cropland.

Buffalo. The local buffalo is a relatively small and hardy animal, suited to conditions of the hills, and with a live weight of 250-300 kg. Buffaloes are reared mainly for milk, production under village conditions being 400-800 l per lactation. Calves consume some of the milk but much is used by farmers for home consumption and ghee making. Some curd, but mostly buttermilk, forms a regular part of local diet. Calving intervals are usually 2 years and lactation extends over 12-14 months, though the production greatly declines with time. Male calves are usually culled at an early age but may be reared up to 1 or 2 years where a market exists. Female animals are culled at 15-20 years of age. Kathmandu has a big market for buffalo meat from surrounding areas. In more recent years improved murrah breeds from India have been introduced with a considerable impact in and around Kathmandu, the Terai, and some other major towns. These produce 1000-2000 l of milk per lactation. These are, however, not yet well adapted to the higher hill conditions.

Because of their greater productivity the farmers are prepared to pay more for buffaloes than for cattle. They are generally better cared for and are mostly stabled and stall-fed in sheds near the farm-houses. Feeding is similar to that of the cattle; but the buffaloes receive not only a relatively generous supply of fodder but are also usually given additional rations of grain feed such as maize and soya-bean flours and bran.

Yak and chauris. Farmers in the montane region, maintain c. 200,000 yak and their various crosses in herds of 20-30 animals along with up to 300 sheep and goats.

Yaks and naks (female yaks) have traditionally been imported from Tibet into higher parts of Nepal. These are used for crossing with local hill cattle to produce chauris,which are female offspring. The male offspring of both crosses,being sterile, are used only for draught power and as pack animals. Chauris are better adapted to the sub-alpine conditions above 3000m and are better milk producers. They reproduce every year and yield 350-600 l of milk during each lactation. Ghee, butter and cheese are produced from chauri milk. Fodder is not considered to be such a limiting factor in the alpine and sub-alpine regions as it is in the Middle Hills.

Livestock management and production system

The practices described below are typical of most of the Pahad but are described with particular reference to Sindhu Palchok and Kabhre Districts.

In the lower and middle Pahad between 600 and 2000 m, animal husbandry practices include both stall feeding and open grazing. Stall feeding is achieved by providing grass, weed and herbaceous fodder, tree-leaf fodder collected by farmers from their agricultural land and nearby forest areas and agriculture crop residues. Tree-leaf fodder is particularly important during the dry season (for more details, see sections 4.4.2, 5.4). Open grazing and browsing by free ranging animals takes place in the forest, shrubland and grassland throughout the year. After crop harvest, terraced agricultural land is also used for this purpose. Most animals in the lower and middle Pahad open graze during the day and are stabled by night in small sheds next to farmers' houses. Milch, very young stock and draught cattle during the working period are usually stabled and stall-fed and receive an additional supply of grain feed, mostly cornflour and soyabean flour. No additional feed is available to other animals except periodic doses of salt mixed with oilcakes to prevent diseases. The practice of feeding concentrates is non-existent. During the dry season after the crop harvest some animals may be sheltered in temporary sheds (goths) erected on the terraces. These goths are moved to new sites every few weeks to manure the terraced farms.

In the upper Pahad (lekh) at c. 2000-2500 m, settlements are mostly mono-ethnic, for example, Tamang, Gurung, Yelmu, Sherpa, Sunwar, Rai, Limbu, Magar peoples. The main source of income is livestock production although this is still closely integrated with the limited crop production possible at these altitudes. Soon after the first monsoon showers in the summer, fields around the scattered settlements are cultivated and most animals are driven out for transhumant grazing.

Transhumant chauri herds graze in summer near the permanent snowline at c. 5000 m. Each evening animals return to summer camps permanently maintained by each family. Milking takes place twice daily. In late autumn (late October) chauri herds move down to winter grazing pastures at lower altitudes around 2700m or below, the level of permanent villages. Hay and fodder from the forest supplement their winter grazing.

2.5 SOME ASPECTS OF BUDGET IN MODERN NEPAL

A detailed discussion of the Nepalese financial system would by beyond the scope of this dissertation and only some aspects that have a bearing on the forestry sector will be noted.

Data on government revenue for the Five Year Plan periods in 1956-1980 are given in Table 2.36. Recent comparative studies of the revenues of developing countries show that on a number of standard criteria taxation is usually low in Nepal. Thus, of the countries studied by Chelliah *et al.*, (1975), Singh (1977) and Dhungana (1980) the Nepalese tax ratios and index value of tax efforts were both the lowest and the Tax:GDP and Tax:GNP ratio were also very small. Further, Nepal has continued to depend heavily upon two traditional taxes, little modified from Rana days, customs and excise. The importance of land revenue, largely levied on arable land, and forest revenue, mostly from round timber sale, have steadily declined (Tables 2.37, 2.38) even though both have increased in absolute terms.

Table 2.36: Government revenue in Nepal (Rs x 10^6). Data from Agrawal (1980a,b) and Dhungana (1980).

Period	TAX REVENUE										NON TAX REVENUE			TOTAL
	Indirect tax				Direct tax									
	Customs	Excise	Sales tax	Total indirect tax	Income tax	Registration	Misc.	Land revenue	Total direct tax	Total Tax revenue	Forest	Misc.	Total non-tax revenue	Revenue
First plan 1956-1961	121.0	17.6	-	139.0	-	6.4	8.5	83.7	98.0	237.0	52.7	71.6	119.0	357.0
Second Plan 1962-1965	179.0	33.7	-	213.0	10.0	7.7	6.5	136.0	160.0	374.0	47.1	59.2	106.0	571.0
Third Plan 1965-1970	721.0	128.0	144.0	994.0	62.5	32.3	25.5	352.0	472.0	1466.0	96.6	-	210.0	1676.0
Fourth Plan 1970-1975	1207.0	384.0	500.0	2092.0	146.0	121.0	86.8	753.0	775.0	3645.0	163.0	371.0	534.0	3403.0
Fifth Plan 1975-1980	2396.0	859.0	1396.0	4653.0	627.0	331.0	309.0	406.0	1586.0	6239.0	277.0	1064.0	1158.0	7580.0

Table 2.37: Land tax as a % of total revenue and total tax revenue. Data from Agrawal (1980a, b) and Dhungane (1980).

Period	Land tax revenue	
	% of total revenue	% of total tax revenue
1952-53	29.2	52.0
1955-56	28.0	49.6
1959-60	18.8	31.1
1964-65	22.4	28.6
1969-70	18.9	21.3
1974-75	9.0	10.8
1979-80	3.7	4.5
1980-81	3.1	3.9

Table 2.38. Declining share of forest revenue in the total revenue. Data from Agrawal (1980a,b) and Dhungane (1980).

Period	Total revenue (Rs x 10^6)	Forest revenue Actual (Rs x 10^6)	%
1953-54	42.4	4.7	11
1954-55	42.5	5.8	13.6
1960-61	97.4	12.0	12.3
1961-62	91.0	8.7	9.5
1963-64	157.9	16.4	10.4
1964-65	192.4	20.9	10.8
1967-68	326.0	21.8	6.7
1969-70	464.0	17.7	3.8
1970-71	459.7	12.5	2.7
1972-73	615.8	35.2	5.7
1974-75	1008.4	45.1	4.5
1977-78	1582.0	63.6	4.0
1978-79	1811.9	82.7	4.5
1979-80	1747.6	62.9	3.4
1980-81	2414.3	138.7	5.7

Most forest revenue has for long been derived from activities in the Terai. Between 1975 and 1980, 42,000 ha of forest were cut and cleared under government supervised programs alone, mostly for resettlement (Wallace, 1981). During that period most of the external technical assistance was also applied to tree felling, conversion and marketing and little to forest management.

The beginning of the decade in 1980 saw total confusion in the handling of forest resources as a source of revenue. This confusion began at the policy-making level and trickled down through all levels of implementation and supervision. There were huge losses during this most ruthless period of exploitation, at times as high as 50%, due principally to involvement of vested interests in policy-making, poor selection of timber operators and inadequate supervision of operations. In 1980 alone valuable timber and other resources from at least 6,500 ha of forest land were lost in this way from a single area of Jhapa district in the eastern Terai (Author's personal observation).

Variable forest revenues reflect then the lack of a real concern on the part of government in proper management, conservation and judicious utilization of this important natural resource as a source of revenue for investment in development on a sustainable basis.

Analysis of the composition of government expenditures since the First Plan, as given in Rana (1973, 1974); Singh (1977); Shrestha and Jain (1978); Pant and Jain (1979, 1980a, b); Stiller and Yadav (1979); Bhoosan (1979); Lohani (1979); Dhungana (1980); Pant (1980) and Agrawal (1980a, b) shows that the emphasis of the first three Plans was on infrastructure with heavy spending on transport, communications and power. Under donor agency influence, the infrastructure sector again took priority in Fourth Plan spending, deviating from the planned priority for agricultural development. In the Fifth Plan, completion of the projects started in the previous plans was the reason given for the still very large share of the total development budget allocated to the infrastructure sector.

Despite the stated high priority objectives for agricultural sector development in each Plan, this lagged far behind the infrastructure sector in actual spending in each case. Moreover, the money actually allocated to agriculture was spent on a wide variety of agriculture-related but mostly centrally based projects and institutions (in the name of institutional development) and not directly on production. In the forestry sub-sector, whatever scant expenditure was actually incurred under the budget beyond that of the regular government services nearly all went to revenue-oriented fellings of trees and deforestation activities such as resettlement in the Terai.

Regional disparity in allocation of development resources has been another important and characteristic feature, placing heavy emphasis on the Kathmandu capital region and the main Terai towns, with the Hills region receiving only residual investment. For instance, between 1950-70 the Bagmati zone, principally because of the Kathmandu Valley received 40% of the government development expenditure, the Kosi and Narayani zones with Biratnagar and Birgung towns, received 27%, and the rest of the country only 24%. The expenditure not classified by area had also been substantially biased in favour of the Kathmandu Valley, Morang, Sunsari and Narayani districts. (Rana, 1973). The decade commencing in 1970 showed some improvement and the Fifth Plan recognised the disparity. However, the traditional bias of Nepalese planning in favour of the Kathmandu capital area in the central development region is still very visible.

Moreover government expenditure (both regular and development) has been increasing fast and there has been a rising trend in Nepal's dependency on external assistance. The provision of adequate finance to meet not only the growing development expenditures but also the regular expenditures is becoming increasingly difficult. A sluggish growth in revenue (10%pa) has lagged behind a faster growth in expenditure (16%pa).

2.6 SUMMARY

The material presented in this Chapter allows us to come to a number of conclusions which are relevant to the two main theses outlined in Chapter 1. These are merely listed below but will be taken up again during the final discussion:

1. Forested land makes up 29.1% of the total land area of Nepal, of greater area than the cultivated land (22.2%), but in total these two constitute only about half of the total area on which 15 million people depend for their survival. There is only 0.27 ha of forest land and 0.21 ha of cultivated land per capita in Nepal making it one of the most densely populated areas in the world if we ignore that half of the country in the high Himalaya which is uninhabitable.

2. The area of forested land has been decreasing at an alarming rate in recent decades but this loss of forest is confined mainly to the Terai (about 4% annually) and the Siwaliks (a little more than 1% annually) but is negligible in the Pahad where land use is relatively stable.

3. The percentage annual growth rate of population between 1971 and 1981 was 2.66% for Nepal as a whole, 1.61% for the Pahad. Population increase has been less in the Pahad because of migration to the Terai but in future years

there will be less and less opportunity for people to settle on the Terai as most of this land is now fully occupied. The migration has been mainly from rural to rural area, not rural to urban as has occurred in many other less-developed countries.

4. Within the study area the percentage annual growth rate of population between 1971 and 1981 was 1.21% in Sindu Palchok but 2.29% in Kabhre. This population is of mixed ethnic groups of Hindu-Buddhist origins.

5. The rate of illiteracy is very high; less than 2% of the population 10 years of age or older had any education in 1971 and in spite of a massive increase in education over the last decade, especially in primary schools, this situation has not changed greatly since then.

6. Since the unification of a number of feudal kingdoms into an identifiable Nepal during the latter half of the 18th century the country has been ruled by a series of power groups, mostly belonging to a relatively small number of elitist (bhardar) families. The vast majority of the country's population living in the villages remained totally unrepresented and took little interest in the machinations for power. Their correct assessment of the situation was that no matter who was in power they were likely to remain deprived.

7. The economy of Nepal has been dominated by the rural sector and based almost exclusively on subsistence agriculture. In the Pahad this agriculture is very much influenced by elevation and topography, everywhere constrained by extreme physical problems which are only overcome by an excessive input of human labour.

8. The ruling classes perceived agricultural land and labour as the major resources of the country, conferred favours by means of land grants (birta or jagir land grants), and generally followed administration policies aimed at converting as much land as possible to agricultural production in order to maximise the tax base.

9. Living standards of the peasantry were of little concern to the ruling elite, intent as they were on political intrigue for power and the process of maximising benefits to themselves. There is some evidence that the tax systems were carefully balanced so as to extract the maximum possible from the peasantry without destroying them.

10. Following the collapse of the Rana administration in 1950 a period of political instability was followed by the institution of the Panchayat Polity in 1962, whereby the administration of local affairs was gradually transferred to Districts, Panchayats and Wards within these panchayats, resulting to a considerable degree in self-government at the village level.

11. Agricultural production within Nepal generally, and within the study area is less than sufficient to maintain a subsistence diet.

12. There is a direct link between community welfare and the use of forested land through the needs for fuelwood and fodder. Fodder is fed to animals which provide almost the only manurial inputs to crop production.

13. Despite the dependence of the economy on agriculture few government funds have been directed towards agricultural development, even fewer to forest development. Even those funds directed to agriculture/forestry tended to be spent on centrally based projects and institution building, not directly on production.

CHAPTER 3

TRADITIONAL RESOURCES AND THEIR ADMINISTRATION

3.1 LAND

3.1.1 Introduction

Nepal is and always has been a predominantly agricultural society so that access to agricultural land and thus the land tenure system is of fundamental importance to all strata of society. Stiller (1975) described three principal features involved in the land tenure system of the pre-Gorkhali period. First, the state owned all land. Second, land as the principal source of wealth could not be allowed to remain unproductive and, third the possession of land was the sole means to wealth and prestige. For the state, land revenue was the principal source of income through which its economic power was judged. Thus, for the individual, landlessness amounted to a low place in society and rendered service to others in the community necessary if food and other essentials of life were to be obtained. Based on the traditional principle of state ownership of land, the real importance and power of the ruler therefore lay in his control of the means of people's livelihood (both peasantry and nobility) through his control on land.

The three principles stated above appear to be very ancient, pre-dating the Kchhetriya rulers of the principalities which had been established by the 15th Century. The Gorkhalis in general did not introduce drastic changes and the ancient practices continued after Gorkhali supremacy (Kirkpatrick, 1811; Stiller, 1975).

According to Regmi (1971, 1976, 1978a,b) and Stiller (1975, 1976) the traditional land systems were as follows. State owned land is commonly known as raikar (raikar: rajya and kar, where rajya means state, kar means tax). The peasants paid to the crown, as rent or tax, one half of the produce of the land they held. The peasant's right to the land was based on his regular payment of this rent to the crown's representatives (zamindars or other revenue functionaries). If he did not farm it, he was obliged to leave it for occupation by someone who wished to cultivate it because land, being the basis of wealth, could not be allowed to remain non-productive. Thus King Prithivi Narayan Shah himself directed that "land which can be converted into field shall be reclaimed even if homesteads have been constructed there and the homestead shall be shifted elsewhere" (quoted by Regmi, 1978a).

The rent of one half of the produce of the land was very high, even with good harvests, for the peasants who tilled it. The remaining crop provided, at most, basic subsistence to them and their families. The only escape from this hard reality was to gain a right to some land through jagir or birta grants, or reclamation of forest or other lands. In a jagir grant, the land was assigned to a person who served the court in some official, civil or military capacity, even if of low rank. These jagirdars (office bearers) would then receive all benefits of this land if they or their family farmed the land. No taxes were due to the state. If tenants farmed the land the jagirdars could exact one half of the crop for themselves. This form of grant remained valid only as long as the official concerned continued to serve the state. The birta land grants were made by the ruler to a noble for some particular services and the whole of the produce of the land became the birta-holder's. Such a land grant had no set time and it was valid until it was recalled or confiscated. The ruler sometimes also mortgaged land to one or more of his nobles to raise funds; this was also classified as birta. Birta land grants had been made in Nepal at least since the 5th century (Regmi, 1978a).

The ways in which the state, jagirdars and birta-holders actually realised the benefits of taxes and rents are extremely complex (Regmi, 1978a) and only a gross simplification can be presented here. Although jagirdars and birta-holders and the state itself might themselves directly require and accept grain and other farm products as rental or tax, this was probably the exception rather than the rule. Generally payment was required in cash so that farmers were forced to obtain cash equivalent in value to half the product of their land. The expansion of agricultural land in the Pahad in the early Gorkhali period, and thus of rents and taxes, was probably the cause of a shortage of coins which arose at this time (Regmi, 1971). How this cash was generated largely remains a mystery (D.M. Griffin, 1984, pers. comm.) but most is thought not to have arisen from the sale of the major farm products. Rather, the gathering of medicinal plants from the forest and their subsequent sale (a large trade existed with India), wages for labour, and miscellaneous minor manufacturing activities were the likeliest sources of cash to meet tax and rent obligations. Some grain was possibly purchased directly by those trading with Tibet and India, such as the Bhotiyas and Newars (see

Section 3.2). (In the Terai trade with India became important by at least the early 19th century but was probably always small from the Pahad.) The state also purchased grain in some areas to establish famine relief stores.

Reclamation of forest was generally open to anyone who undertook to bring it under cultivation. Tax exemption, normally for 3 years, was granted as an incentive in respect of such land, a concession attributed by tradition to King Ram Shah of Gorkha (1606-33) (Regmi, 1972, 1976). The zamindars and other revenue functionaries, over and above the jagir land grants received for their work, were also entitled to reclaim as much new land as they liked without the payment of any additional tax.

Through the jagir and birta land grants to individuals, the state alienated its right to ownership of the raikar land as well as its sovereign power of taxation. Moreover, the limitations of such grants to officials of the court and noblemen reduced the chances of peasantry to till this land for their benefit. Nonetheless, as long as the peasants were left an acceptable tenure of land, they continued to cultivate it and accepted any government that ruled them. When conditions became more difficult for them or when they needed more land, they reclaimed new forest. Very difficult tenurial conditions, however, forced them to quit their homes and farms and resettle elsewhere where conditions were less trying. Necessity or apparently attractive prospects oriented them towards new land reclamation often only to be forced again to move to new areas.

Kipat was another and entirely different concept of land tenure existing in the pre-Gorkhali period (Chemjong, 1966) in some tribal communities in certain hill areas of Nepal. In such communities land was considered to belong not to the state or the king, but the community owned the land and extended to each tenant his right to till the land, but no one had individual title to land.

3.1.2 Land tenure and the expansion of Gorkhali rule

Interrelationships between land tenure and the military were of great significance in the rise of the Gorkha state from a tiny principality to a nation over 2000 km in length. It was through the army that this remarkable increase in Gorkha land was achieved and the common practice of assigning land to support the military rendered it directly dependent on land. Thus Prithivi Narayan Shah's strategy provided significant incentives to the army in the form of land that would accrue to its members in proportion to the increase in Gorkhali territories. In important ways the limit of the army was set by the land, and the limit of the land was set by the army's activities.

Such a strategy, however, has obvious limitations because the newly conquered lands already had a population depending on those lands. Only the surpluses above minimum subsistence needs could be allocated to the military. Further, a considerable cost was involved in supporting the families of the fallen soldiers, in rewards to faithful servants, gifts to Brahmins and temples, generosity to friends and luxury at court. All these costs had to be met by land assignments. The government's increased alienation of its ownership and taxation rights over land through the jagir, birta and the newly introduced rajya systems therefore further reduced the peasants' opportunities to till government owned raikar lands. (Rajyas were semi-autonomous feudal principalities.) Such policies, along with the tax incentives, also induced them to reclaim new lands from forest since land grants from the rulers would not accrue to those in the peasantry.

Wherever the land could be levelled into terraces, however narrow, it was converted to agriculture. Paddy was grown if such land could be supplied with water from a nearby creek or spring, or even monsoon rains. Insufficiency led to further cutting down and burning of forests and this was no longer limited to valley bottoms or gentler slopes that could be converted easily into terraces and irrigated. It extended up and beyond. According to Regmi (1978b) maize was introduced to Nepal during the early 18th century, as was potato. The adaptability of maize to different altitudinal and climatic zones in the Pahad as well as in the plains made it a very popular crop. Both maize and potato are relatively easy to cultivate in newly reclaimed unirrigated sites that hold sufficient soil nutrients and are, therefore, particularly preferred for growing in newly reclaimed nutrient rich forest areas. (The cultivation of maize had become so common and gained such importance by the last decade of the 18th century that areas of dry lands were determined with reference to the quantity of maize seeds (bijan) that would be required for its sowing (Regmi, 1971)).

The common cultivation of maize and potato was therefore associated with increased reclamation of dry agricultural land, particularly from forest, and so contributed to the advanced state of deforestation existing by the late 18th century. Moreover, maize and potato as an additional crop on dry land, in addition to the usual millets, meant increased food production and improved peasant productivity, to which Regmi (1978b) attributes the population increase during and after the mid-18th century. Poffenberger (1980), however, argues that the increase in population during this period was by no means significant. Whether or not there was a significant population growth the introduction of new dry-land crops must have led to the clearing of forest on land hitherto considered too difficult and steep for cultivation, as reported by Hamilton (1819).

Difficult tenurial conditions and related problems, limitation of land and growing population led by the final years of the 18th century to an emigration of peasant population from the Pallokirat region in the eastern Hills and the Terai region to adjacent Indian territories of Darjeeling and Kalimpong, and onwards to Sikkim and Bhutan. All despite new annexations, increased reclamation of forest lands and increased cultivation and production of new crops such as maize and potato (Regmi, 1971).

The already existing shortage of land and limitations on its further reclamation from forest and wasteland in the Pahad had also led to efforts within Nepal by the late 18th century to reclaim land in the Terai. This seemed particularly feasible after the establishment of the Gorkhali rule which had weakened traditional constraints in the colonization of the Terai due to fear of invading neighbours. Such opportunities to reclaim new agricultural land in the Terai were, however, hampered in earlier stages by shortage of labour. Diversion of hill manpower to the Terai was primarily limited by the hillman's reluctance to leave his home in the moderate hill climate and go to the hot, humid and malarious Terai. Since not much cash flow existed in the rural economy, shortage of capital was yet another constraint. Measures to encourage immigration by attracting settlers from India were also not yet effective. However, the Terai was increasingly being seen both by individuals and by the government as a potential source of economic development through extension of agriculture and timber trade.

Whereas the lower ranks in the army had their jagirs mostly in the hills, its officer corps, the governors and other important officials increasingly were allocated lands in the Terai. These people were vital to the Gorkhali state and its administration and had by now gathered their own substantial financial resources as well. To further its own economic development this class was now keen to increase agricultural production through the reclamation of the Terai virgin lands (kalabanjar).

The reclamation of virgin forest was taken up in 1800 in the central and eastern Terai districts of Bara, Parsa, Rautahat, Mahottari, Saptari and Morang (Regmi, 1979). Hamilton (1819) reports export of timber and agricultural products to India from Morang and timber transportation by boat through the Kankai and other rivers. However, the government's first plans to develop land in the Terai, which included as incentives the allocation of land in addition to tax remission for 3 years, did not attract much interest. Far more attractive incentives followed in the subsequent years for private entrepreneurship in this context. The government created settlement conditions that favoured the tenants and at the same time offered substantial financial rewards to those who invested their capital in such land reclamation attempts. Investors could develop as much land as they wanted in the Terai districts. They received as financial encouragements revenue rights for up to seven years in the area they developed. As additional incentives they received substantial grants of land as personal birta. The settler farmers were provided with assistance in homestead building, clearing forests and getting in their first crops. Such assistance included food, building materials, seeds and even finance. Manpower was still a critical factor but this problem was eventually solved largely through immigration from India, encouraged by the attractive incentives in Nepal and difficult agrarian conditions in adjacent territories of the British East India Company (Stiller, 1976; Regmi, 1978a).

Thus started the deforestation of the Terai encouraged by the government policies, while the remaining population in the Pahad carried on with the tilling of existing land and reclaiming whatever new land was available. The remaining forests, mostly on steep land, continued to be exploited for grazing, fodder, fuelwood and other purposes. Little emphasis was given to improved productivity of the existing cultivated land nor was there any thought given to managing the forests so as to produce in perpetuity.

3.1.3 Land and the post-war period (1816-1846)

The end of the Nepal-British war (see section 2.3.2) marks an important turning point not only in the political but also in the economic history of Nepal. The treaty of Sagauli in 1816 terminated on the one hand the hostilities between the two sides but on the other hand resulted in the loss for Nepal of economically important territories in the Indo-Gangetic plains. (The Terai districts between the Kosi and the Gandaki and those between the Gandaki and the Rapti were returned to Nepal in 1816 and reduced somewhat the problems faced by the government.) The treaty also terminated further territorial expansion in the future towards the east, the south and the west and the China War (1791-92) had already terminated chances of expansion to the north.

Acute financial problems led the government to take a number of haphazard measures by the early 1830's (Regmi, 1971). Salaries of non-military employees were cut down by 25% and land grants and assignments were also affected. The government, for some time, prohibited the conversion of jagir lands to birta and measures were taken to increase the area of land under raikar tenure. Land taxes increased to 50-75% of the rice crop and direct relations in revenue administration were established between the central government and the village headman, thus bypassing the district administration and eliminating its authority to collect revenue (Regmi, 1971).

The new system of land tax collection had deep impact on the agrarian structure at the village level. The peasant farmers not only shared their produce of land with the government, but also with the village headman and other functionaries employed to collect the revenues. A similar situation had developed in the case of jagir, birta and rajya lands, the owners of which rarely lived in the villages where their lands were situated. The village headman and other functionaries who collected revenues for the government and other land owners in addition extracted their own shares. Enhanced revenue assessments and collections, harassments by the village headman, pressures from moneylenders and slave owners made the conditions of the peasantry intolerable. Their efforts to reclaim new agricultural lands from forests to offset their hardships proved no longer productive as most of the potentially arable land was already reclaimed. The large scale exodus of population from several parts of Nepal to India in the post-war period was the direct result of these continuing factors (Regmi, 1978b).

Land being the principal economic resource of the kingdom, the fundamental goal of every faction of the competing nobility, even after the downfall of Bhim Sen Thapa, was to control land. As a result the birta and other lands of Bhim Sen Thapa and others of the Thapa family were confiscated by those who gained power. When his nephew returned to power as Prime Minister, he not only confiscated the birta and other lands owned by the Pandays and acquired back the land of his family, but he also got for himself within 2 years, large ricelands and handsome revenues as his jagir emoluments. In addition, he obtained for himself fresh birta lands of 25,346 bighas (16,225 ha) in the rich central and eastern Terai districts and cash revenues of Rs10,562 from villages in the hills adjoining the Kathmandu Valley. Endowments were also made as guthis to temples in different parts of the country in his name, in addition to the above personal land grants (Regmi, 1978a, 1978b).

The remnants of this acquired wealth and prestige is enjoyed to this date by some of his family in the districts of Sindhu Palchok, Nuwakot and Dhading. A recent effort, in late 1980, by the local peasants from the Sindhu Palchok district to free themselves from these ancient obligations failed. This example illustrates how the

Gorkhali nobility had competed for political power, to control the land and use it to enrich itself without considerations of economic betterment of the nation or its common people. It is not difficult, therefore, to discern that the man-made degradation of natural resources, such as forest and land, through the ongoing process of deforestation as a result of continued impoverishment of the peasants of village Nepal, was largely due to the policies and practices of those in power in the past centuries. This was true at least in the case of the Middle Hills.

3.1.4 Land under the Ranas (1846-1950)

The emergence of Jung Bahadur and his Rana family to prominence was another example of competition and conflicts among the Gorkhali nobility to gain political power through which to control the land and thus dominate the economic and social aspects of Nepalese national life.

Since land was the principal economic resource of the nation, the goal of the Rana rule was also to control and exploit this resource. The important sources of government revenue during the Ranas rule remained those from land and forest. Under the Rana rule also the aristocracy remained the beneficiaries of the economic surplus generated by the peasantry.

The Ranas retained the existing land tenure systems and made rajya, birta and jagir grants to extend political control over elite groups and to finance military and civil administration. The Ranas manipulated these systems in such a way that only themselves and their supporters benefited in the reallotment of the land after 1846 up to the end of the Rana rule in 1950. By then at least one-third of the total cultivated land and large forest areas in the kingdom were under birta tenure and of that 75% was assigned to the Rana family (Regmi, 1978a).

Though the Ranas started a system of revenue collection through salaried government servants, the village headman and other local functionaries continued to play important roles. The land tax collection authority remained vested permanently in these local functionaries who played an intermediary role between the landowning elites or the government and the peasants. A complementary relationship had developed over the years between the landowners and the local functionaries. The landowners needed the local elites to collect taxes and control the peasantry, while the former provided necessary political backing to the latter. The Ranas further tightened their hold on the peasantry through the village elites so as to extract a higher share of the peasants' crop output on an ever expanding scale. The result was continued and further impoverishment of peasants and economic stagnation of the nation.

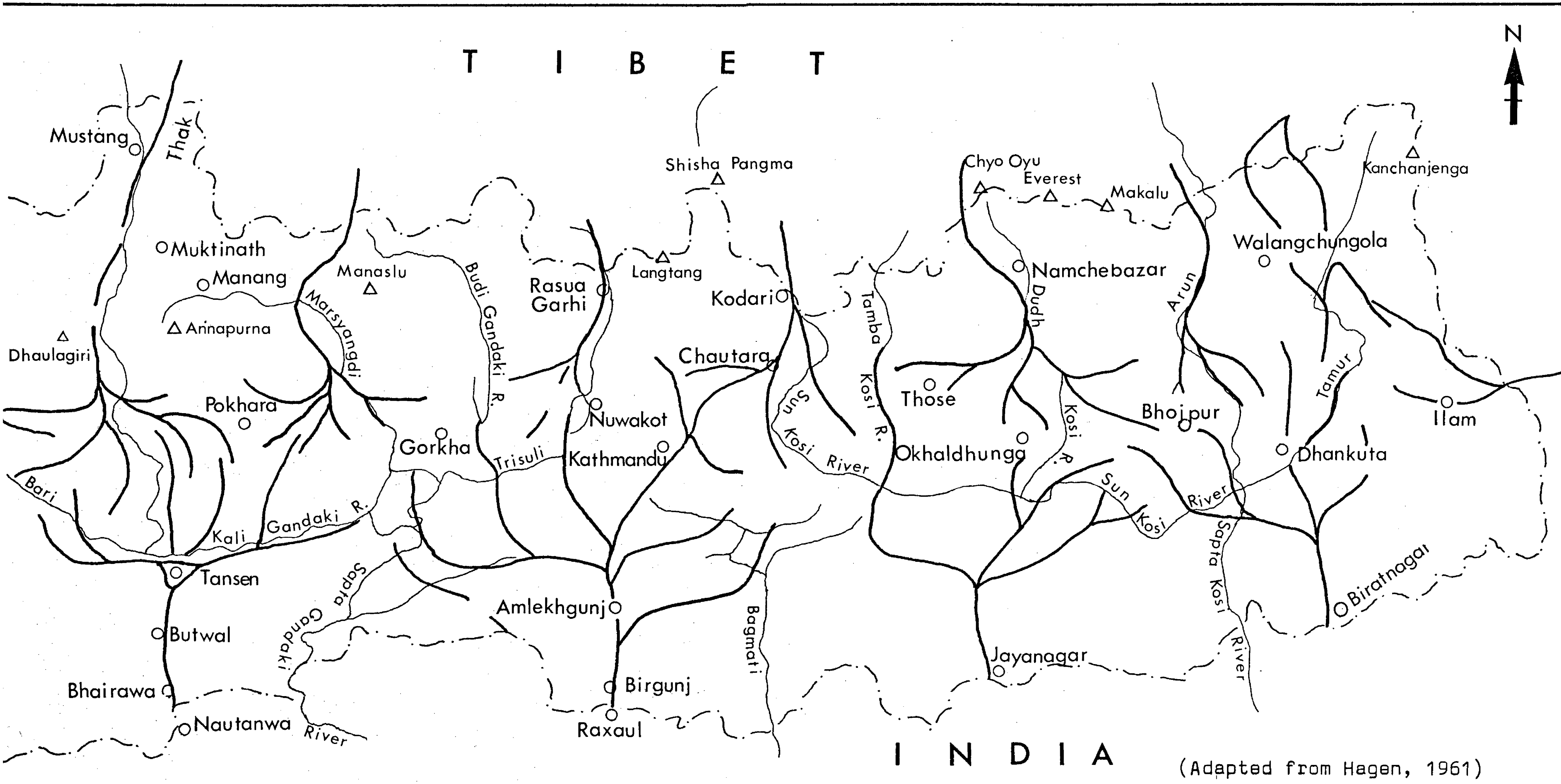
Not surprisingly, a large number of people from the hills of Nepal emigrated as before to Bengal, Assam, Burma and elsewhere outside Nepal in the 19th century (Regmi, 1978b). By 1891 over half of the population of adjacent Darjeeling in India was of Nepalese origin (Donaldson, 1900; O'Malley, 1907), by 1951 77.2% of the Sikkimese population were of Nepalese extraction (Davis, 1951), and in 1960 2-3 million Nepalese were regularly living in India, Sikkim and Bhutan (Patterson, 1962; Rose, 1963). Population in Nepal at this time, according to the 1961 Census, was 9.4 million.

Agricultural development policies of the Ranas were essentially measures to extend the area under cultivation, now mostly in the Terai. To make development attractive and to encourage private enterprise the Ranas continued the policy of fiscal concessions. The 1854 legal code, therefore, prescribed tax exemptions of 3 years in the Pahad and 5 years in the Terai for any new reclamation of land. Any person who worked forest lands received in addition one-tenth of the area reclaimed by him as his personal birta. Further tax concessions and other privileges were introduced in subsequent years. The Hills however, now provided little scope for further extension of cultivated area, and, as in the first half of the 19th century, the efforts to extend agriculture during the Rana rule were concentrated mostly in the Terai region.

3.2 TRADE

The fundamental importance of land and its produce in the economic life of the people of the Hills principalities prior to the unification of Nepal by Prithivi Narayan Shah and thereafter has been demonstrated in the preceding section. It has also been shown how the forest diminished in the process of making more land available for agriculture and allied needs, and how public policies contributed to this trend of deforestation. More land through new reclamation was always needed not only to satisfy subsistence needs of peasants but to generate surpluses required by the social and political conditions. Trade and commercial activities were less significant in people's livelihood and government revenue.

Fig. 3.1 Trade routes before the 1959 Tibetan revolution



Traditionally trade had a north-south orientation, linking India, Nepal and Tibet. In the northern Himalayan region, in the absence of any significant agricultural base due to the harsh climatic conditions, the main occupation of the people was trade even during the pre-Gorkhali period. Such trade concentrated on the passes through the Himalayas into Tibet, such as at Kodari, Rasuwa and Thak (Fig. 3.1). Here the Bhotiyas traded with their specified Tibetan counterparts and clientele. In the Middle Hills, too, the commercial and manufacturing activites were not independent means of livelihood. Trade within Nepal and trade with Tibet in goods of Nepalese origin were relatively small so that the transit trade between India and Tibet predominated. Iron, rice, copper and coinage, and coarse cloth were the chief Nepalese products exported, for which rocksalt, borax, musk, yak tails and gold dust were received from Tibet. The transit trade, too, was advantageous to the Nepalese merchants of the Kathmandu valley, to the Bhotiya of the Himalaya and to government, the last benefiting from customs duties and passport taxes. Thus trade supplied some areas with useful additional wealth but, for the Middle Hills in general, agriculture formed the basis of the economy.

Even under Rana rule, in the field of trade, attention was mainly concentrated on measures for the collection of revenue rather than on measures to expand volume. The main exception was in relation to the Terai where export revenues from forest and agricultural products became attractive incentives for the government. Soon export revenue potentials took precedence over other considerations in the clearing of Terai forests although increased land revenue through extension of agriculture was also important. Such a policy of deforestation of the Terai was supported by forestry experts recruited from outside Nepal. Thus Collier (1928) advised the Rana rulers "to press forward a policy of tree felling in all localities where crops can grow" so as to generate more surpluses for export (quoted in Landon, 1928).

3.3 LABOUR

Land as the ultimate resource can provide subsistence to the peasantry and revenue to the state only through the work of man. Similarly, trade is dependent upon human labour. Thus human labour is, and has always been, a dominant resource in Nepal, as in other non-industrial societies. The role of labour in subsistence agriculture is fundamental but will not be discussed here. Rather, attention will be focussed on ways in which labour in Nepal became a resource directly available to the state and its ruling class.

Traditionally in Nepal the state exacted compulsory and unpaid labour from its subjects for public purposes. According to Regmi (1971, 1976, 1978a, b) and Stiller (1976) jhara and rakam were the two most prevalent forms of compulsory and unpaid labour obligations of the villagers. The state exacted jhara services in its capacity as the landlord so that landless peasants were exempt from jhara in as much as the property right on these did not belong to the state but to the individual owner. (Guthi lands are charitable land endowments.) Jhara was an individual obligation imposed for non-recurring or irregularly recurring purposes, such as the construction and repair of roads and bridges. Rakam was a compulsory labour obligation imposed on those holding certain land occupancy rights and commuted to specific services to be rendered on a regular and inheritable basis.

Exemptions were granted under jhara on the basis of caste and communal considerations but evidence is lacking of such examples under rakam. Rakam supplied the needs of the regular establishments and activities of the government and came to be based on family. Each family was required to provide one able bodied adult worker, although originally the obligation had been imposed collectively on the village rather than on individual families. The hill peasants who did not come under the rakam system had a no less important role to play in the labour tax system insofar as they were the main source of jhara labour and constituted a reserve labour force for rakam enrolments when necessary.

Rakam land tenure was limited mostly to the hill areas and Kathmandu Valley and did not extend throughout the kingdom of Nepal. The same land could be simultaneously under birta, guthi or jagir tenure on the one hand and rakam tenure on the other. Rakam tenure thus necessitated the fulfilment of dual obligations: payment of rents and taxes due on land and performance of prescribed rakam services.

The most important category of services which the villagers were obliged to perform under the rakam system fell under the hulaki rakam, which involved porterage services and was divided into thaple-hulaki (involving transportation of government and other stores) and kagate hulaki (for the operation of the mail system within the country).

From the government's point of view the rakam system was an important tool in its hands to use the services of its subjects on a regular basis, at no cost and according to its requirements. From the point of view of people in general, however, it was necessarily coercive in character and its obligations were invariably imposed upon the poorer sections of the population. Birta owners, jagirdars, temple priests and local functionaries were exempted from these obligations. Top government officials often abused the system and exacted such labour for their personal requirements as well.

Most significantly for forestry, rakam services were used for mining, smelting, manufacturing of arms and ammunitions, transportation of government stores, and for acquiring forest products such as fuelwood and charcoal. Initially these forest products supplied the energy needs of mining and defence manufacturing processes, and then gradually came to meet the demands for forest products by the ruling and privileged classes. The peripheral areas of Kathmandu were most vulnerable to these demands.

Generally speaking, under the rakam labour obligations the needs of the defence establishments received highest priority. Iron was supplied to the defence factories by the villagers under falam khani rakam from their local mines (falam: iron), charcoal was supplied under jangi megjin rakam (jangi: military, megjin: magazine), gol rakam (gol: charcoal) and gol daura (wood cutting and charcoal manufacture) and fuelwood under daura rakam (daura: fuelwood) compulsory labour obligations. Other rakam services lower in order of importance at the time included lumbering and sawing (bosi, kotha bosi and bala rakams), fodder supply for state horses, cattle, elephants, etc. (ghansi rakam) and brick-making (awale rakam). Given, however, the prime importance of defence considerations at the time, the government employed any one or more of these categories of rakam obligations to supply the needs of mining, gunpowder factories, arsenals, and for transportation of military stores and ammunition. Moreover, even stone workers, lumbermen and bricklayers were required to supply either 2 manas (c. 1 kg) of saltpetre or fuelwood to the gunpowder factories for the manufacture of gunpowder.

Rakam obligations involving forest produce were expressed either in terms of number of days (a total of 72 to 75) to be worked in a year, or its quantum in physical terms. Thus, the rakam workers employed in transportation of lumber were prescribed a continuous period of work up to 75 days during the winter after crop harvest and the quantity of timber to be transported by each worker was also prescribed. Daura rakam workers usually supplied 360 dharnis (c. 864 kg) of fuelwood while the jangi megjin workers supplied about the same quantity of charcoal annually (one dharni or c. 2.4 kg daily). Defaulters in the discharge of rakam obligations could be fined in cash but those who supplied forest produce such as lumber were required to provide an equivalent period of compulsory work in the following year. A further failure to meet the obligations rendered the worker liable to be evicted from his rakam lands (Regmi, 1978a).

The forest had to be exploited to fulfil the many demands of the central authority. It is difficult to say how many families or even villages were thus obliged to provide goods and services involving forests directly or indirectly in different parts of the country at various times. Nevertheless there appears to be enough evidence to support the assumption that large numbers of such families and villages were engaged at various periods or concurrently to supply fuelwood, charcoal, lumber, iron and such other needs all over the hills region to the mines, defence factories and other government establishments (See section 4.3.3 for specific examples.). Sindhu Palchok and Kabhre districts, along with other surrounding areas of the Kathmandu valley, were most vulnerable in this respect.

The size of the burden of the peasantry under compulsory labour obligations during the extended period of war and military conquests is also evident from the example of the 1854-56 Nepal-Tibet War which involved 400,000 hill peasants to work as porters (Poffenberger, 1980). The two most important strategic points, the Kodari pass and the Dugunagarhi fort overlooking it, were in Sindhu Palchok and the supply route from Kathmandu to these points and beyond also passed through Sindhu Palchok and Kabhre.

The government was hardly unaware of the hardships of the villagers caused by the coercive nature of the compulsory labour tax. However, the few piecemeal remedial efforts in the Hills region, such as providing 3 manas (c. 1.25 kg) of rice as daily rations to lumbermen hauling timber to Kathmandu, were made only to facilitate further exploitation of forest resources. Similarly, the apparently major concession of abolishing, in 1790, the compulsory labour obligations in the Terai was designed only to encourage increased agricultural colonization of the Terai forest lands towards which the government policy focus had already shifted (Regmi, 1978a). The Pahad, however, no longer provided such incentives to the government to consider the hardships of the rural population. The system of compulsory labour tax, therefore, continued throughout the Pahad, and the peripheral areas of the Kathmandu Valley remained as vulnerable as ever to the demands of the centre.

The Rana period witnessed important changes in the existing pattern of compulsory labour tax, though the exploitation of forest resources continued undiminished, at least in the adjoining hill areas of the Kathmandu valley. The Ranas established peace and stability within the country, and friendship and cordiality with its neighbours, thus reducing the importance of defence preparations. The modernization of the Nepalese army on contemporary British lines during the period made it wholly dependent on external sources for defence equipment, arms and ammunition. The indigenous defence industry as a result almost totally collapsed. Firewood, charcoal, saltpetre, iron, etc., were no longer needed for the mines, arsenals, gunpowder factories and similar establishments. These developments did not, however, necessarily result in any reduction of labour obligations. When the government no longer needed the compulsory labour services for the original purposes, these were often commuted into cash payments in addition to land tax. When the ruling family wanted such services for its personal needs, however, these were not commuted into cash payments but were diverted more and more to the personal use of the rulers, particularly during the later part of the Rana rule.

Although piecemeal efforts to provide rations or sometimes even wages to the rakam workers in the Kathmandu Valley and its adjoining areas commenced at the beginning of the present century, the compulsory labour obligations of the poorer sections of the population continued undiminished. Thus the rakam system in united Nepal underwent many changes with time but remained significant until 1950. Its use to meet the personal needs of the ruling class and political elite group resulted in more and more peasant households being brought within its folds. The ramifications of the system had great impact on the hill forests, as is described in sections 4.3.2 and, more importantly, 4.3.3.

3.4 ADMINISTRATIVE SYSTEMS

3.4.1 Past structures

For the administration of the fifty or so petty principalities that united to form modern Nepal, there evolved a very primitive district administration which over a period of time developed into thirty-two administrative centres during the Rana rule. There were twenty such centres in the Pahad and twelve in the Terai. The objectives of this administration were, however, limited to collection and maximization of revenues and maintenance of law and order. When the Ranas established their pattern of district administration, the sole objective of the local district administrators (bada hakims) was to satisfy the interest of the ruling Rana prime minister. The central government gave strong guidelines for the administration of the district but, because of the constraints of terrain and communications, it also had to allow the district administrators the discretion to apply these guidelines to suit the demands of the situations that arose in their districts. The task of the bada hakim was to keep things running smoothly in the district and he was responsible for the proper functioning of the various offices in the district. This gave him real power and he became the total government of the district in a very real sense.

In the Rana administration, the highest posts were held by the Ranas - particularly the Ranas in the line of succession. The functions below these, which in a modern administration the civil service would have assumed, were performed by officials who were derived from a select group of 200-300 families which also included the bhardars. All these families were under the patronage of the Rana system and hence called the client families (Rana, 1971).

After the 1951 change the first task of the coalition cabinet was to form ministries out of the old Rana administrative organisation. Some important departments, such as Defence, Home, Finance, Forests and Foreign Affairs, were brought over intact as ministries, and, in all ten ministries were established (Stiller and Yadav, 1979; Joshi and Rose, 1966). Unfortunately the new administration had nothing new or better to offer than the old. It put into practice the same rules and regulations as those of the Ranas and the old elite group still controlled the administration. No one in the hierarchy had legal authority to decide anything under the old ains and sawals (Acts and Regulations) but the validity of these ains and sawals continued to be maintained. Consequently, almost every issue had to be referred to the cabinet for instructions. There was thus a great confusion and feeling of insecurity among civil servants. The administration became disorderly and, by 1960, the general lack of law and order made the general public feel insecure. The first internal efforts to reorganise the administration were made in 1956 when a high level Administrative Planning Commission was formed. The first Civil Service Act (1956) was soon introduced but in the districts the Rana pattern of administration continued even after 1960. The central government held all powers and extensive administrative activities were based in Kathmandu but the districts were almost totally neglected. The Rana division of the country into thirty-two districts and three Kathmandu Valley magistracies continued throughout the interim period: their main concern was still revenue collection and maintenance of law and order (Shrestha, 1965; Joshi and Rose, 1966; Pradhan, 1976; Rose and Scholtz, 1980).

The administrative reorganization of the country, announced in 1961 and fully implemented by 1965, made significant contributions to the expansion of administration beyond Kathmandu. The districts were reorganised into 75 development districts and 14 zones. New development agencies and representative agencies of several ministries and departments were added to the districts and gradually to the zonal units. The lower tiers of the panchayat system were created to fill the gaps in the old administrative system. This was considered necessary for the effectiveness of the authority of the central secretariat as well as to assist the program of economic development. The zonal and the district administrations were now headed by the zonal commissioner and the Chief District Officer (CDO). The CDO was responsible for maintenance of law and order in the district with the help of police, and for the coordination of development activities in the district in close collaboration with the district panchayat. This was an effort to bring the administrative machinery into contact with the elected bodies. The panchayats, consisting of village communities, were to be the major vehicles of development. In 1972 another tier, that of the Development Region, was superimposed above the zonal level, mainly for development activities. The increase in number of districts, creation of zonal and regional tiers in administration and addition of new activities at these various levels, all have led to the multiplication of administrative units.

3.4.2 Current structure

The new administrative structure and bureaucracy that has evolved over the years under the panchayat system has the following features:

Council of Ministers or Cabinet. The cabinet as the chief executive body of the country heads its administration. The Prime Minister, Ministers, Ministers of State and Assistant Ministers are drawn from the National Panchayat.

Ministries, the Central Secretariat and Departments. Each ministry is responsible for policy making under the guidelines given by the cabinet and has a secretariat, within which the head of the bureaucracy is the Secretary, subordinate to the Minister. The Chief Secretary with a central secretariat is also the Cabinet Secretary and he coordinates the work of all ministries. The Principal Secretary of the Royal Palace coordinates the work of the King's Palace Secretariat and the Government's Central Secretariat.

Within each ministry departments and instrumentalities implement ministerial policy through design and implementation of appropriate programs of action. The ministries and departments send directives to their representative offices in the field at regional, zonal and district levels. Monitoring and evaluation of performance of different programs launched in the field is done by the central administration.

Development region and zonal administration. As recently as 1972 the country was divided into four development regions but a regrouping in 1980 has created five development regions superimposed above the zonal level. These five are Eastern, Central, Western, Mid-Western, and Far-Western development regions with Dhankuta, Kathmandu, Pokhara, Surkhet and Dipail as the regional centres respectively.

The zonal administration is headed by zonal commissioners who, however, are neither recruited through regular civil service procedures nor elected to office but are appointed by the King. The chief functions of the Zonal Commissioner are the maintenance of law and order within his zone, coordinating and supervising the work of zonal level officers of different ministries and departments, and ensuring the smooth running of zonal, district, village and town panchayats.

District administration. With the introduction of the panchayat system, an effort was made to maintain contact between the administration and the elected bodies through civil servants at the district level. The government representatives have no vote in the local matters but the Chief District Officer, like the Zonal Commissioner, has a strong influence on the affairs of his area. Unlike the Zonal Commissioner, the CDO is a civil servant and for a time he also served as the secretary of the District Panchayat. Unfortunately this was terminated, leaving the CDO only with the maintenance of law and order with the help of the police. He therefore returned to the traditional conservative role of his office.

3.4.3 Recent spatial distribution of administrative resources

The spatial distribution of administrative resources in 1973/1974 was as shown in Table 3.1. Subsequent change has not been great and the overwhelming concentration of the administrative resources in the Kathmandu Valley, and particularly in Kathmandu (with 10,059 personnel), remains as a legacy from the past.

Administratively, Nepal is currently divided into five development regions (East, Central, West, Mid-Western and Far-Western) incorporating 14 zones, 75 administrative districts (55 in the Pahad, 20 in the Terai) and 4,046 (4,023 village and 23 town) panchayats. Outside the Kathmandu Valley, there are only five town panchayats in the Pahad, which has 2,610 village panchayats. There are 1,410 village panchayats and 15 town panchayats in the Terai region.

3.4.4 Forest legislation and administration

Forest legislation

As described in earlier sections, the first hundred years of Gorkhali rule was dominated by war, subjugation and territorial expansion and this reinforced the traditional principle that the state owned the land and, by almost unconscious extension, the forest that existed on such land. Throughout most of Nepalese history the state had only two major interests in the forests of the Pahad: as a land resource that could be converted to agriculture and so brought within the ambit of land taxes and as a source of fuel for the metallurgical industries. Its interest in the Pahad forest as a source of timber for construction of buildings and furniture was relatively minor. Powerful individuals and groups followed the lead of the state in considering the forests in the same way.

Table 3.1. Distribution pattern and cost of administrative services, 1973/74. Data from Gurung, H. (1978).

Geographic Regions	No. of districts	Population %	Govt. offices number (%)	Government personnel				Regular budget
				Number (%)	Personnel /office ratio	Av. no. of Gov.officers per district	No. of gazetted officers	Rs x 1000 (%)
1. Mountains	15	8.0	389 (11.2)	1302 (4.3)	3.25	86	-	14661 (10.5)
2. Hills	37	47.5	1577 (45.4)	6455 (22.0)	4.1	174	-	46727 (33.4)
3. Terai Plains	20	39.0	1129 (32.6)	9513 (32.4)	8.15	475	-	56215 (40.5)
4. Kathmandu Valley	3	5.3	365 (10.5)	11889 (40.7)	32.5	3963	8289 (84.0)	22139 (15.8)
Total	75	100	3460 (100)	29159	-	-	9860 (100)	139742 (100)

Governments therefore seemed to have remained indifferent to any proper management, conservation or wise utilization of the forest resource. With a very few and surprising exceptions, evidence to support government concern in forestry matters is totally lacking in the past centuries.

Earlier government land use policy was well reflected in the "divine counsel" (dibya upadesh) of King Prithivi Narayan Shah and various other royal orders and notifications, and subsequently in the muluki ain and the sanad and sawals (Stiller, 1968, 1975, 1976; Regmi 1971, 1976, 1978a, b). All of these, however, were in fact related only to agricultural land use. Legislation regarding forest land use, forest management and conservation did not exist till the mid-20th century. Government orders, such as those for the planting of an area between Kulekhani and Hetauda to the south of Kathmandu with new forest in the post 1814-16 war period, the forest regulations of 1829 for the Terai, and some other similar regulations, were all either directly related to military purposes or for revenue collections from timber export (Regmi, 1971). There hardly existed any indication in these for better management, conservation, or wise utilization of these vital natural resources of the country. The Rana government continued in much the same way with increasing emphasis on Terai agricultural colonization and timber export revenues. The very absence of any forest legislation throughout the past, therefore, clearly reflects government indifference regarding matters of the forest and forestry.

Following the 1950 change in government, various legislation regarding the ownership, management and conservation of forest was brought in by the government (HMG Nepal, 1976). The most important are noted below.

The Private Forest Nationalization Act, 1957. This Act brought all forest lands under government control with a view to preserving this important natural resource of the country. It provided for the protection of the forest and controlled use by the people. Embedded in it was the egalitarian idea of taking away large forest holdings belonging to only a small percentage of the total population and providing for a more equitable distribution of this wealth among the people of the nation. However, due to lack of manpower in the Forest Department, low government priority in allocating other resources for forest management and development, and other institutional constraints, forest areas brought under government ownership by the Act could not be demarcated nor was adequate control established. Moreover, mainly due to the government's inability to interpret to the common man the implications of the law, the Act was misunderstood by the people who believed that the state had alienated from them the right to use the forests. Influential individuals, however, often continued to enjoy their past privileges by misinterpreting and manipulating the law and evading legal provisions (see also section 4.3.7). This further alienated the common man who thought that the Act only deprived him and not the powerful ones of forest products. Therefore, the enactment of an Act alone was not enough to achieve the desired objectives.

The Forest Act, 1961. This Act was concerned mainly with forest administration. It defined forest categories, covering description, registration and demarcation of forest. It also defined the duties of the Forest Department and forest offences and prescribed penalties for these. This Act also made provision for private forest plots (banbatika), not exceeding in area 1.25 ha in the Pahad and 3.25 ha in the Terai, if the individual landowners planted and raised trees with their own resources and efforts. Although in line with the new panchayat political order, the idea of transferring some government forest area for the use of panchayat communities was also introduced. The provisions of the Act clearly indicated government's reluctance to part with either its ownership of forest land or the overriding authority over it. Moreover, the government did not take any further steps to implement even these conservative provisions.

The Forest Preservation (Special Arrangement) Act, 1967. This Act was mainly concerned with further defining forest offences and prescribing penalties for these and Forest Preservation Special Courts were established under its provisions. The Act and the Forest Preservation Special Courts were important efforts in preserving forest resources and assisted the Forest Department particularly in its policing functions. In actual practice, however, it was only the weaker section of society which was brought under the purview of this law enforcement activity and powerful individuals involved in offences often escaped through influence and manipulation, so that this Act also proved of limited use.

The Birta Abolition Act (1959), the Land Reforms Act (1964) and the Pastureland Nationalization Act (1974) reinforced forest legislation regarding government ownership over most forest land and limitations on individual forest and pastureland holdings. Ownership of forest land is still very much disputed in many areas. It was finally realized that the aims of the 1957 Act were misinterpreted and misunderstood. The need to involve local people and communities in forest conservation and management activities was recognised and the experience gained in some parts of the country, such as Sindhu Palchok, helped in this recognition. Therefore, the First Amendment of the Forest Act in 1977, the Rules and Regulations issued under it, and their further modifications, have made it possible to involve local people and communities in the conservation, management and development of forests.

The new law has recategorised forest into six categories, namely: Panchayat Forest, Panchayat Protected Forest, Religious Forest, Leased Forest, Private Forest and the Government Forest.

The provisions regarding the government-owned forest did not change except for the fact that some of its areas could be converted into other categories. The rules and regulations for the operation of religious and leased forests have not been finalized nor have important provisions relating to the Panchayat Forest and Panchayat Protected Forest categories. Government lands which are treeless or with only scattered saplings and shrubs, and which require major tree planting activity, when given to the local community for creating a new forest are called the Panchayat Forest. All the benefits from these forests accrue to the local people themselves. In the case of Panchayat Protected Forest, existing forest areas are entrusted to the local community for purposes of protection, management and utilization. Some enrichment or interplanting in the gaps may be needed here also. As much as 75% of the benefits in terms of goods from these latter forests accrue to the local community. The limits of private forest holdings have also undergone an upward revision within the total landholding ceiling permitted by the Land Reforms Act. Relaxing the limits of private ownership would encourage private enterprise in forest development on areas currently without any productive vegetation but held by government.

Forest administration

Until recently a system of forest administration hardly existed and forests throughout the country were under the charge of land revenue and general administration officials who had the responsibility to settle as much land as possible. Such an administration which throughout history was concerned only with maximization and collection of revenue, chiefly through land tax by reclaiming new land for agriculture, could hardly be expected to manage properly or work for the conservation and wise utilization of forests.

At the local level non-official functionaries, collectively called talukdars in the Pahad, had operated for a considerable time. The Gorkhali rulers assigned to the talukdars the tasks of reclamation of new agricultural land; facilitating operation of mines, processing of metals and the uninterrupted flow of metals to the arsenals; and the taking care of military stores. Not long before the beginning of the Rana rule, the government gave these talukdars enhanced authority in revenue collection (Regmi, 1978a&b). Responsibility for local forests also must have devolved on them. During the Rana period, despite the introduction of the system of revenue collection through salaried government servants, the talukdars continued to play important roles at the local level. Forests were under the charge of administrative heads (Bada Hakims) of the district and the Ranas throughout their rule hardly created any structure in the Pahad district administration to manage or administer forests. The district Bada Hakims limited themselves only to issuing of permits for major tree felling activities (I.1,4). The responsibility for local forest, therefore, came directly to talukladars, at least in the Pahad. The local functionaries with passage of time came to administer, fairly effectively, the forests that still existed and in providing a reasonable amount of protection and control. Scope for the extension of arable agricultural land had, however, disappeared already so that the local forests under the charge of the local functionaries were used only for fuelwood, fodder, small timber, grazing, collecting of leaf litter, etc. The local population got what goods it needed from the forest without paying any fees, although some sort of gift (theki) to the functionary in return had become customary (I.1,4.).

Thus it can be concluded in the case of the remaining forest of the Pahad that, even though the government itself remained indifferent towards forest administration and management and did not discontinue the traditional policy of agricultural land extension, there developed gradually after the mid-19th century a sense of local responsibility, and subsequently a tradition of it, under the charge of local talukdars for protection and conservation of forest and for using the resource reasonably judiciously. What is more interesting and important is the fact that even the local people themselves had developed a faith in such a system which provided for their needs and maintained forest in their locality. Over a period of time, there developed a sense of 'belongingness' between the village people of Pahad Nepal and their local forests and trees. The smaller patches of forest and scattered trees that still existed were considered by the local farmers as necessary for their hill farming system. This protection and conservation of forest by the local people was certainly true in the case of Sindhu Palchok and Kabhre so long as no outside interference, mainly from Kathmandu, occurred.

In the Terai, however, forest exploitation gained much greater momentum due to developments outside Nepal. Export of timber from Nepal greatly increased as a result of the introduction of railways by the British in India and the consequent economic boom in that country. Nepalese timber had further to respond to the Indian market so as to meet the demands created by later occurrences, e.g. the First World War. Clearly due to revenue attractions, the later Rana government attached much greater attention to forests and forestry, although only for their exploitation. Thus when the Ranas created what later came to be known as the Forest Department it became one of the major structures of the Rana establishment. It was there, however, only to supervise the much increased clearing and creaming of the Terai forest and to collect timber sale revenues.

A Timber Administration Office (Kath Mal Bandobast) was created in Kathmandu. Each Bada Hakim office (Goswara) in the Terai was now equipped with a Timber Removal Section (Kath Niksari Fant) which assisted in the exploitation and export of timber while the Forest Inspection Squad (Banjanch) provided protection both to the above activities and to the forest. For the whole of the Pahad, however, a single forest office based in Kathmandu was created.

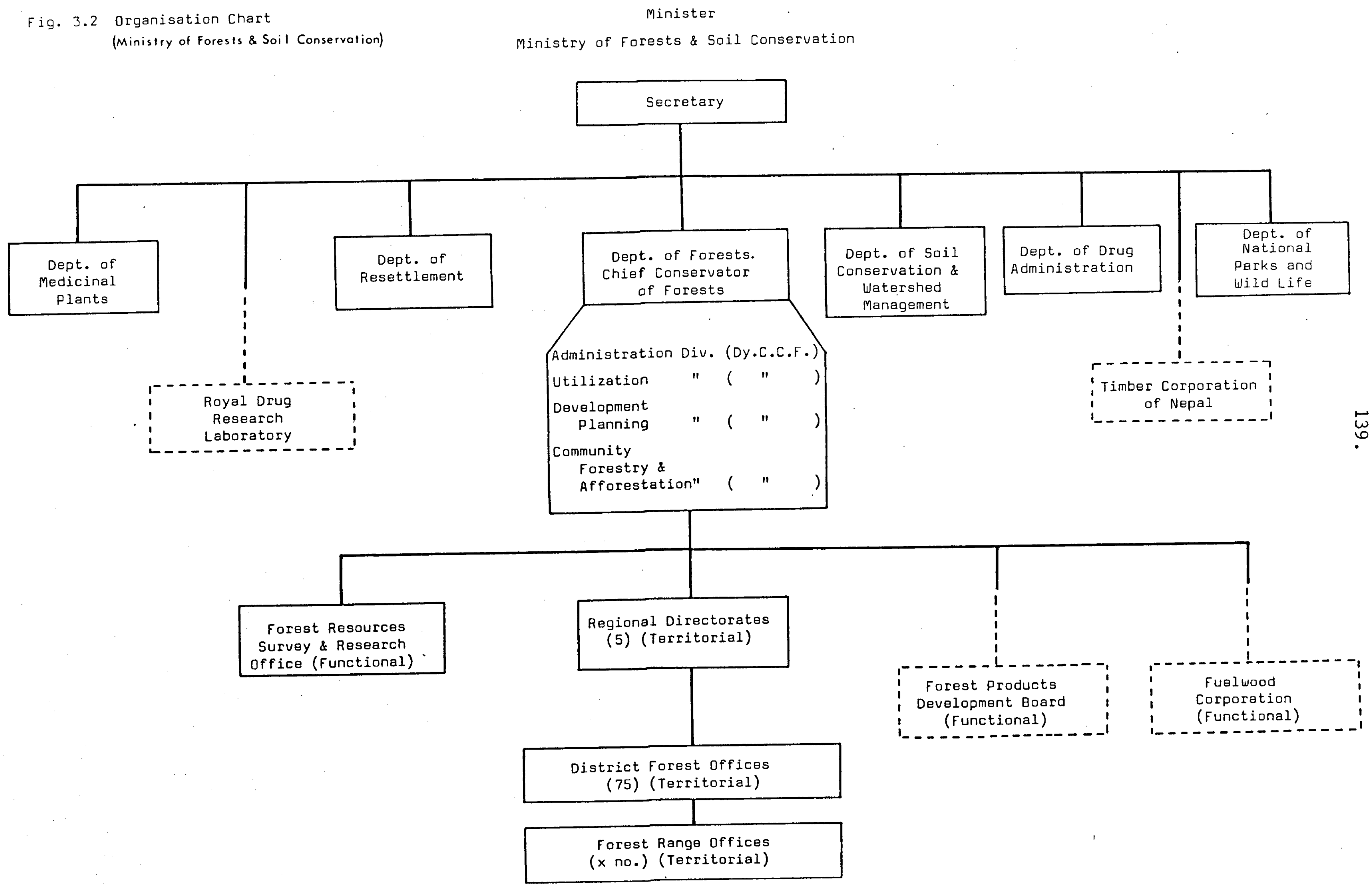
A British forestry expert, J.V. Collier from the Indian Forest Service, was recruited in the 1920s to supervise felling and export of the by now legendary Terai sal (*Shorea robusta*) timber to the Indian railways, with lucrative profits to the Rana government It was in connection with this timber transportation and export that railway lines were constructed in the Terai under the supervision of Collier, the remnants of which 50 years after were still called the 'Collier line' in the western Terai.

The Timber Administration Office was replaced by the Timber Export Office which in 1939 was restructured into two organisations, one for the eastern and the other for the western part of the country. Sometime during this period the Rana government also sent for the first time a few Nepalese cadets to the Imperial Forestry School at Dehra Dun in India for formal forestry training.

Another British forester, E.A. Smythies - also from the Indian Forest Service, came to Nepal as an advisor. Although again with a Terai forest bias, Smythie's recommendations led to the creation in 1942 of a central Forest Department with two regional and twelve divisional level agencies. A beginning was also made with the practice of a few principles of modern scientific forestry, such as the inauguration of forest working schemes for a few areas of the Terai (National Forestry Plan, 1976).

Again, it was due to the lucrative revenue considerations that the Forest Department was one of the five important structures (along with Defence, Home, Revenue and Foreign departments) of the Rana administration to be brought over intact as ministries following the 1950 change. The Forest Ministry was one of the ten ministries to be created then. Various plans and programs have been brought in since 1950 supposedly for the better management of forests and allied resources. These have, however, resulted only in the reorganisation of the existing forestry structures (National Forestry Plan, 1976). The changes in administrative structures have, therefore, added many ramifications of the parent Forest Department under the umbrella of the Forestry Ministry (presently called the Ministry of Forest and Soil Conservation, Fig. 3.2). In function and modus operandi, however, neither the Forest Department nor the Forest Ministry changed much even long after the 1950 change of governmental system. Their function remained limited to the clearing and creaming of the Terai forest and the collection of revenues from timber sales. It is only very recently that some activities in replenishing the declining resource have been added to this traditional role of government forestry organisations in Nepal.

Fig. 3.2 Organisation Chart
(Ministry of Forests & Soil Conservation)



Therefore, till very recently, a government forestry philosophy remained undeveloped and the principle of sustained productivity and yield in perpetuity of a forest has remained far from the practice of Nepalese forestry. The professional practice of forestry (including teaching, management and research) has no established traditions even though the first Civil Service Act of 1956 created the Forest Service (HMG Nepal, 1982) and more and more people have joined the profession after training at home, in India or even after obtaining higher academic credentials overseas in recent times. Government officials and foreign experts alike talk of a shortage of trained manpower in Nepal, as in many other developing nations, but in the case of Nepalese forestry this is only partly true as much of the trained manpower is either under-used or inefficiently used (Shepherd, 1983). To mention only one aspect of the problem is the congregation of most trained personnel in Kathmandu with most of the rest stationed in the Terai. The Pahad remains largely neglected and deprived of their services (National Forestry Plan, 1976).

An undeveloped philosophy of forestry has, therefore, led in Nepal to an inadequate policy framework, a weak institutional foundation and an inappropriate use of available trained manpower. These factors have rendered those in the profession in Nepal not only, as Westoby (1983) puts it, 'guilty of not talking enough (either with each other, or with the community at large) and not listening sufficiently to the community at large' but also frustrated, timid and perhaps, as Pradhan (1976) has said, the 'most demoralized of the new administrative elites' in the country. They are therefore poorly placed to withstand pressures for short-term or personal gain which arise from many sources.

3.5 SUMMARY

The following main points with some relevance to the two main theses stated in Chapter 1 arise out of Chapter 3.

1. Under traditional land systems dating back possibly to the 15th century peasants paid, as rent or tax, one half of the produce of the land they held.

2. Jagir land grants conferred on individuals all products of the land and rent or tax accrued to that individual. Such grants were made in lieu of salary to civil or military officials of the court.

3. Birta land grants were made by the ruler to a noble for some particular service and the whole of the produce of the land, including rent or tax, went to the birta holder.

4. Reclamation of forest was generally open to anyone who undertook to bring it under cultivation but jagir and birta land grants restricted such opportunities for many peasants.

5. The introduction of maize and potatoes in the early 18th century led to much clearing of steeper and higher land for unirrigated cultivation.

6. By the late 18th century the pressure for land in the Pahad led to emigration of peasants to the Terai,

Darjeeling and Kalimpong, and further to Sikkim and Bhutan. This exodus was exacerbated by harsher taxing measures post-1830 when village headmen and other functionaries also took a share of produce in the process of collecting government taxes.

7. Some of these rights to extract a part of the produce of the land are retained even today in Sindu Palchok.

8. The Ranas retained existing land tenure and land grant systems and used their control of the land resource and its exploitation for government revenues almost exclusively for the benefit of themselves and their supporters. By 1950 a quarter of the cultivated land and large forest areas were under birta tenure to the Rana family.

9. Trade did not figure significantly in the economy during these earlier periods and for the Middle Hills generally agriculture formed the basis of the economy.

10. Labour became a resource available directly to the state and its ruling classes as a source of wealth through jhara and rakam obligations, both involving compulsory labour for porterage, mail-carrying, mining, charcoal-making, woodcutting and a host of other such services. Many of these obligations were performed, at cost to the forest cover, until 1950.

11. Forest administration, as with all administration in Nepal, concentrated on revenue collection both during the Rana period and subsequently.

12. Post-Rana legislation concerned with forests was often misinterpreted by the local people as not being in their best interests and as a consequence the forests suffered.

13. Recent legislation dealing with allocation of forested land to be administered by the panchayats themselves has sown the seeds of effective community forestry.

14. An undeveloped philosophy on forestry in Nepal has led to an inadequate policy framework, weak institutional foundation and an inappropriate use of skilled manpower so that the forest administration was unable to stem the tide of forest destruction.

CHAPTER 4

THE FORESTS OF SINDHU PALCHOK AND KABHRE DISTRICTS

4.1 THE FORESTS - GENERAL

4.1.1 Forest types

The whole of Nepal lies within the latitudes of the northern subtropical region yet the natural vegetation varies from tropical moist forests to alpine shrubs and steppe. The variations present in elevation, slope, aspect, rainfall, snow, temperature, geology, soil and drainage have determined the location of the major forest types which thus come to form a most complex mosaic. In the Pahad altitude and aspect are of paramount importance in determining the forest types found at a particular place but in the Terai, the Bhabar, and the dun valleys (see section 2.1.1) soil type and presence of water in the subsoil are major determinants of forest growth.

Following the establishment in 1963 of the Forest Resources Survey wing of the Forestry Dept. a comprehensive survey was undertaken to report on the forest resources of the country for the first time. Aerial photographs of different parts taken between 1953 and 1967 were used. Aerial photographs taken in 1964-65 and 1967 provided a full coverage of the Terai plains and Siwalik hills (Churias) but only strip photographs running east-west, 1 mile in width and 10 miles apart, were taken in the Pahad. Maps and photographs were not available for the belt along the entire northern border of Nepal.

Based on this survey, the Forest Resources Survey has identified about twenty specific types of forests in Nepal.

This classification is by no means complete. This survey concentrated its activities in the Terai and adjoining areas with less attention being given to the Pahad. Attention throughout was focused on forest species for which both tree volume and quality were of importance.

Other sources of information on the forest types of Nepal include: Schlich (1894, 1922), Troup (1921, 1952), Collier (1928), Champion and Griffith (1938, 1957), Bor (1953), Hagen, *et al.* (1961), Champion and Seth (1968), Bhatt (1970, 1977), Dobremez, *et al.* (1972), Stainton (1972), Dept. of Medicinal Plants (HMG Nepal, Forest Ministry) (1976), Borradaile, *et al.* (1977), Speich (1978), Grünenfelder (1977, 1980a), De Von Nelson, *et al.* (1980).

Based on these reports and personal observations, the following is a brief description of the major forest types found within Sindhu Palchok and Kabhre or in nearby areas (see Fig. 4.1 and Table 4.1).

Broad-leaved forests

The Sal forests. These consist of forest stands where *Shorea robusta* (sal) is the predominant species and it is one of the most important forest types of Nepal. It is considered a climax formation and occurs in the Terai and the Bhabar, the valleys of the Churias and in the lower Pahad. The species is resistant to fire, coppices readily and is adaptable to many soil and site conditions. It seeds profusely. These factors permit *S. robusta* to regenerate and survive in spite of severe pressures.

Fig. 4.1 Sindhu Palchok & Kabhre Districts

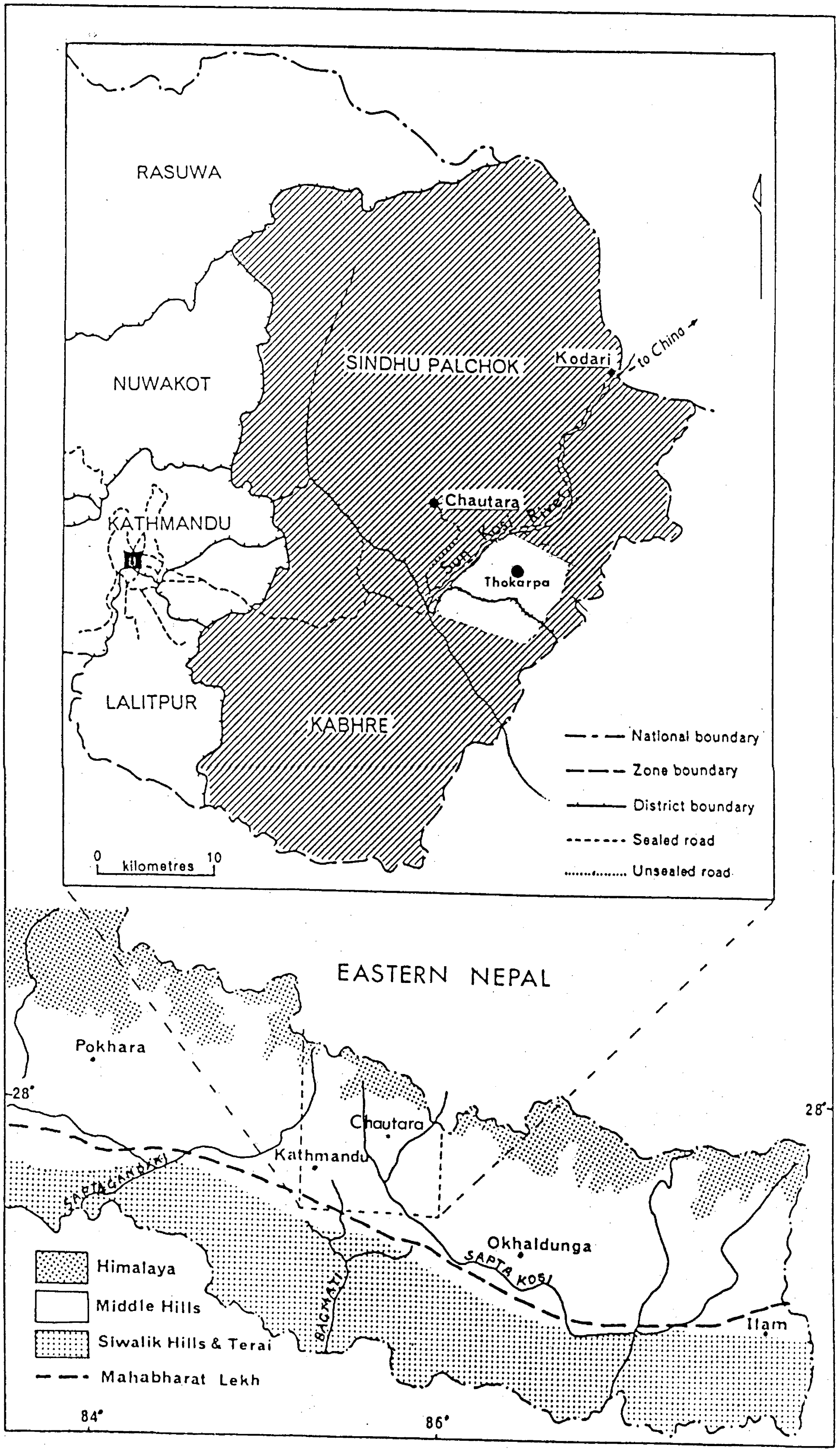


Table 4.1: Major forest types within or near Sindhu Palchok and Kabhre Districts. For sources see text.

Forest type	Altitudinal range m
Broad-leaved forests	
The Sal forests	
(a) The Terai-Bhabar Sal forest	Terai-Bhabar plains
(b) The Hill Sal forest	500-1300
The Terai Hardwood forest	Terai-Bhabar plains
The Khair-Sissoo forest	Terai-Bhabar plains to 1200
The Lower Slopes Mixed Hardwood forest	600-2000
The Oak forests	1800-3000
The Upper Slopes Mixed Hardwood forest	1800-3000
The Alder forest	900-2700
The Rhododendron forest	2000-4000
The Birch-Fir forest	above 3000
Coniferous forests	
Chir pine forest	900-2000
Blue pine forest	1800-4000
Hemlock forest	2100-3300
Fir forests	
(a) *Abies spectabilis* forest	3000-4000
(b) *Abies pindrow* forest	2100-3000
Cypress forest	2000-3000
Larch forest	2900-3800
Scrub formations	
Alpine scrub	
(a) Moist alpine scrub	3200-4500
(b) Dry alpine scrub	4000-4700
Alpine steppes	4100-5000
Sub-alpine and alpine pastures	3500-5000
Bamboos	
(a) Dry bamboo brakes	Dry hillsides
(b) Montane bamboo brakes	above 2300

(a) Terai and Bhabar Sal. Sal forests must have originally covered much of the flat Terai and Bhabar lands except for waterlogged sites or recent alluvial deposits. Sir William Schlich wrote as late as 1922 that there were extensive Sal forests in Nepal estimated at 3000 sq. miles. The adjacent British India (now comprising Pakistan, India, Bangladesh and Burma) had then a total of 6700 sq. miles. Most of the Terai and much of the Bhabar have since been cleared for agriculture.

Trees of up to 45 m may be recorded, but the general height of *S. robusta* in this tract is about 25 m. Common associates include *Terminalia tomentosa, T. chebula, T. belerica, Anogeissus latifolia, Lagerstroemia parviflora, Syzigium cuminii, Adina cordifolia, Lanea grandis, Mallotus philippinensis, Semecarpus anacardium* and *Bauhinia vahlii*.

(b) Hill Sal. *S. robusta* does not usually grow above 1200 m but exceptionally may be found to 1500 m. Hill Sal is to be found on the outer foothills and may penetrate up the lower slopes of the main valleys; its height there is generally limited to 12-15 m. This forest type is characteristic of drier sites and therefore often occurs on south-facing slopes. In the densely-populated Pahad areas *S. robusta* has suffered greatly from lopping, felling, fire and grazing. However, being better able to withstand such harsh treatment as compared to its associate species, *S. robusta* often stands as a pure community in these lower hills and valleys. Thus much-lopped, stunted and deformed trees as an open forest, growing on red clay soils with a pallid subsoil are a common sight on the lower slopes of the Sun Kosi, Balephi, Indrawati and Chakhola within the two districts (Plate 32).

Hill sal is usually replaced by *Pinus roxburghii* or *Schima-Castanopsis* forests at about 1300 m. In certain cases the pine may descend down to 600 m to form a mixed forest with *S. robusta*. The common composition of Hill Sal forest in the central Pahad is *Shorea robusta, Terminalia tomentosa, T. chebula, Lagerstroemia parviflora, Adina cordifolia, Schima wallichii, Eugenia operculata, Semecarpus anacardium, Bassia latifolia, Castanopsis* spp., and *Bauhinia vahlii*. Very dry and overgrazed sites may have *Phoenix* sp. and *Adathoda vasica*.

The Terai Hardwood forest. These are closed mixed broad-leaved forests growing in the Terai, Bhabar and the Churia valleys and the lower river valleys of the Pahad. They may or may not contain *Shorea robusta*. Common trees are *Terminalia tomentosa* (often predominant), *Lagerstroemia parviflora, Syzigium cuminii, Adina cordifolia, Trevia nudiflora* and *Bombax ceiba*. A lower storey of small trees and shrubs exists.

The Khair-Sissoo forest. *Acacia catechu* (khair) and *Dalbergia sissoo* (sissoo) are early colonisers on new gravels and sandy alluvial deposits along large rivers of the Terai, Bhabar and dun valleys, occurring singly or in combination. A dense undergrowth is often present and in older forests an understorey of young trees of the deciduous riverain forests occurs, this being the next stage in the forest succession. *D. sissoo* is found only on riverain sites but *A. catechu* may be found in riverain forests and subtropical hill forests. Both species penetrate for a considerable distance into the Pahad.

The Lower Slopes Mixed Hardwood forest. These forests occur in the central and eastern Himalaya in moist localities between 600-2000 m. Prevalence of *Schima wallichii* and *Castanopsis* spp. characterises the type. Lower level *Quercus* spp. are nearly always present and *Shorea robusta* may also occur. Pines are absent or confined to dry ridges and sandy soils. The forests are of good density and 20-35 m high. The dominant species are mostly evergreen and a middle storey of evergreen trees can also generally be seen. *Schima wallichii* is common in the east and central Pahad between 600-2200 m. *Castanopsis* spp. occupy the same altitudinal range and three species occur in Nepal. East-central Pahad contains *C. indica* and *C. tribuloides*.

Schima-Castanopsis forest must formerly have covered larger areas at these altitudes in this region. However, these forests never exist in a continuous belt in Nepal today as the maximum cultivation and population pressures exist within these same altitudes. But since they coppice well, like *S. robusta*, secondary branches and shrubby growths are a common sight on the stumps. The type varies very much in composition at different altitudes. More frequent associated species include *Engelhardtia spicata*, *Eurya* spp., *Lyonia ovalifolia*, *Cleyera ochnacea*, *Litsea oblonga*, *Ilex doniana*, *Syzigium cuminii*, *S. robusta*, *Myrica esculenta*, *Mallotus philippinensis*, *Eugenia operculata*, *Bauhinia* spp., *Rhus* spp., *Camellia kissi*, *Zizyphus incurva*.

The Oak forests. In Nepal these wet evergreen and moist deciduous forests occur in the Pahad, extending up to the sub-alpine region and Mahabharat Lekh. The wet evergreen closed high

are
forests of large girth but medium height (20-25 m). They occur between 1800-3000 m, mostly in areas of heavy rainfall above 2000 m. Deciduous species occur at higher altitudes and form a relatively small proportion of the mixed mature forest. More common species are *Quercus lamellosa*, *Q. pachyphylla*, *Castanopsis tribuloides*, *Acer campbelli*, *Michelia* spp., and *Machilus gamblei*; a moist deciduous type consists of three common oaks, *Q. incana*, *Q. dilatata* and *Q. semecarpifolia*. These represent three altitudinal zones with typical conifer counterparts.

Quercus incana (also called *Q. leucotricophora*), (banj oak), occupying the lowest belt, has often been confused with *Q. lanuginosa* (also called *Q. lanata*) but these two species are generally considered to be distinct from one another (vide Stainton, 1972).

Q. incana becomes inconspicuous east of the Kali Gandaki and the oak forest in the eastern Middle Hills consists of *Q. lanuginosa*. In the central Middle Hills, in the vicinity of the Kathmandu Valley and within the two districts, *Q. lanuginosa* is common but *Q. incana* is hardly present.

Q. lanuginosa forest is widespread in the central Pahad, mostly on southern slopes or the sides of big river valleys. *Q. lanuginosa* is normally up to 14 m tall, the forest has a rather open appearance and due to its frequent burning has hardly any undershrub. *Rhododendron arborium* and *Lyonia ovalifolia* are often present. In wetter and less burnt areas more species occur and the oak grows up to 25 m tall. *Q. lanuginosa* may also overlap with other oaks such as *Q. glauca* in damper localities and with *Q. semecarpifolia* around 2100 m.

The intermediate zone is occupied by *Quercus dilatata* (also called *Q. floribunda*). This is a tall tree with a height up to 30 m. It occurs generally mixed with *Aesculus indica, Juglans regia, Alnus nepalensis, Ilex* spp. and *Acer* spp. This is mainly a western Himalayan species, being commoner west of the Kali Gandaki River between the altitudes of 2100-2900 m on northern and western faces.

Quercus semecarpifolia is characteristic of the highest temperate belt and its associated forest varies much in composition. Trees of height up to 35 m and a rich understorey may be found in moister localities and deeper soils but stunted trees with heights not more than 15 m are characteristic of dry slopes with a high incidence of burning. The species is completely absent from areas of heavy rainfall.

In the central and eastern Pahad, *Q. semecarpifolia* occurs on southern slopes and the sides of the big valleys in most areas. It often succeeds *Q. lanuginosa* forest at about 2400 m and is itself replaced by *Abies spectabilis* around 3000 m.

The Upper Slopes Mixed Hardwood forest. These forests are the mixed hardwood stands that grow between 1800-3000 m but are distinct from Oak and Birch forests. Trees are often heavily branched but can reach large diameters. This forest is common at higher altitudes in moist hollows and depressions along the streams and gentler slopes. The common genera are *Acer, Aesculus, Alnus, Betula, Celtis, Cornus, Juglans, Fraxinus, Michelia, Prunus, Populus, Morus, Quercus, Corylus, Ulmus* and *Laurels*.

The Alder forest. Typically *Alnus nepalensis* occurs as nearly pure stands, 20-30 m high, in strips of varying width along stream sides. On eroded areas and land slips they spread to larger areas and the species is almost the first to colonize land slides. This forest is found throughout Nepal, between 900-2700 m.

The Rhododendron forest. Although rhododendrons occur as an understorey shrub in many higher elevation forest types, they are themselves dominant in rhododendron forest as described here. These rhododendron forests occur between 2300 m and the tree line at c. 4000 m. In this altitudinal range almost pure dense rhododendron forests occur over extensive areas. At lower altitudes the rhododendrons may be up to 12-14 m tall, but higher up they may grow no bigger than shrubs of 1.5-3 m height. Stainton (1972) lists over thirty species and varieties of *Rhododendron* found in Nepal.

The Birch-Fir forest. This forest generally occurs above 3000 m, and consists of large shrubs or small crooked trees with dominant *Abies* spp. and *P. wallichii* in patches. All broad-leaved trees present are crooked and branchy, except birch *(Betula utilis)* which typically develops a cleaner bole. The conifers are also low, branchy and densely-leaved with the height rarely reaching 30 m while the broad-leaved trees grow up to only 6-10 m. This forest is not represented in the two districts neighbouring Langtang area.

Coniferous forests

The coniferous forests of Nepal can be conveniently divided into lower and higher level types. At lower levels only *Pinus roxburghii* (chir pine or khote salla) is present whereas many species occur at higher elevations.

Chir pine *(Pinus roxburghii)* forms an important forest type throughout the length of Nepal mainly between 900-2000 m, but with extension on ridges down to 600 m, and on drier southern aspects up to 2300 m. This is one of the most ecologically adaptable species of the middle and outer hills of Nepal, occurring mainly on the Churia Hills and the lower slopes of the Mahabharat Lekh and the Pahad. The species is most abundant in the western parts of Nepal. In the central and eastern parts it is more restricted to drier sites. It occurs, however, over a wide range (Plate 33).

Almost pure stands of *P. roxburghii* are typical of climatic conditions with rainfall between 900 and 2000 mm, but there may be an understorey of broad-leaved trees in localities where a little more favourable moisture condition exists. On better sites, *P. roxburghii* may be mixed with *Shorea robusta* at lower elevations, or with *Quercus lanuginosa* at higher sites. Trees often reach 20-35 m, but the top canopy is rarely complete. Typically the understorey is very poor because of heavy grazing and frequent fires.

Blue pine *(P. wallichii, syn. P. excelsa)* forms forests at 1800 m to the tree line throughout Nepal. It is not abundant in central Nepal but quite widespread in western parts of the country. The trees on good sites may grow to 30 m, but usual height is 16-20 m. *P. wallichii* is a typical coloniser of vacant sites. Though it is not a fire-hardy species, its ability to recolonise open spaces quickly gives it an advantage over the other conifers. Besides forming almost pure forest, this pine occurs in mixed forest with other conifers. Under natural conditions it can maintain itself in the broadleaf and conifer forests in gaps caused by wind, snow or land slide. Its colonisation is much helped by its regular and prolific seeding. However, it does not occur alone over large areas unless this is made possible by human disturbance. Accordingly, pure stands are not accorded climax status and are primary and secondary seral types (Champion and Seth, 1968). The altitudinal limit is generally c. 3300 m but in certain areas outside the two districts it may ascend to the tree line at c. 4400 m.

Hemlock *(Tsuga dumosa)* occurs throughout Nepal between 2100-3300 m. Trees up to 25-30 m height form beautiful hemlock forests that are found in pure as well as mixed form in Nepal. Pure stands are more widespread in the west, but in the central and eastern Pahad *T. dumosa* is found mixed with *Quercus, Acer, Magnolia* and *Rhododendron.*

Although three species of fir are identified in Nepal, *Abies spectabilis* is the commonest. *A. spectabilis* and *A. pindrow* are distinct from each other in habitat and appearance and are found in various parts of the country but *A. densa,* similar to *A. spectabilis* in habitat and appearance, is considered to occur only in the easternmost part of the country.

Abies spectabilis (syn. *A. webbiana)* is the high altitude fir occurring extensively throughout the Nepal Himalaya between 3000 m and the tree line, only rarely descending to 2700 m. Trees grow up to 25 m in height and support wide spreading branches. *A. spectabilis* is found extensively in central Nepal where it may occur in a continuous belt and in almost pure stands on the southern faces between 3000-3500 m or mixed with *Tsuga, Acer* and other Upper Mixed Hardwood forest genera. It may at times reach the tree line. A forest of *A. spectabilis* has a dense understorey of rhododendrons and shrubs of *Daphne* spp. This fir occurs singly or in small scattered groups in heavy rainfall areas, often being replaced by rhododendrons, whereas dense bamboo thickets often come up where it is burnt.

Scrub formations

Alpine scrub has two sub-components. Moist alpine scrubs are the low almost evergreen dwarf forests of *Rhododendron* spp. mixed with some *Betula* and other deciduous species. Tree trunks are short, twisted and very branched. The scrubs occur between 3200-4500 m in the eastern part of the country and may ascend as high as 5000 m. Dry alpine scrub is often a xerophytic formation. East of Langtang the vegetation of the dry eastern parts of the inner valleys shows a strong contrast to the valleys at lower elevations. In such areas dwarf shrubs of *Juniperus, Ephedra, Myricaria, Hippophae, Berberis, Lonicera, Caragana, Cotoneaster, Sophora* and *Rhododendron* are found. Such alpine shrubs are found normally on the southern slopes of the main ranges between 4000-4700 m. Rhododendrons are found at the highest of these altitudes, the junipers at the lowest and the other species occurring in between with *Salix* along the streams.

Sub-alpine and alpine pastures. These two plant communities are continuous with each other, differing in altitude, snow duration and floristic details. The grasses in these pastures are species of *Danthonia, Agropyron, Brachypodium, Bromus, Dactylis, Melium, Melica, Poa* and *Cymbopogon.* The alpine meadows are composed of mostly mesophytic herbs such as *Primula, Anemone, Fritillaria* and *Iris* with many species of *Ranunculaceae, Cruciferae, Compositae* and *Caryophyllaceae*.

Grass meadows also typically occur within the high altitude forests, a rich herbaceous vegetation developing during the monsoon.

The Bamboos

Bamboo is a much used forest product and occurs commonly as household clumps throughout the country. It may occur naturally, both as dry bamboo and montane bamboo brakes. Dry bamboo brakes occur mainly on dry hillsides and on alluvium with often shallow and stony soils. It may also occur in moist deciduous forests with scattered *Shorea, Terminalia, Bombax, Albizzia* and *Lagerstroemia* trees. Biotic influences have greatly limited the occurrence of this brake in the Bhabar, Terai and lower Pahad throughout the sub-Himalayan tract of Nepal so that not much bamboo remains in natural occurrence. *Dendrocalamus strictus* is the commonest species. Montane bamboo brakes occur as dense almost impenetrable brakes of one or more species of *Arundinaria* and related genera, often with practically no other large woody plants. Transition stages with scattered overwood also occur. These mountain brakes occur throughout the Upper Mixed Hardwood forests of Nepal, and are commonly present as an understorey with *Quercus, Rhododendron* and conifers above 2300 m. When a conifer forest is burnt dense bamboo thickets often come up, covering the ground completely and checking regeneration of tree species. They occur at times even in living conifer forests with continuous tree canopy but bamboos are eliminated easily due to cutting, overgrazing, and burning, particularly after flowering.

4.1.2 Forest and land use in Sindhu Palchok and Kabhre Districts

As for other parts of Nepal, general land use data are still very sketchy and unreliable for Sindhu Palchok and Kabhre. Mostly, difficult terrain has limited the expansion of agriculture land (see Table 2.30 and section 2.4.2) but data on even this limited area of cultivated land vary a good deal (Nepal Rastra Bank, 1972; HMG Nepal, 1977; Shrestha, 1982; Forestry Services, 1982; ADB/HMG Nepal, 1983). A considerable proportion of the land area in northern Sindhu Palchok is rocky and barren. This forms nearly one-fifth (48980 ha) of the area of the district. About 4% of Sindhu Palchok is covered by grassland and alpine meadows. Grassland and barren areas account for less than 2.5% of the area of Kabhre.

Regarding the cultivated land, a very general type of chain survey was first conducted in the area for paddy (khet) lands in 1895. Revenue settlement of dry (pakho/bari) lands took place only in 1945 on the basis of ocular estimates of the quantities of maize seeds required to sow an area. Until 1983, land revenues were realized on the basis of the 1945 settlements and no measurement of cultivated land was undertaken in the intervening period. Cadastral survey was being undertaken only in 1977/78 in Kabhre and in 1982 and early 1983 in Sindhu Palchok. Even these cadastral surveys hardly provide reliable data on cultivated land. More often than not the cultivated category not only includes abandoned cultivated areas and lands under long fallow but also grazed areas surrounding cultivation and lands which the Pahad farmers must maintain to grow thatch grasses and scattered trees (*kharbari*).

This confusion resulted from lack of adequate provisions in lands and forest legislation for land owners to maintain private forest or even scattered single trees except, perhaps, on 'cultivated land' (abadi jagga ko rukh).

Earlier attempts at forest resources studies, including land use, for parts of the two districts were commissioned by the SATA/HMG Integrated Hill Development Project (IHDP). The first such study was undertaken for the then Chauri Range area of the former Chautara Forest Division. The author's detailed study area of Thokarpa region (Chapter 5) falls within the Chaubas block of this former Chauri Range covering about half of its physical land area but containing most of the forest area reported for the Chaubas block. Chauri Range data therefore give some indication of the existing land use, forest types, stand sizes, stocking classes and timber volume in the eastern part of southern Sindhu Palchok and northern Kabhre, including the Thokarpa region (Grünenfelder, 1977). Table 4.2 gives land use in the Chauri Range.

Over 41% of physical land area of Chauri Range is under some sort of forest cover. Of this 20,233 ha reported under forest land use, just over 14% (2901 ha) was classified as commercial forest. Of the 86% classified as non-commercial, half of it (42.9%) exists on excessively steep and rocky areas and the other half (42.8%) as shrub and brush-land.

The study also showed that over 70% of so-called commercial forest had only pole sized-timber while 23% was under small saw timber, the proportion of large saw timber being very small.

Table 4.2: Land use areas (in ha) in Chauri Range, 1977. Data from Grünenfelder (1977). (Values in parenthesis are percentages.)

Block	Land use class:					
	Forest	Cropland	Grassland	Water	Eroded	Total
Sangachok	2,505 (35.5)	3,317 (47)	1,035 (14.5)	200 (3)	-	7,057 (100)
Chaubas	8,513 (37.5)	12,211 (52.5)	1,621 (7)	467 (2)	266 (1)	23,078 (100)
Lisankhu	5,027 (50.5)	4,445 (44.5)	230 (2.3)	57 (0.5)	171 (2)	9,930 (100)
Pakhar	4,188 (47)	4,363 (49)	332 (3.5)	48 (0.5)	-	8,931 (100)
Total	20,233 (41.3)	24,336 (49.7)	3,218 (6.6)	772 (1.6)	437 (0.9)	48,996 (100)

(The classification as commercial forest also took no account of problems of extraction or of the economics of sale.) Seedling and sapling stages were found to be absent in most forest types. Similarly the Upper Slopes Mixed Hardwood forest alone had 59% of the gross timber volume and hill sal, all in pole size, constituted 20% of the gross timber volume. A comparison of timber volumes of timber stands 12.5 cm diam. or larger showed that 86% of the gross timber volume was cull or useless as saw timber. The existing forest as a whole according to the study looked very degraded as only a few areas not easily accessible have commercial class timber. The poor stocking was mainly the result of forest fire and grazing.

The second study covered the Marming-Kalinchok region in the north-eastern part of Sindhu Palchok district (Grünenfelder, pers. comm., 1980b). This study generated the data given in the Table 4.3.

Table 4.3: Data (in ha) for the Marming-Kalinchok forest lying within Sindhu Palchok, 1980. Source: Grünenfelder. pers.comm. 1980b. (Values in parentheses are percentages).

Land use	Total	Forest	Pasture	Agriculture
	25,832 (100)	17,112 (66)	1,042 (4)	7,678 (30)

Forest category	Total	Commercial	Non-commercial
	17,112 (100)	8,730 (51)	8,382 (49)

Commercial forest types	Total	Fir	Chirpine	Oak	LMH[1]	UMH[2]
	8,730 (100)	2,471 (28)	168 (2)	4,248 (49)	757 (9)	1,087 (12)

[1] LMH - Lower Mixed Hardwood forest

[2] UMH - Upper Mixed Hardwood forest

This study showed that the Marming-Kalinchok region has 66% of its area under mostly high altitude (montane) forest. Fir, Oak and Upper Mixed Hardwood forests claim nearly 90% of the forest area. Nearly half of this area contains non-commercial forests on steep and rugged sites. At higher altitudes *Abies spectabilis* is the dominant tree species, covering 28% of the total forest area, but 27% of the fir forest was found to be badly damaged by fire and burning, particularly towards the upper northern part of the region. Most burnt trees were dead and practically no regeneration was seen. In Oak forests, *Quercus semecarpifolia* was the predominant species which, however, was heavily lopped for fodder and grazing, browsing and fire were frequent. Quantitative assessments of loss due to lopping were not made but 'almost every kharsu (*Q. semecarpifolia)* tree was found to be lopped for cattle feeding'. The resultant forest consisted of only middle- to mature-aged stand sizes and regeneration was inadequate.

Commissioned by the Nepal-Australia Forestry Project, a more comprehensive land use study was undertaken by Forestry Services (1982) (see Table 4.4).

Table 4.4: Areas (in ha) of various forest categories in Sindhu Palchok and Kabhre districts. Data from Forestry Services, 1982. (Values in parentheses are percentages.)

District	Commercial forest	Protection forest	Shrub	Plantation	Total
Sindhu Palchok	66,209 (57.1)	22,751 (19.6)	25,072 (21.6)	1,894 (1.6)	115,926 (100)
Kabhre	31,477 (45.0)	6,838 (9.8)	29,166 (41.7)	2,508 (3.6)	69,989 (100)
Total	97,686 (53.0)	29,589 (15.0)	54,238 (29.0)	4,402 (2.0)	185,915 (100)

The data generated by this survey give an idea of: (a) forest cover condition in terms of commercial forest, protection forest, shrubland and plantation areas; (b) forest stand stocking, taking crown density or percentage of crown closure as its measure; (c) forest stand size or maturity class categorised as mature, immature, and regeneration; and (d) composition (by area and volume) of forest by major forest types. Only (a) is presented here in Table 4.4.

According to this study, 48% of the total land area considered is under some sort of forest or scrub cover (Sindhu Palchok 45% (115,926 ha) and Kabhre 55% (69,989 ha)). All the data, however, suffer from the same problems of definition as were noted in section 2.1.4 relating to forest, scrub and grassland and to commercial and protection forest. In the opinion of the authors of the study report, about one-sixth of the existing forest area needs to be maintained as protection forest, mainly located in Sindhu Palchok. About half of the forest is classified as commercial, the greater proportion lying in the northern montane zone of Sindhu Palchok. Only 2.4% of the forest area consists of plantations and there is much scope for increasing this area.

The study also showed that 30% of the so-called commercial forest is of poor stocking and 45% medium stocking. The immature class covered 55% of the commercial forest area and mature and over-mature 45%. Comparing districts, however, 52% of the commercial forest area in Sindhu Palchok is mature to over-mature whereas in Kabhre 69% of commercial forest is immature. Regeneration is conspicuously absent in both districts.

The survey further revealed that hardwoods form nearly 60% of the commercial forest area, mixed-wood 25% and conifers only 17%. Conifers, however, provide 27% of the estimated total timber volume, mixed-wood 31% and hardwoods 42% but the volume of coniferous wood is relatively small in Kabhre.

4.1.3 Forests and the law

In section 3.4.4 an account is given of the evolution of Nepalese laws concerning forests and of the role of Forest Preservation Special Courts.

Data concerning prosecutions in the Chautara Division brought before the Forest Preservation Special Court for Sindhu Palchok and Kabhre during the period of the author's tenure of the position of Divisional Forest Officer (1973-80) are given in Table 4.5. More than 95% were related to unauthorised felling or cutting of trees and those involving the local population were relatively trivial. More serious cases involved hoteliers and lodge owners sponsored by government finance corporations for tourism promotion or industrial development, contractors supplying rations including fuel wood to government establishments, and those smuggling wood to Kathmandu for business and profiteering. Other crimes were uncommon, were not detected, or did not lead to prosecutions. Thus the unauthorized manufacture of Nepali paper from *Daphne* spp. and its subsequent smuggling and the lighting of forest fires each led to only two prosecutions. No case of clearing forest land for agricultural purposes was significant. Crimes of any significance relating to subsistence farming activities were therefore negligible and prosecutions were largely related to activities encouraged by conflicting government policies and programs.

Of cases submitted to the Special Court, 10% did not meet the necessary legal requirements and were returned without a hearing, 83% resulted in successful prosecution within a year of submission and 7% were carried over to the following year. On an average, 25% of decisions were challenged at a higher court of appeal.

Despite a long tradition of litigation in the local society, the numbers of both prosecutions and appeals to higher courts declined somewhat during this period. These were indications of positive public response to efforts at curbing deforestation activities. Vigorous efforts at forest law enforcement, particularly in the earlier years of the period, contributed to this decline but other more important and longer-lasting factors, were also operating. Initiation of community forestry became an important contributory factor in the gradual reduction of forestry related crimes in the Division. The improved attitudes arose from a number of inter-related developments, including a more positive approach by forestry staff to local needs, better motivation and understanding in some local communities guided by forward-looking, responsible leaders, and the injection of new funds, skills and encouragement by donor agencies such as the Australian Development Assistance Bureau and the Swiss Association for Technical Assistance.

Table 4.5: Prosecutions before the Forest Preservation Special Court in the Chautara Forest Division (1973/74-1979/80). Data from the author's personal records.

Year	Felling and cutting	Forest fire	Manufacture of Nepal paper	Stone quarrying	Total
1973/74	20	1	1	-	22
1974/75	26	1	-	-	27
1975/76	10	-	1	-	11
1976/77	14	-	-	-	14
1977/78	16	-	-	1	17
1978/79	17	-	-	-	17
1979/80	4	-	-	-	4
Total	107	2	2	1	112

4.2 HUMAN IMPACT - INITIAL SETTLEMENT

It seems likely that the original use of the forest when man first colonized the Middle Hills was in the form of shifting cultivation (lhose-phadani, khoriya-phadani) but there is no historical record of such a stage. Certainly in the times for which any form of records exist, the pressure to bring land under permanent cultivation (see section 3.1) has been so great that shifting cultivation could then have been no more than a fringe activity in areas unable to sustain continuous agriculture. It is also important to distinguish shifting cultivation, as a continuing land use form, from the unpredictable cycle that may ensue when forest in marginal areas is cleared, is found to be unsuitable for agriculture and then is abandoned. Scrub or forest may then become re-established, only to be cleared again many years later when another generation seeks to extend the area under arable agriculture. Such aborted attempts at agriculture in marginal areas are common in Nepal but they clearly differ fundamentally from the usual concept of shifting cultivation.

Throughout history, Sindhu Palchok and Kabhre Districts must have been strongly affected by their relative proximity to the Kathmandu Valley, in which an Indo-Aryan civilization had developed about 2000 years ago (Kawakita, 1977). Local tradition and some documentary evidence asserts that the first inhabitants of the districts were of Tibeto-Burman origin, the Kiratis, as were their successors, the Paharis (I.35). These early settlers are thought to have held land under a system of customary land tenure which developed into the kipat system of the Tamangs, also of Tibeto-Burman origins, who succeeded the Paharis. Local traditions point to the existence of large areas of Tamang communal kipat land holdings in Sindhu Palchok and Kabhre in the past. Proximity to the Kathmandu Valley, however, seems to have made these areas more vulnerable to Indo-Aryan penetration. This resulted in the gradual disappearance of kipat lands on the one hand and the faster reclamation of new agriculture land on the other. As a result, even in predominantly Tamang communities such as Bhote Yamna, Tamang kipat holdings disappeared over a century ago (1880-85, I.35), though in others, e.g. in the neighbourhood of Lisankhu, kipat land tenure extended well into the 20th century.

In Majhipheda panchayat in northern Kabhre elderly and knowledgeable Tamang community leaders, such as ex-National Panchayat member Hawal Singh Lama, trace back their history of settlement in the area to the mid-seventeenth century. 'Till then it had been jungle' according to them (personal communication). Those who came first claimed the most land and the government provided them with the authority to collect rentals from it, hence providing additional incentives to reclaim yet more new agriculture land. These pioneer Tamang families first invited to the area other Tamang people from the north (mountains) but the Brahmins and Chhetris also followed. Even the generally urban dwelling Newars arrived in Majhipheda more than 100 years ago. These different ethnic and caste groups first tended to settle in separate hamlets and reclaimed as much new agriculturalland as was possible. They, however, intermingled to a great degree afterwards.

4.3 HUMAN IMPACT - BEYOND SUBSISTANCE NEEDS

4.3.1 The Land as the state's main resource

During the later medieval period, the Newar Malla kings of Kathmandu Valley controlled the trade routes to Tibet that passed through Sindhu Palchok and Kabhre (see section 3.2). They were also naturally attracted to the produce of the surrounding land and the revenue it would generate for them. The Gorkhalis subjugated Kabhre and Sindhu Palchok as early as 1745 (Stiller, 1975) in order to control the same trade routes to Tibet and surround the Kathmandu Valley as a preliminary to its subjugation (section 2.3.2). Sindhu Palchok and Kabhre then became not only strategical and tactical outposts but also important resource bases for the Gorkhalis, particularly during the period of about a quarter century leading to the final conquest of the Kathmandu Valley in 1769. Land being the most important resource for increasing military strength, to feed and generally support it, and to provide state revenues for other purposes, it was important to obtain more and more land for agriculture. There is no reason, therefore, to believe that the Gorkhalis did not continue their policy of extension of agriculture land in their new domain of Sindhu Palchok and Kabhre.

Prithivi Narayan Shah is said to have granted land even as kipat in some areas of East No 1 district to members of the Tamang community during his war of conquest. This grant was later confirmed by King Girban in 1801 (Regmi, 1978a,b). Legal provisions were made, and financial and other incentives provided subsequently, for increased conversion to agricultural land of forest and marginal areas. Following the Gorkhali conquest compulsory and unpaid labour was generally employed for reclamation of new agricultural land, cultivation of crown lands, etc. (Regmi 1978a,b). King Prithivi Narayan Shah himself directed that land which could be converted into fields should be reclaimed. Private enterprise was also encouraged in this respect. Any person who reclaimed new lands and constructed irrigation facilities for these could retain them. Increased revenue from farming surplus for use by the state was the government's main consideration.

Shortage of potentially good arable land, however, eventually came to limit the central government's and local people's quest for more land to convert into farmland. According to Hamilton (1819), the hilly terrain provided very little further scope for extending the cultivated area. If his remarks regarding 'levelling of any available land into rice paddy terraces, however narrow', or about the reclamation of even the steep hill slopes for other food crops were based on his own personal observation they certainly point to the areas surrounding the Kathmandu Valley because Hamilton, who was in Nepal in 1802-3, did not go much further.

The Rana policy of agricultural development also mainly involved expansion of agricultural land. Although these steps brought much desired profits to the ruling regime from the Terai, the shortage of arable land greatly limited their utility in the Pahad. That deforestation had reached an advanced stage, forest resources had become scarce, and wildlife habitat had dwindled in much of Sindhu Palchok and Kabhre by the third quarter of the 19th Century is also substantiated by documentary evidence. Recognising the critical situation, Prime Minister Jung Bahadur himself had promulgated strict orders for the conservation of forest and wildlife in the area. Thus felling, burning and clearing of forest in the Anaikof region that includes Panchkal, Lamidanda, Hokse and Bokse forest areas of Kabhre were banned, in 1874, and so was the killing of wildlife in the area. Defaulters were liable to incur severe penalties and even imprisonment. (For a copy of the document issued by P.M. Jung Bahadur, in June 1874, see Appendix I.)

4.3.2 Urbanisation

Proximity to the Kathmandu Valley has rendered Sindhu Palchok and Kabhre vulnerable to exploitation throughout history as an important resource base for the developing cities of the Valley. Followers of Hinduism and Buddhism arrived in the Kathmandu Valley before the 1st Century A.D. (Kawakita, 1977) and the pagoda style of architecture was already developed by the 7th Century (Gewali, 1977). The Malla kings of Kathmandu Valley who started their rule in c. 1200 were ardent Hindus and great temple builders. They added much to the architectural fame of the Kathmandu Valley, which is the site of such well-known Hindu and Buddhist temples as Pashupatinath and Swayambhu.

The centuries-old Nepalese craftsmanship is particularly brilliant in woodwork and is displayed in innumerable and multistoreyed pagodas and temples, and in ornamental carvings on windows and doors, pillars and beams. Durable *Shorea robusta* of the adjoining river valleys and the lower slopes was the most commonly used timber in constructions and carvings alike. *Michelia champaca* and *Juglans regia* of the upper slopes were the most prized furniture timbers and practically every tree species would have provided charcoal and fuelwood needed for producing the metal craft and minting. Although it is impossible to quantify the impact on the forest resources of the surrounding areas during the rise to fame and civilization of Kathmandu, it must have been significant.

Exploitation of the forests of the two districts was stepped up during the Rana rule and continued into modern times. Hundreds of Rana palaces were built, using mostly free rakam labour services (section 3.3) and the best resources available in the peripheral rural areas. These Rana households, and those of other high civil and military officials, in addition were supplied with charcoal and fuelwood for heating their many rooms. The needs of the rest of the population of the Kathmandu Valley had also to be supplied from these adjoining areas.

The compulsory labour tax (rakam) system (section 3.3) was especially modified by the later Rana rulers and was diverted from other purposes to the exploitation of the forest to meet their personal needs. When any member of the Rana family set up an independent household, the rakam workers were employed as porters to transport timber and other materials. Only the best, well-burnt bricks and tiles available were used. Thus tree-felling, the provision of timber and fuelwood, charcoal production and lime-burning, and transportation of all these products, became important categories of rakam goods and services. As the building industry flourished, an emergent affluent class created a further demand for timber and other related forest products. A special office, Lam Pahad Kath Katani Bandobast (Hill Region Lumbering Administration) was established to organise tree felling, lumbering and timber supply from the surrounding areas under the rakam labour obligations (Regmi, 1978a). As late as 1932, all the timber-grade *Shorea robusta* below Thokarpa in the Sun Kosi valley in Sindhu Palchok was felled on the order of Hari Shumshere Rana, floated to Dolal Ghat and then carried to Kathmandu for construction of his palace (I.14). Also, in 1936, 42,000 trees of *Pinus roxburghii* were felled near Thulo Sirubari in the same district for use in Kathmandu for the reconstruction of the Singha Durbar (information from interview conducted by D.A. Gilmour in 1983, personal communication).

More generally, timber from the two districts was used in the reconstruction of areas of Kathmandu, Bhaktapur, Patan and Dhulikhel towns after the earthquake of 1933 and in the rapid expansion between 1932-1959 of Banepa as a town in Kabhre.

4.3.3 Mines, metals and munitions

Superficial ore deposits occur over much of the Pahad and have been worked for many centuries. Iron ore was originally smelted for the manufacture of simple iron tools needed for subsistence agriculture, and so was little regarded by the state, but copper production was the basis for a long-established coin manufacturing industry that became a major source of revenue to the Malla kings of Kathmandu and no doubt to other petty states of Nepal. Copper coins were for long a major component of trade with Tibet.

With the rise of Prithivi Narayan Shah and the consequent war of unification and wars with China (in Tibet) and Britain (in India), the importance of indigenous metallurgy increased dramatically. The large army required arms and munitions and these had to be largely manufactured within Nepal until late in the 19th century (Temple, 1876).

For long, contracts had been issued to individuals by the states to collect metals and associated revenues from a large area in Nepal (Stiller, 1971, 1975, 1979) but the new significance of metals from the late 18th century led to a spate of administrative changes and government edicts. Thus by 1800 all existing mines were brought under direct government control and the procurement of mineral supplies was emphasized as being as important as that of agricultural products. Prithivi Narayan Shah directed that "in case there are villages on lands containing mineral deposits, mines shall be operated by shifting the village elsewhere".

The smelting of ore and subsequent iron processing requires fuel and this was obtained from the forest. By government edict, fuelwood could be obtained from the forest without restriction and as a free good and was normally converted to charcoal within the forest itself. Even birta lands were sometimes exploited without recompense for this purpose. Trees were not, however, to be felled from places of religious and spiritual significance, resting platforms (chautaras), water-sources, sides of tracks, and from areas at the upper and lower proximities of cultivated land.

The labour required for all this activity was provided through rakam obligations which were increasingly imposed on new sections of the population. Even some birta-holders were required to pay copper and other metals to the government. The main rakam obligations involved were gol rakam (charcoal), jangi megjin rakam (military magazine), daura rakam (fuelwood) and falam khani rakam (iron smelting and supply). In addition free porterage services were required. Thus documents referred to in subsequent paragraphs state that porterage of three types under thaple hulaki rakam was required of people living near Chautara. The first was to carry the iron produced by themselves from Chautara to Kathmandu, the second was the carriage of iron, produced further east by others, from Chautara to Kathmandu four or five times annually, and finally free porterage for 3 kos (6 miles, 9.7 km) either side of Chautara for transport of goods moving between Kathmandu and Tibet. These villagers supplied iron under falam khani rakam for their khet land holdings and thaple hulaki rakam porterage services for their pakho holdings. These obligations were in addition to the prescribed land taxes.

The extent of these operations can be gauged in a number of ways. Geographical limits are stated in a number of orders. Thus the Royal Order (Lal Mohar) of 1813 gave emphasis as a revenue generating activity to the exploiting of copper deposits in an area between Sanga (near Bhaktapur) and the Dudh Kosi river in the eastern Pahad and another large area existed in the western Pahad. Again, the Royal Order of 1837 (sighted by the author, see Appendix II), required of all local authorities in all the revenue and administrative subdivisions (thums and maujas) throughout the eastern Pahad region between the Dhobikhola in the eastern part of the Kathmandu Valley and the Arun River in the far eastern Pahad to facilitate the operation of both new and old iron mines so as to supply iron to the government arsenals (megjins).

It has been estimated that the arsenals existing whilst Bhim Sen Thapa was Prime Minister (1802-1837) held arms and munitions for 45,000 troops and in 1851, according to Cavanagh, for 100,000 men (Regmi, 1978a). An armaments and munitions factory had been established in Kathmandu in 1793 and munitions factories existed in Piuthan, Doti, Chainpur, Morang, Kumaon, etc.

The fuelwood used in all these operations must have been very considerable. Regmi (1978a) has published the recorded jangi megjin rakam obligations of about eighteen families living at Gagalgaon near Panauti in Kabhre. Each was required to provide 1 dharni (c. 2.4 kg) of charcoal daily, the equivalent of at least 150 tonnes of fuelwood annually for the community. More informative estimates can, however, be made for some other operations in Sindhu Palchok.

Land records, sighted by the author and held by Bhakta Dhoj Pradhan whose forefathers came to Chautara from Kathmandu and became government revenue contractors for the area (see Appendix II for a copy of these), reveal that consequent upon the Royal Order of January 1837 kipat lands of twelve villages of the former revenue subdivision (thum) of Chautara, now in Sindhu Palchok District, were brought under rakam labour obligations.

The holders were assigned to falam khani rakam and were required to smelt iron ore obtained from local pits so as to provide iron to the Kathmandu arsenals. The obligations included transport of such iron to Kathmandu. Iron was to be supplied as an in kind payment measured by doko. Each doko was assessed as equivalent to 20 dharnis (c. 48 kg) of iron and was sufficient to meet the obligations required for holding not more than 90 muris (22.5 ropanis or c. 1.10 ha) of kipat land. The twelve villages of the revenue subdivision of Chautara enrolled under falam khani rakam included Syaule, Gaurati, Chautara Dandathok, Waibachhap, Gairigaon, Bhanjyangthok, Kami-Khet-Hundrung, Deurali, Golma, Chature, Kubinde-Chhap and Patikhor.

From this document and interviews in Syaule panchayat, it is possible to gain a measure of the enterprise in that panchayat and of its fuelwood use. Two approaches are possible. First, it is recorded that an area of 4685 muris of land (c. 56 ha, 1 muri = c. 0.012 ha) was subject to this rakam obligation and as noted above 20 dharnis (c. 48 kg) of iron was required as payment for 90 muris. Thus c. 2.5 tonne of iron were to be produced annually. Ten bharis of wood (headloads, each of c. 30 kg from data collected by the author - section 5.2) was said to be required to produce each dharni of iron, i.e. a total of c. 300 tonne. Alternatively, an informant stated that a kamigaon (blacksmith's village) consisting of 16 households had existed in Syaule (interview with Bishakami conducted by D.M. Griffin in 1981b, pers.comm.). Each used to prepare 40-50 khangre doko (large basket) loads of charcoal each year in the montane forests of Chyo Chyo Lekh to the north, a total of 19-24 tonne of charcoal. Allowing a gravimetric wood to charcoal conversion rate of 10% for the primitive method used (Wiart, 1983), this is equivalent to 190-240 tonne dry wood, say 250-310 tonne air-dry wood.

The two methods of derivation are in remarkable agreement and it can be assumed that the Syaule operation used c. 300 tonne of wood annually at the turn of the century. It is further known from the known generations of kamis of two families involved in the industry that iron smelting, although at unknown intensities, had been conducted for 200-300 years. Accepting the statement of informants that oak and rhododendron were favoured wood for charcoal production and assuming that oak and rhododendron stem and branch biomass is c. 50 tonnes per hectare in nearby forests, c. 6 ha would have been exploited each year by the Syaule operation during its period of maximum production. The amount may well have been larger because the government arsenals paid a prescribed price for any additional quantity of iron supplied so that the villagers were motivated to produce more of the metal than required by their obligations. Over a period of 200 years the total effect on the forest must have been considerable. The areas adjoining the village are now quite denuded of forest and much of the land is reduced to poor grassland. Old charcoal pits are common within this grassland and slag from foundry operations (locally called dhau) is widespread. Similar operations are known to have existed in the other eleven areas mentioned earlier within the former Chautara revenue sub-division (thum), and there were 39 thums in the East No. 1 districts of Sindhu Palchok and Kabhre under the Rana administration.

The importance of iron to Nepal during this period was such that all local functionaries and customs officials were ordered to facilitate the unrestricted flow of iron to the defence establishments while the government checkposts, such as the one at Sindhuligarhi to the south-east of Kabhre, were to keep strict vigilance so that no iron was exported from Nepal. All these iron smelting operations declined after 1895 when the falam khani rakam payments in iron were commuted to cash payments, in addition to the prescribed land tax, under the seal of the Rana prime minister (Khadga Nisana). This change followed the new availability of arms and munitions from sources external to Nepal. Iron smelting in the area continued in declining proportion for local, general purposes for at least a further 30 years. It finally ceased under the competition provided by cheaper imports from India.

Imported products were at an advantage for many reasons but two relate to the forest. First, the increasing distance between adequate and suitable fuelwood and the village in which ore processing occurred rendered economic activity impossible (Chalise, 1983a,b). Second, the energy efficiency of the activities was very low and far less than that recorded for Wales in 1560 (Linnard, 1983) or for Europe in the 15th and 16th centuries (A. Schuler, pers.comm.). By the 16th century, however, simple blast furnaces had been introduced into Britain whereas the Nepalese processes for charcoal production (as still practised today (Wiart, 1983))and iron ore smelting, were primitive and of very low efficiency.

4.3.4 Industries and manufacturing

The local people augment their cash income and utilize their spare time by engaging in various home-based cottage industries, most of which are dependent on forests. Although generally small and diffuse, local industries and manufacturing processes put a considerable demand on forest resources in many parts of Nepal, including Sindhu Palchok and Kabhre. Some of these need fuelwood as the source of energy for processing while others require wood as a raw material. Most involve only primary processing but a few involve secondary manufacturing processes. The local industries and manufacturing processes known to the author within Sindhu Palchok and Kabhre districts are first listed and then briefly described below. Information regarding quantities of forest products involved in these operations and their impact on forest is, however, mostly not available and the topic requires further research.

Industries using fuelwood

Agriculture based:

- Alcohol from grain (rakshi)
- Flattened rice (chiura)
- Brown (raw) sugar
- Peanut roasting
- Oil processing

Livestock based:

- Ghiu
- Chhurpi
- Cheese
- Wool washing and dyeing

Forest based:

- Charcoal
- Nepalese paper
- Chiuri ghiu
- Medicinal herbs
- Processing of fruits, nuts and berries

Horticulture based:

- Fruit jam
- Fruit alcohol

Minerals based:

- Blacksmithing (iron)
- Metal-craft (copper, brass, bronze)
- Aluminium utensils
- Khukuri making
- Jewelry (silver and gold)
- Brick and tile manufacture
- Lime-burning

Miscellaneous:

- Tourism
- Fish and meat smoking
- Honey
- Road construction

Industries using wood as raw material:

- Carpentry
- Handicraft
- Wood-carving
- Bamboo and nigalo

Alcohol. Locally brewed alcohol is a popular daily drink except perhaps for the caste Hindus - the Brahmins and some Chhetris. It is domestically manufactured in Sindhu Palchok and Kabhre districts from grains including rice, millet, corn, barley, and wheat. Some alcohol may also be prepared from fruits. Energy needs of the distillation process involved are supplied by wood and other locally available fuels (Plate 27).

Flattened rice. Forming a common snack food, flattened rice (chiura) is eaten with curry, milk, yogurt or tea. Unhusked rice is boiled, roasted and beaten to prepare the flattened rice both domestically and in many bazaar towns by small scale enterprises (Plate 19).

Raw sugar. The juice extract obtained by pressing sugarcane needs boiling to concentrate it into raw brown sugar.

Peanuts. Peanuts grow commonly at the lower altitudes of the two districts and may be considered a minor cash crop of the area. Peanuts are often roasted before eating.

Oil processing. Mustard oilseeds for better quality oil are roasted over wood fires before pressing for oil.

Ghiu (Ghee). This is a type of clarified butter and is derived mainly from buffalo milk at lower and middle elevations and from chauri milk at higher altitudes. Boiled milk is allowed to ferment and is churned vigorously until the water is separated from the fat. Ghiu is thus produced in practically every household of the two districts and throughout the Pahad region of Nepal and most milk animals are maintained for this purpose. A considerable proportion of the ghiu produced in the area is locally consumed but much of it is also exported to Kathmandu, so forming an important source of cash income for the farmers of the area.

Chhurpi. This is another minor product, mainly of chauri milk. It is prepared by hard boiling and driving all the water from milk, the concentrate then being dried and cut into small cubes for chewing and eating. It is exported to Kathmandu from the higher country in the two districts.

Cheese. Cheese production is organised by the government-owned Dairy Development Corporation in the two districts, as in most of Nepal. Chauri and buffalo milk is used for the purpose. The Kyangsing cheese factory in northern Sindhu Palchok uses mostly chauri milk. The three cheese factories on the Mahabharat slopes in southern Kabhre depend on buffalo milk. These cheese factories process milk into cheese and butter, or soft cheese. There is, however, no tradition of cheese-eating, either locally or in Nepal as a whole, so most of the cheese and butter produced is supplied to the Kathmandu market for consumption by foreigners. It is also being promoted for export outside Nepal. All these cheese factories in the area depend solely on fuelwood for boiling the milk, which is done at least twice daily, and substantial quantities of wood are consumed. The cheese factory staff also use rather lavish quantities of fuelwood.

Fuelwood use estimates for the cheese factories in the two districts are not available. Estimates from other cheese factories located in nearby Langtang in Rasuwa district and Jiri (Kapti) in Dolakha district which operate more or less on similar lines provide a fair indication of the use of fuelwood and the impact on forest resources. The Langtang cheese factory processes 600 litres of milk a day for about 120 days in a year and has a theoretical need of

c. 9120 kg of fuelwood. The cheese factory management in 1977, however, sought for permission from the Forest Department to obtain c. 32,000 kg, 3.5 times more than the theoretical need (Borradaile *et al.*, 1977). The Jiri (Kapti) cheese factory has put even greater demand on local forests. According to Grünenfelder 18 ha of forest would need to be felled to meet its annual fuelwood demand of 70,000 kg (Haering, 1980). Recent observations in the Mahabharat Lekh show that cheese factories there are making similar depredations on the forest (D.M. Griffin, 1983b, pers.comm.).

Wool-washing and dyeing. Local people, mainly of Tibeto-Burman extraction and living at higher elevations, such as the Gurungs, Sherpas and Tamangs, manufacture woollen cloth for their own use and for trade for cash income. Carpets, blankets, shawls, jackets, bags and a variety of garments and goods are made from such home-made woollen cloth. Raw sheep wool is washed and rinsed in warm to hot water, requiring fuelwood for heating the water. Some locally available vegetable fibres are also used for weaving of cloth (bhangra) out of which are made garments that are traditionally locally used. Again, heated water and hence fuelwood are often needed for separating the bark and other fibres from woody material of the plant as well as to wash it. The manufacture of many of these goods, straw mats and baskets requires coloured fibres which are dyed locally, using a boiling solution of dye.

Charcoal. Charcoal used in the two districts is still manufactured by the primitive, low yield method in which a pile of wood in a pit is covered with a layer of earth and turf and then fired. Wiart (1983) has studied closely the process of charcoal production in regard to both technique and volume. In the village of Salme, he found that 14 blacksmiths (kamis) used a gross weight of wood equal to 146.7 tonnes per annum. Of this 110 tonnes was burnt, yielding only 11 tonnes of charcoal. (For comparison, the 1,564 inhabitants of Salme used 1,330.6 tonnes gross weight of fuelwood - 850 kg/person/annum - for cooking purposes.) The most favoured species were *Castanopsis tribuloides* and *Prunus cerasoides* because the charcoal from these species burns slowly. Elsewhere, however, *Quercus* spp. are highly favoured (see, for example, section 4.3.3).

Charcoal making is carried on in the forest without effective restriction mostly by blacksmiths who form an important part of the rural community. They are responsible for making, maintaining and repairing practically every farm tool and implement made out of metal, and even of wood. They also practise other metal crafts involving copper, brass, bronze and aluminium. The Gurkha khukuri knife which has always been an useful tool for the local population has gained importance more recently also as a result of increasing numbers of tourist visitors in the area. Charcoal is also used in gold and silver jewellery works in bazaar towns of the two districts.

Nepalese paper. Paper from the bark of *Daphne* shrubs has been locally made in the area for centuries. The practice continues today mostly in the montane forest areas of northern Sindhu Palchok, still employing the traditional technology. Bark of the *Daphne* spp. (lokata) is stripped, beaten, mixed with a caustic prepared from wood ash and then boiled in a large cauldron over an open wood fire.

Preferred tree species for both fuelwood and wood ash in the Marming-Kalinchok forest area is *Quercus semecarpifolia*. Although encouraged by the government and generating most income to those who have monopolised the industry for decades, it is an extremely wasteful process in terms of energy and is most damaging to the forest. Not only are *Daphne* plants killed to strip the bark, but also large quantities of wood are involved as wood fuel and wood ash. One estimate shows that approximately 4 kg of fuelwood is needed to produce each sheet (c. 65 x 45 cm or c. 0.3 m^2) of this local Nepalese paper.

The author's efforts to regulate and control the wasteful production processes carried on in a number of scattered locations in the forest met very considerable opposition initially from influential vested interest groups who had monopolized and been profiteering in unauthorised ways from such operations. By the late 1970s, the social aspect of the situation was somewhat under control but the problem is not solved completely yet. It would need clear policy guidelines from the central government and continued firm action at the local level: both have as prerequisites a much better understanding of the social and technical issues involved and this is a priority area towards which research efforts should be directed.

Chiuri ghiu. A ghiu type of oil product is obtained from the seeds of the tree *Bassia butyracea* (chiuri) which grows at lower altitudes in the two districts, scattered in the forest or sometimes fringing agricultural land. The fruits ripen in July-August and are eaten. The hard seed (kernel) is washed and well-dried for 5 to 7 days and beaten well in a rice husker (dhiki) to make a powder of it.

This then requires steam-boiling over a wood fire so as to turn it into a slurry or paste which is pressed and the ghiu is extracted. Approximately 4 units of chiuri seeds yield one of chiuri ghiu. In Sindhu Palchok and Kabhre it is not manufactured in large quantities and is not of current commercial importance but the tree has a great potential for private plantations.

Medicinal herbs. Some of the medicinal herbs, found mostly at higher altitudes, like *Orchis latifolia* (Panch Aunle) are boiled and dried for preservation, and stored for up to 4-5 years.

Processing of fruit, nuts and berries. Fruits of commonly growing *Chaerospondias axillaris* (lapsi) are boiled over wood fires to separate the seed from the fibre, which is further boiled to drive the water away. The slurry when dried makes what is locally known as mada. It forms a popular 'sweet and sour' appetiser which is consumed locally and has a ready market in Kathmandu. This tree also has a great potential for further propagation in private, communal and government-owned forest lands to inject cash income into the local economy. The wood makes good lumber and fuelwood and is reasonably fast growing (Plate 28).

Brick and tile manufacture. Bricks and tiles are manufactured from heavy clay soil using fuelwood for burning them. Bricks and tiles along with timber have been the major building materials from early times, in the nearby Kathmandu Valley and in towns of the districts including Sanga and Nala, Dhulikhel, Banepa, Chautara, Jalbire and Panauti as well as to some extent even in villages.

They have also been used in many other bazaar towns and villages of the two districts in more recent decades, especially in public constructions such as rest houses, official buildings, bridges and temples as well as in houses of better-off farmers and tradesmen. The pressure on the forest for fuelwood for this purpose in Sindhu Palchok and Kabhre has, therefore, been considerable. Most recently, however, the use of bricks and tiles has been declining because of the poor economic status of farmers, limitation of forest resources, and the policy of the forest administration to discourage such activities by not permitting harvesting of fuelwood from the local forest for brick manufacture.

Lime-burning. Another activity dependent upon the forest and catering mainly for the needs of urban centres is lime-burning, dependent on the deposits of limestone in the two districts. This lime is mainly used for whitewashing and painting town houses because the rural people mostly use raw red-brown or greyish white clay dug from pits. The process is very wasteful of energy, it being estimated that 3 kg of fuelwood are needed to obtain one of quicklime. Lime-burning was common in the past and continued to some extent till recently. To reduce the demand for fuelwood, the author during his tenure as Chautara Divisional Forest Officer tried to stop the practice of lime-burning and even met with some success.

Tourism. Helambu, Nagarkot, Dhulikhel, Chautara and areas along the Kathmandu-Kodari and Lamasangu-Jiri roads and other access tracks are frequented by overseas and local visitors from Kathmandu and other parts of Nepal for pleasure, pilgrimage or business. These people need and use local teashops, eating places and lodges which use fuelwood in their kitchens. The needs of the flourishing tourist industry in Kathmandu were also supplied to some extent from the two districts in the past but because of an already marked deficit of forest produce in the districts themselves, export to Kathmandu had to be greatly discouraged from the first half of the 1970s.

Fish and meat smoking. Smoking of fish, and less commonly meat, is a standard practice for storage, preservation and improvement of taste, and easier transportation in Nepal.

Honey. Collected from forest or farmed domestically in the area, honey may be boiled for better preservation and longer storage. Qualitatively, however, unboiled honey is preferred.

Road construction and maintenance. Since the first motorable road was built in the districts about two decades ago, much of the forest in the vicinity of the roads has thinned out. Although the more direct demand of fuelwood for bitumen boiling has been curbed by forcing the Roads Department to obtain fuel from the Kathmandu market, other problems remain. At least in the Panchkhal-Lamidanda area of Kabhre, a consequence of road building has been encroachment on the forest for town building and profiteering by influential people from Kathmandu.

Carpentry. This is a fairly popular trade in Sindhu Palchok and Kabhre, occupying many skilled people in a profitable year-long job, except perhaps during the peak agricultural season. Besides local rural house constructions, many new private and business houses are being built in Chautara, Barabise, Lamasangu, Dolalghat, Dhulikhel, Banepa and many other places along the newly-built roads, and also in bazaar towns throughout the two districts. These town houses are usually larger than normal houses built in the villages and use much more wood in construction and furniture. According to Haering (1980), the new bazaar town houses in Jiri constructed for joint living-business purposes use 5 to 10 times more timber than the traditional farmhouses (Plates 9, 10, 11, 12, 13, 14, 15).

Wood carving. This is another wood-using local manufacturing process. Wooden pots, containers (theka), cups, etc., of various shapes and sizes are carved for use in practically every household in the area. *Rhododendron arboreum* is a popular species. Wooden masks, idols, and other curio goods are also carved from wood locally and traded in Kathmandu. Wood carving is more popular in the higher Sherpa and Tamang country. The most preferred species, such as *Boehmeria rugulosa*, for containers have already disappeared from many localities.

Bamboos and nigalo. In the forest, *Bambusa* and *Arandinaria* spp. exist in the higher montane zone of the area only, being more common in the upper Balephi catchment and on Chyo Chyo Lekh. These species are also grown commonly on private lands near the fringe of the terraced agricultural area. Split bamboos and nigalo of various thicknesses are woven into doko-baskets and other containers, sieves, cages, fishing nets, roof-mats and ceilings for temporary animal and human shelters. Of the products, 80-90% are manufactured for local consumption, the rest being supplied to Kathmandu.

Bamboo and nigalo are of multi-purpose importance to the farming community and private plantings have great potential for taking the pressure off the existing forest in the area.

4.3.5 Guthi land endowments

The Gorkhali rulers considered themselves responsible for the maintenance of existing temples, monastries and religious and charitable institutions and made generous land endowments called guthis. Endowments were also made by individuals, often of land granted them by the state for that purpose. The recipients of the guthis were usually permitted by law to appropriate what remained after discharging of scheduled function under the guthi. The system of guthi land tenure therefore underwent great expansion after the unification of Nepal by Prithivi Narayan Shah (Regmi, 1976, 1978a). Though guthi land endowments included both crop land and forest, the shortage of arable land in the 19th and 20th centuries restricted state endowment to forest or other unallocated raikar lands. The endowment of jagirland was particularly prohibited. Hence a large number of guthi endowments were made from forest or the so-called wastelands. Official estimates indicated that c. 4% of the total cultivated land area was under guthi tenure in 1950 (Regmi, 1976) but the shortage of agricultural land in the Pahad in the past two centuries resulted in the concentration of the majority and the richest of guthi endowments in the Terai.

Guthi land endowments were made within Sindhu Palchok and Kabhre, the better known among which are mentioned here. Thus land at Phataksila in Sindhu Palchok, along with some in Kathmandu, was endowed as guthi to Pashupatinath temple by King Rana Bahadur Shah in 1799. The Phataksila guthi includes to this day a forest, now mainly of *Pinus roxburghii*. The guthi lands produce rents amounting to at least 3435 muris (c. 167.5 tonne of paddy or c. 233.8 tonne of maize or wheat; 1 muri is equal to c. 48.8 kg of paddy or 68.05 kg of maize or wheat), besides various miscellaneous in-kind payments including forest produce. Similarly, General Dhir Shumshere Rana endowed land at Sipakot in Sindhu Palchok on the eve of his departure for the 1854-56 Nepal-Tibet War. Guthi endowments were also made to Buddhist monastries in Helambu in Sindhu Palchok (Regmi, 1978a,b). The Panchpokhari guthi endowment made to a local diety of Panchpokhari at the source of the Indrawati river in northern Sindhu Palchok and of significance to both the Hindus and the Buddhists, included a large area of montane forest in Bhotang and adjacent panchayats. This guthi is said to have been endowed in the first quarter of the 18th century by a relative of Bhim Sen Thapa whose descendants to this day enjoy social prestige and associated benefits accruing from it. Many similar guthi land endowments exist in the area. A guthi land administration office based at Dhulikhel in Kabhre manages the assets of guthi lands of Sindhu Palchok, Kabhre and some areas further east.

The implications of forest land having been included within a guthi endowment are not clear because the author has been unable to obtain evidence as to how the guthi holder actually benefitted. Such lands are now browsed and lopped like others and the holder, if in reasonable proximity, no doubt receives gifts from those using the land. Payment would also be made if trees were felled.

None of this, however, adds up to a significant revenue yield. It is not known whether forest is better or worse conserved when in a guthi endowment and the whole topic would repay further study.

4.3.6 Jagir

As discussed in section 3.1.1, courtiers and other government employees were traditionally assigned jagir lands in lieu of their salaries. In the post-unification period the government pursued a liberal policy of jagir land assignments to the army, which became the largest jagir-owning class. Officials in charge of defence (Umaras) in the administrative and revenue subdivisions were assigned large land areas to raise a prescribed number of troops to join the army in war and this greatly encouraged new land reclamation throughout the period. The Ranas brought important changes in the jagir system so that it declined gradually and was replaced by cash salaries, first in the Terai during Prime Minister Jang Bahadur's time (1846-1875) and then in most of the Pahad by 1928.

In Sindhu Palchok, Kabhre, West No. 1 and Kathmandu Valley areas, the Ranas retained the jagir land tenure almost to the end of their rule to maintain an army, although not as large as in the period prior to them. This continuation of the jagir system in the Pahad areas nearest to Kathmandu had a number of causes. First was a shortage of cash, inherited from the previous Gorkhali rulers, to pay the lower ranks who were traditionally recruited from the Pahad. It is also probable that the Ranas retained jagirland tenure in the Pahad to make the Nepalese army service, especially for lower ranks, comparably attractive to that of the British Gurkhas, the recruitment of whom was formalized by the Ranas with the British Government in the later part of the 19th century. Presumably, and local traditions suggest this, the British had also made a tacit agreement with the Ranas not to recruit for the British army men from Sindhu Palchok, Kabhre and other adjoining areas of the Kathmandu Valley and leave them for service in the Nepalese army and to the Ranas themselves. This pressure imposed by the jagirland tenure system in the two districts over a long period of time would almost certainly have had a noticeable impact on the forest resource through reclamation for arable agriculture.

The jagirdars collected their share of annual rents on the strength of certificates (Tirja) issued to them by the government. These certificates being negotiable, jagirdars' share of rents was normally collected by intermediaries. Since only the jagirdars themselves, and not the intermediaries to whom these certificates were sold, were permitted to collect the rents in kind, cash was generally collected for rents.

With the end of the Rana rule the jagir system collapsed and subsequent governments made efforts to convert the jagirlands into raikar tenure. The jagirdars were prohibited from collecting rents and the government offered to pay compensation. According to Regmi (1978a) the jagir abolition program was not complete even by 1965 and many of the jagir lands in the Kathmandu Valley and the Pahad had not then been converted into raikar but were still being used as tax-free land. This was certainly true in Sindhu Palchok where the former Chautara Forest Division office had found it difficult to demarcate forest land. For instance, it was long found difficult to demarcate a forest area consisting mainly of *Shorea robusta* on the lower slopes of the Balephi catchment between Jalbire and Balephi-Dobhan in the face of opposition from a former jagirland owner. Further, in Sindhu Palchok the descendants of a former Prime Minister have for a long time enjoyed privileges accruing from jagir assignments of unirrigated pakho lands (khuwa) and khet lands, and appear to have manipulated even the sanctity of the guthi system for their own economic advantage. The continued burden and harassment caused by these practices led to agitation in 1980 by local people for the abolition of these rights (see also section 3.3.2).

4.3.7 Birta, kharka and banbatika

Birta as an ancient land tenure system has been described in section 3.1.1. Kharka is also a traditional land use category but its formal legal definition occurred much later. Under it, the government assigned land to individuals as pastures or grazing lands (kharka) in order to increase its land revenue base and these therefore became a separate category of taxable land. Tradition, current usage or revenue considerations determined whether the land was classified under this category. Pasture land was never surveyed and often the classification was determined on a purely arbitrary basis. Such inadequate policy measures lent themselves both in the past and present to easy manipulation by the more influential section of the society. Tax assessments on pasturelands (chari and kharchari rakams) are made on the basis of the number of livestock, with each category being charged different rates depending on their size.

In the case of the local cattle and chauri, however, this tax is remitted on religious considerations. Pasturelands in the past were often of a communal character and were registered in the name of the local talukdar functionaries.

The provision of private forest plots (banbatika) as a land use category was first made under the Forest Act of 1961 so as to encourage private enterprise in the creation of new forest. According to this Act individuals could maintain private forest plots (banbatika) of area up to a maximum of 1.25 ha in the Pahad and 3.25 ha in the Terai if they created these with their own efforts and resources. Transferring of existing forest to private ownership was, however, clearly not its intention.

The examples and claims of the birta, kharka and banbatika categories in Sindhu Palchok and Kabhre overlap and have become confused with one another and to assess their impact on forests it seems more appropriate to consider them here together.

The birta system of land tenure had important political and religious significance because of the economic benefits accruing to the recipient but the government also used it as a tool to maximize revenue from land. Most birta land grants included the purpose of extending agricultural land, and some were made with the specific purpose of reclaiming forest or wastelands. In addition to tax exemption and the benefit of land tax revenues, the birta owners were also entitled to use forest resources and revenues from forest and pasturage, except for the forest of the Mahabharat Lekh.

The shortage of valuable species prompted the new Rana government in 1854 to withdraw the unrestricted tree felling rights of the birta owners, implying therefore an already advanced state of deforestation in the Pahad by that time. The 1854 Legal Code (Muluki Ain) prohibited the birta owners from felling of tree species of classified categories, such as *Shorea robusta*, *Pinus* spp., *Michelia* spp. and *Juglans regia* (Regmi, 1978a).

Like the jagirlands, most birta lands until about the early 19th century were granted in the Pahad region. Due to their proximity to Kathmandu, it is likely that Sindhu Palchok and Kabhre areas would have attracted many in the nobility, high military and civil offices, and other positions of influence, to seek birta land holdings in the two districts. Later the emphasis on birta lands shifted to the Terai and the two districts were earmarked mainly for jagir land grants. The available information is based on documentary evidence, local traditions, oral history from the living generation of local people, and the author's personal records and observations. These sources suggest that the few birta grants that existed were made by the Ranas and even these few had by and large a detrimental effect on the forests, although exceptions did occur.

Below, three examples of birta grants in the two districts are noted. There then follows a detailed consideration of the important Marming chhap birta forest in northern Sindhu Palchok as this provides an excellent example of the problems faced by the Department of Forests in dealing with opposition by a determined and influential group.

The Colonel's forest. The existing forest areas of Bhalukhop, Thumki, Mahaghar and various other nearby forest localities are called the Colonel's forest. This forest along with the adjacent Siurani shrub-land and the Chaubas degraded grasslands now in eastern Kabhre district were all under birta tenure formerly. This forest and the adjacent areas fall within the author's detailed study area and are covered in section 5.6.1 (Plates 34, 39).

Palanchok birta lands. According to local traditions, the Basnet family of Kaski (see also section 5.6.1) were granted birta in the Palanchok region to compensate for their birta lands in Kaski in the mid-western Pahad which were taken away when Jung Bahadur Rana became the Maharaja of Kaski and Lamjung. The Palanchok region, dominated by the ridge of that name, has been deforested and tree-less for a long time now but no further information on these birta grants or their impact on the forest is available.

Birta grants to Brahmins. Examples of birta grants made to Brahmins (kush birta) are also reported from Bansbari panchayat in southern Sindhu Palchok but their impact on forest is not known.

Marming chhap birta forest. Information regarding birta holdings in the two districts is in general sketchy. The Marming forest, however, presents a clear example of how the birta holders exploited the forest. It also illustrates how the process of exploitation was continued by some of the descendents and relatives of the birta grantee into the present time, over two decades after their legal rights appear to have terminated. They were able to do this through influence, and misinterpretation and evasion of the new legal provisions.

The Marming forest thus presents an example of complications and constraints in forest management and conservation arising not so much from technical as socio-economic issues unrelated to subsistence activities. The roots of the problem lay in the lack of both an adequate policy framework and institutional foundations for forest conservation and management, reflected in poor definition and classification of various land use categories. In the face of these inadequacies most officers involved in actual forest management became timid and even demoralized.

According to the Sindhu Palchok Land Revenue Office records, Marming forest is recorded as a life-time chhap birta granted under the Khadga Nisana seal of the Rana Prime Minister in 1948 to Colonel Kirti Man. The record limits this birta grant geographically to Latupa Jung Damar in the north, Deudhunga to the east, Narman (Nambarjung) Danda to south and Bhote Kosi river to the west. According to a forest resource inventory in 1979 (Grünenfender, 1980b; pers. comm.), the Marming forest block alone, including much of this legally recorded area, has a total area of 11,021 ha of forest and pasture land, with the forest covering 96% of the area. The actual area of influence of the birta recipient, however, extended much beyond these legal limits to the borders of the Tibetan region of China in the north, Palate danda to the south, Marming village and the Bhote Kosi river to the west, and Charikot (in Dolakha District) in the east. These latter boundaries encompass much of the forest area (35,094 ha) of Marming-Kalinchok forest included in the forest resource inventory commissioned by the Integrated Hills Development Project in 1979 (Grünenfelder, 1980b; pers. comm.). Over 94% of the area within

Sindhu Palchok and 92% within Dolakha are under forest cover and the rest is pasture land.

Much of this area is under high altitude montane forest extending up to 4500 m elevation. Over 57% of the forest (32,704 ha) is classed as of commercial category, the predominant species including *Abies spectabilis* and *Quercus semecarpifolia*. According to the authors of the inventory, the total area of the Marming-Kalinchok forest had an estimated 1.87 million m^3 gross volume of live trees to 10 cm top diameter at the time of the inventory. The Marming block included in the Khadga Nisana orders alone had an estimated 0.66 million m^3.

As this birta was granted to Colonel Kirti Man on a lifetime basis, it was not inheritable and resumption to the government on the death of the beneficiary should have been a normal, automatic process. This does not seem to have happened.

Next, this forest should have reverted to government ownership under the Private Forest Nationalization Act of 1957. The Forest Act, 1961, and Forest Preservation (Special Arrangements) Act, 1967 confirmed this and made further legal provisions for the management and conservation of forest and also defined the duties and rights of the Forest Department regarding state-owned forests, including Marming. The 1961 Forest Act also made provisions for private forest plots (banbatika) clearly stating that such plots must be 'created' after 1961 by individuals through their 'own efforts and resources'. Moreover, the legal ceiling for these never exceeded 1.25 ha in the Pahad and 3.25 ha in the Terai. Marming forest stretched far beyond these ceilings and was nobody's own creation since 1961. The Birta Abolition Act of 1959 had also substantiated state ownership of this forest by abolishing birta rights over this and similar forests and converting these to raikar status. The 1964 Land Reforms Act should have cleared up any remaining doubts regarding the ownership and limit of all private land holdings, including forest, by prescribing upper limits of 17 ha in the Terai, 4.1 ha in the Pahad and 2.7 ha in the Kathmandu Valley. Finally, according to the Pasturelands Nationalization Act of 1974, the government also resumed ownership of large private pasturelands exceeding the limit in area prescribed by the earlier Acts. The government agreed to pay compensation for such resumption.

Despite all this legislation, the aims of providing an equitable distribution of the nation's wealth among its people in general and instituting a better forest management and conservation system can hardly be said to have been achieved. Some in the old beneficiary group have attempted to evade each new law and so to benefit from the forest at the expense of the local people. Between 1948 and 1957 they used these lands as their chhap birta forest. Between 1957 and 1974 they evaded all the new legal provisions mentioned earlier in this section (and in section 3.4.4) and claimed and used this forest as their private forest plot (banbatika). It seems they were even able to establish their claim of having created this forest as a banbatika with their own efforts and resources, as required by the relevant Act. Since the promulgation of the 1974 Act they have in fact claimed compensation for the whole of this forest, claiming it as their private pastureland.

No evidence of recent conversion of forest to agricultural land was observed in the Marming area. However, the Marming forest has been traditionally used by local people for purposes of livestock grazing, pasturage, and lopping and collection of fodder. Beside the local livestock, scores of reasonably large herds from adjoining areas and from lower elevations come for summer grazing each year. This forest has also remained the major source of the *Daphne* bark in the two districts which was manufactured locally in the forest itself into paper in the past. It is also the source of timber for construction and roofing shingles for a considerable area around. Valuable *Michelia* spp. and some other furniture timber were also provided for the two districts and Kathmandu. The importance of the forest for timber as well as other products increased especially after the Kathmandu-Kodari road was built.

Throughout the period mentioned above some in the old beneficiary group collected wool, ghiu, paper, lambs, mushrooms, honey, potatoes or cash as tax from the local people, pastoralists and other forest users. These taxes were reportedly collected by them twice in a year, normally once before the monsoon and then before the Dasain festival in September. It is reported that some of the group succeeded even in claiming compensation from the government for timber and land in the area used in development activities.

It therefore became necessary to stop the degeneration of the forest arising from the misuse of the law and to gain the confidence of the local population so as to institute a better system of forest management and conservation. The former Chautara Forest

Division office, during the author's tenure of office, therefore took control of the forest as provided by the various laws and prohibited the use of the forest except in accord with those laws and regulations. Thus the use of the forest for obtaining timber, fuelwood and *Daphne* bark was banned unless permitted by the Chautara Forest Division and the raising of taxes by individuals was prohibited. Permits for the use of the forest by the local population were issued by the Division Office but any export of timber and other goods to Kathmandu was restricted because of the limited forest resource in the districts as a whole. The monopoly of manufacturing and supplying of Nepalese paper was ended and the Forest Department chose new operators on a competitive basis. Relevant information regarding forest landholdings in the two districts was obtained from the records of land revenue offices in Sindhu Palchok and Kabhre. The claimants of banbatika were unable to substantiate their claim with legal evidence when asked for it by the Chautara Division Office. The forest boundary running over 100 km with the agricultural land alone, was demarcated. A forest resource inventory of the area was also accomplished subsequently, as already indicated, with the assistance of SATA/HMG, Integrated Hill Development Project.

This loss of monopoly in use of the forest and all associated benefits led to complaints in a higher court of law by some in the old beneficiary group against the Chautara Division and its staff and the case was pending decision in 1983 when the author left the Chautara Division.

The Panchkhal, Lamidanda, Gidde, Hokse, Bokse and other forests of surrounding areas in Kabhre district comprising an area of c. 1100 ha of mainly hill sal forest presents yet another example of evasion of legal provisions allegedly by the same group of people. Here the forest was claimed to be a private forest plot (banbatika). Being situated along a motorable road and of relatively easy accessibility, and proximity to Kathmandu, this forest was excessively over-exploited, reducing it to very open woodland and poor brushland. Some land was also sold to settlers adjacent to the bazaar town of Lamidanda. The Chautara Forest Division finally raised the issue and similar steps were taken here to those in the case of the Marming forest. The area was surveyed and forest land demarcated from agricultural and other land use categories. Any registration by the district land revenue office of agricultural land, homesteads and shops made on land acquired by selling, buying and clearing of this forest area was suspended and the harvesting and export of timber and fuelwood were stopped. Here also the case went to a higher (Zonal) court of law. All the evidence available from local people, old and new maps, aerial photographs, and even an order issued by Prime Minister Jung Bahadur Rana in 1874, confirmed this as public forest land and the court concurred. The new regeneration and regrowth of *Shorea robusta* and other species in this forest since the change in management is very impressive.

These two examples clearly illustrate the problems involved in attempting to institute adequate forest management and conservation measures where some of these old forms of land tenure still exist, or are claimed to exist.

4.4 HUMAN IMPACT - SUBSISTENCE ACTIVITIES

4.4.1 Fuel

Plant biomass, in one form or another, is by far the most important source of energy in Nepal, and nothing else is of any significance to most subsistence farmers (Tribhuwan University, 1976) (Plate 21).

Estimates of use have been collated by Donovan (1981), who noted their great variability, from 0.1 to 2.57 (or even 6.67) m^3/annum/person. She discussed the many sources of error which might underlie the variability, ranging from poor questionnaire design to uncertain validity of many necessary conversion factors. Her conclusion was that c. 1.4 m^3/annum/person was a likely average consumption value (assuming 5.5 persons per family and a weight of 600 kg fuelwood per m^3) and that lower values probably characterised exceptionally fuel-deficient areas where average demand significantly exceeded actual consumption. The earliest data available for Sindhu Palchok and Kabhre districts are those produced by survey undertaken in 1979 by the New Era consultancy group on commission from the Nepal Australia Forestry Project. These data were restructured and presented by Parajuli *et al.* (1981) (see Table 4.6). Apart from sampling and survey procedure errors that may have existed these consumption values are now thought to be too low because of the assumed weight of a bhari (head load) of wood. New Era assumed this to be 22 kg,

Table 4.6: Fuel use per person in Sindhu Palchok and Kabhre. Data based on a survey of 485 households in selected panchayats (New Era, 1980).

Fuel	Weight[1] kg/year	Energy[1,3] MJ/day	Weight[2] kg/year	Energy[2,3] MJ/day
Fuelwood				
Domestic	277	11.4	378	15.5
Commercial	14	0.6	19	0.8
Total fuelwood	291	12.0	397	16.4
Agriculture waste, etc.	45	1.9	61	2.6
Grand Total	336	13.9	458	19.0

[1] 1 bhari = 22 kg, as in Parajuli *et.al.* (1981)

[2] 1 bhari = 30 kg.

[3] 1 kg air-dry wood yields 15 MJ.

a value subsequently confirmed by staff of the Nepal Australia Forestry Project who weighed 19 bharis of split, air-dry wood being carried into Kathmandu Valley for sale. The mean weight was 22.1 kg (D.M. Griffin, pers.comm. 1981a). Nonetheless, bharis for sale in the regulated Kathmandu market and bharis for home consumption in the country may well vary and the author's own studies reveal a mean value of 30 kg in the Thokarpa area (section 5.2). The resultant recalculated consumption values for the New Era survey are also given in Table 4.6. (Note, however, that Donovan (1981) records weights of bharis from 20.4 to 40 kg and herself assumed the weight of 1 bhari to be 1 maund (a measure used in the Terai), equal by her statement to 37.3 kg.)

An even more serious source of confusion, however, lies in the assumption that all fuel biomass is wood or a tree product. In fact, as mentioned by Donovan (1981) and the New Era report and investigated in more detail by Bajracharya (1983) and Metz-Fox (1983), not all fuel is tree or forest product although in many surveys all are subsumed as 'fuelwood'. Bajracharya's analysis divides 'fuelwood' into three main components: 'jhikra' (material gathered from the immediate homestead area, and consisting of agricultural residues and waste wood from fences, buildings, etc.); 'tree-fell daura' (wood obtained from felled trees); and 'gathered daura' (lopped branches and gathered dead wood). Both types of daura can be obtained from private trees and public forest areas. Such an analysis still fails to account for non-tree fuel components from the forest and other wooded areas and casual observation suggest that these are not inconsiderable. In Bajracharya's study they are presumably included in gathered daura. These matters are considered further in section 5.3.

Given such great uncertainties concerning wood consumption data and the scarcely less uncertain values for fuelwood production in shrubberies and average forests, it is not surprising that authors differ in their conclusions as to the adequacy of the forest resource in the Middle Hills to meet either demand or actual consumption. Levenson (1979), Bajracharya (1983), and Wiart (1983) all concluded that total sustainable fuelwood supply in their study areas exceeded total consumption but acknowledged that the distribution of the forest resource was very uneven, causing areas of local fuelwood shortage. Metz-Fox (1983), reporting a study on another Middle Hills village, concluded that 'available firewood supplies are being burnt faster than they are grown' but noted that the wood cut on public lands, i.e. government owned forests, did not exceed increment. It was on private land that more wood was being cut than grown. In none of these studies, however, has there been an adequate analysis of the effects of lopping for fodder on the increment of wood for fuel, although Levenson (1979) clearly realized the importance of the issue.

Neville (1983) concluded that the forest resource in the whole of Sindhu Palchok and Kabhre districts was unlikely to be able to balance consumption without considerable augmentation by the establishment of new forests. Certainly the data on existing forests in the districts obtained by Forestry Services (1983) for the Nepal Australia Forestry Project make it inconceivable that many panchayats are not fuel deficit areas. Timber volumes (of trees with dbh > 5 cm) on land carrying trees are 150 and 107 m^3/ha for Sindhu Palchok and Kabhre respectively but if forest is, as usual in Nepal taken to include shrubland as well the volumes fall to 86 and 48 m^3/ha. Of Sindhu Palchok's 79 panchayats, 6 have less than 200 ha of forest (including shrubland) and a further 21 have less than 500 ha. The corresponding figures for Kabhre's 96 panchayats are 21 and 35 (Forestry Services, 1982). Given the population data for the two Districts (section 2.2.3) areas of 200 and 500 ha yield averages of c. 0.065 and 0.16 ha per person respectively. Even if much wood comes from private trees, no likely growth rates will match production to consumption of fuelwood in panchayats with less than 200 ha of forest and those with 500 ha are likely to have at best a precarious balance. Levenson (1979) concluded from his study area that 0.106 ha/person was required. Although some further aspects are considered in section 5.3 in the light of the author's own field work, it will not be profitable to attempt to consider further, and in detail, the balance of supply and demand until far more precise information is available on growth rates under heavily lopped conditions and on rates of dead wood generation.

The question then arises as to what extent the past usage of wood as a household fuel has contributed to the present state of deforestation in districts such as Sindhu Palchok and Kabhre. In the light of the foregoing discussion, it is impossible to substantiate any conclusion with certain data but it seems unlikely that fuelwood gathering has been singularly significant: rather it is one of many factors. If fuelwood supply and demand are now precariously balanced in many areas, it is difficult to imagine that fuelwood demand one or two hundred years ago by the much smaller populations then existing (section 2.2.1 and 3.1.2) could have seriously contributed to the extensive deforestation already existent then. In more recent times, however, fuelwood gathering is certainly a factor in forest degradation, particularly near villages (see also section 5.3).

4.4.2 Fodder, grazing and browsing

Reference to a number of dictionaries reveals no consistent difference, and certainly none applicable to Nepal, between the definitions of forage and fodder. The latter term, which would appear to be in more common usage in the relevant literature, will be used to denote plant material, fresh or dry, which is consumed by livestock as food (Plates 22, 23, 24).

Further, although the term fodder was earlier largely used in connection with stall-fed animals, and hence referred to material gathered by man, this is no longer the case and fodder is taken to include material grazed, browsed and gathered.

Wyatt-Smith (1982) has summarised a considerable literature relating to fodder availability and consumption through the various seasons of the year in Nepal. On data derived from the Phewa Tal and Tinau watersheds, he has estimated that 3.5 ha of accessible unmanaged forest land are required to provide a necessary source of the total fodder for the livestock owned by each family. The derivation of this value involves the following assumptions, validated by data from the Phewa Tal area: (a) accessible unmanaged forest produces full rations per hectare for no more than two large animals for one month; (b) each household owns five large animals or their equivalents; (c) on average throughout the year animals obtain only half the desirable rations for optimal productivity; (d) gravimetrically, tree fodder and herbage are of equivalent value; (e) one quarter of total fodder is derived from the forest; and (f) all values remain constant with time.

Alternatively, Wyatt-Smith has suggested that 2.8 ha of accessible unmanaged forest are required for 1 ha of agricultural land if the existing farming system is to be sustained. In the Tinau and Phewa Tal watersheds this ratio is in fact only 0.97, even when forest land is taken to include forest, shrubberies and grasslands, i.e. all uncultivated, vegetated land not in private ownership.

In Sindhu Palchok only 12 out of 79 panchayats have a ratio as great as 2.8, and only a further 19 exceed unity. The corresponding values for Kabhre are 13 and 21 (calculated from Forest Services, 1982). The values for Sindhu Palchok and Kabhre as districts are 1.69 and 0.52 respectively. From Wyatt-Smith's (1982) data it can be further calculated that each person requires c. 1.65 ha of accessible, unmanaged forest if the existing farming system is to be sustained. If the average panchayat in Sindhu Palchok and Kabhre contained 3211 persons in 1981, then that panchayat required c. 5300 ha of forest, shrubbery and grassland for equilibrium to exist. Only six such panchayats exist, all in northern Sindhu Palchok, and only 34 have greater than one-quarter of that area, out of a total of 175 (Forestry Services, 1982).

The foregoing has considered fodder but there is another significant use of plant biomass as bedding for stall-fed animals which is presently neglected. Khadka *et al.* (1983) have estimated that 50% of the litter production (dry leaves, etc.) is removed annually from some forests, thereby interrupting seriously the cycling of nutrients within the forest. The author has also obtained some data on this topic (section 5.4).

Apart from direct consumption of biomass, the depredations of browsing animals are felt mainly in poor or absent vegetation regeneration and in the further degeneration of shrubberies, themselves created by excessive lopping of forests. Quantification is not possible but casual observation suggests that the effects of uncontrolled browsing by goats are serious. Goats, however, remain important and suitable components of livestock held by subsistence farmers and in many cases are only compounding a degradation started by man. More effective control to exclude goats from critical areas of regeneration would go far to solving this particular problem.

Compared to browsing, grazing is seen as being of little significance to the forest itself unless tree seedlings are grazed along with grass and other herbs. Excessive grazing does, however, lead to degeneration of grasslands and herb fields and so to erosion.

The impact of the provision of animal fodder on the forest is almost inseparable from that of fire, the subject of the next section. Clearly, however, as Wyatt-Smith (1982) affirms for the Pahad in general, the forests in nearly all panchayats of Sindhu Palchok and Kabhre are being grossly overexploited for fodder and it is interesting to speculate how long this may have been the case. Human population increase resulting in a greater total number of animals (even if number per household has declined as stated by a number of people in conversation) and multiple-cropping resulting in a reduction of grazing on and around terraces will both have exacerbated the situation in recent decades. It is, however, difficult to believe that fodder from the forest or from all trees and shrubs has been adequate (on a sustained yield basis) for well over a century. Near Narayansthan a small religious forest still stands as the sole remnant of the forests that must once have covered the whole ridge, indeed the whole of north-eastern Kabhre, and it is difficult to believe that the degeneration to poor grassland could have occurred in less than a century. Certainly not even the oldest inhabitant has memory of forests on these degraded lands.

4.4.3 Fire

In a subsistence farming community, fire is used as a simple, effective and hence popular method of modifying the environment. The principle reasons for man-induced forest fires are:

(a) Forest has traditionally been cut and burnt to clear the area for agricultural extension or to create new pastures. (b) In the existing pastures and grazing areas burning has been practised to induce new growth of grasses and herbaceous material for grazing animals. This type of burning is usually not controlled and so once started is very harmful and even devastating when it spreads to forests particularly susceptible to burning. (c) Forest may be burnt by hunters and poachers to drive animals into traps. It is found very effective in the inaccessible areas of the hills but this technique has also worked very well for the hunters in more accessible areas of the Terai plains. (d) Accidental fires may be started by herdsmen, lumbermen, fuelwood and fodder collectors, travellers and tourists from their campfires or cigarette butts. (e) Some people start fires for amusement.

In the two districts all these reasons for forest fires, in addition to lightning strikes, exist and in the past fires were a common sight during the dry season. Fortunately, their incidence is much reduced in Sindhu Palchok and Kabhre since the initiation of community forestry, especially in panchayats working with the Nepal-Australia Forestry Project. Vast areas have, however, been reduced from forest to scrub or poor grassland by past fires and are maintained in this condition by fire and excessive browsing.

In the high level conifer forests of Nepal, where the important species are fire tender, fires are very destructive. *Abies spectabilis* forms a distinctive and very attractive forest type throughout the Chautara division between the elevations of

3000–3500 m. Fire occurs at long intervals in the fir forests but when it does it has far reaching effects (Stainton, 1972). A recent inventory of forest resources of Marming-Kalinchok forest in the north-east of Sindhu Palchok showed that a large area of this fir forest was severely burnt, nearly all the trees in the burnt area were dead and practically no regeneration was seen. An area of 1400 ha out of a total of 5253 ha of fir forest was thus burnt, damaged and without any regeneration (Grünenfelder, 1980b, pers. comm.). Similar extensive areas of fire-killed fir exist on Chyo Chyo Lekh, Bhairabkund Lekh and Yangri Lekh.

In the regeneration of conifer areas damaged by fire, *Pinus wallichiana* is favoured over other species. Though not a fire hardy species, its profuse seeding habit and ability to withstand more exposure helps it to become an early and widespread colonizer of vacant sites, such as burnt areas, abandoned fields and grazing grounds. The young and rather pure stands of *P. wallichiana* in the Tistung and Daman areas on the Tribhuwan Rajpath to the west of Kabhre owe their origin to these same factors.

Fire has caused considerable damage to *Tsuga dumosa* forests even in the mature stage in Sindhu Palchok. Fairly extensive and pure stands on the ridges and drier parts, however, suggest this species' considerable fire hardiness compared to most other high altitude conifers.

Incidence of fire is common in the juniper forest also. These forests in the upper catchments of the Indrawati, Balephi and other rivers are extensively destroyed by fire due both to the particular susceptibility of juniper forests to burning and its increased vulnerability after the small trees have been girdled and killed to dry by the local people. Dried branches are used as incense every day and on special occasions in offerings in this upland Buddhist country. This wood, ground and powdered, is also exported from this area to Kathmandu for incense and in earlier days was also exported to Tibet.

Sometimes, when a montane conifer forest is burnt, dense bamboo thickets of *Arundinaria* spp. arise. However, the bamboos also get eliminated by repeated burning, cutting and overgrazing. Burning after flowering, especially, kills the bamboo brakes.

The lower level conifer forests of Chir pine are burnt at frequent intervals, often annually, and excessive burning of this most gregarious conifer has greatly limited its distribution. Its ability, however, to recolonize quickly vacant sites created by fire or abandoned cultivation as well as to perist in harsh, dry and exposed sites have helped greatly in its survival.

In the high level forests of *Quercus semecarpifolia* the damage by fire along with that from heavy lopping and felling is very severe. The trees are often stunted in growth and the composition of the crop is very poor. The Mahabharat Lekh and the upper catchments of the Melamchi, Indrawati, Balephi, Bhote Kosi and Sun Kosi rivers present innumerable examples of *Q. semecarpifolia* damaged by fire. At higher altitudes, within the districts and elsewhere in the hills of Nepal such areas as were burned, cleared and abandoned during the course of shifting cultivation in the past are often seen fringed with dense coppice of *Quercus semecarpifolia*. In certain cases such abandoned areas may also revert to a forest, generally of a much modified and degraded type, through seedling establishment or vegetative regrowth from coppice.

Lower level oak forests (*Quercus incana, Q. lanuginosa*) and *Schima-Castanopsis* forests, being in the area of maximum population pressure, have been heavily subjected to lopping for fodder, and have traditionally been burnt annually to stimulate new growth of shrubs and grasses. The species surviving are those which coppice easily or which regenerate abundantly from seed, but the form of the forest is very poor and it degenerates progressively to shrubland and eventually grassland with scattered species, as shrubs, from the original forest.

The hill forest of *Shorea robusta* also occurs in the densely populated zone and has suffered greatly from fire, lopping and felling. Fire has always caused the loss of a great amount of sal regeneration because the seedlings are very sensitive to burning. One or two year old seedlings are most vulnerable to fire and are usually killed, whereas older ones may survive but receive wounds that permit subsequent decay. Limited burning, however, especially before seedfall, is a good preparation for regeneration by clearing the seedbed.

Thus in the Middle Hills, the lower ridges and slopes and the valley bottoms that could hold large tracts of sal and its associate forests, are devoid of any such vegetation even though sal is relatively tolerant of fire. Any patchy forest or scattered trees that may exist as a result of chance regeneration from seeds or vegetative regrowth from coppice shoots or surviving stumps and branches are of stunted growth, malformed and degraded types.

The combined effects of fodder use and fire have probably led to the destruction of most of the forests that survived clearing for agriculture, the southern drier aspects being most affected. No other explanation can be suggested for the existence of the vast areas of grassland or poor shrubberies now present, all designated as forests in many surveys because they are lands of the Department of Forests. Very extensive areas in northern and eastern Kabhre are particularly conspicuous in this regard, extending from the Chaubas ridge in the north to the northern slopes of the Mahabharat Lekh to the south and thus including the Sun Kosi slopes, the Narayansthan ridge and much of the steeper land in the Rosi catchment below 1500 m. Chaubas panchayat is an extreme example, data for which are given in section 5.1.1.

4.4.4 Implements and construction

As with so many topics relating to forest use in Nepal, the data concerning consumption of timber for the manufacture of farm and household implements and the construction and maintenance of houses is of uncertain accuracy. Wiart (1983) has, for instance, considered the timber used in the making of ploughs. In the village he studied, 190 ploughs were made in a year for which 228 trees with a wood weight of 143.8 tonne were felled. Only 1.6 tonne of this (1%) was actually to be found in the weight of finished ploughs, 39.29 tonne of waste wood was burnt as fuel but 103 tonne was abandoned in the forest. Clearly plough manufacture is a very wasteful process, utilizing valuable trees of c. 80 years of age of *Quercus* spp. and *Schima wallichii*. In such a system, percentage net utilization rates are likely to vary significantly and to be significantly improved by design alterations, such as in the two-piece rather than one-piece plough. Estimates of the duration of use of a plough vary greatly from a minimum of 3 months to a maximum of 3 years: Wiart (1983) adopted 18 months. Plough life in India is taken to be 3 years but these ploughs appear to be sturdier, with a timber content of 0.056 m^3 (Banerjee, 1979) compared to 0.019 m^3 for those of Wiart.

Wiart (1983) also measured the timber used in house construction and maintenance. Net rates were 0.027 and 0.05 m^3/person/annum, respectively (29% and 13% of gross rates). Other estimates of net rates are 0.05m^3/person/year from Sindhu Palchok and Kabhre (New Era, 1980) and 0.1 m^3/person/year for elsewhere in the Pahad (Wyatt-Smith, 1982) for total construction and maintenance timber. Indian usage for house construction alone is much less - 0.018 m^3 (Banerjee, 1979).

Whilst these net rates of consumption per person are small, the aggregate gross rates for a panchayat are of the order of 1200 m^3 per annum (allowing c. 20% conversion efficiency (Wiart, 1983)), an amount not easily found in the poor forests currently existing.

Utilization for impliments and construction is considered further in section 5.5.

A particularly damaging use of the forest is in the provision of roofing shingles by many communities in northern Sindhu Palchok and the Mahabharat Lekh region of Kabhre. This practice is limited to those living within reasonably good access to montane forests as only *Abies spectabilis* and *Tsuga dumosa* are used. Large trees are felled, usually at shoulder height, and split with an axe. The process is an extremely wasteful one and the forest floor becomes littered with chips and unused baulks. Trees found to have appreciable spiral grain are not used and are left to rot. In nearby Langtang where the process seems also to be extremely wasteful, on an average 5 trees are felled for every one which is found suitable; a tree yielding only about 200 shingles. Here a typical house contains 1200-1500 shingles and the life of a shingle in the area is 3-4 years (Dudley, quoted in Bolton, 1976). Generally speaking, according to Wyatt-Smith (1982), two trees are required to provide shingles for a single house which are replaced every 5 years.

4.5 THE ROLE OF *EUPATORIUM ADENOPHORUM*

The Mexican perennial weed *Eupatorium adenophorum* has now become pan-tropical in distribution and presents problems through competition, reduction of carrying capacity and loss of productivity in agriculture and forestry. An extensive literature has developed on this, and related species, both in the Indian sub-continent, e.g. Ramakrishnan and Mishra (1981), Tripathi and Yadav (1982), Yadav and

Tripathi (1982), and elsewhere (Auld and Martin, 1975; Falvey and Hengmichai, 1979). These studies reveal the species to produce abundant widespread seeds (c. 40,000 per m^2) of which more than 50% survive in soil for at least 2 years. The seeds require light for germination but seedlings tolerate shading to 10% of daylight. The species competes well against other plants, particularly on over-grazed, nutrient-poor sites. On slash and burn sites, survival is low after 6 years so that cycles of less than this duration maintain the site in a favourable state for the species.

In Thailand, *E. adenophorum* invades even grasslands of *Imperata cylindrica*, the intensity of invasion depending on the years a site had previously sustained grazing. In many places, including Nepal, the species is extensively parasitized by the gall-forming tephritial fly *Procecidochares utilis* which may act as an agent of biological control (Kapoor and Malla, 1978).

E. adenophorum was first reported in the scientific literature as being present in Nepal in 1958 (Banerjee, quoted in Kapoor and Malla (1978)) but according to local tradition in Sindhu Palchok and Kabhre it first appeared there in 1950-1951, coincident with a plague of locusts. As this also coincided with the influx of Nepali Congress Party groups into these hill areas from Kathmandu and other Terai towns, this species was called the Congressi Jhar (congress weed) and older sections of the population in the area still know it by that name (I. 4,16,21,23,35). More generally, however, its Nepali name is banmara, forest killer, a name which dramatically depicts the local view of the species.

In the two districts this weed is generally most abundant between 1000-2000 m in areas subjected to deforestation by fire, excessive grazing, lopping and clearing. It prefers moister sites and grows well in shady depressions without much overhead tree cover. In many areas the weed completely dominates any forest regeneration and also renders the area very vulnerable to fire when it dries out during spring and early summer. In many interviews, the presence of the week was given as an important factor in forest degeneration but research would be required to determine adequately its effects. The farmers from tree-scarce hill areas have been forced to supplement scarce fuelwood, roofing material and compost manure supplies with banmara. Its gregarious growth and easy establishment have also been put to some use for roadside slopes stabilization on the new Lamasangu-Jiri road by forest engineer Thomas Grünenfelder. The author himself used it for making shelters for nursery beds for many years and this practice continues usefully.

4.6 SUMMARY

A number of important points have arisen in this discussion. of the forests of Sindu Palchok and Kabhre Districts. As they have a bearing on the final discussions in Chapter 6 they are summarised here for easy reference.

1. Enormous variation in elevation, slope, aspect, climate and soil has resulted in a very complex mosaic of forest types in the Pahad.

2. Most of the forest types occurring from the valley bottoms to the limits of cultivation at around 2400-2600 m have been modified due to use and abuse and some types have been almost eliminated.

3. It is very difficult to obtain accurate statistics on land use, and especially for the forested land, because of inadequate survey and assessment and conflicting definitions of forest type.

4. Impacts on land discussed in Chapter 3 are seen to have been especially severe within Sindu Palchok and Kabhre Districts due to proximity to Kathmandu. Thus, development of arable land was intense but exploitation through the various forms of rakam or compulsory labour are seen as being particularly destructive in parts of these two Districts.

5. Many common agricultural pursuits and cottage industries are quite damaging to the forest, often due to the need for fuelwood.

6. Some extensive areas of forest were allocated to religious organisations as land endowments called guthis. These, together with birta and jagir grants have often been held very tenaciously by the original grantees in spite of recent legislation overruling such grants as a means to obtain more equitable use of the forests.

7. The collection of fuelwood within Sindu Palchok and Kabhre represents a serious drain on forest resources but fuelwood use of about 350 to 450 kg per person per year is one of the lowest recorded in Nepal, and probably in the world. Fuelwood use will exceed forest production unless considerable efforts are made to establish new forests.

8. Fodder use from the forest is considerable, requiring about 2.8 ha of accessible unmanaged forest for every 1 ha of agricultural land. Sindu Palchok and Kabhre Districts do not have forest areas sufficient to satisfy this ratio and, due to the inequitable distribution of the remaining forests, many panchayats have quite inadequate forest areas for local needs.

9. Fire has been an agent of forest destruction in the past but the incidence of deliberate and accidental fire has declined in recent years, often as a result of community forestry initiatives.

10. Banmara (*Eupatorium adenophorum*), translated as 'forest killer', is a serious weed which threatens the welfare of forest areas and may prove a major problem in the establishment, protection and maintenance of panchayat forests.

CHAPTER 5

THE THOKARPA FORESTS

5.1 INTRODUCTION

5.1.1 The Thokarpa region

The special study area consists of ten village panchayats on the eastern slopes of the Sun Kosi straddling the Sindhu Palchok-Kabhre boundary (Fig. 5.1). The river here lies at about 680 m elevation and the highest point is at Devisthan (2360 m). The village and the panchayat of Thokarpa have been most influential in recent developments in Nepalese forestry and the forests of the ten panchayats have been called the Thokarpa forests as a form of shorthand. In fact, many of the forests discussed lie in the other nine panchayats. (Thokarpa panchayat was divided into Thokarpa and Kalika panchayats in 1982. Some data are available only for the original undivided panchayat.)

The impact of man has been strongly felt as this is one of the most heavily populated parts of the Pahad. Important data are given in Tables 5.1 and 5.2. Although 58% of land area is said to be forest, 66% of this is in fact shrubland and at least 5% is unsuited for harvesting and so was classified as protection forest by the Forestry Services group. The volumes of wood per hectare, where volume measurements follow the traditional methodology, considering only stemwood of trees with diameter at breast height of 5 cm or larger and neglecting all smaller wood in the crown, are extraordinarily small. Chaubas panchayat is an extreme example, having 1369 ha of forest entirely as shrubland bearing no timber.

Fig. 5.1 The Thokarpa region

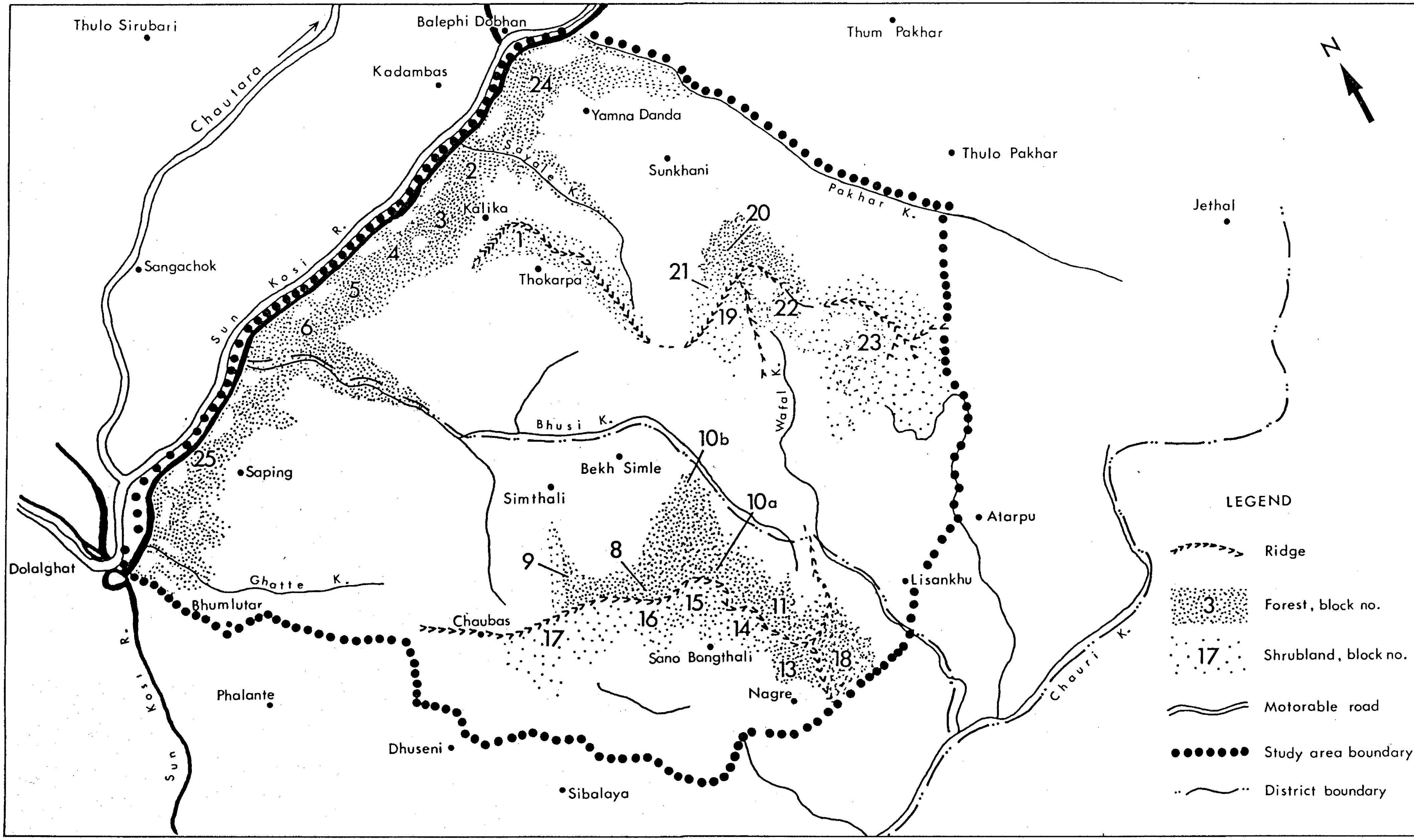


Table 5.1 Landuse data of the Thokarpa region. Population data for 1971 from HMG Nepal (1975). Other data derived from Forestry Services (1982).

Panchayat	Population	Total area		Agricultural land			Forest land			Forest: Agri-culture area ratio	Forest area per person ha
		ha	Persons per ha	ha	% total	Person per ha	ha	% total	Persons per ha		
Sindhu Palchok:											
1. Thokarpa	3877	1306	1.15	893	68	2.64	413	32	2.03	0.46	0.49
2. Kalika		2070		575	28		1493	72		2.60	
3. Lisankhu	4271	1794	2.38	706	39	6.05	1088	61	3.93	1.54	0.25
4. Sunkhani	1934	1462	1.32	893	61	2.17	569	39	3.40	0.64	0.29
5. Yamna Danda	1736	644	2.69	344	53	5.05	300	47	5.79	0.87	0.17
Kabhre:											
6. Bekh Simle	2005	400	5.03	169	42	11.86	231	58	8.68	1.37	0.12
7. Chaubas	1992	2125	0.94	756	36	2.63	1369	64	1.46	1.81	0.69
8. Sano Bangthali	1792	1381	1.30	269	20	6.66	1112	80	1.61	4.13	0.62
9. Saping Bhumlu	3187	1656	1.92	681	41	4.68	887	54	3.59	1.30	0.28
10. Simthali Danda-kharka	1389	775	1.79	275	35	5.05	500	65	2.78	1.82	0.36
Total	22183	13613	1.63	5561	41	4.0	7964	58	2.79	1.43	0.36

Table 5.2: Characteristics of the forests in the special study area. Data derived from those in Forestry Services (1982).

Village panchayats	Hardwoods			Conifers		Shrubs	Total		
	Area	Volume		Area	Volume	Area	Area	Volume	
	ha	m^3x1000	m^3/ha	ha	m^3x1000	ha	ha	m^3x1000	m^3/ha
Sindhu Palchok:									
1. Thokarpa	119	3.2	26.89	0	0	294	413	3.2	7.75
2. Kalika	587	9.1	15.50	0	0	907	1494	9.1	6.09
3. Lisankhu	244	19.6	80.33	44	1.4	800	1088	21.0	19.30
4. Sunkhani	88	1.5	17.05	0	0	481	569	1.5	2.64
5. Yamna Danda	287	5.9	20.56	0	0	13	300	5.9	19.67
Kabhre:									
6. Bekh Simle	69	2.3	33.33	0	0	81	231	2.3	9.96
7. Chaubas	0	0	0	0	0	1369	1369	0	0
8. Sano Bangthali	119	3.9	32.77	0	0	993	1112	3.9	0
9. Saping Bhumlu	600	16.0	26.67	0	0	287	887	16.0	18.04
10. Simthali Danda-kharka	175	5.7	32.57	0	0	19	500	5.7	11.40
Total	2288	67.2	29.37	44	1.4	5244	7963	68.6	8.61
% of total	29	98	-	0.6	2	66	100	100	-

The timber volumes for the Thokarpa region average 29.37 m^3/ha for hardwood forests (Sindhu Palchok and Kabhre mean is 136 m^3/ha), far lower than that of 101.84 m^3/ha recorded by Bajracharya (1983) for Pangma panchayat in the Eastern Hills region (even two areas considered to be in wood-deficit had over 75 m^3/ha), and of 71 m^3 for the Hill Sal forest studied by Metz-Fox (1983) at Bhogteni, north of Gorkha. Only some forests forming the very degraded group at Salme, 45 km north-west of Kathmandu, had volumes as low as the mean for these Thokarpa forests (Wiart, 1983). If the forest area is taken to include shrubland, as is conventional in Nepal, the mean volume of wood for the ten panchayats is only 8.61 m^3/ha (Sindhu Palchok and Kabhre mean is 72 m^3/ha), comparable to 7 m^3/ha for the heavily used communal areas at Bhogteni.

In Thokarpa panchayat over 200 ha of shrubland have been planted, mainly with pines, since 1975 and a similar area has been planted in Chaubas panchayat since 1979, both with the support of the Nepal Australia Forestry Project. These new forests in Thokarpa in particular are associated with changes in utilization patterns noted in subsequent sections.

5.1.2 Field work

The field work undertaken by the author fell into two parts. In the first, 50 individual residents and five groups were interviewed to gain information from them. A few more individuals were interviewed outside the structure of the survey. In the second, the author examined the forest areas remaining in the ten panchayats and to which the interviews related.

Interviews

The main purpose of the interviews was to gain information on the history of the Thokarpa forests and so the selection of those to be interviewed was deliberately and strongly biased towards the elderly. Most interviewees were males and heads of households although in many a case the wife also joined her husband during the interview (I. 8,10,11,17,23,27). In many cases other members of the household, often sons and sometimes daughters, also joined their parents during the interview (I. 1,3,5,7,20,21,26,34). The group interviewees represented various sections of the local society including ordinary farmers, ex-talukdars, panchayat and class organisation representatives at various levels of hierarchy, forestry committee members, and forest conservation and development workers. The interview was conducted informally and discursively in Nepali, in order to obtain answers to the questions set out in the prepared schedule (see Appendix III). Thus the questions were usually not put directly but an issue was discussed, perhaps more than once until an answer became clear, in a way consistent with normal Nepalese conversational practice. Most interviews lasted for c. 2 hours or more. A summary of the main attributes of those interviewed individually is given in Table 5.3. A list of those interviewed is given in Appendix IV. (See Plates 4-8 for I.14, 13, 17, 19 &21 respectively.)

5.2 THE THOKARPA FORESTS AS SEEN BY INFORMANTS

The responses of the informants to questions relating to changes in land use patterns and forests during their lifetime are summarized in Table 5.4. It is clear that there is no evidence of

Table 5.3: Main attributes of persons interviewed.

Questionnaire schedule number															
1	Age	30-39	40-49	50-59	60-69	70-79	80-89								
	No	2	4	8	13	11	12	Mean - 66.7							
2	Sex	Male - 48; Female - 2													
3	Ethnic/caste group	Brahmin	Chhetri	Tamang	Magar	Pahari									
	No	21	21	6	1	1									
4	District	Sindhu Palchok - 38; Kabhre - 12													
5	Panchayat (see Table 5.1 for number code	1	2	3	4	5	6	7	8	9	10				
	No	28	7	2	1	0	3	5	1	0	3				
8,9	Place of residence	Born in present house - 41; born elsewhere - 9; always lived in panchayat - 48; lived elsewhere - 2													
11	Family size	1	2	3	4	5	6	7	8	9	10	11	12	>12	Mean
	No	2	0	2	1	4	10	7	8	3	4	1	5	3	7.82
13	Private land holding (area in ropanis - 1 ropani=0.05 ha)	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	>100	NA*	Mean holding	
	No	4	8	9	7	4	6	1	0	2	1	4	4	44.4	
15	Amount of crops produced used by grower%	30	50	70	95	100	NA								
	No	1	2	2	1	42	2	Mean - 95%							
16	Livestock unit held	<5	5-10	11-20	21-30	NA									
	No	5	22	19	2	2	Mean - 10.5								
17	Economic status	Rich	Average	Poor											
	No	6	33	11											
18	Food sufficiency %	25	35	50	65	85	100	>100	NA						
	No	3	3	3	4	2	27	7	1						

*NA - not available

Table 5.4: Response by those interviewed to questions of landuse and changes to the forest.

QUESTION	YES	NO	DON'T KNOW
LAND USE CHANGES			
1. Has land-use pattern changed.	0	49	1
2. Has agricultural land increased.	0	48	1
3. Has much forest been cleared for agriculture or terracing.	0	44	0
4. Has agricultural land reverted to forest.	0	36	0
5. Did your parents talk of changes in land pattern occurring in their lifetime.	0	18	13
6. Since your childhood, has population of your village:			
(a) doubled	4	-	-
(b) more than trebled	2	-	-
(c) increased but uncertain of amount	9	-	-
(d) remained the same	0	-	-
7. In the light of population increase, has the forest area declined noticeably	2	33	0
8. Were abandoned terraces abandoned:			
(a) before your lifetime	16	0	0
(b) less than 100 years ago	2	-	7
(c) more than 100 years ago	5	-	-
(d) before the Gurkhalis started ruling from Kathmandu >200 years before	3	-	-
9. Has the small increase in cultivated land area occurring in your lifetime originated from:			
(a) reclamation of abandoned terraces	1	-	-
(b) marginal grazing areas and fringe forest	36	-	-
(c) forest	0	-	1
CHANGES TO THE FOREST			
10. Is area of forest:			
(a) similar to when you were young	47	1	1
(b) decreased	2	44	0
(c) increased near where you live	27	18	0
(d) increased in the general Thokarpa region	0	48	0

Table 5.4 continued

QUESTION	YES	NO	DON'T KNOW
11. Have forests thinned out and their quality declined	47	1	0
If you answered YES to previous question, do you base this on difficulty in obtaining:			
(a) fuelwood, fodder, etc.	46	-	-
(b) good trees for timber	44	-	-
12. Forest degeneration has been caused by:			
(a) commercial export to Kathmandu	7	-	-
(b) removal of best trees by influential outsiders	8	-	-
(c) decline of local control and authority	15	-	-
(d) Government interference in management	4	-	-
(e) Government policies encouraged deforestation and discouraged conservation	6	-	-
(f) excessive use by local people for subsistence needs	17	-	-
(g) forest fires	7	-	3
(h) population growth	15	-	-
(i) arbitrary land ownership boundaries	5	-	-
13. Did maximum damage to the forest occur between 1951 and 1963	17	-	-
14. Did effective forest conservation commence about 8 or 10 years ago (1972-1974) with the commencement of community forestry programs	23	-	-

significant changes in areas of agricultural land and forest this century despite large population increases. The little new cultivated land has come from grazing areas and fringe forest adjacent to existing holdings. Equally well demonstrated, however, is that forests have degenerated in quality and that fuelwood, fodder and timber are all in short supply. Although informants realized that local subsistence needs were causing much of this degeneration they also singled out the period 1951 to 1963 as a time of rapid decline. This coincides with a partial breakdown in general government administration (sections 2.3.4, 3.4 and 5.7). The initiation of local community forestry activities in mid-1970's is seen as a turning point, both in attitudes and increase in forest area.

Other results of the survey, not included in Table 5.4, will now be summarized. Informants gained fuelwood and fodder from forest, shrublands and private land. Many considered that forests also control erosion (14), improve water supplies (10), and conserve moisture (15). Fewer (less than 10) perceived the forest as conferring a wide range of other benefits. Most (36/45) considered that forests used by them were inadequate to supply their needs and 43/44 considered that new forest should be created by planting and protection. To participate themselves in such activities, most thought technical guidance and training, supplies of materials and labour wages were essential. Most (41/50) had already participated in such activities. Only 2 thought community grazing and miscellaneous purpose (sandi-sarpan) lands should also be planted, but there was majority support for planting on private land (41), state-owned grazing land (24) and poorly forested areas (39). When their grazing lands were planted with trees 22 substituted stall-feeding for grazing and a further 13 did so partly; 19 hoped that grazing in forests would again be possible as trees became older.

On questions relating to the distribution of forest products from community forestry activities, it was considered that the annual yield of grass and herbaceous fodder, dead wood and leaf litter should be available free of charge but with access limited to prescribed periods for supervised harvesting. Prunings should be sold to local people at a price that met the cost of labour involved but the sale of poles from thinnings should be at a rate that gave some return to the panchayat, although less than the government royalty rates. There was a wide range of opinion on how the benefits of final yield should be distributed should a forest area be largely felled. The ranking of forestry activities amongst the many development activities is shown by Table 5.5. It can be seen that forestry ranks high along with irrigation but both are clearly of less importance than the provision of drinking water.

5.3 FUEL SUPPLY AND CONSUMPTION (Plate 21)

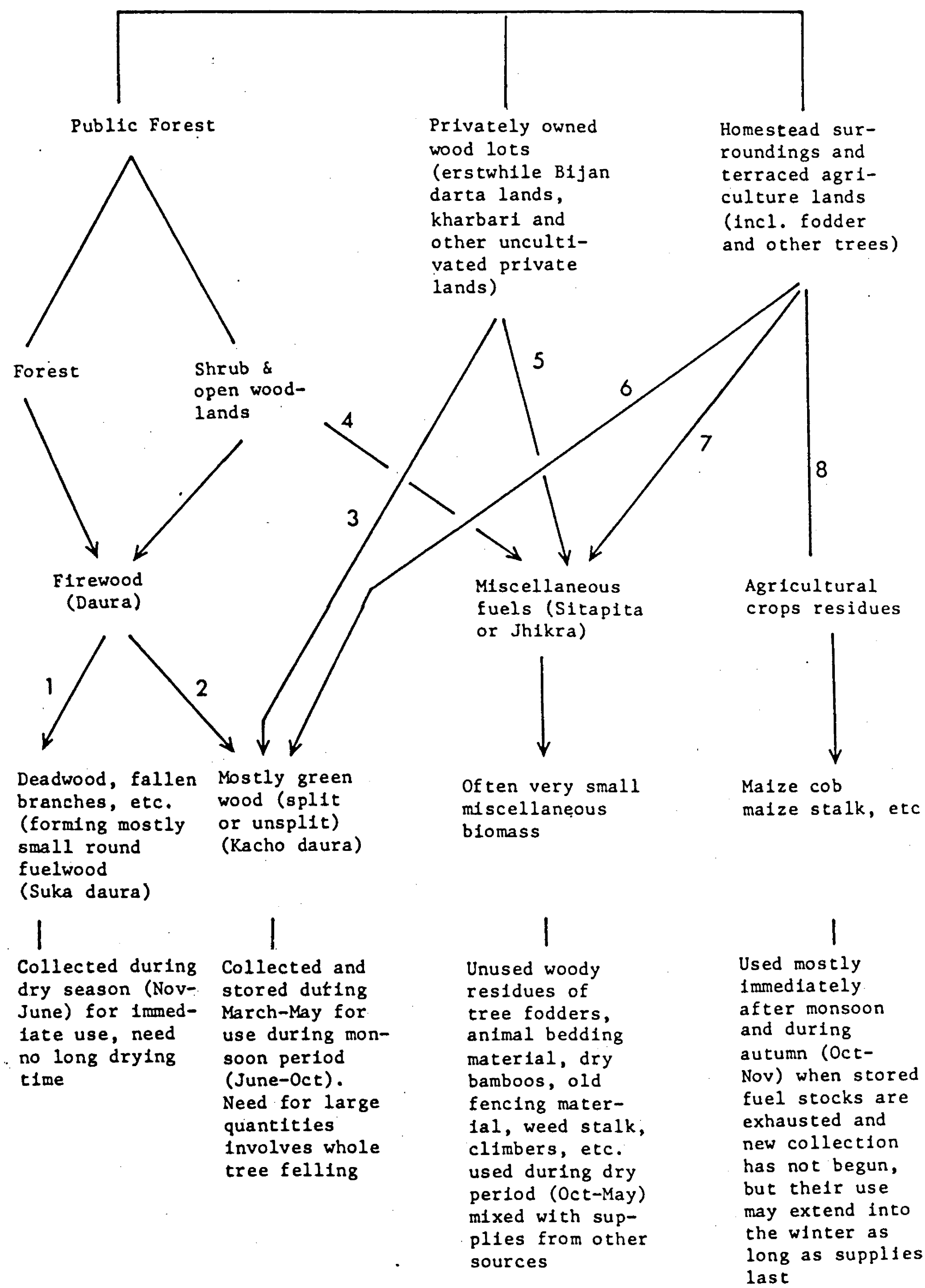
In the study area, as elsewhere in the Middle Hills region of Nepal, biomass forms the entire fuel supply and is obtained from the forest, shrublands, agricultural and other private lands.

A classification of fuels according to local usage is given in Fig. 5.2. This classification is similar to that of Bajracharya (1983) but separates agricultural residues from jhikra.

Table 5.5: Order of priority of development activities as seen by informants

Development activities	Order of priority						Total
	I	II	III	IV	V	lower	
Roads	-	-	-	2	-	2	4
Education	4	2	2	2	1	-	11
Electricity	1	-	6	-	-	2	9
Forest	4	3	5	5	-	-	17
Drinking water	29	2	2	-	-	1	34
Irrigation	2	7	3	1	1	2	16
Agriculture inputs	-	2	1	3	2	-	8
Horticulture	-	2	-	-	-	-	2
Public health	-	3	-	1	-	-	4
Livestock	-	-	-	2	2	1	5
Tourism	-	-	-	-	-	1	1
Credit facilities	-	-	-	-	1	-	1
Drinking water ponds for livestock	-	-	1	-	-	-	1
Cottage industries	-	-	-	1	-	2	3

Fig. 5.2: A classification of fuel supplies.



Numbers indicate categories in Table 5.6

Dry stalks of *Eupatorium adenophorum* and other forest weeds are included in jhikra.

Table 5.6 summarises the data gathered by the author on fuel origin and consumption and is based on informants' memories of bharis consumed annually by a household. Fuel is generally scarce and instances occur of burning tree seeds of *Choerospondias axillaris* (lapsi) and pine cones whenever available. In extremely wood-scarce areas farmers may also buy wood or barter it for green corn (with an early harvest), chillies or potatoes, or borrow fuelwood from people in other communities. Use of animal dung as fuel is a rarity even in wood-scarce areas of the region and was reported only in one case in Chaubas (I. 29). In this case the dung used amounted to about 9% of the annual fuel consumption of the household concerned. However, the practice was said to be in a declining trend since tree planting activities started in the past 4 or 5 years in these areas and animal movements became restricted there.

Fuel wood for the wet monsoon period of 4-5 months must be collected, dried and stored well before the onset of rains in early to mid-June each year. The collection is done whenever possible from nearby forests but when necessary from forests situated in other areas at considerable distances. Although the scarcity of firewood may force the lopping and felling of any available wood-yielding species, the commonly used forest and shrubland species for the purpose in the Thokarpa region include *Schima wallichii*, *Castanopsis indica*, *Lyonia ovalifolia*, *Engelhardtia spicata*, *Terminalia tomentosa*, *Shorea robusta* when available, *Eugenia operculata*,

Table 5.6: Fuel origin and consumption in the Thokarpa region. Figures in parenthesis indicate percentages.

Altitudinal range	Population involved			Fuel supply (bharis)										Fuel consumption (kg)		
				Forest				Private land					Total	Total	Ave. annual consumption	
	People	House-holds	Ave. no. of people per house hold	Fuelwood	Misc. wood fuels	Weeds	Sub-total	Agr. crops residues	Tree fodder residues	Old & over-mature trees	Purchased fuel-wood	Sub-total			Per house hold	Per capita
Category*				1,2	4	4		8	5,7	3,6						
Lower elevations: (1200 - 1800 m)	275	36	7.9	1061 (35)	352 (11.6)	231 (7.6)	1644 (54)	523 (17.2)	458 (15)	412 (13.6)	- -	1393 (46)	3037 (100)	91,110	2615	331
Higher elevations: (1800 - 2200 m)	116	12	8.9	887 (39)	387 (17)	253 (11)	1527 (67)	493 (21)	43 (2)	14 (0.6)	210 (9)	760 (33)	2289 (100)	68,670	5269	592
(a) Wooded areas	69	7	8.6	822 (59.2)	377 (27.2)	2 (0.1)	1201 (87)	161 (11.6)	14 (1)	8 (0.6)	-	183 (13)	1384 (100)	41,520	5175	602
(b) Wood-scarce areas	47	5	9.4	65 (7)	10 (1)	251 (28)	326 (36)	332 (37)	29 (3)	6 (0.7)	210 (23)	577 (64)	905 (100)	27,150	5430	578
Total	391	48	8.15	1948	739	484	3171	1016	501	426	210	2153	5326	159,780		409

*Category - see Fig. 5.2

Choerospondias axillaris, Pinus roxburghii, Bassia butyracea, etc., for the lower elevation (besi) areas; and *Rhododendron arboreum, S. wallichii, L. ovalifolia, Myrica esculenta, Castanopsis tribuloides, C. indica, Alnus nepalensis, Prunus cerasoides, P. nepalensis, Eurya* spp., *Quercus semecarpifolia, Litsea oblonga, Pyrus pashia, Macaranga* sp., etc., at higher elevations (lekh). Unlike the higher montane forest areas of northern Sindhu Palchok and the Mahabharat Lekh region of Kabhre, all lops, tops and offcuts of tree species felled or lopped for timber, poles, etc. in the Thokarpa region are used for fuelwood so that hardly any wastage of such biomass is witnessed in the area. Older and over-mature fodder and other trees when present on private lands may also be felled judiciously to provide for monsoon fuelwood but even very young tree saplings and poles normally protected by the farmers on their holdings do not escape felling if the fuelwood needs become exceptionally pressing.

Table 5.7 shows seasonal supply sources and Table 5.8 mean air-dry weights per headload (bhari) of fuels used in the area. The weight of a bhari thus approximates closely to 30 kg in this area.

The mean value of 409 kg fuel/person/year agrees quite closely with that of 458 kg/person/year which can be calculated from the New Era (1980) survey in six panchayats in Sindhu Palchok (Table 4.6) but exceeds that of 223 kg/person/year for Chautara panchayat non-bazar areas (Shrestha, 1982). Donovan (1981) and Wiart (1983) have suggested that values of c. 400 kg/person/year are suspect, but if biases have been introduced, deliberately or unintentionally, by informants in the two districts they have done

Table 5.7: Fuel supply calendar for the Thokarpa region.

Fuels and sources	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
	-tha Asadh	Saun	Bhadau	Asauj	Kartik	Mungsir	Push	Magh	Fagun	Chait	Baisakh	Je-
Wood fuels:												
Forest:												
- Fuelwood (kacho daura)	— ×	× ×	× ×	× ×	× —	—	—	—	—	—	—	—
- Miscellaneous fuels (suka daura & jihikra)	× —	—	—	—	— ×	× —	— ×	× ×	× ×	× ×	× ×	× ×
Private land:												
- Tree fodder residues (jhikra)	—	—	—	—	—	× ×	× ×	× ×	× ×	× ×	—	—
- Old & over-mature trees (kacho daura)	— ×	× ×	× ×	× ×	× —	—	—	—	—	—	—	—
Agriculture crops residue:												
- Maize cob and stalk, & other crop residues	—	—	—	—	— ×	× ×	× ×	× ×	× ×	× —	—	—

× indicates period of use, ——— not available/not used.

so remarkably uniformly. In view of the extreme scarcity of wood in the Thokarpa region (section 5.1.1), the author prefers to accept the consumption values as a fair estimate.

Table 5.8: Fuels: average weight (air-dry) per bhari (head-load) during November-February.

Fuels	Number of bharis weighed	Mean weight kg
1. Split fuelwood	31	32.5
2. Unsplit fuelwood	15	33.0
3. Small fuelwood and miscellaneous wood fuels (Sitapita or Jhikra)	32	28.0
Sub total (Fuelwood)	78	30.7
4. Weeds (Banmara, etc.)	29	31.3
5. Maize cob	23	26.6
6. Maize stalk & roots	2	33.0
Total (All fuels)	132	30.15

The patterns and quantities of fuel consumption vary considerably due to marked change in climate between the lower and higher altitudes, an altitude of 1800 m being the approximate dividing line. Consumption at the higher altitudes averages 1.8 times that at the lower. Another conspicuous difference within the data is in percentages of fuel obtained from the forest (87 and 36%) and private land (13 and 64%) for wooded and wood-scarce areas, respectively, at elevations above 1800 m. In the latter areas most of the fuel from private land is agricultural residues and that from the forest is dry weeds, indicating both an extremely impoverished general environment and deterioration of agricultural land.

It is instructive to compare and contrast these data with those of others. As noted above, the earlier New Era (1980) data for total weight of fuel used (Table 4.6) are similar but the proportion of fuel consisting of wood (categories 1, 2, 3, 6) is even less for Thokarpa area (44% compared with 13%). Compared with the many data of Donovan (1981) (section 4.4.1) the total consumption rates are very low, in keeping with the general picture of an impoverished forest resource given in the preceding section. A comparison with the data provided by Bajracharya (1983) is particularly interesting (Table 5.9). Not only is total per capita consumption of fuel nearly double at Pangma but proportionately more is from the forest and far more from the two components of wood (kacho daura and suka daura). For six villages in the Phewa Tal Catchment near Pokhara fuelwood from forest trees alone amounted to 686.5 kg/person/year (Levenson, 1979).

The extreme scarcity of fuel in the Thokarpa region revealed by all these data and comparisons no doubt contributed to the interest in community forestry that has been characteristic (section 5.7).

5.4 FODDER AND LITTER (Plates 22-24)

On the criteria of Wyatt-Smith (1982) for adequacy of forest land to supply the animal fodder required by the hill farming system, the ten panchayats are grossly deficient in forest area, including shrubland (Table 5.1). Thus only one panchayat meets the criterion of 2.8 ha forest to 1 ha agricultural land and none that of 1.65 ha forest per person (only two exceed 0.6 ha/person). It is therefore to be expected that fodder, like fuel, will be in short supply.

Table 5.9: Origin of fuel in the Thokarpa and Pangma areas. Data for Pangma from Bajracharya (1983).

Category[1]	Thokarpa kg/person /year	Thokarpa %	Pangma kg/person /year	Pangma %
1+2	147	36	-	-
2	-	-	158	19
1	-	-	457	55
3+6	33	8	100	12
4	94	23	-	-
5+7	37	9)	116	14
8	78	19)		
Bought	20	5	0	0
Total	409	100	831	100
1+2+4 (forest)	241	59	614	74
3+5+6+7+8 (private land)	148	36	216	26
1+2+3+6 (daura)	180	44	715	86
4+5+7+8 (jhikra + agri. residues)	209	51	116	14

[1] Category - See Fig. 5.2

Like the fuels, livestock feed supplies in the study area come from both the agricultural terraces and other private land as well as from forests, including shrublands, and consist of some grain feed but mostly leafy fodder. Even this fodder, however, is in short supply in the area, particularly in the dry season limiting livestock production greatly.

Grain feed does not constitute a major proportion of animal feed in the Thokarpa region, as is also the case in other areas in the two districts. This is given only to selected animals at particular periods and consists mostly of cooked corn flour, soya-bean flour in some instances and a very little oil cake mixed with salt as a preventative measure against diseases. Some scales of grain feed of animals in the area are presented below:

- Milch buffalo	=	c. 1 kg (2 manas) per day, during the lactation period.
- Draught cattle	=	c. 1 kg (2 manas) per day, during draughting period of 2 months (1.5 months in winter + 0.5 months during monsoon)
	=	c. 60 kg/beast/year.
- Goat/sheep during	=	c. 0.5 kg (1 mana) every 4-5 days.
lambing and castrated goats/pig (for meat production)	=	c. 4 kg (8 manas) per month.

- Horses and ponies also receive additional supplies of grain feed (raw paddy, corn, etc.), but there are not many of these maintained by farmers in Sindhu Palchok and Kabhre.

Growth of most of the grass and other herbaceous fodder in the forest and agricultural land is restricted to the monsoon period (mid-June to mid-October) and then it is relatively plentiful. Many broad-leaved tree species yield leaf fodder for varying periods of time during the year. Most of the crop residues are dried and stored to provide the principal animal fodder during the long dry period of the year. Green fodder is in extremely short supply during the dry season with practically none coming from agricultural land and only some being harvested from forests. Any green matter that is given is mixed with and is subsidiary to the dry fodder, including the tree fodder from private land and forest. Although almost all of the animal feed comes from fodder, it is characteristically in short supply outside the wet monsoon months.

Stall feeding of livestock, mostly partial and in some cases full, is generally constrained due to the inadequate supply of fodder. Free-range grazing which constitutes the other part of the livestock management and production system also takes place in the forest and shrub areas, grasslands and terraced agricultural land after harvest. There are, however, no well-managed pastures and grazing areas available to the farmers. As depicted by Berthet-Bondet (1983) and many others, the shortage of fodder, especially in the dry season, greatly limits animal productivity. Also the period of relatively plentiful fodder production in the monsoon does not usually coincide with the calving period, which often takes place very late in the monsoon.

Fodder supply sources in various seasons of the year for stall feeding of livestock in the area are shown in Table 5.10. By comparison with Metz-Fox's (1983) study of Bhogteni, the proportions of both grass and tree fodder obtained from private land is lower in the Thokarpa region. Table 5.11 gives the average weight per head load of various green and air-dry fodders obtained from different sources in the area. In Table 5.12 the calendar of fodder supplies is given. This table also lists, in order of the local people's preference, the fodder tree species grown on private land. Table 5.13 lists forest fodder tree species. The local farmer households take meticulous care to maintain this fodder supply line intact through different periods despite their commitments within the total farming system. This exercise is by no means simple.

Table 5.14 shows the number and proportion of various livestock maintained by households and their stall feeding and open grazing patterns at various altitudes in the study area. Existing feeding patterns in the area are shown to vary according to altitude, distance from existing forest and shrub areas, and the species maintained. This study also reveals that livestock feeding patterns are changing in localities such as Thokarpa panchayat where the local communities have for some years been involved in forest conservation and reforestation activities. These interesting changes arose quite unexpectedly as a result of changing social attitudes of the local people and not at the suggestion of officials or assistance projects. Thus, at lower altitudes (below 1800 m), the large population has no easy access to forests or grazing lands and the area has been under maximum pressure of terracing and cultivation. Existing forests are situated much

Table 5.10: Fodder consumption by 46 households in the Thokarpa region.

Sources of supply	Period of supply	Fodder types	Fodder/Forage Harvest: Total annual harvest by respondent households		Fodder/Forage Harvest: As a proportion of total fodder/forage supply
			Headloads (bharis)	Weight (kg)	%
Forest	Wet monsoon period (mid June-October)	Green grass/ herbaceous fodder and some tree leaf fodder	1,979	63,526	5.5
	Dry period (Nov-June)		5,122	164,416	14.3
Sub-total			7,101	227,942	19.8
Private/agriculture land	Wet monsoon period (June-October)	Green grass/ herbaceous fodder	21,085	676,828	58.8
		crop residues	5,422	174,046	15.1
	Dry period (Nov-June)	Tree leaf fodder	2,227	71,486	6.2
Sub-total			28,734	923,360	80.2
Total			35,835	1,151,302	100

Table 5.11: Fodder: weight per bhari (head-load) weighed between November and February.

Fodder	Moisture content	Total number weighed	Mean weight per bhari kg
Tree fodders:			
Ficus cunea	Green	17	31.4
Litsea polyantha	"	22	30.6
Grewia tiliaefolia	"	15	30.9
Mean			31.0
Agricultural crop residues:			
Finger-millet straw	Air dry	28	38.2
Rice "	"	32	31.8
Maize stalk	"	28	31.4
Mean			33.7
Grass			
Dry grasses (*Typha angustata*, etc.)	"	6	35.8
Green grasses[1]	Green	5	11.4
Total		153	32.1

[1] Green grass forage is very scarce during dry season. When available it is too short for tying into bundles and is normally collected in small Doko baskets: the contents weigh much less than a normal bhari.

lower down or higher up the steep slopes and remote from the majority of the population. Open grazing and unrestricted movement of livestock in search of grass and other food has been the norm of the animal husbandry practice in the past. Sunkhani and Simthati panchayats are typical examples at present and this was also the practice in Thokarpa until recently.

Table 5.12: Fodder supply calendar for the Thokarpa region.

Fodder	Jun		Jul		Aug		Sept		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May	
	-tha	Asadh		Saun		Bhadau		Asauj		Kartik		Mungsir		Push		Magh		Fagun		Chait		Baisakh		Je-
DRY:																								
Rice straw																								
Finger millet straw																								
Maize stalk	×	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	×	×	×	×	×	×	×
" husk																								
Grasses																								
GREEN:																								
Agricultural land -																								
Grass & herbaceous fodder	—	×	×	×	×	×	×	×	×	×	×	×	×	—	—	—	—	—	—	—	—	—	—	—
Crop residues -																								
Maize stalk	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Millet straw	—	—	—	—	—	—	—	—	—	×	×	×	×	—	—	—	—	—	—	—	—	—	—	—
Forest -																								
Miscellaneous fodder	×	×	×	×	×	×	×	×	×	×	×	×	—	—	—	—	×	×	×	—	—	—	—	—
Tree fodders from private land -																								
Artocarpus lakoocha	—	—	—	—	—	—	—	—	—	×	×	×	×	×	×	×	×	×	×	—	—	—	—	—
Morus alba	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×
Bauhinia purpurea	—	—	—	—	—	—	—	—	—	×	×	×	×	×	×	×	×	×	×	—	—	—	—	—
Litsea polyantha	—	—	—	—	—	—	—	—	—	×	×	×	×	×	×	×	×	×	×	×	×	×	—	—
Buddleja asiatica	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	×	×	×	×	—	—	—	—	—
Ficus nemoralis	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	×	×	—	—	—	—	—	—	—
Ficus cunia	×	—	—	—	—	—	—	—	—	×	×	×	×	×	×	×	×	×	×	—	—	—	—	—
(Odal)*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	—	—	—	—	—
Grewia tiliaefolia	×	×	×	—	—	—	—	—	—	—	—	×	×	×	×	—	—	—	—	—	—	—	—	×
Ficus lacor	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	×
Prema sp.	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×
Ficus roxburghii	—	×	×	—	—	—	—	—	—	×	×	×	×	—	—	—	—	—	—	—	—	—	—	—
Prunus cerasoides	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×
Arundinaria spp. } *Bambusa* spp. }	—	—	—		(No regular harvest, fodder yield only with final felling of bamboos and nigalo)																		—	—
(Padendu)*	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	×	×	×	×	—	—	—	—	—
Bassia butyracea	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	—	—	—	—	—	—	—
Machilus gamblei	—	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	×	×	—	—	—	—	—

× indicates period of use, ——— not available/not used. *Species not known to the author.

Table 5.13: Forest tree and shrub species used as fodder in the Thokarpa region.

Lower elevation (Besi)	Higher elevation (Lekh)
Quercus glauca	*Ficus nemoralis*
Castanopsis indica	*Quercus lanuginosa*
Ficus glaberrima	*Q. semecarpifolia*
Schima wallichii	*Q. fenestrata*
Shorea robusta	*Q. lamellosa*
Syzygium cuminii	*Machilus gamblei*
E. operculata	*Castanopsis tribuloides*
Bauhinia vahlii	*Michelia champaca*
Woodfordia fruticosa	*Ilex doniana*
Wendlandia exerta	*Eurya acuminata*
Engelhardtia spicata	*E. cerasifolia*
Bassia latifolia	*Cleyera ochnacea*
Garuga pinata	*Schima wallichii*
Symplocos pyrifolia	*Alnus nepalensis*
Terminalia tomentosa	*Bridelia retusa*
T. chebula	*Viburnum coriaceum*
Melia azedarach	*Rhus javanica*
Boehmeria rugulosa	*R. succedanea*
Mallotus philippinensis	*Myrsine semiserrata*

Many of the species listed above are of low preference as fodders but fodder scarcity in the region forces their excessive lopping.

Thokarpa now has been involved in tree planting and forest conservation for about 10 years but the Sunkhani and Simthali panchayat communities have no tradition of such activities, nor has the newly constituted Kalika panchayat.

At higher elevations (above 1800 m), areas with some forests (wooded areas) such as Bekh Simle, Sano Bangthali, Lisankhu, and Gogane in upper Thokarpa have relatively easier access to many forest areas, described in sections 5.6.1 and 5.6.2. Chaubas represents the wood-scarce areas (with no forest nearby) of the higher altitudes, although extensive tree planting has occurred recently under the auspices of the Nepal-Australia Forestry Project (Plates 41, 42, 51).

Table 5.14 shows that below 1800 m altitude where no tree planting and forest conservation activities have yet been taken up, 54% of the total livestock maintained by the farmers graze openly and 46% are stall-fed. The buffalo population is mostly (80%) stabled and stall-fed but most cattle, sheep and goats are found open grazing. Thokarpa, situated in the same altitudinal range and having a similar pressure of population and cultivation, presents a much different picture. Livestock grazing and stall-feeding have already been considerably affected as a result of tree planting in the last 10 years and 75% of the livestock is now stall-fed, including 69% of cattle and 78% of goats and sheep.

At higher altitudes (above 1800 m) tree planting and forest conservation are newer activities and the significant distinctions occurring in grazing and stall-feeding practices relate to areas with and without nearby forest.

Table 5.14: Livestock population: grazing and stall feeding patterns in the Thokarpa region.

	Respondents		Live-stock units per person	Livestock holdings of respondent population														
				All livestock			Buffaloes			Cattle			Sheep & goats					Others
	House-holds	Popula-tion		Total	Stall-fed	Open-grazed	Sub-total	Stall-fed	Open-grazed	Sub-total	Stall-fed	Open-grazed	Sub-total	Stall-fed	Open-grazed	Goats	Sheep	(Pigs)
Lower elevations: (below 1800 m)																		
1. Thokarpa	27	210	1.19	323	240.5	82.3	80	60.7	19.3	102	70.5	31.5	141	109.3	31.7	141	-	
				(100)	(75)	(25)	(100)	(76)	(24)	(100)	(69)	(31)	(100)	(78)	(22)	(100)		
2. Other areas	9	65	1.01	90	41	49	15	12	3	36	10.6	25.4	37	16.4	20.6	37	-	2
				(100)	(46)	(54)	(100)	(80)	(20)	(100)	(29)	(71)	(100)	(44)	(56)	(100)		(100)
Higher elevations: (above 1800 m)																		
1. Wooded areas	7	69	1.74	181	10.3	170.7	36	7	29	46	-	46	99	3.3	95.7	43	56	
				(100)	(6)	(94)	(100)	(19)	(81)	(100)		(100)	(100)	(3)	(97)	(43)	(57)	
2. Wood scarce areas (with no nearby forest)	5	47	1.25	70	42.8	27.2	13	9.5	3.5	35	17.8	17.2	22	15.5	6.5	22		
				(100)	(61)	(39)	(100)	(73)	(27)	(100)	(51)	(49)	(100)	(70)	(30)	(100)		
Total	48	391	1.26	664 (100)	335 (50.4)	329 (49.6)	144			219			299					2

The preferred species for bedding and leaf litter are *Schima wallichii, Castanopsis indica, Terminalia tomentosa, Engelhardtia spicata, Bassia butyracea, Litsea oblonga, Myrica esculenta, Rhododendron arboreum, Alnus nepalensis, Juglans regia* and *Castanopsis tribuloides*. *Shorea robusta* and many other broad leaved species and even *Pinus roxburghii* are also used for the purpose. *Eupatorium adenophorum*, other weeds, and ferns are also commonly used. The survey (Table 5.22) shows that almost all forests in the vicinity of the Colonel's Forest (section 5.6.1) are used for dry and green leaf litter collection, with people often travelling considerable distance to collect these materials.

Forest is also the principal source of fallen dry leaf litter (patkar) and lopped green foliage of trees, shrubs and herbaceous species (syaula, sottar) which are used for animal bedding and composting. Such forest biomass when mixed with animal excreta yields organic compost manure which forms the principal source of soil nutrients for agricultural land.

No adequate assessment of the effects have been made but the significance of animal manure and litter in the study area can be seen from Table 5.15. The use of chemical fertilizers by farmers for their croplands is either small or negligible because of shortage of cash in the rural economy, lack of knowledge and of irrigation facilities. There is thus an overwhelming dependence of the croplands on organic manuring derived from animal dung and forest leaf biomass. The yield of organic manure is directly proportional not only to the stall-fed livestock units of the farmers but also to the quantities of forest biomass used for the purpose.

Table 5.15: Annual use of litter and manure and chemical fertilizers (mean data from 48 households).

Land holding (ha)		Litter & manure (kg)		Chemical fertilizer (kg)[1]	
Per household		Per household	Per ha cultivated land	Per household	Per ha cultivated land
Total	cultivated				
2.1	1.85	4293	2320	52	28

[1] 97% as nitrogen compounds, 3% as phosphorus and potassium compounds.

5.5 OTHER USES OF FOREST PRODUCTS

In addition to fuelwood and fodder, the forest in the Thokarpa region provides timber for housing, furniture and many agricultural and household implements.

Local houses in the Thokarpa region, as also in other parts of the two districts, are simple structures, two- to three-storeyed but with low ceilings. They vary in size, normally 3 to 5 m in breadth and 6 to 8 m in length, but a few extra-large houses may measure up to 6 x 15 m (i.e. 7 x 13 hath up to 12.5 x 20 hath . The usual Nepalese measure in this context is the hath, where one hath is the distance from the elbow to the tip of the middle finger, normally taken as 1.5 ft or 45 cm). Besides the size and economic status of the family, the size of the houses constructed depends much on the ready availability of timber (see Plates 9 to 17).

Much of the cost of labour for house construction is offset by the traditional communal labour sharing practice. Timber, stones, mud mortar and thatch grasses, and either stone slabs or wooden shingles at higher altitudes for roofing, are the principal construction materials which have to be obtained locally. Occasionally corrugated iron sheet roofing may be used but is the only imported material. The use of locally made tiles and bricks, however, seems to have been more prevalent in the past. The use of conifer wooden shingles is not common in the area as they have to be brought from a considerable distance. Tree leaves are sometimes used for roofing of temporary shelters and animal sheds. Thatch grass is the most commonly used roofing material. Stones in mud mortar are used for walls and flooring and sometimes as roofing slabs. For all other purposes of construction (roof frames, doors, windows, partitions and flooring, timber, poles, bamboos and other forest products are used.

Estimates from the Integrated Hill Development Project (IHDP) area show that a medium sized house for a family of seven people uses on an average 1.13 m^3 finished wood or 2.26 m^3 round logs every 37 years when a new house is built or major overhauling is done (Grünenfelder, 1977). This estimate based on the experience of IHDP's construction phase shows a 50% conversion waste of timber using saws.

In the Thokarpa region timber is generally available as a free good but local households rarely use sawn timber for construction. There is neither a local tradition nor the extra cash needed for sawing. The axe is usually used for felling, bucking, squaring, splitting, chopping, etc. It would be a wasteful method of conversion if the finished timber product alone was considered but almost everything left over is used as fuelwood, particularly if the harvesting site is not at a great distance and there is hardly any waste in such cases. This differs dramatically from the practice in Salme as reported by Wiart (1983). There, of trees felled for construction purposes, 19% is actually so used, 10% is recovered as fuelwood and 70% is wasted.

My survey showed that the local houses normally last 60-80 years and some even longer. When the children grow up the daughters get married and live elsewhere while the sons, except one, normally separate from the parents household to live independently.

This usually necessitates building a new house for each departing son, even though these are often adjacent to parents. Thus two new houses may be built by a family with three sons every 25-30 years. Major maintenance of the existing house may also be done on an average once in 25-30 years but, given the monsoonal climate, at least the roofs of all houses need regular maintenance and replacement, on an average every 5-6 years. During this operation, the small poles used for cross pieces, bottoms, etc., need to be replaced. All but about 5-10% of the bigger poles and timber components used as beams and pillars last for at least 25-30 years.

Each farm household also builds in its homestead area either a permanent shed (goth) for stabling livestock by night or, on larger holdings, an additional two-storey house locally called a matan.[1] The upper storey of the matan is used for storing fodder, and for accommodating guests or even for regular dwelling and the lower for livestock. Temporary animal sheds (also called goths), made of poles with a bamboo mat roofing, are also erected each year in winter by farmers to stall-feed animals and so manure their terraced fields located far from the homestead area and permanent goth. The location of these temporary goths is changed every few weeks to cover as much land as possible belonging to the farmer. For monsoon paddy cultivation also some households build sheds in their khet land located lower down the slopes or at the valley bottoms. Poles and small timber are also needed for these. The quantities of poles and timber required by a household for goths or matan on an average would be about half of what is required for a

[1] See Plate 16

medium-sized dwelling house. Smaller poles than in houses, however, are required for the construction of goths and for the many pegs for tethering animals.

Informants in the author's survey estimated that a new medium-sized house and goth or matan for a family of seven or eight persons required for construction seven or eight trees of medium-sized *Shorea robusta* or *Schima wallichii* every 25-30 years. The trees indicated had a mean diameter at breast height of 36.4 cm and height of 26 m. Each tree is estimated to yield a wood volume of 0.67 m^3 by the following formula:

$$V = [D^2 \times k \times H] \times \tfrac{1}{4}, \text{ where}$$

V is volume in m^3,

D tree diameter at breast height in cm,

H top height of tree in m

$k = 0.0000785398$, and the

Form factor = ¼

[Forest Resources Survey Tree Volume Tables (1967) based presumably largely on better growing Terai sal (*Shorea robusta*) give somewhat higher yields than this.]

The round wood used per house and matan or goth is therefore c. 5 m^3 (Table 5.16), giving an annual per capita usage of 0.05 m^3 and no more than 0.02 m^3 of finished product. Besides the use of this timber of saw-log sizes, many pole-sized components are used in roofing and elsewhere but their volume has not been quantified. Data on roof components using principally poles are given in Table 5.17.

Table 5.16: Gharsangha (house construction and maintenance) timber and poles requirements in the Thokarpa region (per average household with medium sized holding, and per annum).

	Timber			Medium-sized poles (danra)		Small-sized poles (bhata)	
Time interval yr	Trees no.	Average dbh cm	Estimated volume m^3	Time interval yr	Poles no.	Time interval yr	Poles no.
25-30	7-8	36.4	5	25-30	60^+	5-6	200^+

Table 5.17: Roof components

Component	Number by components	
	Medium house	Large house
Main beam	1	3
Large beam	5	9
" " accessories	8	10
Smaller beams	56	92
Cross pieces/battens	220	220+
Roof support	3	4

These figures show high consumption of young poles and hence of the potential future tree crop. The increasing scarcity of poles has led to the use of bamboos as substitutes and the people of Thokarpa panchayat, since the initiation of community forestry and protection of local forest, have also taken largely to bamboos to substitute for their poles requirement. According to them, 10 mature bamboos are sufficient to substitute the requirement of small poles needed for roof maintenance every 5-6 years.

According to informants the use of timber in house construction is as given in Table 5.18.

Table 5.18: Use of timber species in house construction in the Thokarpa region. Different species are used for the various components at lower and higher elevations. For the explanation of the seven numbered components, see below.

Lower elevations (besi)		Higher elevations (lekh)	
Species	Use (components)	Species	Use (components)
Alnus nepalensis	2,3,5,7	*Abies spectabilis*	5
Castanopsis indica	1,2,4	*Alnus nepalensis*	2,3,5,6,7
Duabunga sonneratoides	7	*Camellia kissi*	3
Engelhardtia spicata	3,7	*Castanopsis tribuloides*	1,4
Eugenia operculata	1,2,7	*Choerospondias axillaris*	4
Lagerstroemia parviflora	1	*Cleyera ochnacea*	2,3
Litsea oblonga	7	*Engelhardtia spicata*	7
Pinus roxburghii	2,5,7	*Eurya* spp.	3,4
Schima wallichii	1,2,3,6	*Juglans regia*	7
Shorea robusta	1,3,4,5,6	*Litsea oblonga*	1,3,4,5,7
Terminalia tomentosa	1,2,3,4,5	*Lyonia ovalifolia*	3,6
		Michelia champaca	4,5,7
		Myrica esculenta	1,3,4
		Pinus wallichii	5
		Prunus cerasoides	1,2,3
		P. nepalensis	1,4
		Pterocarpus santalinus	2,3
		Quercus lanuginosa	4
		Rhododendron arboreum	3,4,6
		Rhus spp.	3
		Schima wallichii	2,3,4
		Shorea robusta	4
		Symplocos pyrifolia	3
		Tsuga dumosa	5

The numbers (1-7) indicate use of the species for components as follows:

(1) support pillars (tham)

(2) main beams (nidal)

(3) large and smaller beams, rafters, purlins, cross pieces, battens (dhuri balo, balo, dalin, met, danra, bhata, etc.)

(4) door and window frames

(5) door and window panels, staircases and ladders

(6) split wood (chirpat)

(7) furniture (boxes, racks, beds, benches, chairs, tables, etc.)

Besides the construction and maintenance of houses, goths and matans, the local population also uses the forest to obtain wood for making various farm implements and tools (harsangha)[1] which need to be renewed regularly to sustain the practices of crop production. For instance, an average household with a medium-sized holding needs each year 3 or 4 ploughshares (halo), 1 or 2 plough handles (anau) 1 or 2 plough yokes (juwa), 2-3 implements for levelling of dry and wet lands (lendko and dande), and an unquantifiable number of hafts, shafts, handles, pegs and nails (Table 5.19). Two or three small-sized trees may meet the needs of the average household if 1 or 2 species only were involved but the differing requirements for various tools and implements call for the use of different tree species, the scarcity of which may involve the felling of many alternative species and many more trees of varying sizes. As in house construction,

[1] Plates 18-20, 40

bamboos are often used to substitute for timber in the building of implements, although never for plough shares. Bamboos also are used as first choice for many household utensils and for fencing and temporary goth construction.

Table 5.19: Harsangha (farm implements and tools)

Requirement (No.) per household per annum						
Plough share (halo)	Pole of plough (haris)	Plough handle (anau)	Yoke of plough (juwa)	Levelling tools (lendko dande)	Hafts, shafts, handles, etc.	Total (Trees of small size)
3-4	1-2	2-3	1-2	2-3	unquantifiable	2-3

This has further added to the depletion of forest resources within each forest area of the Thokarpa region.

Forest species used for various agriculture tools and implements (indicated by numbers) used at different altitudes in the region are listed in Table 5.20.

Table 5.20: Species used for agricultural tools and implements in the Thokarpa region.

Lower elevations (besi)		Higher elevations (lekh)	
Species	Use (implements, tools, etc.)	Species	Use (implements, tools, etc.)
Albizzia spp.	10	*Camellia kissi*	1,3,6,7,9
Artocarpus integrifolia	10	*Castanopsis indica*	5,6
Bassia butyracea	10	*C. tribuloides*	2,6,9
Bauhinia variegata	10	*Choerospondias axillaris*	2,6
Boehmeria rugulosa	10	*Cleyera ochnacea*	1,3,6,8
Camellia kissi	3	*Eurya* spp.	1,3,6
Castanopsis indica	1-3,5,6	*Ficus roxburghii*	4
Choerospondias axillaris	2,4	*Fraxinus floribunda*	4
Engelhardtia spicata	3,4,10	*Litsea oblonga*	4,10
Fraxinus floribunda	4	*Macaranga indica*	4
Gmelina arborea	4	*Melia azedarach*	4
Lagerstroemia parviflora	6,9	*Michelia champaca*	4
Litsea oblonga	4	*Myrica esculenta*	1,7
Melia azedarach	4	*Pyracantha crenulata*	5,6
Michelia champaca	4	*Pyrus pashia*	1,3,5,6
Myrsine capitellata	3	*Quercus fenestrata*	2
Ougenia oogenensis	10	*Q. glauca*	2,6,8,9
Pyracantha crenulata	3	*Q. lamellosa*	2
Schima wallichii	1-8	*Q. lanuginosa*	2,5,7,8
Semecarpus anacardium	10	*Rhododendron arboreum*	8,10
Shorea robusta	1,2,5	*Rhus succedanea*	6
Terminalia chebula	9	*R. wallichii*	6
T. tomentosa	2,9	*Schima wallichii*	1,4,6,8
		Symplocos pyrifolia	6
		Woodfordia fruticosa	5

The numbers (1-10) in front of the species indicate their uses for various tools and implements as follows:

Agricultural production tools and implements -

1 ploughshare (halo)

2 plough pole or beam (haris)

3 plough handle (anau)

4 plough yoke (juwa)

5 levelling implements for dry and wet lands (lendko, dande)

6 haft, shaft, handle, etc. for various farm tools.

7 dhiki

8 okhali

9 musli

(7–9: rice husking and flattening tools)

10 theka, theki, etc. (wooden containers for milk, milk products, honey, etc.)

5.6 THE FORESTS

The forest and shrubland areas remaining in the 10 panchayats forming the special study area and to which the interviews related were examined in detail by the author during his fieldwork (see also section 5.1.2). These forest and shrubland areas are covered here under three broad headings: The Colonel's Forest and adjoining areas (section 5.6.1), Gogane Pakho and adjacent areas (section 5.6.2) and the Sun Kosi Lower Slopes Forests (section 5.6.3). A description of forest characteristics of the constituent localities based on the information gathered by the author follows (see also Table 5.21; Appendix V and VI).

5.6.1 The Colonel's Forest and adjoining areas

The Colonel's Forest is the collective name given locally to Bhalukhop, Thumki and part of Mahaghar Forests, each encompassing various other locally described smaller forest localities. Siurani Pakho is nearby (F. 8-11). At present the Bhalukhop Forest forms a part of Bekh Simle panchayat, Sano Bangthali claiming Thumki, and the Mahaghar and Siurani areas fall within Simthali panchayat.

History and use (I. 4,5,14,17-19,21-24,26-29)

These areas were under birta tenure formerly. According to the informants Kaji Hariman Singh Basnet's family was granted birta in the Palanchok, Shikharpur and Bhamarkot region of Kabhre to compensate for their birta lands in Kaski in the mid-western Pahad which were taken away when Jung Bahadur Rana became the Maharaja of Kaski and Lamjung. This birta grant of the Basnets extended east of the Sun Kosi to include the Thumki, Bhalukhop and the eastern section of the Mahaghar Forests, along with the mostly non-forested areas of Hile,

Table 5.21: Forest and shrubland areas of the Thokarpa region.

Forest/shrubland, Block No.	Elevation (m)	Predominant aspect	Slope	Original forest type	Most prominent species	Main ground cover	Regeneration (main species)
The Colonel's Forest and adjoining areas:							
Upper Thumki Forest (F.10a)	1850-2200	N	37-38° (very steep)	Rhododendron,[1] UMH[2]	*Rhododendron arboreum*	*Eupatorium adenophorum*	Seedlings of tree species almost absent
Lower Thumki Forest (F.10b)	1500-1850	N	" (")	LMH[3]	*Schima wallichii*	"	" "
Bhalukhop Forest (F.11)	1800-2200	NW	" (")	Rhododendron, UMH	*R. arboreum*	"	A few
Mahaghar Forest (F.8)	2050-2200	W	" (")	Rhododendron, UMH	"	"	Very few
Siurani Pakho Shrubland (F.9)	1760-2150	N	38-40° (very steep)	UMH	"	"	Almost absent
Sangasoti-Laure Shrubland (F.14-17)	1770-2260	S	14-17° (moderate)	UMH	"	"	Absent
Nigale Luku Forest (F.18)	1750-2240	N	25-30° (steep)	UMH, LMH	"	", Ferns	Some below 2100m
Balkuche-Patale Pakho Shrubland (F.13)	1770-2240	N	30-35° (steep)	UMH	*Quercus lanuginosa*, *Alnus nepalensis*	*E. Adenophorum*	*A. nepalensis* represented
Gogane Pakho and adjacent areas:							
Gogane Pakho (F.19)	2100-2360	S	25-30° (steep)	Rhododendron, UMH	*R. arboreum*	"	*Lyonia* sp., *Quercus semecarpifolia*, *Symplocos pyrifolia*
Silkhu-Devisthan Forest (F.20)	"	N,NW	35-37° (very steep)	Rhododendron, UMH	*R. arboreum*, *Pterocarpus santalinus*	", Ferns	Some *R. arboreum*
Bhedukharka Pakho Shrubland (F.21)	1650-2100	NW	34-36° (")	Rhododendron, UMH	No single species	*E. adenophorum*	Some *R. arboreum*
Pokhari-Lumel Pakho (F.22)	1800-2250	E	25-30° (steep)	UMH, LMH	No single species (*A. nepalensis*, *Engelhardtia spicata*, *S. wallichii*	", (less abundant)	Some *E. spicata*, *L. ovalifolia*, *R. arboreum*, *S. wallichii*

Table 5.21 (cont'd): Forest and shrubland areas of the Thokarpa region.

Forest/shrubland, Block No.	Elevation (m)	Predominant aspect	Slope	Original forest type	Most prominent species	Main ground cover	Regeneration (main species)
Thampokhari-Machhyan Forest (F.23)	1800-2350	W	31-35° (steep)	Rhododendron, UMH	*R. arboreum*, *S. wallichii*	*E. adenophorum*, (less abundant)	*A. nepalensis*, *R. arboreum*
Sun Kosi Lower Slopes Forests							
Ambote-Jhilige Forest (F.2) Kafle Forest (F.3) Paire-Dandakhet Forest (F.4) Kalleri Pakho Forest (F.5) Jhingetar Forest (F.6)	680-1300	W,N	38-40° (very steep)	Hill Sal	*Shorea robusta*	*E. adenophorum* is absent or thinly scattered on dry sties, but abundant on moist, shady localities	*S. robusta* abundant
Sila Parbat Forest (F.24) Saping-Rithe Forest (F.25)	"	"	" (")	"	"	Ground cover nearly absent	Very few of any species

1 Rhododendron - Rhododendron Forest

2 UMH - Upper Slopes Mixed Hardwood Forest

3 LMH - Lower Slopes Mixed Hardwood Forest

Bhalukhop, Arubot, Bhusi, Simle, Jagu and Bhusapheda. After Hariman Singh's death the eastern part of Mahaghar Forest came into the possession of his son Lokman Singh Basnet but the other two forest areas, Bhalukhop and Thumki, along with some of the cultivated land were sold to Colonel Dal Bahadur Basnet in about 1915.[1] These forests thus became the purchased (kinuwa) birta of the Colonel. (Col. Dal Bahadur came from Makaibari, near Charikot, and was A.D.C. to Prime Minister Chandra Shumshere Rana.) The western part of the Mahaghar Forest and the areas west of it including Kotka, Pokhari Okhre and Kabhre that now form part of Chaubas panchayat were the birta of Rajendra Prashad Shah of Kathmandu. Tej Bahadur Kunwar was his talukdar. The mode of management adopted by the birta holders and their talukdars dictated much of the fate of these forests in the subsequent period.

Rajendra Prashad Shah and Lokman Singh Basnet (and their descendants) followed the government's general policy of clearing forest for agriculture. Thus much of Mahaghar Forest and the lands to the west were converted. However, agriculture proved to be impossible on most of this land and most has reverted to poor quality forest (Mahaghar Forest), shrubland (Siurani Pakho) or poor grassland. These areas have remained disclimax communities under the pressure of heavy utilization, browsing and grazing.

Col. Dal Bahadur Basnet, however, protected the forest in his possession and allowed no clearing for agriculture. Its continued existence through the years appears to stem from a tradition of protection that he instituted, although many changes have occurred.

---

[1] See Plate 9, Col. Dal Bahadur Basnet's house at Durge

Thus the Colonel's son sold the forest along with other property to Lalit Bahadur Bhandari[1] in 1957. With the Private Forest Nationalization Act, 1957 and the Birta Abolition Act, 1959, all these forests became state owned. In recent times the forests have been continuously but apparently conservatively used by the surrounding population for their forest needs, although some perturbations of use were reported. In about 1925 most of the forest was destroyed by a severe fire, only large trees surviving. Extensive regeneration occurred, although the small nigalo bamboos (*Arundinaria* spp.) never re-established in their previous abundance. Most of the existing forest probably dates from after the fire, with only the largest trees predating it. *Eupatorium adenophorum* was variously stated to have first appeared between 1942 and 1953 and to have decreased subsequent regeneration markedly. The Private Forest Nationalization Act, 1957 and the establishment of the local Forest Range office at Chauri in 1960/61 (subsequently moved to Chaubas) also had deleterious consequences. The former led to an upsurge of tree felling by the local population instigated by distrust of the government's motives. Such distrust was reinforced when the Range Office permitted and promoted for a decade the selective felling and over-exploitation of the more popular species for export from the immediate area. So much so that the regular sights of dozens of pairs of pit-sawers from outside the area operating in their forest agitated the local people of Simthali Panchayat. The saws and other tools of these sawers were confiscated by the local people. This helped to reduce the major damage. The intensity of exploitation for local usage, however, continued to be heaviest nearest the centres of population, with obvious effects to the present day.

[1] Plate 8, Lalit Bahadur Bhandari (I. 21).

Table 5.22: Uses of the Colonel's Forest and adjoining forest and shrubland areas

Forest or shrubland: Panchayat	Ward/village	Timber poles	Fuel-wood	Fodder	Leaf litter	Agricul- tools & implements
Thumki Forest:						
Bekh Simle	Hile, Nepta, Bhalukhop and Arubot	✓	✓	✓		
Simthali	All villages	✓	✓	✓	✓	✓
Sano Bangthali	Surke, Sano Bangthali Jarange, Dandakharka and Sanga Soti	✓	✓	✓	✓	✓
Chaubas	Okhre, Chaubas, Hile and Dandagaon	✓	✓			
Dhusini-Siwalaya	Gumti, Bigati and Dhusini	✓	✓	✓	✓	
Chauri-Gothpani	Ward No. 9 Majhuwa		✓		✓	
Majhi Feda	Salmi and Bajh		✓			✓
Chauri	Keurini		✓			✓
Bhalukhop Forest:						
Bekh Simle	Bhalukhop, Arubot and Chilapati	✓	✓	✓	✓	✓
Lisankhu	Nargaon		✓			
Sano Bangthali	Singarche, Simle	✓	✓	✓	✓	✓
Thulo Bangthali	Gyangtole, Patale, Siurani	✓	✓	✓	✓	✓
Mahaghar Forest:						
Chaubas	Ward Nos. 1,2,5,7 & 8	✓	✓	✓	✓	✓
Chauri-Gothpani	Ward No. 9		✓			
Dhusini Sibalaya	Gumti, Bigati & Dhusini		✓			
Sangasoti-Laure shrubland:						
Nagre	Nagre, Simpani		✓			✓
Sano Bangthati	Sano . Jarange, Dandakharka, Sangasoti and Surke		✓	✓	✓	✓
Chaubas	All villages		✓	✓		✓
Dhusini Sibalaya	Gumti, Bigati, Dhusini		✓			✓
Chauri Gothpani	Majhuwa		✓			✓
Chauri	Keurini		✓			✓
Balkuche Forest:						
Thulo Bangthali	Gyangtole, Patale, Siurani	✓	✓	✓	✓	✓

Those interviewed indicated current use of the various components of the Colonel's Forest and adjoining areas as set out in Table 5.22.

Upper Thumki Forest (F.10a) (Plates 34, 36, 39)

Location: The Thumki Forest consists of a largely continuous area extending from 1500 m elevation at Bhusikhola basin in the west to 2200 m at the top of the ridge along the southern edge of which runs the Chaubas-Laure Bhanjyang track. It may be conveniently divided into 2 portions: Upper Thumki (F.10a) including the areas known as Chitrepari, Raibari and Thuli Lekh (1850-2200 m) and Lower Thumki (F.10b) (1500-1850 m).

Elevation: 1850-2200 m

Predominant aspect: N; slope: 37-38° (very steep)

Original forest type: Rhododendron and Upper Slopes Mixed Hardwood Forests.

Most prominent species:

Rhododendron arboreum

Main associates:

Alnus nepalensis

Eurya acuminata

E. cerasifolia

Ilex doniana

Juglans regia

Lagerstroemia floribunda *

Litsea oblonga

Lyonia ovalifolia

Prunus cornuta

*Pyrus pashia**

*Rhododendron anthopogon**

Rhus succedanea

Schima wallichii

(* understorey species)

Stand description:

R. arboreum (dbh max. 71 cm, mean 41.7 cm) is dominant throughout the stand especially above 2000 m. There *L. ovalifolia* (max. dbh 56 cm) is also common in the forest canopy, with lesser numbers of *P.cornuta* and *R. succedanea.* The understorey is composed principally of *P. pashia* and *L. floribunda.* Scattered through this highest section elevation are over 70 mature to over-mature trees of *J. regia* (dbh - max. 126 cm, mean (24 trees) 56.9 cm; mean height 32.4 m).

Between 1850-2000 m *R. aboreum* remains the most prominent species, but particularly in cooler and shadier localities and along gullies. *A. nepalensis* (dbh - max. 117 cm, mean (7 trees) 5.9 cm), *I. doniana, L. oblonga* (dbh - max. 71 cm), *P. cornuta* (dbh - max. 78 cm) form a significant proportion of the canopy. *S. wallichii* is also present but in small numbers. *R. anthopogon* is conspicuous as an understorey shrubbery in some localities. *Eupatorium adenophorum* is the main ground cover.

Regeneration:

Seedlings of tree species are nearly completely absent.

History and use:

See under 'The Colonel's Forest' above.

Lower Thumki Forest (F.10b)

Elevation: 1500-1850 m

Predominant aspect: N; slope: 37-38° (very steep)

Original forest type: Lower Slopes Mixed Hardwood Forest

Most prominent species:

Schima wallichii

Main associates:

Alnus nepalensis

*Camellia kissi**

Castanopsis indica

Cleyera ochnacea

Engelhardtia spicata

Eurya acuminata

E. cerasifolia

Litsea oblonga

Lyonia ovalifolia

Macaranga indica

Myrica esculenta

Rhus succedanea

*Rhododendron anthopogon**

R. arboreum

Zizyphus incurva

(* understorey species)

Stand description:

The most prominent species is *S. wallichii;* it is abundant below 1800 m where many tall trees (dbh - max. 63 cm, mean 59.3 cm) are conspicuous. In the higher elevations of this stand

A. nepalensis (dbh - max. 70 cm, mean height 23.1 m) is also frequent in the upper canopy, along with fewer *C. ochnacea, E. spicata, L. ovalifolia* and *M. esculenta*. With decreasing altitude *S. wallichii* maintains its prominance, with *E. spicata* as the next most abundant species in the canopy. Scattered trees of *C. indica, C. ochnacea, E. acuminata, L. oblonga, M. indica, M. esculenta, R. succedanea* and *Z. incurva* also occur. *L. ovalia* and *R. aboreum* are characteristic of drier sites.

Dense shrubberies of *R. anthopogon* occur at some sites but *Eupatorium adenophorum* is the main ground cover, with a height of up to 2.4 m. Ferns (especially dense masses of *Gleichenia glauca*) are common, and the scrambling *Rubus foliolosus* also occurs. Only on dry exposed ridges is *E. adenophorum* scattered and small or absent.

Regeneration:

Tree regeneration is almost absent; very few seedlings of any species are present.

History and use:

See under 'The Colonel's Forest' above.

Bhalukhop Forest (F.11)

Location: Bhalukhop Forest extends to NE from Thumki Forest, from Bhusikhola basin and Bhalukhop hamlet in the west to the top of the Laure Bhanjyang ridge to the east. The hamlet of Bhalukhop lies in Bekhsimle panchayat, Laure in Sano Bangthali panchayat.

Elevation: 1800-2220 m

Predominant aspect: NW; slope: 37-38° (very steep)

Original forest type: Rhododendron and Upper Slopes Mixed Hardwood Forests.

Most prominent species:

Rhododendron arboreum

Main associates:

Alnus nepalensis

Berberis sp.*

*Camellia kissi**

Cotoneaster sp.*

*Desmodium microphylla**

Engelhardtia spicata

*Eurya acuminata**

E. cerasifolia

Ilex doniana

Juglans regia

*Lagerstroemia floribunda**

Litsea oblonga

Lyonia ovalifolia

*Mahonia nepalensis**

Myrica esculenta

Myrsine semiserrata

*Pyrus pashia**

*Quercus lanuginosa**

Q. semecarpifolia

Rhododendron arboreum

Rhus succedanea

Schima wallichii

(* understorey species)

Shrubbery:

Many species are represented by small heavily-lopped shrubs, especially:

Berberis sp.

Camellia kissi

Cotoneaster sp.

Dichroa febrifuga

Eurya spp.

Lagerstroemia floribunda

Lyonia ovalifolia

Mahonia nepalensis

Myrica esculenta

Myrsine semiserrata

Phyllanthus parviflora

Pyracantha crenulata

Pyrus pashia

Quercus lanuginosa

Q. semecarpifolia

Rhododendron anthopogon

R. arboreum

Rhus sp.

Schima wallichii

Stand description:

R. arboreum is the most prominent species in the canopy throughout this forest.

Towards the top of the ridge (2200 m) on very dry and SW facing slopes *Berberis* sp., *L. ovalifolia, M. esculenta, M. semiserrata, P. pashia, Q. lanuginosa* and rarely *S. wallichii* are present in shrubbery form.

Between 2100-2200 m *R. arboreum* is of considerable size on the west facing slopes (dbh max. 74 cm, mean 47.5 cm) and large trees of *A. nepalensis* occur in gullies and shady depressions. Scattered *Q. semecarpifolia* occurs on drier N and NW slopes as small, heavily lopped trees (dbh - max. 18 cm, mean 15 cm) and shrubs. Many other species are found, mainly as shrubs.

Between 1900-2100 m the top canopy is almost continuous *R. arboreum*, occasionally broken by dense patches of *I. doniana* (dbh - max. 65 cm, mean 42.2 cm), particularly on easterly aspects, and in gullies. Other large trees include *A. nepalensis*. (dbh - max. 132.5 cm) mainly in gulleys, fifteen mature *J. regia* and *L. oblonga* (dbh - max. 48 cm, mean 34.5 cm). Many other species occur in the understorey and shrubbery.

In the lowest section (1800-1900 m) *R. arboreum* becomes very scattered and its main associate in the top canopy changes to *E. spicata* (dbh - max. 89 cm, mean 74.3 cm). The frequency of

S. wallichii, mainly as coppice, increases considerably. *A. nepalensis* is found primarily in shady depressions and a few *J. regia* are present.

On very dry and exposed sites, the ground cover is often the fern *Gleichenia glauca* but elsewhere *Eupatorium adenophorum* is the most abundant except under very dense shade. *E. adenophorum*[1] is particularly vigorous on overgrazed, moist sites where the upper canopy is broken. Here plants may reach 2.5 m height. Dense masses of *Rubus foliolosus* may also occur on such sites.

Regeneration:

Seedlings of *A. nepalensis* *Eurya* spp., *L. oblonga*, *M. esculenta*, *M. semiserrata*, *Q. semicarpifolia*, *R. arboreum* and *S. wallichii* were found, although rarely where *Eupatorium* dominated the ground.

History and use:

See under 'The Colonel's Forest' above.

Mahaghar Forest (F.8)

Location: Mahaghar Forest lies to SW of Thumki Forest adjacent to Mahaghar, Neopane and Siurani villages of Simthali panchayat. The land is very steep and downhill to SW and W adjoins the Suirani Pakho Shrubland.

Elevation: 2050-2200 m

Predominant aspect: N; slope: 37-38° (very steep)

Original forest types: Rhododendron and Upper Slopes Mixed Hardwood Forests.

---

[1] Plate 47

Most prominent species:

Rhododendron arboreum

Main associates:

Alnus nepalensis

Eurya cerasifolia

Garuga pinnata

Litsea oblonga

Lyonia ovalifolia

Michelia champaca

Myrica esculenta

Myrsine semiserrata

Pinus roxburghii

Pterocarpus santalinus

Pyracantha crenulata

Pyrus pashia

Quercus fenestrata

Q. glauca

Q. lanuginosa

Rhus wallichii

Schima wallichii

Trichillia connaroides

Shrubbery:

Berberis sp.

Camellia kissi

Dichroa febrifuga

Eurya cerasifolia

Lagerstroemia floribunda

Lyonia ovalifolia

Maesa chisia

Mahonia nepalensis

Myrica esculenta

Myrsine semiserrata

Pyracantha crenulata

Quercus lanugenosa

Rhus wallichii

Rhododendron arboreum

Rubia cordifolia

Viburnum nepalensis

Xanthoxylum acanthopodium

Stand description:

In the upper section of this forest (2100-2200 m) *R. arboreum* is the major species in the upper canopy, with *L. ovalifolia* as its main associate, *M. esculenta* and *Q. fenestrata* also being present. Representative data, from groups of trees, are:

R. arboreum (Group 1, 12 trees) dbh - max. 52 cm, mean 26.5 cm. Height - max. 8.55 m. (Group 2, 10 trees) dbh - max. 65 cm, mean 34.6 cm. Age - c. 90 years. (Group 3, 2 trees) dbh - max. 76 cm, mean 73.5 cm. Age - c. 125 years.

L. ovalifolia (Group 1) dbh - max. 50 cm, mean 30.9 cm. (Group 2) dbh - max. 17 cm, mean 14.7 cm.

Between 2050-2100 m the stand is markedly poorer, especially so near the villages. There, apart from a few trees of *R. arboreum* and *A. nepalensis*, the stand has degenerated to a heavily lopped shrubbery. Further from the villages, however, large numbers of *R. arboreum*, *A. nepalensis* (dbh - max. 67 cm, mean 47.5 cm), *L. ovalifolia* and scattered trees of *L. oblonga*, *P. roxburghii* and *S. wallichii* persist.

The groundcover in most areas is dominated by *Eupatorium adenophorum* but ferns, *Lycopodium clavatum*, *Asparagus racemosus* and *Indigofera cylindrica* are also common.

Regeneration:

Seedlings of all tree species were extremely few: only three of *R. arboreum* and one of *E. acuminata* were found in a representative plot of 100 m^2.

History of use:

See under 'The Colonel's Forest' above.

Siurani Pakho Shrubland (F.9) (Plate 37)

Location: The Siurani Pakho shrubland lies SW and W of the Mahaghar Forest on extremely steep (up to 40° slope) rocky land from the Runchekhola basin to the top of Phagar Danda. Mahaghar, Siurani and Runchekhola villages of Simthali panchayat, and Phagar and Patlegaon villages of Chaubas panchayat, are immediately adjacent.

Elevation: 1760-2150 m

Predominant aspect: N; slope: 38-40° (very steep)

Original forest type: Upper Slopes Mixed Hardwood Forest.

Most prominent species:

Rhododendron arboreum

Main associates:

Alnus nepalensis

Eurya acuminata

Litsea oblonga

Lyonia ovalifolia

Pinus roxburghii

Schima wallichii

Shrubbery:

Species in shrub form were similar to those in the Mahaghar Forest.

Stand description:

The area is covered with low shrubs (1-1.5 m high), and with a few scattered, stunted, and malformed trees. *Eupatorium adenophorum* has largely suppressed other herbs and grasses. Fires are said to be rare. Few people considered that the northern portion contained more and better trees (similar to Mahaghar Forest) in their youth but others remembered no change.

Sangasoti-Laure Shrubland (F.14-17) (F.14-17)

Location: The boundaries of this area are: on the north - Sangasoti-Laure ridge; S - Sangu Khola, Dobhan Khola, with the villages of Jarange, Danda Kharka and Sano Bangthali; E - Patale cultivated area; W - Hile Danda. Locally, the area is divided (W-E) into: Sangasoti-Jarange Pakho (F.17), Simnagi-Dandakharka Pakho (F.16), Surke Pakho (F.15), and Simpani Pakho (F.14).

Elevation: 1770-2260 m

Predominant aspect: S; slope: 14-17° (moderate)

Original Forest Type: Upper Slopes Mixed Hardwood Forest.

Most prominent species*:

Rhododendron arboreum

Main associates*

Alnus nepalensis

Berberis sp.

Castanopsis tribuloides

Engelhardtia spicata

Eurya acuminata

E. cerasifolia

Ficus nemoralis

Fraxinus floribunda

Hypericum ovatum

Ilex doniana

Lyonia ovalifolia

Myrica esculenta

Myrsine semiserrata

Prunus cerasoides

Pyrus pashia

Quercus fenestrata

Q. lanuginosa

Rhus succedanea

Schima wallichii

(*almost entirely as lopped, browsed shrubs)

Stand description:

The whole of this area has been reduced to poor grassland with scattered low shrubs c. 1 m high, although the species still present indicate that Upper Slopes Mixed Hardwood Forest was once present. The western portions, nearer villages, are more barren than the eastern. The only trees now existing are those of preferred fodder and fuelwood species (*A. nepalensis*, *C. tribuloides*, *F. nemoralis*, *Q. lanuginosa* and *S. wallichii*) at the edges of cultivated land, where they are effectively privately-owned since the time of bijan darta registration of dryland.

Measurements of such protected trees were:

C. tribuloides dbh - max. 39 cm, mean 33.2 cm; height - max. 12.1 m, mean 10.9 m. *M. esculenta* dbh - max. 44 cm. *Q. lanuginosa* dbh - max. 21 cm, mean 16.9 cm; height - max. 11.6 m, mean 8.4 m. *R. arboreum* dbh - max. 12 cm, mean]0.5 cm. *S. wallichii* dbh - max. 13.5 cm, mean 12.0 cm.

Between the shrubs the ground cover is mainly grasses; even *Eupatorium adenophorum* and ferns are much reduced by the exposed, degenerate nature of the site.

Regeneration:

There were very few seedlings of any species. A count within a 100 m^2 plot in the relatively better north portion revealed the following seedlings: *Berberis* sp. (5), *C. tribuloides* (2), *E. spicata* (1), *Eurya* sp. (1), *M. semiserrata* (10), *Q. lanuginosa* (15), *R. arboreum* (2), *S. wallichii* (2). In the same plot there were 34 plants of *E. adenophorum*.

History and Use (I.8,17-18,20-24,26-32)

The contrast of Sangasoti-Laure shrubland with the adjacent Thumki, Bhalukhop and Mahaghar forests with different aspect and history is extreme. The Sangasoti-Laure area has clearly been subject to excessive lopping, felling and collection of leaf litter and grazing for a long period. Of those interviewed, only a few thought that the area was in slightly better condition in their youth. A few abandoned terraces can be seen but certainly are not of a recent origin. The history of the area is little known and unclear. The Ghyangalidanda in the Sangasoti locality was converted into terraces sometime in the distant past, later abandoned, then reclaimed for agriculture by Ghyangali Tamang, hence its current local name, and abandoned again c. 45-50 years ago. Since then these terraces have remained abandoned.

In the Surke locality the Kumai Brahmins (including the Kharels) had kept their goths for summer grazing and practiced limited agriculture. According to local inhabitants terracing and new land reclamation was achieved by their previous generations and little significant change in land-use pattern has taken place since, although small areas might have been added to terraced agriculture from adjacent shrubland and grazing areas. The Kharels have been living in Surke on a permanent basis for c. 30 years now.

At Laure Bhanjyang the few houses, some including shops selling a few basic items for local consumption and providing shelter to travellers by night in an otherwise lonely area, are reported to have been there for a considerable time. Old abandoned terraces are visible in the vicinity of Laure. The area, generally facing south, has remained a poor and over-grazed grassland, devoid of trees and with only very scattered shrubs for as long as those interviewed could remember.

The extent of impact of past copper mining, smelting and minting activities of nearby Nagre (also called Nagre Taksar, Taksar: mint) on the forests of Laure and adjoining slopes is uncertain. It is, however, known that the government had put great emphasis on these activities since the late 18th century in the eastern Pahad, including Kabhre and Sindhu Palchok areas (section 4.3.3). Gorakhpuri coins minted at Nagre according to the government orders of 1817 were among the Nepalese coins in circulation in India through traders (Regmi, 1972). The government had also employed Newar metal workers (Banas) from Kathmandu and Bhaktapur to operate the Nagre mint. Many of them acquired property and settled in the area of their work. Descendants of these Newar mint workers still live in Nagre, Bhusapheda and other nearby areas. Those interviewed also have a knowledge of the mining activities continuing in the area until about the first quarter of the present century (I.24,26; see also section 4.2).

Such evidence supports the assumption that mining, smelting and minting activities flourished in the area in the past and depended on local charcoal and fuelwood for their energy needs with obvious consequences of accelerated deforestation in the Laure-Sangasoti, Thulo-and Sano-Bangthali and other nearby areas. These areas today present a picture of extreme deforestation and are rather desolate looking. Nagre itself is today the site of conspicuous erosion and the longest landslide in the two Districts.

Nigale-Luku Forest (F.18)

Location: The Nigale-Luku Forest is the collective name given to various forest localities, situated west to east, of Luku, Nigale, Gurumarang Kharka and Alung Kharka. This forest is situated on generally north-facing slopes and extends N-S from 1750 m at Wafal Khola basin to 2240 m at the top of the ridge along the southern edge of which runs the Laure Bhanjyang-Nagre track. E-W, it extends between the Wangarche (Nagre) Danda and the Laure-Wafal Bhanjyang track.

Elevation: 1750-2240 m

Predominant aspect: N; slope: 25-30° (steep)

Original forest types: Upper and Lower Slopes Mixed Hardwood Forests.

Most prominent species:

Rhododendron arboreum

Main associates:

Alnus nepalensis

Berberis sp.*

*Camellia kissi**

Castanopsis tribuloides

Choerospondias axillaris

Engelhardtia spicata

Eurya sp.*

*Inula cappa**

Ilex doniana

Juglans regia

*Lagerstroemia floribunda**

Litsea oblonga

Lyonia ovalifolia

*Mahonia nepalensis**

Myrica esculenta

Prunus cerasoides

*P. nepalensis**

*Pyrus pashia**

Schima wallichii

*Viburnum coreaceum**

(* understorey species)

Shrubbery:

Many of the above species in addition to very low to prostrate heavily lopped and browsed shrubs of *Quercus lanuginosa* towards the ridge.

Stand description:

R. arboreum (dbh - max. 58.5 cm, mean (7 trees) 44.1 cm; mean height 12.1 m) is dominant throughout the stand except towards the ridge top. *L. ovalifolia* is also common in the forest canopy. *E. spicata* (dbh - max. 58 cm, mean (3 trees) 51.5 cm; mean height 15.4 m) is also common particularly below 2000 m. Above this altitude the density of bigger mature trees of *E. spicata* decreases considerably and the species occurs singly as poles or saplings. Lesser numbers of *S. wallichii*, *L. oblonga* and *M. esculenta* are scattered in the forest canopy with *A. nepalensis* being more abundant along the gullies and shady depressions. Also, rather sparsely scattered in the canopy are tall mature to over-mature trees of *J. regia.*

The forest as a whole gradually starts thinning above 2000 m with increasing incidence of lopping and felling thus indicating greater pressure from the south. Above 2100 m, generally speaking, the forest consists of shrubbery of most species of lower altitudes. *R. arboreum* and *L. ovalifolia* still predominate with a few heavily lopped and malformed trees of even larger diameter. Towards the ridge top *Q. lanuginosa* is seen as a very low and almost prostrate shrub but only in patches, being often completely dominated by the dense ferns. Old and new charcoal pits occur all over the place in this forest.

Eupatorium adenophorum is found towards the shady slopes and along the gullies. Even here it is hardly ever able to cover the ground fully and occurs either in dense clusters or singly. Ferns are seen on dry exposed ridges. Towards the upper part of this forest (above 2180 m) dense masses of *Gleichenia glauca* completely cover the ground dominating any *Q. lanuginosa* or a few other species that may exist here.

Regeneration:

R. arboreum, E. spicata, C. tribuloides, L. ovalifolia and *S. wallichii* are represented in regeneration stages at altitudes below 2100 m.

History and use (I.31; also informal interviews with the inhabitants of Nargaon, Wafal and Lisankhu.)

The impact of man through felling, lopping, browsing, charcoal making and some clearing in this apparently dense looking Nigale-Luku forest can be clearly discerned. Interviews with the local residents suggest that in the past it was all Tamang Kipat land, and the forest and grazing land was also under Kipat management. Indo-Aryan penetration in the area resulted, however, in the gradual disappearance of the Tamang communal land ownership and its conversion into raikar tenure. Such steps of the government as the introduction of the Hale-Pate-Kodale system of land survey and registration in 1895 in the region seem to have further strengthened the process while encouraging reclamation of new land in steep higher country. It thus also encouraged the Lekh-besi system of land holding in which a farmer traditionally living and cultivating land at lower altitudes (besi) with moderate climate also cleared land and made a goth at higher altitude (lekh) for growing summer crops but principally for grazing and browsing of livestock in the summer. When the government, to further extend its land tax base, began to allocate forest areas as private grazing and pasture land (kharka) the Upreti Brahmins registered this forest as their kharka, leading to further degradation of forest. The Upretis came from Bhumlu and other adjacent lower areas and had settled in adjacent Nargaon in an otherwise predominantly Tamang country. Some more Upreti and Kharel Brahmins had also settled in nearby Balkuche and Patale hamlets on towards the upper part of the adjacent southern slopes of the Pathibhara ridge. The 1945 Bijan darta system also registered as private property some agricultural land fringing on forest.

No recent evidence of clearing of forest for agriculture was witnessed or reported in the Nigale-Luku forest or the other adjacent areas although old abandoned terraces were met and indicated past efforts that failed. Occurrence of charcoal pits all over the forest, many of them old, indicated the continued heavy incidence of charcoal-making within the forest itself; *Lyonia ovalifolia* being the most popular species for the purpose among kamis of local and surrounding areas. *Myrica esculenta* is also used for the purpose while *Rhododendron arboreum* is less preferred for charcoal although it is popular for fuelwood. This forest has also been always used for grazing, browsing, lopping and timber by the population of adjacent Nigale, Rajchhap, Guru-Marang and Alung villages and that of surrounding lower areas, particularly to the south.

Balkuche-Patale Pakho shrubland (F.13)

Location: The Balkuche-Patale Pakho is situated on the southern slopes and extends upwards from the Dobhan Khola basin at 1770 m forming its southern boundary to the top of the ridge (2240 m) in the north. The ridge separates it from the Nigale-Luku forest of the north facing slopes. Patale cultivated areas lie to its west and the Thulo Bangthali danda to its east.

Elevation: 1770-2240 m

Predominant aspect: N; slope: 30-35° (steep)

Original forest type: Upper Slopes Mixed Hardwood Forests.

Most prominent species:

Quercus lanuginosa

Alnus nepalensis

Main associates: (mainly as young and small trees)

Betula alnoides

*Camellia kissi**

Ficus nemoralis

*Leucosceptrum canum**

Lyonia avalifolia

Myrica esculenta

Prunus cerasoides

*Pyracantha crenulata**

Pyrus pashia

Rhododendron arboreum

Rhus succedanea

Schima wallichii

(* understorey species)

Shrubbery:

Besides most of the above species the shrubbery consists of: *Berberis* sp., *Engelhardtia spicata*, *Eurya* sp., *Ilex doniana*, *Q. lanuginosa*, *Rhus javanica*, etc.

Stand description:

The main feature of the Balkuche Pakho is the small forest consisting of a few patches of pure stands of *Q. lanuginosa* and others of mixed nature growing on the upper part of the slope and along the gullies and depressions fringing the Balkuche cultivated area. This forest has come up as a result of protection instituted by the local people in order to meet their needs of fodder, fuelwood and other forest produce, their action being especially encouraged by the bijan darta system of land registration under which forest and trees could be maintained on private land. (See section on history and use below.) Pure stands of *Q. lanuginosa* are found mainly in two age classes. The first is c. 55-60 years old with a mean (23 trees) dbh of 20 cm. The younger stands are c. 35-40 years old. *A. nepalensis* (dbh - max. 57 cm, mean (7 trees) 42.2 cm; age c. 40 years) dominates the canopy along moist gullies and depressions where the pole stages (dbh - max. 19.75 cm, mean 12.75 cm) are also growing impressively. Particularly on the protected SW slopes above 2000 m the forest canopy is scattered with *B. alnoides*, *C. kissi*, *F. nemoralis*, *L. ovalifolia*, *M. esculenta*, *P. pashia*, *R. arboreum* and *R. succedanea* and a few other species. Below 2000 m most species met are in the form of heavily lopped and browsed shrubs. Even this shrubland grades into poor, overgrazed grassland below 1900 m.

Eupatorium adenophorum is particularly abundant along the Dobhan Khola valley, where it completely covers the overgrazed ground. It also covers the poor grassland slopes up to 2000 m altitude except the sites dominated by dense patches of ferns, mainly *Gleichenia glauca*. Between 2000-2100 m, *E. adenophorum* is seen to occur in open patches in the canopy but occurs infrequently under the canopy.

The weed is absent from the ridges and dry exposed slopes above 2100 m.

Regeneration:

A. nepalensis is represented in various regeneration stages in moist localities. Fast colonizing *E. adenophorum*, however, tends to dominate the younger regeneration of the tree species.

History and use (Author's informal interviews with Hari Prashad Upreti and Dharma Raj Kharel)

The Upreti and Kharel Brahmins from lower altitudes had reclaimed land and settled in Balkuche and Patale areas perhaps in the last century. Living memories of local inhabitants, however, suggest that excessive exploitation and shortage of forest resource in the locality had induced farmers to protect forest near their agricultural land since at least the beginning of the present century. The farmers started protecting trees and forest, especially of preferred species. Hari Prashad Upreti, 79 years of age, therefore, remembered the older stand of *Q. lanuginosa* in Balkuche as only a heavily-browsed very low scrub in his childhood and which started growing bigger when he was c. 15-20 years of age. By the time he was 60 the trees were about the present size (dbh - mean (23 trees) 20 cm). The younger stand of *Q. lanuginosa* according to him was c. 35-40 years old and its protection was instituted by his brother Krishna Prashad Upreti who is now dead. Initiation of protection of the latter stand coincides with the introduction of the bijan darta system. Krishna Prashad Upreti and his family seem to have protected other trees and forest also in Balkuche, presenting even today a good example of local level conservation efforts.

Patale is not as fortunate as some other areas, although *Q. lanuginosa* seems to have been protected here more recently. Here old and abandoned terraces are conspicuous.

5.6.2 Gogane Pakho and adjacent areas (Plates 1b, 29, 30, 35)

These include the Gogane Pakho, Silkhu-Devisthan forest, Bhedukharka Pakho, Pokhari-Lumel Pakho and the Thampokhari-Machhyan forest areas. The first four of these forest and shrubland areas are situated on the various slopes of the Devisthan-Gogane ridge while the Thampokhari-Machhyam forest faces the eastern slopes of it. Gogane Pakho and Bhedukharka Pakho form parts of the Thokarpa panchayat, Silkhu-Devisthan forest falls in Sunkhani panchayat and Pokhari-Lumel Pakho and Thampokhari-Machhyam forest areas are included in the Lisankhu panchayat.

History and use (I. 31, 32, 33, 34, 35)

Limited information was obtained of the history of this area in general. The impact of man and animal is, however, clearly seen grading from severe to moderate in the various component parts. The earliest utilization by felling, lopping, browsing and limited clearing was probably by the Tamangs, and then by the Brahmins and other Indo-Aryan ethnic and caste groups. Under the pressure of the latter groups the Tamang communal land (kipat) ownership patterns were relaxed, to eventually disappear from the area as from elsewhere in the two districts. Thus in the process of Indo-Aryan penetration and domination, a few cultivated areas and terraces were created in the region. This activity was strengthened by the introduction of Brahminic legislation and Indo-Aryan land tenure patterns benefiting the dominant groups and increasing the government's land tax base, and also adversely affecting the forest resource. Thus, according to the 1895 Hale-Pate-Kodale System of land survey and registration, reclaimed land (particularly khet land) could be registered as private land under this system. Little land suitable for cropping existed, however, and much that had been cleared reverted to shrubland. A further attempt by the government to increase revenue occurred in 1907 in this area when large areas of forest land were allocated to individuals as private grazing and pasture land (kharka). This formalized the right to browse and lop leading to further degradation of stand but no alteration to its boundaries.

Next in 1945, the Bijan darta survey and registration system was introduced under which not only agricultural and grazing lands but also forest and land planted with trees could be registered as private land. The consequence was that land owners began to protect trees on their bijan darta land, using them more conservatively for their own purposes.

Gogane Pakho (F.19) (Plate 1b, 29)

Location: South and SE slopes of Devisthan-Gogane ridge.

Elevation: 2100-2360 m

Predominant aspect: S; slope; 25-30° (steep)

Original forest types: Rhododendron and Upper Slopes Mixed Hardwood Forests.

Most prominent species:

Rhododendron arboreum

Main associates (mainly as shrubbery)

Berberis sp.

Camellia kissi

Castanopsis indica

C. tribuloides

Desmodium tilifolium

Eriobotrya dubea

Eurya spp.

Ilex doniana

Lyonia ovalifolia

Mahonia nepalensis

Myrica esculenta

Myrsine semiserrata

Prunus cerasoides

Pterocarpus santalinus

Pyracantha crenulata

Pyrus pashia

Quercus lanuginosa

Q. semecarpifolia

Rhus succedanea

Rosa spp.

Rubus foliolosus

Schima wallichii

Symplocos pyrifolia

Stand description:

Above 2300 m *R. arboreum* forms an almost pure, dense forest (dbh - max. 45.5 cm, mean 28.9 cm; height - max. 9.9 m, mean

7.26 m), but scattered small trees of *L. ovalifolia, M. esculenta* and *Q. semecarpifolia* also occur. In openings these species occur as shrubs, along with *Q. lanuginosa*.

Below 2300 m, *R. arboreum* is still the commonest species, represented by low open, woodland or shrubs. All its associates (listed above) also occur as low shrubs.

Eupatorium adenophorum covers the ground under canopy openings above 2300 m. Below this, the dense shrubbery has greatly restricted colonization by this species.

Regeneration: *L. ovalifolia, Q. semecarpifolia* and *S. pyrifolia* are represented in regeneration stages.

History and uses:

The Gogane Pakho has been open woodland and shrubbery for as long as the memory of the interviewees and there is no oral history of mature forest existing at the site. Following some earlier utilization by Tamangs for browsing, lopping and limited clearing, the Neopane Brahmins of lower Thokarpa used these higher (lekh) areas as their summer refuge building goths for the purpose. In winter they returned to their besi (lowland) homesteads. This unusual Brahmin transhumance no doubt also reflects severe pressure on resources on the lower Sun Kosi slopes which occurred more than one hundred years ago. Such severe pressure on resources during the period was also reflected in the Kharel and Upreti Brahmins transhumance activities in Surke, Nargaon, Balkuche and Patale lekh areas of Kabhre.

The Neopane Brahmins established a few cultivated areas and terraces in the Gogane Pakho and this activity was strengthened by the introduction of the Hale-Pate-Kodale System of land survey and registration. Pressure on the lower lands led the Neopane Brahmins and others subsequently to spend 9-12 months of the year at these higher altitudes, tilling such land as was suitable and practising free-range animal husbandry. This had led to the maintenance of an extreme disclimax ecosystem, undergoing slow degeneration within relatively fixed landuse boundaries. The pressure is greatest on the warmer southerly slopes at this altitude, less on the cooler easterly aspects, and this is reflected in the vegetation.

Silkhu-Devisthan Forest (F.20) (Plate 35)

Location: N and NW slopes of the Devisthan-Gogane ridge

Elevation: 2100-2360 m

Predominant aspect: N and NW; slope: 35-37° (very steep)

Original forest types: Rhododendron Forest and Upper Slopes Mixed Hardwood Forest.

Most prominent species:

Rhododendron arboreum

Pterocarpus santalinus

Main associates:

Alnus nepalensis

Camellia kissi

Engelhardtia spicata

Eurya acuminata

E. cerasifolia

Ilex doniana

Litsea oblonga

Lyonia ovalifolia

Myrica esculenta

Pyrulis edulis

Pyrus pashia

Quercus lanuginosa

Q. semecarpifolia

Rhus succedanea

Schima wallichii

Symplocos pyrifolia

Shrubbery:

Many of the above species in addition to:

Myrsine semiserrata

Plumbago zeylanica

Rhus javanica

Viburnum coriaceum

Stand description:

Above 2300 m, mature *R. arboreum* often forms a dense upper canopy with few associates. On the somewhat drier NW aspect sites, *R. arboreum* sometimes stands over a low open woodland of *Eurya* spp., *M. esculenta, Q. lanuginosa* and *Q. semecarpifolia* whilst on cooler N aspects its associates are mainly *E. spicata, I. doniana, P. santalinus* and *S. pyrifolia*. A shrubbery, of species listed above, may also be present.

Between 2100-2300 *P. santalinus* is the most prominent species (dbh - max. 50 cm, mean 35.5 cm; height max - 21 m, mean 13.1 m), the largest trees being in gullies and depressions.

Where it is growing less densely it is often associated with shorter trees, occasionally shrubs, of the main associates listed above.

Eupatorium adenophorum is scanty where the canopy is dense but completely covers the ground under canopy openings, especially on damper sites.

Regeneration:

Established older regeneration stages of *P. santalinus* are present but younger stages of it are either missing or suppressed by *E. adenophorum*. Regeneration of *S. pyrifolia* is also seen.

History and use

Although nothing in particular of the history of the area was obtained from the interviews, it is clear that the nature of the present stand was determined by man. Abandoned terraces at Dhakrepari show failed efforts of agricultural land extension in this forest. *R. arboreum* has been heavily exploited to make charcoal and many abandoned and new charcoal pits along with *R. arboreum* stumps are present within the forest. *P. santalinus* is, however, not favoured by Kamis for charcoal making nor is it lopped for fodder. It is also not a preferred species for either fuelwood or construction purposes. It has therefore been allowed to remain and has become the most prominent tree below 2300 m because most of its associates are preferred species for one purpose or another and therefore have been lopped or coppiced.

Bhedukharka Pakho (F.21)

Location: NW slopes of the Devisthan-Gogane ridge with a lower boundary set by the terraces of Bhote Yamna in the Sayele Khola.

Elevation: 1650-2100 m

Predominant aspect: NW; slope: 34-36° (very steep)

Original forest types: Upper and Lower Slopes Mixed Hardwood Forests

Most prominent species:

No single species

Main associates (large shrubs):

Alnus nepalensis

Berberis sp.

Camellia kissi

Desmodium tilifolium

Eurya spp.

Litsea oblonga

Lyonia ovalifolia

Myrica esculenta

Pterocarpus santalinus

Pyracantha crenulata

Pyrus pashia

Quercus lanuginosa

Q. semecarpifolia

Rhodendron arboreum

Rhus succedanea

Schima wallichii

Xanthoxylum hamiltonianum

Stand description:

The stand consists mainly of a low shrubbery of many species, over which in a few localities scattered trees of *A. nepalensis*, *L. oblonga*, *P. santalinus*, *R. arboreum* and *S. wallichii* occur. The trees are fewer at lower altitude and below 1950 m the stand is reduced to vertical strips between strips of terraced agricultural land extending up from the main agricultural zone below 1650 m. The whole area is under heavy pressure from man and animals.

Eupatorium adenophorum and a number of colonial fern species form a dense ground cover between shrubs and on abandoned terraces.

Regeneration:

Seedling stage regeneration of *R. arboreum* in good number was observed in areas colonized by *E. adenophorum*.

History and use:

Little is known of the history of this area but abandoned terraces, now covered with shrubs and *E. adenophorum*, show that attempts to convert some of the area to agriculture were made in the past. This is not surprising in the light of the existing heavy pressure by man and animals on the remaining vegetation, but the remaining scrubland cannot support agriculture.

Pokhari-Lumel Pakho (F.22) (Plates 29, 30)

Location: Eastern slopes of Devisthan-Gogane ridge; lower boundary the terraced agricultural land of the Ratan Khola.

Elevation: 1800-2250 m

Predominant aspect: E; slope: 25-30° (steep).

Original forest types: Upper and Lower Slopes Mixed Hardwood Forests

Most prominent species:

No single species above 2000-2250

Alnus nepalensis)
Engelhardtia spicata) 2000-2250 m
Schima wallichii)

Main associates:

Berberis sp.

Betula alnoides

Camellia kissi

Castanopsis indica

Cleyera ochnacea

Desmodium tilifolium

Engelhardtia spicata

Eurya spp.

Lyonia ovalifolia

Machilus gamblei

Myrica esculenta

Myrsine semiserrata

Pterocarpus santalinus

Pyrus pashia

Quercus lanuginosa

Q. semecarpifolia

Rhododendron arboreum

Rhus succedanea

Schima wallichii

Viburnum coreaceum

Woodfordia fruticosa

Stand description:

Above 2000 m the stand has been largely reduced to a shrubbery and low woodland, under heavy human and animal pressure. The main species present here are *Berberis* sp., *C. kissi*, *E. spicata*, *Eurya* spp., *L. ovalifolia*, *M. esculenta*, *M. semiserrata*, *P. santalinus*, *P. pashia*, *Q. lanuginosa*, *Q. semecarpifolia*, *R. arboreum* and *R. succedanea*, representative of Upper Slopes Mixed Hardwood Forest. The stand is relatively better as 2000 m is approached.

Between 1800-2000 m the stand composition is basically that of Lower Slopes Mixed Hardwood Forest. *S. wallichii* (mean dbh - 47.3 cm, mean height 19.25 m) and *E. spicata* (dbh - max. 64 cm, mean 61 cm; mean height 14.95 m) form an open woodland with many *A. nepalensis* and *C. indica*. Other tree species are *B. alnoides*, *Eurya* spp., *L. ovalifolia*, *M. esculenta*, *M. semiserrata*, *P. santalinus*, *R. javanica*, *R. succedanea*, and *R. arboreum*. The understorey consists of smaller trees of the above species along with *C. kissi*, *C. ochnacea*, *M. nepalensis* and *W. fruticosa*.

The ground cover is varied with relatively little *Eupatorium adenophorum*.

Regeneration:

Few seedlings or young plants were found in the highest shrubbery but lower, especially in gullies and depressions, they were common. Many young plants of *E. spicata*, *L. ovalifolia*, *R. arboreum* and *S. wallichii* were found at about 2050 m, along with those of *C. ochnacea, Desmodium* sp., and *V. coriaceum.* Coppice regeneration of *E. spicata, L. ovalifolia, M. gambei, P. santalinus* and *S. wallichii* was also noticeable. Lower, seedlings and coppice regeneration of many species were found, especially *E. spicata* and *S. wallichii.*

History and use:

Little was learnt of the history of this particular area but the impact of man and animals is clearly seen, grading from severe at the highest elevation to moderate lower down.

Thampokhari-Machyam Forest (F.23) (Plate 30)

Location: Western slopes of Thampokhari Danda and facing the east facing slopes of Devisthan-Gogane ridge.

Elevation: 1800-2350$^+$ m

Predominant aspect: W; slope: 31-35° (steep)

Original forest types: Rhododendron and Upper and Lower Slopes Hardwood Forests.

Most prominent species:

Rhododendron arboreum

Schima wallichii

Main associates:

Alnus nepalensis

Castanopsis indica

C. tribuloides

Choerospondias axillaris

Desmodium tilifolium

Engelhardtia spicata

Eurya spp.

Ilex doniana

Litsea oblonga

Lyonia ovalifolia

Myrica esculenta

Prunus cerasoides

Pterocarpus santalinus

Quercus semecarpifolia

Rhus succedanea

Schima wallichii

Shrubbery:

Many of the above species in addition to:

Berberis sp.

Myrsine semiserrata

Pyracantha crenulata

Quercus lanuginosa

Viburnum coriaceum

Stand description:

Generally speaking this consists of a low forest and shrubbery over which scattered tall trees of a few species form an open woodland.

Towards the uppermost part *R. arboreum* exists either as a pure stand or scattered mixed with various other Upper Slopes Mixed Hardwood species. The ridge top and more exposed upper slopes have *Q. lanuginosa* and *Q. semecarpifolio* with or without *R. arboreum*.

At lower altitudes up to 2000 m *R. arboreum* may still be seen very frequently scattered on drier Thampikhari slopes. On the shadier Machyam slopes, however, the rather open forest consists of many other species including *A. nepalensis, C. tribuloides, E. spicata, I. doniana, L. oblonga, L. ovalifolia, M. esculenta, P. santalinus, Q. semecarpifolia, R. succedanea* and *S. wallichii.*

Below 2000 m *S. wallichii* (dbh - max. 74 cm, mean 54 cm; mean height 23.7 m) is the dominant species seen growing well on these middle and lower slopes where the site is well drained but not too dry. The species is represented here by some large and handsome trees, especially near the terraces where the farmers have protected them. Young and patchy *A. nepalensis* (mean dbh 25 cm, age c. 8-10 yrs) at places stands over low open forest or shrubbery. Generally speaking, however, between 1800-2000 m altitudes *Castanopsis* spp., *C. axillaris, D. tilifolium, E. spicata, Eurya* spp., *L. ovalifolia, M. esculenta, P. cerasoides, P. santalinus* and *R. arboreum* form a low forest towards the upper part grading down to a dense shrubland below due to excessive lopping and browsing.

Eupatorium adenophorum is rather scattered and is not very gregarious on these slopes as a whole. But in blanks and overgrazed areas near terraced lands of Chiple, Bhusinagi, etc., this covers the ground densely. *E. adenophorum* and the scrambling *Rubus foliolosus* are both denser in the shadier and moister slopes of Machyam and along gullies. Dense patches of ferns particularly *Gleichenia glauca* also cover the ground in many places.

Regeneration:

Regeneration stages of *A. nepalensis* in shadier localities and *R. arboreum* towards the upper part of Thampokhari slopes are seen.

History and use:

Nothing in particular was obtained of the history of the area. An examination of the area reveals no new land reclamation. The cultivated areas and hamlets of lower and upper Chiple (2100-2200 m) and Bhusinagi (1900 m) settled by Indo-Aryan groups are considerably older settlements according to local inhabitants. Of particular interest among these is the agri-pastoral farming settlement of Newars in upper Chiple hamlet at 2200 m. The transhumance followed by this permanent settlement of the generally low valley and bazar town living Newars is even more unusual than that of the Brahmins. This further reflects a long history of degeneration of resources at the lower altitudes of the region already in the past. In the Thampokhari-Machyam area itself, it is clear that man and his animals have determined the nature of the present stand.

Comparison with new forest:

Above Thokarpa village lies an extensive ridge (F.1)[1] including various generally south-sloping localities (W-E) of Thamdanda, Baghthala, Sotrenagi, Bhitrenagi (nagi: blank/barren area), Mulkharka, Banjhthala, Kafle, Aiselukharka and Bhanjyangdanda. This until 1975 was covered with an impoverished grassland scattered, particularly towards its eastern part, with some poor shrubbery. In Aiselukharka and Banjhthala there existed abandoned terraces of generally an unknown origin.

[1] Plate 1a

Only the eastern part of this area was comparable to that of the Siurani Pakho Shrubland described above (section 5.6.1).

Mukti Nath Bhandari (Plate 3) was the oldest inhabitant of Thokarpa to be met by the author. Before he died in 1980, aged 91, he had told the author that the Thokarpa ridge immediately above his home had always been as it now was, with no forest, only poor grassland and grazing area scattered with only a few shrubs towards its eastern section.

Other inhabitants of Thokarpa and closeby areas (I. 1-8, 10, 14-18, 23, 31-33) also concurred that although the northern mostly inaccessible slopes had dense trees of *Rhododendron arboreum, Myrica esculenta,* etc., in their younger days they saw no forest or trees on the Thamdanda, Sotrenagi and Bhitrenagi in their living memory. Banjthala and Aiselukharka had abandoned terraces as long as they remembered. The origin of these terraces was generally unknown but some presumed these to have been built well over a century ago in about the middle of the 19th century. At that time also this land was reportedly only a grassland and grazing area with the forest having disappeared before that time. When other local inhabitants objected to this reclamation of their grazing area the newly built terraces were abandoned soon after. Since then these terraces remained abandoned.

After 1975 much of the area was planted with seedlings of pine (*Pinus roxburghii,* and *P. patula*) and a few broad-leaved species, and new forest has developed. Amongst the pines many volunteer trees and shrubs are now to be found of species characteristic of the original forest, as listed below (M.W. Campbell and B. Mohns, pers.comm., 1984).

Berberis asiatica

Desmodium microphylla

Dichroa febrifuga

Engelhardtia spicata

Eurya cerasifolia

Ficus nemoralis

Fraxinus floribunda

Hypericum uralum

Inula cappa

Litsea monopetala

Lyonia ovalifolia

Myrica esculenta

Osbeckia nepalensis

O. stellata

Pyracantha crenulata

Phyllanthus parvifolius

Prunus cerasoides

Quercus pubescens

Rhododendron arboreum

Rubus ellipticus

Schima wallichii

Wendlandia coriacea

5.6.3 Sun Kosi Lower Slopes Forests

Location, elevation and original forest type:

The Sunkosi Lower Slopes Forests studied form a continuous stretch of Hill Sal forest rising from the eastern bank of the Sun Kosi River. The aspect varies between N and W, with the latter predominating. The slope is very steep (38-40°). The western boundary is formed by the river at elevations of 680 m (in the south) to 700 m (in the north). The eastern boundary is formed by the boundary between forest and agricultural land, generally situated at an elevation of c. 1300 m. The southern boundaries of each forest are shown in Table 5.23. The northern boundary of the northern-most Sila Parbat forest block is formed by the Pakhar Khola.

Table 5.23: Forests of Sun Kosi Lower Slopes (in order from north to south)

Forest number	Name	Southern boundary
24	Sila Parbat	Sayele Khola
2	Ambote-Jhilinge	Kafle Kholso
3	Kafle	Shero Kholso
4	Paire Dandakhet	Andheri Khola
5	Kalleri Pakho	Ghartini Khola
6	Jhingetar	Bhusi Khola
25	Saping-Rithe	Ghatte Khola

These forests are a complex association of species, in which *Shorea robusta* is dominant, with *Terminalia tomentosa* as its most important associate. Many of the main associates listed below also occur in the understorey; the species listed as understorey or shrub species are in addition to these.

Most prominent species:

Shorea robusta

Main associates:

Adina cordifolia

Alnus nepalensis

Anthocephalus cadamba

Bambas ceiba

Castanopsis indica

Duabunga sonneratoides

Engelhardtia spicata

Hydrangea anomala

Lagerstroemia parviflora

Pinus roxburghii

Randia uliginosa

Schima wallichii

Semecarpus anacardium

Syzygium cuminii

Terminalia chebula

T. tomentosa

Wrightia antidysenterica

Understorey and shrubs:

Adhatoda vesica

Ardisia macrocarpa

Bassia butyracea

Boehmeria rugulosa

Caesalpina decapitala

Cissampelos pareira

Cornus oblonga

Desmodium floribundum

Eugenia operculata

Ficus clavata

F. glomerata

Indigofera cylindrica

Inula cappa

Lyonia ovalifolia

Maesa macrophylla

Mallotus philippinensis

Phoenix sylvestris

Phyllanthus emblica

Premna integrifolia

Rhus javanica

Smilex menispermoidea

Sterospermum tetragonum

Symplocos pyrifolia

Trichelia connaroides

Wendlandia exerta

Wendlandia sp.

Woodfordia fruticosa

Stand description (F.2-6) (Plates 31, 32):

Forest Numbers 2,3,4,5 and 6 lie within Thokarpa and Kalika panchayats and have been protected from exploitation for a number of years (see the section on History and use below). There is a considerable similarity in stand characteristics between the five forest blocks and they will therefore be described together.

S. robusta is clearly the dominant species throughout, although very few mature trees are present. Generally the canopy is provided by advanced-pole stage trees of the following approximate characteristics:

age 25-30 yr, dbh 16 cm, height 12 m;

age 30-35 yr, dbh 22 cm, height 18 m;

age 35-40 yr, dbh 34 cm, height 24 m.

Other notable species in the upper canopy are *T. tomentosa* (max dbh 55 cm, max height 31 m), *S. wallichii* (dbh 25.6 cm, height 12 m; max dbh 44.5 cm) and, in some sites *L. parviflora* (max dbh 28 cm, max height 24.3 m), *B. ceiba*, and *E. spicata*.

The stand is in good condition in most areas to an elevation of c 1000 m but above this, in closer proximity to villages, the intensity of lopping increases and the stand deteriorates. Near the border with agricultural land in Ambote-Jhilinge forest, *C. indica* is frequent but is heavily utilized. At 1250 m in Paire Dandakhet forest, *S. robusta* gives way to *P. roxburghii*. In Jhingetar forest, 6-7 yr old *S. robusta* poles showed evidence of damage from a severe fire that occurred in 1980. Many had produced coppice shoots from the base.

Abandoned terraces overgrown with forest occur at Jhingetar, Bibirini gairo, Soti kafle, Kafle pakho, Kuhenle pakho, Andhari pakho, Mahaghar pakho, etc. Near the abandoned terraces at Jhingetar there is a very large specimen of *Mangifera indica* (dbh 101 cm, height 14.6 m).

Eupatorium adenophorum is absent or thinly scattered on drier exposed sites or under dense shade. On moister sites, particularly if the canopy is broken, it occurs abundantly.

Regeneration:

Throughout most of these forests, regeneration of *S. robusta* is abundant, with all young age classes represented. Seedlings of *A. cordifolia, C. indica, L. parviflora, T. tomentosa, S. anacardium* and *S. wallichii* can also be found in at least some sites.

Stand description (F. 24,25) (Plate 49):

Sila-Parbat Forest (F.24) and Saping-Rithe Forest (F.25), falling in the Yamma Danda and Saping Bhumlu panchayats, lie to the north and south, respectively, of the forest area discussed in the immediately preceding section and they are fundamentally similar. The obvious differences arise from the fact that the population utilizing Sila Parbat and Saping-Rithe Forests have shown scarcely any interest in protecting and conserving the forest resource in their areas. Thus in Sila Parbat Forest *S. robusta* is largely represented by advanced pole or young tree stages in clumps on the most inaccessible terrain. At elevations between 700-800 m, the age class is predominantly 30-35 years, at 800-900 m, 35-40 yr (dbh 22.2 cm, height 18.2 m, with a few larger trees (dbh 36.3 cm). From 1000-1350 m excessive lopping occurs and scarcely any plants of greater than shrub form exist. The stand in Saping-Rithe Forest is equally poor with heavily lopped, malformed *S. robusta* of perhaps 40-45 yr. At 900 m elevation *P. roxburghii* appears. Ground cover is nearly absent.

Regeneration:

Seedlings and young plants of all species are very few because the area is burnt almost annually and uncontrolled grazing occurs. The contrast between F. 24-25 and F. 2-6 is extreme in this regard.

History and use (I. 1-4,10,11,13-17,28,29,38,40,42,44,50,54)

The oldest person interviewed (I.3) considered that the terraces in the Hill Sal Forest on eastern slopes of the Sun Kosi River below Thokarpa were cleared during the times of the Malla kings of Kathmandu before Gorkhali ascendancy, i.e. over two hundred years ago. In c. 1854, however, an epidemic of eight-day fever (possibly cholera) occurred and a large proportion of the population of the area died. Many cultivated areas and terraces were abandoned, being beyond the immediate needs of the surviving population, and those on the lower Sun Kosi slopes were never brought back into cultivation, presumably because of extreme steepness, lack of water and excessive heat (aul).

These early settlers no doubt used Hill Sal Forest for their own purposes but it remained a superior stand of *Shorea robusta*, *Terminalia tomentosa* and *Schima wallichii* (the last at somewhat higher elevations) into existing human memory. Local revenue functionaries (talukdars, mukhiyas, chitaidars and mijars) became responsible for the forests and only the bada hakim at Chautara was empowered to authorise the harvesting of large timber. Part of the forest was also under the Tamang communal kipat system of landholding and was supervised by the mijars. Elsewhere for the raikar forest areas, the Acharya Brahmins, Magars, Tamangs and Paharis were the local talukdars. The system of local caretaking of forest in most cases was hereditary.

All these local functionaries accepted Theki or Saugat (gifts, such as ghiu, dahi, chicken, free labour and even grain) in return for permitting small scale harvesting of forest products by the local people, but charged no fee. Nonetheless, the functionaries had to keep a record (muchulka) of all trees marked and felled for submission to the bada hakim. All trees near water sources, main tracks, religious sites and resting places (chautaras) were to be preserved.

Under this local supervision, the forest was administered and protected quite effectively but steadily increasing interference from Kathmandu from about 1900 AD caused a deterioration. Most older persons interviewed have vivid memories of having seen in their lifetime the exploitation of these forests, especially for *Shorea robusta*, for use outside the local area. Some had themselves been employed in harvesting and transportation.

Examples of exploitation on orders from Kathmandu are many. From at least the turn of the century, timber from these forests was used in buildings in the expanding towns of Kathmandu, Bhaktapur and Dhulikhel, and of Banepa from 1932.

Specific examples are building of a durbar (palace) in Kathmandu by Dhruba Shumshere Rana in about 1920 and of Bagh Durbar in about 1932 by General Hari Shumshere Rana, son of Prime Minister Judha Shumshere Rana. Around 1910 timber was used to build bridges at Dolalghat on the Sun Kosi and Indrawati Rivers and on the Tamba Kosi at Charange. The great Kathmandu earthquake of 1933 also resulted in much rebuilding using Sun Kosi timber.

Some time after the 1933 earthquake, the Kumai Brahmins of Palanchok and their Newar subsidiaries of Bhainse near Banepa instituted a timber trade between the Sun Kosi Sal forests, Kathmandu and areas of northern Kabhre where wood was already extremely scarce.

In most of these operations, only squared timber was transported. Far larger numbers of trees were usually felled than were actually needed and only the best were squared. Others were left to rot or were burnt. The selected trees were floated to Dolalghat and baulks then carried by men to Kathmandu or elsewhere. The whole process was therefore extremely wasteful and arduous.

From 1951 the effective control of the forests by talukdars and other local functionaries was rapidly lost. The bada hakims issued more and more permits for large scale exploitation for consumption outside the area so that the local people could see the resource disappearing, for the benefit of others. This led to a free-for-all and no one had an interest in sustaining yield.

The talukdari system of local forest control finally ceased with the Private Forest Nationalization Act, 1957 and the introduction to the area of the new forest administration in 1960. Then, a Forestry Division Office was established at Chautara and a professional forest officer was assigned to it, taking over the forestry responsibilities of the bada hakim. Regrettably the function did not change, largely remaining the issuing of permits for harvesting. In theory, permits were to be issued only for silviculturally available timber but in practice anything merchantable was sold. The local people remained excluded from any effective control of the forest around them. Further, they found tnemselves subject to legal action for minor forest crimes whereas more influential people often escaped such action even for serious breaches of the forest law.

Thus, the sense of belongingness between the people of Thokarpa and their local forests and trees, developed over a period of more than 100 years in the past, had declined and was eventually lost.

Most elderly members of the local community considered that most damage to the forest resource occurred between 1951 and 1965 and was not affected by the stricter laws introduced between 1957 and 1967. Only the introduction of the panchayat system of local government in 1962 its village level assemblies and councils and other local level representation have led to a renewed awakening of interest in the forests and the awareness by local communities that they might be able to control again their destiny as it related to forested land. Initiation of community forestry in Thokarpa, in 1973, contributed principally to this awakening of interest and awareness by local communities.

5.7 Initiation of Community Forestry and the New Forests
(I. 1.3, 6-11, 14-16, 36-49)

As noted above, the degradation of the forests of Thokarpa and similar areas had become extreme by the decade commencing in 1960, accompanied by a demoralization of local communities concerning the possibility of effective control for their purposes of the forest resource. The introduction of the panchayat system in 1962 gave a new possibility for local government, however, and this was eventually seized by a few exceptional leaders, notably Nil Prashad Bhandari, the long-standing Pradhan Pancha of Thokarpa. He clearly foresaw the need for local action and in 1973 a Forestry Committee (Ban Samiti) was formed in his panchayat. The committee consisted of representatives of the various components and had a membership of 103: it was thus very widely based. This committee had the concurrence of the D.F.O. Chautara who also worked as its advisor. Initial meetings and useful discussions among the Panchayat Forestry Committee members themselves, and between them and the D.F.O. were followed by an agreement. The principal features of this agreement were that the panchayat through its Forestry Committee would work for the protection and conservation of the forests and trees within its area, and the Forest Division Office in turn would not allow any harvesting of forest produce without the concurrence of the Panchayat Forestry Committee. Such an agreement was also formalized through exchange of letters of understanding between the panchayats and the Forestry Division in August 1973. This arrangement was made for an initial two year 'trial period' with prospects of future extension depending upon the success and experience gained during the trial period. The D.F.O. also promised to bring in other forest development programmes in future if the trial succeeded. The effective control of the forest thus gained by the local community was initially, perhaps, the most important motivating factor for the local population to work for protection, conservation and development of their forest and trees that followed.

The Forest Committee first set about protecting and conserving the remnant forest on the lower slopes of the Sun Kosi (F. 2-6), and the few other much smaller patches scattered over the settlement area. The lighting of fires, lopping, felling and free grazing were prohibited in forest set aside to permit natural regeneration. Only dead timber and grass could be extracted.

On the higher ground above Thokarpa, the forest had been reduced to poor, low, open shrubbery or sparse grassland. At the request of the Panchayat Forestry Committee, the D.F.O. Chautara agreed to support a pioneering community plantation endeavour and a forest nursery was established at Thokarpa in 1975. The active community participation in the planting programme engendered much enthusiasm and forest protection and rehabilitation became a part of the local way of life. Barbed wire fencing, faithfully adhered to as an essential part of plantation programmes elsewhere in Nepal, became unnecessary in Thokarpa because of the enthusiasm of the local people for forest plantations and restrictions imposed by them on open grazing and browsing by their livestock. In January 1979, Thokarpa was one of the first of 17 panchayats in Sindhu Palchok, and hence in whole of Nepal, to obtain forest land as panchayat forest and panchayat protected forest under the newly introduced panchayat forestry Act. By 1982, 300 ha had been planted in Thokarpa when a revision in panchayat boundaries divided it into Kalika and Thokarpa panchayats.

A complementary activity has been the demarcation by the D.F.O. of forest boundaries, both between forest and agricultural land, and between government and panchayat forest. Such demarcation resolved and avoided subsequent disputes and gave further confidence to the local people.

Concurrent with the early activity at Thokarpa, Laxman Dong Tamang, the Pradhan Pancha of Banskharka had had much the same perceptions as Nil Prashad Bhandari. Community forestry in the Banskharka panchayat has followed a similar pattern to that of Thokarpa and strong leadership supporting the panchayat role in forest protection and tree planting activities has continued in both panchayats.

Initially, there was similar motivation in Pipal Danda panchayat under the leadership of Pradhan Pancha Tej Bahadur Basnet but as his influence waned the commitment to forest protection and afforestation has fluctuated. Presumably here the vision and enthusiasm of a leader was not always matched by his successors, or the general population, and this indicates the need to secure a broad support for community forestry through appropriate education, in the widest sense.

These activities in a few panchayats provided the foundations on which the subsequent Nepal-Australia Forestry Project Stage 2 has been developed since 1978 (Griffin 1977, 1981c, 1982; Campbell and Mahat, 1977a&b, 1978; Midgley and Mahat, 1978; Shepherd, 1981; Fearnside, 1976; Gilmour, 1983a), a development that has since spread in other project areas throughout much of Nepal (Watanabe *et al.*, 1977; Campbell, 1978; Simeon *et al.*, 1979; Grünenfelder, 1980c; Rana, 1984). That development, however, lies out of the scope of this dissertation.

5.8 SUMMARY

A considerable amount of data concerning the study area in the vicinity of Thokarpa-Chaubas has been presented in this chapter. The following main points are summarised out of this discussion because of their relevance to the main thesis offered in Chapter 1, and are drawn together in the final discussions in the next chapter.

1. The study area is one of the most heavily populated areas of the Pahad, with a population density of 1.63 persons per hectare of agricultural and forest land combined.

2. The forested land is generally of low quality with small volumes of timber per unit area ($8.61m^3/ha$), amongst the lowest recorded for Nepal. Much of the forested land is little more than shrubland.

3. The results of an extensive series of personal interviews exposed a number of strongly held views:

   (a) That there has been no significant change in areas of agricultural and forested land this century despite large population increases.

   (b) Forests have degenerated in quality and fuelwood, fodder and timber are now all in short supply.

   (c) Fuelwood consumption was estimated at 409 kg/person per year, 60% of which comes from the forested land. This figure confirms other reports for the region, giving one of the lowest consumption figures for Nepal.

   (d) The nature of fuelwood use varies considerably from community to community, from lower to higher elevations.

   (e) Stall-feeding of livestock is generally constrained by the inadequate supply of fodder. Feeding patterns vary with altitude in the study area. There are no well-developed open grazing lands within the area.

(f) Timber is generally available as a free good but local households use little timber for construction.

(g) The sense of belongingness between the people of Thokarpa and their local forests and trees, developed over a period of more than 100 years in the past, was largely destroyed by a series of events over recent decades, including heavy use of local timber for buildings in Kathmandu.

(h) Only the introduction of the panchayat system of local government in 1962, its village level assemblies and councils, and other local level representation have led to a renewed awakening of interest in the forests and an awareness of local communities that they might be able to control their destiny as it relates to forested land.

4. A survey of a number of separate forest areas revealed a quite varied history, depending in most instances on the objectives of those who controlled the land in the historical past. The land was held mostly under birta grant, but kipat, bijan and government control were also involved. Some land was conservatively managed while other land was heavily exploited, damaged by fire and overgrazed.

5. The new opportunities for local control were siezed by exceptional leaders in a few communities. Foreseeing the need for local action to meet local needs,widely based Forestry Committees (ban samiti) were formed. These became the most important motivating factor for the local population to work for forest development. Forest protection, nursery establishment and tree planting activities followed and became a part of the local way of life. These activities of active local participation started initially in a few communities have since spread throughout much of Nepal.

CHAPTER 6

GENERAL DISCUSSION

6.1 DISCUSSION

In Chapter 2, the major characteristics of Nepal as a Least Developed Country are presented and an outline of Nepalese history is given. As in most similar countries, the economy has been dominated by the rural sector, based almost exclusively on subsistence agriculture. In the Pahad, agricultural practice varies in detail considerably with elevation and topography but is almost everywhere constrained by extreme physical problems that have been overcome only by the massive continual expenditure of human labour. Agriculture is heavily dependent on trees and the forest, although the linkages have only recently started to be fully understood.

Also in Chapters 2 and 3 can be found an outline of traditional resources of Nepal, their administration and budgetary implications. Until about 30 years ago, and indeed in many ways to the present day, the major resources were land and labour and the state, from at least the mid-18th century, sought to maximize its utilization of these resources for its own purposes. Therefore, there developed an onerous system of taxation, based largely on land and agricultural productivity, and of labour obligations that sought to appropriate for the state all economic surpluses and labour availability. For many years, these resources of the state were largely directed to the support of Gorkhali territorial expansion, with its need of a large army, but were also used to benefit the members of whichever group held power at a given time.

The living standards of the peasantry were a matter of no real concern to successive ruling groups and the lives of the peasants were extremely hard, often with deep indebtedness, and this frequently led to emigration from the country in search of a less oppressed life.

Against such a background, it is of interest to consider in some detail the impact of man on the nation's forest, and particularly those of the Pahad. Man's activities, when carried to excess can lead to forest degradation and eventually to deforestation.

The work reported in this dissertation makes it clear that deforestation is no new twentieth century phenomenon in Nepalese Pahad. Rather, it has been occurring for centuries and long before there was any significant, widespread influence of the modern industrialised world on the Hills region.

If the Nepalese situation is to be put into a wider context, this must be done with care for Nepal cannot just be considered as one of the lesser developed or least developed countries. Its historic situation, if not unique, is certainly unusual. Nepal clearly shares in the long and great history of Asian civilization, intricately involved with the Buddhist and Hindu religions. Buddha himself was born within the boundaries of present day Nepal and much of Hindu mythology involves the Himalayan region. That Nepal formed an integral part of ancient Asian civilization is further attested to by many facts, of which the origins of pagoda architecture in Nepal and the early reference in Hiuen Tsang to Nepal in Chinese writings are but two. The unusual feature of Nepal lies in the fact that here an integral part of Asian civilization remained almost uninfluenced by the industrial revolution and European technology until the mid-twentieth century.

It is therefore not too fanciful to suggest that the deforestation of the Pahad must have occurred in times when Nepal resembled ancient and medieval Europe, particularly the hot and hilly Mediterranean basin, rather than most lesser developed countries in the 20th century. The analogy cannot of course be pressed too far but it is of interest to compare what has been revealed for Nepal with the Mediterranean situation as described by Thirgood (1981, 1984) and Meiggs (1982). Thirgood (1981) listed agents of deforestation and it is convenient to use these, differently ordered, as bases for consideration. Some agents are clearly not significant in Nepal and will be briefly noted first.

Climatic change has been blamed for the deterioration of the Mediterranean ecosystem but Thirgood (1981) remains unconvinced that there is evidence to support such a thesis. That deforestation and other environmental changes induced by man have caused more severe micro-climates is entirely probable but is another matter. The situation in Nepal appears similar in that there is no evidence of any climatic change that would have induced the deforestation that has occurred.

Throughout the whole littoral region of Europe, the need of timber for shipbuilding was a significant factor but it obviously is of no significance in landlocked Nepal. Similarly, there is no record of the use of wood and fire in war in Nepal in contrast to Europe and the Mediterranean basin where much wood was used to construct war machines, e.g. battering rams, seige towers, etc., and for huge fires to destroy even the stone and brick walls of cities. Fire was also used to drive enemy armies from forests, but none of these uses are recorded from Nepal.

In much of the Mediterranean lands, the prime cause of deforestation was clearing for agriculture and thus for food production. Much of the clearing must have been to meet strictly local needs but as cities arose and their population grew the creation of agricultural surpluses in some areas to feed the cities became important. By the commencement of the Christian era, Rome had a population of 700,000 and many other major cities existed around the Mediterranean coast. To encourage reclamation for agriculture, a Roman law of 111 AD stated that anyone who occupied up to 8 ha of forest in order to bring it under cultivation had full legal right of ownership to such land. At a similar time, in the Roman province of Africa, incentives were offered to workers to bring new land into cultivation.

> "Tenants on imperial estates who planted an olive orchard on uncultivated land were entitled to keep for themselves the olive harvest for the first ten years, after which they were required to give annually a third of the oil from the olives to the estate managers. The general policy of the imperial government was clearly stated in the answer to a petition from imperial tenants to plant olive-groves and vineyards in certain lands that were marshy and wooded. The imperial officials gave their consent 'since it is our emperor's command, with the unremitting care with which he ceaselessly watches over the interests of his people, that all lands that are suitable for olives and vines as well as for grain crops should be brought into cultivation." (Meiggs, 1982)

Such stimulation to produce surpluses was evidently successful. Thus the export of grain from Africa to Rome at the end of the 1st century was sufficient to feed a million people for two-thirds of the year. The conversion from forest to agriculture had even wider economic purposes, however, and became the base for the development of commerce, financial sophistication and capital development (Meiggs, 1982).

The past situation in Nepal in regard to the clearing of forest for agriculture appears to have been subtly different. Large cities on the scale of the ancient Mediterranean did not exist: even the towns of Kathmandu Valley remained small until recent times. To this day, the Newar people of Bhaktapur can be seen cultivating nearby land and it is likely that the Nepalese towns and their immediate environs were largely self-sustaining in food until recently. Certainly no large, long-distance trade in food used to exist in Nepal, and could scarcely have done so because of the great problem of transportation on steep, narrow tracks. The trans-Himalayan trade with Tibet, although important in other aspects, is not really an exception because bulky foodstuffs were not involved on a scale requiring significant agricultural surpluses to be produced in the Pahad.

Conversion of land to agriculture in the Pahad was not solely to meet subsistence needs, however, although these were undoubtedly pressing. Conversion was fostered by legislation similar to that of Rome and its African provinces because of the role that agricultural land and production played in the state's economy. As described in Chapter 3, the land was the state's ultimate resource and it and its produce were used to support the states activities, to compensate for services rendered to the state and to confer wealth and prestige on the ruling group. In part, this was done by the appropriation of agricultural surpluses in kind but this was not always possible or desired. On the one hand, the state could not use as tax one-half of the agricultural yield of jagera land: the equivalent in cash had to be paid. On the other hand, the subsistence farmer on jagir or birta lands could not always give up half his production if his family was to survive: obligation could be commuted to an equivalent cash payment to the jagirdar or birta holder. Hence arose the characteristic and widespread indebtedness of so many of the rural people. Clearing of the forest thus arose from the interrelated attacks of governments seeking to increase their revenue base and of farmers seeking to lighten the load of tax and other obligations. In this Nepal was but an extreme example, for land ownership, or a right to agricultural surpluses in the absence of land ownership, was probably the most common foundation of wealth and prestige throughout the world until the great rise in manufacturing and trade associated with the industrial revolution. It is noteworthy, however, that in Nepal, in contrast to the ancient Mediterranean world, deforestation for agricultural development did not provide the starting point for commerce, financial sophistication and capital development.

The cultivation of land for crops is only one component of agriculture. The other is animal husbandry, which itself has two main subdivisions. The first is grazing and browsing, in which animals are allowed to find their own food, under variable control. The second is stall-feeding, or one of its variables, where fodder is supplied in cut or processed form to the animals. Thirgood (1981) emphasizes that in much of the Mediterranean basin, there arose a distinction between farmers, tilling the plains and gentle slopes and keeping few animals usually under strict control, and shepherds, who were restricted to more marginal and steeper country at higher elevations. There they kept and almost entirely relied upon, large numbers of animals living under range conditions. The border between cultivated and rangeland was one of tension, in both an ecological and social sense. The populations in the two areas had relatively little in common and a gain by one was often a loss to the other. A commonplace view is that the farmers in the main treated their land conservatively because they had a long-term interest in it. The hill shepherds, on the other hand, were the despoilers, allowing their flocks to ravage the forest and marginal lands at will because they were the 'outsiders', lawless brigands, who had no individual vested interest in maintaining the productivity of the land they used. Of the various livestock, the goat is seen as the main destroyer, a picture well depicted by Thirgood (1981). This is not the place to debate the validity of this viewpoint as applied to the Mediterranean basin but it certainly is not valid for the Pahad. Here there is no significant population without some land. The family that owns animals almost always owns some land and the shepherd and the tiller are the same person. Only in the montane lands of the Pahad do communities depend largely on their livestock but they also own land. Nonetheless, the impact of animal husbandry on the forests of the Pahad has been, and is, enormous and has been documented in earlier chapters.

There is no certain evidence that forest was deliberately cleared in the Pahad to provide grazing. Indeed, the presence of the goat in abundance makes this unlikely for the goat is primarily a browser. Rather, grazing land has probably originated as failed arable land or by the gradual degradation under browsing, lopping and fire, first to a shrubland and then to a treeless grassland. One of the great uncertainties of Nepalese forestry is the exact nature and speed of this degradation. Another is the extent to which the forests revealed by aerial survey or remote sensing have in fact been degraded.

In absolute terms, the use of the forest area for fodder of all sorts is therefore likely to have been the second most important cause of deforestation, ranking behind only clearance for arable agriculture.

The role of fire as a destroyer of forests is well documented in all continents over many centuries and it has had a major effect in Nepal. Fire has no doubt been sometimes used deliberately to begin the process of forest destruction for the establishment of agriculture but recent usage of this sort has probably been limited to the Terai. In the Pahad, forest fires are nearly always caused by breakouts from the burning of marginal or grasslands to stimulate new growth. Such fires in forest are no less harmful for being accidental and if they occur each year, or even less frequently, the forest will soon be destroyed. Fires occurring at long intervals appear to be a major factor in destruction of the montane coniferous forests but their precise origins, and the motives of incendiarists, are unknown.

Within the Sindhu Palchok and Kabhre Districts, uncontrolled burning of grasslands appears to be reducing and the annual loss of forest to fire is small although regeneration may still be stopped (section 5.6.3). This change probably signifies a profound alteration in the perceptions of many farmers.

In recent years, the problem of supplying fuelwood for domestic consumption in lesser developed countries has risen to such prominence (Montalembert and Clement, 1983) that it has been dubbed 'the other energy crisis' (Eckholm, 1975), in reference to the oil crisis in the industrialized economies. The impact of fuelwood gathering has been treated in some detail in Chapter 4 and 5 and shown to be a far more complex matter than appears at first sight. It seems that communities reduce their usage as supplies diminish so that linear extrapolations of usage on the forest resource are invalid. Although use as fuel is an obviously significant factor in forest degradation, its impact in Nepal (particularly in the past) is probably less than is often supposed. Again, however, generalizations are risky and the situation has been shown to vary significantly from village to village.

The overwhelming use of forests in industry before the advent of the modern industrial age was to provide energy for a variety of often small scale manufacturing processes. Preeminent amongst these is the use of fuelwood and charcoal in smelting metal ores. Thirgood (1981) was persuaded by earlier writers that "it is not mere coincidence that the principal sources of Mediterranean iron ore are today amongst the most depleted of wood" - and quotes an estimate by T. Wertime that 400,000 ha of coppice woodland were necessary to meet fuel needs of a single large metallurgic centre in the classical age. Meiggs (1983), however, is less convinced and considers that "there is perhaps more danger of exaggerating rather than of underestimating the contribution of metallurgy to deforestation". He quotes a figure by J. Healy that an annual deforestation of 5420 ha would have met the entire needs of the iron industry as it existed in the Roman Empire. In Britain, Evelyn in his famous 'Sylva' blames the iron and glass industry for extensive deforestation but Rackham (1976), James (1981) and Linnard (1983) question this.

The situation in Nepal is no clearer. The evidence presented earlier (section 4.3.3) shows that significant quantities of wood for charcoal production were used in the Pahad for metal production, largely linked to military needs, but its precise role in general deforestation is uncertain. Again, the use of fuelwood in brick production, lime burning, paper manufacture and distilling (section 4.3.4) is characteristic of most pre-industrial civilizations and is well represented in Nepal although the effects of each on the forest are unknown. In total, however, these early industrial uses of the forest as an energy source are likely to have been a significant factor in the deforestation of at least parts of the Pahad, especially those near ore deposits or centres of population.

The use of timber in the construction of buildings, bridges and implements is probably only a significant factor in deforestation in the neighbourhood of large towns. If the land is relatively flat, permitting timber movement on carts, or if the town is near the sea or large rivers, permitting movement by water, problems of adequate supply are reduced. An aggravating factor is the inflammability of wooden dwellings and fires destroying large parts of ancient cities are commonly recorded. Such a calamity resulted in a sudden, concentrated demand for large quantities of construction timber that had to be met rapidly, with a likely severe deleterious effect on nearby forests. The growth of both Athens and Rome in ancient times soon outstripped local supplies of timber which had to be brought from increasing distances (Thirgood, 1981; Meiggs, 1982).

In Nepal, the utilization of timber in buildings in the Pahad countryside and for agricultural and household implements is relatively modest (sections 4.4.4 and 5.5) and is unlikely to have had any marked impact on the forest in general when populations were low. Even now the use of timber in construction is not seen to be a major cause of deforestation in general as very little is used in house construction.

Cities of size in Nepal were limited until recent times to those of the Kathmandu Valley. Construction and reconstruction of these is likely to have had a major local effect because of the great difficulties posed for long-distance transport by the extreme topography and lack of roads. Even water transport must have been restricted because only the Bagmati system flows through the valley and the nearest large rivers of the Sun Kosi and Trisuli systems lie about 60 to 70 km to the east and west respectively. Nonetheless, there are records of timber being carried as billets over a distance of at least 4 days walk (65-70 km) and evidence is presented in Chapter 5 concerning the felling of *Shorea robusta* on the slopes of the Sun Kosi near Thokarpa for use in Kathmandu.

In this case, river transport was utilized for less than 10 km, a relatively small proportion of the total involved.

It, therefore, seems likely, although quantification is not possible, that the need for timber by the Kathmandu Valley towns played a significant role in the gradual loss of trees of desired species and size from the immediately surrounding area. *Shorea robusta* and *Pinus roxburghii* were the species most prized for construction, the former for its durability, the latter for its ease of working. Of other hill species, *Michelia champaca* has been largely cut out because of its valued properties as a furniture timber.

Tucker (1983) has described the impact of the British colonization of India on the forests of the Western Himalaya between 1815 and 1915. In this region, various factors contributed to deforestation but in all cases the areas of significant utilization were in the plains and not in the hills themselves. Forest depletion evolved in the wake of the expansion of agriculture on the Indo-Gangetic plain and this in turn supported a great growth in the cities of that region. It gathered new momentum with the beginning of the construction of the railway network in 1953. The railways provided a timber demand themselves through their great need for sleepers and wood for coach construction. In addition they provided cheaper transport for timber to cities remote from the Himalaya. The situation in the Indian and Nepalese Pahad in the 19th century thus provide a sharp contrast. In the former, deforestation ensued mainly from the export of timber to the plains under the new and dynamic influence of British colonial rule. In the latter, deforestation primarily resulted from Nepalese government pressure to maximize the area of cultivated land within the hills themselves. Export of timber from the Pahad was negligible, only later in the Nepalese Terai did export to India assume volumes comparable to that in India itself.

In India, the use of wood in the construction of carts is remarkably high, being 2.5 x 10^6 m^3/annum or 0.5 m^3 round wood/cart (Banerjee 1979) but such a use is negligible in the Pahad. Instead, ploughs are probably the most significant wood-using agricultural implement in arable areas.

Minor uses of forest products in medicine and religious ceremonies has been widespread and certainly has high social significance in Nepal. The pressure on the resources is probably not usually high in most cases. The gathering of green branches of tree-line species of *Juniperus* is, however, extremely wasteful and damaging in areas such as Bhairabkund Lekh.

The foregoing has considered man's impact on the forests in terms of specific activities and has sought to estimate their effects as contributory factors to deforestation. A quite different approach to environmental deterioration, of which deforestation is an aspect, has been developed by P.M. Blaikie (draft of article for publication in a book being edited by H.C. Brookfield and P.M. Blaikie). There, four major conventional attributions for degradation have been indentified and criticised. It is instructive to consider these in the context of deforestation.

The first approach assumes, even if in a quite unrecognized way, that environmental deterioration is essentially a technological issue. Thus it might be argued that the problem of deforestation would be solved were more appropriate species grown, or if silvicultural practices were improved. The social context might be limited to a prescription that people be excluded from forest by pursuasion or coercion in order that forest growth can be maximized. Such a limited social perspective has no place in Nepal but leads easily to the next approach.

Here the problem is seen as a mismanagement of the environment by generally local users. These are usually, if unintentionally, referred to in a more or less pejorative way and a good example in forestry literature is:

> "To them (the Cypriots), forests were a God-given resource to be used for the satisfaction of their immediate needs. If they needed timber or fuelwood, they cut it from the nearest forest; if they wished to expand their agricultural holdings they had but to clear the trees. If they needed money they could slash for resin or pitch or make charcoal. The forest provided browse for their flocks and, when the trees threatened to suppress the undergrowth, what more natural than to set fire to the forest particularly when this provided dry fuel simultaneously with the production of fresh grazing?" (Thirgood, 1984)

With such a perspective, the forest service all too easily becomes seen as no more than an extension of the police force enforcing better standards of forest management (protection, silvicultural treatment, harvesting and so on) onto a wayward and reluctant population.

Overpopulation is the third component of conventional wisdom concerning degradation and is embodied in the statement:

> " Any solution to the problem of environmental deterioration must first cope with the basic cause, over population"(FAO, 1980).

In one sense, this proposition is platitudinous yet it leaves much unsaid. If the main thesis of this dissertation is accepted, the widespread deforestation of the Nepalese Pahad occurred not because of high population density but largely as an offshoot from deliberate government policies. Further, there is evidence from these studies that fuelwood consumption, for instance, declines through more conservative usage as availability falls, only in part from increased population.

Finally, an involvement in the market economy and loss of 'primitive purity' is sometimes seen as a cause of environmental deterioration. Again, this may be valid in some cases, and is at least partially so for the western Himalaya of India (Tucker, 1983). However, it clearly has no validity for the Nepalese Pahad. Here, the indigenous system in relation to land use was in no way 'pure' in a primitive, naive sense, but involved maximizing the surpluses available to the ruling groups, quite independent of any market economy. Throughout the period, on the contrary, Nepal retained an essentially subsistence economy.

A consideration of neither the agents of deforestation nor the conventional wisdom about environmental degradation provide by themselves a satisfying explanation for the history of forests in the Pahad.

The beginnings of an explanation may be found in the virtual synonymy of 'forest' (ban) and 'wasteland' (kalabanjar) throughout much of the indigenous Nepalese literature up until quite recent times. Throughout most of Nepal's history, any surplus of forest products (in the widest sense) in the Pahad was turned to profit with great difficulty, except near cities. In the countryside, the forest was mainly needed to provide fuel, fodder and construction timber for local use. All these products were difficult to transport and in most areas, until very recently, there could have been no purpose in transporting them - a situation identified by Kirkpatrick in 1811. Only the Kathmandu Valley towns provided a concentrated demand for products that could not be satisfied by the direct efforts of the users themselves. Here, probably uniquely within Nepal, was a significant absorber of forest product surpluses from within an area defined by the transportation problem. Within that area, the forest had an obvious value, beyond that of subsistence, for the production of timber for palaces, pagodas and domestic town dwellings, for furniture and for fuel in brick manufacture and lime burning for town construction. Documentary evidence has been given earlier showing that some forests meeting these needs were protected and preserved and so were perceived as having value.

In most of the Pahad, however, the potential supply of forest products for long exceeded utilization and it is easy to comprehend how the surplus resource was viewed as wasteland, especially by regimes hungry for utilizable resources. The next step was to stimulate forest clearing to establish arable agriculture, which did yield surpluses that could in one way or another be appropriated usefully by the state.

At the same time, the progressive modification of the obligation to provide free labour for community purposes (rakam) to one of working to produce a product for the state, e.g. smelting ore for iron production, contributed to deforestation in certain areas through government action.

Such actions, by ruling regimes which probably unconsiously viewed the forest resource of the Pahad as inexhaustible and certainly saw it as almost valueless, were added to those of the subsistence economy. When population was small, up till the early part of the 20th century, it is likely that subsistence needs could be met by the remaining forest resource, even in the relatively heavily deforested districts which are the main focus of this thesis where all land suitable for agriculture had been reclaimed. Lately, however, increasing population has placed far greater pressure on this resource. The people appear to have adapted by progressively reducing their per capita demand for timber and for fuelwood, both through an absolute reduction in total fuel used and by substitution of jhikra and agricultural residues for wood (daura). It is unlikely, however, that fodder consumption has declined. Nonetheless, adaptation can only go so far and per capita fuel consumption now seems to be at minimal levels in many areas. Nothing but a steady degradation of the existing forest can therefore be envisaged unless the size of the forest resource can be increased, by increases in both area and productivity.

The rate of recovery from the complete deforestation implied by clearing for arable agriculture is uncertain, and may never occur if grazing and browsing occur. In some cases, however, restoration of terraces to forest has been described but the exact conditions under which this occurred are unknown. The rate at which forests deteriorate under various lopping and browsing pressures is also unknown but the experience of the Nepal Australia Forestry Project is that even heavily degraded forests respond rapidly if full protection is given. The surveys reported in section 5.6 show that such degraded forests and shrublands still contain many species of the original forest. Most forest types therefore seem to be resilient but their annual increments are probably relatively low. The judicious introduction of exotic species of higher growth rate is therefore warranted to increase the mean increment of the total forest resource so long as there is a demand to balance the supply of exotic biomass. The management of forests to produce the complex mixture of desired products revealed by sections 5.3 to 5.5 will be a difficult task.

6.2 CONCLUSION

In Chapter 1, the two theses of this dissertation were set out. The first was 'that deforestation of the Pahad is not a recent phenomenon but has a long history, being well-established by the late 18th century at least'. This thesis is held to be established in general from the secondary sources referred to and in particular for the Sindhu Palchok and Kabhre Districts by the failure to find any evidence of recent conversion of forest to agricultural or grazing land. Throughout the Districts, however, and particularly in the Mahabharat range, the most recently inhabited area, forests are being degraded by browsing, fire and overcutting for fodder and fuel.

The second thesis was 'that deforestation in much of the Pahad, and certainly in Sindhu Palchok and Kabhre, was caused by the joint attack of government land use policy and subsistence agriculture'. Again the secondary sources and the first-hand interviews strongly support this thesis. Not only were revenues, as taxes on cultivated land, used directly to support the governing regime but also, through the practices of birta and jagir, to pay for the otherwise reward service to state. The modification of the obligation to provide free labour for community purposes (rakam) to one of the working to produce a product for the state, e.g. smelting ore for iron production, also contributed to deforestation in certain areas. Within the two districts, the evidence is against any hypothesis that deforestation resulted from the needs of the local population alone. Within the two districts there is now no forest land suitable for conversion to arable agriculture, with the possible exception of some areas on the southern slopes of the Mahabharat Lekh. It appears that the situation has been the same for many decades and probably for more than a century. Further, in recent years at least, some communities (and perhaps many) have acted in their own interests to reduce in general the damaging utilization of local forest resources.

This is not of course to deny that forests continue to deteriorate, mainly under the pressure to yield forage and fuel, but the picture is not quite so disastrously gloomy as it is sometimes depicted.

What implications has this exercise in 'historical ecology (Driver and Wigston, 1983; Jones and Wigston, 1984) for future forest policy? Past ruling regimes have been shown to be poor custodians of the forest resource in the Pahad and to have used it not at all for local benefit. Such attitudes die hard (for example, see Bajracharya, 1983) and it is unlikely that the situation will change significantly unless the whole attitude of successive future governments and power groups towards subsistence farmers is radically different to that of the past. Local communities, however, have proved capable of taking appropriate action in their own enlightened self-interest, but are limited by their lack of general education, technical knowledge and financial resources. The 1977 Amendment of the Forest Act is thus seen to be particularly appropriate for it allows, under proper safeguards, for forest areas to be placed in the hands of local communities whilst providing assistance with operation planning, materials, finance and technology. The Act has yet to be proved in practice, particularly in regard to the flow of benefits to the panchayats, but in principle this is seen as a step in the right direction. Panchayat Forests and Panchayat Protected Forests as now defined are, however, by themselves unlikely to solve the problems facing the forestry sector in Pahad. They are too restricted in area to provide for the huge needs of the hill communities. Instead, the innovative thinking embodied in the panchayat forestry Act must be boldly extended to establish a partnership in forestry between central government and communities for all the forest lands of the Pahad. The government clearly has interests, and legally has rights, regarding non-panchayat forest lands that transcend local issues. Nonetheless, the forestry-related problems facing the communities stand no chance of solution unless nearly all government forest is used primarily to satisfy local needs.

Further, with land pressure as it is, it would be foolish to assume that land, under whatever legal ownership, will be readily given up to forestry unless it is in the local interest to do so. Procedures need to be established to introduce the local interest into planning for government-owned forests and especially into their utilization. In this way, a productive partnership could be established between the state, with its technological, manpower and financial resources, and the local communities with their local knowledge and interest in protection and conservation of resources for their own use.

GLOSSARY
Nepalese Words and Terms

abadi jagga	cultivated land
ailani parti	wasteland
ain	an act of law
amali	local functionary
anau	plough handle
awale rakam	an obligation to work in brick making
bada hakim	head of Rana district administration
bala rakam	an obligation to work as sawers
ban	forest
banjaneh	forest inspection squad, forest protection squad
banmara	forest killer, *Eupatorium adenophorum*
banbatika	a private forest plot
bana (banda)	Newar metal worker
begar	labour obligation
besi	lower slopes and river valley areas of Pahad
beth	labour obligation
bhabar	the northern elevated part of the Terai consisting of deep deposits of gravel and boulders
bhangra	a cloth traditionally made locally from vegetable fibres
bhardar	a member of nobility, a high ranking official
bhari	head-load
bhata	battens used in house roof frames
bigha	a measure of land in the Terai
bhotiya	high altitude living Mongoloid people of Nepal and of a more recent Tibetan origin
bijan	seeds
bijan darta	a system of revenue settlement of dry (pakho) lands in the hill region based on visual estimates of quantities of maize seeds required to sow an area
birta	a land grant as a special favour with no set time
bosi	an obligation to work as sawers
bund	an embankment, dyke
chari rakam	tax assessment on pasture lands
chauri	a female offspring of crossing between the yak and local hill cattle
chautara	resting platform
chhap birta	a lifetime birta grant

chirpat	split wood
chitaidar	caretaker of forest, temples, etc.
chiura	flattened rice
chiuri ghiu	ghiu seeds of *Bassia butyracea*
chhurpi	hardened milk concentrate
chyangra	mountain goat
dahi	yogurt
dal	lentil
dalin	beams used in house construction
danda	ridge
danra	purlins and rafters used in house roof frames
dasain	most popular festival of the Nepalese
daura	fuelwood
daura rakam	obligation to supply fuelwood
dhau	slag
dharni	a unit of weight measurement, equal to c. 2.4 kg
dhiki	foot-worked rice husking implement
dhuri balo, balo	various-sized beams of house roof frames
dibya upadesh	divine counsel
doko	basket
dun	valley between the hills
durbar	palace, aristrocratic building
falam khani rakam	obligation to operate iron mines and supply iron
gaurung	local functionary
ghansi rakam	obligation to supply fodder to state stable
ghansangha	timber and poles for rural housing and construction purposes
ghiu	a type of clarified butter, ghee
gol	charcoal
gol daura	charcoal and fuelwood
goswara	office of the district bada hakim
goth	animal shelter
guthi	a charitable land endowment
hal abadi	new land reclamation
halo	plough share
haris	pole or beam of plough

harsangha	wood for making farm implements and tools
hath	hand, a usual Nepalese measure of length equal to 1.5 ft or 45 cm
hulaki rakam	porterage services
izaradar	revenue contractor
jagera land	unallocated
jagir	a land grant in lieu of pay for government employment
jagirdar	office bearer
jaisi kotha	An office in Kathmandu, an office from which passports are issued to visitors
jangi megjin	military magazine, military arsenal
jhar	weed
jhara	compulsory and unpaid labour obligations of the villages to the state for irregularly recurring purposes
jhikra	small woody material used as fuel
jimmawal	revenue functionary
juwa	yoke of plough
kacho daura	green fuelwood
kagate hulaki rakam	obligation for operation of mail system within the country
kalabanjar	virgin forest land
kar	tax
karu	a naked barley grown above 2000 m
kathmal bandobast	timber administration office, timber revenue administration office
kath miksari font	timber removal section
kazi	a high ranking official, a minister
khadga misana	seal of the Rana prime minister
khangre doko	a large doko basket
kharbari	private land for growing thatch grasses with scattered trees
kharchari rakam	tax assessments on pasture lands
kharka	pasture and grazing lands
khet	irrigated wet low land terraces for paddy production
khoriya	slash and burn agriculture
khoriya phadani	clearing of forest for agriculture
khukuri	Gurkha curved knife
khuwa	jagir assignment of unirrigated pakho land

kinuwa birta	purchased birta
kipat	communal ownership of land
kot	courtyard
kotha bosi rakam	an obligation to work as sawers
kos	a unit of measurement of distance (c. 2 miles, 3.2 km)
kush birta	birta grants to Brahmins
lal mohar	royal seal (also royal orders)
lekh	higher areas of Pahad
lendko dande	levelling implement for agricultural land
lhose phadani	clearing of forest for agriculture
lokata	*Daphne* sp. bark used for paper making
mada (lapsi ko)	a sweet and sour appetizer made from the fruit of *Choerospondias axillaris*
mana	a unit of measure, usually by volume, but also by weight (c. 5kg)
matan	a two-storey house built by a farmer, in addition to the main house, for storage and animal shelter
mauja	revenue and administrative sub-division of a district
maund	a measure of weight used in the Terai
megjin	magazine, arsenal
met	a wooden component of a house, a beam
mijar	Tamang local functionary, caretaker of Tamang communal kipat land and forest
moth	records
mukhiya	local functionary, village headman
muluki ain	legal code
muri	a measure of area of land equal to c. 0.0125 ha a volumetric measure of grain
nagi	blank areas, degraded grasslands
nak	female yak
nidal	main beam of house roof frame
okhali, musli	parts of hand-worked rice-husking tools
pahad	hills
pahad mal bandobast	hill revenue administration office
pajani	a system of annual screening and renewal of government employment
pakho	dry agricultural land, degraded forest and shrubland

pakho bari	unirrigated dry upland terraces, only rainfed
pallo-kirat	far-kirat region, far-eastern Pahad
panch aunle	a medicinal herb, *Orchis latifolia*
panchayat	village council
patkar	leaf litter
rajya	state, feudal principality
rai	local functionary
raikar	state landlordism, raikar land is one on which the state itself collects taxes directly or through intermediaries
rakam	compulsory labour obligations rendered on regular and inheritable basis
rakshi	locally brewed alcoholic drink
rastriya	national
roj	day of the week
ropani	a unit of measurement of land equal to 0.0125 ha
sanad and sawal	rules and regulations
sapta	seven
sandi sarpan	land used for communal uses - grazing and miscellaneous purposes
saugat	gift
sita pita	fuel from dry weed, etc.
suka daura	dry wood fuel
syaula, sottar	green foliage for animal bedding and composting
talukdar	a non-official local revenue functionary
talukdari	a system of tax collection through local functionaries
tar	old river bench terraces
taksar	mint
terai	southern flat lowland part of Nepal
thaple hulaki rakam	obligations to transport government stores
tham	support pillars
thari	local functionary
theki, theka	a gift, a wooden container or pot
thum	a revenue and administrative sub-division
tirja	rent collection certificates given to government employees of a district
umara	officials in charge of defence in the administrative sub-divisions

wallo-kirat	near-kirat region, near-eastern Pahad
yak	high altitude cattle traditionally imported into the higher parts of Nepal from Tibet
zamindar	non-official revenue functionary

REFERENCES

(All publications by HMG Nepal are listed here in order of date of publication and the order takes no account of the name of the particular instrumentalities involved).

ADB/HMG Nepal, (1982). Nepal agriculture sector strategy study, Vols. I & II Asian Development Bank/His Majesty's Govt. of Nepal (Unpublished Report).

Agrawal, G.R., (1980a). Resource mobilization for development: the reform of income tax in Nepal. Kathmandu. Tribhuwan University, Centre for Economic Development and Administration (TU/CEDA).

Agrawal, G.R., (1980b). Resource mobilization in Nepal. Kathmandu. Tribhuwan University, Centre for Economic Development and Administration (TU/CEDA).

APROSC, (1977). Bench mark study on Integrated Hill Development Project. Kathmandu. Agriculture Projects Services Centre.

Auld, B.A. & P.M. Martin, (1975). The autecology of *Eupatorium adenophorum* Spreng. Australia Weed Research, 15: 27-31.

Bajracharya, D., (1983a). Fuel, food or forest? Dilemmas in a Nepali village. World Development 11: 1057-1074.

Bajracharya, D., (1983b). Deforestation in the food/fuel context: historical and political perspects from Nepal. Mountain research and Development 3:227-240.

Banerjee, A.K., (1978). Local needs of small timber and fuel wood in India. In Shepherd, K.R., and H.V. Richter (eds.) Forestry in National development. pp. 92-103. Canberra. Development Studies Centre Monograph 17. Australian National University. (1978).

Banskota, M., and N.K. Bista (eds.), (1980). Nepal's economy: an overview. Kathmandu. Tribhuwan University, Centre for Economic Development and Administration (TU/CEDA).

Berthet-Bondet, J., (1983). Livestock, breeding and management system in the Himalayan foothills - a case study in Salme. Dijon. Institut National de la Recherche Agronomique.

Bhatta, D.D., (1977). Natural history and economic botany of Nepal. New Delhi. Orient Longman Ltd.

Bhoosan, B.S., (1979). The development experience of Nepal. New Delhi. Concept Publishing Company.

Bista, D.B., (1972). People of Nepal. Kathmandu. Ratna Pustak Bhandar.

Blaikie, P.M., (1984). The political economy and land degradation. Unpublished paper presented at the workshop on 'Land degradation and agrarian change : approaches to understanding', held at the Australian National University, Canberra (20-22 February).

Bolton, M., (1976). Lantang National Park management plan : An outline. Kathmandu. UNDP/FAO Fo. NEP/72/002. Project Working Document No. 1.

Bor, N.L., (1953). Manual of Indian forest botany. London. Oxford University Press.

Borradaile, L., M. Green, L. Moon, P. Robinson and A. Tait, (1977). Langtang National Park management plan, 1977-1982. Kathmandu. Durham University Himalayan Expedition, HMG/UNDP/FAO Project NEP/72/002.

Campbell, J.G., (1978). Community involvement in conservation: social and organisational aspects of the proposed Resource Conservation and Utilization Project in Nepal. Kathmandu. Office of Agriculture, USAID/Nepal. (Unpublished cyclostyled final report).

Campbell, M.W., (1980). Plant propagation for reforestation in Nepal. Canberra. NAFP/Forestry Dept., Australian National University.

Campbell, M.W., and B. Mohns, (1984). A qualitative survey of volunteer regrowth on the Thokarpa ridge. (Pers. comm.)

Campbell, R.G., and T.B.S. Mahat, (1977a). People's participation in community forestry in the Hills region of Nepal. (NAFP occasional paper). Kathmandu. Nepal-Australia Forestry Project.

Campbell, R.G., and T.B.S. Mahat, (1977b). An integrated forestry development programme for the Chautara Forest Division in the Middle Hills of Nepal. (NAFP internal paper). Kathmandu. Nepal-Australia Forestry Project.

Campbell, R.G., and T.B.S. Mahat, (1978). A practical approach to the development of community forestry in Nepal. Nepal Journal of Forestry. 1: 25-33.

Caplan, L., (1970). Land and social change in East Nepal: a study in Hindu - tribal relations. London. Routledge & Kegan Paul.

Chalise, S.R., (1983a). Energy efficiency and conservation in Nepal. Energy 8:133-136.

Chalise, S.R., (1983b). Food and development resource utilization : deforestation and needs of food and energy in a small and mountainous country. Unpublished paper prepared for the Workshop on Food and Development - Resource Utilization. Manila. IRRI.

Champion, H.G., and A.L. Griffith, (1960). Manual of general silviculture for India. Calcutta. Govt of India Press.

Champion, H.G., and S.K. Seth, (1968). The Forest types of India (A revised survey). Delhi. Manager of Publications, Government of India.

Chelliah, R.J., H.J. Bass and W.R. Kelly, (1975). Quoted in Dhungana (1980).

Chemjong, I.S., (1966). History and culture of the Kirat people. Panchthar. Tumeng Hang and Chandraw Hang Zobegu.

Collier, J.V., (1928). Forestry in Nepal. Appendix XIV to: Landon, P. Nepal, Vol. II, p.251-255. (Reprinted, 1976). Kathmandu. Ratna Pustak Bhandar.

Davis, K., (1951). The population of India and Pakistan. Princeton University Press.

Dhungana, B., (1980). Financial resource mobilization in Nepal during the nineteen eighties. Kathmandu. Tribhuwan University, Centre for Economic Development and Administration.

Dobremez, J.F., C. Jest, G. Toffin, and F. Vigny, (1974). Carte ecologique du Nepal region Kathmandu - Everest 1/250,000.

(Cahiers Nepalais - documents no. 4.) Paris. Editions du centre national de la recherche scientifique.

Donaldson, F., (1900). Lepchaland. London. Sampson Low, Marston.

Donovan, D.G., (1981). Fuelwood : how much do we need? Hanover. Institute of Current World Affairs.

Driver, E.A., & D.L. Wigston, (1983). Historical ecology in the analysis of the ecological effects of long-term forest management. In Guillard, J. (ed.), Actes du Symposium Internationale d'Histoire Forestiere. Vol. 1:58-81. Nancy. Ecole Nationale du Genie Rural des Eaux et des Forets.

Eckholm, E.P., (1975). The other energy crisis : fuelwood. Worldwatch Paper 1. Washington, D.C. Worldwatch Institute.

Eckholm, E.P., (1976). Losing ground : environmental stress and world food prospects. Washington, D.C. World Watch Institute.

Falvey, J.L. and P. Hengmichai, (1979). Invasion of Imperata cylindrica (L) Beav. by Eupatorium species in Northern Thailand. Range Management 32:340-344.

FAO, (1980). Natural resources and the human environment for food and agriculture. Environment Paper 1. Rome. FAO.

FAO, (1981). Quoted in ADB/HMG Nepal, 'Nepal agriculture Sector strategy study, Vol. 2, 1982'.

FAO/UNDP, (1980). Quoted in HMG Nepal (Water and Energy Commission), 1983.

Fearnside, A., (1976). Forestry and land use development in the Melamchi-Sun Kosi area, Bagmati zone, Nepal. (NAFP

Internal Paper) Kathmandu. Nepal-Australia Forestry Project.

Forestry Services, (1982). Forestry-land use report of the Chautara Forest Division. (NAFP Occasional paper). Kathmandu. Nepal-Australia Forestry Project.

Gewali, S.B., (1977). History of Nepal. Asian Culture 16: 4-7.

Gilmour, D.A., (1983a). History of Australian involvement in forestry in Nepal, 1962-1983. In Gilmour, D.A. (ed.), Operations of the Nepal-Australia Forestry project in the Chautara Forest Division. pp.1-5. Kathmandu. Nepal-Australia Forestry Project.

Gilmour, D.A., (1983b). Felling of Pinus roxburghii (42,000 trees) near Thulo-Sirubari in Sindhu Palchok for the reconstruction of Singha Durbar (Pers. comm.)

Griffin, D.M., (1977). Proposals for Nepal-Australia Forestry Project, Stage 2. (NAFP/2). Canberra. Australian Development Assistance Bureau. (Restricted distribution).

Griffin, D.M, (1981a). Mean air dry weight of a bhari of fuelwood, (pers. comm.)

Griffin, D.M, (1981b). Interview with Bisha Kami, (Pers. comm.)

Griffin, D.M., (1981c). Case study: data requirements for the Nepal-Australia Forestry Project. Canberra. The Australian National Univesity, Development Studies Centre. (Mimeograph).

Griffin, D.M., (1982). Graduation Address. (Friday 24th April 1982). Canberra. Australian National University. (Mimeograph).

Griffin, D.M., (1983a). Settlement on the southern slopes of the Mahabharat Lekh in Kabhre District. (Pers. comm.)

Griffin, D.M, (1983b). Observations in the Mahabharat Lekh. (Pers. comm.)

Griffin, D.M., (1984). The problem of cash generation by subsistence farmers in Nepal prior to 1950. (pers. comm., based on conversation with M.C. Regmi).

Grünenfelder, T., (1977). Management plan for Chauri Range (Chautara Forest Division) 1977-1987 (2034-2044). Dandapakhar. Integrated Hill Development Project (IHDP), HMG/SATA.

Grünenfelder, T., (1980a). Silviculture notes on some tree species used in IHDP. Kathmandu. Integrated Hill Development Project (IHDP) HMG/SATA.

Grünenfelder, T., (1980b). Forest resource inventory report of Marming-Kalinchok forest. (Pers. comm.).

Grünenfelder, T., (1980c). Forestry development in the IHDP region (1974-1980). Final report. Kathmandu. Integrated Hill Development Project (IHDP). HMG/SATA.

Gurung, H., and D.B. Bista, (1975). The land and the people. Kathmandu. HMG, Ministry of Communications, Dept of Information.

Gurung, H., (1978). Distribution pattern and cost of administration in Nepal. Journal of Development and Administrative Studies 1: 1-19.

Haering, B., (1980). Jiri today - Jiri tomorrow? Zurich. ETH.

Hagen, T., (1961). Nepal : The kingdom in the Himalayas. Berne. Kimmerley & Frey.

Hamilton, F.B., (1819). An account of the kingdom of Nepal. (Reprinted, 1971.) New Delhi. Manjushri Publishing House.

HMG Nepal (Forest Resources Survey), (1967). Tree volume tables for Nepal. Kathmandu. Ministry of Forest, Dept. of Forests (Publication No.3).

HMG Nepal (Forest Resources Survey), (1967). Forest statistics for the Terai & adjoining regions. Kathmandu. Ministry of Forests, Dept. of Forests (Publication No.4).

HMG Nepal (Dept. of Medicinal Plants), (1969). Flora of Phulchoki and Godawari. Kathmandu. Ministry of Forests (Bull. Dept. Med. Plants. No.2).

HMG Nepal (Remote Area Development Committee), (1971). Survey report of various districts under Remote Area Development Committee, 1977. (In Nepalese). Kathmandu. Remote Area Development Committee.

HMG Nepal (Economic Analysis & Planning Division), (1971). Farm management study in the selected regions of Nepal, 1968-69. Kathmandu. Ministry of Food & Agriculture.

HMG Nepal (Economic Analysis and Planning Division), (1972). Agriculture statistics of Nepal. Kathmandu. Ministry of Food and Agriculture.

HMG Nepal (Forest Resources Survey), (1973). Forest statistics for the Hill Region. Kathmandu. Ministry of Forests, Dept. of Forests (Publication No.21).

HMG Nepal (Dept. of Medicinal Plants), (1973). Flora of Nagarjun. Kathmandu. Ministry of Forests (Bull. Dept. Med. Plants No. 4).

HMG Nepal (Dept. of Medicinal Plants), (1974). Flora of Phulchoki and Godawari - (Supplement). Kathmandu. Ministry of Forests (Bull. Dept. Med. Plants No.5).

HMG Nepal (Dept of Medicinal Plants), (1975). Royal Botanical Garden Godawari. Kathmandu. Ministry of Forests.

HMG Nepal (Food and Agricultural Marketing Services Dept. (FAMSD)), (1975). Agriculture Marketing Information Bulletin : Vol. V. No. 11. Special Issue. Kathmandu. Ministry of Food, Agriculture and Irrigation Dept.

HMG Nepal (National Planning Commission), (1975). The Fifth Plan (1975-1980); Population policy. Kathmandu. National Planning Commission.

HMG Nepal (Central Bureau of Statistics), (1975). Population census - 1971 : Nepal. Kathmandu. National Planning Commission.

HMG Nepal (Dept. of Medicinal Plants), (1976a). Flora of Langtang and cross section vegetation survey (central zone): Kathmandu. Ministry of Forests (Bull Dept. Med. Plants No.6).

HMG Nepal (Dept. of Medicinal Plants), (1976b). Royal Botanical Gardens : Index Seminium. Kathmandu. Ministry of Forests.

HMG Nepal (Legal Books Management Committee), (1976). Nepal Acts Collection, Part 7, 1976: Food, agriculture, land, water power and forest laws, and their amendments. (In Nepalese). Kathmandu. Ministry of Law and Justice.

HMG Nepal (Food and Agricultural Marketing Services Dept. (FAMSD)), (1976). Agricultural Marketing Information Bulletin, Vol. VI No. 1, Agriculture Year Special Issue. Kathmandu. Ministry of Food, Agriculture and Irrigation.

HMG Nepal (Dept. of Forests), (1976). National forestry plan, 1976. (In Nepalese). Kathmandu. Ministry of Forests.

HMG Nepal (Central Bureau of Statistics), (1977). The analysis of the population statistics of Nepal. Kathmandu. National Planning Commission.

HMG Nepal (Food and Agricultural Marketing Services Dept.), (1977). Agricultural statistics of Nepal, 1977. Kathmandu. Ministry of Food, Agriculture and Irrigation.

HMG Nepal (National Planning Commission), (1980). Sixth Plan (1980-1985). (In Nepalese). Kathmandu. National Planning Commission.

HMG Nepal (National Planning Commission), (1981). The Sixth Plan (1980-1985) - Part I : A Summary. Kathmandu. National Planning Commission.

HMG Nepal, (1981). Nepal's experience in Hill agriculture development. Kathmandu. Ministry of Food and Agriculture.

HMG Nepal (Legal Books Management Committee), (1982). Nepal Civil Service Act, 1956 and Civil Service Regulations, 1964 (with revisions). (In Nepalese). Kathmandu. Ministry of Laws and Justice.

HMG Nepal (National Population Commission), (1982). National population census 1981 : a brief analysis. (In Nepalese). Kathmandu. National Population Commission, Population Division. (Cyclostyle copy for limited circulation.)

HMG Nepal (Central Bureau of Statistics), (1982). Statistical handbook, Nepal. Kathmandu. National Planning Commission Secretariat.

HMG Nepal (Water and Energy Commission), (1983). The Forests of Nepal. Kathmandu. Ministry of Water Resources (Report No. 4/2/200783/1/1).

International Development Agency, Settlement Mission (1972), (quoted in HMG Nepal (Water and Energy Commission), (1983). The Forests of Nepal. Kathmandu. Ministry of Water Resources.

James, N.D.G., (1981). A history of English forestry. Oxford. Blackwell.

Jones, S.R., and D.L. Wigston, (1984). The Warleigh Woods of Tamerton Foliot, Devon, U.K. 1778-1914; a study in the decline of sustained yield wood and timber management. In Steen H.K. (ed). History of sustained yield forestry, pp. 375-381. Forest History Society.

Joshi, B.L. and L.E. Rose, (1966). Democratic innovations in Nepal : a case study of political acculturation. Berkeley, University of California Press.

Kapoor, V.C. and Y.K. Malla, (1978). The infestation of the gall fruit-fly, Procecidochares utilis (Stone) on Crofton weed, Eupatorium adenophorum Sprengel in Kathmandu. Indian Journal of Entomology 40: 337-339.

Kawakita, J., (1977). Culture of Nepal valley. Asian Culture 16: 8-11.

Kessler, C.D.J., (1981). Notes on the raising of some fodder trees for the hills of Nepal. International Tree Crops Journal 1:245-273.

Khanal, N.D., (1982). Local panchayats and class organisations: elections. Kathmandu. The Gorkha Patra. Year 81, issue no. 339. 26 April. (In Nepalese).

Khadka, B.B., and J.C. Gautam, (1981). Demand and production of food grains in the hills. In HMG Nepal, Nepal's Experience in Hill Agriculture development, pp.29-42. Kathmandu. Ministry of Food and Agriculture.

Khadka, R.B., J. Shrestha and A.S. Tamraker, (1984). Ecology of Godawari. In Majupuria, T.C. (ed.) Nepal - Nature's Paradise, pp.408-437. Bangkok. White Lotus Co.

Kirkpatrick, W., (1811). An account of the kingdom of Nepaul. (Reprinted, 1969.) New Delhi. Manjushri Publishing House.

Kumar, D.P., (1980). Nepal: year of decision. New Delhi. Vikash Publishing House.

Landon, P., (1928). Nepal : Vols. I & II. (Reprinted, 1976.) Kathmandu. Ratna Pustak Bhandar.

Landy, J.P., (1982). Tropical forest resources. Rome. FAO.

Levenson, B., (1979). Fuelwood utilization : A study of the demand and the available fuelwood resources at six selected villages. FAO/UNDP IWMP Report No. 9 (1979).

Linnard, W., (1983). Historical importance of charcoal burning in woodlands of Wales. In Guillard J. (ed.), Actes du Symposium Internationale d'Histoire Forestiere Vol I, 206-16. Nancy. Ecole Nationale du Genie Rural des Eaux et des Forets.

Lohani, K.N., T.B. Rayamajhi, K.B. Acharya, N.K. Adhikari, H.N. Sharma, and S.M. Joshi., (1954). Population census of Nepal, 1952/54. Kathmandu. Statistics Dept.

Lohani, P.C., (1979). Economic plans and economic planning in Nepal. Kathmandu. Tribhuwan University, Centre for Economic Development and Administration.

Meiggs, R., (1982). Trees and timber in the ancient Mediterranean world. Oxford. Clarendon Press.

Metz-Fox, J., (1983). Managing public lands in a subsistence economy :the perspective from a Nepali village. Ph.D. dissertation. University of Wisconsin. Madison.

Midgley, S.J., and T.B.S. Mahat, (1978). Reforestation and forest protection in the hills of Nepal - A challenge. In Annual Report of Nepal Nature Conservation Society, 1978.

Montalembert, M.R.de, and J. Clement, (1983). Fuelwood supplies in the developing countries. FAO Forestry Paper No. 42 : 1-125 (1983).

National Planning Commission (1975 and 1980). Quoted in HMG, Nepal (Water and Energy Commission), (1983).

Nepal Rastra Bank, (1980). Quoted in ADB/HMG-Nepal (1982). Nepal agriculture sector strategy study Vol. II.

Nepal Rastra Bank, (1982). Agriculture credit survey Nepal : the survey report (Vol. I) and the technical report (Vol. II). Kathmandu. Nepal Rastra Bank.

Nelson, D.O., P. Laban, G.P. Kandel and B.D. Shrestha, (1980). A reconnaisance inventory of the major ecological land units and their watershed condition in Nepal. Kathmandu. HMG/FAO/UNDP. (Project Field Document WP/17. FO.NEP/74/020.)

Neville, G., (1983a). Demand and supply situation for wood and fodder from forests in the Chautara Division. In Gilmour, D.A. (ed.), Operations of the Nepal-Australia Forestry Project in the Chautara Forest Division, pp.46-59. Kathmandu. Nepal-Australia Forestry Project.

Neville, G.A., (1983b). A note on Ghurmiso (Leucosceptrum canum). In Nepal Forestry Technical Bulletin (NEFTIB) No. 9 (1983), p.18. Kathmandu. Forest Research and Information Centre. (Forest Survey and Research Office, Dept. of Forests).

New Era, (1980). Community and forestry development : Kathmandu. Nepal- Australia Forestry Project.

Niesslein, E., (1984). Can historical research be of help in forest policy decisions? In Steen H.K., (ed.) History of sustained yield forestry: a symposium, pp. 16-20 Forest History Society.

O'Malley, L.S.S., (1907). Bengal District Gazetteers. Calcutta. The Bengal Secretariat Book Depot.

Panday, K.K., (1975). Importance of fodder trees and tree fodders in Nepal. (Post Graduate Diploma Thesis) Zurich. Institute of Plant Production, Federal Technical University, Switzerland.

Panday, K.K., (1982). Fodder trees and tree fodders in Nepal. Bern. Swiss Development Cooperation and Swiss Federal Institute of Forestry Research, Birmensdorf, Switzerland.

Panday, K.K., (1984). 'Effects of altitude on the growth and development of saplings of the fodder tree Artocarpus lakoocha Roxb'. (Doctor of Technical Science Thesis, Swiss Federal Institute of Technology, Zurich, Switzerland.) Zurich. ADAG Administration & Druck A.G.

Pant, Y.P., (1980). Development planning. In Banskota, M., and N.K. Bista (eds.), Nepal's economy: an overview pp. 157-191. Kathmandu. Tribhuwan University, Centre for Economic Development and Administration (TU/CEDA).

Pant, Y.P., and S.C. Jain, (1979). Agriculture development in Nepal : a search for new strategy. Bombay. Vohra & Co.

Pant, Y.P., and S.C. Jain, (1980a). Regional imbalances and process of regional development in Nepal. Delhi. Development Publishers.

Pant, Y.P., and S.C. Jain, (1980b). Rural problems and rural development in Nepal. Delhi. Development Publishers.

Parajuli, D.P., T.B.S. Mahat, D.M. Griffin and K.R. Shepherd, (1981). The Nepal-Australia Forestry Project. Commentary for a poster exhibit at IUFRO Conference, Kyoto.

Patterson, G.N., (1962). Recent Chinese policies in Tibet and towards the Himalayan border states. China Quarterly 12: 191-206.

Pradhan, B. D. (1982). Old land records : iron industry in Chautara, (Pers. comm.). (See Appendix II).

Pradhan, P., (1976). Public administration in Nepal. Kathmandu. Tribhuwan University (Curriculum Development Centre).

Poffenberger, M., (1980). Patterns of changes in the Nepal Himalaya. Delhi. The Macmillan Company of India.

Rackham, O., (1976). Trees and woodland in the British landscape. London. Dent.

Ramakrishnan, P.S., and B.K. Mishra, (1981). 'Population dynamics of Eupatorium adenophorum Spreng during secondary succession after slash and burn agriculture (jhum) in North- Eastern India'. Weed Research 22:77-84.

Rana, P.S.J.B., (1971). Towards an integrated policy of national integration. In Pradhan, P. (ed.) Aspects of development administration. pp.40-46. (CEDA study series, occasional paper no. 2.) Kathmandu. Centre for Economic Development and Administration.

Rana, P.S.J.B., (1973). Regional incidence of tax and allocation of resources. In CEDA study series, quoted in Pant, Y.P. & S.C. Jain, (1980a).

Rana, P.S.J.B., (1974). The Nepalese economy : problems and prospects. Asian Survey, 14:651-662.

Rana, P.S.J.B., (1984). Need of patience for development. Kathmandu. The Gorkha Patra. Year 84, Issue no.219. 16 December. (In Nepalese).

Rajbhandari, H.B., and S.G. Shah, (1981). Trends and projections of livestock production in the Hills. In HMG Nepal, (1981), pp. 43-58.

Regmi, D.R., (1975). Modern Nepal, Vols. I & II. Calcutta. Firma K.L. Mukhopadhyay.

Regmi, M.C., (1971). A study in Nepali economic history (1768-1846). New Delhi. Manjushri Publishing House.

Regmi, M.C., (1976). Land ownership in Nepal. Berkeley. University of California.

Regmi, M.C., (1978a). Land tenure and taxation in Nepal, Vols. I-IV. Kathmandu. Ratna Pustak Bhandar.

Regmi, M.C., (1978b). Thatched huts and stucco palaces. New Delhi. Vikash Publishing House.

Regmi, M.C., (1979). Readings in Nepali economic history. Varanasi. Kishor Vidya Niketan.

Rose, L.E., (1963). The Himalayan border states : buffers in transition. Asian Survey 3: 116-21.

Rose, L.E.and J.T. Scholz, (1980). Nepal : profile of a Himalayan kingdom. New Delhi. Selected Service Syndicate.

Speich, A., (1978). Silvicultural and horticultural notes on some recommended tree species for multiple use mountain forestry development in Nepal. Birmensdorf. Swiss Federal Institute of Forestry Research. (Unpublished manuscript).

Schlich, W., (1922). Schlich's manual of forestry,Vol. I. (First edition 1894). London. Bradbury, Agnew & Co.

Shah, S.G., (1980). Phewa Watershed : Animal husbandry and feed resource survey result and recommendations. Ministry of Forest and Soil Conservation, Dept. of Soil Conservation and Watershed Management, Integrated Watershed Management, Torrent control and Land use Development Project. (HMG/FAO/UNDP - IWM/WP/16 1980.)

Shahi, S.B. (1982). General Election, 1982. Kathmandu. The Gorkha Patra, (8 September).

Sharma, C.K., (1974). Land slides & soil erosion in Nepal. Quoted in ADB/HMG-N, Nepal Agriculture Sector Strategy Study Vol. II, (1982).

Sharma, P.R., (1980). The cultural & social background of Nepal. In Banskota, M. and N.K. Bista (eds.). Nepal's economy: an overview, pp.157-191. Kathmandu. Tribhuwan University, Centre for Economic Development and Administration (TU/CEDA).

Shepherd, K.R., (1981). The Nepal-Australia Forestry Project. Australian Forestry 44: 210-221.

Shepherd, K.R., (1983). Silvicultural and research aspects of the Community Forestry Development and Training Project in Nepal. Annex Report 2 of HMGN/World Bank/UNDP/FAO Joint Mid-Term Review, NEP/80/030 (Limited distribution report).

Shrestha, B.P., and S.C. Jain, (1978). Regional development in Nepal : an exercise in reality. Delhi. Development Publishers.

Shrestha, C.B., and P. Sharma, (1980). Physical setting and natural resources : availability and prospects. In Banskota, M. & N.K. Bista, (eds.) Nepal's economy: an overview pp. 1-70. Kathmandu. Tribhuwan University, Centre for Economic Development and Administration (TU/CEDA).

Shrestha, K., (1979). Nepali names for plants. Kathmandu. Tribhuwan University, Institute of Science, Natural History Museum.

Shrestha, M.K., (1965). A handbook of public administration. Kathmandu. HMG Nepal, Ministry of Panchayat Affairs, Dept of Publicity.

Shrestha, R.L.J., (1982). The relationship between the forest and the farming system in Chautara, Nepal. (Unpublished sub-thesis submitted for the degree of Master of Agricultural Development Economics, Australian National University.)

Simeon, M., M. Grut, T.J. Wormald, K. Watanabe and T.B.S.Mahat, (1979). Nepal Community Forestry Development Project (Draft report of the preparation mission). FAO/World Bank Cooperative Programme. Rome. FAO of UN (Investment Centre). (Report No. 16/79 NEP 12.) (Limited distribution report.)

Singh, S.K., (1977). The Fiscal system of Nepal. Kathmandu. Ratna Pustak Bhandar.

Smith, T.B., (1981). Nepal's political system in transition. World Today 37: 74-80.

Stainton, J.D.A., (1974). Forests of Nepal. London. John Murray.

Stiller, L.F, (1968). Prithivi Narayan Shah in the light of Dibya Upadesh. Ranchi. The Catholic Press.

Stiller, L.F., (1975). The Rise of the House of Gorkha (1768-1816). Kathmandu. Ratna Pustak Bhandar.

Stiller, L.F., (1976). The Silent cry : the people of Nepal, 1816-39. Kathmandu. Sahayogi Prakashan.

Stiller, L.F., and R.P. Yadav, (1979). Planning for people : a study of Nepal's planning experience. Kathmandu. Sahayogi Prakashan.

Temple, R., (1876). Quoted in Regmi, M.C., (1978b).

Thapa, Y.S., (1980). Population, labour force and employment. In Banskota, M. and N.K. Bista (eds.) Nepal's economy: an overview pp. 103-156. Kathmandu. Tribhuwan University, Centre for Economic Development and Administration (TU/CEDA).

The Gorkha Patra, Population of Nepal. 2 November 1983, Issue No. 175. (In Nepalese). Kathmandu.

Thirgood, J.V., (1981). Man and the Mediterranean forest. London. Academic Press.

Thirgood, J.V., (1984). The struggle for sustentation on the island of Cyprus. In Steen, H.K., (ed.) History of sustained yield forestry: a symposium pp. 313-330. Forest History Society.

Tribhuwan University (Energy Research and Development Group), (1976). Nepal: the energy sector. Kathmandu. Institute of Science.

Tripathi, R.S., and A.S. Yadav, (1982). Population regulation of Eupatorium adenophorum Spreng and E.reparium Regel : Effects of population density, soil nitrogen and light intensity. Plant and Soil 65: 35-49.

Troup, R.S., (1921). The Silviculture of Indian Trees Vols. I-III. Oxford. The Clarendon Press, 1921.

Tucker, R.P. (1983). The British colonial system and the forests of the western Himalayas, 1815-1914. In Tucker, R.P. and J.F. Richards, (eds.) Global deforestation and the nineteenth century world economy, pp.146-166. Durham. Duke Press Policy Studies, NC.

Tuladhar, J.M., B.B. Gubhaju and J. Stoeckel, (1977). The population of Nepal : structure and change. Berkeley. University of California, Centre for South and South-east Asia Studies, Research Monograph No.17.

Tuladhar, J.M., B.B. Gubhaju and J. Stoeckel, (1978). Population and family planning in Nepal. Kathmandu. Ratnapustak Bhandar.

Upreti, B.N., (1973). The Royal Chitwan National Park. Kathmandu. National Park and Wildlife Conservation Office. (Unpublished Cyclostyled paper).

Wake, C.J., (1980). Bikas: evolution in Nepal. Kathmandu. Tribhuwan University.

Wallace, M.B., (1981). Solving common-property resource problems : deforestation in Nepal. (Ph.D. Thesis) Harvard University. Cambridge, Massachusetts.

Watanabe, K., A. Speich, I.M. Nakarmi, B. Bhatta and K. Sabnam, (1977). Mountain forest management for community development. Report of the FAO/TCP 6/NEP/04/T Mission to HMG, Ministry of Forests, Department of Forests, Nepal, and FAO/TCP. Rome.

Wertime, T., (1978). Prime culprit : the pyrotechnical furnace or the goat? Conference on deforestation, erosion and ecological change in the ancient Mediterranean and Middle East. Washington. Nat. Mus. Nat. Hist., Smithsonian Institute.

Westoby, J.C., (1983). Facing forestry's future. Keynote address. 10th Triennial conference. Institute of Foresters of Australia. (University of Melbourne, 29 Aug - 2 Sept 1983.)

Wiart, J., (1983). Ecosystem villageois traditionnel en Himalaya Nepalais. Thesis, Universite Scientifique et Medicale de Grenoble.

World Bank, (1974). Agriculture sector survey of Nepal. Quoted in HMG Nepal (Water and Energy Commission), 1983.

World Bank, (1976). Nepal appraisal of rural development project. South Asia Projects Department. (Report No. 959a - NEP.) (Document for restricted distribution.)

World Bank, (1978). Forestry sector review. South Asia Projects Department, Agriculture B Division. Report No. 1952 - NEP. (Document for restricted distribution.)

World Bank, (1979). Nepal agriculture sector review. South Asia Projects Department, Agriculture C Division. Report No. 2205-NEP. (Document for restricted distribution.)

World Bank, (1980). Nepal community forestry development & training project. (Staff Project appraisal report). South Asia Projects Department, Education and Agricultural Institutions Division. (Document for restricted distribution.)

Wyatt-Smith, J., (1982). The agricultural system in the hills of Nepal : the ratio of agricultural to forest land and the problem of animal fodder. APROSC Occasional Papers : 1. Kathmandu. Agricultural Projects Services Centre, Nepal.

Yadav, A.S., & R.S. Tripathi, (1982). A study on seed population dynamics of three weed species of *Eupatorium*. *Weed Research* 22: 69-76.