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*NATURAL  
HISTORY AND  
ECONOMIC BOTANY OF  
NEPAL*

Dibya Deo Bhatt



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# Natural History and Economic Botany of Nepal

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## Preface to the Second Edition

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The author is naturally happy to put the second edition of the book, *Natural History and Economic Botany of Nepal*, into the hands of the readers. This edition incorporates some of the latest information on wildlife, plant distribution, agriculture and economic botany of Nepal, and as such, it would be of greater use for the students of biology, forestry, agriculture and economics. At the same time, the author hopes that the book in its revised form would continue to be patronized by the laymen also.

The impetus to revise this book came not only because of its inclusion as a text for the Certificate Level biology students of the Tribhuvan University, but also due to the generous response from the general public. The author is indeed grateful to all those who encouraged him to undertake the revision of the book and particularly to Orient Longman for constantly helping him in the preparation of the manuscript. Thanks are also due to the National Parks and Wildlife Office of His Majesty's Government for making available the reports and photographs.

Finally, it is the earnest hope of the author that in the context of the new and emerging interest in the conservation and rational use of natural resources, this publication will help in the development of a new perspective in the students of the Tribhuvan University on whom so much of the future of the country rests.

July 15, 1977

DIBYA DEO BHATT

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## Preface to the First Edition

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This book is an attempt to present the basic elements of the natural history and economic botany of Nepal. The author has tried to make the book useful to a wide range of readers — agriculturists, biologists, naturalists and the laymen, all may find something of interest in this small publication.

In writing this book the author has drawn information from many sources and it is hoped that this work will stimulate others to undertake more deeper studies on various aspects of the natural resources of this country. It is also hoped that this will generate a feeling of awareness on the part of our countrymen to conserve and make rational use of these resources.

The author would like to express grateful thanks to Dr. Richard Schultes, Director, Arnold Arboretum, and Editor of the *Economic Botany*, Harvard University for going through the manuscript and speaking kindly about the book. Thanks are also due to Dr. M. L. Bristol, Assistant Professor, Department of Botany, University of Hawaii for making helpful suggestions and giving encouragement in writing this book.

Finally, thanks are also due to Mr. S. R. Basnet, Lecturer, Patan College for making some of the line drawings and the Department of Information of H. M. Govt. of Nepal for undertaking publication of this book.

1970

AUTHOR

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## Chapter I

# The Land

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### Location

Nepal lies between the latitudes  $26^{\circ} 20' \text{ N}$  and  $30^{\circ} 10' \text{ N}$  and the longitudes  $80^{\circ} 15' \text{ E}$  and  $88^{\circ} 10' \text{ E}$  — a roughly rectangular piece of land in the middle Himalayas. It covers an area of 141,577 sq. km. From east to west, at its maximum point, the country is 830 km long ; from north to south, its breadth varies between 145 km and 242 km, yielding a mean width of 200 km.

Nepal is a land-locked country, lying in between the two giants of Asia — India towards the south, east and west, and China towards the north. In the east the Singalila range, which is dominated by the Kangchanjunga, demarcates the boundary of Sikkim and Nepal.

The Himalayas form the northern boundary between Nepal and Tibet only in certain parts. In western Nepal, 'the relief is less rugged than those found on the main Himalayas', and the Tibetan marginal ranges, with an average altitude of 6,096 m, form the 'main watershed between the Rivers Ganges and Tsang-po'.

The Himalayan ranges which run all along the northern frontier of Nepal 'are arranged like narrow strips predominantly longitudinally and the highest Himalayan chains are not massive elevations but narrow ridges. The Himalayas pass into the highly elevated Tibetan plateau...the Tibetan plateau desert often called "The Roof of the World" which has an average elevation of 15,000 ft (4,572 m)'.<sup>1</sup>

1. Good, Ronald. 1953. *The Geography of Flowering Plants*. Longman Green. p. 35.

## Physiography

Nepal can be conveniently divided into seven natural zones<sup>1</sup> which occur in the following order from south to north : 1. The Terai ; 2. the Siwalik hills ; 3. the Mahabharat Lekh (Lekh-mountain) ; 4. the Midlands ; 5. The Himalayas ; 6. the Inner Himalayas ; 7. the Tibetan marginal mountains.

It is significant that 'more than a quarter of the country's land surface exceeds 10,000 ft (3,048 m) in altitude, including a thousand square miles under the realm of snow and ice (2,590 sqm.)'.<sup>2</sup>

Of the total land surface, nearly half lies below 1,524 m and 20 per cent has an elevation of less than 305 m above sea-level. As one flies from south to north, the 'succession of the ranges arranged *en echelon*'<sup>3</sup> becomes at once manifest.

## Terai

The Terai is part of the alluvial *cis-gangetic* plain of northern India. It covers an area of 20,720 sq. km with an average width of 32 km. It contains more than 70 per cent of the cultivated land and narrows from east to west.

## Bhabar

This is a narrow strip of land between the Siwalik (Churiya) and the Terai, extending over 9,065 sq. km. Locally, it is called '*Char Kose Jhadi*' because of its average width of 13 km which was entirely under forest in the past. The soil contains mainly gravel, boulders, and sand brought down by the streams from the Siwalik hills and Mahabharat ranges. This tract of land is characterized by a humid tropical climate and is noteworthy for possessing such valuable timber trees as *Sal* (*Shorea robusta*), *Semal* (*Salmalia malabarica*), *Khair* (*Acacia catechu*), *Sisso* (*Dalbergia sisso*), etc. Here one finds a rich wild life including tiger, elephant, bear, deer, rhino, antelope, etc.

## Churiya

The Churiya range is made up mainly of gravel, pebbles and a conglomerate of sand and limestone deposited by the south flowing rivers during the pliocene times. The soil contains little or

1. Hagen, Toni. 1960. *Nepal. The Himalayan Kingdom*. p. 36.

2. Gurung, Harka. The land. *Nepal in Perspective*. Ed. P. S. Rana and K. P. Malla. CEDA 1973.

3. *Ibid*. p. 25.

no humus and is porous. Geologically, the *Churiya* hills consist of 'a great thickness of detrital rocks, such as coarsely bedded sandstones, clays, conglomerates, and sandy limestones and are known to be derived from the weathering of the granite core of the Central Himalayas'. The depositions of the Siwalik were, at a later date, raised up due to tectonic movements. Ravines, steep hillocks and pillar-like mounds are the most characteristic features of this region, whose altitudes vary from 150 m to 1,368 m. A number of *duns* (valleys), viz. Rapti, Nawal Parasi and Dang-Deokhuri lie between the Siwalik and the Mahabharat ranges.

### **Mahabharat Lekh**

This is the central region of the country, which comprises the high lying valleys and central range of mountains with elevations between 1,524 m and 2,743 m. The climate of this region is cool and humid. The Mahabharat is a fold mountain and is made up of 'little differentiated, metamorphosed, sedimentary and igneous rocks of various ages'.<sup>1</sup> The spurs of the Mahabharat are a conspicuous feature of the topography of this region. The 'heart of the country' as Toni Hagen calls the Nepal midlands, lies between the Mahabharat and the high Himalayas. Hagen divides these midlands into nine natural regions each enclosing a wide valley drained by one of the major branches of the great rivers which form the main drainage system of Nepal. The valleys of Kathmandu, Pokhara, Banepa, etc. in the midland are tectonic in origin.

### **Dun**

There are some minor '*dun*' valleys — Jogbura, Surkhet, Narim Kamala, Trijuga, etc. which are formed as a result of formation of longitudinal basins by the east flowing rivers between the *Churiya* and the Mahabharat. A little over 71 per cent of the Nepalese people live in this central hilly region ; it has about 27 per cent of the land under crop and 58 per cent in forest.<sup>2</sup> Through their sheer industry the farmers living in this part of the country have made terraces on the steep hillsides, sometimes rising from the valley floors (altitude *circa* 609 m) to the top of the high mountains

1. Rimal, D. N. 1967. *A Guide to Mineral Resources in Nepal*. Bureau of Mines, Kathmandu.

2. *Forest Statistics : Hill Region*. Forest Resources Survey. 1973.

which average around 3,500 m. Due to the removal of the forest cover, however, serious soil erosion problems have arisen in this part.

### **Himalayas and 'Tibetan Marginal land'**

In this region are included the outer, lesser and inner greater Himalayas, as well as the Tibetan marginal land, with altitudinal limits varying between 3,657 m to 8,848 m — Mount Everest, the highest mountain in the world. North of the main Himalayan range is an area of wet alpine (altitude 4,014 m to 4,572 m) and dry alpine zones (altitude 4,739 m upwards).<sup>1</sup> This region is characterized by a series of peaks which are part of the great solid wall of snow and ice, which present towards the north a flat tableland, the Tibetan plateau. Such well-known peaks of the Himalayas as Kangchanjunga (8,732 m), Makalu (8,476 m), Everest (8,848 m), Cho Oyu (8,153 m), Ganesh Himal (7,406 m), Machhapuchhre (7,059 m), Nampa (6,754 m) and Api (7,131 m), are found in this region.

The country lying beyond the inner Himalayas and described as the 'Tibetan marginal land' varies in altitude between 3,657 m to 4,572 m. It is an arid zone, as it lies in the rain shadow of the high mountain ranges. The country is windswept and presents a bleak appearance.

The districts of Manag, Mustang, Dolpo, Humla, Tibrikot are part of this distinct geographical unit. It has a vegetation similar to that of Tibet, the landscape is one of 'rolling hills, often smooth and round in outline but sometimes crowned with masses of red and yellow rock which resembles the castle-like peaks of the dolomites'.<sup>2</sup> The peaks, which arise from comparatively flat land, are formed of sandy shales of sedimentary origin but the rocky dolomite peaks are made of limestone.

### **Land Use**

Topographically, the country is principally mountainous. Only 20 per cent of the land lies below 3,048 m.

Nearly a third of the land (32 per cent) is under forest,<sup>3</sup>

1. Swan, Lawrence. 1963. The Ecology of the Heights. *Natural History*.

2. Stainton, J. D. A. 1963. Notes on Journey in West Nepal. p. 2. (Mimeo.).

3. Area under forest has further decreased, according to recent studies.

and 14.9 per cent under permanent snow, as shown in the following Table.

TABLE 1  
LAND USE TYPE (1970/71)

<i>Land Use Type</i>	<i>Area</i>	<i>Sq. km.</i>	<i>Per cent</i>	<i>of Total</i>
I. Agricultural		19,800		13.98
Hilly Region	5,795		4.9	
Terai Region	14,005		9.89	
II. Forest Land		44,750		31.61
Hilly Region	28,750		20.31	
Terai Region	16,000		11.30	
III. Other Land		77,027		54.41
Land Reclaimable	18,600		13.14	
Land Un-reclaimable	26,441		18.68	
Land Under Perpetual Snow	21,121		14.92	
Land Under Riverbeds, Canals and others	10,865		7.67	

Source : Ministry of Food and Agriculture, Economic Analysis and Planning Division, HMG/Nepal.

The difference in altitude combined with an increasing rainfall from west to east has resulted in difference in climate and vegetation — both vertically and horizontally. One should look at the diversity in agriculture, economy and cultures of Nepal against the topographical complexities.

### Regional Variations

There are wide differences in land area — cultivated land and population density in the hills and the Terai, as the following table shows :

TABLE 2  
REGIONAL VARIATION

<i>Criteria</i>	<i>Mountains and hills</i>	<i>Terai &amp; Inner Terai</i>	<i>Kathmandu Valley</i>	<i>Nepal</i>
1. Land area ( % )	72.9	26.7	0.5	100
2. Cultivated land 1970/71 ( % )	26.9	70.7	2.4	100
3. Population density 1971 (sq. km)	58.0	128	1,039	80

Source : Ministry of Food and Agriculture, Central Bureau of Statistics.

The geographical distribution of the population is as follows :

Hills	66,81,287
Terai	39,94,502
Inner Terai	8,80,194

The country has a population of 11.5 million people, with an average density of 213 per sq. mile<sup>1</sup> (80/sq. km). By 1980, the population of Nepal will exceed 13 million. Of the country's total population, 94.4 per cent is engaged in agriculture ; it provides bulk of the GDP — Rs. 6539 000,000 in 1969-70 (at 1964/65 constant prices). Only a small section of the people is engaged in manufacturing (2.47 per cent) and service (2.74 per cent). Agriculture contributed 68.75 per cent of the total GDP at current market prices (1968/69).

According to the latest census, the percentage of rural and urban population is 96.16 and 3.84 respectively.

Nearly two million people fall within the age group of 15-24, of which nearly a third are economically inactive. The majority of the people are Hindus (89 per cent), followed by those who follow Buddhism. There are many ethnic groups : Gurungs, Magars, Rais, Limbus, Tharus, Sunwars, Rajbhanshis, Satars, Danuwars, etc.

From the linguistic standpoint, for more than 6 million people Nepali is the mother tongue; the rest speak Maithili (1.32 million), Bhojpuri (8,64,800), Tamang (5,55,560), Tharu (4,95,881), Newari (4,54,979), Awadhi (3,16,950).

### Demographic Trends

The disparity between the Terai and the hills is also seen in the density of population. To cite an example: Siraha (Terai) has 265 people/sq. km and Terathum 145/sq. km. While the rate of population increase in the hills is 56 per cent, in the Terai it is 129 per cent. Besides the Kathmandu Valley, the hills and mountainous regions cover 72.9 per cent of the land area but they support 53.2 per cent of the total population. The Terai and Inner Terai, which have only 26.7 per cent of the land area, support 41 per cent of the population.

1. Nepal: National Report on Human Environment. National Planning Commission, Kathmandu.

Though the national average of density of population is rather low, in terms of arable land per head, in Nepal it is 0.17 ha. as against 0.07 in Japan, 0.33 in India, 1.05 in USSR and 20.5 in Canada.

In Nepal birth rate is 42.87 per 1,000 which is much higher than that prevalent in the developed countries. A number of factors have contributed to this: early marriage, the desire to have more children, both as an insurance for old age and to fulfil the need for extra hands to work on the farm and manage the family, the uncertainty about survival of new-born children and lack of information on birth control. The 'crude' mortality rate, as estimated by the Bureau of Statistics, is 22.87 per 1,000 which is higher than that in other Asian countries. Infant mortality in Nepal is around 145 per 1,000 newborn babies and life expectancy about 43. According to the demographers, 'a gain of 6 months of life expectancy is expected to be realized every year'.<sup>1</sup> This is attributable to the greater medical facilities in the rural and urban areas. Population problems in Nepal are real because of limited amount of cultivable land in the country, a fall in foodgrain production (2.4 per cent) in the hills and a marginal increase of 1.3 per cent in the Terai. In fact, experts<sup>2</sup> have predicted that at the end of the Fifth Plan period (1980-81), 'there would be a gap in the demand and supply of paddy to the order of 240 thousand tonnes'. In the coming decade, i.e. 1980-90, 'the situation with respect to the gap between demand and supply for "total foodgrains", would, however, be most distressing. By 1985-86, under all situations, the country will have a deficit ranging from 103.04 thousand tonnes under best conditions to about 804.57 thousand tonnes under worst conditions'.

While the need for bringing about an increase in agricultural production cannot be overemphasized, a diversification in the pattern of cereal consumption would reduce too much dependency on rice, millet, wheat and barley. The *per capita* consumption of foodgrains in 1969-70 was: paddy 192.13 kg, maize 72.62 kg, millet 9.21 kg, wheat 19.43 kg (total 293.39 kg). Though there is still a more or less heavy consumption of paddy and maize, an

1. Manandhar, T. B. 1974. *The Growth and Distribution of Population in Nepal*. Bull. Nepal National Commission for Unesco 6 (4) : 39-42.

2. Pant, Y. P. and Jain, S. C. 1972. *Long Term Planning for Agriculture*. Vikas. pp. 166-67.

increase in the amount of millet and wheat is seen during 1961-70 period.

The Central Bureau of Statistics had estimated an annual increase of 1.81 per cent in population during the Third Five Year Plan (1965-70) and for the Fourth Plan (1970-75) around 1.95 per cent. The actual increase in the last decade has been 2.07 per cent. The projected rate of increase in the Fifth Plan is 2.24, which would mean a population of 12.59 million in 1976.

TABLE 3  
ESTIMATES OF POPULATION PROJECTIONS OF NEPAL OVER  
THE PERIOD 1971 TO 1991

<i>Year</i>	<i>Population in Millions</i>	<i>Percentage Annual Increment</i>
1970	11.04	—
1971	11.25	1.81
1976	12.39	1.95
1981	13.78	2.14
1986	15.35	2.28
1991	17.21	2.42

Source : Central Bureau of Statistics.

### Population Problems

The developing countries of the world contain two-thirds of the world population with a growth rate of 2.5 per cent. The world is witnessing an unprecedented increase of 70 million per year, and if the present rate continues, by the year 2000 the world population will be nearly 6.5 billion. At the existing rate of growth, India will have a billion people by 1990, Pakistan 250 million, and Indonesia 200 million. U. N. demographers predict a decline in birth rate for the world as a whole — 38 per thousand to 34 per thousand in 1985. This would still be much greater than the world can manage with the limited resources now available. Reduction in population growth rate would be accompanied by an increase in life expectancy in developed countries — from the present 55 years to 59 years by 1985.

In Nepal new patterns in demography are emerging. Some parts of the country, such as the Terai, are growing faster than the hills, a fact which is ascribed to large-scale migration, as Rana and Thapa (1974) point out :



'Population movement in Nepal, however, is not limited to Terai. Nepal has since long been a population exporting country and the past two censuses indicate that this trend is on the increase. Whereas 2.4 per cent of the total population had migrated outside the country in 1952/54, the corresponding figures for 1961 and 1971 were respectively 3.5 and 5.2 per cent.'<sup>1</sup> Another significant fact which has emerged from present studies is that in the last two decades there has been a steady increase in the re-distribution of population within the country. While in 1952/54 the total population involved was 0.13 per cent, ten years later (1961 census) it had increased to 1.3 per cent, and by 1971 it had more than doubled, viz. 3.6 per cent. During this period, some areas had increased by as much as 75 per cent, while in the hills the density has remained more or less the same. The population in the hill and Terai regions is not increasing at the same rate. In the last decade though the population in the hill and the mountainous regions did not exceed 1.76 per cent, the population in the western Terai doubled during the same period. Furthermore, while the growth rate for the country as a whole was 2 per cent, that of the Terai was 3.4 per cent. Thus the increase in the population in the Terai 'is due to immigrants both from the hills as well as from people born outside the country (98.9 per cent from India)'.<sup>2</sup> The results of the last census also revealed that '9.5 per cent of the total population of the Terai had been born in the hills (including Kathmandu Valley); of the population as a whole, 8 per cent of the total were born in India'.<sup>3</sup> Obviously, one sees a shift in favour of migration of the hill population into the Terai.

The reasons for this shift are not far to be found. Two decades ago, people from the hilly region never ventured to go to the *awl* (malaria) infested inner valleys of Chitwan, Dang-Deokhuri, Udayapur Sinduli, and to parts of the Terai still under heavy forest. The eradication of malaria set in process migration of population on a scale unprecedented in the history of the country. Some people who were habituated to living in the hills at altitudes of 1,524 m to 2,438 m, were also emboldened to move into the

1. Rana, Ratna S. J. B. and Thapa, Yadav S. 1974. 'Population and Development'. T. U. CEDA. Seminar. August 1 and 2, 1974. (Mimeographed, draft paper).

2. *Ibid.*

3. *Ibid.*